Structural Calculations for:

Hinckley Residence

8240 SE 26th Street, Mercer Island, WA 98040

Client: Ripple Design Studio

Code: 2021 Seattle Building Code

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Scope: Structural Design of 2-Story Addition to Existing Single-Family Residence

August 2, 2024

Buker Engineering, llc
PO Box 55124
Seattle, WA 98155
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Seismic Design Loads (ASCE 7-16)

for a Wood Framed Structure

RISK CATEGORY	II				
OCCUPANCY CAT.	II	Table 1.5-1			
IMP. FACTOR	1	Table 1.5-2			
SITE CLASS	D	Table 20.3-1	SEISMIC		
R =	6.5	Table 12.2-1	DESIGN CATEGORY	D	11.6

S_s =	1.388		T_0 =	0.11	
S_1 =	0.484		Ts =	0.53	
F_a =	1.20	Table 11.4-1	T_L =	6	Fig 22-14
F_v =	1.82	Table 11.4-2	T =	0.193	
S_{DS}=	1.110		Seismic Dead Load:	15 psf Roof	
S_{D1}=	0.587			15 psf Floor	
				20 psf Walls	

Cs_{ULT}=	0.171	Eqn. 12.8-2	W_{roof}=15 + 10= 25 psf
Cs_{ASD}=	0.122		W_{floor}=10 + 10 + 10= 30 psf

Vertical Design Loads

Criteria

ASCE 7-16

IBC 2021

Dead Loads

Roof (Composit)	2.5	psf	Flooring	1	psf
1/2" Ply	1.5	psf	Sheathing	2.3	psf
Rafter/Truss	2	psf	Joist	2.6	psf
Insulation	1	psf	5/8" GWB	3.1	psf
5/8" GWB	3.1	psf	Misc. Mech	1	psf
Misc./Mech.	2	psf		10	psf
	12.1	psf			
Use	15	psf	Use	15	psf

Live Loads

Snow	25	psf
floor	40	psf

Soil Bearing

2000 psf

buker ENGINEERING LLC

Project:	Hinckley Residence 8240 SE 26th Street Mercer Island, WA	Date:	7/29/2024
		Design:	CEH

Wind Design Loads (ASCE 7-16)

Directional Procedure - Part 1

Exposure	C		
V=	98	mph	
K_d=	0.85		Table 26.6-1
I=	1		
G=	0.85		26.11.1
Ke=	1.00		Table 26.9-1

Roof Angle =	14.04	degrees
Ground to top of roof	20.5	ft
Bottom of roof to top of roof	3	ft
(mean roof height) h=	19.0	ft

K_{zt}= 1.00

Pressure Coefficients from Figure 27.4-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.5
Windward Roof	0.3
Leeward Roof	-0.6

*Note= Cp values are conservative worst case values

Pressures:	Calculated using ASCE7-16 Ch. 27 (Directional Procedure)					
Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lwwalls}$	Ultimate P_{walls} (psf)	**Allowable P_{walls} (psf)**
0-15	0.85	17.76	12.08	7.99	20.07	**12.04**
15-20	0.9	18.81	12.79	7.99	20.78	**12.47**
20-25	0.94	19.64	13.36	7.99	21.35	**12.81**
25-30	0.98	20.48	13.93	7.99	21.92	**13.15**
30-40	1.04	21.73	14.78	7.99	22.77	**13.66**

$P_{ww\ roof}$	$P_{lw\ roof}$	P_{roof} (psf)	**P_{roof} (psf)**
4.80	9.59	14.39	**8.63**

