Structural Calculations For:

Ogden Point Residence

Lot C

3675 W. Mercer Way

Mercer Island, WA.

Prepared for: Demetriou Architects

Job #: 00641-2017-01-00

Date: January 23rd, 2018

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	
	ASCE 7-10	Address line 1
Wood:	NDS 2015	Address line 2
Steel:	AISC 14th ed.	Address line 3
Concrete:	ACI 318-14	
Masonry:	ACI 530-13	Location: (Lat, Long)

Occupancy Category

Risk Category: II ASCE 7 Table 1.5-1

Seismic Load Summary:

Analysis Procedure:	Equivalent Lateral Force Procedure		
Lateral System:	Special Light Framed Shear Walls		
R:	6.50		C_d= 4
Base Shear V =	35.7	k	Ω_o= 2.5
S_S=	1.404		S_1= 0.54
S_{DS}=	0.94		S_{D1}= 0.54
C_s=	0.144		I_E= 1.0

Wind Load Summary:

I_w=	1		V= 110
Exposure =	C		K_{ZT}= 1.00

Dead Loads:

Roof		
Roofing	2.5	psf
1/2" Sheathing	1.8	psf
Trusses @ 24" oc	2.5	psf
Misc./Mech.	1.4	psf
Ceiling Finish	2.8	psf
Future Solar Panels	4	psf
	15	psf
Use	15	psf
Slab 1		
2" Metal Deck w/ 2" concrete	38.3	psf
2 inch concrete topping	25	psf
Partition	10	psf
	0	psf
	0	
	73.3	psf
Use	75	psf
Slab 2		
2" Metal Deck w/ 6" concrete	88.3	
Partitions	10	psf
	98.3	psf
Use	100	psf

Live Loads:

Snow	25	psf	Deck	60	psf
Floor	40	psf			
Garage	40	psf			

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Project: Ogden Point Lot C

Date: *11/10/2017*

Project #:

Design: JWJ

Sheet: Criteria

Seismic Design

ASCE 7-10 Seismic Analysis
Equivalent Lateral Force Procedure

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)

Ω_o	2.5		
S_S	1.404		2% in 50 yr, Latitude & Longitude lookup
S_1	0.54		2% in 50 yr, Latitude & Longitude lookup
h_n	28.5	ft	
R	6.50		Special Light Framed Shear Walls
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	0.25	(sec)	Eq. 12.8-7
T_0	0.12	(sec)	
T_S	0.58	(sec)	
k	1.000		
Fa	1.00		Table 11.4-1
Fv	1.50		Table 11.4-2
S_{MS}	1.40		Eq. 11.4-1
S_{M1}	0.81		Eq. 11.4-2
S_{DS}	0.94		Eq. 11.4-3
S_{D1}	0.54		Eq. 11.4-4
Cs	0.144		Eq. 12.8-2
	0.337		Eq. 12.8-3 need not exceed, T < T_L
	0.010		Eq. 12.8-5 or 12.8-6 minimum
Cs, design	0.144		
Bldg. Weight	282.5	k	
V = C_SW	40.7	k	Eq. 12.8-1, Strength Level Base Shear
V = C_{Sasd}W	28	k	Eq. 12.8-1 Allowable Stress 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= 1.0

Level	hx (ft)	Wx	hx^k (ft)	$Wxhx^k$	Cvx (%)	Story Shear ASD Fx (k)	Diaphragm Force (ρ not included) ΣV (k)	Fpx (k)	γ=Fpx/Fx
			0.0	0.0	0.000	0.0	0.0	0.0	0.00
			0.0	0.0	0.000	0.0	0.0	0.0	0.00
			0.0	0.0	0.000	0.0	0.0	0.0	0.00
			0.0	0.0	0.000	0.0	0.0	0.0	0.00
Roof	29.0	55.9	29.0	1621.1	0.417	11.9	11.9	11.9	1.00
Main	10.0	226.6	10.0	2266.2	0.583	16.6	28.5	22.8	1.38
	Σ	282.5		3887.3		28.5			

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Project: Ogden Point Lot C *Date:* 1/23/2018
Seismic Analysis Project #:
Design: JWJ
Sheet: L1

Wind Design

ASCE 7-10 Method 2 - Analytical Procedure

Wind Coefficients

Exposure	C	
V=	110	mph
K_d=	0.85	Table 26.6-1
I_w=	1	Table 1.5-2
G=	0.85	26.9.4

Location and Building Dimensions

Calculate Kzt?	no	
Kzt	1	
Roof Angle	31	degrees
Ground to top of roof	33	ft
Bottom of roof to top of roof	9	ft
(mean roof height) h	28.5	ft

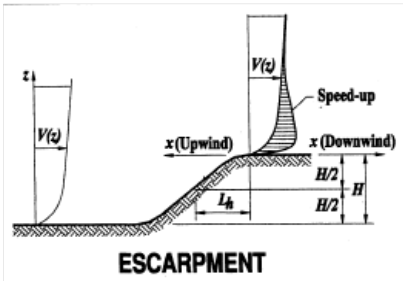
Pressure Coefficients from Figure 27.4-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.5
Windward Roof	0.4
Leeward Roof	-0.7

*Note= Cp values are conservative worst case values

Pressures:

Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lwwalls}$	Strength P_{walls} (psf)	Allowable P_{walls} (psf)
0-15	0.85	22.38	15.22	10.97	**26.18**	**15.71**
15-20	0.9	23.70	16.11	10.97	**27.08**	**16.25**
20-25	0.94	24.75	16.83	10.97	**27.80**	**16.68**
25-30	0.98	25.80	17.55	10.97	**28.51**	**17.11**
30-40	1.04	27.38	18.62	10.97	**29.59**	**17.75**
41-50	1.09	28.70	19.52	10.97	**30.48**	**18.29**
			$P_{ww\ roof}$	$P_{lw\ roof}$	P_{roof} (psf)	P_{roof} (psf)
			8.77	15.35	**24.13**	**14.48**



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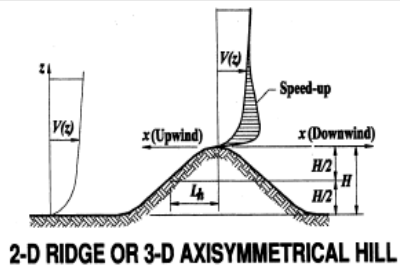

2-D RIDGE OR 3-D AXISYMMETRICAL HILL

$K_{zt} = (1 + K_1K_2K_3)^2$
K_1 = Per Figure
$K_2 = (1 - |x|/\mu L_h)$
$K_3 = e^{-\gamma z/L_h}$
$K_{zt} = 1$, If H/Lh ≤ 0.2

PER FIGURE 26.8-1

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Project: Ogden Point Lot C — *Date:* 11/10/2017

Wind Analysis — Project #:

Design: JWJ

Sheet: L2

WIND ANALYSIS OF ROOF ONLY

N/S

WW only

$V = 15.71\,PSF(.6)(7')(52.75') + 14.48\,PSF(9')(52.75')$

$= 10.35K \rightarrow$ WIND CONTROLS ROOF

7.5 k seismic

E/W WW only:

$V = 16.68PSF(.6)(7')(26.5') + .75(.6)17.75PSF(9')(26.5')$

$= 3.76\,K$

SEISMIC CONTROLS ROOF

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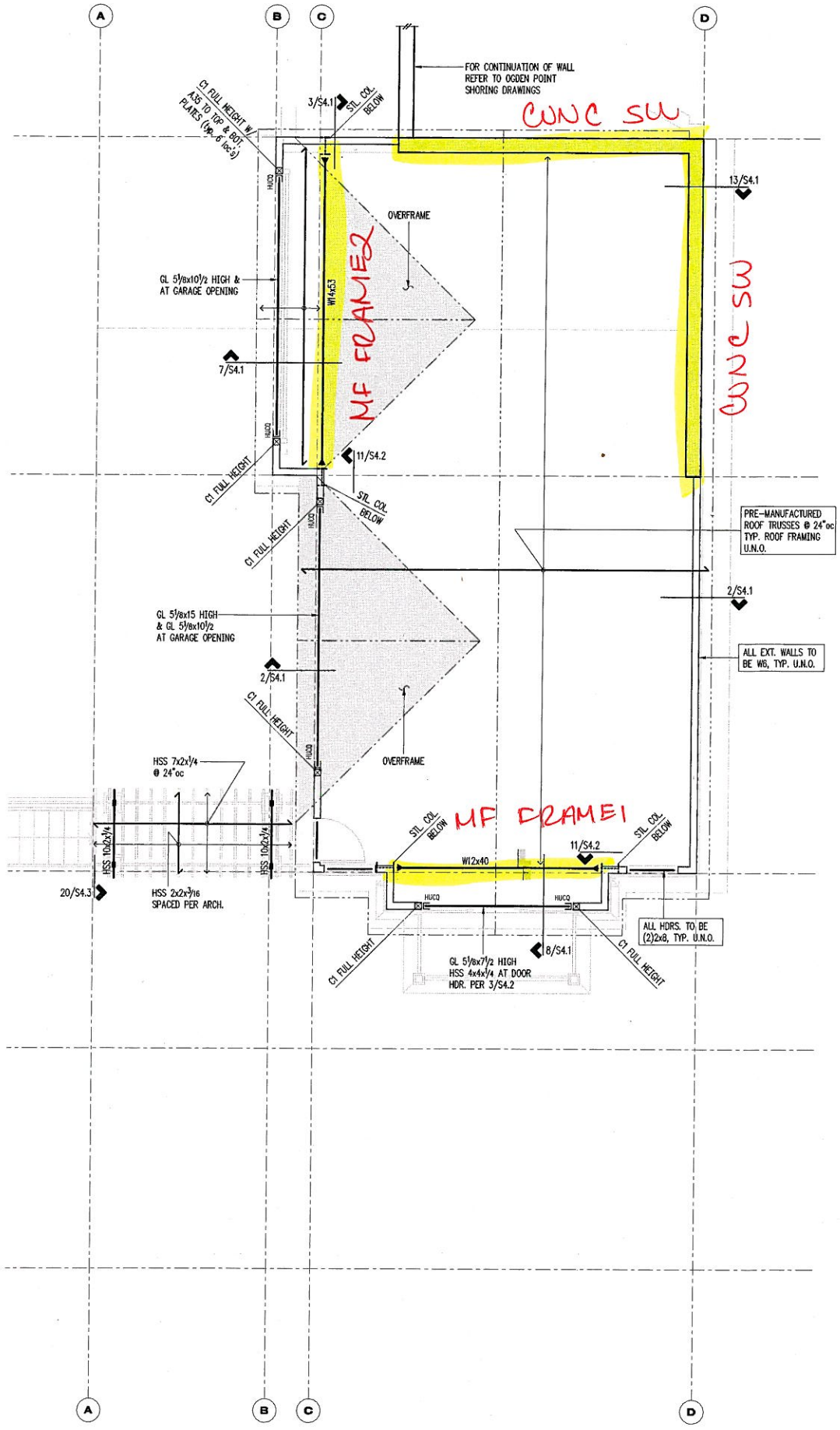
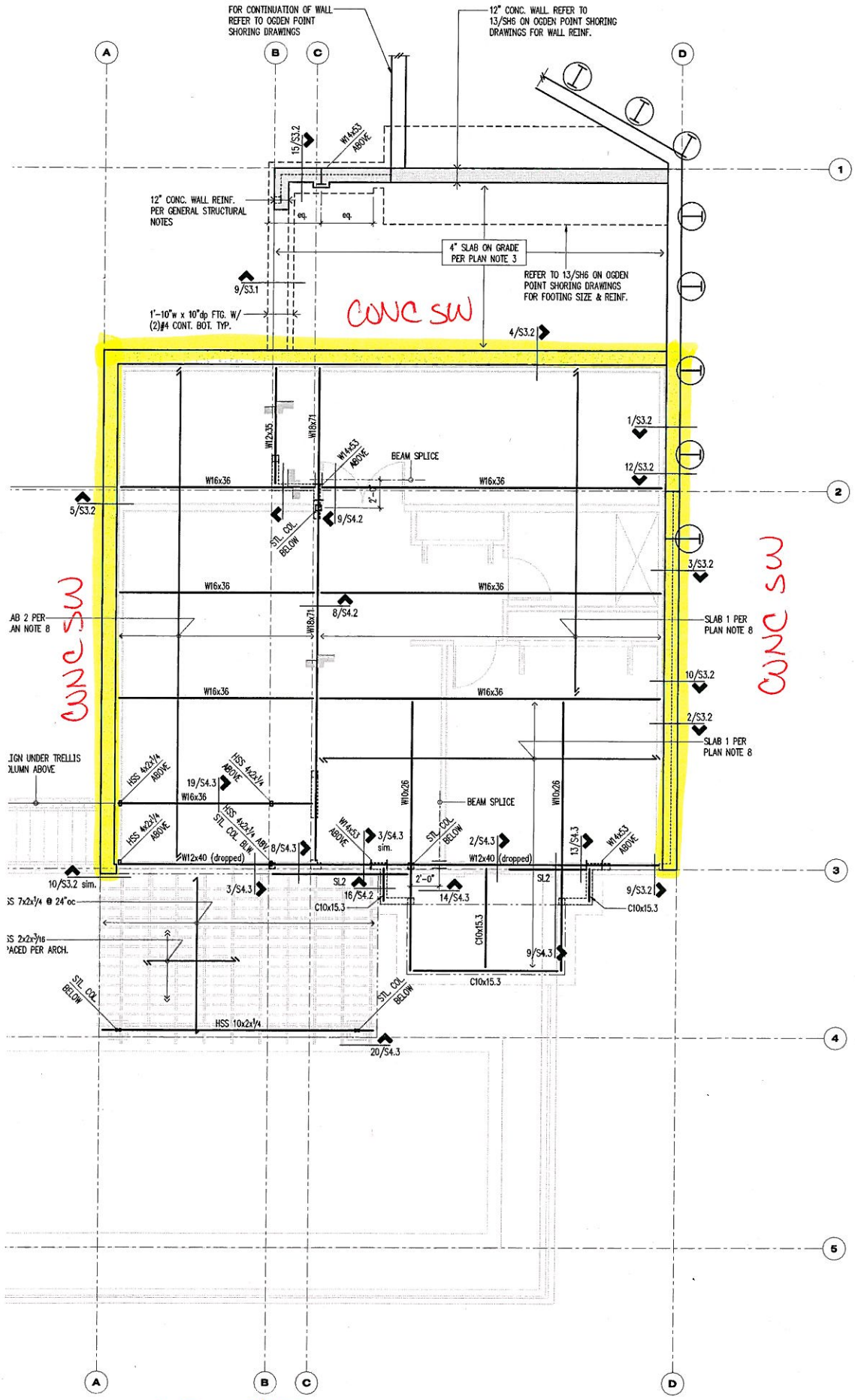


