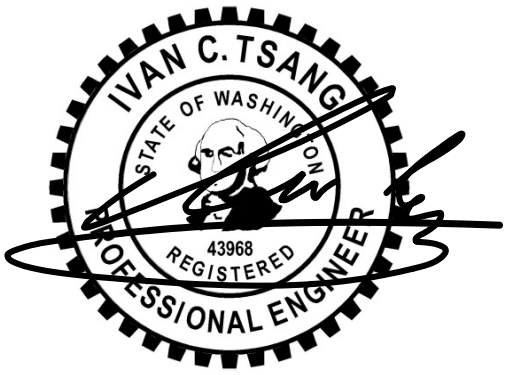
STRUCTURAL CALCULATIONS FOR:

6427 E MERCER WAY

MERCER ISLAND, WA

ARCHITECT: CITIZEN DESIGN

JUNE 12, 2025



MALSAM TSANG
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DESIGN CRITERIA IBC 2021

DEAD LOADS

ROOF		GAR ROOF		FLOOR	
Composition	2.5 psf	Composition	2.5 psf	3/4" Plywood	2.4 psf
3/4" Plywood	2.4 psf	3/4" Plywood	2.4 psf	Truss @ 24" o.c.	3 psf
Truss @ 24" o.c.	3.0 psf	Truss @ 24" o.c.	3.0 psf	Flooring	1.0 psf
Insulation	1.0 psf	Insulation	1.0 psf	Gyp Board (5/8")	2.8 psf
Gyp Board (5/8")	2.8 psf	Gyp Board (5/8")	2.8 psf	MEP	1.5 psf
MEP	1.5 psf	MEP	1.5 psf		
Solar Panels	5.0 psf				
Total	18.2 psf	Total	13.2 psf	Total	10.7 psf
Use	20.0 psf	Use	20.0 psf	Use	15.0 psf

LIVE LOADS/OCCUPANCY

		ROOF LIVE		FLOOR LIVE		DECK LIVE	
Risk Category	II	Snow =	25 psf	Occupancy =	40 psf	Occupancy =	60 psf
Roof Deck	No			Stair/Corridor =	40 psf		
Common Access	No						

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

Imp. Factor = 1.00 Seismic Ht, hn= 26 ft
Site Class = D(Geo) T, Building= 0.2
R Value = 6.5 Ts= 0.6

Geo. Ground Hazard? **No w/ASCE 11.4.8 Excep's**

S_s =	1.451		F_a =	1.000	Table 11.4-1
S_1 =	0.502		F_v =	NULL	Table 11.4-2
S_{ms} =	1.451	x 2/3 =	S_{ds} =	**0.967**	Eqn. 11.4-3
S_{m1} =	NULL	x 2/3 =	S_{d1} =	**NULL**	Eqn. 11.4-4

C_{SULT} = 0.149
C_{SALL} = 0.104

T/Ts= 0.37 ≤ 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 GAR ROOF 22.5 psf
FLOOR 26.0 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 = C G = 0.85
h = 26 ft K_{zt} = 1.00

Roof Slope = 2 : 12 = 9.5 °

PRESSURE COEFFICIENTS (Cp)

Windward Wall = 0.8 Windward Roof = N/A
Leeward Wall = -0.5 Leeward Roof = N/A

PRESSURE (PSF) $q = 0.00256K_zK_{zt}K_dV^2$

Ht	K_z	q_z	$0.6xq_z$[1]	q_h	P_{WW}	P_{LW}	P_{WALL}	P_{ROOF}
0-15	0.85	17.4	10.4		7.1	5.1	**12.2**	
15-20	0.90	18.4	11.1		7.5	5.1	**12.6**	
20-25	0.94	19.2	11.5		7.9	5.1	**13.0**	
25-30	0.98	20.1	12.0	12.0	8.2	5.1	**13.3**	**N/A**
30-35	1.02	20.9	12.5		8.5	5.1	**13.6**	
35-40	1.04	21.3	12.8		8.7	5.1	**13.8**	
40-45	1.07	21.9	13.1		8.9	5.1	**14.1**	
45-50	1.09	22.3	13.4		9.1	5.1	**14.2**	