Use 13 psf on all surfaces

buker ENGINEERING LLC

Project: Hinckley Residence
8240 SE 26th Street
Mercer Island, WA

Date: 7/29/2024

Design: CEH

LATERAL DEMANDS - SEISMIC

ROOF

DL = 15 psf ROOF + 5 psf SOLAR = 20 psf

DL_{WALL} = 20 psf / 2 = 10 psf

A_{ROOF} = 885 ft²

W_{ROOF} = (20 psf + 10 psf) 885 ft² = 26.55 k

2nd FLR / LOW ROOF

DL = 15 psf

DL_{WALL} = 20 psf

A_{2nd} = 934 ft²

W_{2nd} = (15 psf + 20 psf) 934 ft² = 32.69 k

BASE SHEAR

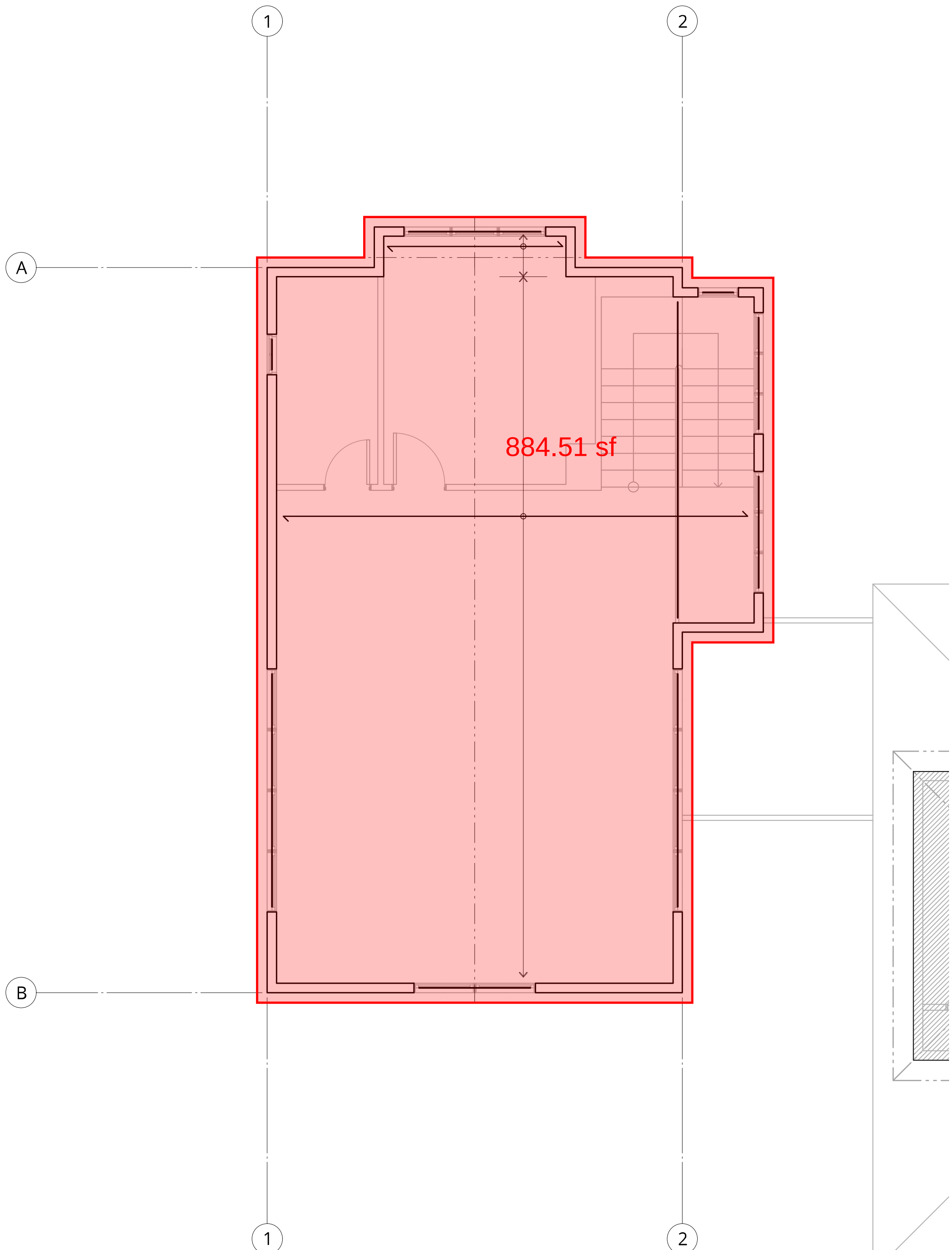
V = C_sW = 0.171 (26.55 k + 32.69 k) = 10.13 k

V_{ASD} = V/1.4 = 10.13 k/1.4 = 7.24 k

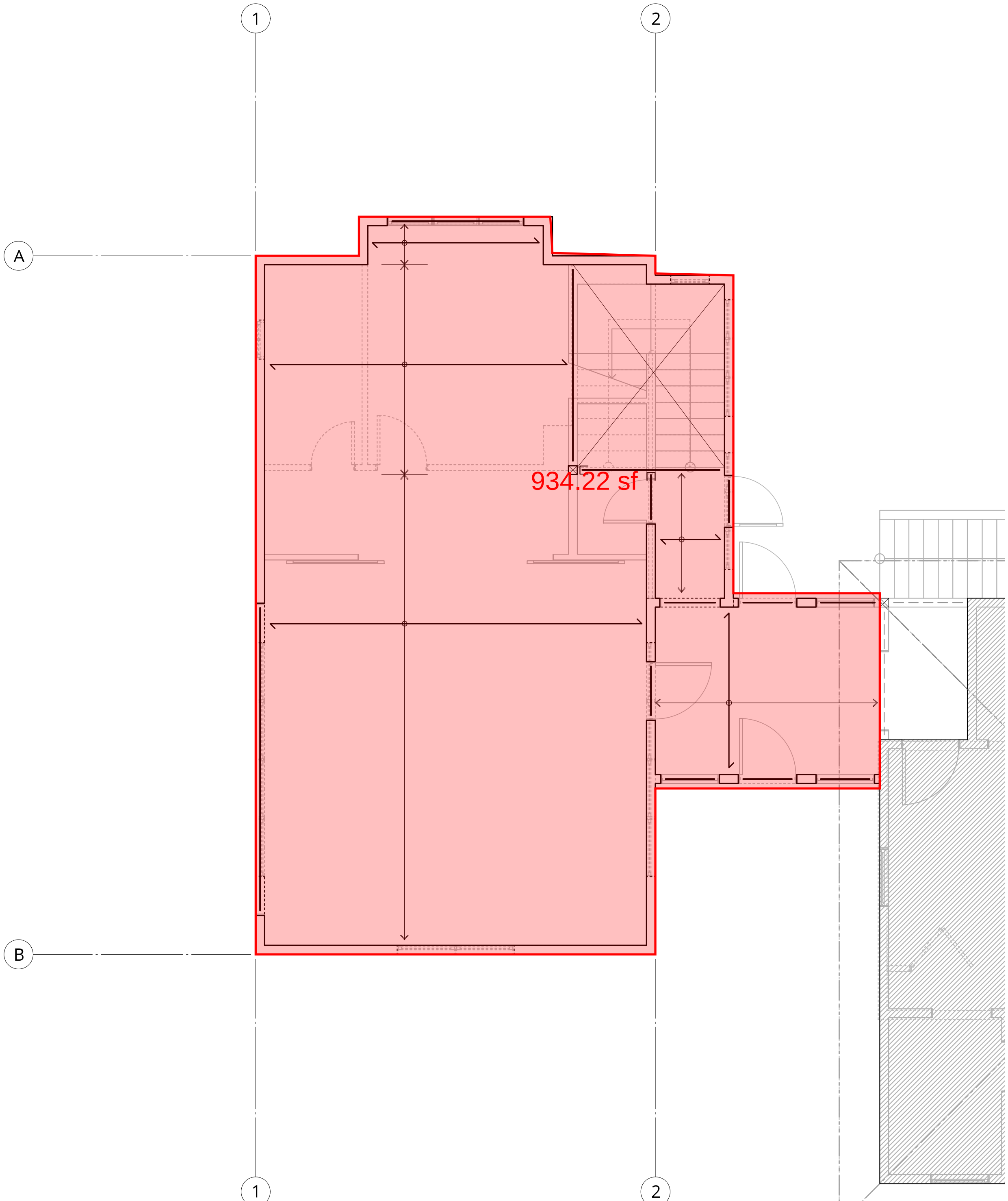
VERTICAL DISTRIBUTION

LEVEL	w_x	h_x	$w_x h_x$	C_{vx}	$F_{x,ASD}$
ROOF	26.55 k	9.83 ft	261.08	0.315	2.28 k
2nd FLR/ LOW ROOF	32.69 k	17.33 ft	566.63	0.685	4.96 k
TOTAL			827.71	1.0	7.24 k