OGDEN POINT
LATERAL KEY PLAN

Lot C Roof Framing Plan

Scale: ¼" = 1'-0"



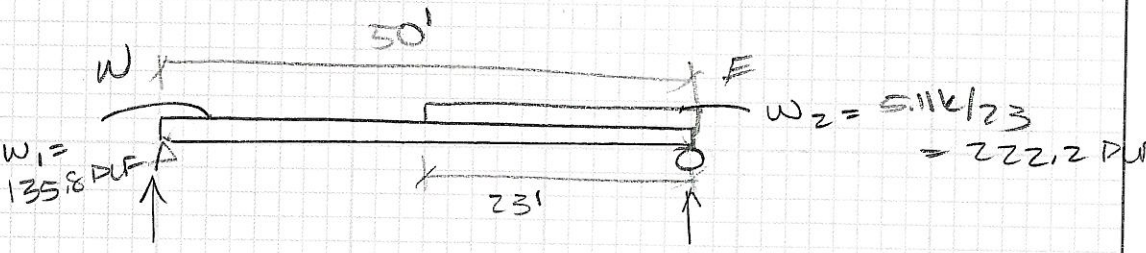
OGDEN POINT
LATERAL KEY PLAN

Main Floor Framing Plan

Scale: 1/4" = 1'-0"

N/S LAT. DESIGN

ROOF F_x = 10.35k WIND
F_x = 11.9k seismic (43% IS WGHT OF WALL



LOAD(k) 4.57k 7.32k

LENGTH(L) MF

SHEAR (PLF)

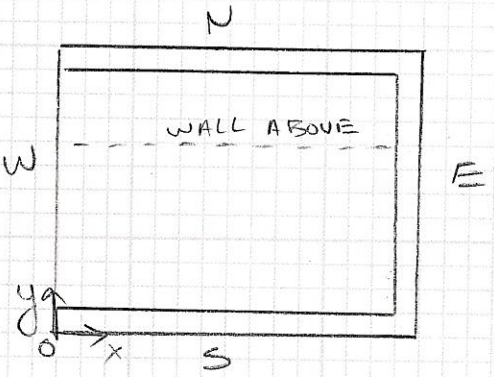
WALL

OT

HD

CONC WALL
V_u = 17.67k (L7)

MAIN LEVEL : RIGID DIAPHRAGM



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Ogden Point Lot C
Rigid Diaphgram Analysis-Main level

COM:

Item	Weight (k)	x	y	Wx	Wy
Slab 1	74	18.5	13	1369	962
Slab 2	50.4	18.5	33	932.4	1663.2
North	27.8	18.5	41	514.3	1139.8
South	48.8	18.5	0	902.8	0
East	30.4	37	20.5	1124.8	623.2
West	5.45	0	20.5	0	111.725
	236.85			4843.3	4499.925

Xcm=	**20.4**
Ycm=	**19.0**

COR

Wall	Length	h/l	Rcy	Rcx	x	y	yRcx	xRcy
North	37	0.270	0	11.252	0	41	461.332	0
South	37	0.270	0	11.252	0	0	0	0
East	41	0.244	12.898	0	37	0	0	477.226
			12.898	22.504			461.332	477.226

Xcr=	**37**
Ycr=	**20.5**

Torsional Eccentricity

	Ecc.	5%	Total
Ey=	-1.50	2.05	**3.55**
Ex=	16.55	1.85	**18.40**

Shear

V= 52.91 k (R=5, ULT)

Tx= 973.61 k-ft
Ty= 187.88 k-ft

Force Distribution N/S Direction

Wall	Ry	Rx	dx	dy	Rd	Rd^2	Fv	Ft	Fv+Ft
North	0	11.252		20.5	230.7	4728.7	0	23.75	**23.75**
South	0	11.252		20.5	230.7	4728.7	0	23.75	**23.75**
East	12.898	0	0		0.0	0.0	52.91	0.00	**52.91**
	12.898	22.504				9457.306			

Force Distribution E/W Direction

Wall	Ry	Rx	dx	dy	Rd	Rd^2	Fv	Ft	Fv+Ft
North	0	11.252		20.5	230.7	4728.7	26.46	4.58	**31.04**
South	0	11.252		20.5	230.7	4728.7	26.46	4.58	**31.04**
East	12.898	0	0		0.0	0.0	0	0.00	**0.00**
	12.898	22.504				9457.306			

DRIFT CHECK OF EAST WALL

$t = 12''$
$L = 41'$
$H = 10'$

$f_c = 2500$ psi
$E_m = 2850$ ksi
$E_v = 1140$ ksi

$P = 52.91$ k

$I = \frac{tL^3}{12} = 1190954.88$ in^4

$A = 5904$ in^2

$$\Delta_c = \Delta_m + \Delta_v = \frac{Ph^3}{3E_m I} + \frac{1.2Ph}{AE_v}$$

$$= \frac{52.91^k (120'')^3}{3(2850\text{ ksi})(1190954.88\text{ in}^4)} + \frac{1.2(52.91)(120'')}{5904\text{ in}^2 \cdot 1140\text{ ksi}}$$

$$= .00008978 + .001132$$

$$= .00122''$$

$C_d(\Delta) = .006'' < .02 h_{sx} = 2.4''$

$C_d = 5$

Shear check:

$\rho V = 1.3(52.91k) = 68.78\text{ k} = V_u$

$A_{cv}\lambda\sqrt{f_c'} = 295.2\text{ k} \Rightarrow$ reinforce per 11.6.

$V_u < \phi V_n$

$V_n = \frac{V_u}{\phi} = 114.64\text{k}$ $\quad \phi = .6$

$< 8 A_{cv}\sqrt{f_c'} = 2361.6\text{k}$ OK ✓

$\phi V_n = \phi A_{cv}(\alpha\sqrt{f_c'} + \rho_t f_y) = 796\text{k}$ ✓

$\rho_t = .00208$ $\quad \frac{h_w}{L_w} = .2$ $\quad \alpha = 2$

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BE CHECK

$$\frac{P}{A} + \frac{Mc}{I} = .032\ ksi < .2(2.5ksi) = .5\ ksi$$

OK ✓

M= 68.78k(10') = 687.8 k-ft

P= 86.1k

ϕM_n = 881 k-ft (2)#4 OK ✓

NORTH AND SOUTH WALL HAVE SMALLER LOAD - OK ✓

01458

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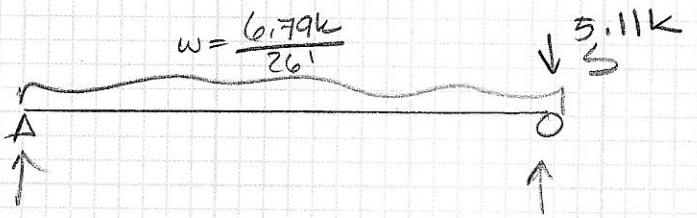
E/W LAT DSGN.

ROOF $F_x = 11.9k$ SEISMIC (43% IS WEIGHT OF CONC WALL = 5.11k

$H = 14'$ N



L(k)

L(H)

V(DUF)

WALL

OT

HD

MF

CONC WALL

CONC WALL $V = 8.51k\left(\frac{6.5}{5}\right)\left(\frac{1}{.17}\right)(1.3) = 20.54k = V_u$

$t = 12''$
$L = 23'$
$H = 14'$

$f_c' = 2.5ksi$
$E_m = 2850ksi$

> than EAST SIDE CONC WALL : 17.67k

$A_{cv}\sqrt{f_c} = 165.6k$ ⇒ reinf. per 11.6

$\frac{V_u}{\phi} = 34.2k < 8A_{cv}\sqrt{f_c} = 1324.8k$ ✓

$\phi V_n = 446.72k$ ✓ $\quad \frac{h_w}{l_w} = .6 \quad \alpha = 2$

$M = 287.6k\text{-}ft$
$P = 48.8k$

$\frac{P}{A} + \frac{Mc}{I} = .037 < .5ksi$

$\phi M_n = 492.35k\text{-}ft$ (2) #4

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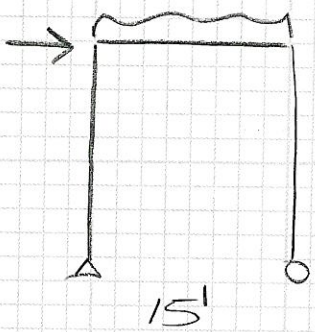
SHEET

MF DESIGN

FRAME 1 - WEST ELEV.