[1] Per ASCE 7-16 2.4.1 Basic Combinations

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0424.2025.01
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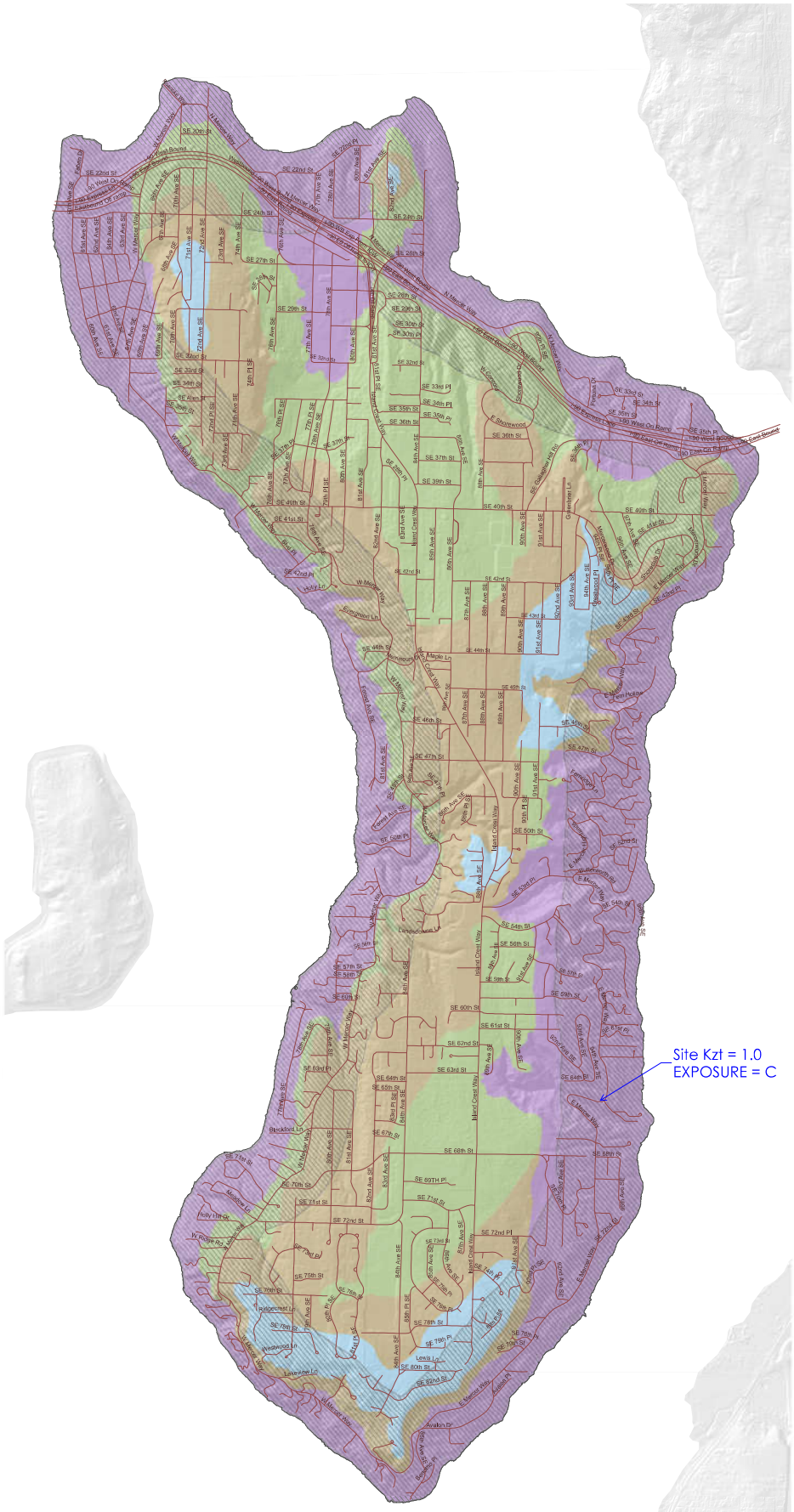
Mercer Island Wind Exposure and Wind Speed-Up (Topographic Effect)

by Development Services Group (DSG), City of Mercer Island
April 2009

0 0.5 1 Kilometers 1:12,000
0 0.5 1 Miles
T N



WIND EXPOSURE CATEGORIES & WIND SPEED-UP FACTORS
(ICC Section 1609 & ASCE 7-05 Chapter 6)

It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the Kzt factor to be utilized for each specific project. The Kzt factors and wind exposure categories indicated on this map are the minimum values accepted by the City of Mercer Island without requiring the design professional to submit additional calculations and supporting topographic documentation (to verify the values utilized in their wind load determination).

Please note – The Kzt values indicated on this map are approximations based upon periodic calculations of representative samplings around Mercer Island. These values are intended for City of Mercer Island's plan review purposes only.

