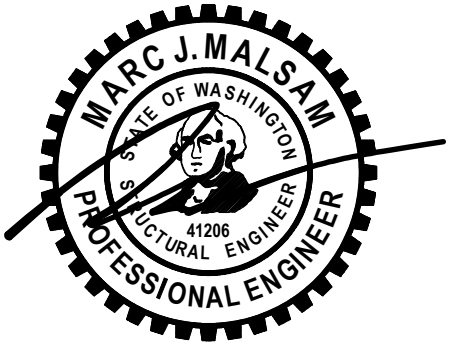
*STRUCTURAL CALCULATIONS FOR:*

# PLAN MN472

7119 80TH AVE SE
MERCER ISLAND, WA 98040

ARCHITECT: MN CUSTOM HOMES

JULY 14, 2023

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STRUCTURAL ENGINEERING

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# 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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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.

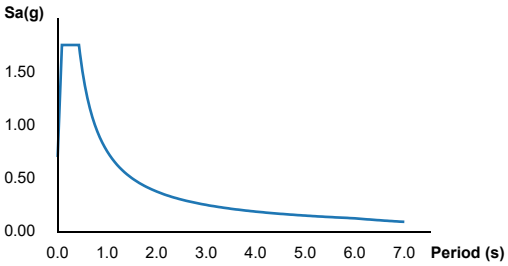
ℹ The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

# Hazards by Location

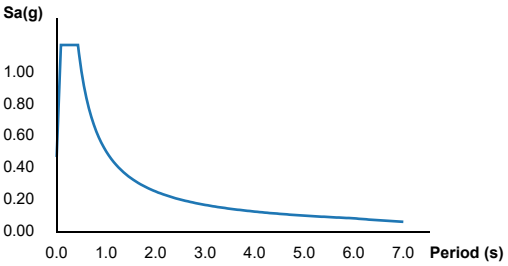
## Search Information

| | |
|---|---|
| **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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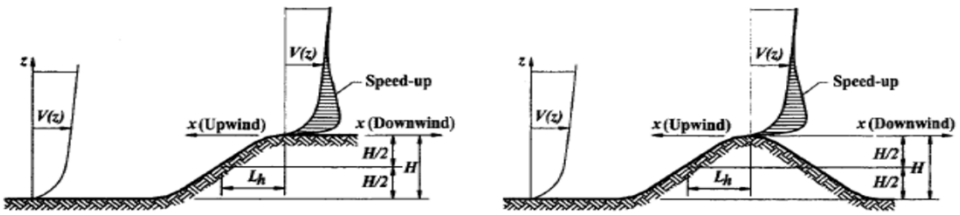
# Kzt WORKSHEET