$V = 4.57k\left(\frac{6.5}{3.5}\right)\left(\frac{1}{.7}\right)(1.3) = 15.76k$ ρ

SEISMIC CONTROLS

W = W_{DL} = 30 PLF
W_{LL} = 50 PLF

$C_d = 3$ $\Omega = 2.5$ $R = 3.5$

DRIFT $V_u = 12.12k$ (not including ρ)

$\frac{C_d \delta}{I} = \frac{3(1.17")}{1.0} = 3.51" > .02 h_{sx} = 3.48$ (OK w/ 5%)

BM W12x50 L = 15'

P = 8 k $\phi P = 354k$
M = 116 k-ft $\phi M = 221$ k-ft
V = 16.3k $\phi V = 135k$

$I = .53 < 1.0$

COL W14x53 L = 14.5'

P = 2(15.2) + 1.7 = 39.7k x ρ = 369 k
M = 116 k-ft $\phi M = 261$ k-ft
V = 8 k $\phi V = 154$

$I = .5 < 1.0$

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CONN. @ BASE

MAX T = 28.32k w/ Ω
14.16k w/o Ω

C = 31.5k w/ Ω
17.5k w/o Ω

V = 7.9k

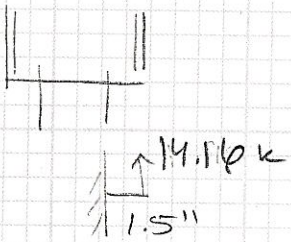
} ULT

TENSION ON BM BLW:

T = 29.12k

(4) 3/4" Ø BOLTS $\phi R_n = 35.7k$ ✓

BASE PL



$M = 21.24 k\text{-in} < \phi S F_y = 24.3 k\text{-in}$ ✓

b = 8" d = .75"

Weld (2) 14" 1/4" FILLET

$\phi R_n = 155.7k$ ✓

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MOM. CONN. — WUFW

CONTINUITY PL – .66" thick

Weld of CONTINUITY PL TO COL: (WORSE CASE → 14x53 bm)

$$\min \begin{cases} \phi T_n = .9(50\,ksi)\,5"(.66") = 148.5\,k \\ \phi V = 1(.6)(50ksi)(.66")(7.9") = 156.4\,k \\ \phi R_n = \phi .6 F_y d_c t_w \left(1 + \dfrac{3 b_{cf} t_{cf}^2}{d_b d_c t_w}\right) \\ \quad = 1(.6)(50)(13.9)(.37)\left(1 + \dfrac{3(8)(.66)^2}{13.9(13.9)(.37)}\right) \\ \quad = 180.64\,k/2 = 90.3\,k \rightarrow \text{governs} \\ \phi T_n = R_y F_y b_{cf} t_f = 1.1(50)(8)(.66) = \dfrac{290}{2} \\ \quad = 145. \end{cases}$$

$$D = \frac{90.3\,k}{2(1.39)(7.9")} = 4.09 \Rightarrow 5/16$$

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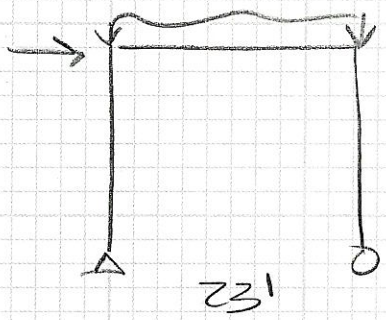
FRAME 2



$V = 3.4\left(\frac{6.5}{3.5}\right)(1.7) = 9.02k$

w/ ρ = 11.7k

$w = w_{DL} = 191$ PLF

$w_L = 319$ PLF

$\frac{C_d\delta}{I} = \frac{3(1.003")}{1} = 3" < 3.48"$ OK ✓

BM W14x53 L=23'

P= 6.9 ϕP = 157k

M=100 k-ft ϕM = 198k-ft

V=13k ϕV = 154k

I = .53 < 1.0

COL W14x53

P= 27 k ϕP = 369k

M=100 k-ft ϕM = 260k-ft

V= 7k ϕV = 154k

I = .42 < 1.0

SAME MF CONN AS FRAME 1

FOUNDATION AND ANCHORAGE

w/o Ω

T= 7.37k V= 5.86k

HILTI: 75%

(4) 3/4" Ø A.B. EMBED 7" INTO CTG @ FOUND.

C= 17.5k(1.7) = 12.25k

A= 2.5'(8') = 20 ft²

PROJECT g=.6(1.4)

DATE

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DESIGN CH

SHEET

SSF STRUCTURAL ENGINEERING

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

OOP CONC WALL ALONG GRID D

$F_p = .4 S_{DS} I_e W_p k_a > .2 k_a I_e W_p$

$S_{DS} = .94$

$W_p = .150 \text{ KCF} (1')(1')(7.125') = 1.09 \text{ KLF}$

$k_a = 1 + \frac{4}{100} = 1 + \frac{50}{100} = 1.5$

$F_p = .615 \text{ KLF}$ (UUT) $> .33 \text{ KLF}$

$F_p = .431 \text{ KLF}$ (ALL)

$F_p = 860 \text{ lb}$ @ EA TRUSS

HS24 EA TRUSS 880lb ✓

CONC RETAINING WALL ALONG GRID 1.5 HAS BEEN EVALUATED FOR SEISMIC LOADS.

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TRELLIS #1

LL = 25 PSF

DL = STL − 10 PSF

15 PSF

W = 1.26 k

V = $C_S W$ = .336 k

C_S = .267

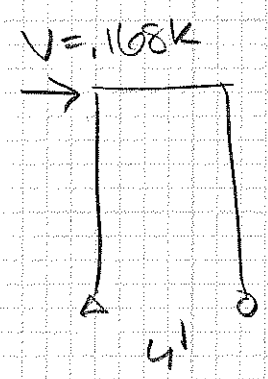
R = 3.5 − OMF

MOM. CONN.

1.1 $R_y M_p$ = 208 k-in (of col)

$T = C = \frac{M}{d}$ = 52k

2) 3/16" 9" Weld ϕR_n = 75k ✓



$\frac{C_d \delta}{I} = \frac{3(.236")}{1.0} = .708"$

< 2.16" ✓

TRELLIS 2

V = 92.1k → base shear

$\frac{C_d \delta}{I} = \frac{(3)(.25)}{1} = .75$ ✓

TRELLIS

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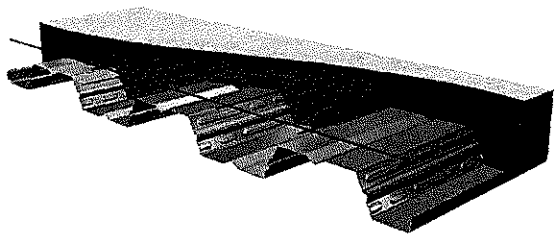
PLW2™ or W2 FORMLOK™

- **4 in. TOTAL SLAB DEPTH**
- **Normal Weight Concrete**



Maximum Unshored Clear Span (ft-in.)

Deck Gage	Number of Deck Spans		
	1	2	3
22	7'-9"	9'-0"	9'-2"
21	8'-6"	9'-8"	10'-0"
20	9'-3"	10'-3"	10'-8"
19	10'-0"	11'-5"	11'-10"
18	10'-5"	12'-3"	12'-5"
16	11'-2"	13'-11"	13'-1"

Shoring is required for spans greater than those shown above. See Footnote 1 on page 51 for required bearing.

Concrete Properties

Density (pcf)	Uniform Weight (psf)	Uniform Volume ($yd^3/100\ ft^2$)	Compressive Strength, f'_c (psi)
145	36.3	0.926	3000

Notes:
1. Volumes and weights do not include allowance for deflection.
2. Weights are for concrete only and do not include weight of steel deck.
3. Total slab depth is nominal depth from top of concrete to bottom of steel deck.

Allowable Superimposed Loads (psf)

Deck Gage	Number of Deck Spans	Span (ft-in.)													
		6'-0"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"	11'-6"	12'-0"	12'-6"	13'-0"	14'-0"
22	1	337	261	232	172	152	135	120	107	96	86	78	70	63	57	46
	2	337	261	232	209	189	171	120	107	96	86	78	70	63	57	46
	3	337	261	232	209	189	171	120	107	96	86	78	70	63	57	46
21	1	377	292	260	234	211	155	139	125	112	101	91	82	75	68	55
	2	377	292	260	234	211	192	175	125	112	101	91	82	75	68	55
	3	377	292	260	234	211	192	175	161	112	101	91	82	75	68	55
20	1	400	324	288	259	234	213	158	142	128	116	105	95	86	79	65
	2	400	324	288	259	234	213	195	179	128	116	105	95	86	79	65
	3	400	324	288	259	234	213	195	179	165	116	105	95	86	79	65
19	1	400	389	347	311	275	242	214	190	161	146	133	121	110	99	81
	2	400	389	347	311	275	242	214	190	169	152	133	121	110	99	81
	3	400	389	347	311	275	242	214	190	169	152	136	121	110	99	81
18	1	400	400	386	335	293	258	229	203	181	162	146	131	118	105	84
	2	400	400	386	335	293	258	229	203	181	162	146	131	118	105	84
	3	400	400	386	335	293	258	229	203	181	162	146	131	118	105	84
16	1	400	400	396	356	322	292	261	233	208	187	157	143	131	116	93
	2	400	400	396	356	322	292	261	233	208	187	168	148	131	116	93
	3	400	400	396	356	322	292	261	233	208	187	168	148	131	116	93

See footnotes on page 51.

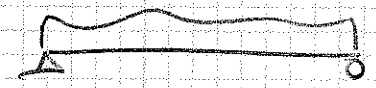
Shoring required in shaded areas to right of heavy line.

Allowable Diaphragm Shear Strengths, q (plf) and Flexibility Factors, F (in./lb. x 10^6)

Attachment Pattern	Deck Gage		Span (ft-in.)													
			6'-0"	7'-0"	7'-6"	8'-0"	8'-6"	9'-0"	9'-6"	10'-0"	10'-6"	11'-0"	11'-6"	12'-0"	12'-6"	13'-0"	14'-0"
36/3	22	q	1674	1635	1619	1606	1594	1583	1573	1565	1557	1550	1543	1537	1532	1527	1518
	21	q	1680	1637	1620	1605	1592	1580	1570	1560	1552	1544	1537	1530	1524	1519	1509
	20	q	1689	1643	1624	1608	1593	1580	1569	1559	1549	1541	1533	1526	1519	1513	1503
	19	q	1714	1659	1637	1618	1602	1587	1573	1561	1550	1540	1531	1523	1515	1508	1496
	18	q	1739	1678	1653	1632	1613	1596	1581	1568	1556	1545	1534	1525	1517	1509	1495
	16	q	1809	1733	1702	1675	1652	1631	1612	1595	1580	1566	1553	1541	1531	1521	1503
36/4	22	q	1834	1762	1734	1708	1686	1667	1649	1633	1619	1606	1594	1583	1573	1563	1547
	21	q	1867	1788	1756	1729	1704	1683	1663	1646	1630	1616	1602	1590	1579	1569	1551
	20	q	1902	1816	1781	1751	1725	1701	1680	1661	1643	1628	1613	1600	1588	1577	1557
	19	q	1977	1877	1836	1801	1770	1742	1718	1696	1675	1657	1640	1625	1611	1598	1575
	18	q	2044	1931	1886	1847	1812	1781	1753	1729	1706	1686	1667	1650	1634	1619	1593
	16	q	2212	2071	2015	1965	1922	1883	1848	1817	1789	1763	1740	1718	1698	1680	1647

See footnotes on page 51.

6" SLAB



9'