SEISMIC AREA - ROOF



SEISMIC AREA - 2nd FLOOR/LOW ROOF



This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

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

ATC Hazards by Location

Search Information

Address:	8240 SE 26th St, Mercer Island, WA 98040, USA
Coordinates:	47.58739569999999, -122.2275809
Elevation:	77 ft
Timestamp:	2024-06-24T16:33:35.157Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	II
Site Class:	D-default

Basic Parameters

Name	Value	Description
S_S	1.388	MCE_R ground motion (period=0.2s)
S_1	0.484	MCE_R ground motion (period=1.0s)
S_{MS}	1.666	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.111	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	0.903	Coefficient of risk (0.2s)
CR_1	0.897	Coefficient of risk (1.0s)
PGA	0.594	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.713	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.388	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.538	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.238	Factored deterministic acceleration value (0.2s)
S1RT	0.484	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.539	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.325	Factored deterministic acceleration value (1.0s)
PGAd	1.12	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

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. L4

LATERAL DEMANDS – WIND
N-S DIRECTION

02 EAST ELEVATION

SCALE: 1/4" = 1'-0"

W_{roof} = 13 psf (4.59 ft) = 60 lb/ft

$W_{2nd/low\ roof}$ = 13 psf (8.66 ft) = 113 lb/ft

LATERAL DEMANDS - WIND
E-W DIRECTION

W_{ROOF} = 13 psf (5.28 ft) = 69 lb/ft
$W_{2nd\ FLR/LOW\ ROOF}$ = 13 psf (10.25 ft) = 133 lb/ft

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

ATC Hazards by Location

Search Information

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Coordinates:	47.58739569999999, -122.2275809
Elevation:	77 ft
Timestamp:	2024-06-24T16:35:16.260Z
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

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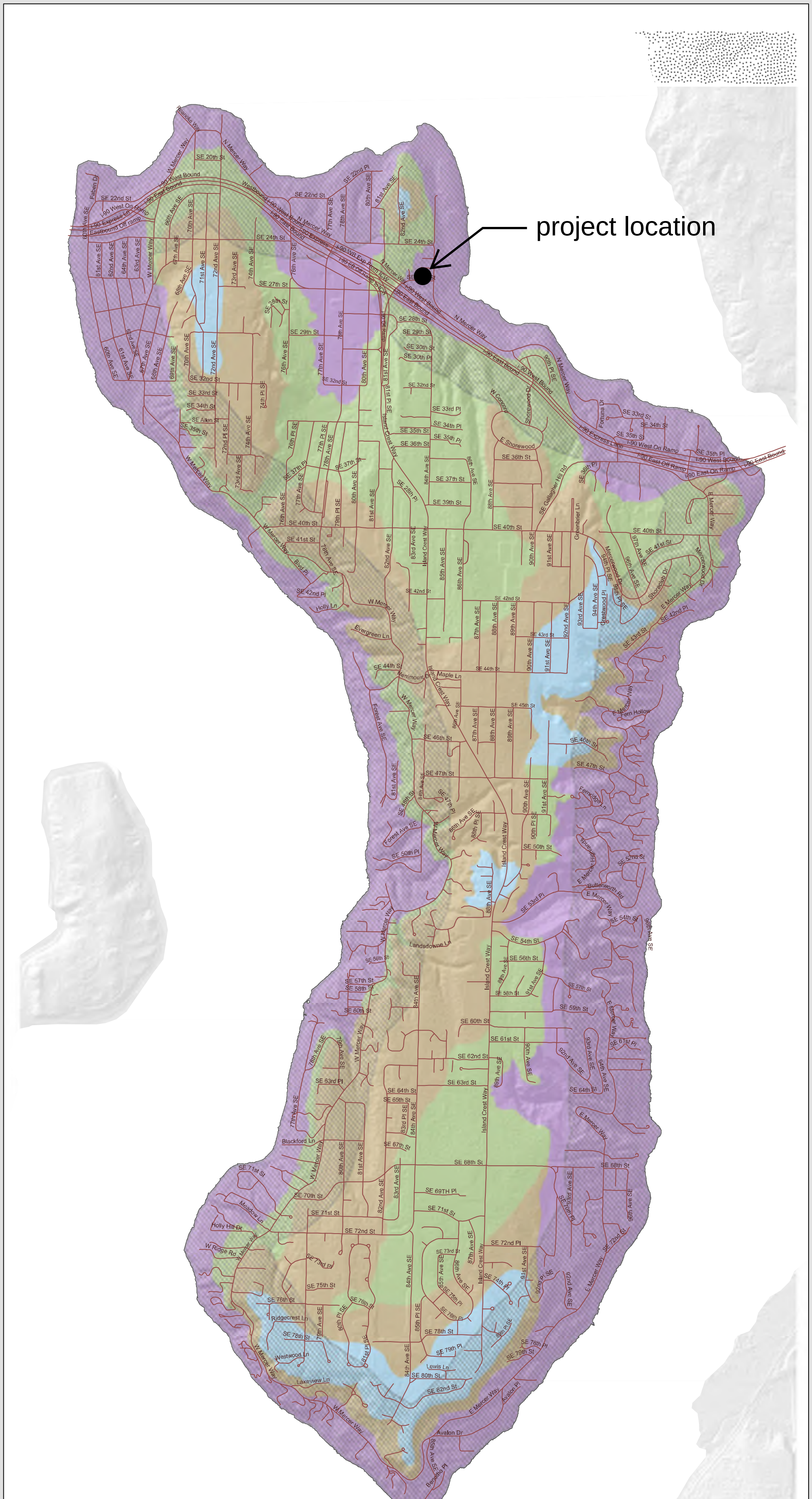
Mercer Island Wind Exposure and Wind Speed-Up (Topographic Effect)

