Structural Calculations For:

Morelli Residence

8454 W. Mercer Way

Mercer Island, WA 98040

Prepared for:	Sturman Architects
Job #:	10315-2020-06
Date:	January 20, 2021

STRUCTURAL ENGINEERING

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Criteria Sheet

Codes:

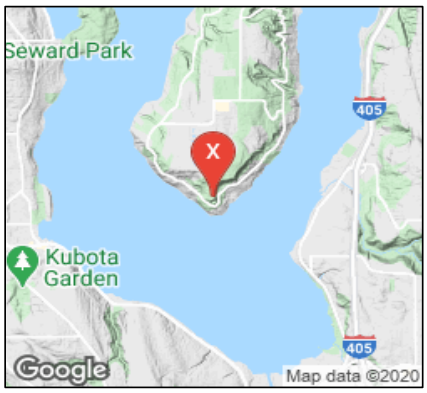
Structural:	IBC 2015
Loading:	ASCE 7-10
Wood:	NDS 2015
Steel:	AISC 360-10
Concrete:	ACI 318-14
Masonry:	TMS 402/602-13

Project Location:

Street & Number:	8454 W Mercer Way		
City:	Mercer Islanc	State:	WA
ZIP:	98040		
Latitude:	47.5274 N		
Longitude:	-122.2271 W		

Occupancy Category

Risk Category: II ASCE 7 Table 1.5-1



Seismic Load Summary:

Analysis Procedure:	Equivalent Lateral Force Procedure		
Lateral System:	Light-frame (wood) Walls Sheathed with Wood Structural Panels Rated for Shear Resistance		
R:	6.50	C_d=	4
Base Shear V =	16 kips	Ω_o=	2.5
S_S=	1.463	S_1=	0.556
S_{DS}=	0.98	S_{D1}=	0.56
C_s=	0.150	I_E=	1.0

Wind Load Summary:

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

Dead Loads:

Roof		
Roofing	2.5	psf
1/2" Sheathing	1.8	psf
Rafters @ 16" oc	2.5	psf
Misc./Mech.	1.5	psf
Ceiling Finish	2.8	psf
Solar Panels	4	
	15	psf
Use	15	psf
Floor		
Finish Floor	1	psf
3/4" Sheathing	2.7	psf
Joists @ 16" oc	2.2	psf
Misc./Mech.	2	psf
Ceiling Finish	2.8	
	10.7	psf
Use	12	psf

Live Loads:

Snow	25	psf	Deck	60	psf
Floor	40	psf			

Soils:

Allowable Bearing	1500	psf

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Seismic Design

ASCE 7-10 Seismic Analysis Equivalent Lateral Force Procedure

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

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

Ω_o	2.5	
S_S	1.463 g	2% in 50 yr, Latitude & Longitude lookup
S_1	0.556 g	2% in 50 yr, Latitude & Longitude lookup
h_n	16.8 ft	
R	6.50	
I_e	1.0	Table 1.5-2
C_d	4	
Ct	0.02	Table 12.8-2
x	0.75	Table 12.8-2
T	0.17 sec	Eq. 12.8-7
T_0	0.11 sec	
T_S	0.57 sec	
k	1.000	
Fa	1.00	Table 11.4-1
Fv	1.50	Table 11.4-2
S_{MS}	1.46 g	Eq. 11.4-1
S_{M1}	0.83 g	Eq. 11.4-2
S_{DS}	0.975 g	Eq. 11.4-3
S_{D1}	0.556 g	Eq. 11.4-4
Cs	***0.150 Controls***	Eq. 12.8-2
	0.517	Eq. 12.8-3 need not exceed, $T < T_L$
	0.010	Eq. 12.8-5 or 12.8-6 minimum
Cs, design	0.150	
Bldg. Weight	109.3 k	
$V = C_S W$	16.4 k	Eq. 12.8-1, Strength Level Base Shear
$V = C_{Sasd} W$	11.5 k	Eq. 12.8-1 ASD Base Shear

$$T_a = C_t h_n^x \quad \text{Eq. 12.8.7}$$

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

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

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

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

Vertical Distribution ASD ρ= 1.3

Level	h_x (ft)	W_x (k)	h_x^k (ft)	$W_x h_x^k$	Story Shear ASD			Diaphragm Force (ρ not included)				
					C_{vx} (%)	F_x (k)	SV (k)	$F_{px,calc}$	$F_{px,min}$	$F_{px,max}$	$F_{px,design}$	$\gamma=F_{px}/F_x$
Roof	16.8	46.38	16.8	777	0.572	8.53	**8.5**	6.6	6.3	12.7	**6.6**	0.77
Upper	9.3	62.90	9.3	582	0.428	6.39	**14.9**	6.6	8.6	17.2	**8.6**	1.34
Σ		109.3		1359		**14.92**						

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Wind Design - MWFRS

ASCE 7-10 Chapter 27 - Directional Procedure

Design Method	ASD

Wind Coefficients

Exposure	C	
V=	110	mph
K_d=	0.85	Table 26.6-1
K_h=	0.90	Table 27.3-1
G=	0.85	26.9.4

Transverse Wind Pressures

L/B = 0.86 h/L = 0.33

Pressure Coefficients from Figure 27.4-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.50
Windward Roof	-0.28 / 0.21
Leeward Roof	-0.60

Location and Building Dimensions

Calculate Kzt?	Yes	
Kzt	1.00	
Roof Type	Gable	
Roof Angle - Transverse Dir	22.764	degrees
Roof Angle - Long Dir	22.764	degrees
Ground to top of roof	23	ft
Bot of roof to top of roof	6.25	ft
Mean Roof Height, h	19.875	ft
Short Plan Dimension	60.5	ft
Long Plan Dimension	70.75	ft
Parapet ?	No	
Ground to top of parapet		ft
Average Parapet Height		ft
Ht of 2nd Level Above Grade	9.25	ft

Velocity Pressure at Mean Roof Height, q_h =	23.7	psf

Wall Pressures (Unfactored): ASD

Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lwwalls}$	**P_{walls} (psf)**
0-15	0.85	22.38	15.22	10.08	**15.18**
15-20	0.9	23.70	16.11	10.08	**15.72**
20-25	0.94	24.75	16.83	10.08	**16.15**
25-30	0.98	25.80	17.55	10.08	**16.57**
30-40	1.04	27.38	18.62	10.08	**17.22**
41-50	1.09	28.70	19.52	10.08	**17.76**
51-60	1.13	29.75	20.23	10.08	**18.19**
61-70	1.17	30.81	20.95	10.08	**18.62**
71-80	1.21	31.86	21.66	10.08	**19.05**
81-90	1.24	32.65	22.20	10.08	**19.37**
91-100	1.26	33.18	22.56	10.08	**19.58**

