CK Engineering LLC.

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Lake Forest Park, WA 98155

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STRUCTURAL CALCULATIONS

Partial Lateral & Gravity Design
21-066

12/16/2021

ROBINSON RESIDENCE
8834 SE 40TH ST.
Mercer Island, WA 98040
December 16, 2021

Hazards by Location

Search Information

Address: 8834 SE 40th St, Mercer Island, WA 98040, USA

Coordinates: 47.5747346, -122.2206334

Elevation: 321 ft

Timestamp: 2021-12-04T23:18:11.688Z

Hazard Type: Wind

ASCE 7-16

MRI 10-Year	67 mph
MRI 25-Year	73 mph
MRI 50-Year	78 mph
MRI 100-Year	83 mph
Risk Category I	92 mph
Risk Category II	97 mph
Risk Category III	105 mph
Risk Category IV	108 mph

ASCE 7-10

MRI 10-Year	72 mph
MRI 25-Year	79 mph
MRI 50-Year	85 mph
MRI 100-Year	91 mph
Risk Category I	100 mph
Risk Category II	110 mph
Risk Category III-IV	115 mph

ASCE 7-05

ASCE 7-05 Wind Speed	85 mph

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.

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.


SE 33rd Pl
SE 34th Pl
SE 35th St
SE 35th Pl
SE 36th St
SE 37th St
SE 39th St
SE 40th St
SE 42nd St
E Shorewood
SE 36th St
SE 36th Pl
SE Gallagher Hill Rd
Greenbrier Ln
Fortuna Dr
I-90 Express
N Concord
Shorewood Dr
Island Crest Way
77th Pl SE
78th Ave SE
79th Pl SE
80th Ave SE
81st Ave SE
82nd Ave SE
83rd Ave SE
84th Ave SE
85th Ave SE
86th Ave SE
88th Ave SE
90th Ave SE
91st Ave SE
93rd Ave SE
94th Ave SE
94th Pl SE
Crestwood Pl
W Mercer Way
Holly Ln

Hazards by Location

Search Information

Address: 8834 SE 40th St, Mercer Island, WA 98040, USA

Coordinates: 47.5747346, -122.2206334

Elevation: 321 ft

Timestamp: 2021-12-04T23:20:03.935Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: I

Site Class: D-default

Basic Parameters

Name	Value	Description
S_S	1.409	MCE_R ground motion (period=0.2s)
S_1	0.49	MCE_R ground motion (period=1.0s)
S_{MS}	1.691	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.127	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.902	Coefficient of risk (0.2s)
CR_1	0.897	Coefficient of risk (1.0s)
PGA	0.603	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.724	Site modified peak ground acceleration

T_L	6	Long-period transition period (s)
SsRT	1.409	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.561	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.594	Factored deterministic acceleration value (0.2s)
S1RT	0.49	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.546	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.438	Factored deterministic acceleration value (1.0s)
PGAd	1.226	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

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

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Design Criteria

Scope of Work:	Partial Lateral & Gravity Design		
Site Address:	8834 SE 40TH ST. Mercer Island, WA 98040		
Number of Stories:	1	Engineer:	PK

Roof Loading

Roofing	Composition	3.0
Sheathing	5/8" Plywood	1.8
Insulation	Roll/Batt	3.0
Ceiling	5/8" GWB	2.8
Framing	Trusses	2.2
Miscellaneous	fixtures, mechanical, electrical, etc.	2.2
	TOTAL DEAD LOAD:	15.0 psf
	ROOF SNOW LOAD:	25.0 psf

Main Floor Loading

Floor Covering	Carpet/Hardwood/Tile	3.0
Sheathing	3/4" T&G	2.3
Ceiling	1/2" GWB	2.2
Joists	Solid Sawn @ 16" o/c	3.3
Beams		2.8
Miscellaneous	fixtures, mechanical, electrical, etc.	1.4
	TOTAL DEAD LOAD:	15.0 psf
	FLOOR LIVE LOAD:	40.0 psf

Not Used

Floor Covering	Carpet/Hardwood/Tile	0.0
Sheathing	3/4" T&G	0.0
Ceiling	5/8" GWB	0.0
Joists	I-Joists	0.0
Beams		4.2
Miscellaneous	fixtures, mechanical, electrical, etc.	0.6
	TOTAL DEAD LOAD:	4.8 psf
	FLOOR LIVE LOAD:	0.0 psf

Soil Bearing Capacity:	1500 psf
Frost Depth:	18 in

Type of construction:	REMODELING/ADDITION	Location:	8834 SE 40TH ST.
Applicable Building Codes:	IBC 2018, ASCE 7/SEI 7-16		Mercer Island, WA 98040