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

0 0.5 1 Kilometers
1:12,000
0 0.5 1 Miles
TN



EXPOSURE CATEGORY = C
K_{ZT} = 1.0

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	
(hatched)	Exposure 'C' (1500 feet from Lake)
(blank)	Exposure 'B' (all other areas)

WIND SPEED-UP (TOPOGRAPHIC EFFECT) - $K_z t$ Factor :

$K_z t$ Factor	
(purple)	$K_z t$ = 1.0
(light green)	$K_z t$ = 1.3
(tan)	$K_z t$ = 1.6
(light blue)	$K_z t$ = 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, "$K_z t$" 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.

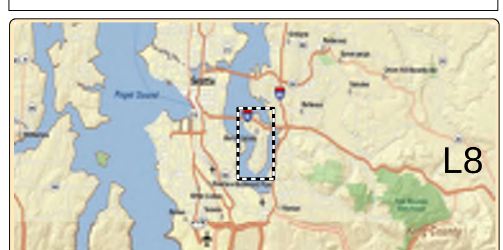
DEFINITIONS:

$K_z t$ 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.

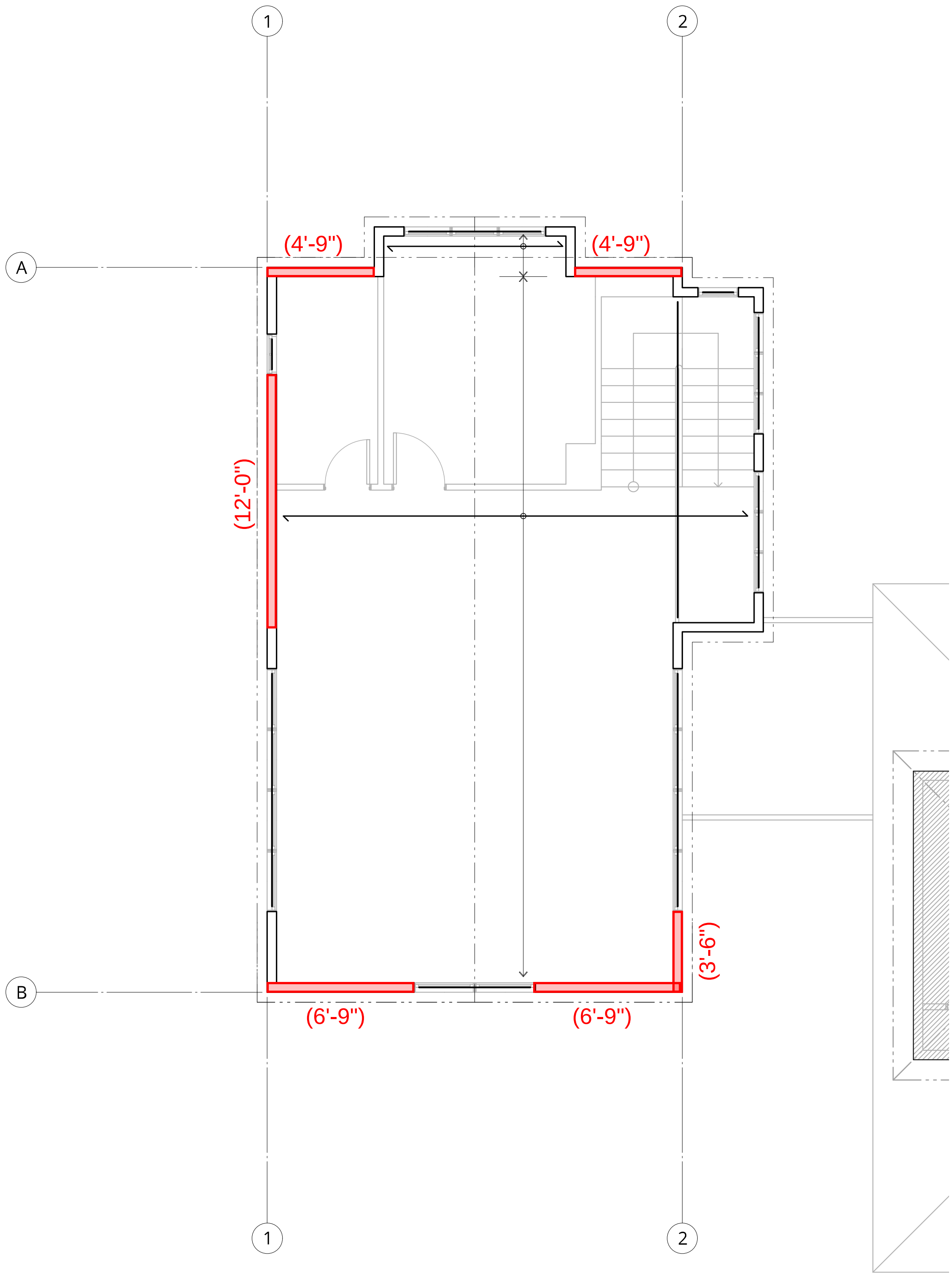
Exposure C: The wind exposure category that applies where the site in question is located within 1500 feet from the shoreline per IBC 2006 section 1609.4.3.