Roof Pressures (Unfactored) ASD

Windward		Leeward	**Horiz Proj (psf)**
Max	Min		
4.2	-5.6	-12.1	**4.80**

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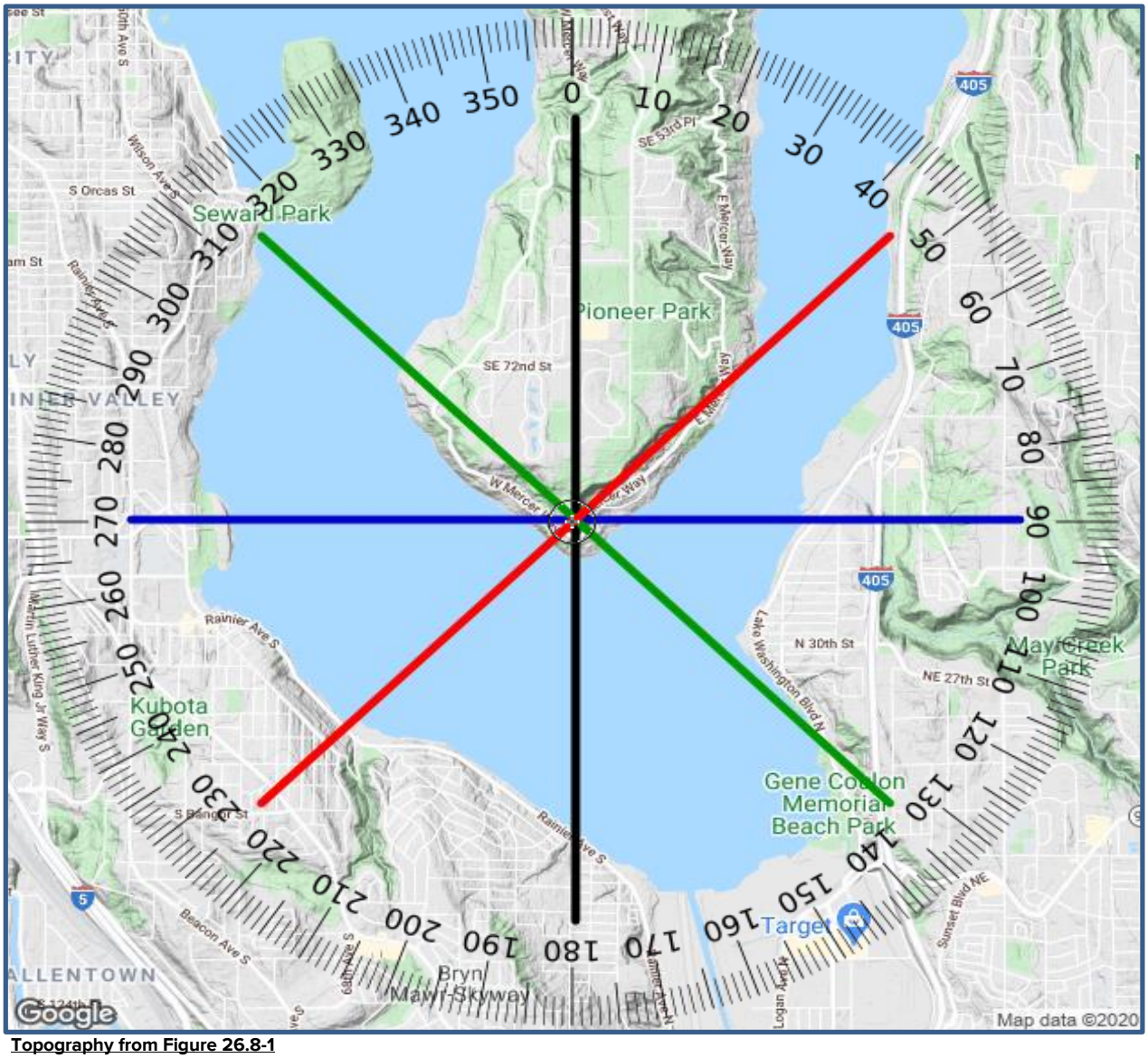
Site Address

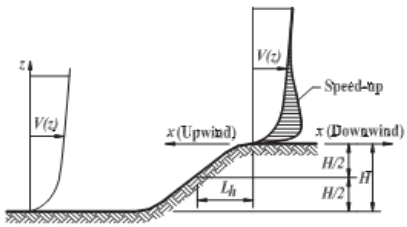
Address	8454 W Mercer Way			Wind Radius	2.00 Miles
City:	Mercer Islanc	State:	WA	Angle	0 ˚
Lat Long	47.52744	-122.2271		Exposure	C

Profile 1 : 0 ˚ to 180 ˚
Profile 2 : 270 ˚ to 90 ˚
Profile 3 : 315 ˚ to 135 ˚
Profile 4 : 45 ˚ to 225 ˚

SITE MAP



Topography from Figure 26.8-1



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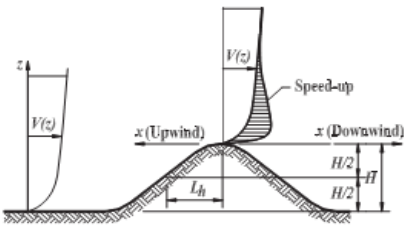

2-D RIDGE OR 3-D AXISYMMETRICAL HILL

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

PER FIGURE 26.8-1

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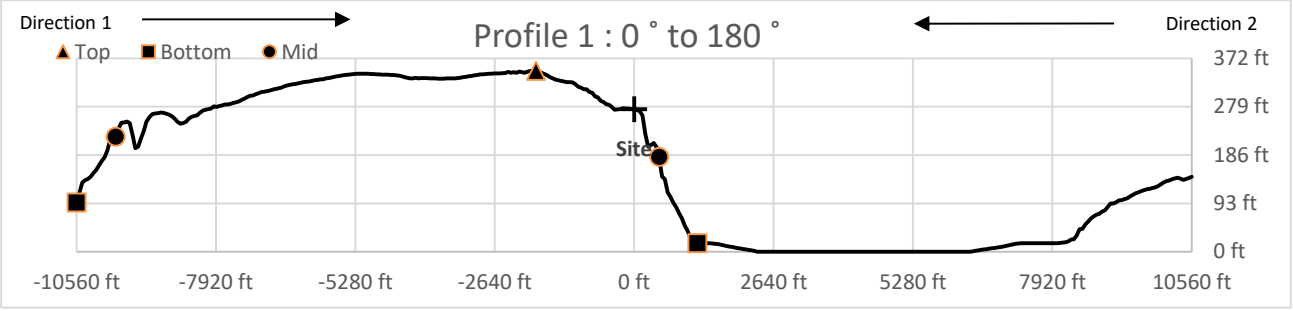