**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** | |
| $K_2$: | $(1 - \lvert x\rvert/\mu L_h)$ | $K_2$: | $(1 - \lvert x\rvert/\mu L_h)$ | $K_2$: | $(1 - \lvert x\rvert/\mu L_h)$ | $K_2$: | $(1 - \lvert x\rvert/\mu L_h)$ |
| $\mu$ = | 1.5 (Figure 26.8-1) | $\mu$ = | 1.5 (Figure 26.8-1) | $\mu$ = | 1.5 (Figure 26.8-1) | $\mu$ = | 1.5 (Figure 26.8-1) |
| **$K_2$ = N/A** | | **$K_2$ = 0.92** | | **$K_2$ = N/A** | | **$K_2$ = -1.35897** | |
| $K_3$: | $e^{-\gamma z/Lh}$ | $K_3$: | $e^{-\gamma z/Lh}$ | $K_3$: | $e^{-\gamma z/Lh}$ | $K_3$: | $e^{-\gamma z/Lh}$ |
| $\gamma$ = | 4 (Figure 26.8-1) | $\gamma$ = | 4 (Figure 26.8-1) | $\gamma$ = | 4 (Figure 26.8-1) | $\gamma$ = | 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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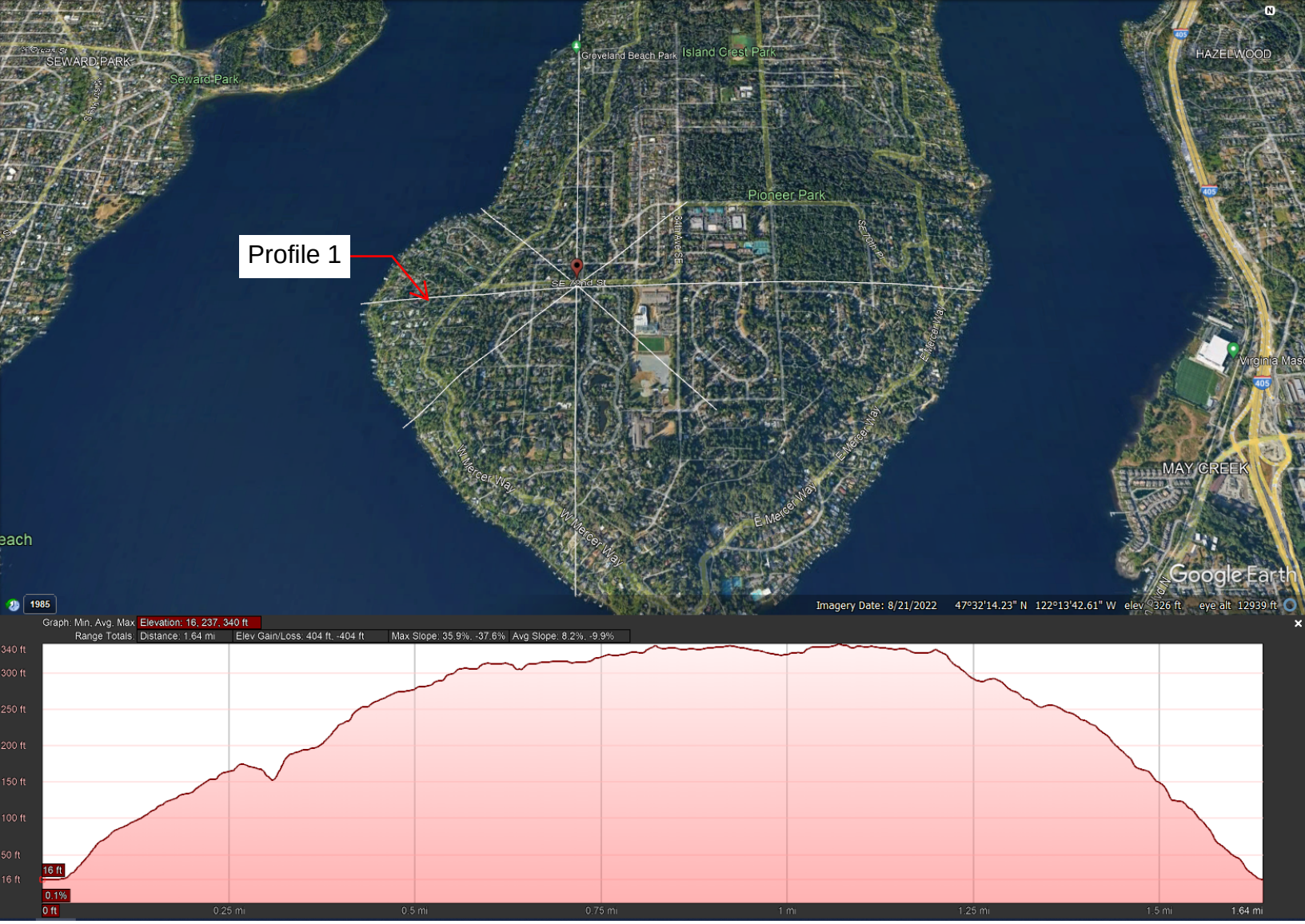
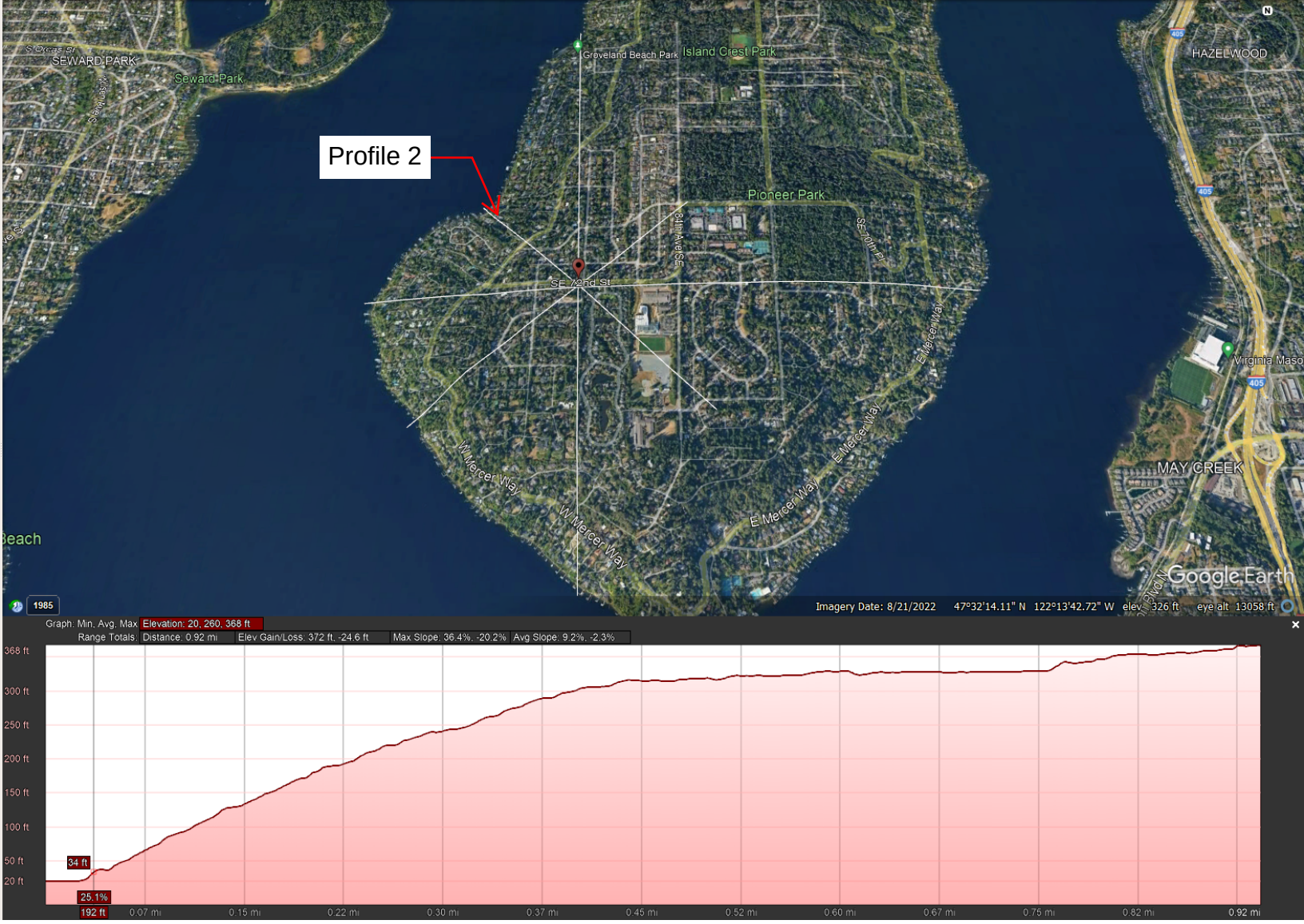
Mercer Island, WA 98040

