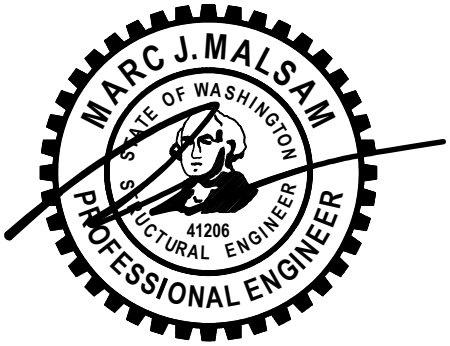
REVISED STRUCTURAL CALCULATIONS FOR:

PLAN MN472

7119 80TH AVE SE
MERCER ISLAND, WA 98040

ARCHITECT: MN CUSTOM HOMES

DECEMBER 1, 2023



MALSAM TSANG
STRUCTURAL ENGINEERING

122 S JACKSON ST | SUITE 210 | SEATTLE WA 98104 | 206.789.6038 T | 206.789.6042 F

DESIGN CRITERIA IBC 2018

DEAD LOADS

ROOF

Composition	2.5 psf
3/4" Plywood	2.4 psf
Truss @ 24" o.c.	3 psf
Insulation	1.0 psf
Gyp Board (5/8")	2.8 psf
MEP	1.5 psf
Solar Panels	5.0 psf
Total	18.2 psf
Use	20.0 psf

FLOOR

3/4" Plywood	2.4 psf
TJI @ 16" o.c.	2.3 psf
Flooring	1.0 psf
Gyp Board (5/8")	2.8 psf
MEP	1.5 psf
Total	10.0 psf
Use	15.0 psf

LIVE LOADS/OCCUPANCY

Risk Category	II
Roof Deck	No
Common Access	No

ROOF LIVE: Snow = 25 psf

FLOOR LIVE: Occupancy = 40 psf; Stair/Corridor = 40 psf

DECK LIVE: Occupancy = 60 psf

SEISMIC CRITERIA ASCE 7-16 Ch. 11 & Ch. 12

Imp. Factor =	1.00	Seismic Ht, hn=	32 ft	
Site Class =	D(Default)	T, Building=	0.3	
R Value =	6.5	Ts=	0.5	
Geo. Ground Hazard?		No w/ASCE 11.4.8 Excep's		
S_s =	1.6	F_a =	1.200	Table 11.4-1
S_1 =	0.5	F_v =	NULL	Table 11.4-2
S_{ms} =	1.920	x 2/3 = S_{ds} =	**1.280**	Eqn. 11.4-3
S_{m1} =	NULL	x 2/3 = S_{d1} =	**NULL**	Eqn. 11.4-4

C_{SULT} =	0.197
C_{SALL} =	0.138

T/Ts= 0.567 ≤ 1.5

Okay, Cs Eqn. 12.8-2

SEISMIC WEIGHT ASCE 7-16 12.7.2

Partitions = 15 psf

*Roof weight = 1/2 Partition + Roof DL

*Floor weight = Full Partition + Floor DL

ROOF 26.0 psf

FLOOR 25.0 psf

0 22.5 psf

SEISMIC DESIGN CATEGORY IBC 1613.2.5

Seismic DC= D

WIND CRITERIA ASCE 7-16 Ch. 27 Directional Procedure

V =	97 mph	K_d =	0.85
Exposure =	B	G =	0.85
h =	32 ft	K_{zt} =	1.44 *See Kzt Worksheet

Roof Slope = 6 : 12 = 27 °

PRESSURE COEFFICIENTS (Cp)

Windward Wall =	0.8	Windward Roof =	0.3
Leeward Wall =	-0.5	Leeward Roof =	-0.6

PRESSURE (PSF) $q = 0.00256 K_z K_{zt} K_d V^2$

Ht	K_z	q_z	$0.6 x q_z$ [1]	q_h	P_{WW}	P_{LW}	P_{WALL}	P_{ROOF}
0-15	0.57	16.8	10.1		6.9	5.5	**12.3**	
15-20	0.62	18.3	11.0		7.5	5.5	**12.9**	
20-25	0.66	19.5	11.7		7.9	5.5	**13.4**	
25-30	0.70	20.6	12.4		8.4	5.5	**13.9**	
30-35	0.73	21.5	12.9	12.9	8.8	5.5	**14.3**	**9.9**
35-40	0.76	22.4	13.4		9.1	5.5	**14.6**	
40-45	0.79	23.3	14.0		9.5	5.5	**15.0**	
45-50	0.81	23.9	14.3		9.7	5.5	**15.2**	

[1] Per IBC 2018 1605.3.1 Basic Load Combinations

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122 South Jackson
Suite 210
Seattle, WA 98104
t 206.789.6038
f 206.789.6042

Plan MN472 — Project

7119 80th Ave SE

Mercer Island, WA 98040

7/10/2023 — Date

0444-2023-23-01 — Proj. No.

JMT — Design

DC1 — Sheet

⚠ This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

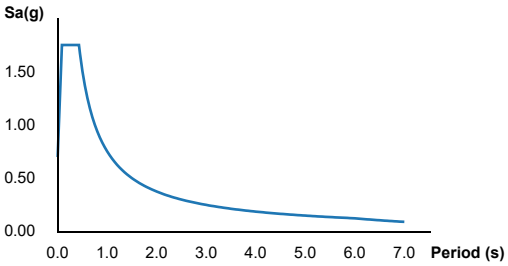
ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Hazards by Location

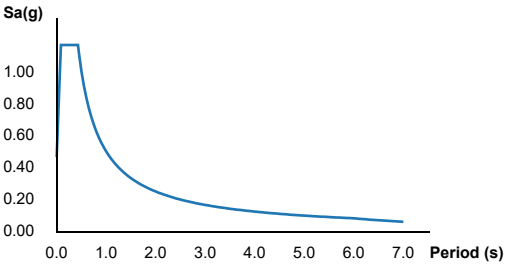
Search Information

Address:	7119 80th Ave SE, Mercer Island, WA 98040, USA
Coordinates:	47.5387084, -122.2327365
Elevation:	297 ft
Timestamp:	2023-07-10T18:43:33.856Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	II
Site Class:	C

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	1.469	MCE_R ground motion (period=0.2s)
S_1	0.508	MCE_R ground motion (period=1.0s)
S_{MS}	1.763	Site-modified spectral acceleration value
S_{M1}	0.758	Site-modified spectral acceleration value
S_{DS}	1.175	Numeric seismic design value at 0.2s SA
S_{D1}	0.505	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	1.492	Site amplification factor at 1.0s
CR_S	0.902	Coefficient of risk (0.2s)
CR_1	0.898	Coefficient of risk (1.0s)
PGA	0.629	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.754	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.469	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.629	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	4.282	Factored deterministic acceleration value (0.2s)
S1RT	0.508	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.566	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)

S1D	1.638	Factored deterministic acceleration value (1.0s)
PGAd	1.42	Factored deterministic acceleration value (PGA)