Work performed : **Partial Lateral & Gravity Design**

WIND DESIGN:

$P_s = \lambda I_w P_{s30} K_{zt}$

Exposure :	B	Wind Exposure Category as set forth in Section 26.7 of ASCE 7-16
Wind Speed =	85 MPH	Basic Wind Speed (LRFD) as used in Figure 28.5 of ASCE 7-16 and converted to (ASD)
P_{s30} =		Simplified design wind pressure for Exposure B, at h = 30 feet and for I = 1.0, from Figure 28.5-1
I_w =	1	Importance factor as defined in Table 1.5-2 of ASCE 7-16
λ =	1.00	Adjustment factor for building height and exposure from Figure 28.5-1 of ASCE 7-16
K_{ZT} =	1.60	Adjustment factor for increased wind speed due to a hill or escarpment from Section 26.8 of ASCE 7-16

Roof slope :

		rise		run		
Front/Rear	$\tan^{-1}$ (	4	/	12	)	= 18.4 degrees
Left/Right	$\tan^{-1}$ (	6	/	12	)	= 26.6 degrees

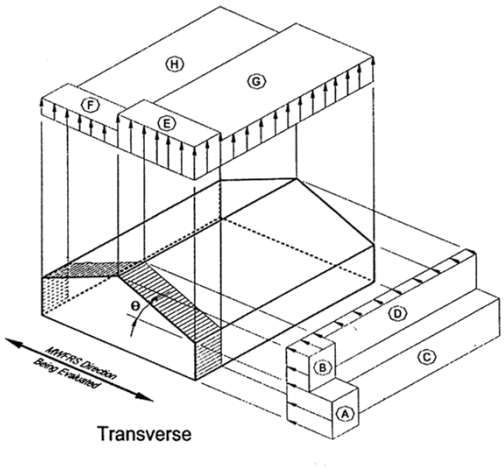
12 ft Mean Elevation

Number of floors: 1

0

Average uplift (F/R)= -13.4 psf Based on wind zones 'G' and 'H'

Average uplift (R/L)= -7.0 psf Based on wind zones 'G' and 'H'



	End zone of wall Front/Rear	Left/Right	End zone of roof Front/Rear	Left/Right
P_{s30} =	A = 15.4 psf	13.9 psf	B = -4.4 psf	4.3 psf
P_s =	24.7 psf	22.3 psf	-7.0 psf	6.9 psf

	Interior zone of wall Front/Rear	Left/Right	Interior zone of roof Front/Rear	Left/Right
P_{s30} =	C = 10.3 psf	10.3 psf	D = -2.4 psf	3.8 psf
P_s =	16.5 psf	16.5 psf	-3.9 psf	6.1 psf

WIND LOAD CALCULATIONS

FRONT ⟶ REAR

ΣV MAIN FLOOR =

WIND ZONE	B	D	A	C								
AVE. HEIGHT	5.5	5.5	4	4								
AVE. WIDTH	8	42	8	42								
Ps	0.00	0.00	24.69	16.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	790	2765	0	0	0	0	0	0	0	0

TOTAL 4,750 lbs Minimum net pressure controls. The calc. pressure is less than the min. net pressure, equal to 16psf(A-C), and 8psf(B-D) applied over the entire area. (ASCE 7-16 28.5.3)

NOT USED

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL 0 lbs

NOT USED

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0

TOTAL 0 lbs

WIND LOAD CALCULATIONS

LEFT ⟶ RIGHT

ΣV MAIN FLOOR =

WIND ZONE	B	D	C	A	C							
AVE. HEIGHT	4	4	4	4.5	4.5							
AVE. WIDTH	6.5	25.5	12.5	6.5	45.5							
Ps	6.94	6.14	16.54	22.29	16.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	180	627	827	652	3387	0	0	0	0	0	0	0
TOTAL	5,672 lbs											

NOT USED

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0 lbs											

NOT USED

WIND ZONE												
AVE. HEIGHT												
AVE. WIDTH												
Ps	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0 lbs											

ρ CALCS:

MAIN FLOOR CALCULATIONS:

Plate Height:	8.50 ft	Tributary Area:	1.0
Total length of Shearwall in Shortest Line:	7.00 ft	Total Area:	2.0
Length of Shortest Segment within Shear Line:	3.50 ft		
Length of Longest Segment in Shear Line:	3.50 ft	ρ =	1.00

ASCE 7-16 12.3.4.2 a

NOT USED:

Plate Height:	8.00 ft	Tributary Area:	1.0
Total length of Shearwall in Shortest Line:	8.75 ft	Total Area:	2.0
Length of Shortest Shearwall within Shear Line:	3.00 ft		
Length of Longest Wall in Shear Line:	3.50 ft	ρ =	NA