Wind Speed: Minimum 85 mph 3-second gust per IRC Figure R301.2(4)

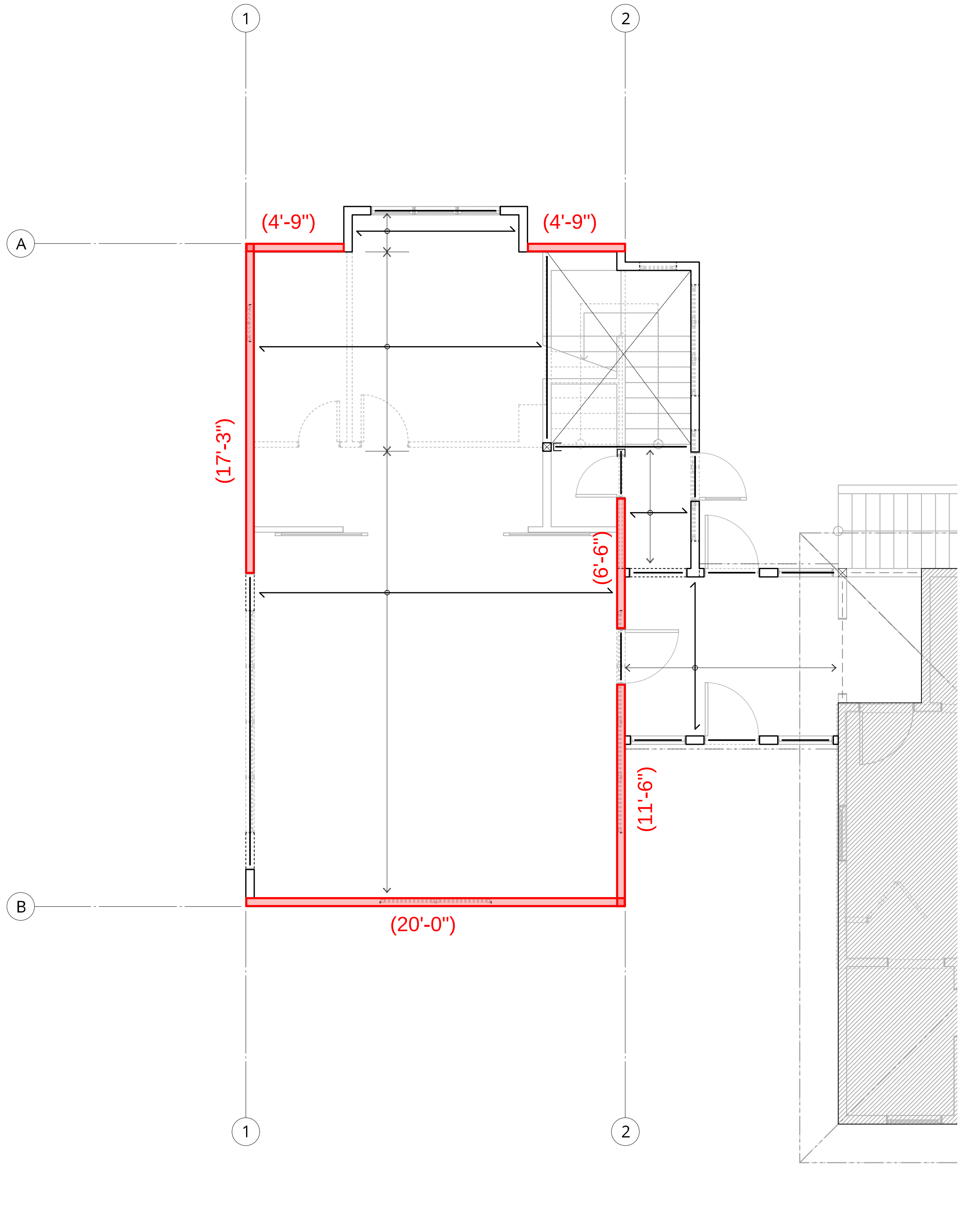


L8

SHEARWALL KEY PLAN - ROOF



SHEARWALL KEY PLAN - 2nd FLOOR/LOW ROOF



North/South Direction - Roof

Grid	1	2
Vwind (kips)	0.645	0.975
Vseismic (kips)	0.961	1.45
Length of wall (ft)	12	3.5
v_wind (plf)**	54	298
v_siesmic (plf)**	80	444
h (ft)	7.5	7.5
OTF_Wind (lbs)*	403	2089
OTF_Seismic (lbs)*	601	3107
Length of shortest wall pier (ft)	12	3.5
Apect Ratio	0.63	2.14
Aspect Ratio Penalty	1.0	0.93
Shearwall	W6	W3
Holdown	CS16	(2) CS16

***OTF does not take into account dead load and weight of the wall uno**
****v_siesmic/wind includes penalty**

North/South Direction - 2nd Flr/Low Roof

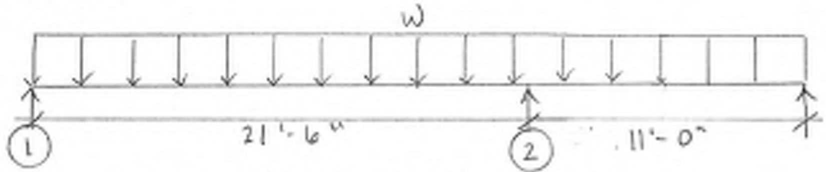
Grid	1	2
Vwind (kips)	1.8	2.78
Vseismic (kips)	3.03	4.68
Length of wall (ft)	17.25	18
v_wind (plf)**	104	154
v_siesmic (plf)**	176	260
h (ft)	8.83	8.83
OTF_Wind (lbs)*	921	1364
OTF_Seismic (lbs)*	1551	2296
Length of shortest wall pier (ft)	17.25	6.5
Apect Ratio	0.51	1.36
Aspect Ratio Penalty	1.0	1.0
Shearwall	W6	W3
Holdown	HDU2	HDU5

