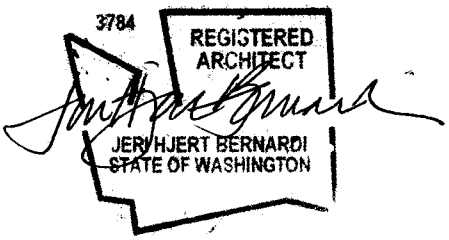
Structural Calculations

Gao Residence

3914 88th Ave SE

Mercer Island, WA 98040

5-30-24



DESIGN CRITERIA:

Address: 3914 88th Ave SE, Mercer Island, WA

Lat: 47.57

Long: -122.22

LOADS: LL 60psf (balcony)

SL 25psf

DL 15psf

SEISMIC:

Ss = 1.397

S1 = .537

Fa = 1

Fv = 1.3

Sds = .931

Sd1 = .698

Cs =.143

WIND:

85 mph

Exp B

Kzt = 1.3

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.

Gao Residence

3914 88th Ave SE, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.5752459, -122.2217636

Date	5/30/2024, 4:22:28 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	C - Very Dense Soil and Soft Rock

Type	Value	Description
S_S	1.397	MCE_R ground motion. (for 0.2 second period)
S_1	0.537	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.397	Site-modified spectral acceleration value
S_{M1}	0.698	Site-modified spectral acceleration value
S_{DS}	0.931	Numeric seismic design value at 0.2 second SA
S_{D1}	0.465	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.3	Site amplification factor at 1.0 second
PGA	0.576	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.576	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	1.397	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.458	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	3.086	Factored deterministic acceleration value. (0.2 second)
S1RT	0.537	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.575	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.265	Factored deterministic acceleration value. (1.0 second)

Type	Value	Description
PGAd	1.192	Factored deterministic acceleration value. (Peak Ground Acceleration)
PGA_{UH}	0.576	Uniform-hazard (2% probability of exceedance in 50 years) Peak Ground Acceleration
C_{RS}	0.958	Mapped value of the risk coefficient at short periods
C_{R1}	0.934	Mapped value of the risk coefficient at a period of 1 s
C_V		Vertical coefficient

DISCLAIMER

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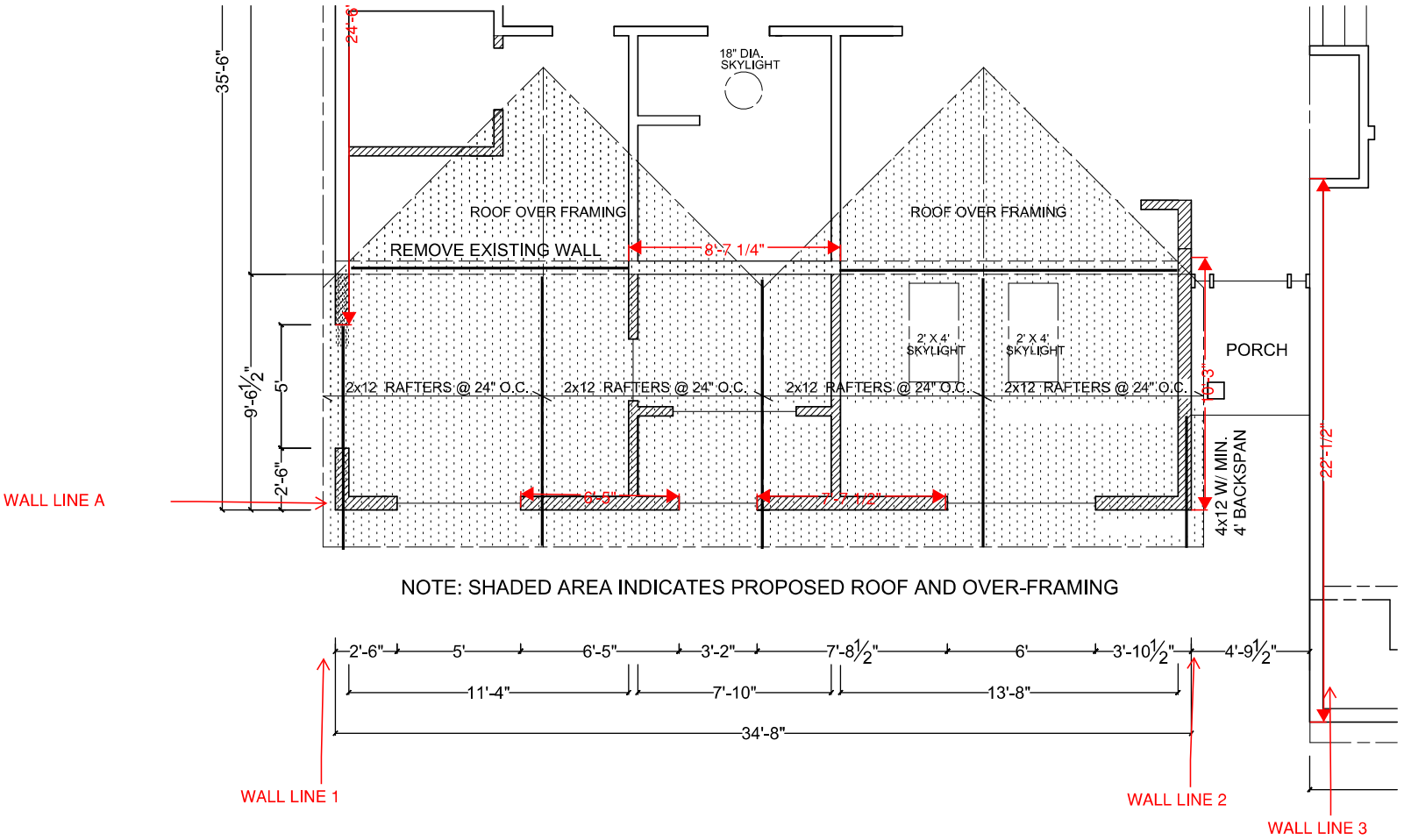