b=12" d=3" h=6"
f_c = 2.5ksi

W = 1.2 DL + 1.6 LL
= 1.2(100 PSF) + 1.6(40)
= (184 PSF)(1') = 184 PLF

M = 1.86k-ft ØM = 3.68k-ft ✓ #5@12"oc EW.
V = .83k ØV = 2.7k ✓ center

5 SPAN:

HEAVY TRUCK LOADING

P = 1.6(8k)(4.5²/12²) = 1.8k

w_{DL} = 120 PLF w_{LL} = 64 PLF

2.64

M = 2.83k-ft ØM = 3.68 k-ft
V = 1.75k ØV = 2.7k

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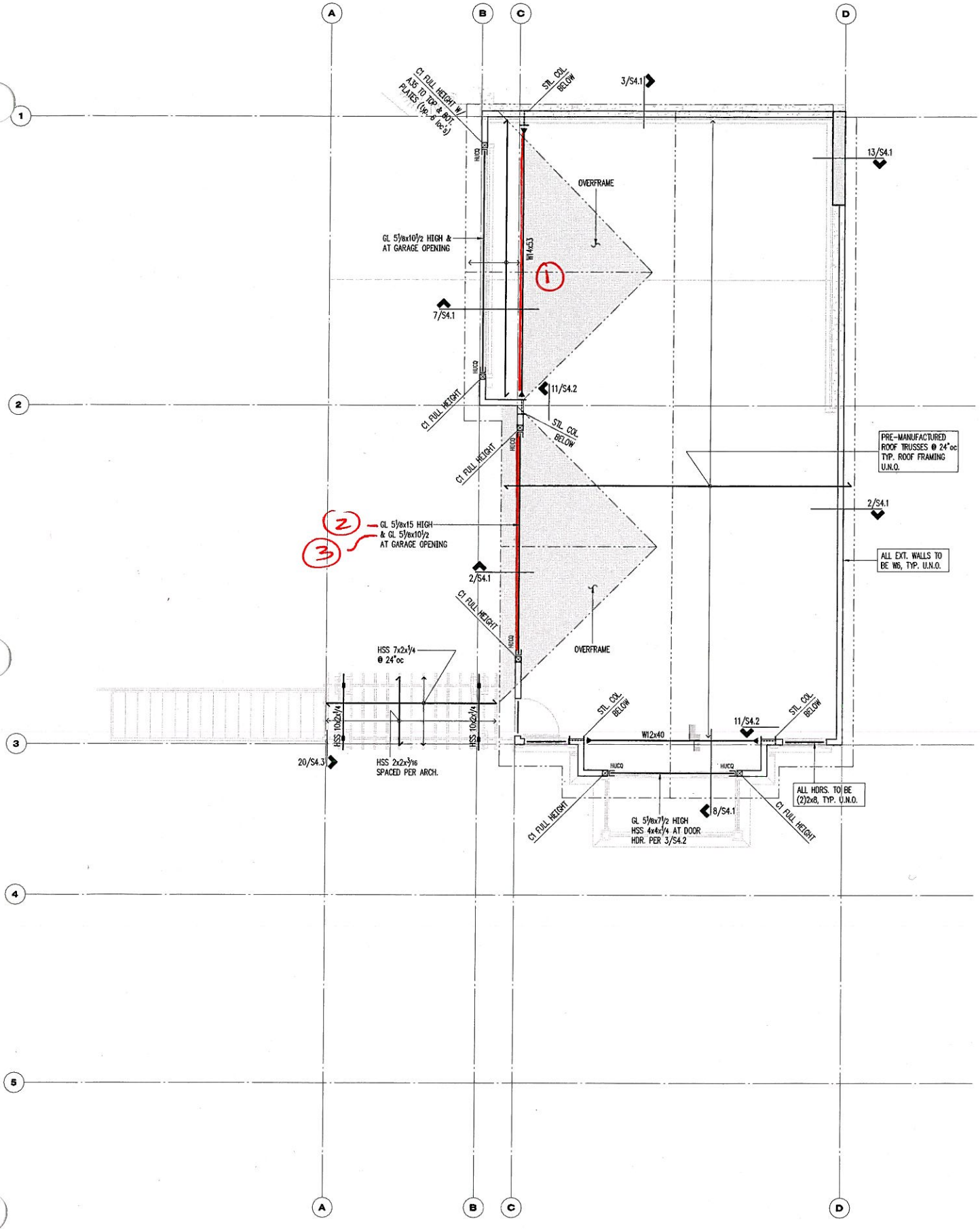
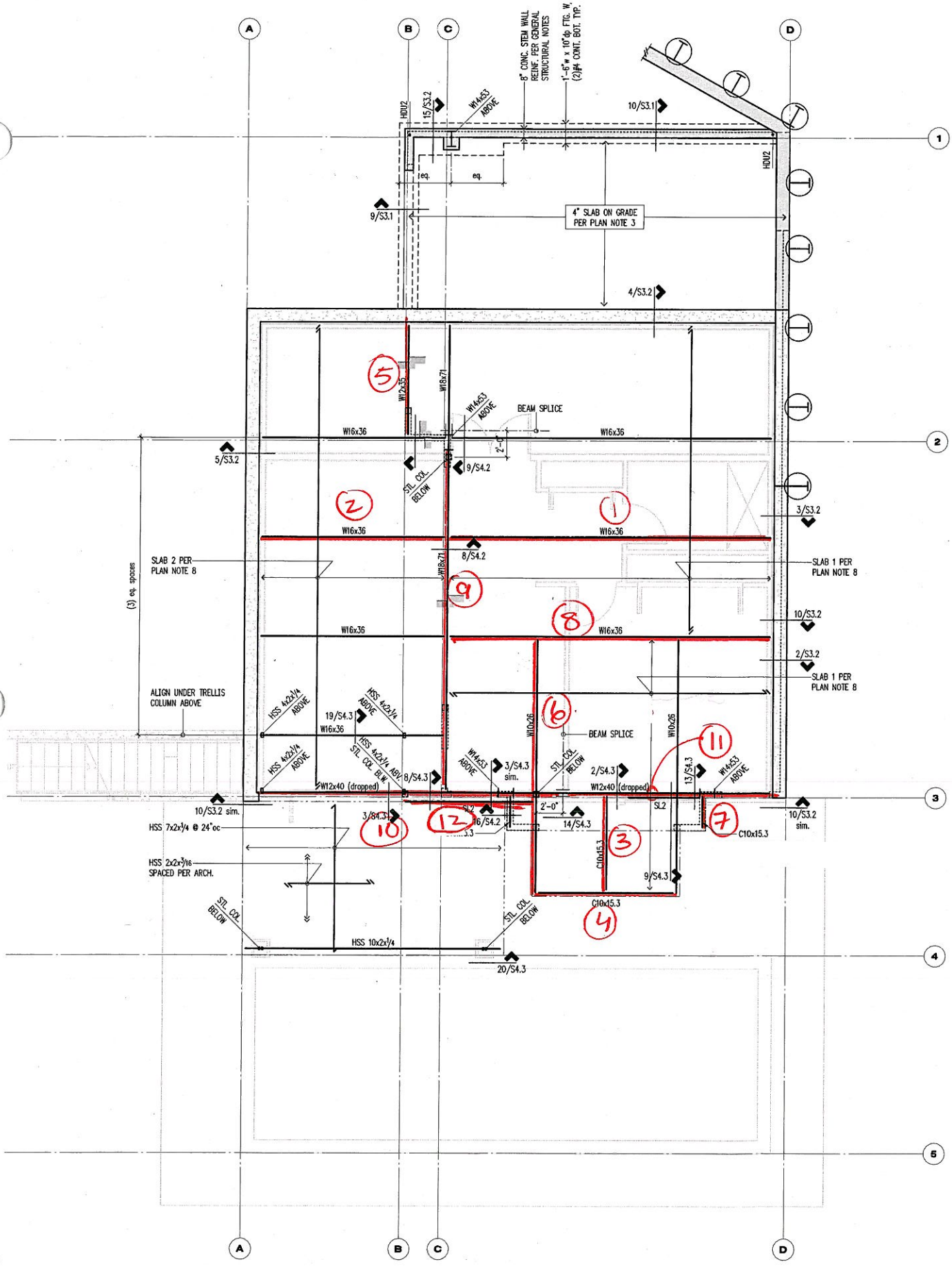


OGDEN POINT

GRAVITY KEY PLAN

Lot C Roof Framing Plan

Scale: ¼" = 1'-0"

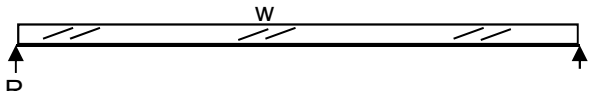


OGDEN POINT
GRAVITY KEY PLAN

Main Floor Framing Plan

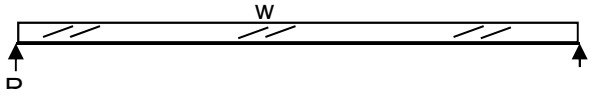
Scale: 1/4" = 1'-0"

Beam		B1		PSL	1	x 1
w=	510	plf		R=	5,865	lbs
L=	23	ft		M=	33,724	ft-lbs
b=	1.00	in		Fb=	2,428,110	psi
d=	1.00	in		Fv=	8,734	psi
E=	1	ksi		Δ=	##########	in
Cv=	1.00	≤1.0		l /	0	

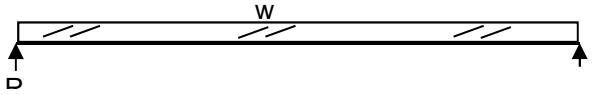


Steel Size					W14X53	
I =	541	in^4		Fy=	50	ksi
Δ =	0.20	in		Mn/Ω =	217.3	k-ft
l /	1348			Vn/Ω =	83.6	kips

Beam		B2		GL	5 1/8 x 15	
w=	590	plf		R=	5,163	lbs
L=	17.5	ft		M=	22,586	ft-lbs
b=	5.13	in		Fb=	1,410	psi
d=	15.00	in		Fv=	86	psi
E=	1800	ksi		Δ=	0.48	in
Cv=	1.00	≤1.0		l /	438	



Beam		B3		GL	10 1/2 x 5 1/8	
w=	156	plf		R=	1,365	lbs
L=	17.5	ft		M=	5,972	ft-lbs
b=	10.50	in		Fb=	1,559	psi
d=	5.13	in		Fv=	36	psi
E=	1800	ksi		Δ=	1.55	in
Cv=	1.00	≤1.0		l /	135	



STRUCTURAL ENGINEERING

2124 Third Avenue . Suite 100 . Seattle . WA 98121
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Project: Ogden Point Lot C

Roof Framing

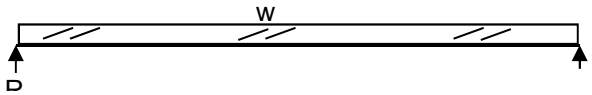
Date: 11/10/17

Project #:

Design: JWJ

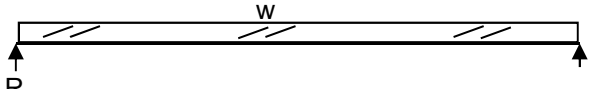
Sheet:

Beam		B1		PSL	1	x 1
w=	977.5	plf		R=	11,974	lbs
L=	24.5	ft		M=	73,343	ft-lbs
b=	1.00	in		Fb=	5,280,699	psi
d=	1.00	in		Fv=	17,839	psi
E=	1	ksi		Δ=	##########	in
Cv=	1.00	≤1.0		l /	0	



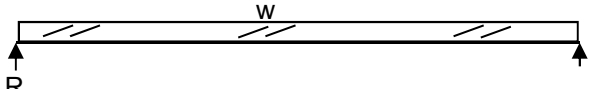
Steel Size					W16X36	
I =	448	in^4		Fy=	50	ksi
Δ =	0.61	in		Mn/Ω =	159.7	k-ft
l /	482			Vn/Ω =	79.7	kips

Beam		B2		PSL	1	x 1
w=	1190	plf		R=	8,628	lbs
L=	14.5	ft		M=	31,275	ft-lbs
b=	1.00	in		Fb=	2,251,778	psi
d=	1.00	in		Fv=	12,793	psi
E=	1	ksi		Δ=	##########	in
Cv=	1.00	≤1.0		l /	0	



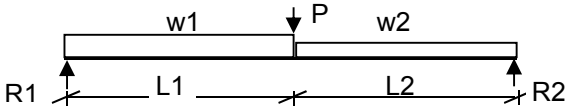
Steel Size					W16X36	
I =	448	in^4		Fy=	50	ksi
Δ =	0.09	in		Mn/Ω =	159.7	k-ft
l /	1910			Vn/Ω =	79.7	kips

Beam		B3		PSL	1	x 1
w=	603.75	plf		R=	2,264	lbs
L=	7.5	ft		M=	4,245	ft-lbs
b=	1.00	in		Fb=	305,648	psi
d=	1.00	in		Fv=	3,321	psi
E=	1	ksi		Δ=	515781.74	in
Cv=	1.00	≤1.0		l /	0	



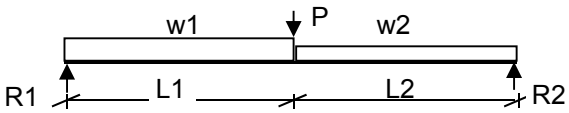
Steel Size					C10X15.3	
I =	67.3	in^4		Fy=	50	ksi
Δ =	0.02	in		Mn/Ω =	39.7	k-ft
l /	4087			Vn/Ω =	39.4	kips

Beam		B4		PSL	1	x 1
w1=	-	plf		R1 =	1,132	lbs
w2=	-	plf		R2 =	1,132	lbs
L1=	5	ft		M =	5,943	lb-ft
L2=	5	ft		Fb =	427,896	psi
X=	5.3	ft		Fv =	1,698	psi
P=	2,264	lbs		Δ=	##########	in
b=	1.00	in		l /	0	
d=	1.00	in		Cv=	1.00	
E=	1	ksi				



Steel Size					C10X15.3	
I =	67.3	in^4		Fy=	50	ksi
Δ =	0.048	in		Mn/Ω =	39.7	k-ft
l /	2606			Vn/Ω =	68.2	kips

Beam		B5		PSL	1	x 1
w1=	-	plf		R1 =	826	lbs
w2=	-	plf		R2 =	254	lbs
L1=	2	ft		M =	1,652	lb-ft
L2=	7	ft		Fb =	118,927	psi
X=	2.0	ft		Fv =	1,239	psi
P=	1,080	lbs		Δ=	##########	in
b=	1.00	in		l /	0	
d=	1.00	in		Cv=	1.00	
E=	1	ksi				