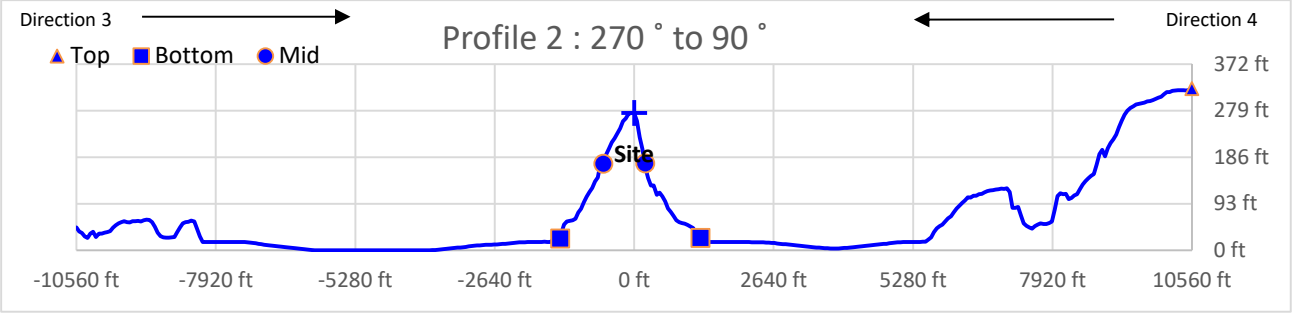

Direction 1 - 0 ˚to Site

Site Conditions (26.8.1)

1. Unubstructed	Yes
2. Isolated	Yes
3. Upper Half Hill	Yes
4. H/Lh ≥ 0.2	No
5. H≥ 15'	Yes

Kzt=1

Terrain Data

Terrain	Escrpmnt
Top of Hill Dist.	-1857
Bott. of Hill Dist.	-10560
L @ H/2	-9817
Site	downwnd
Top of Hill Elev.	348
Bott. of Hill Elev.	95
Site Elev.	274.3
Site Dist.	0
H/2	221

Kzt Calculations

H=	253
Lh=	7960
x=	1857
z=	19.875
μ=	4
γ=	2.5
K1 value =	0.85
K1=	0.03
K2=	0.94
k3=	0.99
H/Lh =	0.03
Kzt =	1.00

Direction 2 - Site to 180 ˚

Site Conditions (26.8.1)

1. Unubstructed	Yes
2. Isolated	Yes
3. Upper Half Hill	Yes
4. H/Lh ≥ 0.2	No
5. H≥ 15'	Yes

Kzt=1

Terrain Data

Terrain	Escrpmnt
Top of Hill Dist.	-1857
Bott. of Hill Dist.	1199
L @ H/2	478
Site	upwind
Top of Hill Elev.	348
Bott. of Hill Elev.	16
Site Elev.	274.3
Site Dist.	0
H/2	182

Kzt Calculations

H=	332
Lh=	2335
x=	1857
z=	19.875
μ=	1.5
γ=	2.5
K1 value =	0.85
K1=	0.12
K2=	0.47
k3=	0.98
H/Lh =	0.14
Kzt =	1.00

Direction 3 - 270 ˚to Site

Site Conditions (26.8.1)

1. Unubstructed	Yes
2. Isolated	Yes
3. Upper Half Hill	Yes
4. H/Lh ≥ 0.2	No
5. H≥ 15'	Yes

Kzt=1

Terrain Data

Terrain	Hill
Top of Hill Dist.	10560
Bott. of Hill Dist.	-1399
L @ H/2	-584
Site	upwind
Top of Hill Elev.	323
Bott. of Hill Elev.	23
Site Elev.	274.3
Site Dist.	0
H/2	173

Kzt Calculations

H=	300
Lh=	11144
x=	10560
z=	19.875
μ=	1.5
γ=	4
K1 value =	1.05
K1=	0.03
K2=	0.37
k3=	0.99
H/Lh =	0.03
Kzt =	1.00

Direction 4 - Site to 90 ˚

Site Conditions (26.8.1)

1. Unubstructed	Yes
2. Isolated	Yes
3. Upper Half Hill	Yes
4. H/Lh ≥ 0.2	No
5. H≥ 15'	Yes

Kzt=1

Terrain Data

Terrain	Hill
Top of Hill Dist.	10560
Bott. of Hill Dist.	1255
L @ H/2	212
Site	downwnd
Top of Hill Elev.	323
Bott. of Hill Elev.	25
Site Elev.	274.3
Site Dist.	0
H/2	174

Kzt Calculations

H=	298
Lh=	10348
x=	10560
z=	19.875
μ=	1.5
γ=	4
K1 value =	1.05
K1=	0.03
K2=	0.32
k3=	0.99
H/Lh =	0.03
Kzt =	1.00

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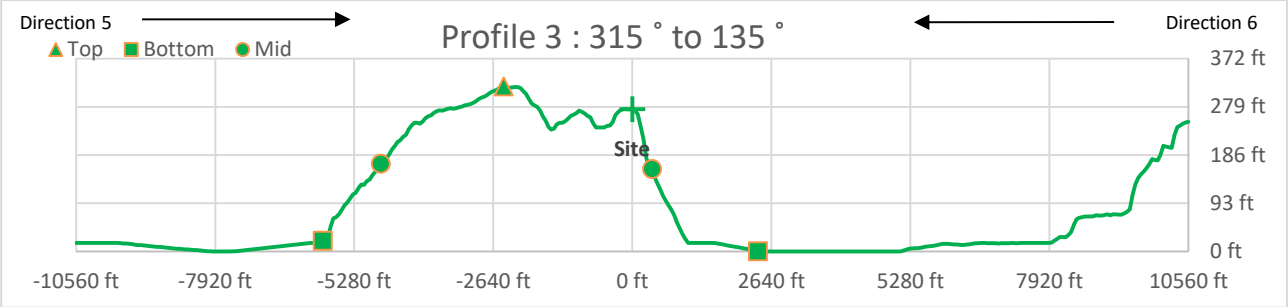