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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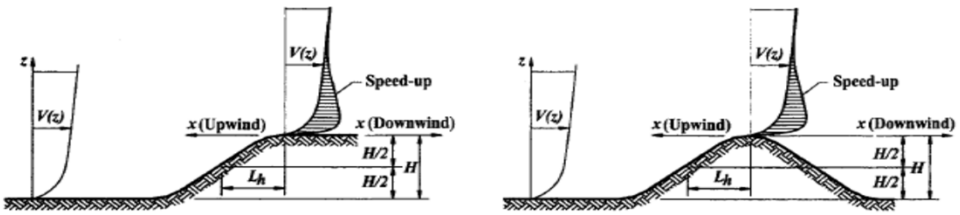
Kzt WORKSHEET

ASCE 7-10 26.8.1

Exposure = C
Bldg Height = 31.5 ft
Site Elev = 307 ft

Topographic Factor, K_{zt}
Figure 26.8-1



PROFILE 1		PROFILE 2		PROFILE 3		PROFILE 4	
Shape =	3-D Hill	**Shape =**	3-D Hill	**Shape =**	3-D Hill	**Shape =**	3-D Hill
H =	319 **ft**	**H =**	298 **ft**	**H =**	289 **ft**	**H =**	308 **ft**
H/2 =	160 **ft**	**H/2 =**	149 **ft**	**H/2 =**	145 **ft**	**H/2 =**	154 **ft**
L_h =	2640 **ft**	**L_h =**	1320 **ft**	**L_h =**	2323 **ft**	**L_h =**	686 **ft**
x =	1320 **ft**	**x =**	158 **ft**	**x =**	0 **ft**	**x =**	2429 **ft**
z =	32 **ft**	**z =**	32 **ft**	**z =**	32 **ft**	**z =**	32 **ft**
Unobstructed[1]	Yes	**Unobstructed[1]**	Yes	**Unobstructed[1]**	Yes	**Unobstructed[1]**	Yes
Above Terrain[2]	Yes	**Above Terrain[2]**	Yes	**Above Terrain[2]**	Yes	**Above Terrain[2]**	Yes
Upper Half[3]	Yes	**Upper Half[3]**	Yes	**Upper Half[3]**	Yes	**Upper Half[3]**	Yes
Site to Crest	Upwind	**Site to Crest**	Upwind	**Site to Crest**	Upwind	**Site to Crest**	Downwind
H/Lh[4]	0.121	**H/Lh[4]**	0.225758	**H/Lh[4]**	0.124397	**H/Lh[4]**	0.4487179
Calc Kzt ?	NO	**Calc Kzt ?**	YES	**Calc Kzt ?**	NO	**Calc Kzt ?**	YES
K_1:	$(K_1/H/L_h)$	K_1:	$(K_1/H/L_h)$	K_1:	$(K_1/H/L_h)$	K_1:	$(K_1/H/L_h)$
Coefficient =	1.05	Coefficient =	1.05	Coefficient =	1.05	Coefficient =	1.05
K_1 = N/A		**K_1 = 0.23705**		**K_1 = N/A**		**K_1 = 0.47115**	
K_2:	$(1 - \lvert x\rvert/\mu L_h)$	K_2:	$(1 - \lvert x\rvert/\mu L_h)$	K_2:	$(1 - \lvert x\rvert/\mu L_h)$	K_2:	$(1 - \lvert x\rvert/\mu L_h)$
μ =	1.5 (Figure 26.8-1)	μ =	1.5 (Figure 26.8-1)	μ =	1.5 (Figure 26.8-1)	μ =	1.5 (Figure 26.8-1)
K_2 = N/A		**K_2 = 0.92**		**K_2 = N/A**		**K_2 = -1.35897**	
K_3:	$e^{-\gamma z/Lh}$	K_3:	$e^{-\gamma z/Lh}$	K_3:	$e^{-\gamma z/Lh}$	K_3:	$e^{-\gamma z/Lh}$
γ =	4 (Figure 26.8-1)	γ =	4 (Figure 26.8-1)	γ =	4 (Figure 26.8-1)	γ =	4 (Figure 26.8-1)
K_3 = N/A		**K_3 = 0.90896**		**K_3 = N/A**		**K_3 = 0.8323**	
$K_{zt} = (1 + K_1 K_2 K_3)^2$		$K_{zt} = (1 + K_1 K_2 K_3)^2$		$K_{zt} = (1 + K_1 K_2 K_3)^2$		$K_{zt} = (1 + K_1 K_2 K_3)^2$	
K_{zt} = 1.00		**K_{zt} = 1.44**		**K_{zt} = 1.00**		**K_{zt} = 1.00**	

1 ***Hill, ridge, or escarpment is isolated and unobstructed upwind by other similar topographic features of comparable height for 100H or 2 miles (whichever is less) ASCE 7-10 26.8.1***

2 ***The hill, ridge, or escarpment protrudes above the height of the upwind terrain features within a 2-mi radlus in any quadrant by a factor of two or more. ASCE 7-10 26.8.1***

3 ***The structure is located as shown in Fig. 26.8-1 in the upper one-half of a hill or ridge or near the crest of an escarpment. ASCE 7-10 26.8.1***

4 ***For $H/L_h > 0.5$, assume $H/L_h = 0.5$ for K_1 and $L_h = 2H$ for K_2 and K_3***