WIND EXPOSURE CATEGORIES:

Wind Exposure Category	
	Exposure 'C' (1500 feet from Lake)
	Exposure 'B' (all other areas)

WIND SPEED-UP (TOPOGRAPHIC EFFECT) - K_zt Factor :

K_zt Factor	
	$K_zt = 1.0$
	$K_zt = 1.3$
	$K_zt = 1.6$
	$K_zt = 1.9$

GENERAL NOTES FOR WIND EXPOSURE AND WIND SPEED-UP MAP

This map is the Wind Exposure Category and Wind Speed-up (Topographic Effects) Map for the City of Mercer Island. This map shows the minimum wind exposure category and the minimum wind speed-up, "K_zt" factor, which will be accepted without site specific documentation and calculation.

Other wind speed phenomena may occur on Mercer Island that is not specifically indentified on this map. It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the appropriate design wind speed and exposure category for their specific project and location.

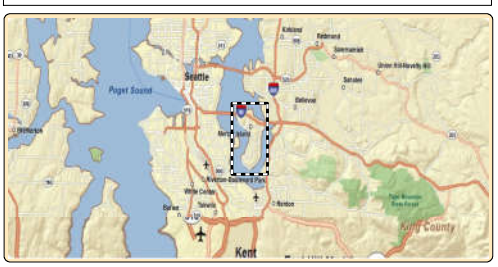
This map is for the sole use of the staff of the City of Mercer Island's Development Services Group (DSG) for the purposes of permit application evaluation. This map provides DSG staff a general assessment of Wind Exposure Category and Wind Speed-up (Topographic Effects). All areas have not been specifically evaluated and there may be locations that are not correctly represented on this map. It is the responsibility of individual property owners and map users to evaluate risk associated with their proposed development. No site-specific assessment of risk is implied or otherwise indicated by the City of Mercer Island with this map.

Information about data used for the map, references, and data limitation are all described the associated 'Read Me' document. The digital version of this map is accompanied by a meta data file containing pertinent information about map construction. This data map is available on the City of Mercer Island website.

The City of Mercer Island is using guidance provided within ICC Section 1609 & ASCE 7-05 Chapter 6 regarding definitions used when creating this map.

DEFINITIONS:

K_zt factor:	The topographic effect of wind speed-up at isolated hills, ridges, and escarpments constituting abrupt changes in the general topography, located in any exposure category, that meet all of the conditions noted in ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, Section 6.5.7.
Exposure B:	The wind exposure category that applies where the site in question is located a minimum of 1500 feet from the shoreline and the mean roof height is less than or equal to 30 feet per IBC 2006 section 1609.4.3.
Exposure C:	The wind exposure category that applies where the site in question is located within 1500 feet from the shoreline per IBC 2006 section 1609.4.3.
Wind Speed:	Minimum 85 mph 3-second gust per IRC Figure R301.2(4)



USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout* error.
USGS web services are now operational so this tool should work as expected.

6427 E Mercer Way

6427 E Mercer Way, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.5449439, -122.2124699

Date	3/4/2025, 10:47:39 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.451	MCE_R ground motion. (for 0.2 second period)
S_1	0.502	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.451	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.967	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.621	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.683	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	1.451	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.609	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	4.287	Factored deterministic acceleration value. (0.2 second)
S1RT	0.502	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.559	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.643	Factored deterministic acceleration value. (1.0 second)

Type	Value	Description
PGAd	1.424	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.621	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.902	Mapped value of the risk coefficient at short periods
C_{R1}	0.899	Mapped value of the risk coefficient at a period of 1 s
C_V	1.39	Vertical coefficient

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LATERAL ANALYSIS

- SEISMIC DESIGN LOADS

LEVEL	AREA	#/SF	WT	HT	W·Hi	% DISTRIB	V(k)
ROOF	2500	26.0	65.0	25.75'	1674	0.57	9.84
2ND FL	3070	25.0	76.75	12.5'	959	0.33	5.7
GARAGE ROOF	1080	22.5	24.3	12.75'	310	0.1	1.74
			Σ = 166.05k		Σ = 2943		

$V_{SULT} = 0.149 \times 166.05^k = 24.74^k$

$V_{SALL} = 0.104 \times 166.05^k = \underline{17.28^k}$

- WIND DESIGN LOADS

LEVEL	TRIB HT			TOTAL
ROOF	9.75'	(1 × 13.3) + (5 × 13.0) + (3.75 × 12.6)	=	125.6 #/,
2ND FLOOR	10.25'	(1.25 × 12.6) + (9 × 12.2)	=	125.6 #/,
GAR ROOF	8.25'	8.25 × 12.2	=	100.7 #/,