***OTF does not take into account dead load and weight of the wall uno**
****v_siesmic/wind includes penalty**

LATERAL DESIGN

N-S DIRECTION - ROOF

DEMANDS



$V_{1,WIND}$ = 60 lb/ft (21.5 ft)/2 = 0.645 k

$V_{2,WIND}$ = 60 lb/ft (21.5 ft + 11.0 ft)/2 = 0.975 k

w_{SEIS} = 2.28 k / 25.5 ft = 89.4 lb/ft

$V_{1,SEIS}$ = 89.4 lb/ft (21.5 ft)/2 = 0.961 k

$V_{2,SEIS}$ = 89.4 lb/ft (21.5 ft + 11 ft) / 2 = 1.45 k

CHECK DIAPHRAGM

$v = \frac{1450 \text{ lb}}{18.25 \text{ ft}} = 79$ lb/ft

v_{all} = 167 lb/ft > 79 lb/ft → OK

LINE 1

v_{SEIS} = 80 lb/ft

USE W6 SHEARWALL

v_{all} = 242 lb/ft > 80 lb/ft → OK

OTF = 601 lb

USE CS16 STRAPS

T_{all} = 1705 lb > 601 lb → OK

LINE 2

v_{SEIS} = 444 lb/ft

USE W3 SHEARWALL

v_{all} = 456 lb/ft > 444 lb/ft → OK

OTF = 3107 lb

USE (2) CS16 STRAPS

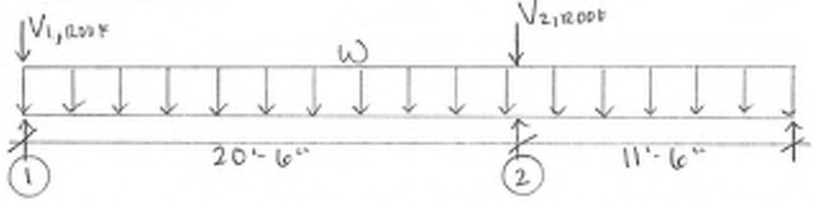
T_{all} = 1705 lb (2 STRAPS) = 3410 lb > 3107 lb → OK

LATERAL DESIGN, CONT.

N-S DIRECTION, CONT.

2nd FLR / LOW ROOF

DEMANDS



$V_{1,WIND}$ = 0.615 k + 113 lb/ft (20.5 ft/2) = 1.80 k

$V_{2,WIND}$ = 0.975 k + 113 lb/ft (20.5 ft + 11.5 ft)/2 = 2.78 k

$w_{SEIS} = \frac{4.96\ k}{24.5\ ft}$ = 202 lb/ft

$V_{1,SEIS}$ = 0.961 k + 202 lb/ft (20.5 ft)/2 = 3.03 k

$V_{2,SEIS}$ = 1.45 k + 202 lb/ft (20.5 ft + 11.5 ft)/2 = 4.68 k

CHECK DIAPHRAGM

$v = \frac{3232\ lb}{24.5\ ft}$ = 132 lb/ft

v_{all} = 167 lb/ft > 132 lb/ft → OK

LINE 1

v_{SEIS} = 176 lb/ft

USE W6 SHEARWALL

v_{WALL} = 242 lb/ft > 176 lb/ft → OK

OTF = 1551 lb + 601 lb = 2152 lb

USE HDU2

T_{all} = 3075 lb > 2152 lb → OK

LINE 2

v_{SEIS} = 260 lb/ft

USE W3 SHEARWALL

v_{WALL} = 456 lb/ft > 260 lb/ft

OTF = 2296 lb + 3107 lb = 5403 lb

USE HDU5

T_{all} = 5645 lb > 5403 lb → OK

East/West Direction - Roof

Grid	A	B
Vwind (kips)	1.39	1.25
Vseismic (kips)	1.18	1.11
Length of wall (ft)	9.5	13.5
v_wind (plf)**	146	93
v_siesmic (plf)**	124	82
h (ft)	7.5	7.5
OTF_Wind (lbs)*	1097	694
OTF_Seismic (lbs)*	932	617
Length of shortest wall pier (ft)	4.75	6.75
Apect Ratio	1.58	1.11
Aspect Ratio Penalty	1.0	1.0
Shearwall	W6	W6
Holdown	CS16	CS16

***OTF does not take into account dead load and weight of the wall uno**
****v_siesmic/wind includes penalty**

East/West Direction - 2nd Flr/Low Roo

Grid	A	B
Vwind (kips)	4.04	3.63
Vseismic (kips)	3.72	3.54
Length of wall (ft)	9.5	20
v_wind (plf)**	425	182
v_siesmic (plf)**	392	177
h (ft)	8.83	8.83
OTF_Wind (lbs)*	3755	1603
OTF_Seismic (lbs)*	3458	1563
Length of shortest wall pier (ft)	4.75	20
Apect Ratio	1.86	0.44
Aspect Ratio Penalty	1.0	1.0
Shearwall	W3	W6
Holdown	HDU5	HDU2

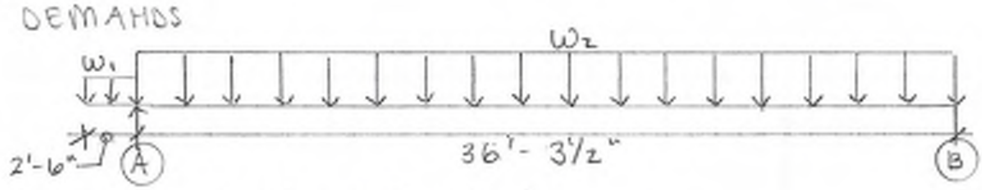
***OTF does not take into account dead load and weight of the wall uno**
****v_siesmic/wind includes penalty**

LATERAL DESIGN, CONT.