NOTE: SHADED AREA INDICATES PROPOSED ROOF AND OVER-FRAMING

MAIN LEVEL FLOOR PLAN WITH PROPOSED RO

LATERAL

Seismic **(Equivalent Lateral Force Procedure per ASCE 7 9.5.5)**

Ss =	1.397	from USGS website (see attached)
S1 =	0.537	from USGS website (see attached)
Fa =	1	Table 9.4.1.2.4a ASCE 7
Fv =	1.3	Table 9.4.1.2.4b ASCE 7
I =	1	Table 9.1.4 ASCE 7
R =	6.5	Table 9.5.2.2 ASCE 7
Site Class =	D	

hx =	23.0	Ta =	0.210	
Sms =	1.397	Sds =	0.93	
Sm1 =	0.6981	Sd1 =	0.47	
Ts =	0.49971			
Cs =	0.143			
V =	0.143 W		ASCE 12.8	

Level	DL (kips)	Height (ft)	DL*Ht	%	Fx (kips)	Fx all (kips)
Roof	26.3	18.0	474	0.47	**5.4**	**3.8**
Main	52.9	10.0	529	0.53	**6.0**	**4.3**
	79		1003		**11.3**	**8.1**

V =	11.3	ultimate
V =	8.1	allowable

LATERAL

Seismic **(Equivalent Lateral Force Procedure per ASCE 7 9.5.5)**

Ss =	1.397	from USGS website (see attached)
S1 =	0.537	from USGS website (see attached)
Fa =	1	Table 9.4.1.2.4a ASCE 7
Fv =	1.3	Table 9.4.1.2.4b ASCE 7
I =	1	Table 9.1.4 ASCE 7
R =	6.5	Table 9.5.2.2 ASCE 7
Site Class =	D	

hx = 23.0 Ta = 0.210

Sms = 1.397 Sds = 0.93

Sm1 = 0.698 Sd1 = 0.47

Ts = 0.500

Cs = 0.143

V = 0.143 W ASCE 12.8

Level	DL (kips)	Height (ft)	DL*Ht	%	Fx (kips)	Fx all (kips)
Roof	26.3	18.0	474	0.50	**5.3**	**3.8**
Main	47.9	10.0	479	0.50	**5.3**	**3.8**
	74		953		**10.6**	**7.6**

V = 10.6 ultimate

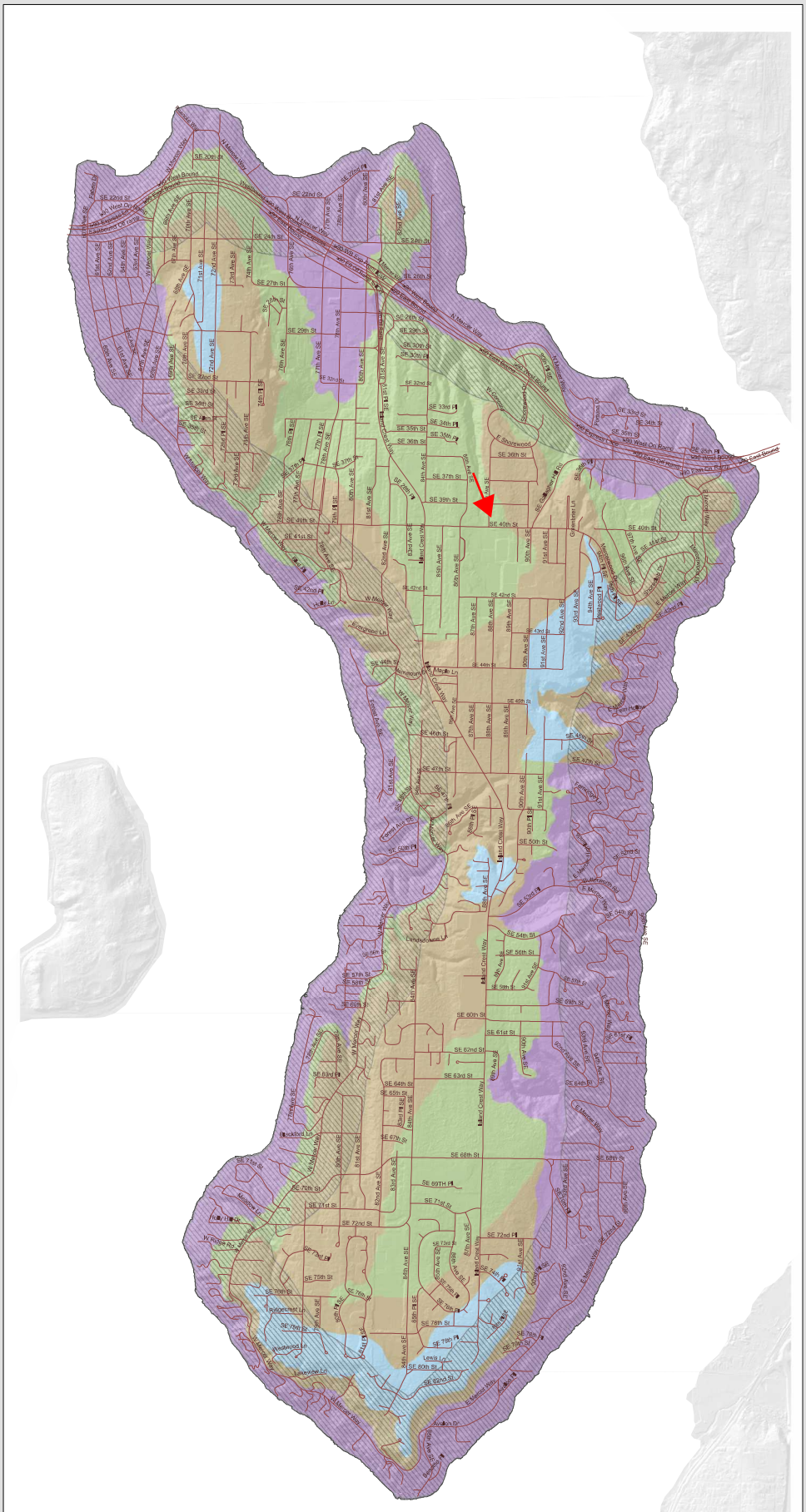
V = 7.6 allowable

DIFFERENCE IS NEGLIGIBLE

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
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.