Steel Size					W12X35	
I =	285	in^4		Fy=	50	ksi
Δ =	0.001	in		Mn/Ω =	127.7	k-ft
l /	68160			Vn/Ω =	106.9	kips

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Project: Ogden Point Main Floor

Date: 11/10/17

Project #:

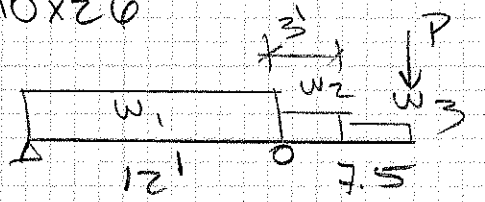
Design: JWJ

Sheet:

MAIN FRL

B6

W10x26



W_1 = 1006.3 PLF P = 1.13k

W_2 = 431 PLF

W_3 = 316.3 PLF

R_1 = 4.5k R_2 = 11.4k

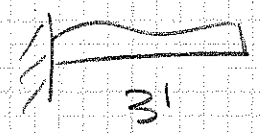
M = 18k-ft M/2 = 50.6k-ft

V = 8k V/2 = 53.6

Δ_{cont} .116 24/1157

Δ = .048 L/3000

C10x15.3 B7



W = 115 PLF + 380 = 495 PLF

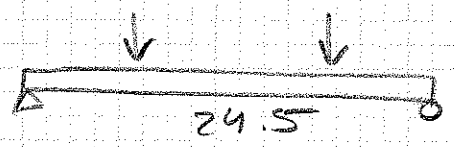
R = 1.5k

M = 2.23k-ft M/2 = 28k-ft

V = 1.5k V/2 =

Δ = .004" L/18000

W16x36 B8



W = 460 PLF

P = 4.5k @ 7', 17.5'

R_1 = 10.14k R_2 = 10.14k

M = 66k-ft M/2 = 160k-ft

V = 10.14 V/2 = 95.8k

Δ = .567" L/518

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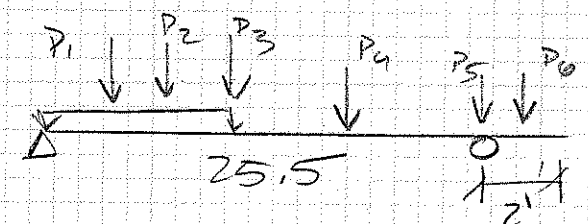
W18x71 B9



P_1 = 6.4k W16x36 @ 4'

P_2 = 7.1k ROOF @ 6'

P_3 = 6.67 + 10.14k = 16.8k (2) W16x36 @ 12'

P_4 = 6.67 + 11.27 = 18k (2) W16x36 @ 20'

P_5 = 5.3k ROOF @ 25'

P_6 = 7.2 + 21.4 + 15.75 = 44.4k COL + (2) W16x36 @ 26.5'
→ w/o EQ − 28.6k

w = 403 PLF

w_{bm} = 71 PLF

R_1 = 27k R_2 = 62k

W12

R_1 = 26.6k R_2 = 78.2k → HSS5x5x1/4

$P_{1/2}$ = 91.3k

M = 199k-ft $M_{1/2}$ = 364k-ft L_b = 8'

V = 45 k $V_{1/2}$ = 183k

Δ = .637" L/480

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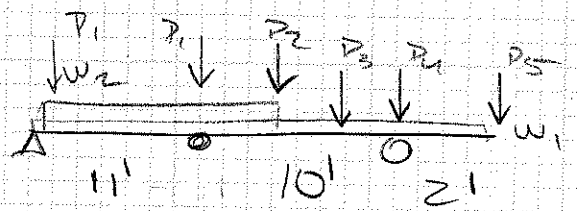
W12X40 B10



$W_1 = 240$ PLF

$W_2 = 350$ PLF

$P_1 = 1.32$k @ 11', 5'

$P_2 = 28$k @ 14'

$P_3 = 1.5 + 25$ (EQ) @ 19'

$P_4 = 11.4$k @ 21'

$P_5 = 15.4$k (7.6 w/o EQ)

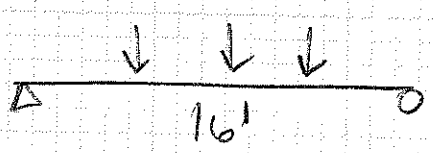
$R_1 = 1.1$ $R_2 = 29.2$ $R_3 = 38.9$k

$M = 39$k-ft $M/\Omega = 128$k-ft

$V = 23$k $V/\Omega = 70.2$k-ft

$\Delta = .05"$ $L/2400$

W12X40 B11



$P_1 = 2.3$k @ 3.5'

$P_2 = 11.4$k @ 8.5'

$P_3 = 1.5 + 25$k @ 11'
Σ EQ

$R_1 = 15.4$k $R_2 = 24.8$k

$M = 124$k-ft $M/\Omega = 138$k-ft

$V = 25$k $V/\Omega = 70.2$k

$\Delta = .231"$ $L/829$

$L_b = 8'$

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SSF STRUCTURAL ENGINEERING

PROJECT

DATE

PROJ. #

DESIGN

SHEET

UNTELS B12

SL2 L 6x 3½x ⅜

W= 103.2 PLF

L= 9.5'

M= 11641b-ft < $\frac{S F_y}{\Omega}$ = 4.88k-ft

Δ= .06" L/1906

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STRUCTURAL ENGINEERING

PROJECT

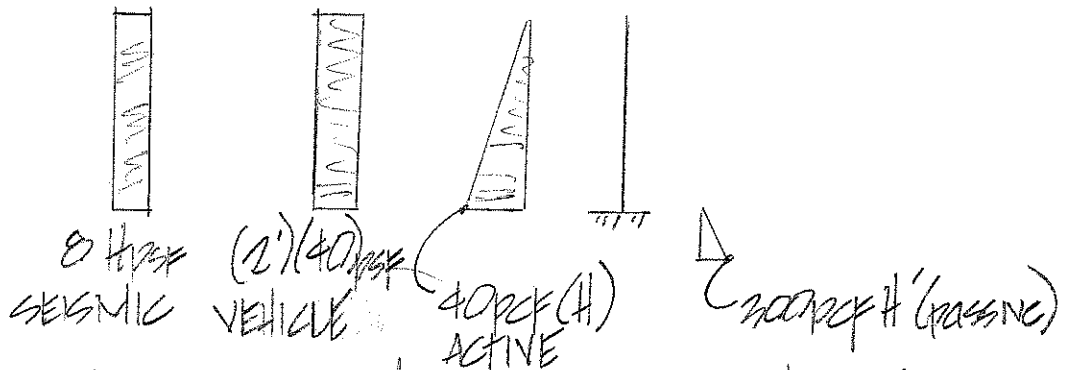
DATE

PROJ. #

DESIGN

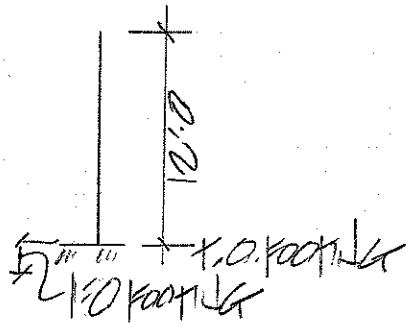
SHEET

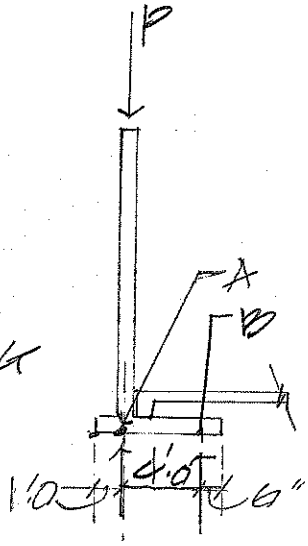
RETAINING WALLS



F.S. O.T = 1.5 ; F.S. SLIDING = 1.5 ; F.S. at SEISMIC = 1.2 SLIDE

BASEMENT WALLS





LBS./FT. = P

WALL = 12" × 13'-0"	=	1.95
FTG = 12" × 5'-6"	=	.825
SLAB = (.075 k/sf)(3')	=	.225
ROOF: DL = 12'(.015)	=	.180
LL = 12'(.025)	=	0.3
FLR: DL = 9.5'(.03)	=	.285
LL = 9.5'(.04)	=	.380
M.FLR DL = 9.5'(.03)	=	.285
9.5'(.04)	=	.380

EVLL = 1.00 k/LF
EVDL = 3.75 k/LF

- O.T.

R PASSIVE = 3.30k ; HT = 4.29'
MOT = 14.15k'
END A = 0;
-14.15k' - .825k/LF(1.75') - .225(75')
+RB(4') = 0 ; RB = 4.03k/FT. ; PILE CAPACITY = 20k
SPACING OF PILES = 20k / 4.03k/ft. ; S = 5'-0
S W/ F.S. = 1.5 ; $S_{MAX\ OT}$ = 3.33'

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STRUCTURAL ENGINEERING

PROJECT agreed point
DATE 3.03.2017
PROJ. # RDH
DESIGN
SHEET RET.1

RETAINING WALLS cont'd

BASEMENT WALLS (cont'd)

END B=0; (INCLUDE LIVE LOADS)

$-14.5k' + .025klf(2.25') + .345(3.25') + (1.95+1.81k)4' - R_A(4'0)$; $R_A = .880klf$

MAX DIST BET PILES:

$20kips/.880klf = 22'0$

CONC. DESIGN:

FTG:

END A=0;

$(1.6)(-14.5k') - .025klf(1.75')(1.2) - (.225)(.75')(1.2) - (.120)(.75')(1.6) + R_B(4') - 0$ (12')(6') SEISMIC

$\frac{R_B}{Ft} = 6.90klf$; CHECK SHEAR: PUNCHING - $V_U = 6.0^k/(3.33')$

$V_U = 22.97k$

$\frac{M_U}{3.33'} = (22.97)(3\frac{1}{2}')$

$M_U = 80.4k'$; $M_U/Ft. = 24.1k'$

12" dppg: d=9" ; BRG. ℄ = 4"

$b_o = (4" + 4" + 9")2 + (2)(18.4")$

$b_o = 78"$

$V_c = 4b_o \cdot d\sqrt{f'c}$

$V_c = 140.4k$

$\phi V_c = 105k$

d=9" ; TRY #7's @ 9"o/c

$A_s = 0.6$; $a = 1.88$

$a/2 = .941$

$M_N = 24.18k'$; $\phi M_N = 21.75k'$

$M_U/9"o/c = 18.1k' < \phi M_N = 21.75k'$

$a/d = .2088 < .85\left(\frac{87,000}{87,000+60000}\right)$ TENSION-CONTROLLED.

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BASEMENT WALL CONT'D:

WALL DESIGN

M_u WALL $= (1.6)(-14.5k') - \frac{8(12')\text{PSF}}{1000}(6')$

M_u WALL $= 23.8k'/\text{FT.}$

$d = 12" - 1.5"$ $d = 10.5"$

TRY #7's @ 12" o/c: $a = 1.41$; $a/2 = .71$

$\frac{M_u}{1\text{FT.}} = 29.37k'$ $\phi M_u = 26.43k' > 23.8k'$

RETAINING WALL @ BASEMENT:

WALL: 12" conc. wall w/ #7's @ 12" o/c VERT. & #4's @ 16" Hz @ EXT. FACE & #4's @ 16" o/c VERT & 16" o/c Hz I.F.

12" dp x 5'-6" conc. FOOTING w/ #7's @ 9" o/c BOTT. & (5) #5's LONG.