Kzt = 1.44

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122 South Jackson
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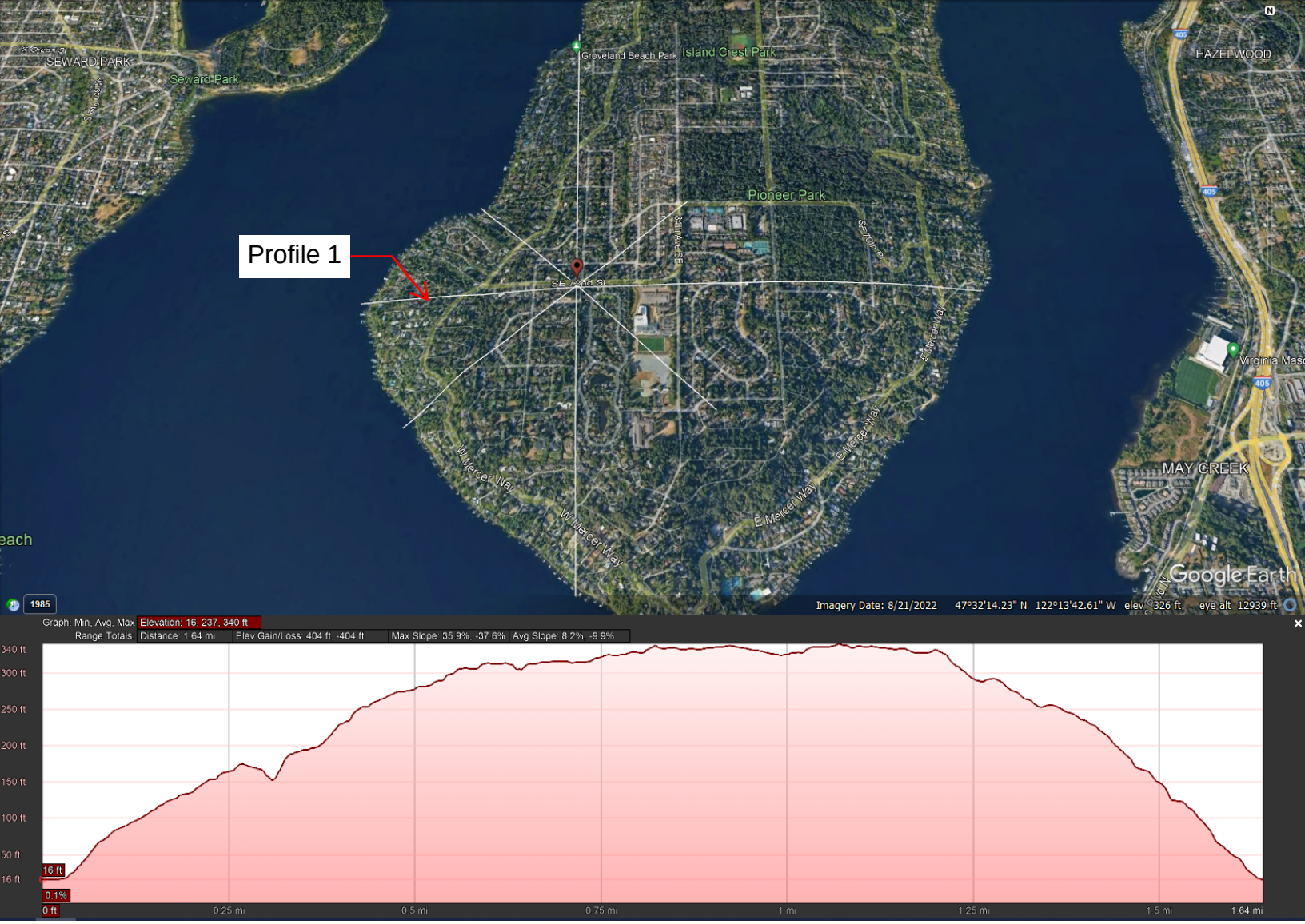
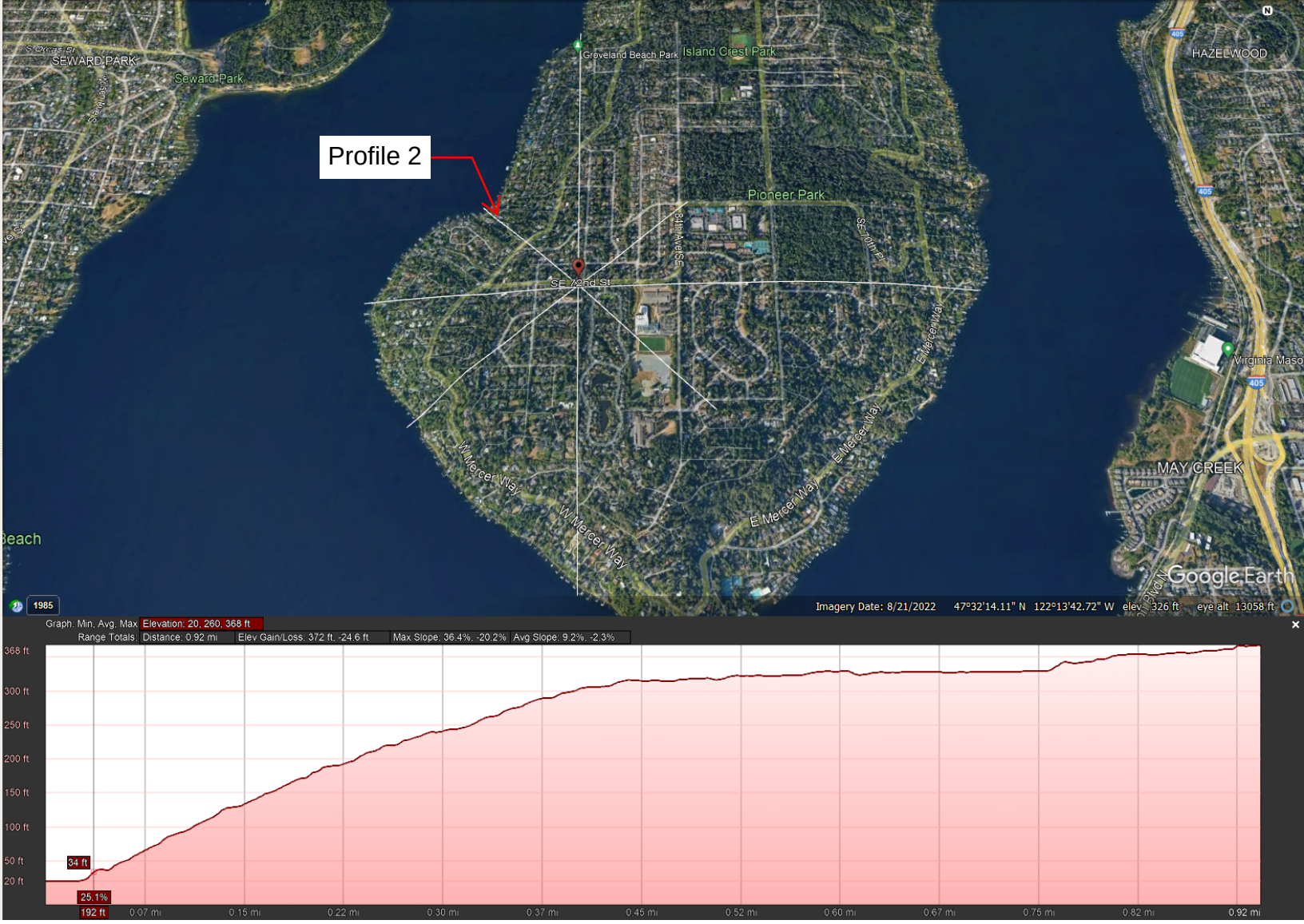
Mercer Island, WA 98040