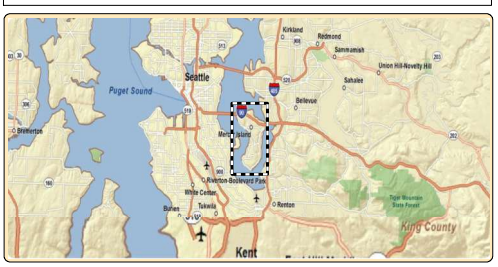
DEFINITIONS:

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)



LATERAL

Wind (Analytical Procedure per ASCE 7 6.5)

Input

Vs3 =	85	mph
Exposure	B	
Kh =	1	
Kd =	0.85	
Kzt =	1.3	homogeneous topography

height =	23.0	ft
EW dimension (roof) =	52	ft
NS dimension (roof)	25.3	ft
EW dimension (upper) =	52	ft
NS dimension (upper) =	64.8	ft

roof wall trib =	5.0	ft
Upper Level wall trib =	9.0	ft
roof height =	9.5	ft

GCpi =	0.18	enclosed bldg Table 6-5
Roof Angle =	20	degrees

Zone	1	2	3	4	1E	2E	3E	4E
GCpf =	0.400	-0.690	-0.370	-0.290	0.610	-1.070	-0.530	-0.430

Output

Pressure on Walls: 0.690
1.040 at corners

P = qh[(GCpf)-(Gcpi)]

qh = .00256Kh*Kzt*Kd*V^2*I = 20 psf > 15psf DL

a = 3 ft

Right/Left

Area at roof:			Area at upper floor:		
Wall Area:	230	sf	Wall Area:	414	sf
	30	sf (corners)		54	sf (corners)
Roof Area:	437	sf	Roof Area:	0	sf
	57	sf (corners)		0	sf (corners)
@ roof:	Fx =	**7.54** k	@ floor:	Fx =	**7.0** k @ floor:
TOTAL =	14.5	kips			

Front/Back

Area at roof:			Area at upper floor:		
Wall Area:	97	sf	Wall Area:	529	sf
	30	sf (corners)		54	sf (corners)
Roof Area:	183	sf	Roof Area:	0	sf
	57	sf (corners)		0	sf (corners)
	Fx =	**3.7** k	@ floor:	Fx =	**8.6** k @ floor:
TOTAL =	12.3	kips			

Summary:

Roof		
RL	FB	
7.5	3.7	3.8

Upper		
RL	FB	
14.5	12.3	8.1

NS:	WIND GOVERNS	14.5	kips
EW:	WIND GOVERNS	12.3	kips

Total Wall length (ft)		trib (ft)
Upper Level	24.5	17.45

Seismic Forces (k)		Wind Forces (k)		Story Heights (ft)	
Upper Level	2.2	Upper Level	3.3	Upper Level	8.0

Upper Level Wind Controls

Wall Elements					Dead Loads		
Length (ft)	H:W Ratio	Increase [1]	Shear (klf) [2]		Wall (lbs)	Floor (plf)	Holdown Force (k)
24.5	0.3	1	0.09	0.135	1960	135	-0.50
			(E) SW1				***NA***

[1] Increase per IBC Table 2305.3.3

[2] Per IBC 2306.4 Wind capacities for shearwalls may be increased by 40%
Therefore shear has been reduced by 40% to compare it with the seismic shear
First number shown is seismic shear in the same wal
Holdowns @ straps are calculated without the reduction

Total Wall length (ft)		trib (ft)
Upper Level	10.3	19.95

Seismic Forces (k)		Wind Forces (k)		Story Heights (ft)	
Upper Level	2.5	Upper Level	3.8	Upper Level	8.0

Upper Level Wind Controls

Wall Elements					Dead Loads			
Length (ft)	H:W Ratio	Increase [1]	Shear (klf) [2]		Wall (lbs)	Floor (plf)	Holdown Force (k)	
10.25	0.8	1	0.24	0.369	820	10	2.67	HD REQ'D
			SW2				***HDU4-SDS2.5***	

[1] Increase per IBC Table 2305.3.3

[2] Per IBC 2306.4 Wind capacities for shearwalls may be increased by 40%
Therefore shear has been reduced by 40% to compare it with the seismic shear
First number shown is seismic shear in the same wall
Holdowns @ straps are calculated without the reduction

Total Wall length (ft)		trib (ft)
Roof Level	47.0	12.7
Upper Level	17	15.2

Seismic Forces (k)		Wind Forces (k)		Story Heights (ft)	
Roof Level	1.9	Roof Level	1.8	Roof Level	8.0
Upper Level	1.9	Upper Level	2.9	Upper Level	8.0

Roof Level Seismic Controls

Wall Elements					Dead Loads		
Length (ft)	H:W Ratio	Increase [1]	Shear (klf) [2]		Wall (lbs)	Floor (plf)	Holdown Force (k)
47.0	0.2	1	0.04	0.039	3760	10	-0.94
			(E) SW1				***NA***

Upper Level Wind Controls

Wall Elements					Dead Loads		
Length (ft)	H:W Ratio	Increase [1]	Shear (klf) [2]		Wall (lbs)	Floor (plf)	Holdown Force (k)
17.0	0.5	1	0.11	0.169	1360	248	-0.32
			(E) SW1				***NA***