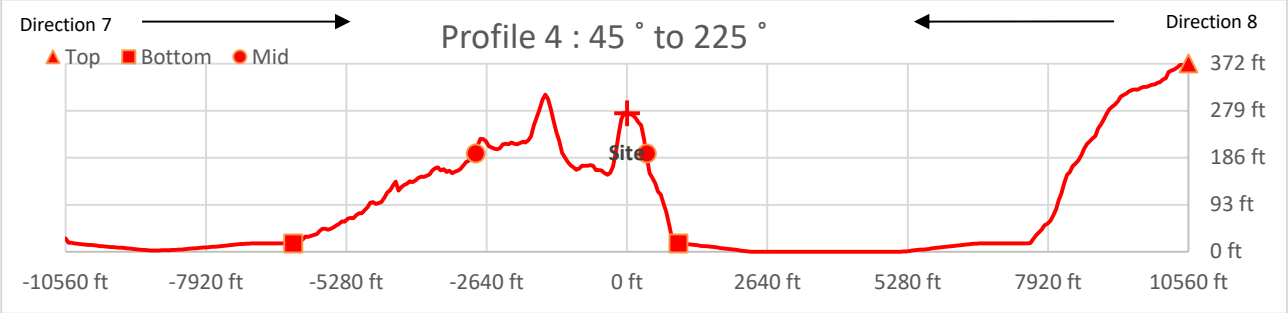

Direction 5 - 315 ˚to Site

Site Conditions (26.8.1)

1. Unobstructed	Yes
2. Isolated	Yes
3. Upper Half Hill	Yes
4. H/Lh ≥ 0.2	No
5. H≥ 15'	Yes

Kzt=1

Terrain Data

Terrain	Hill
Top of Hill Dist.	-2441
Bott. of Hill Dist.	-5874
L @ H/2	-4776
Site	downwnd
Top of Hill Elev.	319
Bott. of Hill Elev.	20
Site Elev.	274.3
Site Dist.	0
H/2	169

Kzt Calculations

H=	298
Lh=	2335
x=	2441
z=	19.875
μ=	1.5
γ=	4
K1 value =	1.05
K1=	0.13
K2=	0.30
k3=	0.97
H/Lh =	0.13
Kzt =	1.00

Direction 6 - Site to 135 ˚

Site Conditions (26.8.1)

1. Unobstructed	Yes
2. Isolated	
3. Upper Half Hill	Yes
4. H/Lh ≥ 0.2	No
5. H≥ 15'	Yes

Kzt=1

Terrain Data

Terrain	Hill
Top of Hill Dist.	-2441
Bott. of Hill Dist.	2388
L @ H/2	376
Site	upwind
Top of Hill Elev.	319
Bott. of Hill Elev.	0
Site Elev.	274.3
Site Dist.	0
H/2	159

Kzt Calculations

H=	319
Lh=	2817
x=	2441
z=	19.875
μ=	1.5
γ=	4
K1 value =	1.05
K1=	0.12
K2=	0.42
k3=	0.97
H/Lh =	0.11
Kzt =	1.00

Direction 7 - 45 ˚to Site

Site Conditions (26.8.1)

1. Unobstructed	Yes
2. Isolated	Yes
3. Upper Half Hill	Yes
4. H/Lh ≥ 0.2	No
5. H≥ 15'	Yes

Kzt=1

Terrain Data

Terrain	Hill
Top of Hill Dist.	10560
Bott. of Hill Dist.	-6277
L @ H/2	-2845
Site	upwind
Top of Hill Elev.	372
Bott. of Hill Elev.	16
Site Elev.	274.3
Site Dist.	0
H/2	194

Kzt Calculations

H=	356
Lh=	13405
x=	10560
z=	19.875
μ=	1.5
γ=	4
K1 value =	1.05
K1=	0.03
K2=	0.47
k3=	0.99
H/Lh =	0.03
Kzt =	1.00

Direction 8 - Site to 225 ˚

Site Conditions (26.8.1)

1. Unobstructed	Yes
2. Isolated	Yes
3. Upper Half Hill	Yes
4. H/Lh ≥ 0.2	No
5. H≥ 15'	Yes

Kzt=1

Terrain Data

Terrain	Hill
Top of Hill Dist.	10560
Bott. of Hill Dist.	966
L @ H/2	371
Site	downwnd
Top of Hill Elev.	372
Bott. of Hill Elev.	16
Site Elev.	274.3
Site Dist.	0
H/2	194

Kzt Calculations

H=	356
Lh=	10189
x=	10560
z=	19.875
μ=	1.5
γ=	4
K1 value =	1.05
K1=	0.04
K2=	0.31
k3=	0.99
H/Lh =	0.03
Kzt =	1.00

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Morelli Residence

Kzt Calculations

DATE 1/20/2021

PROJ. #

DESIGN VMB

SHEET 6

SEISMIC WEIGHT (for RESIDENCE)

W_S(ROOF) = ROOF + WALLS
he 16.75' = 15(2505 S.F) + 5(1760 S.F)
= 46375 lbs

W_S(UPP) = (LOW ROOF + WALLS) + (FLOOR + WALLS)
h = 9.25' = 15(900 S.F) + 5(505 S.F) + 12(1760 S.F)
+ 10(1760 S.F) + 15(100 S.F + 360 S.F)
+ 5(250 S.F)
= 62895 lbs

STORY SHEARS (SEISMIC) C_S = 0.150, ρ = 1.3, ASD

V_S(ROOF) = 8.53 kips

V_S(UPP) = 6.39 kips

ΣV_S = 14.92 kips

APPROPRIATE SEISMIC LOAD BY AREA:
NEW WORK LIMITED TO WEST GARAGE
DESIGN GARAGE TO SUPPORT GARAGE
LOADS ONLY, TYPICAL

SEISMIC WEIGHT/LOAD IN GARAGE/2ND FLOOR

@ ROOF:

A_{GARAGE} = 670 S.F = A_1

A_{TOTAL} = 2505 S.F

V% = 0.268 V_S

V_{ROOF} = 2.29 kips @ A_1

@ UPPER FL

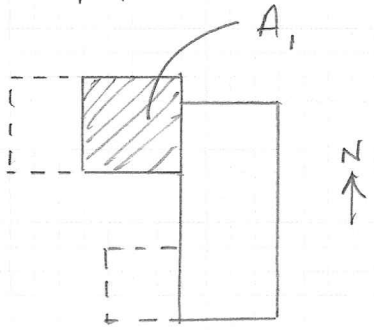
A_{GARAGE} = 1000 S.F = A_1

A_{TOTAL} = 2655 S.F

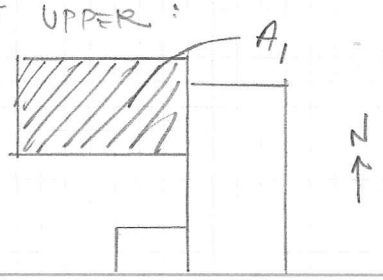
V% = 0.377 V_S

V_{UPP} = 2.41 kips @ A_1

AT ROOF:



AT UPPER:



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MORELLI RESIDENCE
PROJECT

LATERAL LOADING – SEISMIC

12/21/20
DATE

PROJ. # VMB

DESIGN

SHEET

SIZE SHEAR WALLS @ GARAGE FOR TRIBUTARY WIND LOAD ONLY. DUE TO LIMITED SHEAR WALLS FOR E/W DIRECTION, SIZE WALLS TO RESIST TOTAL FORCE ON RESIDENCE W/O (E)