NOT USED:

Plate Height:	8.00 ft	Tributary Area:	1.0
Total length of Shearwall in Shortest Line:	8.00 ft	Total Area:	2.0
Length of Shortest Shearwall within Shear Line:	8.00 ft		
Length of Longest Wall in Shear Line:	8.00 ft	ρ =	NA

All loads in pounds per square foot

SEISMIC DESIGN:

$E = E_h + E_v$

$E = \rho Q_{E+.2S_{DS}D}$ $\quad Q_E = V = C_sW$

WALL DEAD LOAD =	10 psf	ROOF DEAD LOAD =	15.0 psf
FLAT ROOF SNOW LOAD =	25 psf	UPPER FLOOR D.L. =	15.0 psf
RED. S.L. (20%*S.L.) =	0	LOWER FLOOR D.L. =	4.8 psf
		FLOOR LIVE LOAD =	40.0 psf

ρ =	1.00		
Site Class =	D	Geotech Report: No	20% Seismic Load Increase
I_E =	1	Importance factor as defined in Table 11.5-1	
R =	6.5		
h_n =	15	Total height of structure	

$V = 0.7S_{DS}I_EW / R$ $\quad S_{DS} = 2/3\ S_{MS}$ $\quad Ss =$ 140.9% $\quad S_{MS} = 169.1\%$ $\quad$ **V =** 0.121 W

$V_{max} = S_{D1}I_EW / T_aR$ $\quad S_{MS} = (Fa)(Ss)$ $\quad Fa =$ 1.20 $\quad S_{DS} = 112.7\%$ $\quad$ **E =** 0.121 W

$T_a = 0.02h_n^{0.75}$ $\quad S_{D1} = 2/3\ S_{M1}$ $\quad S_1 =$ 49.0% $\quad S_{M1} = 73.5\%$

T_a = 0.15 s $\quad S_{M1} = (Fv)(S_1)$ $\quad Fv =$ 1.50 $\quad S_{D1} = 49.0\%$ $\quad$ **Cs =** 0.121

MAIN FLOOR DIAPHRAGM LOADING:

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
50	31	15.0	23250
30	18	15.0	8100
		15.0	0
		15.0	0
		15.0	0

Area = 2090 Sub-Total= 31350

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
		15.0	0
		15.0	0
		15.0	0
		15.0	0
		15.0	0

Area = 0 Sub-Total= 0

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
200	4	10.0	8000
		10.0	0
		10.0	0
		10.0	0
		10.0	0

Area = 800 Sub-Total= 8000

TOTAL = 39350 lb

NOT APPLICABLE

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
		15.0	0
		15.0	0
		15.0	0
		15.0	0
		15.0	0

Area = 0 Sub-Total= 0

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
		4.8	0
		4.8	0
		4.8	0
		4.8	0
		4.8	0

Area = 0 Sub-Total= 0

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
		10.0	0
		10.0	0
		10.0	0
		10.0	0
		10.0	0

Area = 0 Sub-Total= 0

TOTAL = lb

NOT APPLICABLE

W (ROOF) =

LENGTH	WIDTH	LOAD	TOTAL
		15.0	0
		15.0	0
		15.0	0
		15.0	0
		15.0	0

Area = 0 Sub-Total= 0

W (FLOOR) =

LENGTH	WIDTH	LOAD	TOTAL
		15.0	0
		15.0	0
		15.0	0
		15.0	0
		15.0	0

Area = 0 Sub-Total= 0

W (WALL) =

LENGTH	TRIB. HT.	LOAD	TOTAL
		10.0	0
		10.0	0
		10.0	0
		10.0	0
		10.0	0

Area = 0 Sub-Total= 0

TOTAL = lb

V (MAIN FLOOR) = .121 x 39350 lb = 4777 lbs

V ( ) = .121 x lb = lbs

V ( ) = .121 x lb = lbs

REDISTRIBUTE:

ΣV x ρ	height	ΣV x height
4777 lb	8.5	40602
lb		0
lb		0
TOTAL = 4777 lb		TOTAL = 40602

E (MAIN) $= \dfrac{\Sigma V \times \text{height} \times \Sigma V\ \text{TOTAL}}{\Sigma V \times \text{height TOTAL}} =$ 4777 lbs

E ( ) = NOT USED = 0 lbs

E ( ) = NOT USED = 0 lbs

SUMMARY:

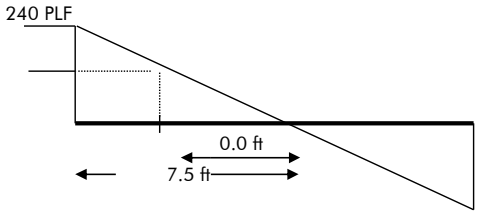
	WIND (front-rear)	WIND (left-right)	SEISMIC
ΣV (MAIN) =	4750 lbs	5672 lbs	5732 lbs
NOT APLICABLE	0 lbs	0 lbs	0 lbs
NOT APPLICABLE	0 lbs	0 lbs	0 lbs
TOTAL =	4750 lbs	5672 lbs	5732 lbs

DIAPHRAGM SHEAR:

Total diaphragm length = 50.0 ft Sub-diaphragm length = 24.0 ft
Diaphragm width = 15.0 ft ΣV (MAIN) = 5,732 lbs

$$v = \frac{\Sigma V(roof)}{(2)(width)} = \frac{2751\ lb}{30\ ft} = 92\ PLF$$

IBC Table 2306.3.1 ⟶ 240 PLF



USE 15/32 CDX ROOF SHEATHING OR 3/4 T&G CDX SUBFLOORING w/8d AT 6 in o/c(PANEL EDGE), END 8d AT 12in o/c(PANEL FIELD)

CHORD:

Sub-diaphragm length = 24.0 ft Total-diaphragm length = 50.0 ft
Sub-diaphragm width = 15.0 ft

$$T = \frac{M}{B} = \frac{\Sigma V \times (diaphragm\ length)}{8 \times (diaphragm\ width)} = \frac{2751 \times 24\ ft}{8 \times 15\ ft} = 550\ lbs$$

Top Plate Size: 2x6 Species/Grade: HF #2

Area = 8.25 in^2 F_t = 525 psi
Load duration (C_D) = 1.33 $T_{allowable}$ = Area x C_D x F_t = 5,761 lbs

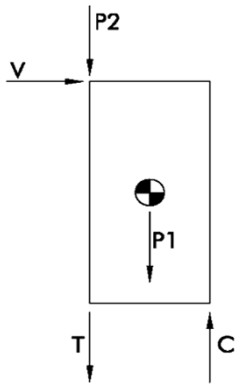
Since T allowable is greater than T applied, OK.

SHEAR CAPACITY OF 10d COMMON NAIL = 102 lbs 102 x Cd x p = 136 lbs 2018 NDS

$$\#\ OF\ NAILS\ PER\ 4\ FT\ SPLICE = \frac{550\ lbs}{136\ lbs} = 4$$

USE 2x6 HF #2 TOP PLATE W/ (8) 10d COMMON NAILS PER SPLICE.

Lateral Calculation Key



V = Shear, plf
H = Height of shearwall
L = Length of shearwall
P1 = Weight of shearwall and connected framing
P2 = Weight of adjacent wall

T = V x H - 0.5P1 - P2 = Tension reaction to be resisted by holdown
C = V x H + 0.5P1 = Compression reaction

ASD Basic Load Combinations

For calculation of tension and compression forces in compliance with ASCE 7-16 2.4.1

Tension Equations (Uplift)

7. 0.6D + W
8. $(0.6 - 0.14S_{DS})D + E$ → 0.44 D + E

*8. $(0.6 - 0.14S_{DS})D + 2.5\ E$ → 0.44 D + 2.5 E

Compression Equations

5. D + W
5. $(1 + 0.14S_{DS})D + E$ → 1.16 D + E
6. D + 0.75W + 0.75L + 0.75S
6. $(1.0 + 0.105S_{DS})D + 0.75E + 0.75L + 0.75S$ → 1.12 D + 0.75 E + 0.75 L + 0.75 S

*5. $(1 + 0.14S_{DS})D + 2.5E$ → 1.16 D + 2.5 E
*6. $(1.0 + 0.105S_{DS})D + 1.875E + 0.75L + 0.75S$ → 1.12 D +1.875 E + 0.75 L + 0.75 S

** Equations include overstrength factor.*

Note: The 0.7 factor for Earthquake loading has already been incorporated into the calculation of the lateral design force E_h, but not E_v. Therefore this factor has been omitted from equations 5, 6 and 8 where appropriate.