	N-S (L)	V(k)	E-W (L)	V(k)
ROOF	42.0	5.28	42.0	5.28
2ND FL	52.5	6.6	42.0	5.28
GAR ROOF	32.0	3.22		
		Σ = 15.1k		Σ = 10.56k

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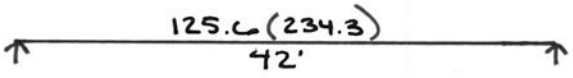
NORTH - SOUTH EXPOSURE

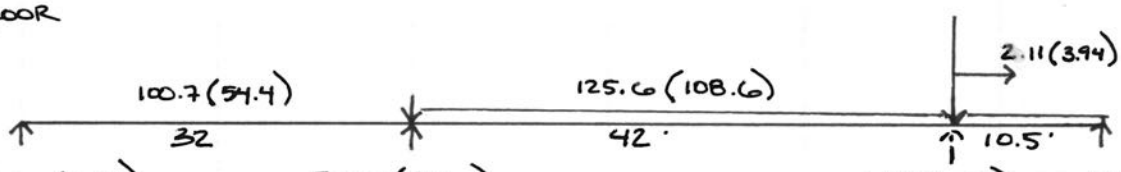
( ) - SEISMIC VALUES

ROOF
R = 9'-0"



R(k)	2.64 (4.92)	2.64 (4.92)
L(')	4.16'×2 + 7.16 + 6 + 4.5 = 25.98	8.83 + 16.16 + 5.41 = 30.4
V(#)	102 (189)	87 (162)
SW	SW6	SW6
OT	0.9 (1.7)	0.78 (1.46)
HD	CS16	CS16
2w/H	2×4.16/9 × 230 = 212 > 102 (189)	>1.0

SECOND FLOOR
R = 9'-0"



R(k)	1.61 (0.87)	7.55 (8.64)	0.53 (0.98)	5.41 (6.79)
L(')	6+8+6 = 20	12 + 8.25 + 15.75 = 36	8+4 = 12	3.83 + 6.5 + 6.4 = 16.73
V(#)	81 (44)	210 (240)	44 (82)	323 (406)
SW	SW6	SW4	SW6	SW 2
OT	—	1.89 (2.16)	—	2.91 (3.65)
OT(STACK)	—	2.79 (3.86)	—	—
HD	—	LSTHD8	—	STHD 14
HD(STACK)	—	STHD 14	—	—
2w/H	>1.0	>1.0	2×4/9 × 230 = 204 > 44 (82)	2×3.83/9 × 600 = 510 > 323 (406)

Σ = 15.1 (17.28)

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L2
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EAST - WEST EXPOSURE

() - SEISMIC VALUES

ROOF
R = 9'-0"

(SOUTH) 125.6 (234.3) 42' (NORTH)

	(SOUTH)	(NORTH)
R(k)	2.64 (4.92)	2.64 (4.92)
L(')	3'×2 + 7.83'×2 = 21.66	4'×4 + 12 = 28
V(#)	122 (227)	94 (176)
SW	SW4	SW6
OT	1.1 (2.04)	0.85 (1.58)
HD	(2) CS16	CS16
2w/H	2×3/9 × 350 = 233 > 122 (227)	2×4/9 × 230 = 204 > 94 (176)

[A] - SEE BLW

SECOND FLOOR
R = 9'-0"

125.6 (177.1) 42'

R(k)	5.28 (8.64)	5.28 (8.64)
L(')	4+4.25+4.83+3.58+27 = 43.66	4'×4 + 3.58'×2 = 23.16
V(#)	121 (198)	228 (373)
SW	SW4	SW2
OT	1.1 (1.78)	2.05 (3.36)
OT (STACK)	2.2 (3.82)	2.9 (4.94)
HD	CSTHD8	STHD14 / (2) CS16
HD (STACK)	STHD14	HDU8
2w/H	2×3.58/9 × 350 = 278 > 121 (198)	2×3.58/9 × 600 = 477 > 228 (373)

**WALLS AT BED 3 NOT USED IN DESIGN - SHEATHED AND NAILED TO MATCH REST OF ELEVATION

[A] - CHECK 0.6DL

$0.6\left[(40/2 + 6) \times 15\text{psf} + 9 \times 15\text{psf}\right](12/2) = 1.89 > 0.85\ (1.58)$