WIND LOADING (BOX APPROACH) $K_{zt} = 1.0$; EXP. C

NORTH / SOUTH @ TWO STORY

@ Roof (GABLE) = WALL

$W_w = [50\ S.F\ (16.15) + 125\ S.F\ (15.72)] \div 25.5\ ft + 2(15.18)$
$= 140\ PLF$

@ Roof (Roof) = Roof + WALL

$W_w = 6.25(4.80) + 1.75(15.72) + 2(15.18)$
$= 88\ PLF$

@ UPPER (2 STORY) = WALL

$W_w = 8.375(15.18)$
$= 127\ PLF$

@ UPPER (Low Roof) = Roof + WALL

$W_w = 5(4.80) + 4.625(15.18)$
$= 95\ PLF$

EAST / WEST @ TWO STORY (AREA OF ADDITION)

@ Roof (GABLE) = WALL

$W_w = 3(16.15) + 5(15.72) + 2(15.18)$
$= 157\ PLF$

@ UPPER = WALL

$W_w = 8.375(15.18)$
$= 127\ PLF$

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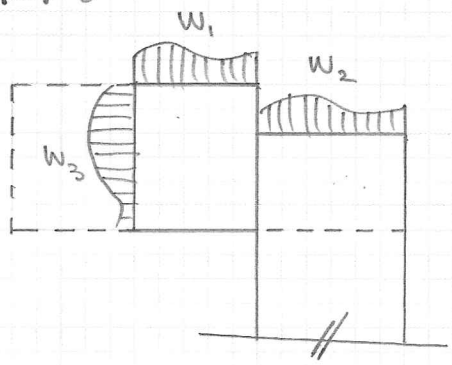
SUMMARY of DIAPHRAGM LOADING

At Roof:

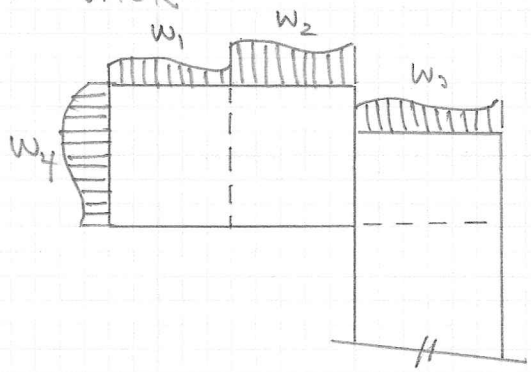


W_1 = 100 PLF (E) @ L = 23 ft
88 PLF (W)

W_2 = 242 PLF (E) @ L = 25.75 ft
140 PLF (W)

W_3 = 241 PLF (E) @ L = 19.75 ft
157 PLF (W)

AT UPPER:



W_1 = 54 PLF (E) @ L = 22 ft
95 PLF (W)

W_2 = 54 PLF (E) @ L = 23 ft
127 PLF (W)

W_3 = 155 PLF (E) @ L = 25.75 ft
127 PLF (W)

W_4 = 100 PLF (E) @ L = 23 ft
127 PLF (W)

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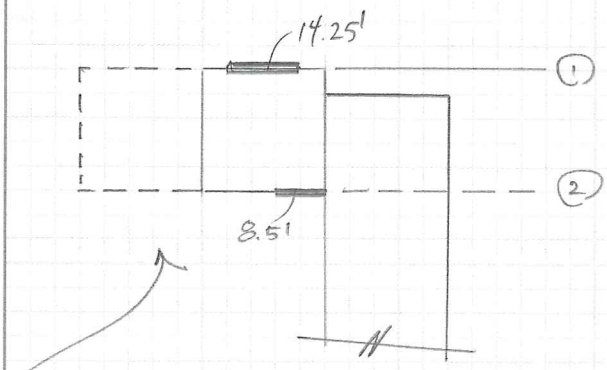
SHEAR WALL DESIGN (EAST/WEST) @ Roof

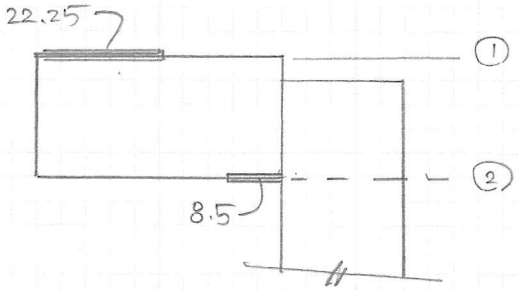


NOTE: ADDITION SUPPORTS ADDITION LOADS ONLY

$V(1) = 2.38\ k\ (E)$
$1.55\ k\ (W)$
$L_w = 14.25\ ft$
$v = 167\ \#/f\ (E)$
$108\ \#/f\ (W)$
S.W = (W6)
$OT = 1.25\ k$
$OTR = 0.80\ k$
$OT' = 0.45\ k$
$Hb =$ (CS16)

$V(2) = 2.38\ k\ (E)$
$1.55\ k\ (W)$
$L_w = 8.5\ ft$
$v = 280\ \#/f\ (E)$
$182\ \#/f\ (W)$
S.W = (W4) → W3
$OT = 2.10\ k$
$OTR = 0.43\ k$
$OT' = 1.62\ k$
$Hb =$ (2) CS16, CS14

SHEAR WALL DESIGN (EAST/WEST) @ UPPER



$V(1) = 3.53\ k\ (E)$
$3.01\ k\ (W)$
$L_w = 22.25\ ft$
$v = 159\ \#/f\ (E)$
$135\ \#/f\ (W)$
S.W = (W6)
$OT = 1.51\ k$
$OTR = 1.58\ k$
$OT' = 2.0\ k$
$Hb =$ (NONE)

$V(2) = 3.53\ k\ (E)$
$3.01\ k\ (W)$
$L_w = 13.75\ ft$
$v = 257\ \#/f\ (E)$
$219\ \#/f\ (W)$
S.W = (W4) → W3
$OT = 3.95\ k + 2.10\ k$
$OTR = 1.25\ k$
$OT' = 4.80\ k$
$Hb =$ (HDU5)