MAIN FL. REAR

SHEARWALL

Floor Info

		WIND		SEISMIC	
		Tributary Width (Main Floor)		Tributary Area (Main Floor)	
Main	Floor Level, e.g. Upper, Main, Lower	12.0	tributary width	12.0	tributary area
Lt-Rt	Load Direction, e.g. Left-Right, Front-Rear	49.0	total width	49.0	total area
	(For Left Wall, Use Front-Rear Load Direction)	Not Used		Not Used	
CDX	Sheathing type	1.0	tributary width	1.0	tributary area
	Values in accordance with AF&PA SDPWS-2015	2.0	total width	2.0	total area
Roof	Resisting Dead Load	Not Used		Not Used	
	(e.g. Roof, Upper Floor, Main Floor)	1.0	tributary width	1.0	tributary area
6.00 ft	Total Length of Shearwalls	2.0	total width	2.0	total area

V(from upper)=	5672 lb	5732 lb	Height of Shearwall =	8.5 ft	Weight of Shearwall = 10.0 lbs
V(from main)=	0 lb	0 lb	Length of Shearwall =	3.0 ft	Tributary width for dead load = 2.0 ft
V(from lower)=	0 lb	0 lb	Aspect Ratio OK		Length of adjoining wall = 1.0 ft
Σ (Wind) =	5,672 lb	Σ (Smc) = 5,732 lb	Use alternate R factor for seismic?	No	
v =	232 PLF	v = 234 PLF			

SDPWS, Table 4.3A → (2w/h) x 0.93 x 456 = 299 PLF → USE SW3

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =		+ 1968 lbs	= 1968 lbs	Wind controls
T_{TOTAL} =	(floor above) + (this floor) =		+ 1862 lbs	= 1862 lbs	Load case 8 controls - Seismic

Seismic controls holdown design

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 1989 lbs

USE SIMPSON DESIGNED HOLDOWN: CS14

OR AT FOUNDATION / INTERIOR WALLS USE: LSTHD8/RJ

MAIN FL. MID

SHEARWALL

Floor Info

		WIND		SEISMIC	
		Tributary Width (Main Floor)		Tributary Area (Main Floor)	
Main	Floor Level, e.g. Upper, Main, Lower	1.0	tributary width	1.0	tributary area
Lt-Rt	Load Direction, e.g. Left-Right, Front-Rear	2.0	total width	2.0	total area
	(For Left Wall, Use Front-Rear Load Direction)	Not Used		Not Used	
CDX	Sheathing type	1.0	tributary width	1.0	tributary area
	Values in accordance with AF&PA SDPWS-2015	2.0	total width	2.0	total area
Roof	Resisting Dead Load	Not Used		Not Used	
	(e.g. Roof, Upper Floor, Main Floor)	1.0	tributary width	1.0	tributary area
16.00 ft	Total Length of Shearwalls	2.0	total width	2.0	total area

V(from upper)=	5672 lb	5732 lb	Height of Shearwall =	8.0 ft	Weight of Shearwall = 10.0 lbs
V(from main)=	0 lb	0 lb	Length of Shearwall =	7.5 ft	Tributary width for dead load = 2.0 ft
V(from lower)=	0 lb	0 lb	Aspect Ratio OK		Length of adjoining wall = 1.0 ft
Σ (Wind) =	5,672 lb	Σ (Smc) = 5,732 lb	Use alternate R factor for seismic?	No	
v =	177 PLF	v = 179 PLF			

SDPWS, Table 4.3A → 0.93 x 242 = 225 PLF → USE SW6

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =		+ 1418 lbs	= 1418 lbs	Wind controls
T_{TOTAL} =	(floor above) + (this floor) =		+ 1202 lbs	= 1202 lbs	Load case 8 controls - Seismic

Seismic controls holdown design

HDU2

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 1433 lbs

USE SIMPSON DESIGNED HOLDOWN: CS14

OR AT FOUNDATION / INTERIOR WALLS USE: LSTHD8/RJ

MAIN FL. LEFT

SHEARWALL

Floor Info

		WIND		SEISMIC	
		Tributary Width (Main Floor)		Tributary Area (Main Floor)	
Main	Floor Level, e.g. Upper, Main, Lower	1.0	tributary width	1.0	tributary area
Ft-Rr	Load Direction, e.g. Left-Right, Front-Rear	2.0	total width	2.0	total area
	(For Left Wall, Use Front-Rear Load Direction)	Not Used		Not Used	
CDX	Sheathing type	1.0	tributary width	1.0	tributary area
	Values in accordance with AF&PA SDPWS-2015	2.0	total width	2.0	total area
Roof	Resisting Dead Load	Not Used		Not Used	
	(e.g. Roof, Upper Floor, Main Floor)	1.0	tributary width	1.0	tributary area
24.00 ft	Total Length of Shearwalls	2.0	total width	2.0	total area

V(from upper)=	4750 lb	5732 lb	Height of Shearwall =	8.5 ft	Weight of Shearwall = 10.0 lbs
V(from main)=	0 lb	0 lb	Length of Shearwall =	24.0 ft	Tributary width for dead load = 6.0 ft
V(from lower)=	0 lb	0 lb	Aspect Ratio OK		Length of adjoining wall = 1.0 ft
Σ (Wind) =	4,750 lb	Σ (Smc) = 5,732 lb	Use alternate R factor for seismic?	No	
v =	99 PLF	v = 119 PLF			