NO HD REQD AT 12ft WALL

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L3
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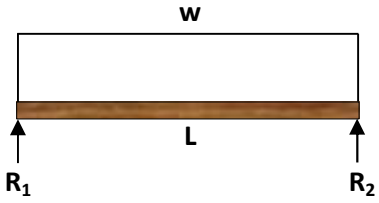
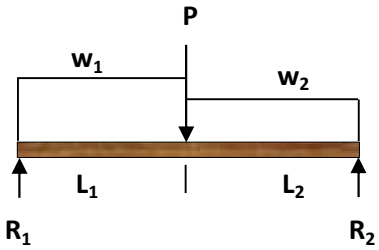
TYPICAL BEAM CASES

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

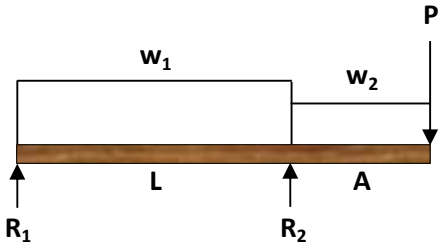
CASE #1: (C1)



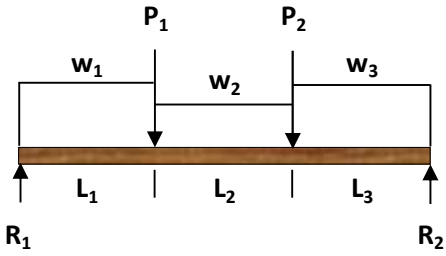
CASE #2: (C2)



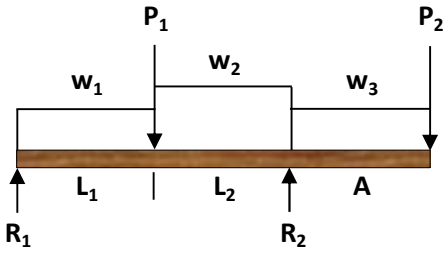
CASE #3: (C3)



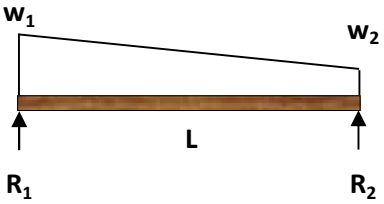
CASE #4: (C4)



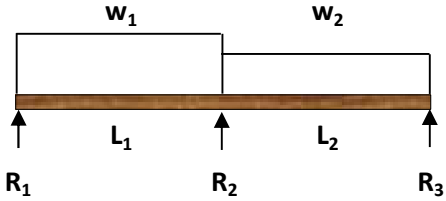
CASE #5: (C5)



CASE #6: (C6)



CASE #7: (C7)



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VERTICAL ANALYSIS

ROOF FRAMING

PRE-MFR TRUSSES @ 24"oc

STRUCTURAL FASCIA BM (#401)

L = 14'
w = 4/2 x .04 = .08k/'
R = 0.56k
M = 1.96k-ft

f_b = 0.57ksi
f_v = 35psi
Δ = 0.14"
= L/1187

1 3/4 x 11 7/8 LVL

HIP TRUSS (c3) (#402)

L = 14' A = 5.75'
w_1 = 16/2 x .045 = .36k/'
w_2 = 4 x .04 = .16k/'
P = 1.12k
R_1 = 1.87k
R_2 = 5.21k
M = 4.86k-ft / -9.09k-ft

HIP TRUSS

3 1/2 x 12 GL/LVL = f_b = -1.3ksi; f_v = 100psi
Δ = .19" = L/725

CANTILEVERED TRUSS (c3) (#403)

L = 9.75' A = 4'
w_1 = .09k/'
w_2 = .08k/'
P = 0.56k
R_1 = 0.14k
R_2 = 1.61k
M = -2.88k-ft

BM OPTION: 1 3/4 x 11 7/8 LVL Δ = .13" L/713
f_b = -.84ksi f_v = 58psi

HIP MASTER (c4) (#404)

L_1 = 10' L_2 = 21.25' L_3 = 10'
w_1 = w_3 = .09k/'
w_2 = (10/2 + 1) x .045 = 0.27k/'
P_1 = P_2 = 2.52k
R_1 = 6.29k
R_2 = 6.29k
M = 73.63k-ft

EAST HDR - HEAVIEST LOADING (#405)

L = 3'
w = (1/2 x .045 + 4 x .04) = .385k/'
R = 0.58k
M = 0.43k-ft

f_b = 0.2ksi
f_v = 24psi
Δ = L/1000+

(2) 2 x 8

SOUTH BDRM / BATH HDR (#406)