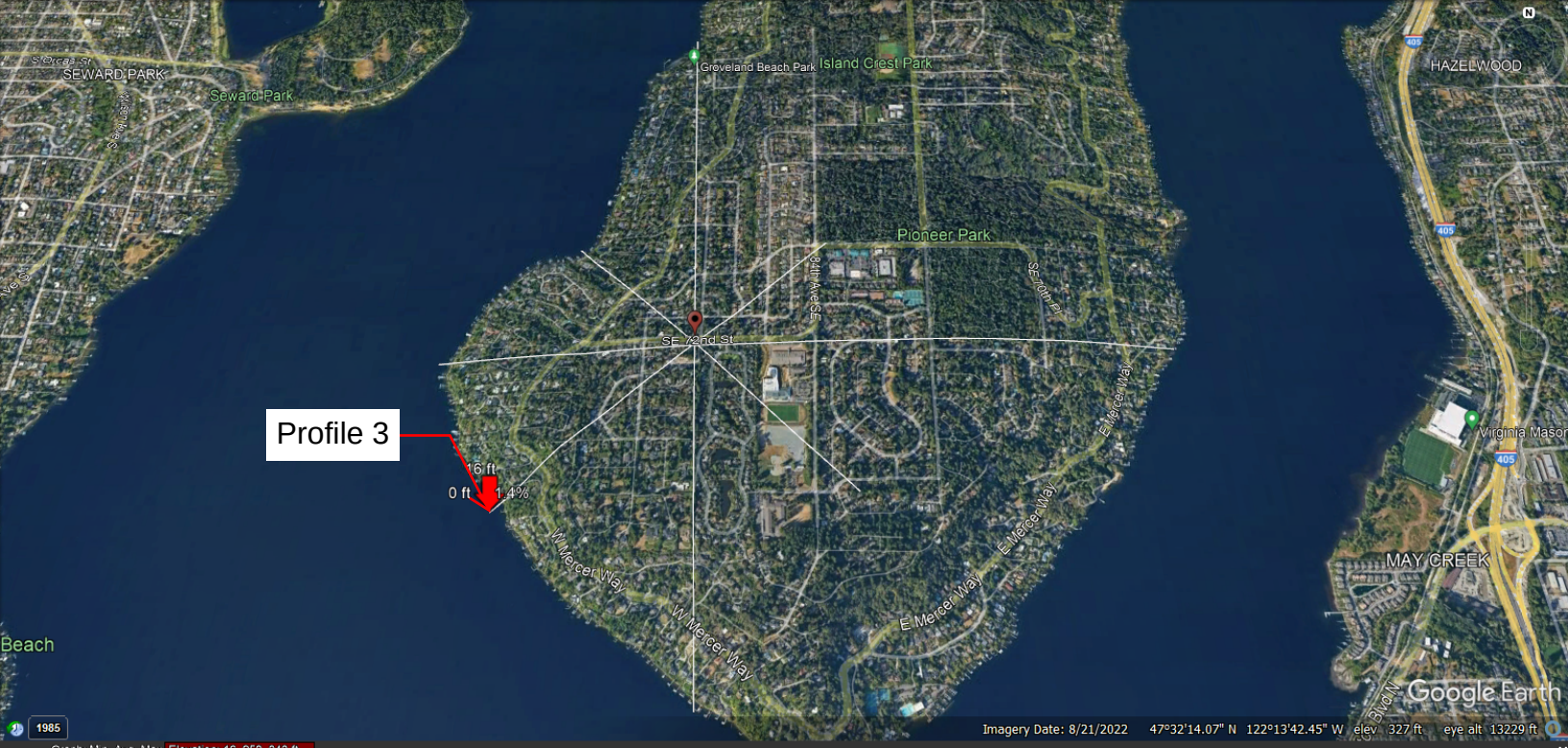
Date: 7/10/2023
Proj. No.: 0444-2023-23-01
Design: JMT
Sheet: DC3