SDPWS, Table 4.3A → 0.93 x 242 = 225 PLF → USE SW6

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =		+ 841 lbs	= 841 lbs	Wind controls
T_{TOTAL} =	(floor above) + (this floor) =		+ 9 lbs	= 9 lbs	Load case 8 controls - Seismic

Seismic controls holdown design

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 1015 lbs

NO HOLDOWNS REQUIRED: OK

MAIN FL. RIGHT — SHEARWALL

Floor Info		WIND		SEISMIC	
		Tributary Width (Main Floor)		Tributary Area (Main Floor)	
Main	Floor Level, e.g. Upper, Main, Lower	1.0	tributary width	1.0	tributary area
Ft-Rr	Load Direction, e.g. Left-Right, Front-Rear	2.0	total width	2.0	total area
	(For Left Wall, Use Front-Rear Load Direction)	Not Used		Not Used	
CDX	Sheathing type	1.0	tributary width	1.0	tributary area
	Values in accordance with AF&PA SDPWS-2015	2.0	total width	2.0	total area
Roof	Resisting Dead Load	Not Used		Not Used	
	(e.g. Roof, Upper Floor, Main Floor)	1.0	tributary width	1.0	tributary area
12.00 ft	Total Length of Shearwalls	2.0	total width	2.0	total area

V(from upper)=	4750 lb	5732 lb	Height of Shearwall =	8.5 ft	Weight of Shearwall =	10.0 lbs
V(from main)=	0 lb	0 lb	Length of Shearwall =	12.0 ft	Tributary width for dead load =	6.0 ft
V(from lower)=	0 lb	0 lb	Aspect Ratio OK		Length of adjoining wall =	1.0 ft
Σ (Wind) =	4,750 lb	Σ (Smc) = 5,732 lb	Use alternate R factor for seismic?	No		
***v* =**	198 PLF	***v* =** 239 PLF				

SDPWS, Table 4.3A → 0.93 x 353 = 328 PLF → USE SW4

Seismic controls shearwall design

C_{TOTAL} =	(floor above) + (this floor) =		+	1682 lbs	=	1682 lbs	Wind controls
T_{TOTAL} =	(floor above) + (this floor) =		+	1488 lbs	=	1488 lbs	Load case 8 controls - Seismic

Seismic controls holdown design

Where overstrength factor is applicable, use this value for E in equations 5, 6, and 8: E= 2030 lbs

USE SIMPSON DESIGNED HOLDOWN: CS14

OR AT FOUNDATION / INTERIOR WALLS USE: LSTHD8/RJ

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 4 DEC 2021, 4:36PM

Wood Beam

File: 21-066.ec6

Lic. # : KW-06009431 — CK Engineering LLC

DESCRIPTION: HDR#1

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-16

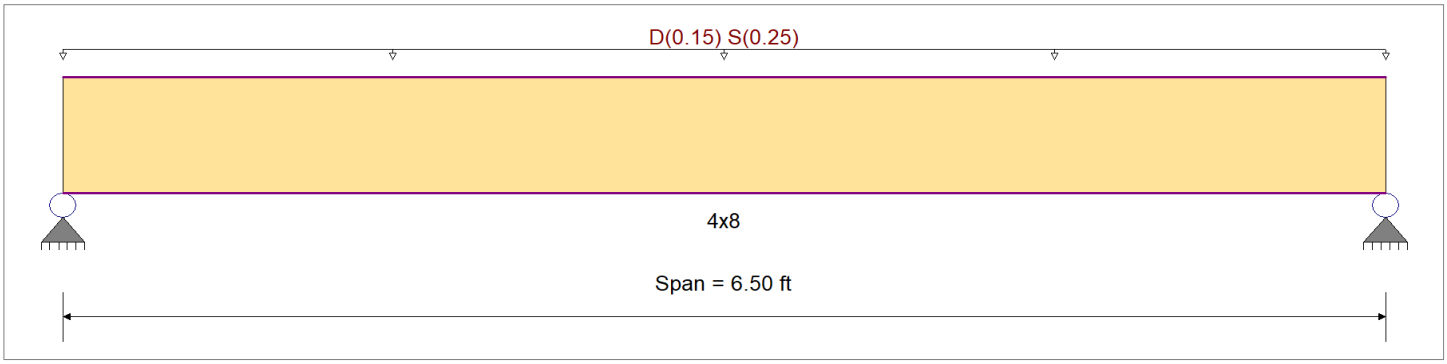
Wood Species : Hem Fir
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	675 psi
Fb -	675 psi
Fc - Prll	500 psi
Fc - Perp	405 psi
Fv	140 psi
Ft	350 psi