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SSF STRUCTURAL ENGINEERING

OGDEN POINT — PROJECT

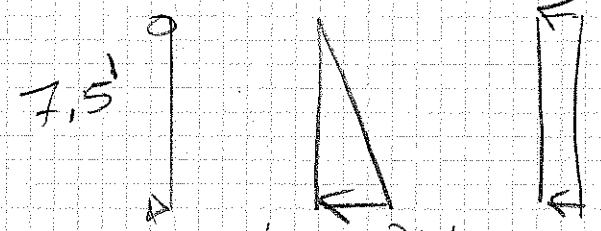
2.23.2017 — DATE

PROJ. # KDH

DESIGN RET.3

SHEET

POOL RETAINING WALL



M= 2.8k-ft ϕM_n = 7.44k-ft ✓

V= 2k $\frac{\phi V_c}{2}$ = 3.8k ✓

10" CONC. WALL w/ #4@12"oc EW EF

b=12" f'_c = 2.5ksi

d=8.5" f_y = 60ksi

$A_{s,min}$ = .34in²/ft > .2in²/ft

$A_{s,provided}$ = .2in²/ft > 1.33 $A_{s,req'd}$ OK ✓

= 1.33(.07) = .093in²/ft

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SSF STRUCTURAL ENGINEERING

PROJECT O.P. LOT C POOL RET. WALL

DATE 12/4/17

PROJ. # JJJ

DESIGN RET. 4

SHEET

FTG5

6" SLAB w/ #4 @12"oc E.W. centered

$L_{max} = 12.75'$ 3 SPAN

Min thickness $\frac{\ell}{28} = 5.46 < 6"$ OK ✓

$W_u = 1.2(85PLF) + 1.6(40PLF) = 166PLF$

$M_u = w\ell_n^2/10 = 2.1$ k-ft $\quad \phi M_n = 2.5$k-ft ✓

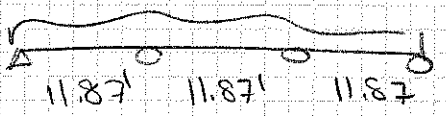
$V_u = 1.26k \quad \phi V_n = 2.7k$ ✓

$b = 12" \quad d = 3"$

$f_c = 2.5ksi$

$\ell_n = 11.25'$

GRADE BM 18" x 18" dp GRADE BM
w/ (3) #5 TOP & BOT



$W_u = 2.37 kLF + .41 = 2.78 kLF$

$M_u = -39.2$k-ft $\quad \phi M_n = 59.7$k-ft ✓

$V_u = 19.8k \quad \phi V = 20.25k$ ✓

$R_1 = 13.2k \; R_2 = 36.3k \; R_3 = 36.3k \; R_4 = 13.2k$

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SSF STRUCTURAL ENGINEERING

PROJECT

12/14/17
DATE

PROJ. # JWJ

DESIGN FTG 1

SHEET

7" CONC SLAB REINF w/ #4@10"oc E,W, centred.

$L_{max} = 10.83'$ SIMPLY SUPPORTED

$\frac{\ell}{20} = 6.5" < 7"$

$w_u = 181$ PLF

$M_u = 2.65$ k-ft $\quad \phi M_n = 3.5$ k-ft ✓

$V_u = .98$ k $\quad \phi V_c = 3.15$ k ✓

12" MAT FTG w/ #5 @12" oc EW BOT

$L = 9'$

$\frac{\ell}{20} = 5.4" < 12"$

$w_u = .88$ KLF

$M_u = 8.91$k-ft $\quad \phi M_n = 12.05$ k-ft

$V_u = 4$k $\quad \phi V_n =$

$A_{s\,min} = .36 in^2/ft > .31 in^2/ft$

$A_{s\,provided} = .31 in^2/ft > 1.33 A_{s\,req}$

$= 1.33(.23) = .306 in^2/ft$ OK ✓

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STRUCTURAL ENGINEERING

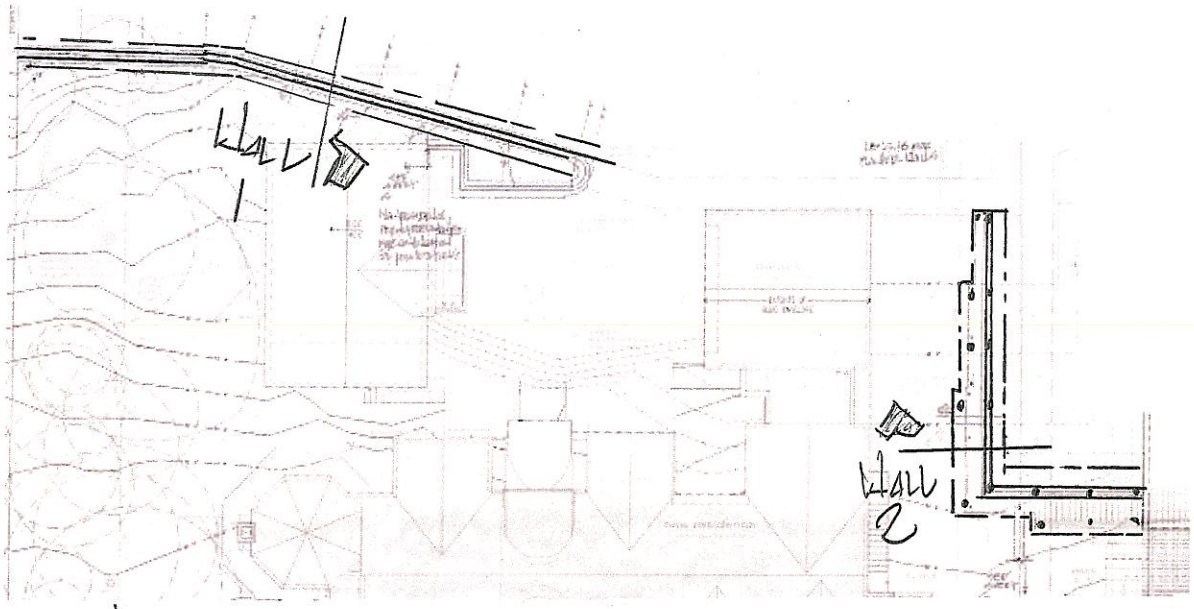
PROJECT

DATE 12/14/17

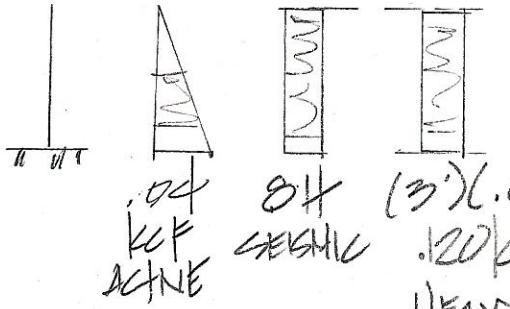
PROJ. # JWJ

DESIGN FTG 2

SHEET

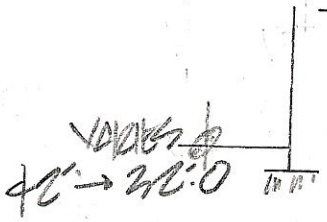


GEOTECH CRITERIA:



PASSIVE = .3 KCF
μ = 0.4
γ = .130 KCF
4'ϕ PILE = 10 TONS

SEE FOLLOWING SHEETS FOR WALL 2 DESIGN



Δ = 4:0
Δ = 8:0
Δ = 10:0

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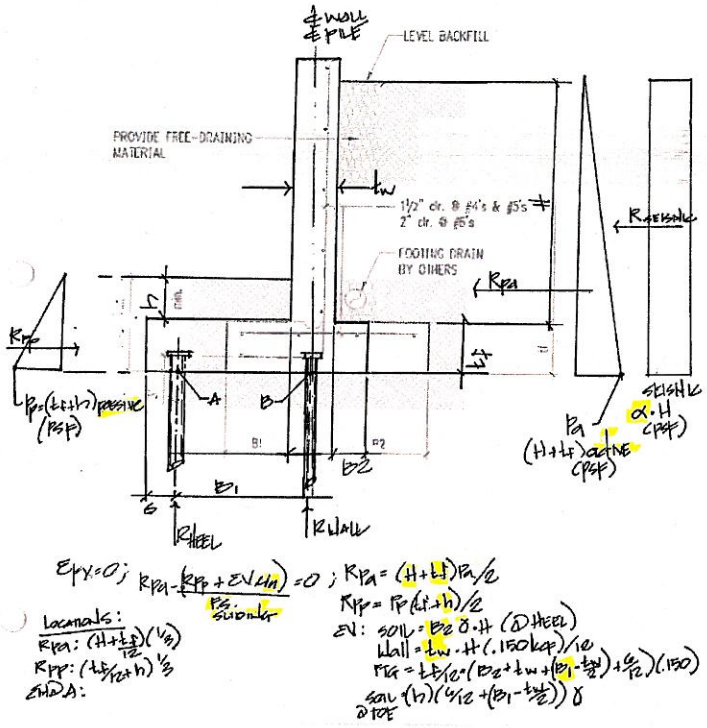
STRUCTURAL ENGINEERING

PROJECT	Ogden Point
DATE	12-18-2017
PROJ. #	RDH
DESIGN	SITEWALL 1
SHEET	

INPUT:

Active=	40	pcf
Passive=	300	pcf (ULT)
μ=	0.4	Coeff. Friction (ULT)
γ=	130	Soil pcf
FS_{Active}=	1.5	slide/OT
$FS_{Seismic}$=	1.2	slide/OT
H=	4	ft
tw=	8	inches
tf=	12	inches
h=	18	inches
B2=	0.5	feet
B1=	1.5	feet
α=	8	Seismic Surcharge
Pile Capacity=	20	Kips



OUTPUT

α*(H+tf)=	160	psf w/HVS =3*Active
Pa=	200	psf
Pp=	750	psf (ult)

R_{pa}=	0.5	k/ft
R_{pp}=	0.9375	k/ft (ult)
$R_{seismic}$=	0.64	k/ft

Weights in klf:		LOCATIONS (ft)		
		Relative to A		Relative to B
Soil @ Heel Weight=	0.26	2.08		0.583
Wall Weight=	0.400	1.5		0
Ftg Weight=	0.425	0.92		0.58
Soil @Toe Weight=	0.455	0.33		1.167
∑V=	1.54			

Sliding

∑Vμ=	0.62 k/ft (ult)	R_{pp}=	0.9375 k/ft (ult)
R_{pa}=	0.5 k/ft		
FS_{Active}=	3.11 SLIDING	OK	
$R_{pa+seismic}$=	1.14 k/ft		
$FS_{pa+seismic}$ =	1.36 SLIDING	OK	

Concrete Design Loads:
(includes seismic)

FOOTING:

Ru Toe=	2.45	k/ft
ΦVc=	105	k
Pin Pile Spacing (ft) =	42.9	
based on Punching Shear		
Mu/ft=	3.7	k-ft/ft

WALL:

Mu=	2.34	k-ft/ft

Pin Pile Reactions:

∑M@B=0:	Rtoe=	0.97 Klf	Pile Spacing=	20.66 Ft.
∑M@A=0:	Rwall=	0.57 Klf	Pile Spacing=	34.97 Ft.

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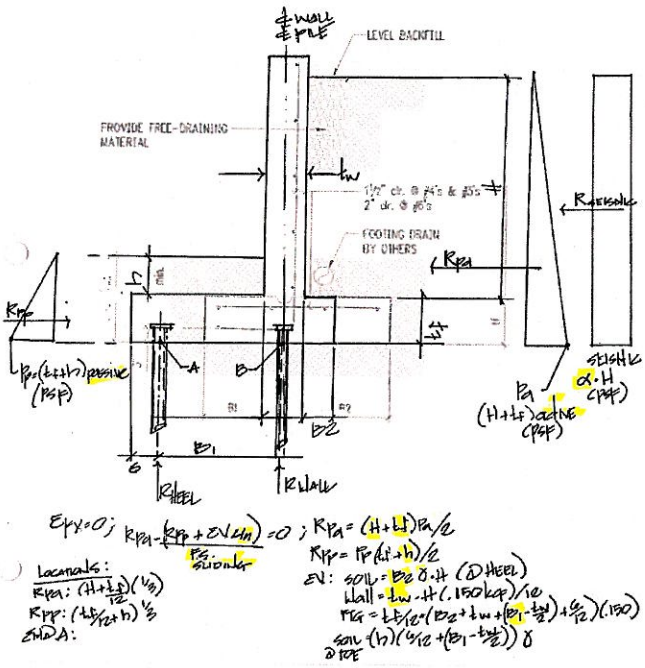
STRUCTURAL ENGINEERING

PROJECT	Ogden Point
DATE	12-18-2017
PROJ. #	RDH
DESIGN	SITEWALL 2
SHEET	

INPUT:

Active=	40	pcf
Passive=	300	pcf (ULT)
μ=	0.4	Coeff. Friction (ULT)
γ=	130	Soil pcf
FS $_{Active}$=	1.5	slide/OT
FS $_{Seismic}$=	1.2	slide/OT
H=	6	ft
tw=	8	inches
tf=	12	inches
h=	18	inches
B2=	1	feet
B1=	2.5	feet
α=	8	Seismic Surcharge
Pile Capacity=	20	Kips



OUTPUT

α*(H+tf)=	120	psf w/HVS =3*Active
Pa=	280	psf
Pp=	750	psf (ult)

R_{pa}= 0.98 k/ft

R_{pp}= 0.9375 k/ft (ult)

$R_{seismic}$= 0.72 k/ft

Weights in klf:		LOCATIONS (ft)		
		Relative to A		Relative to B
Soil @ Heel Weight=	0.78	3.33		0.833
Wall Weight=	0.600	2.5		0
Ftg Weight=	0.650	1.67		0.83
Soil @Toe Weight=	0.650	0.83		1.667
∑V=	2.68			

Concrete Design Loads:
(includes seismic)

Ru Toe= 2.92 k/ft

ΦVc= 105 k

Pin Pile Spacing (ft) = 35.9
based on Punching Shear

Mu/ft= 7.3 k-ft/ft

Sliding

∑Vμ= 1.07 k/ft (ult) R_{pp}= 0.9375 k/ft (ult)

R_{pa}= 0.98 k/ft

FS $_{Active}$= 2.05 SLIDING OK

$R_{pa+seismic}$= 1.7 k/ft

$FS_{pa+seismic}$ = 1.18 SLIDING OK

WALL:

Mu= 5.26 k-ft/ft

Pin Pile Reactions:

∑M@B=0: Rtoe= 1.30 Klf Pile Spacing= 15.44 Ft.