[1] Increase per IBC Table 2305.3.3

[2] Per IBC 2306.4 Wind capacities for shearwalls may be increased by 40%
Therefore shear has been reduced by 40% to compare it with the seismic shear
First number shown is seismic shear in the same wal
Holdowns @ straps are calculated without the reduction

3914 88th Ave SE
Mercer Island WA

Wall Line A

Total Wall length (ft)		trib (ft)
Roof Level	16.0	14.0
Upper Level	17.6	19.0

Seismic Forces (k)		Wind Forces (k)		Story Heights (ft)	
Roof Level	1.0	Roof Level	2.0	Roof Level	8.0
Upper Level	3.0	Upper Level	5.3	Upper Level	8.0

Roof Level — Wind Controls

Wall Elements					Dead Loads			
Length (ft)	H:W Ratio	Increase [1]	Shear (klf) [2]		Wall (lbs)	Floor (plf)	Holdown Force (k)	
8	1.0	1	0.06	0.127	640	15	0.79	
8	1.0	1	0.06	0.127	640	15	0.79	
			SW1				***NA***	

Upper Level — Wind Controls

Wall Elements					Dead Loads			
Length (ft)	H:W Ratio	Increase [1]	Shear (klf) [2]		Wall (lbs)	Floor (plf)	Holdown Force (k)	
7.6	1.1	1	0.17	0.302	608	15	2.20	HD REQ'D
6.5	1.2	1	0.17	0.302	520	116	2.03	HD REQ'D
			SW1				***HDU4-SDS2.5***	

[1] Increase per IBC Table 2305.3.3

[2] Per IBC 2306.4 Wind capacities for shearwalls may be increased by 40%
Therefore shear has been reduced by 40% to compare it with the seismic shear
First number shown is seismic shear in the same wal
Holdowns @ straps are calculated without the reduction

3914 88th Ave SE
Mercer Island WA

Wall Line B

Total Wall length (ft)		trib (ft)
Roof Level	25.3	26.0
Upper Level	33.8	22.0

Seismic Forces (k)		Wind Forces (k)		Story Heights (ft)	
Roof Level	1.9	Roof Level	3.8	Roof Level	8.0
Upper Level	3.4	Upper Level	6.1	Upper Level	7.7

Roof Level Wind Controls

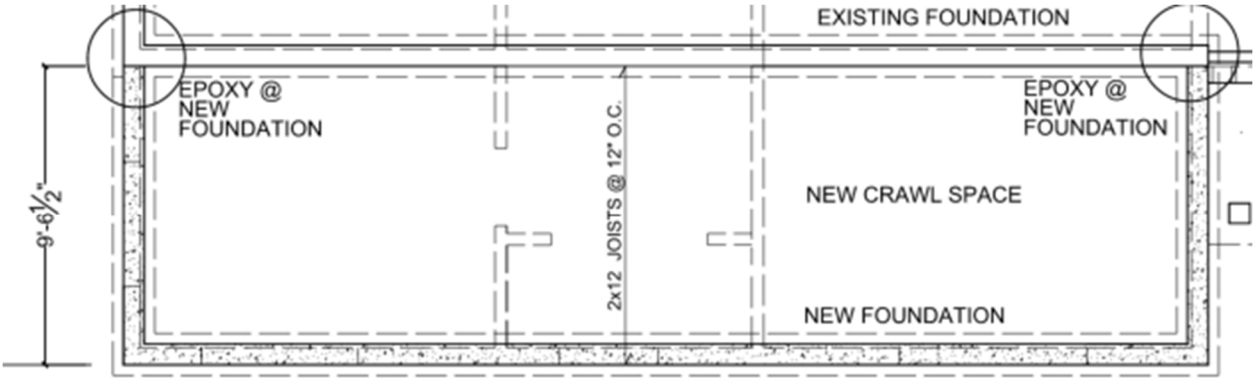
Wall Elements			Shear (klf) [2]		Dead Loads		
Length (ft)	H:W Ratio	Increase [1]			Wall (lbs)	Floor (plf)	Holdown Force (k)
25.3	0.3	1	0.08	0.149	2024	10	0.51
			(E) SW1				***NA***

Upper Level Wind Controls

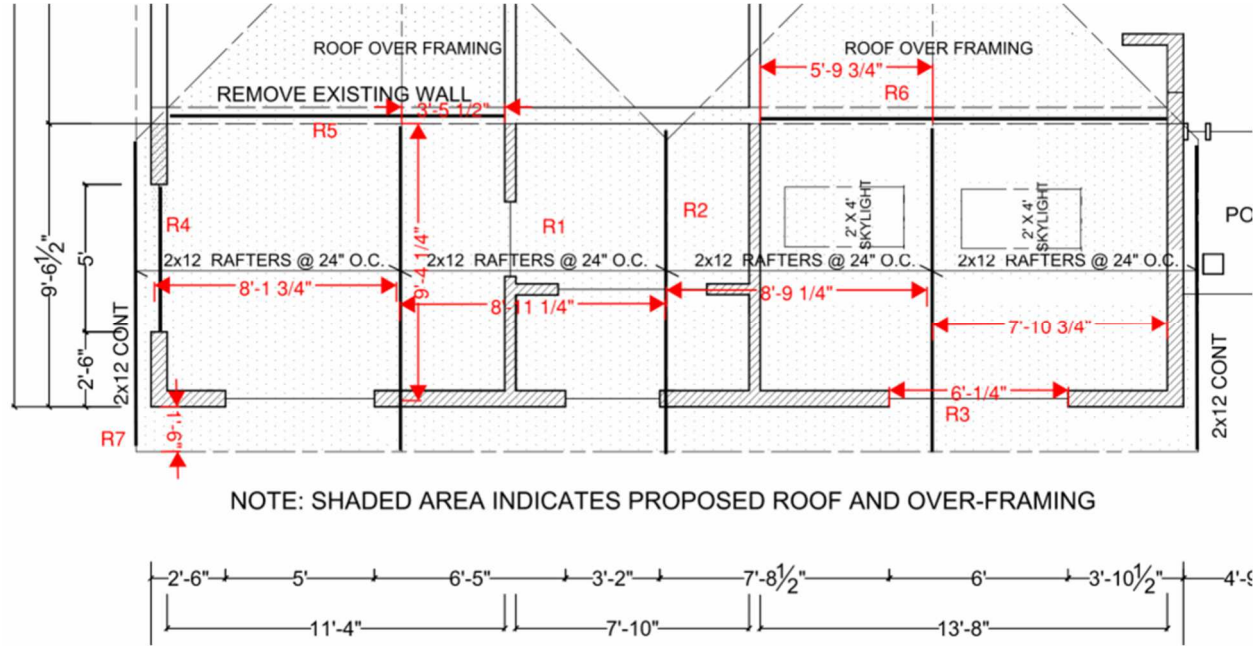
Wall Elements			Shear (klf) [2]		Dead Loads		
Length (ft)	H:W Ratio	Increase [1]			Wall (lbs)	Floor (plf)	Holdown Force (k)
25.3	0.3	1	0.10	0.182	1940	10	0.74
			(E) SW1				***EXISTING***