E : Modulus of Elasticity

Ebend- xx	1100 ksi
Eminbend - xx	400 ksi
Density	26.84 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 10.0 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.829 : 1	Maximum Shear Stress Ratio	=	0.395 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	836.55 psi	fv: Actual	=	63.57 psi
Fb: Allowable	=	1,009.13 psi	Fv: Allowable	=	161.00 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	3.250 ft	Location of maximum on span	=	5.907 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.083 in	Ratio =	944 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.134 in	Ratio =	583 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.405	0.193	0.90	1.300	1.00	1.00	1.00	1.00	1.00	0.82	319.81	789.75	0.41	24.30	126.00
+D+S					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.829	0.395	1.15	1.300	1.00	1.00	1.00	1.00	1.00	2.14	836.55	1009.13	1.08	63.57	161.00
+D+0.750S					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.701	0.334	1.15	1.300	1.00	1.00	1.00	1.00	1.00	1.81	707.36	1009.13	0.91	53.75	161.00
+0.60D					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 6.50 ft	1	0.137	0.065	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.49	191.89	1404.00	0.25	14.58	224.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.1337	3.274		0.0000	0.000

Wood Beam

DESCRIPTION: HDR#1

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.315	1.315
Overall MINimum	0.813	0.813
D Only	0.503	0.503
+D+S	1.315	1.315
+D+0.750S	1.112	1.112
+0.60D	0.302	0.302
S Only	0.813	0.813

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 4 DEC 2021, 3:54PM

Wood Beam

File: 21-066.ec6

Lic. # : KW-06009431 — CK Engineering LLC

DESCRIPTION: FLOOR JOIST

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-16

Wood Species : Hem Fir
Wood Grade : No.2

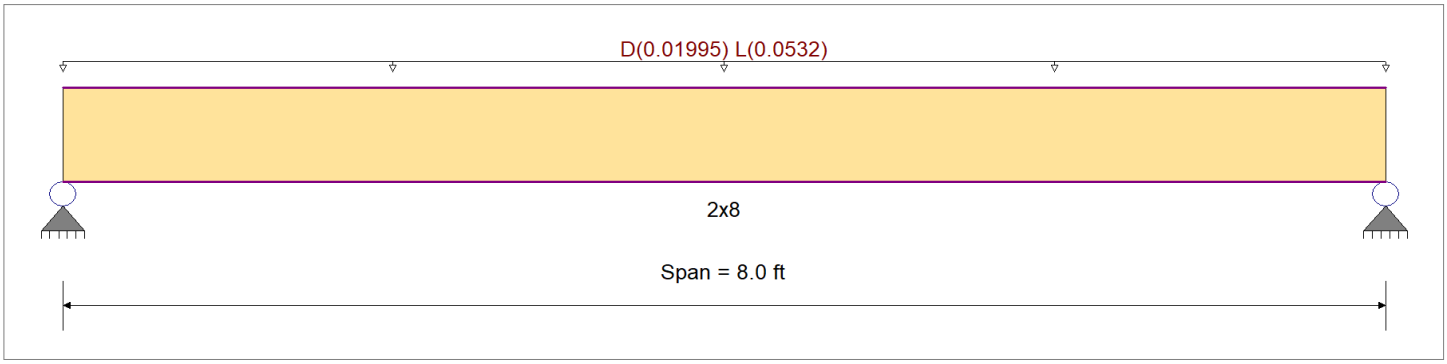
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	850 psi
Fb -	850 psi
Fc - Prll	1300 psi
Fc - Perp	405 psi
Fv	150 psi
Ft	525 psi

E : Modulus of Elasticity

Ebend- xx	1300 ksi
Eminbend - xx	470 ksi
Density	26.84 pcf

Repetitive Member Stress Increase



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 1.330 ft, (FLOOR)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.468 : 1	Maximum Shear Stress Ratio	=	0.236 : 1
Section used for this span		2x8	Section used for this span		2x8
fb: Actual	=	549.21 psi	fv: Actual	=	35.42 psi
Fb: Allowable	=	1,173.00 psi	Fv: Allowable	=	150.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	4.000 ft	Location of maximum on span	=	7.416 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.080 in	Ratio =	1205 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.113 in	Ratio =	853 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 8.0 ft	1	0.152	0.077	0.90	1.200	1.00	1.15	1.00	1.00	1.00	0.18	160.55	1055.70	0.08	10.36	135.00
+D+L					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.0 ft	1	0.468	0.236	1.00	1.200	1.00	1.15	1.00	1.00	1.00	0.60	549.21	1173.00	0.26	35.42	150.00
+D+0.750L					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.0 ft	1	0.308	0.155	1.25	1.200	1.00	1.15	1.00	1.00	1.00	0.50	452.05	1466.25	0.21	29.16	187.50
+0.60D					1.200	1.00	1.15	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 8.0 ft	1	0.051	0.026	1.60	1.200	1.00	1.15	1.00	1.00	1.00	0.11	96.33	1876.80	0.05	6.21	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.1125	4.029		0.0000	0.000