E-W DIRECTION

ROOF

DEMANDS



$w_{1,WIND} = w_{2,WIND} = 69$ lb/ft

$V_{A,WIND} = 69$ lb/ft $(2$ ft $+ 36.29$ ft$/2) = 1.39$ k

$V_{B,WIND} = 69$ lb/ft $(36.29$ ft$/2) = 1.25$ k

$w_{1,SEIS} = \dfrac{2.28\ \text{k}\ (27\ \text{ft}^2)}{885\ \text{ft}^2\ (2.5\ \text{ft})} = 28$ lb/ft

$w_{2,SEIS} = \dfrac{2.28\ \text{k}\ (858\ \text{ft}^2)}{885\ \text{ft}^2\ (36.29\ \text{ft})} = 61$ lb/ft

$V_{A,SEIS} = 28$ lb/ft $(2.5$ ft$) + 61$ lb/ft $(36.29$ ft$/2) = 1.18$ k

$V_{B,SEIS} = 61$ lb/ft $(36.29$ ft$/2) = 1.11$ k

CHECK DIAPHRAGM

$v = \dfrac{1180\ \text{lb}}{20.5\ \text{ft}} = 58$ lb/ft

$v_{all} = 167$ lb/ft > 58 lb/ft $\rightarrow$ OK

LINE A

$v_{WIND} = 146$ lb/ft

USE W6 SHEARWALLS

$v_{all} = 339$ lb/ft > 146 lb/ft $\rightarrow$ OK

OTF = 1097 lb

USE CS16 STRAPS

$T_{all} = 1705$ lb > 1097 lb $\rightarrow$ OK

LINE B

$v_{WIND} = 93$ lb/ft

USE W6 SHEARWALLS

$v_{all} = 339$ lb/ft > 93 lb/ft $\rightarrow$ OK

OTF = 694 lb.

USE CS16 STRAPS

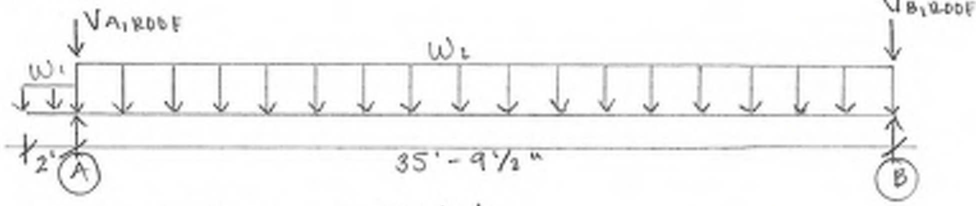
$T_{all} = 1705$ lb > 694 lb $\rightarrow$ OK

LATERAL DESIGN, CONT.

E-W DIRECTION

2nd FLR / LOW ROOF

DEMANDS



$w_{1,WIND} = w_{2,WIND} = 133\ lb/ft$

$V_{A,WIND} = 1.39\ k + 133\ lb/ft\ (2\ ft + 35.79\ ft/2) = 4.04\ k$

$V_{B,WIND} = 1.25\ k + 133\ lb/ft\ (35.79\ ft/2) = 3.63\ k$

$w_{1,SEIS} = \frac{4.96\ k\ (20\ ft^2)}{934\ ft^2\ (2\ ft)} = 53\ lb/ft$

$w_{2,SEIS} = \frac{4.96\ k\ (914\ ft^2)}{934\ ft^2\ (35.79\ ft)} = 136\ lb/ft$

$V_{A,SEIS} = 1.18\ k + 53\ lb/ft\ (2\ ft) + 136\ lb/ft\ (35.79\ ft/2) = 3.72\ k$

$V_{B,SEIS} = 1.11\ k + 136\ lb/ft\ (35.79\ ft/2) = 3.54\ k$

CHECK DIAPHRAGM

$v = \frac{2434\ lb}{16\ ft} = 152\ lb/ft$

$v_{all} = 167\ lb/ft > 152\ lb/ft \rightarrow OK$

LINE A

$v_{SEIS} = 392\ lb/ft$

USE W3 SHEARWALLS

$v_{all} = 456\ lb/ft > 392\ lb/ft \rightarrow OK$

$OTF = 3755\ lb + 1097\ lb = 4852\ lb$

USE HDU5

$T_{all} = 5645\ lb > 4852\ lb \rightarrow OK$

LINE B

$v_{SEIS} = 177\ lb/ft$

USE W6 SHEARWALL

$v_{WALL} = 242\ lb/ft > 177\ lb/ft$

$OTF = 694\ lb + 1603\ lb = 2297\ lb$

USE HDU2

$OTF = 3075\ lb > 2297\ lb \rightarrow OK$

SHEAR WALLS (ASD CAPACITIES)

ASSUME HEM-FIR FRAMING → $G_{ADJ} = 0.93$

WIND

W6: $v_w = \frac{730 \text{ lb/ft}}{2}(0.93) = 339 \text{ lb/ft}$

W4: $v_w = \frac{1065 \text{ lb/ft}}{2}(0.93) = 495 \text{ lb/ft}$

W3: $v_w = \frac{1370 \text{ lb/ft}}{2}(0.93) = 637 \text{ lb/ft}$

W2: $v_w = \frac{1790 \text{ lb/ft}}{2}(0.93) = 832 \text{ lb/ft}$

SEISMIC

W6: $v_s = \frac{520 \text{ lb/ft}}{2}(0.93) = 242 \text{ lb/ft}$

W4: $v_s = \frac{760 \text{ lb/ft}}{2}(0.93) = 353 \text{ lb/ft}$

W3: $v_s = \frac{980 \text{ lb/ft}}{2}(0.93) = 456 \text{ lb/ft}$

W2: $v_s = \frac{1280 \text{ lb/ft}}{2}(0.93) = 595 \text{ lb/ft}$

DIAPHRAGMS - UNBLOCKED (ASD CAPACITIES)

WIND: $v_w = \frac{505 \text{ lb/ft}}{2}(0.93) = 234 \text{ lb/ft}$

SEISMIC: $v_s = \frac{360 \text{ lb/ft}}{2}(0.93) = 167 \text{ lb/ft}$

DIAPHRAGMS - BLOCKED (ASD CAPACITIES)

WIND: $v_w = \frac{1010 \text{ lb/ft}}{2}(0.93) = 469 \text{ lb/ft}$

SEISMIC: $v_s = \frac{720 \text{ lb/ft}}{2}(0.93) = 334 \text{ lb/ft}$

CS/CMST/CMSTC

SIMPSON Strong-Tie

Coiled Straps

Coiled straps are continuous utility straps which can be cut to length at the jobsite. CMSTC provides countersunk nail slots for lower profile when installed with 0.148" x 3¼" sinkers.