[1] Increase per IBC Table 2305.3.3
[2] Per IBC 2306.4 Wind capacities for shearwalls may be increased by 40%

Floor Framing Plan



Roof Framing Plan



RedSpec™ by RedBuilt™
v7.1.15

Project: Gao Residence Addition
Location: Mercer Island, WA
Folder: Folder
Date: 5/29/24 10:19 AM
Designer: JHB
Comment: Roof 1

Type: Roof 1

1.5x11.25 Hem-Fir #2

This product meets or exceeds the set design controls for the application and loads listed

DESIGN CONTROLS	%	Design	Allow.	DOL	Combination	Pattern	Pass/Fail
Shear (lb)	14%	289	2109	Roof(125%)	1.0D+1.0Lr	All Spans	PASS
Positive Moment (ft-lb)	30%	848	2799	Roof(125%)	1.0D+1.0Lr	All Spans	PASS

DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Combination	Pattern	Pass/Fail
Span Live	7%	0.034	0.470	L / 999+	L / 240	1.0D+1.0Lr	All Spans	PASS
Span Total	9%	0.058	0.627	L / 999+	L / 180	1.0D+1.0Lr	All Spans	PASS

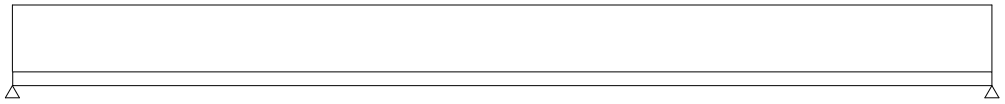
SUPPORTS	Support 1	Support 2
Live Reaction, Critical (lb) (DOL%)	223 (125)	223 (125)
Dead Reaction (lb)	158	158
Total Reaction (lb) (DOL%)	380 (125)	380 (125)
Bearing	Flush	Flush
Support	Beam	Beam
Req'd Bearing (in)	1.50	1.50

HANGERS	Model	Top	Face	Member	Header	Size
Left	HU212XSLU18 Slope: 18º Up, Skew: 0 None		(10) 0.148x3	(6) 0.148x1.5	Glulam DF/SP	8.75x34.5
Right	HU212XSLD18 Slope: 18º Down, Skew: 0 None		(10) 0.148x3	(6) 0.148x1.5	Glulam DF/SP	8.75x34.5

SPANS AND LOADS

Dimensions represent horizontal design spans.

Member Slope: 4/12



8'- 11.0"

APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Roof(125%)	25	15	0	2'-0.0"	Roof Beam

NOTES

- Building code and design methodology: 2021 IBC ASD (US).
- Product Acceptance: ICC-ES ESR-2993 and LABC/LARC Supplement.
- No repetitive member increase applied in design.
- Sloped connections require additional consideration. Support bearing length requirements must be checked separately.
- Continuous lateral support required at top edge. Lateral support required at bearings for bottom edge.
- Sloped length multiplier = 1.054. Bevel cut add = 3.75".

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RedSpec™ by RedBuilt™
v7.1.15

Project: Gao Residence Addition
Location: Mercer Island, WA
Folder: Folder
Date: 5/29/24 10:23 AM
Designer: JHB
Comment: Roof 2

Type: Roof 2

3.5x11.25 Douglas Fir #1

This product meets or exceeds the set design controls for the application and loads listed

DESIGN CONTROLS	%	Design	Allow.	DOL	Combination	Pattern	Pass/Fail
Shear (lb)	25%	1452	5906	Roof(125%)	1.0D+1.0Lr	All Spans	PASS
Positive Moment (ft-lb)	48%	4085	8458	Roof(125%)	1.0D+1.0Lr	Even Members	PASS
Negative Moment (ft-lb)	5%	-415	8256	Roof(125%)	1.0D+1.0Lr	All Spans	PASS

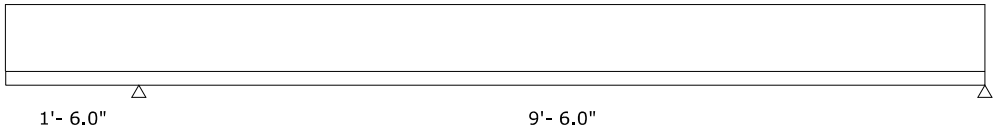
DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Combination	Pattern	Pass/Fail
Span Live	12%	0.058	0.475	L / 999+	L / 240	1.0D+1.0Lr	Even Members	PASS
Span Total	15%	0.094	0.633	L / 999+	L / 180	1.0D+1.0Lr	Even Members	PASS
Overhang Live (down)	2%	0.003	0.150	2L / 999+	2L / 240	1.0D+1.0Lr	Odd Members	PASS
Overhang Total (down)		0.000	0.200	2L / 999+	2L / 180	1.0D+1.0Lr		PASS
Overhang Live (up)		-0.030		2L / 999+				
Overhang Total (up)		-0.046		2L / 777				