Wood Beam

DESCRIPTION: FLOOR JOIST

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.301	0.301
Overall MINimum	0.213	0.213
D Only	0.088	0.088
+D+L	0.301	0.301
+D+0.750L	0.248	0.248
+0.60D	0.053	0.053
L Only	0.213	0.213

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 4 DEC 2021, 4:35PM

Wood Beam

File: 21-066.ec6

Lic. # : KW-06009431 — CK Engineering LLC

DESCRIPTION: BM#1

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-16

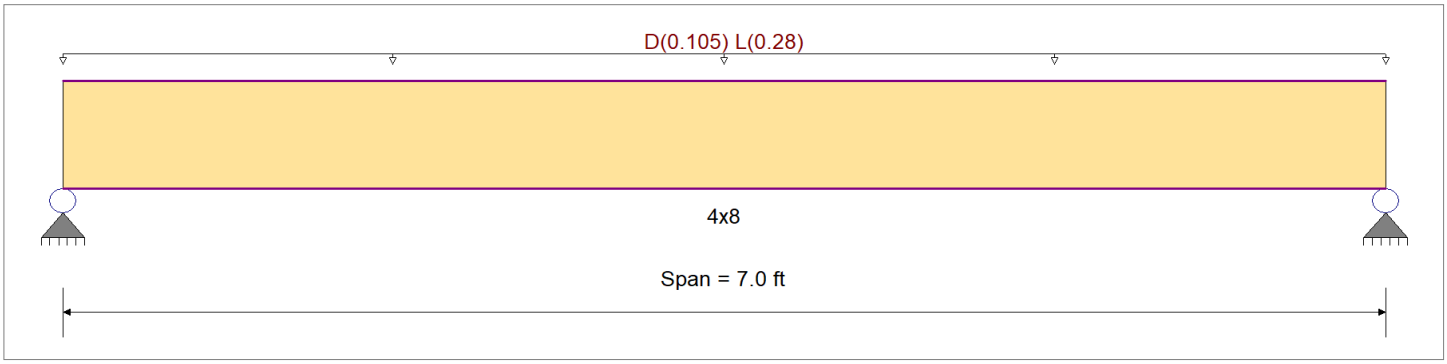
Wood Species : Douglas Fir - Larch (North)
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	875 psi
Fb -	875 psi
Fc - Prll	600 psi
Fc - Perp	625 psi
Fv	170 psi
Ft	425 psi

E : Modulus of Elasticity

Ebend- xx	1300 ksi
Eminbend - xx	470 ksi
Density	30.59 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loads
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 7.0 ft, (FLOOR)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.823 : 1	Maximum Shear Stress Ratio	=	0.395 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	935.82 psi	fv: Actual	=	67.21 psi
Fb: Allowable	=	1,137.50 psi	Fv: Allowable	=	170.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	3.500 ft	Location of maximum on span	=	6.412 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.105 in	Ratio =	797 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.147 in	Ratio =	572 >=240
Max Upward Total Deflection	0.000 in	Ratio =	0 <240

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
D Only													0.00	0.00	0.00	0.00
Length = 7.0 ft	1	0.258	0.124	0.90	1.300	1.00	1.00	1.00	1.00	1.00	0.68	264.62	1023.75	0.32	19.01	153.00
+D+L					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 7.0 ft	1	0.823	0.395	1.00	1.300	1.00	1.00	1.00	1.00	1.00	2.39	935.82	1137.50	1.14	67.21	170.00
+D+0.750L					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 7.0 ft	1	0.540	0.260	1.25	1.300	1.00	1.00	1.00	1.00	1.00	1.96	768.02	1421.88	0.93	55.16	212.50
+0.60D					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 7.0 ft	1	0.087	0.042	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.41	158.77	1820.00	0.19	11.40	272.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.1468	3.526		0.0000	0.000

Wood Beam

DESCRIPTION: BM#1

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.366	1.366
Overall MINimum	0.980	0.980
D Only	0.386	0.386
+D+L	1.366	1.366
+D+0.750L	1.121	1.121
+0.60D	0.232	0.232
L Only	0.980	0.980