FOR STACKING WALL, L = 8.5 ft

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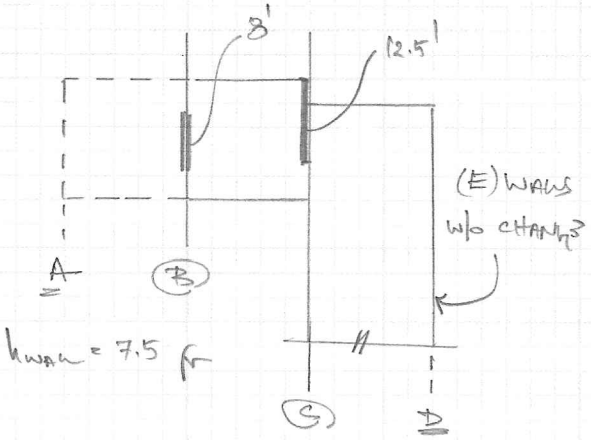
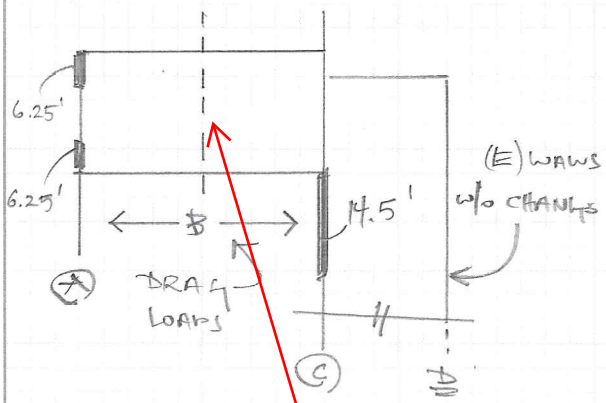
SHEAR WALL DESIGN (NORTH/SOUTH) @ ROOF



V(B) = 1.15 k (E)
1.01 k (W)
L_W = 8 ft
v = 144 #/f (E)
126 #/f (W)
S.W = (W6)
OT = 1.08 k
OTR = 0.36 k
OT' = 0.72 k
Hb = (CS16)

V(C) = 4.27 k (E)
2.81 k (W)
L_W = 12.5 ft
v = 342 #/f (E)
144 #/f (W)
S.W = (W4)
OT = 2.56 k
OTR = 0.56 k
OT' = 2.00 k
Hb = (CS14)

SHEAR WALL DESIGN (NORTH/SOUTH) @ UPPER



NOTE: WALLS DO NOT STACK, ΣOT IS N/A

ΣV(A) = 1.79 k (E)
2.80 k (W)
L_W = 12.5 ft
v = 143 #/f (E)
224 #/f (W)
S.W = (W6)
OT = 2.09 k
OTR = 0.28 k
OT' = 1.79 k
Hb = (Hbu2)

ΣV(C) = 8.06 k (E)
7.66 k (W)
L_W = 14.5 ft
v = 556 #/f (E)
529 #/f (W)
S.W = (W2)
OT = 5.14 k
OTR = 1.51 k
OT' = 3.63 k
Hb = EPOXY Hbu5

NOTE TO PLAN REVIEWER, SHEAR WALL ADDED AT B FOR ADDITIONAL STIFFNESS

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MORELL RESIDENCE
PROJECT

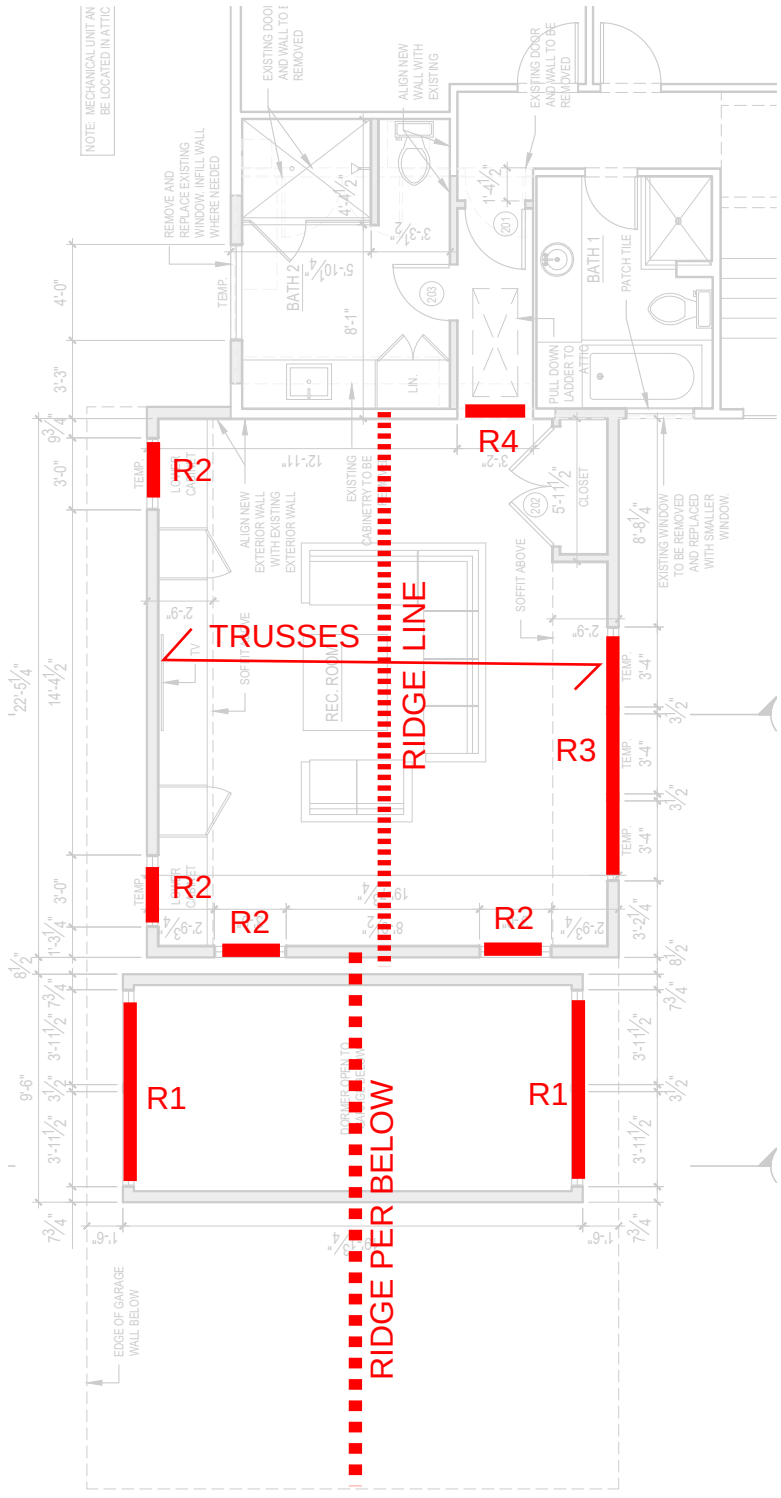
LATERAL DESIGN - SHEAR WALLS (N/S)