L = 6'
w = (9/2 x .045 + 4 x .04) = .363k/'
R = 1.1k
M = 1.63k-ft

f_b = .74ksi
f_v = 60psi
Δ = .09"
= L/842

(2) 2 x 8

SOUTH FAMILY SITTING HDR (#407)

L = 8'
w = (40/2 x .045 + 4 x .04) = 1.06k/'
R = 4.24k
M = 8.48k-ft

f_b = 1.37ksi
f_v = 104psi
Δ = 0.16"
= L/591

GL 5 1/2 x 9

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VERTICAL ANALYSIS

SECOND FLOOR FRMG

18" DP PRE-MFR TRUSSES @24"oc MAX

(#301) - TRUSS @ SOUTH PORCH

L = 11.5'

w = 8/2 x .04 = 0.16k/'

R = 0.92k

M = 2.64k-ft

(#302) - BM @ EAST SIDE OF PORCH (C2)

L_1 = 7.5' L_2 = 6.25'

$w_1 = (11.5/2 + 2.5) \times .04 = 0.33$k/'

$w_2 = (10.5/2 + 2.5) \times .04 = 0.31$k/'

P = 0.92k

R_1 = 2.66k

R_2 = 2.67k

M = 10.66k-ft

f_b = 1.27ksi

f_v = 62psi

Δ = 0.36" = L/459

GL 5½ x 10½

(#303) - TRUSS OVER PORCH (C2)

L_1 = 8' L_2 = 2'

w_1 = .08k/'

$w_2 = (11.5/2 + 1) \times .04 = 0.27$k/'

P = 0.92k

R_1 = 0.62k

R_2 = 1.48k

M = 2.42k-ft

(#304) - SOUTH PORCH BM (C2)

L_1 = 13.25' L_2 = 1.0'

$w_1 = (10/2 + 3) \times .04 = 0.32$k/'

w_2 = 0.32k/'

P = 0.62k

R_1 = 2.32k

R_2 = 2.86k

M = 8.44k-ft

f_b = 1.0ksi

f_v = 67psi

Δ = 0.325" = L/526

GL 5½ x 10½

(#305) - S LIVING WINDOW (C4)

L_1 = 2' L_2 = 1' L_3 = 1'

$w_1 = (40/2 + 4) \times .045 + .135 + .75 = 1.97$k/'

$w_3 = 20/2 \times .055 + 10/2 \times .04 = 0.75$k/'

$w_2 = (10/2 + 2) \times .045 + .135 + 0.75 = 1.2$k/'

P_1 = 6.29k

P_2 = 1.1k

R_1 = 6.81k

R_2 = 6.47k

M = 9.67k-ft

f_b = 2.25ksi

f_v = 208psi

Δ = .07" = L/684

GL 5½ x 9

W/OT

$P_2 = 2.04k \times \Omega_0 2.5 = 6.2k$

R_1 = 8.08k

R_2 = 10.3k

M = 12.22k-ft

f_b = .71ksi

f_v = 160psi

=> USE 5½ x 15 GL RIM BM FOR EQ

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SHEET

VERTICAL ANALYSIS

2ND FLOOR CONT.

(#306) - SOUTH BM OVER PATIO DOOR (C4)

$L_1 = 3.5'$ $L_2 = 8.0'$ $L_3 = 0.5'$

$w_1 = 1.97^{\#}/_{'}$

$w_2 = 0.75^{\#}/_{'}$

$w_3 = 1.97^{\#}/_{'}$

$P_1 = 4.24^{k}$

$P_2 = 4.24^{k}$

$R_1 = 11.34^{k}$

$R_2 = 11.02^{k}$

$M = 27.65^{k}\cdot ft$

$f_b = 1.61\ ksi$

$f_v = 161\ psi$

$\Delta = 0.252"$

$= L/572$

5 1/2 x 15 GL

↳ USE 18" BM

W/OT

$P_1 = 2.04^{k} \times \frac{\Omega_o}{2.5} + 4.24^{k} = 9.84^{k}$

$R_1 = 14.95^{k}$

$R_2 = 12.51^{k}$

$M = 40.27^{k}\cdot ft$

$f_b = 2.34\ ksi$

$f_v = 227\ psi$

(#307) - SOUTH KITCHEN WNDW HDR

$L = 5'$

$w = 20/2 \times .055 = .55^{\#}/_{'}$

$R = 1.38^{k}$

$M = 1.72^{k}\cdot ft$

$f_b = .78\ ksi$

$f_v = 72\ psi$

$\Delta = .106"$

$= L/961$

(2) 2x8

(#308) - EAST BDRM HDR

$L = 5'$

$w = (10.5/2 + 2.5) \times .04 = 0.31^{\#}/_{'}$

$R = 0.78^{k}$

$M = 0.97^{k}\cdot ft$

$f_b = .44\ ksi$

$f_v = 41\ psi$

$\Delta = L/1000+$

(2) 2x8

(#309) - N/S BM O/ BDRM (C4)