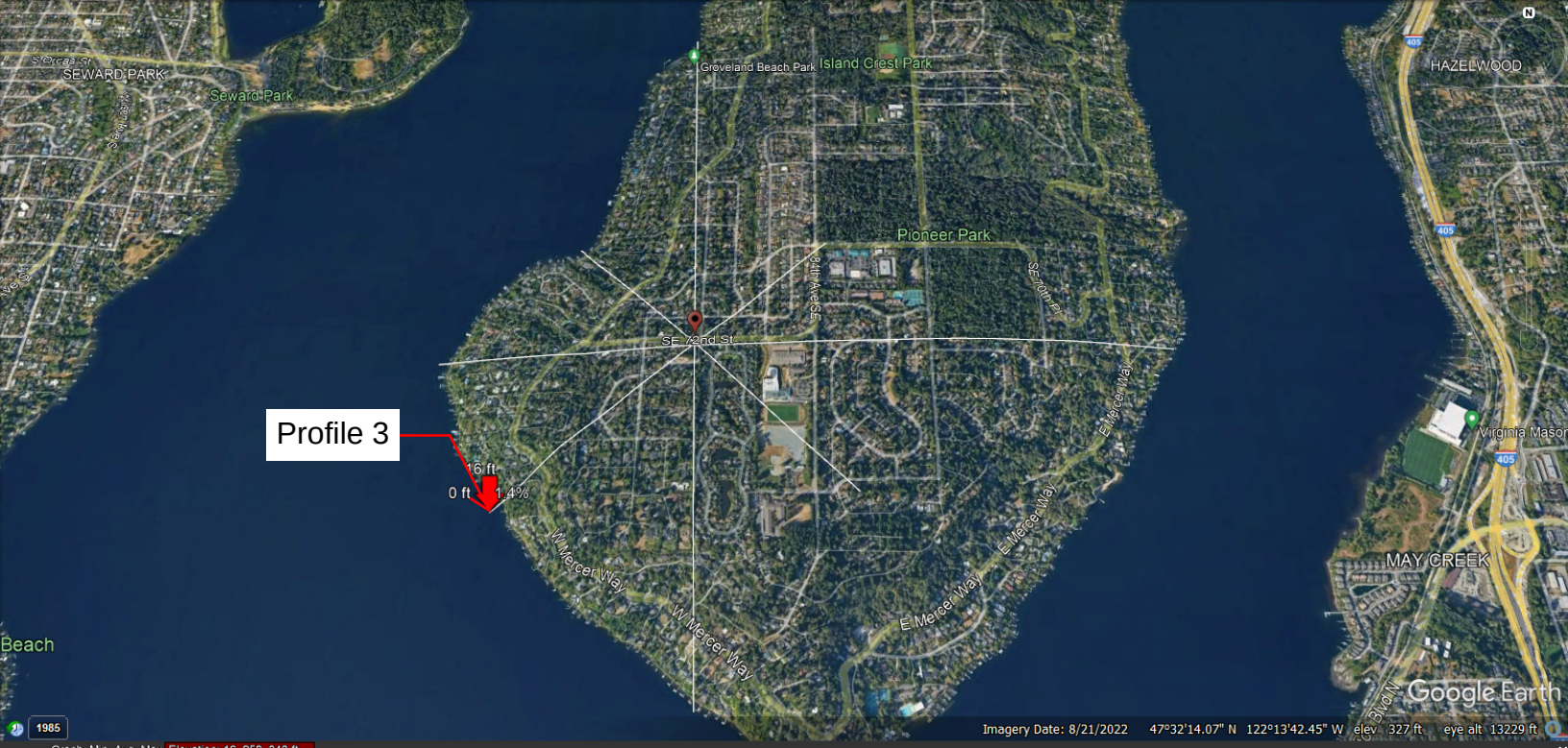
Date: 7/10/2023
Proj. No.: 0444-2023-23-01
Design: JMT
Sheet: DC3


Profile 1
SEWARD PARK
Seward Park
Groveland Beach Park
Island Crest Park
HAZELWOOD
Pioneer Park
SE 32nd St
84th Ave SE
E Mercer Way
W Mercer Way
MAY CREEK
Google Earth
1985
Imagery Date: 8/21/2022 47°32'14.23" N 122°13'42.61" W elev 326 ft eye alt 12939 ft

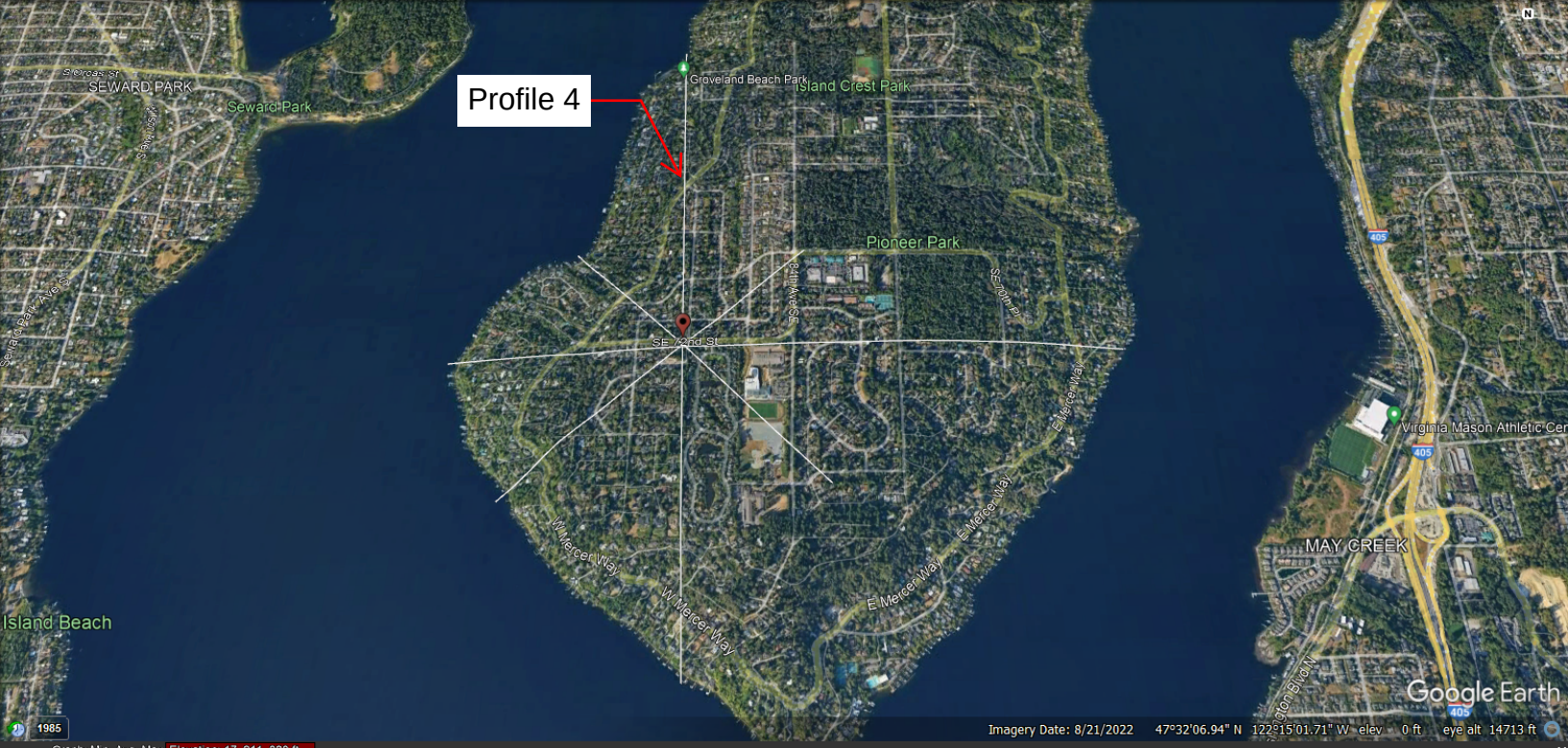
Graph: Min, Avg, Max Elevation: 16, 237, 340 ft
Range Totals: Distance: 1.64 mi Elev Gain/Loss: 404 ft, -404 ft Max Slope: 35.9%, -37.6% Avg Slope: 8.2%, -9.9%
340 ft
300 ft
250 ft
200 ft
150 ft
100 ft
50 ft
16 ft
16 ft
0.1%
0 ft
0.25 mi
0.5 mi
0.75 mi
1 mi
1.25 mi
1.5 mi
1.64 mi