SUPPORTS	Support 1	Support 2
Live Reaction, Critical (lb) (DOL%)	1433 (125)	1069 (125)
Dead Reaction (lb)	919	668
Total Reaction (lb) (DOL%)	2352 (125)	1737 (125)
Bearing	Bottom	Bottom
Support	Wall	Beam
Req'd Bearing (in)	3.00	1.50

SPANS AND LOADS

Dimensions represent horizontal design spans.

Member Slope: 0/12



APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Roof(125%)	25	15	0	9'-0.0"	Roof Beam

NOTES

- Building code and design methodology: 2021 IBC ASD (US).
- Product Acceptance: ICC-ES ESR-2993 and LABC/LARC Supplement.
- No repetitive member increase applied in design.
- Support bearing length requirements must be checked separately.
- Continuous lateral support required at top edge. Lateral support required at bearings for bottom edge.

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RedSpec™ by RedBuilt™
v7.1.15

Project: Gao Residence Addition
Location: Mercer Island, WA
Folder: Folder
Date: 5/29/24 10:30 AM
Designer: JHB
Comment: Roof 3

Type: Roof 3

DOUBLE 1.5x9.25 Hem-Fir #2

This product meets or exceeds the set design controls for the application and loads listed

DESIGN CONTROLS	%	Design	Allow.	DOL	Combination	Pattern	Pass/Fail
Shear (lb)	56%	1955	3469	Roof(125%)	1.0D+1.0Lr	All Spans	PASS
Positive Moment (ft-lb)	70%	2936	4166	Roof(125%)	1.0D+1.0Lr	All Spans	PASS

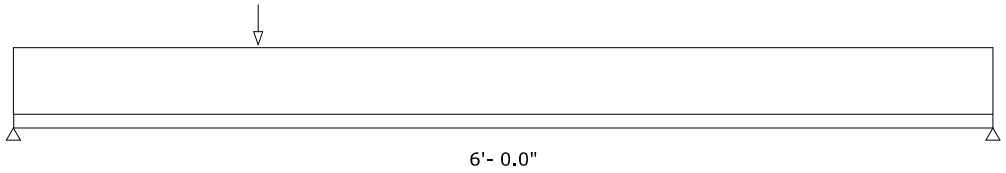
DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Combination	Pattern	Pass/Fail
Span Live	12%	0.035	0.300	L / 999+	L / 240	1.0D+1.0Lr	All Spans	PASS
Span Total	15%	0.059	0.400	L / 999+	L / 180	1.0D+1.0Lr	All Spans	PASS

SUPPORTS	Support 1	Support 2
Live Reaction, Critical (lb) (DOL%)	1225 (125)	508 (125)
Dead Reaction (lb)	797	337
Total Reaction (lb) (DOL%)	2021 (125)	845 (125)
Bearing	Bottom	Bottom
Support	Wall	Wall
Req'd Bearing (in)	1.66	1.50

SPANS AND LOADS

Dimensions represent horizontal design spans.

Member Slope: 0/12



APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Roof(125%)	25	15	0	2'-0.0"	Roof Beam

ADDITIONAL LOADS

Type	Units	DOL	Live	Dead	Location from left	Application	Comment
Point	lb	Roof(125%)	1433	919	1'-6.0"	Adds To	FROM R2

NOTES

- Building code and design methodology: 2021 IBC ASD (US).
- Product Acceptance: ICC-ES ESR-2993 and LABC/LARC Supplement.
- No repetitive member increase applied in design.
- Support bearing length requirements must be checked separately.
- Continuous lateral support required at top edge. Lateral support required at bearings for bottom edge.

D:\Marika Personal Files\Hjert-Bernardi Architects\Gao Residence\Gao Residence Addition.red

RedSpec™ by RedBuilt™
v7.1.15

Project: Gao Residence Addition
Location: Mercer Island, WA
Folder: Folder
Date: 5/29/24 10:32 AM
Designer: JHB
Comment: Roof 4

Type: Roof 4

DOUBLE 1.5x7.25 Hem-Fir #2

This product meets or exceeds the set design controls for the application and loads listed

DESIGN CONTROLS	%	Design	Allow.	DOL	Combination	Pattern	Pass/Fail
Shear (lb)	17%	464	2719	Roof(125%)	1.0D+1.0Lr	All Spans	PASS
Positive Moment (ft-lb)	27%	764	2792	Roof(125%)	1.0D+1.0Lr	All Spans	PASS

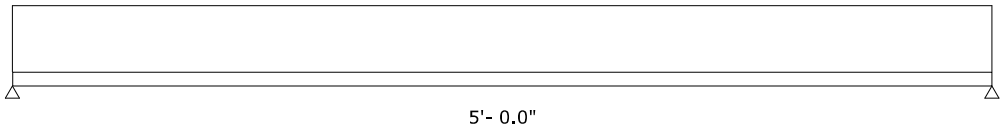
DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Combination	Pattern	Pass/Fail
Span Live	7%	0.017	0.250	L / 999+	L / 240	1.0D+1.0Lr	All Spans	PASS
Span Total	8%	0.028	0.333	L / 999+	L / 180	1.0D+1.0Lr	All Spans	PASS

SUPPORTS	Support 1	Support 2
Live Reaction, Critical (lb) (DOL%)	375 (125)	375 (125)
Dead Reaction (lb)	236	236
Total Reaction (lb) (DOL%)	611 (125)	611 (125)
Bearing	Bottom	Bottom
Support	Wall	Wall
Req'd Bearing (in)	1.50	1.50

SPANS AND LOADS

Dimensions represent horizontal design spans.