$L_1 = 1'$ $L_2 = 3'$ $L_3 = 11.75'$

$w_1 = 10/2 \times .045 + 10/2 \times .04 + .135 + .055 = 0.615^{\#}/_{'}$

$w_2 = 10/2 \times .04 + .055 = .255^{\#}/_{'}$

$w_3 = (10/2 + 4) \times .045 + .135 + .255 = .795^{\#}/_{'}$

$P_1 = 0.58^{k}$

$P_2 = 2.19^{k}$

$R_1 = 6.9^{k}$

$R_2 = 6.59^{k}$

$M = 27.32^{k}\cdot ft$

$f_b = 1.06\ ksi$

$f_v = 111\ psi$

$\Delta = 0.44"$

$= L/430$

GL 5 1/2 x 15

W/OT

$P_2 = 1.46^{k} \times \frac{\Omega_o}{2.5} = 5.84^{k}$

$R_1 = 9.62^{k}$

$R_2 = 7.52^{k}$

$M = 35.54^{k}\cdot ft$

$f_b = 2.07\ ksi$

$f_v = 161\ psi$

(#310) - TRUSS OVER BATH

$L = 11.5'$

$w = (8/2 + 1) \times .04 = 0.2^{\#}/_{'}$

$R = 1.15^{k}$

$M = 3.3^{k}\cdot ft$

(#311) - N/S BM OVER HALLWAY (C4)

$L_1 = 4.5'$ $L_2 = 3'$ $L_3 = 6'$

$w_1 = .795^{\#}/_{'}$ $w_2 = .255^{\#}/_{'}$ $w_3 = .615^{\#}/_{'}$

$P_1 = 1.73^{k}$

$P_2 = 2.19^{k}$

$R_1 = 6.35^{k}$

$R_2 = 5.6^{k}$

$M = 22.53^{k}\cdot ft$

$f_b = 1.31\ ksi$

$f_v = 97\ psi$

$\Delta = 0.26"$

$= L/625$

GL 5 1/2 x 15

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VERTICAL ANALYSIS

2ND FLOOR CONT.

(#311) - CONT.

W/OT

$P_2 = 1.46^k \times 2.5^{D_o} = 5.84^k$

$R_1 = 7.98^k$

$R_2 = 7.63^k$

$M = 34.69^{k \cdot ft}$

$f_b = 2.02 ksi$

$f_v = 127 psi$

(#312) - HDR @ BDRM DOOR (C2)

$L_1 = 1.5'$ $L_2 = 1.5'$

$w_1 = 39/2 \times .055 = 1.07^k/_{ft}$

$w_2 = .08^k/_{ft}$

$P = 6.59 + 6.35 = 12.94^k$

$R_1 = 7.7^k$

$R_2 = 6.96^k$

$M = 10.35^{k \cdot ft}$

$f_b = 1.67 ksi$

$f_v = 209 psi$

$\Delta = .02''$

$= L/1589$

GL 5½ x 9

(#313) - E/W SUPPORT BM OVER BED

$L = 14.25'$

$w = 21.5/2 \times .055 = .591^k/_{ft}$

$R = 4.21^k$

$M = 15.04^{k \cdot ft}$

$f_b = 1.37 ksi$

$f_v = 99 psi$

$\Delta = 0.31''$

$= L/553$

GT OR GL 3½ x 15

(#314) - NORTH BEDRM HDR

$L = 7'$

$w = .055^k/_{ft}$

$R = 0.19k$

$M = 0.34^{k \cdot ft}$

$f_b = 0.15 ksi$

$f_v = 11 psi$

$\Delta = L/1000+$

(2) 2 x 8

(#315) - GT AT STAIRS

$L = 8.5'$

$w = 22.5/2 \times .055 = .619^k/_{ft}$

$R = 2.63^k$

$M = 5.59^{k \cdot ft}$

$f_b = .51 ksi$

$f_v = 53 psi$

$\Delta = L/1000+$

GT OR GL 3½ x 15

(#316) - BM @ EDGE OF OPENING

$L = 8.5'$

$w = 3/2 \times .055 = .08^k/_{ft}$

$R = 0.34^k$

$M = 0.72^{k \cdot ft}$

$f_b = .07 ksi$

$f_v = 7 psi$

$\Delta = L/1000+$

3½ x 15 GL

USE 5½" BM FOR RAIL

(#317) - N/S BM @ OPENING (C2)