Profile 2
SEWARD PARK
Seward Park
Groveland Beach Park
Island Crest Park
HAZELWOOD
Pioneer Park
64th Ave SE
SE 104th Pl
SE 72nd St
E Mercer Way
W Mercer Way
MAY CREEK
Virginia Maso
Google Earth
1985
Imagery Date: 8/21/2022 47°32'14.11" N 122°13'42.72" W elev 326 ft eye alt 13058 ft

Graph: Min, Avg, Max Elevation: 20, 260, 368 ft
Range Totals: Distance: 0.92 mi Elev Gain/Loss: 372 ft, -24.6 ft Max Slope: 36.4%, -20.2% Avg Slope: 9.2%, -2.3%
368 ft
300 ft
250 ft
200 ft
150 ft
100 ft
50 ft
20 ft
34 ft
25.1%
192 ft
0.07 mi
0.15 mi
0.22 mi
0.30 mi
0.37 mi
0.45 mi
0.52 mi
0.60 mi
0.67 mi
0.75 mi
0.82 mi
0.92 mi


Profile 3
16 ft
0 ft
1.4%
SEWARD PARK
Seward Park
Groveland Beach Park
Island Crest Park
Pioneer Park
SE 72nd St
84th Ave SE
E Mercer Way
W Mercer Way
HAZELWOOD
MAY CREEK
Virginia Mason
Beach
Google Earth
Imagery Date: 8/21/2022 47°32'14.07" N 122°13'42.45" W elev 327 ft eye alt 13229 ft


Graph: Min, Avg, Max Elevation: 16, 258, 343 ft
Range Totals: Distance: 0.97 mi Elev Gain/Loss: 406 ft, -82.6 ft Max Slope: 47.7%, -31.4% Avg Slope: 11.1%, -4.6%
343 ft
300 ft
250 ft
200 ft
150 ft
100 ft
50 ft
16 ft
16 ft
1.4%
0 ft
0.07 mi
0.15 mi
0.22 mi
0.30 mi
0.37 mi
0.45 mi
0.52 mi
0.60 mi
0.67 mi
0.75 mi
0.82 mi
0.90 mi
0.97 mi

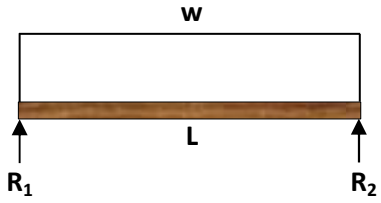

Profile 4
Groveland Beach Park
Island Crest Park
SEWARD PARK
Seward Park
Pioneer Park
SE 72nd St
E Mercer Way
W Mercer Way
MAY CREEK
Island Beach
Google Earth
Imagery Date: 8/21/2022 47°32'06.94" N 122°15'01.71" W elev 0 ft eye alt 14713 ft


Graph: Min, Avg, Max Elevation: 17, 211, 330 ft
Range Totals: Distance: 1.80 mi Elev Gain/Loss: 437 ft, -434 ft Max Slope: 63.6%, -54.4% Avg Slope: 11.0%, -6.8%
330 ft
300 ft
250 ft
200 ft
150 ft
100 ft
50 ft
17 ft
0.0%
0 ft
0.25 mi
0.5 mi
0.75 mi
1 mi
1.25 mi
1.5 mi
1.80 mi

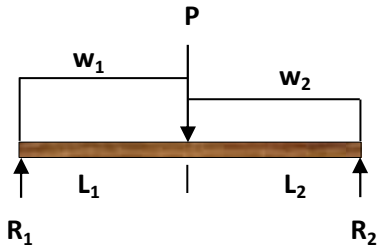
TYPICAL BEAM CASES

***ASSUME CASE 1 FOR ALL BEAMS U.N.O.**

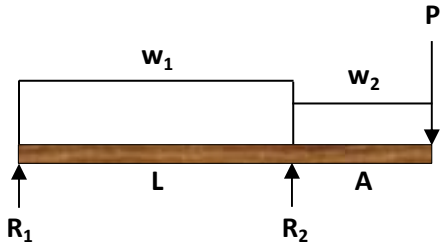
CASE #1: (C1)



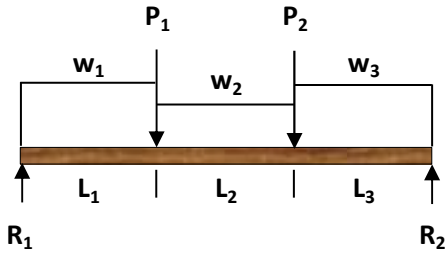
CASE #2: (C2)



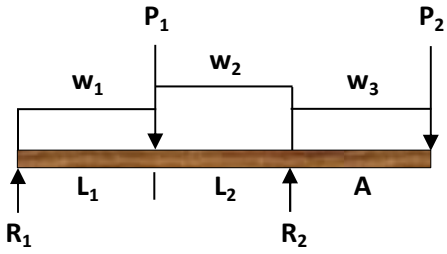
CASE #3: (C3)



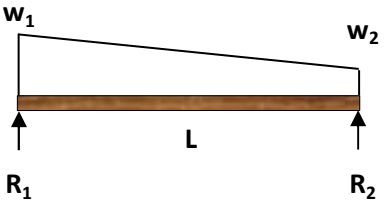
CASE #4: (C4)



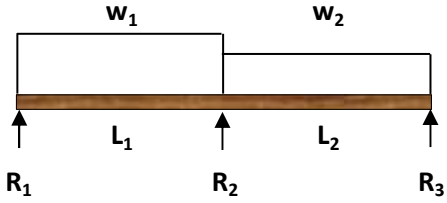
CASE #5: (C5)



CASE #6: (C6)



CASE #7: (C7)



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Project	Date
7119 80th Ave SE	0444-2023-23-01
Mercer Island, WA 98040	Proj. No.
	JMT
	Design
	DC8
	Sheet

LATERAL ANALYSIS

Seismic: * Includes 2000lbs for PV Panels

Level	Area (ft^2)	Unit Wt (psf)	Weight (kips)		Avg Ht (ft)	Wi·Hi (k-ft)	Distrib. (%)	Shear, V (kips)	Uniform (plf)
Roof	2800	22.5	65.00	*	31	2015.00	66%	**13.84**	215 / 311
Upper Floor	3500	25	87.50		12	1050.00	34%	**7.21**	112 / 146