∑M@A=0: Rwall= 1.38 Klf Pile Spacing= 14.45 Ft.

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Ogden Point
PROJECT

12-18-2017
DATE

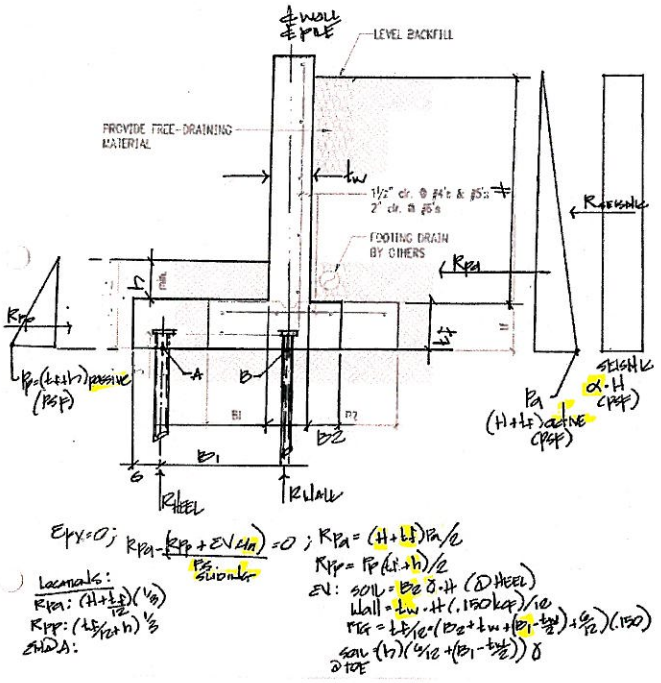
PROJ. # RDH

DESIGN SITEWALL 3

SHEET

INPUT:

Active=	40	pcf
Passive=	300	pcf (ULT)
μ=	0.4	Coeff. Friction (ULT)
γ=	130	Soil pcf
FS_{Active}=	1.5	slide/OT
$FS_{Seismic}$=	1.2	slide/OT
H=	8	ft
tw=	8	inches
tf=	12	inches
h=	24	inches
B2=	1.5	feet
B1=	4	feet
α=	8	Seismic Surcharge
Pile Capacity=	20	Kips



OUTPUT

α*(H+tf)=	120	psf w/HVS =3*Active
Pa=	360	psf
Pp=	900	psf (ult)

R_{pa}=	1.62 k/ft
R_{pp}=	1.35 k/ft (ult)
$R_{seismic}$=	0.96 k/ft

Weights in klf:		LOCATIONS (ft)		
		Relative to A		Relative to B
Soil @ Heel Weight=	1.56	5.08		1.083
Wall Weight=	0.800	4		0
Ftg Weight=	0.950	2.67		1.33
Soil @Toe Weight=	1.257	1.58		2.417
∑V=	4.57			

Sliding

∑Vμ=	1.83 k/ft (ult)	R_{pp}=	1.35 k/ft (ult)
R_{pa}=	1.62 k/ft		
FS_{Active}=	1.96 SLIDING	OK	
$R_{pa+seismic}$=	2.58 k/ft		
$FS_{pa+seismic}$ =	1.23 SLIDING	OK	

Concrete Design Loads:
(includes seismic)

FOOTING:

Ru Toe=	3.79 k/ft
ΦVc=	105 k
Pin Pile Spacing (ft) =	27.7
based on Punching Shear	
Mu/ft=	15.2 k-ft/ft

WALL:

Mu=	10.68 k-ft/ft

Pin Pile Reactions:

∑M@B=0:	Rtoe=	1.86 Klf	Pile Spacing=	10.77 Ft.
∑M@A=0:	Rwall=	2.71 Klf	Pile Spacing=	7.38 Ft.

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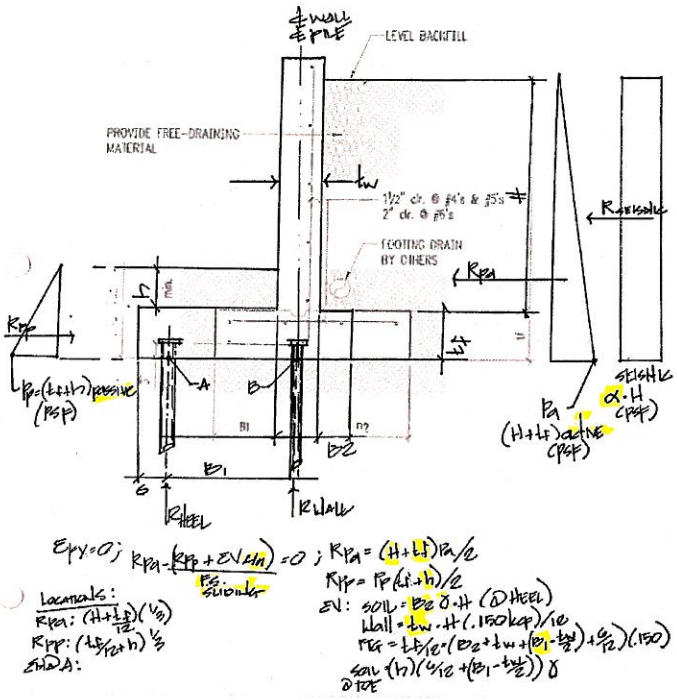
INPUT:

Active=	40	pcf
Passive=	300	pcf (ULT)
μ=	0.4	Coeff. Friction (ULT)
γ=	130	Soil pcf
FS $_{Active}$=	1.5	slide/OT
FS $_{Seismic}$=	1.2	slide/OT
H=	10.67	ft
tw=	10	inches
tf=	14	inches
h=	30	inches
B2=	1.75	feet
B1=	6	feet
α=	8	Seismic Surcharge
Pile Capacity=	20	Kips



OUTPUT

α*(H+tf)=	120	psf w/HVS =3*Active
Pa=	473.4667	psf
Pp=	1100	psf (ult)

R_{pa}=	2.802134	k/ft
R_{pp}=	2.016667	k/ft (ult)
$R_{seismic}$=	1.2804	k/ft

Weights in klf:		LOCATIONS (ft)		
		Relative to A		Relative to B
Soil @ Heel Weight=	2.427425	7.29		1.292
Wall Weight=	1.334	6		0
Ftg Weight=	1.517	3.83		2.17
Soil @Toe Weight=	2.248	2.54		3.458
∑V=	7.53			

Concrete Design Loads:
(includes seismic)

Ru Toe=	5.77	k/ft
ΦVc=	105	k
Pin Pile Spacing (ft) =	18.2	
based on Punching Shear		

Mu/ft= 34.6 k-ft/ft

Sliding

∑Vμ= 3.01 k/ft (ult) R_{pp}= 2.016667 k/ft (ult)

R_{pa}= 2.802134 k/ft

FS $_{Active}$= 1.79 SLIDING OK

$R_{pa+seismic}$= 4.082534 k/ft

$FS_{pa+seismic}$ = 1.23 SLIDING OK

WALL:

Mu= 22.62 k-ft/ft

Pin Pile Reactions:

∑M@B=0:	Rtoe=	3.15 Klf	Pile Spacing=	6.36 Ft.
∑M@A=0:	Rwall=	4.38 Klf	Pile Spacing=	4.57 Ft.

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Ogden Point
PROJECT

12-18-2017
DATE

PROJ. # RDH

DESIGN SITEWALL 5

SHEET

FLEXURAL CHECK FOR 4'-0 Walls:

Mu (k-ft)/18"=	3.51		As_{min}=	0.29	≥	$As_{minflex}$=	0.39
f'c=	2.5	ksi	As_{mingov}=	0.39	in^2	$Asmin_{t\&s}$=	0.21
As=	0.2	in^2					
bw=	18	in	Tension-Controlled?				
fy=	60	ksi	β_1=	0.85			
d=	6.5	in	a_b/d=	0.503061			
Φ=	0.9		a/d=	0.048265			
			fs=fy?	yes			
a=	0.313725		d_t=	6.25	(d_t= dist. To bott. layer of flex reinf.)		
a/2=	0.156863		a_{tcl}/d_t=	0.319			
			a/d_t <	yes-tension controlled			
ΦMn(k-ft)=	5.71	OK	a_{tcl}/d_t?				
As≥ 1.33 Asrq'd?=	ok		#4 @ 18"o/c				

FLEXURAL CHECK FOR 4' PIPE PILE FOUNDATIONS:

Mu (k-ft)/12"=	3.7		As_{min}=	0.27	≥	$As_{minflex}$=	0.36
f'c=	2.5	ksi	As_{mingov}=	0.36	in^2	$Asmin_{t\&s}$=	0.19
As=	0.2	in^2					
bw=	~~12~~ 10"	in	Tension-Controlled?				
fy=	60	ksi	β_1=	0.85			
d=	9	in	a_b/d=	0.503061			
Φ=	0.9		a/d=	0.052288			
			fs=fy?	yes			
a=	~~0.470588~~		d_t=	8.75	(d_t= dist. To bott. layer of flex reinf.)		
a/2=	~~0.235294~~		a_{tcl}/d_t=	0.319			
			a/d_t <	yes-tension controlled			
ΦMn(k-ft)=	~~7.84~~	OK	a_{tcl}/d_t?				
As≥ 1.33 Asrq'd?=	ok		#4 @ 18"o/c				

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FLEXURAL CHECK FOR 6'-0 Walls:

Mu (k-ft)/12"=	5.26		As_{min}=	0.20	≥	$As_{minflex}$=	0.26
f'c=	2.5	ksi	As_{mingov}=	0.26	in^2	$Asmin_{t\&s}$=	0.14
As=	0.31	in^2					
bw=	12	in	Tension-Controlled?				
fy=	60	ksi	β_1=	0.85			
d=	6.5	in	a_b/d=	0.503061			
Φ=	0.9		a/d=	0.112217			
			fs=fy?	yes			
a=	0.729412		d_t=	6.25	(d_t= dist. To bott. layer of flex reinf.)		
a/2=	0.364706		a_{tcl}/d_t=	0.319			
			a/d_t <	yes-tension controlled			
ΦMn(k-ft)=	8.56	OK	a_{tcl}/d_t?				
As≥ 1.33 Asrq'd?=	ok		#5's @ 12"o/c				

FLEXURAL CHECK FOR 6' PIPE PILE FOUNDATIONS:

Mu (k-ft)/12"=	7.3		As_{min}=	0.27	≥	$As_{minflex}$=	0.36
f'c=	2.5	ksi	As_{mingov}=	0.36	in^2	$Asmin_{t\&s}$=	0.19
As=	0.31	in^2					
bw=	12	in	Tension-Controlled?				
fy=	60	ksi	β_1=	0.85			
d=	9	in	a_b/d=	0.503061			
Φ=	0.9		a/d=	0.081046			
			fs=fy?	yes			
a=	0.729412		d_t=	8.75	(d_t= dist. To bott. layer of flex reinf.)		
a/2=	0.364706		a_{tcl}/d_t=	0.319			
			a/d_t <	yes-tension controlled			
ΦMn(k-ft)=	12.05	OK	a_{tcl}/d_t?				
As≥ 1.33 Asrq'd?=	ok		#5's @ 12"o/c				