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

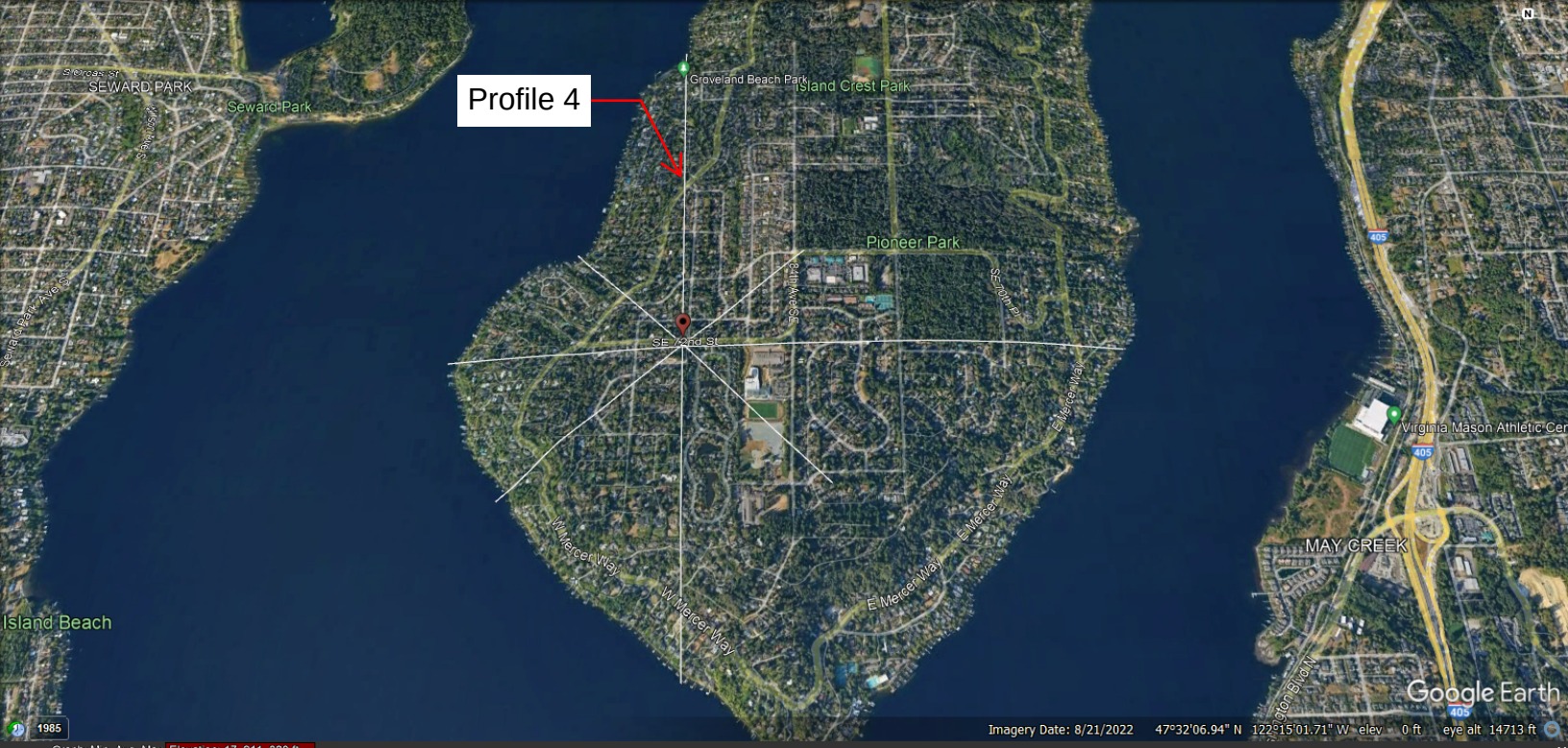

Graph: Min, Avg, Max Elevation: 16, 237, 340 ft
Range Totals: Distance: 1.64 mi Elev Gain/Loss: 404 ft, -404 ft Max Slope: 35.9%, -37.6% Avg Slope: 8.2%, -9.9%
340 ft
300 ft
250 ft
200 ft
150 ft
100 ft
50 ft
16 ft
16 ft
0.1%
0 ft
0.25 mi
0.5 mi
0.75 mi
1 mi
1.25 mi
1.5 mi
1.64 mi


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

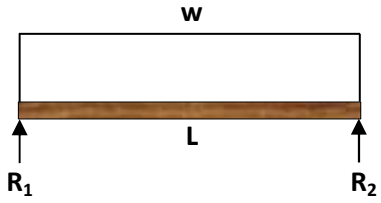

Profile 4
Groveland Beach Park
Island Crest Park
SEWARD PARK
Seward Park
Pioneer Park
SE 72nd St
E Mercer Way
W Mercer Way
MAY CREEK
Island Beach
Google Earth
Imagery Date: 8/21/2022 47°32'06.94" N 122°15'01.71" W elev 0 ft eye alt 14713 ft


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

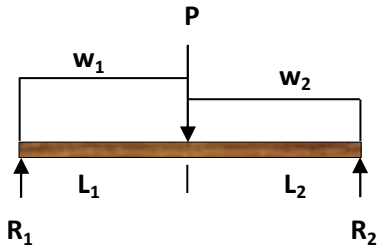
# TYPICAL BEAM CASES

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

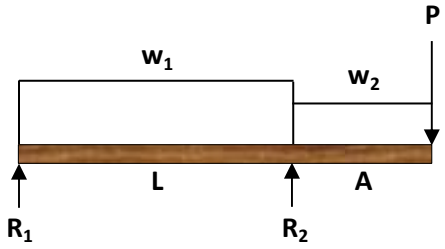
**CASE #1:** (C1)