Totals: 152.50 k 3065.00 **21.05 k**

Base Shear:

$V = C_S \times W$

= 0.197 x 152.5k = 30.05 kips (Ultimate)

= 0.138 x 152.5k = 21.05 kips (Allowable)

Wind:

North-South Exposure

Level	Trib (ft)	Wind Load (#/ft)	Length (ft)	Shear, V (kips)
Roof	16	11' x 9.9 + 1' x 13.4 + 4' x 12.9 = 174 plf	64.5	**11.22**
Upper Floor	10	1' x 12.9 + 9' x 12.3 = 124 plf	64.5	**8.00**

19.22 k

East-West Exposure

Level	Trib (ft)	Wind Load (#/ft)	Length (ft)	Shear, V (kips)
Roof	16	11' x 9.9 + 1' x 13.4 + 4' x 12.9 = 174 plf	44.5	**7.74**
Upper Floor	10	1' x 12.9 + 9' x 12.3 = 124 plf	49.5	**6.14**

13.88 k

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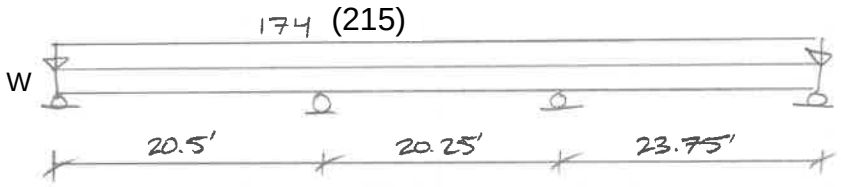
Mercer Island, WA 98040

7/10/2023 — Date
0444-2023-23-01 — Proj. No.
JMT — Design
L-1 — Sheet

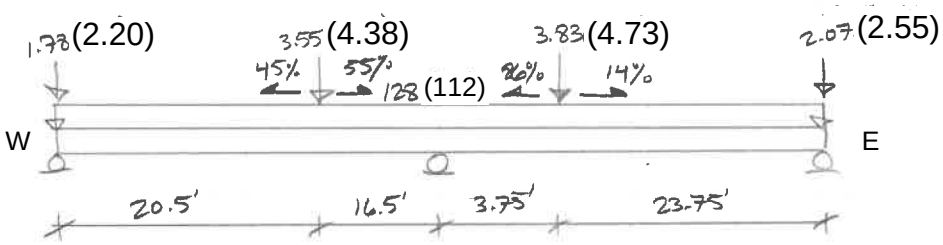
LATERAL ANALYSIS – NORTH/SOUTH EXPOSURE (SEISMIC LOADS)

ROOF (9' R-HT)



R(K)	1.78 (2.20)	3.55 (4.38)	3.83 (4.73)	2.07 (2.55)
LL(ft)	8'+5.5' = 13.5'	17'	11.75'+12.75' = 24.5'	4.75'+7.25'+3.75'+3.75'
V(plf)	132 (163)	209 (258)	156 (193)	106 (131)
SW	SW6	SW4	SW6	SW6
OT(K)	1.2 (1.5)	1.9 (2.3)	1.4 (1.7)	1.0 (1.2)
HD	CS16	(2) CS16	CS16	CS16
2w/h	>1.0	>1.0	>1.0	((2)(3.75)/9)(230) = 177 > 131

LEVEL 2 (10' PL-HT)



R(K)	5.75 (6.24)	9.61 (10.1)	4.37 (4.71)
LL(ft)	5.25'+5.5' = 10.75'	17.5'+15' = 32.5'	37'+4.75' = 41.75'
V(plf)	535 (580)	296 (310)	105 (113)
SW	SW2	SW4	SW6
OT (K)	5.4 (5.8) / 6.6 (7.3)	3.0 (3.1)	1.1 (1.1) / 2.1 (2.3)
HD	HDU8 / HDU8	HDU4	HDU2 / HDU2
2w/h	>1.0	>1.0	((2)(4.75)/10)230 = 219 > 113 ✓

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122 South Jackson
Suite 210
Seattle, WA 98104
t 206.789.6038
f 206.789.6042

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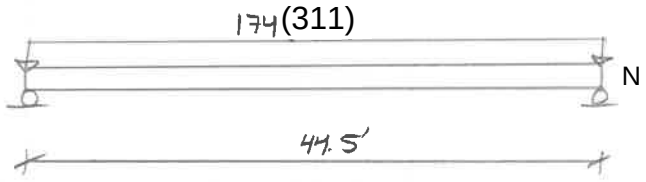
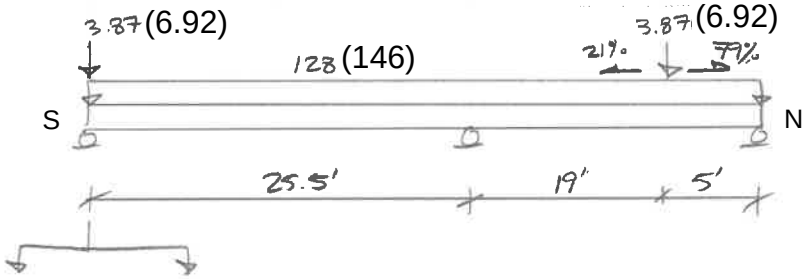
LATERAL ANALYSIS – EAST/WEST EXPOSURE (SEISMIC LOADS)

ROOF (9' R-HT)



R(K)	3.87 (6.92)	3.87 (6.92)
L(ft)	4.5'(4) + 3.5'(2) = 25'	4.5' + 3.5' + 3.75'(4) = 23'
V(plf)	158 (277)	168 (301)
SW	SW4	SW3
OT(K)	1.4 (2.5)	1.5 (2.7)
HD	(2)CS16/HDU4	(2)CS16
2w/h	((2)(3.5)/9)(350) = 277 = 277 ✓	((2)(3.5)/9)(450) = 350 > 301 ✓

LEVEL 2 (10' R-HT)



R(K)	1.08 (2.06)	4.42 (6.72)	3.98 (5.07)	4.59 (7.22)
L(ft)		4.5'(2) + 3.5' = 12.5'	13.25' + 7.5' + 6.75' + 12.5' = 40'	3.75'(3) + 3.5' = 14.75'
V(plf)	TO FNDN	354 (537)	100 (127)	311 (489)
SW		SW3-2	~~SW6~~ USE SW2 FOR STIFFNESS	SW3-2
OT(K)	1.4 (2.5)	3.5 (5.4) / 4.9 (7.9)	1.0 (1.3)	3.1 (4.8) / 4.6 (7.5)
HD	HDU4	HDU8 / HDU8	HDU2	HDU8 / HDU8
2w/h	—	((2)(3.5)/10)(900) = 630 > 537	>1.0	(2(3.5)/10)(900) = 630 > 489 ✓

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122 South Jackson
Suite 210
Seattle, WA 98104
t 206.789.6038
f 206.789.6042

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LATERAL PANEL DIAGRAM

ROOF:

ELEVATION	MIN. LENGTH OF SHEARWALL	PLATE HEIGHT	ASPECT RATIOS (AWC TABLE 4.3.4: 3.5:1)	AWC 4.3.3.4.1: 2lbs/ft
NORTH	3.5'	9'	9'/3.5 = 2.57'	2lbs/ft = [(2)(3.5)/9](450) = 350
SOUTH	3.5'	9'	9'/3.5 = 2.57'	= 350
EAST	3.75'	9'	9'/3.5 = 2.57'	2lbs/ft = [(2)(3.75)/9](230) = 192
WEST	5.5'	9'	9'/3.5 = 2.57'	>1.0

LEVEL 2:

ELEVATION	MIN LENGTH OF SHEARWALL	PLATE HEIGHT	ASPECT RATIOS (AWC TABLE 4.3.4: 3.5:1)	AWC 4.3.3.4.1: 2lbs/ft
NORTH	3.5'	10'	10'/3.5 = 2.86'	[(2)(3.5')/10](900) = 630
SOUTH	3.5'	10'	10'/3.5 = 2.86'	[(2)(3.5')/10](900) = 630
EAST	4.75'	10'	10'/3.5 = 2.86'	[(2)(4.75')/10](230) = 219
WEST	5.25'	10'	10'/3.5 = 2.86'	>1.0

MALSAM TSANG
STRUCTURAL ENGINEERING
122 SOUTH JACKSON ST
SUITE 210
SEATTLE, WA 98104
T 206.789.6038
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VERTICAL ANALYSIS

CASE 1, UNO

Typical Units: L = ft, W = klf, P = kip, R = kip, M = k-ft, V = k, Fb = ksi, Fv = psi
Units in (Parenthesis) represent Dead Load or 0.6DL (Ωo=2.5)

ROOF FRAMING

TYPICAL ROOF FRAMING

PRE-MFR TRUSSES AT 24" oc

GT AT SE CORNER #301

L = 25'

W = .045(40/2) = .90

R = 11.25

M = 70.31

[f_b = 1.72]

[f_v = 115]

[Δ = .74" = L/403]

GT or [GL 5 1/8x24]

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VERTICAL ANALYSIS

CASE 1, UNO

Typical Units: L = ft, W = klf, P = kip, R = kip, M = k-ft, V = k, Fb = ksi, Fv = psi
Units in (Parenthesis) represent Dead Load or 0.6DL (Ωo=2.5)

LEVEL 2 FRAMING

TYPICAL FLOOR FRAMING

RFPI JOISTS AT 16" oc

CANT BM AT OPENING (C3) #201

L = 17'
a_1 = 4'
W_1 = .055(16/12) = .073
W_2 = .055(8/2) =
P = 1.48
R_1 = .17
R_2 = 3.43
M = -7.08

f_b = -.77
f_v = 53
Δ_L = .12" = 2/835
↑BS=4.75'

GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8

N/S BEAM AT OPENING (C2) Ωo CHECK #202

L_1 = 17.25'
L_2 = 1.5'
W_1 = .055(16/12)/2 + .135 = .172
W_2 = .055(16/12) = .073
P = 1.48
R_1 = 1.72
R_2 = 2.83
M = 8.64

f_b = .86
f_v = 70
Δ = .43" = 4/523

GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8
Ωo CHECK
$P_E = \left(\frac{2.5}{\Omega_o}\right)(2.30) = 5.75^K$

R_1 = 2.18
R_2 = 8.12
M = 13.84

f_b = 1.38
f_v = 201

GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8

E/W BEAM AT NORTH (C2) Ωo CHECK #203

L_1 = 4'
L_2 = 3.5'
W_1 = .055(18.5/2) + .04(8.5/2) + .135 + .045(41/2) = 1.736
W_2 = .055(18.5/2) + .04(8.5/2) + .135 = .814
P = 2.54
R_1 = 6.94
R_2 = 5.39
M = 13.88

f_b = 1.38
f_v = 133
Δ = .10" = 4/674

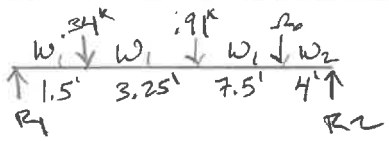
GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8
Ωo CHECK
$P_E = \left(\frac{2.5}{\Omega_o}\right)(2.33) = 5.83^K$

R_1 = 9.66
R_2 = 8.50
M = 24.76

f_b = 2.47
f_v = 210

GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8

N/S BEAM AT GARAGE OPENING Ωo CHECK #204



W_1 = .055(16/12) + .135 = .208
W_2 = .055(16/12) = .073
R_1 = 2.58
R_2 = 1.51
M = 2.06

f_b = .90
f_v = 59
Δ = .35" = 4/596

GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8
Ωo CHECK
$P_E = \left(\frac{2.5}{\Omega_o}\right)(1.72) = 4.30^K$

R_1 = 3.63
R_2 = 4.76
M = 18.50

f_b = 1.84
f_v = 118

GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8

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122 South Jackson
Suite 210
Seattle, WA 98104
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f 206.789.6042

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VERTICAL ANALYSIS

CASE 1, 4NO

Typical Units: L = ft, W = klf, P = kip, R = kip, M = k-ft, V = k, Fb = ksi, Fv = psi
Units in (Parenthesis) represent Dead Load or 0.6DL (Ω0=2.5)

LEVEL 2 CONT

E/W BEAM SUPPORTING #205 (C2). #205 Ω0 CHECK

$L_1 = 6'$
$L_2 = 1.5'$
$W_1 = .055(6/2) = .165$
$W_2 = .055(18/2) = .495$
$P = 2.58$
$R_1 = 1.18$
$R_2 = 3.13$
$M = 4.14$
$f_b = .68$
$f_v = 127$
$\Delta = .05"$

GL 3 1/8x11 7/8 OR LVL 3 1/2x11 7/8

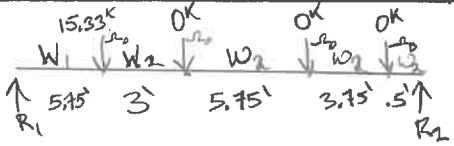
Ω0 CHECK

$P_E = (2.5)(1.72) = 4.30^K$ (Ω0)

$R_1 = 2.04$
$R_2 = 6.57$
$M = 9.30$
$f_b = 1,152$
$f_v = 2166$

GL 3 1/8x11 7/8 OR LVL 3 1/2x11 7/8

E/W AT GARAGE Ω0 CHECK #206



$W_1 = .055(11.5/2) + .135 + .04(6/2) = .571$
$W_2 = .055(16/2) + .135 + .04(6/2) = .695$

$R_1 = 16.54$
$R_2 = 11.11$
$M = 85.67$
$f_b = 1.65$
$f_v = 174$
$\Delta = .32" = L/708$