FLEXURAL CHECK FOR 8'-0 Walls:

Mu (k-ft)/10"=	10.68		As_{min}=	0.16	≥	$As_{minflex}$=	0.216667
f'c=	2.5	ksi	As_{mingov}=	0.216667	in^2	$Asmin_{t\&s}$=	0.12
As=	0.44	in^2					
bw=	10	in	Tension-Controlled?				
fy=	60	ksi	β_1=	0.85			
d=	6.5	in	a_b/d=	0.503061			
Φ=	0.9		a/d=	0.191131			
			fs=fy?	yes			
a=	1.242353		d_t=	6.25	(d_t= dist. To bott. layer of flex reinf.)		
a/2=	0.621176		a_{tcl}/d_t=	0.319			
			a/d_t <	yes-tension controlled			
ΦMn(k-ft)=	11.64	OK	a_{tcl}/d_t?				
As≥ 1.33	NG-USE						
Asrq'd?=	Asmingov						

#6's @ 10"o/c

FLEXURAL CHECK FOR 8' PIPE PILE FOUNDATIONS:

Mu (k-ft)/12"=	15.2		As_{min}=	0.27	≥	$As_{minflex}$=	0.36
f'c=	2.5	ksi	As_{mingov}=	0.36	in^2	$Asmin_{t\&s}$=	0.19
As=	0.44	in^2					
bw=	12	in	Tension-Controlled?				
fy=	60	ksi	β_1=	0.85			
d=	9	in	a_b/d=	0.503061			
Φ=	0.9		a/d=	0.115033			
			fs=fy?	yes			
a=	1.035294		d_t=	8.75	(d_t= dist. To bott. layer of flex reinf.)		
a/2=	0.517647		a_{tcl}/d_t=	0.319			
			a/d_t <	yes-tension controlled			
ΦMn(k-ft)=	16.80	OK	a_{tcl}/d_t?				
As≥ 1.33	NG-USE						
Asrq'd?=	Asmingov						

#6's @ 12"o/c

FLEXURAL CHECK FOR 10'-0 Walls:

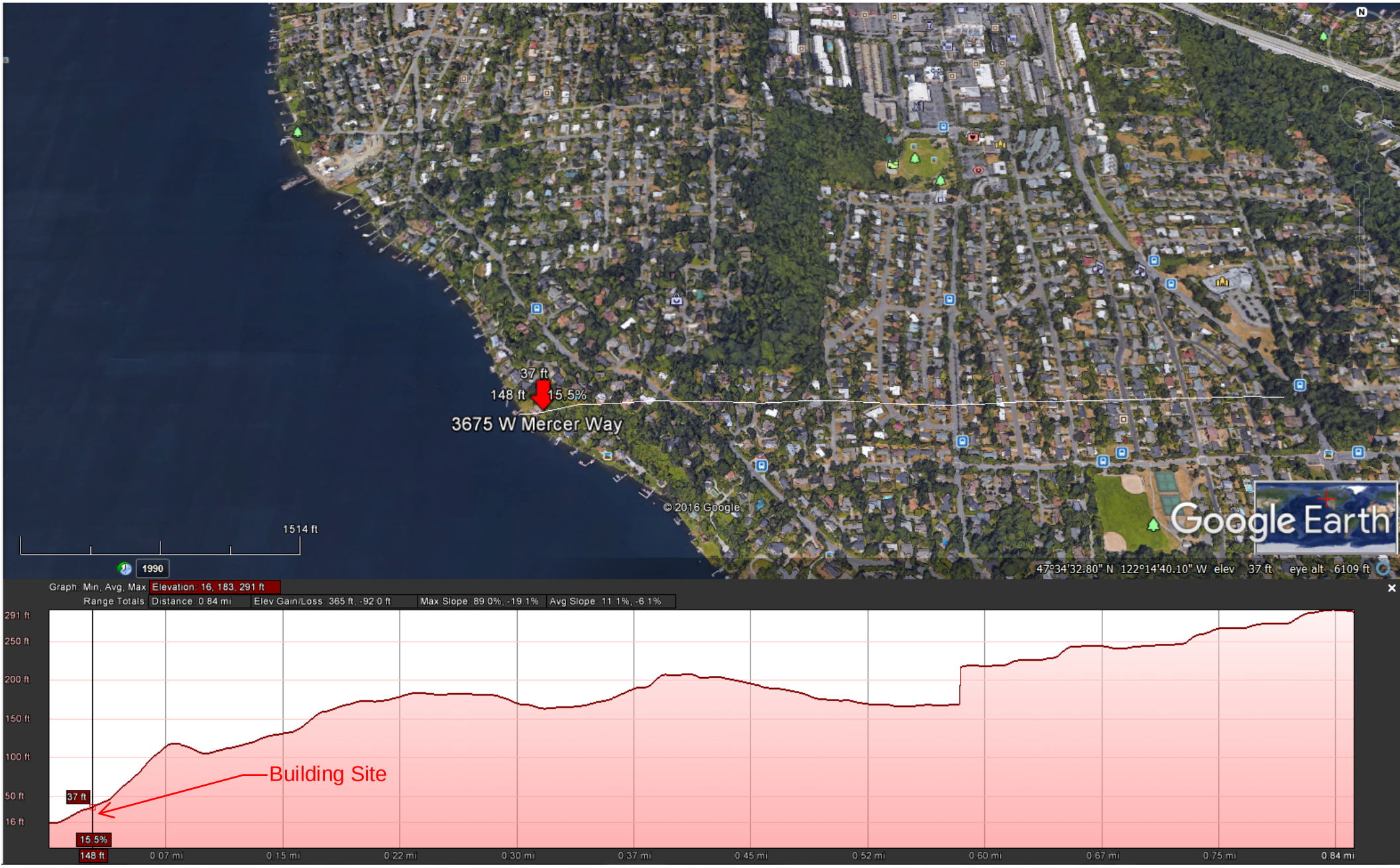
Mu (k-ft)/10"=	18.77		As_{min}=	0.21	≥	$As_{minflex}$=	0.283333
f'c=	2.5	ksi	As_{mingov}=	0.283333	in^2	$Asmin_{t\&s}$=	0.15
As=	0.6	in^2					
bw=	10	in	Tension-Controlled?				
fy=	60	ksi	β_1=	0.85			
d=	8.5	in	a_b/d=	0.503061			
Φ=	0.9		a/d=	0.199308			
			fs=fy?	yes			
a=	1.694118		d_t=	8.25	(d_t= dist. To bott. layer of flex reinf.)		
a/2=	0.847059		a_{tcl}/d_t=	0.319			
			a/d_t <	yes-tension controlled			
ΦMn(k-ft)=	20.66	OK	a_{tcl}/d_t?				
As≥ 1.33	NG-USE						
Asrq'd?=	Asmingov						

#7's @ 10"o/c

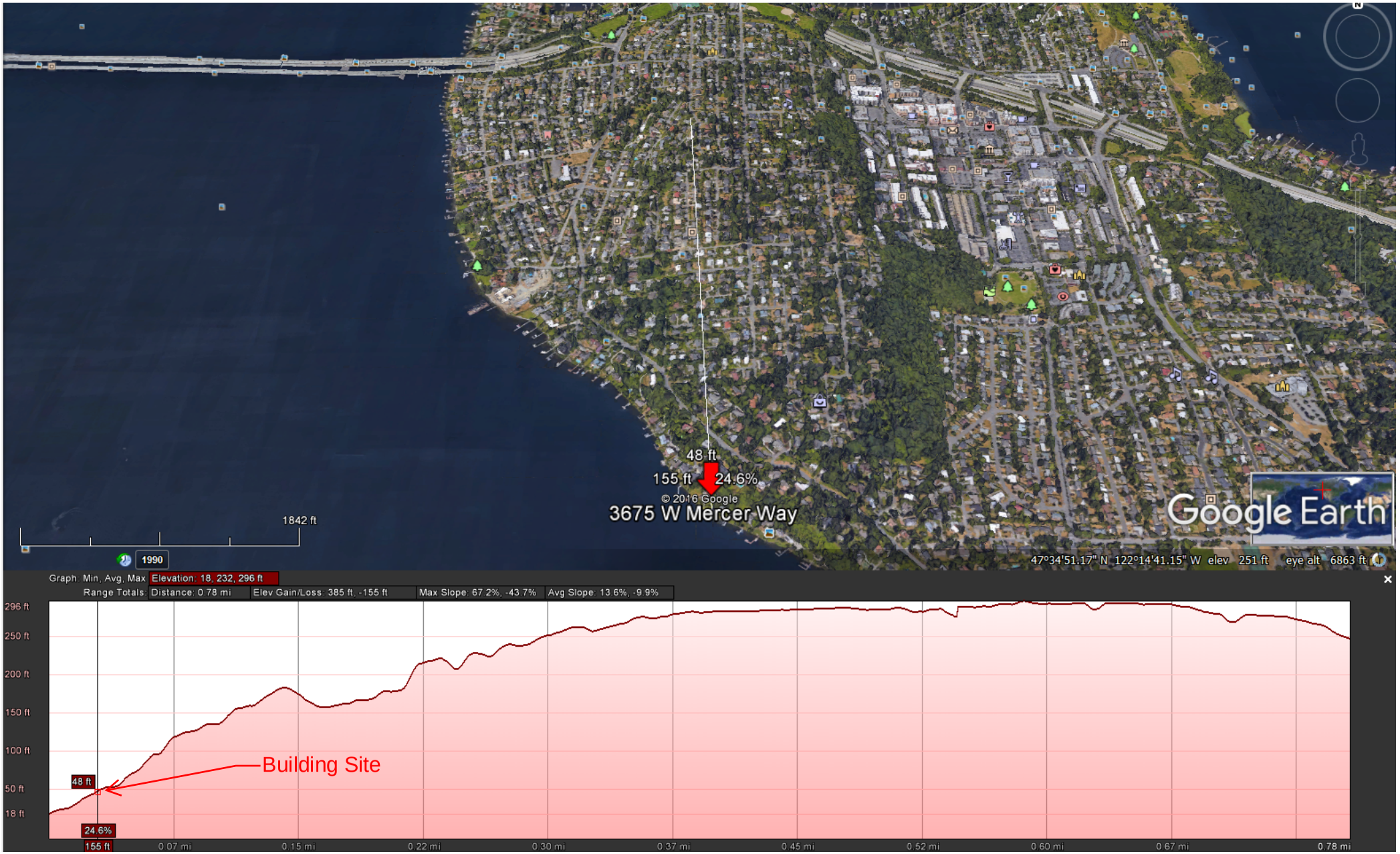
FLEXURAL CHECK FOR 10' PIPE PILE FOUNDATIONS:

Mu (k-ft)/9"=	25.95		As_{min}=	0.25	≥	$As_{minflex}$=	0.33
f'c=	2.5	ksi	As_{mingov}=	0.33	in^2	$Asmin_{t\&s}$=	0.18
As=	0.6	in^2					
bw=	9	in	Tension-Controlled?				
fy=	60	ksi	β_1=	0.85			
d=	11	in	a_b/d=	0.503061			
Φ=	0.9		a/d=	0.171123			
			fs=fy?	yes			
a=	1.882353		d_t=	8.75	(d_t= dist. To bott. layer of flex reinf.)		
a/2=	0.941176		a_{tcl}/d_t=	0.319			
			a/d_t <	yes-tension controlled			
ΦMn(k-ft)=	27.16	OK	a_{tcl}/d_t?				
As≥ 1.33	NG-USE						
Asrq'd?=	Asmingov						

#7's @ 9"o/c



Exposure Category C
Kzt=1.0



Exposure Category C
Kzt=1.0

Design Maps Summary Report

User–Specified Input

Building Code Reference Document	2012/2015 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	47.57645°N, 122.24366°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

USGS–Provided Output

S_S =	1.404 g	S_{MS} =	1.404 g	S_{DS} =	0.936 g
S_1 =	0.540 g	S_{M1} =	0.810 g	S_{D1} =	0.540 g

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.