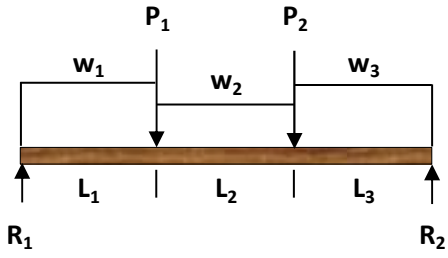

**CASE #2:** (C2)



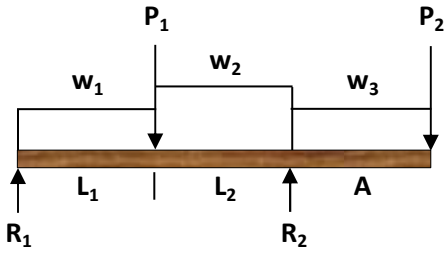

**CASE #3:** (C3)



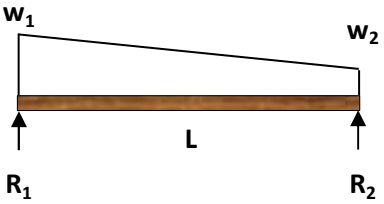

**CASE #4:** (C4)



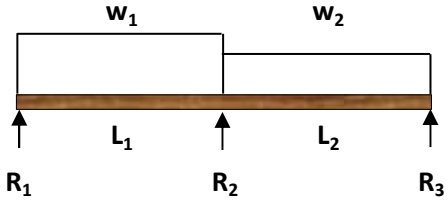

**CASE #5:** (C5)




**CASE #6:** (C6)




**CASE #7:** (C7)





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| | |
|---|---|
| Plan MN472 | 7/10/2023 |
| 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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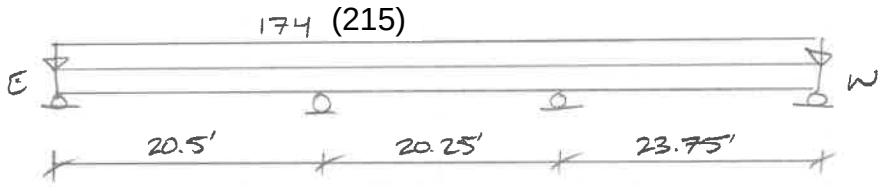
JMT — Design
L-1 — Sheet

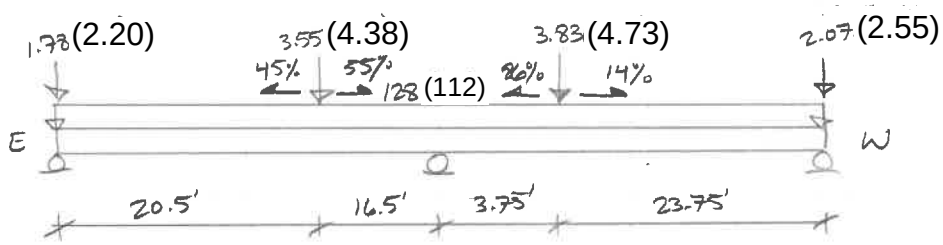
# LATERAL ANALYSIS – NORTH/SOUTH EXPOSURE (SEISMIC LOADS)

## 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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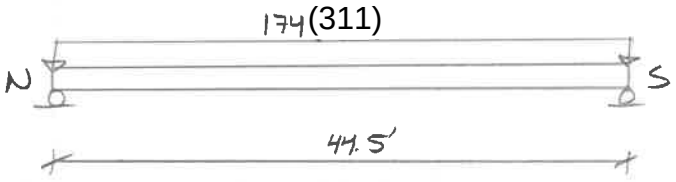
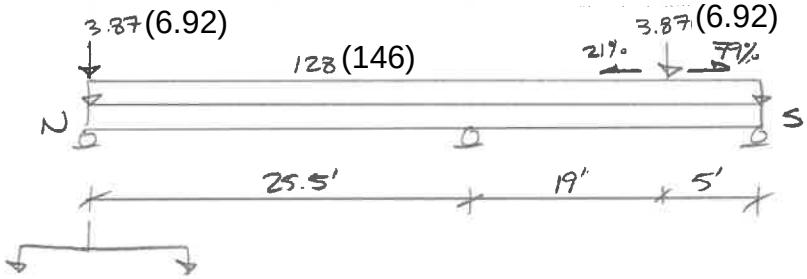
# LATERAL ANALYSIS – EAST/WEST EXPOSURE (SEISMIC LOADS)

## 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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| Design | JMT |
| Sheet | L3 |

# 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
$\Delta_L$ = .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
$\Delta$ = .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
$\Delta$ = .10" = 4/674

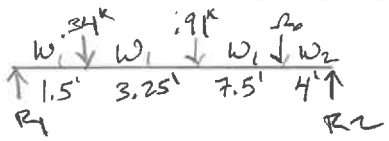
GL 5 1/8x11 7/8 OR LVL 5 1/4x11 7/8
Ωo CHECK
$P_E = \left(\frac{2.5}{\Omega_o}\right)(2.33) = 5.83^K$

$R_1$ = 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
$\Delta$ = .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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# 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

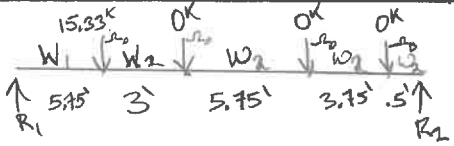
Ω0 CHECK

$P_E = (2.5)(1.72) = 4.30^K$ (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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# 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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