12/21/20
DATE

PROJ. # VMB

DESIGN

SHEET



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STRUCTURAL ENGINEERING

MORELLI RESIDENCE
PROJECT

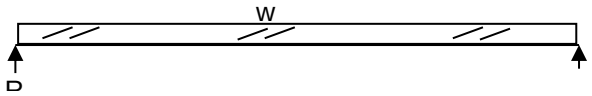
12 / 21 / 2020
DATE

PROJ. #

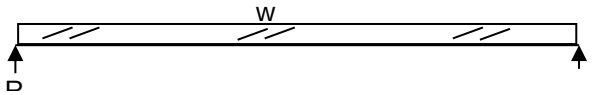
VMB
DESIGN

SHEET

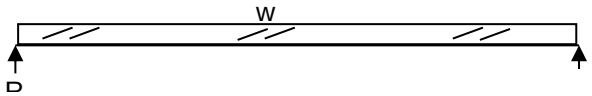
Beam		R1		HF	3	x 8
w=	200	plf		R=	925	lbs
L=	9.25	ft		M=	2,139	ft-lbs
b=	3.00	in		Fb=	977	psi
d=	7.25	in		Fv=	55	psi
E=	1300	ksi		Δ=	0.27	in
Cv=	1.00	≤1.0		l /	417	



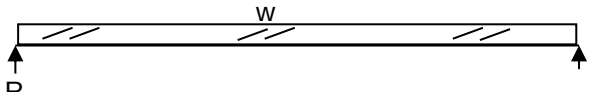
Beam		R2		HF	3	x 8
w=	395	plf		R=	593	lbs
L=	3	ft		M=	444	ft-lbs
b=	3.00	in		Fb=	203	psi
d=	7.25	in		Fv=	24	psi
E=	1300	ksi		Δ=	0.01	in
Cv=	1.00	≤1.0		l /	6193	



Beam		R3		HF	6	x 10
w=	400	plf		R=	2,100	lbs
L=	10.5	ft		M=	5,513	ft-lbs
b=	5.50	in		Fb=	843	psi
d=	9.25	in		Fv=	53	psi
E=	1300	ksi		Δ=	0.23	in
Cv=	1.00	≤1.0		l /	543	



Beam		R4		HF	3	x 6
w=	500	plf		R=	875	lbs
L=	3.5	ft		M=	766	ft-lbs
b=	3.00	in		Fb=	607	psi
d=	5.50	in		Fv=	59	psi
E=	1300	ksi		Δ=	0.03	in
Cv=	1.00	≤1.0		l /	1345	



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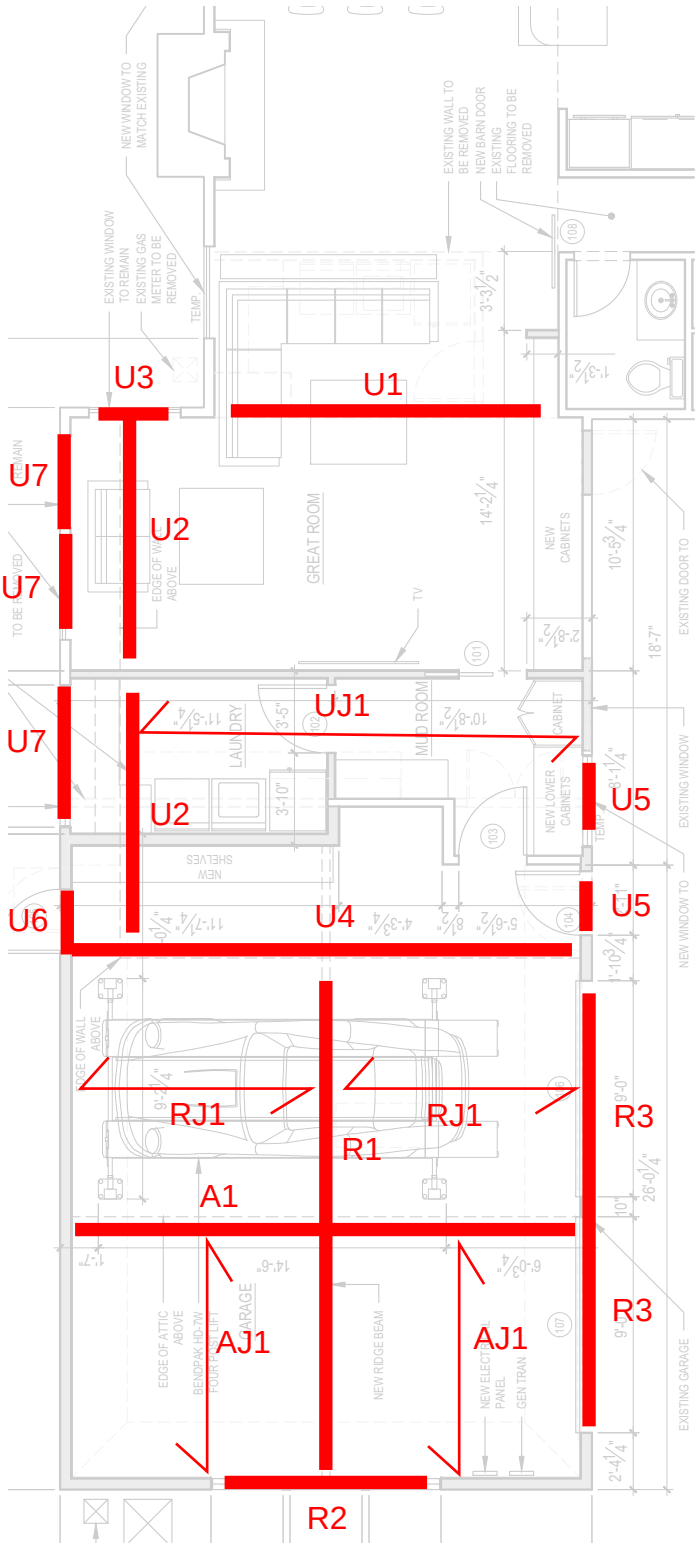
Project: MORELLI RESIDENCE *Date:* 12/21/20

HIGH ROOF FRAMING Project #:

Design: VMB



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STRUCTURAL ENGINEERING

MORELLI RESIDENCE
PROJECT

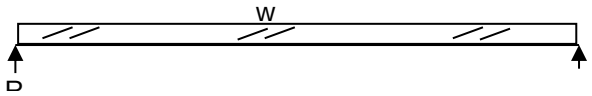
12 / 21 / 2020
DATE

PROJ. #

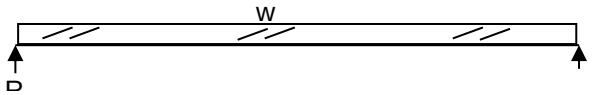
VMB
DESIGN

SHEET

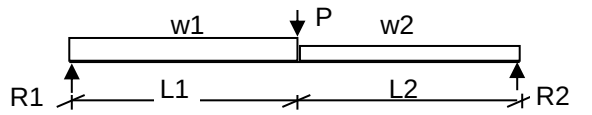
Beam		U1		PSL	5 1/4 x 12	
w=	650	plf		R=	4,875	lbs
L=	15	ft		M=	18,281	ft-lbs
b=	5.25	in		Fb=	1,741	psi
d=	12.00	in		Fv=	101	psi
E=	2000	ksi		Δ=	0.49	in
Cv=	1.00	≤1.0		l /	368	