$L_1 = 2.5'$ $L_2 = 16.75'$

$w_1 = w_2 = 2 \times .055 = 0.11^k/_{ft}$

$P = 0.34^k$

$R_1 = 1.35^k$

$R_2 = 1.1^k$

$M = 5.53^{k \cdot ft}$

$f_b = .51 ksi$

$f_v = 35 psi$

$\Delta = .21''$

$= L/1097$

3½ x 15 GL

↳ USE 5½ x 18

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VERTICAL ANALYSIS

2ND FLOOR CONT.

(#318) - HDR @ PANTRY DOOR

L = 3'
W = 39.5/2 x .055 = 1.09 k/'
R = 1.64 k
M = 1.22 k-ft

f_b = 0.56 ksi
f_v = 67 psi
Δ = L/1,000+

(2) 2x8

(#319) - HDR @ 2-CAR DOOR

L = 18'
W = 32/2 x .045 = .72 k/'
R = 6.48 k
M = 29.16 k-ft

f_b = 1.7 ksi
f_v = 101 psi
Δ = 0.61"
= L/354

GL 5 1/2 x 15

(#320) - HIP MASTER OVER GARAGE

L = 27'
W = (8/2 + 1) x .045 = .225 k/'
R = 3.04 k
M = 20.5 k-ft

(#321) - HDR @ SINGLE CAR DOOR (C2)

L_1 = 6.25' L_2 = 2.75'
W_1 = 3.5 x .045 = .158 k/'
W_2 = .72 k/'
P = 3.04 k
R_1 = 1.88 k
R_2 = 4.13 k
M = 8.64 k-ft

f_b = 1.4 ksi
f_v = 109 psi
Δ = 0.17"
= L/620

GL 5 1/2 x 9

(#322) - WEST WNDW HDR

L = 4'
W = (8/2 + 2) x .045 = .27 k/'
R = 0.54 k
M = 0.54 k-ft

f_b = 0.25 ksi
f_v = 26 psi
Δ = L/1,000+

(2) 2x8

(#323) - NORTH PORCH BEAM

L = 11.75'
W = (8.5/2 + 2.75) x .04 = .28 k/'
R = 1.64 k
M = 4.83 k-ft

f_b = 1.12 ksi
f_v = 53 psi
Δ = 0.345"
= L/409

GL 5 1/2 x 7 1/2

VERTICAL ANALYSIS

FIRST FLOOR FRMG

18" DP PRE-MFR TRUSSES @ 24" o.c. MAX

(#201) CRAFT DOOR HDR (G2)

$L_1 = 1.5'$ $L_2 = 1.75'$

$w_1 = 1.07\% + .135 + .963\% = 2.17\%$

$w_2 = 35/2 \times .055 = .963\%$

$P = 7.7^k$ $f_b = 1.53ksi$

$R_1 = 7.1^k$ $f_v = 212psi$

$R_2 = 5.54^k$ $\Delta = .02"$

$M = 8.21^{k\cdot ft}$ $= L/1798$

GL 3½ x 10½

(#202) BATH DOOR HDR

$L = 3'$ $f_b = 0.62ksi$

$w = 1.07\% \times 2 + .135 = 2.28\%$ $f_v = 77psi$

$R = 3.42^k$ $\Delta = L/1000+$

$M = 2.57^{k\cdot ft}$

4x10

(#203) - BM @ NORTH WNDW (G4)

$L_1 = 1'$ $L_2 = 3.25'$ $L_3 = 1'$

$w_1 = w_3 = (8/2 + 2) \times .04 + .135 + 14/2 \times .055 = 0.76\%$

$w_2 = .76^{k/ft}$

$P_1 = 0.39^k$

$P_2 = 0.39^k$ $f_b = .18ksi$

$R_1 = 2.39^k$ $f_v = 26psi$

$R_2 = 2.39^k$ $\Delta = L/1000+$

$M = 3.01^{k\cdot ft}$

GL 5½ x 15

W/ OT

$P_1 = 3.36^k \times \frac{5}{2.5} = 8.79\ (-8.4^k)$

$R_1 = 9.19^k\ (-4.73^k)$ $f_b = 0.51ksi$

$R_2 = 4.0^k$ $f_v = 150psi$

$M = 8.0^{k\cdot ft}$

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