Member Slope: 0/12



APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Roof(125%)	25	15	0	6'-0.0"	Roof Beam

NOTES

- Building code and design methodology: 2021 IBC ASD (US).
- Product Acceptance: ICC-ES ESR-2993 and LABC/LARC Supplement.
- No repetitive member increase applied in design.
- Support bearing length requirements must be checked separately.
- Continuous lateral support required at top edge. Lateral support required at bearings for bottom edge.

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RedSpec™ by RedBuilt™
v7.1.15

Project: Gao Residence Addition
Location: Mercer Island, WA
Folder: Folder
Date: 5/29/24 10:35 AM
Designer: JHB
Comment: Roof 5

Type: Roof 5

3.5"x9.5" RedLam™ LVL 2.0E

This product meets or exceeds the set design controls for the application and loads listed

DESIGN CONTROLS	%	Design	Allow.	DOL	Combination	Pattern	Pass/Fail
Shear (lb)	50%	3978	7897	Roof(125%)	1.0D+1.0Lr	All Spans	PASS
Positive Moment (ft-lb)	76%	12439	16413	Roof(125%)	1.0D+1.0Lr	All Spans	PASS

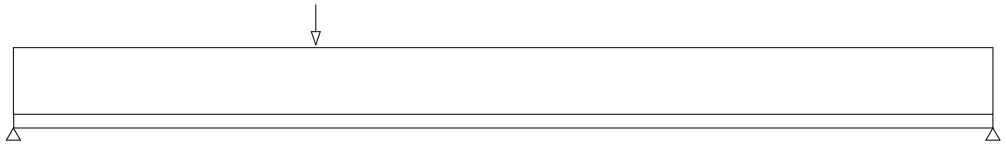
DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Combination	Pattern	Pass/Fail
Span Live	64%	0.361	0.567	L / 377	L / 240	1.0D+1.0Lr	All Spans	PASS
Span Total	78%	0.588	0.756	L / 231	L / 180	1.0D+1.0Lr	All Spans	PASS

SUPPORTS	Support 1	Support 2
Live Reaction, Critical (lb) (DOL%)	2722 (125)	2313 (125)
Dead Reaction (lb)	1707	1451
Total Reaction (lb) (DOL%)	4429 (125)	3765 (125)
Bearing	Bottom	Bottom
Support	Wall	Wall
Req'd Bearing (in)	1.69	1.50

SPANS AND LOADS

Dimensions represent horizontal design spans.

Member Slope: 0/12



APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Roof(125%)	25	15	0	14'-0.0"	Roof Beam

ADDITIONAL LOADS

Type	Units	DOL	Live	Dead	Location from left	Application	Comment
Point	lb	Roof(125%)	1069	668	3'-6.0"	Adds To	FROM R2

NOTES

- Building code and design methodology: 2021 IBC ASD (US).
- Product Acceptance: ICC-ES ESR-2993 and LABC/LARC Supplement.
- No repetitive member increase applied in design.
- Support bearing length requirements must be checked separately.
- Continuous lateral support required at top edge. Lateral support required at bearings for bottom edge.

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RedSpec™ by RedBuilt™
v7.1.15

Project: Gao Residence Addition
Location: Mercer Island, WA
Folder: Folder
Date: 5/29/24 10:36 AM
Designer: JHB
Comment: Roof 6

Type: Roof 6

3.5"x11.875" RedLam™ LVL 2.0E

This product meets or exceeds the set design controls for the application and loads listed

DESIGN CONTROLS	%	Design	Allow.	DOL	Combination	Pattern	Pass/Fail
Shear (lb)	44%	4350	9871	Roof(125%)	1.0D+1.0Lr	All Spans	PASS
Positive Moment (ft-lb)	76%	18807	24877	Roof(125%)	1.0D+1.0Lr	All Spans	PASS

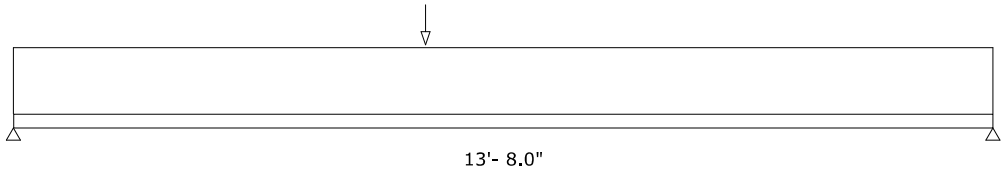
DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Combination	Pattern	Pass/Fail
Span Live	57%	0.390	0.683	L / 421	L / 240	1.0D+1.0Lr	All Spans	PASS
Span Total	70%	0.636	0.911	L / 258	L / 180	1.0D+1.0Lr	All Spans	PASS

SUPPORTS	Support 1	Support 2
Live Reaction, Critical (lb) (DOL%)	3011 (125)	2841 (125)
Dead Reaction (lb)	1905	1799
Total Reaction (lb) (DOL%)	4916 (125)	4640 (125)
Bearing	Bottom	Bottom
Support	Wall	Wall
Req'd Bearing (in)	1.87	1.77

SPANS AND LOADS

Dimensions represent horizontal design spans.

Member Slope: 0/12



APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Roof(125%)	25	15	0	14'-0.0"	Roof Beam

ADDITIONAL LOADS

Type	Units	DOL	Live	Dead	Location from left	Application	Comment
Point	lb	Roof(125%)	1069	668	5'-9.0"	Adds To	FROM R2

NOTES

- Building code and design methodology: 2021 IBC ASD (US).
- Product Acceptance: ICC-ES ESR-2993 and LABC/LARC Supplement.
- No repetitive member increase applied in design.
- Support bearing length requirements must be checked separately.
- Continuous lateral support required at top edge. Lateral support required at bearings for bottom edge.