GL 5 1/8x27

Ω0 CHECK

$P_E = (2.5)(2.71) = 6.78$ (Ω0) ← ACT AS COUPLES

WORST CASE
$R_1 = 18.98$
$R_2 = 13.55$
$M = 99.71$
$f_b = 1.92$
$f_v = 200$

GL 5 1/8x27

E/W BM AT GARAGE #207

$L = 11.75'$
$W = .055(17/2) + .135 + .04 = .643$
$R = 3.78$
$M = 11.10$
$f_b = 1.11$
$f_v = 77$
$\Delta = .21" = L/658$

GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8

N/S BEAM AT GARAGE (C4) #208 Ω0 CHECK

$L_1 = 15.75'$
$L_2 = 1.5'$
$L_3 = 4.75'$
$W_1 = .055(16/12) = .073$
$W_2 = .055(16/12) + .135 = .208$
$W_3 = .04(11.75/2) = .235$
$P_1 = 11.11$
$P_2 = 3.78$
$R_1 = 4.91$
$R_2 = 12.56$
$M = 68.26$
$f_b = 1.32$
$f_v = 137$
$\Delta = .31" = L/852$

GL 5 1/8x27

Ω0 CHECK

$P_{E1} = 13.55^K$ ← INCLUDES Ω0 = 2.5

$R_1 = 5.60$
$R_2 = 14.31$
$M = 79.18$
$f_b = 1.53$
$f_v = 156$

GL 5 1/8x27

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122 South Jackson
Suite 210
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t 206.789.6038
f 206.789.6042

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VERTICAL ANALYSIS

CASE 1, UNO

Typical Units: L = ft, W = klf, P = kip, R = kip, M = k-ft, V = k, Fb = ksi, Fv = psi
Units in (Parenthesis) represent Dead Load or 0.6DL (Ωo=2.5)

LEVEL 2 CONT

HEADER AT GARAGE #209

L = 16'
W = .045(15/2) = .169
R = 1.35
M = 5.41

f_b = .94
f_v = 40
Δ = .44" = L/431

GL 5 1/8 x 9

DROP BEAM AT FRONT PATIO #210

L = 16.5'
W = .04(9/2+2) = 0.18
R = 1.49
M = 6.13

f_b = 1.21
f_v = 63
Δ = 0.69" = L/404

GL 3-1/2 x 10-1/2

DROP BEAM AT KP (2) #211

L_1 = 4.75'
L_2 = 4.75'
W_1 = .04
W_2 = .04
P = 1.68
R_1 = 1.03
R_2 = 1.03
M = 4.44

f_b = 1.07 < 1.24
f_v = 46
Δ = .16" = L/411

4x10

DROP BM AT WEST PATIO #212

L = 16.5'
W = .04(9/2+2) = .26
R = 2.2
M = 8.9

f_b = 1.1
f_v = 56
Δ = 10.45" = L/436

GL 5-1/2 x 10-1/2

TYPICAL CRAWL HEADER

L = 7'
W = .055(18/2) = .495
R = 1.73
M = 3.03

f_b = .73
f_v = 63
Δ = .07" = L/1160

4x10

RIDGE BEAM AT WEST PATIO #213

L = 18.75'
W = .04(18/2) = 0.36
R = 3.4
M = 15.8

f_b = 1.23
f_v = 71
Δ = 0.55" = L/408

GL 5-1/2 x 13-1/2

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122 South Jackson
Suite 210
Seattle, WA 98104
t 206.789.6038
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FULL HEIGHT COLUMNS AT GREAT ROOM

VERTICAL BEARING CONDITION:

H = 20'

P = 9.4K

P_{ALLOW} = 13.9K

Δ = 0.4"

L/595

USE LVL 5¼×5¼ (PSL 5¼×5¼ SIM)

MALSAM TSANG
STRUCTURAL ENGINEERING
122 SOUTH JACKSON ST
SUITE 210
SEATTLE, WA 98104
T 206.789.6038
MALSAM-TSANG.COM

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FORTEWEB

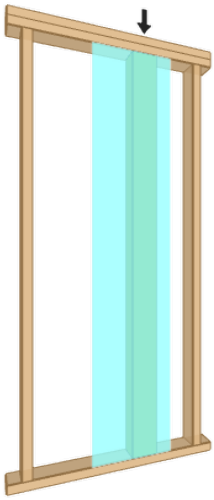
MEMBER REPORT

PASSED

Level, Wall: Column

1 piece(s) 5 1/4" x 5 1/4" 1.8E Parallam® PSL

Wall Height: 20' Member Height: 19' 7 1/2" Tributary Width: 1'



Drawing is Conceptual

Design Results	Actual	Allowed	Result	LDF	Load: Combination
Slenderness	38	50	Passed (76%)	--	--
Compression (lbs)	9400	13906	Passed (68%)	1.00	1.0 D + 1.0 L
Plate Bearing (lbs)	9400	17227	Passed (55%)	--	1.0 D + 1.0 L
Lateral Reaction (lbs)	129	--	--	1.60	1.0 D + 0.6 W
Lateral Shear (lbs)	123	6762	Passed (2%)	1.60	1.0 D + 0.6 W
Lateral Moment (ft-lbs)	631 @ mid-span	8812	Passed (7%)	1.60	1.0 D + 0.6 W
Total Deflection (in)	0.40 @ mid-span	0.98	Passed (L/595)	--	1.0 D + 0.45 W + 0.75 L + 0.75 Lr
Bending/Compression	0.88	1	Passed (88%)	1.00	1.0 D + 1.0 L

- Lateral deflection criteria: Wind (L/240)
- Input axial load eccentricity for this design is 16.67% of applicable member side dimension.
- Applicable calculations are based on NDS.
- This product has a square cross section. The analysis engine has checked both edge and plank orientations to allow for either installation.

Supports	Type	Material
Top	Dbl 2X	Douglas Fir-Larch
Base	2X	Douglas Fir-Larch

System : Wall
Member Type : Column
Building Code : IBC 2018
Design Methodology : ASD

Max Unbraced Length	Comments
1'	

Lateral Connections

Supports	Connector	Type/Model	Quantity	Connector Nailing
Top	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A
Base	Nails	8d (0.113" x 2 1/2") (Toe)	2	N/A

- Nailed connection at the top of the member is assumed to be nailed through the bottom 2x plate prior to placement of the top 2x of the double top plate assembly.

Vertical Load	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
1 - Point (lb)	N/A	-	9400	Default Load

Lateral Load	Location	Tributary Width	Wind (1.60)	Comments
1 - Uniform (PSF)	Full Length	1'	21.9	

- ASCE/SEI 7 Sec. 30.4: Exposure Category (B), Mean Roof Height (13'), Topographic Factor (1.0), Wind Directionality Factor (0.85), Basic Wind Speed (115), Risk Category(II), Effective Wind Area determined using full member span and trib. width.
- IBC Table 1604.3, footnote f: Deflection checks are performed using 42% of this lateral wind load.

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Garrett Oswald Malsam Tsang (206) 902-7287 garretto@malsam-tsang.com	

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11/29/2023 11:10:37 PM UTC

ForteWEB v3.6, Engine: V8.3.1.5, Data: V8.1.4.1

File Name: Calculations