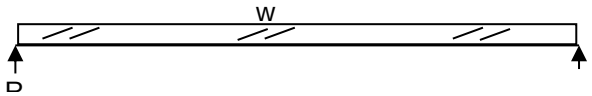
Beam		U2		GL	5 1/2 x 12	
w=	1110	plf		R=	6,383	lbs
L=	11.5	ft		M=	18,350	ft-lbs
b=	5.50	in		Fb=	1,668	psi
d=	12.00	in		Fv=	120	psi
E=	1800	ksi		Δ=	0.31	in
Cv=	1.00	≤1.0		l /	450	



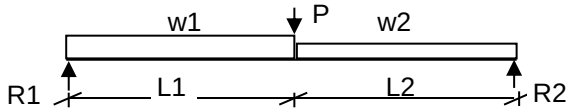
Beam		U3		HF	6 x 12	
w1=	100	plf		R1 =	2,992	lbs
w2=	100	plf		R2 =	3,790	lbs
L1=	2.25	ft		M =	6,480	lb-ft
L2=	1.75	ft		Fb =	670	psi
X=	2.3	ft		Fv =	90	psi
P=	6,383	lbs		Δ=	0.02	in
b=	5.50	in		l /	2,749	
d=	11.25	in		Cv=	1.00	
E=	1,300	ksi				



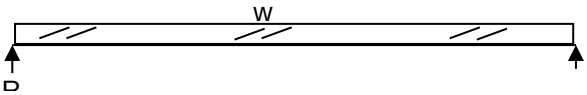
Beam		U5		HF	3 x 10	
w=	1060	plf		R=	2,253	lbs
L=	4.25	ft		M=	2,393	ft-lbs
b=	3.00	in		Fb=	671	psi
d=	9.25	in		Fv=	78	psi
E=	1300	ksi		Δ=	0.03	in
Cv=	1.00	≤1.0		l /	1686	



Beam		U6		HF	6 x 9	
w1=	100	plf		R1 =	2,013	lbs
w2=	100	plf		R2 =	5,638	lbs
L1=	3.00	ft		M =	5,588	lb-ft
L2=	1.00	ft		Fb =	903	psi
X=	3.0	ft		Fv =	169	psi
P=	7,250	lbs		Δ=	0.02	in
b=	5.50	in		l /	2,126	
d=	9.00	in		Cv=	1.00	
E=	1,300	ksi				



Beam		U7		HF	3 x 6	
w=	80	plf		R=	240	lbs
L=	6	ft		M=	360	ft-lbs
b=	3.00	in		Fb=	286	psi
d=	5.50	in		Fv=	18	psi
E=	1300	ksi		Δ=	0.04	in
Cv=	1.00	≤1.0		l /	1669	



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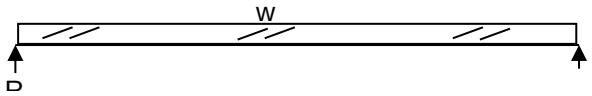
Project: MORELLI RESIDENCE *Date:* 12/21/20

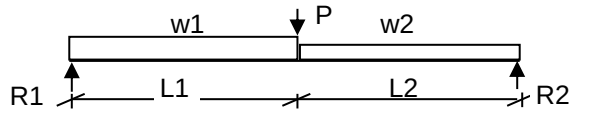
GARAGE ROOF FRAMING Project #:

Design: VMB

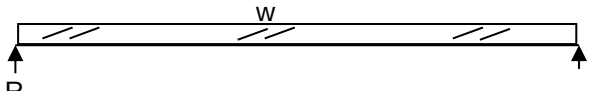
Beam		R1		GL	5 1/2 x 16 1/2	
w=	440	plf		R=	4,785	lbs
L=	21.75	ft		M=	26,018	ft-lbs
b=	5.50	in		Fb=	1,251	psi
d=	16.50	in		Fv=	69	psi
E=	1800	ksi		Δ=	0.60	in
Cv=	0.96	≤1.0		l /	437	



Beam		R2		GL	5 1/2 x 12	
w1=	100	plf		R1 =	3,093	lbs
w2=	100	plf		R2 =	3,093	lbs
L1=	7	ft		M =	19,198	lb-ft
L2=	7	ft		Fb =	1,745	psi
X=	7.0	ft		Fv =	68	psi
P=	4,785	lbs		Δ=	0.39	in
b=	5.50	in		l /	428	
d=	12.00	in		Cv=	1.00	
E=	1,800	ksi				



Beam		R3		GL	3 1/2 x 12	
w=	240	plf		R=	1,140	lbs
L=	9.5	ft		M=	2,708	ft-lbs
b=	3.50	in		Fb=	387	psi
d=	12.00	in		Fv=	32	psi
E=	1800	ksi		Δ=	0.05	in
Cv=	1.00	≤1.0		l /	2351	



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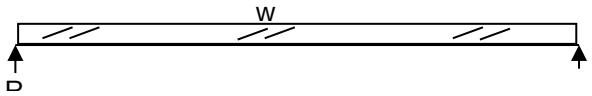
Project: MORELLI RESIDENCE *Date:* 12/21/20

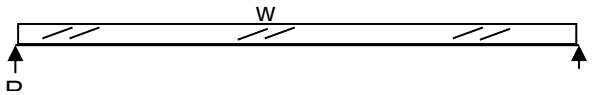
GARAGE ROOF FRAMING Project #:

Design: VMB

Beam		AJ1		HF 2 x 8		
w=	70	plf		R=	385	lbs
L=	11	ft		M=	1,059	ft-lbs
b=	1.50	in		Fb=	967	psi
d=	7.25	in		Fv=	47	psi
E=	1300	ksi		Δ=	0.37	in
Cv=	1.00	≤1.0		l /	354	



Beam		A1		PSL 6 3/4 x 12		
w=	300	plf		R=	3,263	lbs
L=	21.75	ft		M=	17,740	ft-lbs
b=	6.75	in		Fb=	1,314	psi
d=	12.00	in		Fv=	55	psi
E=	2000	ksi		Δ=	0.78	in
Cv=	0.97	≤1.0		l /	336	



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Project: MORELLI RESIDENCE

GARAGE LOFT FRAMING

Date: 12/21/20

Project #:

Design: VMB