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RedSpec™ by RedBuilt™
v7.1.15

Project: Gao Residence Additi
Location: Mercer Island, WA
Folder: Folder
Date: 5/31/24 1:42 PM
Designer: JHB
Comment: Roof 7

Type: Roof 7

1.5x7.25 Hem-Fir #2

This product meets or exceeds the set design controls for the application and loads listed

DESIGN CONTROLS	%	Design	Allow.	DOL	Combination	Pattern	Pass/Fail
Shear (lb)	33%	-455	1359	Roof(125%)	1.0D+1.0Lr	All Spans	PASS
Positive Moment (ft-lb)	57%	796	1395	Roof(125%)	1.0D+1.0Lr	Even Members	PASS
Negative Moment (ft-lb)	67%	-664	989	Roof(125%)	1.0D+1.0Lr	All Spans	PASS

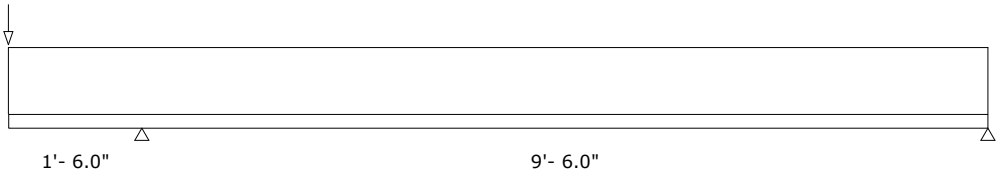
DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Combination	Pattern	Pass/Fail
Span Live	31%	0.148	0.475	L / 770	L / 240	1.0D+1.0Lr	Even Members	PASS
Span Total	32%	0.200	0.633	L / 569	L / 180	1.0D+1.0Lr	Even Members	PASS
Overhang Live (down)	40%	0.060	0.150	2L / 603	2L / 240	1.0D+1.0Lr	Odd Members	PASS
Overhang Total (down)	27%	0.053	0.200	2L / 677	2L / 180	1.0D+1.0Lr	Odd Members	PASS
Overhang Live (up)		-0.075		2L / 482				
Overhang Total (up)		-0.081		2L / 443				

SUPPORTS	Support 1	Support 2
Live Reaction, Critical (lb) (DOL%)	577 (125)	237 (125)
Dead Reaction (lb)	388	124
Total Reaction (lb) (DOL%)	965 (125)	362 (125)
Bearing	Bottom	Bottom
Support	Wall	Wall
Req'd Bearing (in)	3.00	1.50

SPANS AND LOADS

Dimensions represent horizontal design spans.

Member Slope: 0/12



APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Roof(125%)	25	15	0	2'-0.0"	Roof Beam

ADDITIONAL LOADS

Type	Units	DOL	Live	Dead	Location from left	Application	Comment
Point	lb	Roof(125%)	223	158	0'-0.0"	Adds To	FROM R1

NOTES

- Building code and design methodology: 2021 IBC ASD (US).
- Product Acceptance: ICC-ES ESR-2993 and LABC/LARC Supplement.
- No repetitive member increase applied in design.
- Support bearing length requirements must be checked separately.
- Continuous lateral support required at top edge. Lateral support required at bearings for bottom edge.

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RedSpec™ by RedBuilt™
v7.1.15

Project: Gao Residence Addition
Location: Mercer Island, WA
Folder: Folder
Date: 5/29/24 10:52 AM
Designer: JHB
Comment: Floor Joist - F1

Type: Joist

1.5x7.25 Hem-Fir #2

This product meets or exceeds the set design controls for the application and loads listed

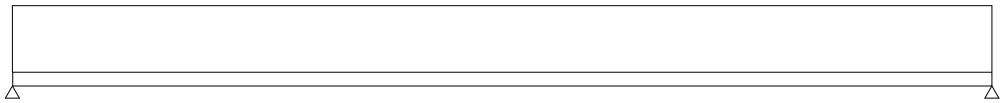
DESIGN CONTROLS	%	Design	Allow.	DOL	Combination	Pattern	Pass/Fail
Shear (lb)	29%	315	1088	Floor(100%)	1.0D+1.0L	All Spans	PASS
Positive Moment (ft-lb)	77%	860	1116	Floor(100%)	1.0D+1.0L	All Spans	PASS

DEFLECTIONS (in)	%	Design	Allow.	Design	Allow.	Combination	Pattern	Pass/Fail
Span Live	67%	0.161	0.239	L / 713	L / 480	1.0D+1.0L	All Spans	PASS
Span Total	48%	0.228	0.477	L / 503	L / 240	1.0D+1.0L	All Spans	PASS

SUPPORTS	Support 1	Support 2
Live Reaction, Critical (lb) (DOL%)	254 (100)	254 (100)
Dead Reaction (lb)	106	106
Total Reaction (lb) (DOL%)	361 (100)	361 (100)
Bearing	Bottom	Bottom
Support	Beam	Beam
Req'd Bearing (in)	1.50	1.50

SPANS AND LOADS

Dimensions represent horizontal design spans.



9'- 6.5"

APPLICATION LOADS

Type	Units	DOL	Live	Dead	Partition	Tributary	Member Type
Uniform	psf	Floor(100%)	40	15	0	1'-4.0"	Floor Beam

NOTES

- Building code and design methodology: 2021 IBC ASD (US).
- Product Acceptance: ICC-ES ESR-2993 and LABC/LARC Supplement.
- No repetitive member increase applied in design.
- Support bearing length requirements must be checked separately.
- Continuous lateral support required at top edge. Lateral support required at bearings for bottom edge.

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