Finish: Galvanized. Some products available in ZMAX® coating. CS may be ordered in stainless steel (order CS16SS-R).

Material: See table

Installation:

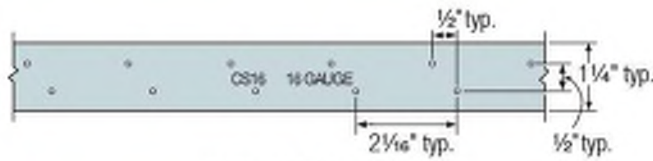
- Use all specified fasteners; see General Notes.
- Wood shrinkage after strap installation across horizontal wood members may cause strap to buckle outward.
- Refer to the applicable code for minimum nail penetration and minimum wood edge and end distances.
- The table shows the maximum allowable loads and the nails required to obtain them. Fewer nails may be used; reduce the allowable load as shown in the table notes or in the Straps and Ties General Notes on pp. 276–277.
- For lap slice and alternate nailing information, refer to p. 285.
- The cut length of the strap shall be equal to twice the "End Length" noted in the table plus the clear span dimension.
- CS straps are available in 25' lengths (add -R to model no.).

CMST:

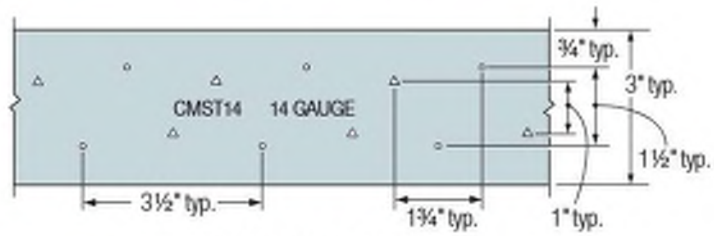
- Use every other round hole if the wood tends to split.
- Fill round and triangle holes for loads shown. If wood tends to split, fill only round holes and double the end length listed for full load.

Codes: See p. 13 for Code Reference Key Chart

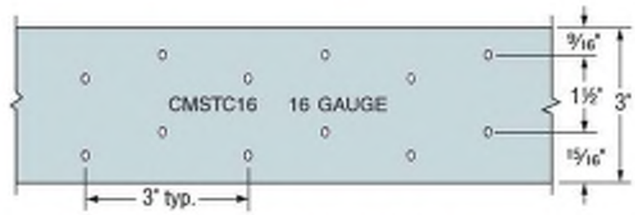
Web Applications: Visit app.strongtie.com/csc to access our Coil Strap Calculator web application.



CS16 Hole Pattern
(all other CS straps similar)

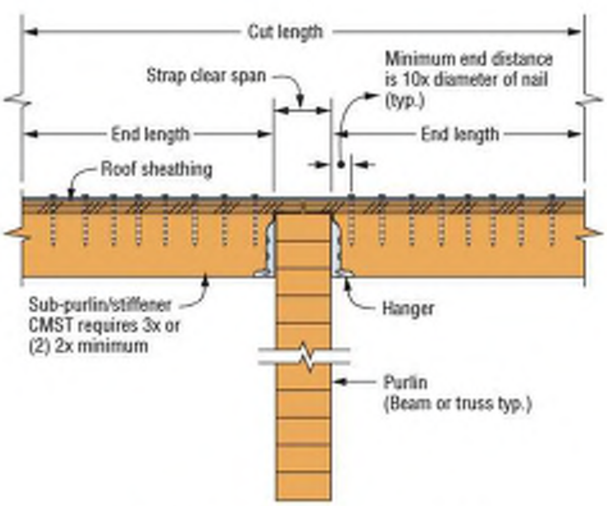


CMST14 Hole Pattern
(CMST12 similar)

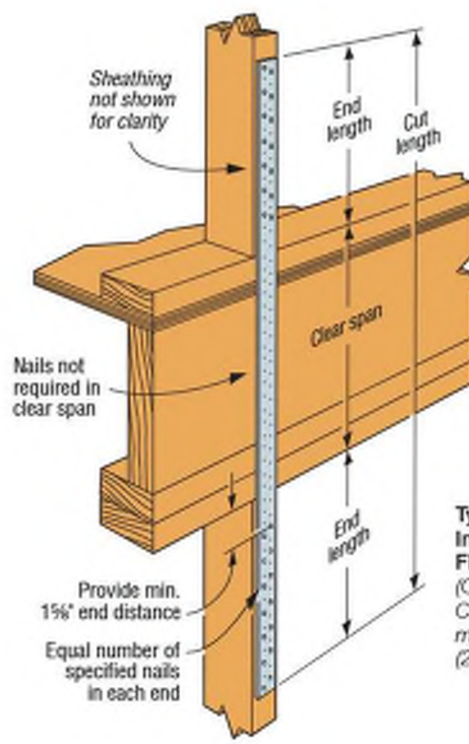


CMSTC16 Hole Pattern

Gauge stamped on part for easy identification



Typical Horizontal CS/CMST Installation



Typical CS Installation as a Floor-to-Floor Tie
(CMST similar; CMST requires minimum (2) 2x studs)

CS/CMST/CMSTC

Coiled Straps (cont.)

These products are available with additional corrosion protection. For more information, see p. 16.

SS For stainless-steel fasteners, see p. 23.

SD Many of these products are approved for installation with Strong-Drive® SD Connector screws. See pp. 362–366 for more information.

Model No.	Total L (ft.)	Ga.	DF/SP Fasteners (in.)	DF/SP End Length (in.)	SPF/HF Fasteners (in.)	SPF/HF End Length (in.)	Allowable Tension Loads (160)	Code Ref.
CMST12	40	12	(74) 0.162 x 2½	33	(84) 0.162 x 2½	38	9,215	IBC®, FL, LA
			(86) 0.148 x 2½	39	(98) 0.148 x 2½	44	9,215	
CMST14	52½	14	(56) 0.162 x 2½	26	(66) 0.162 x 2½	30	6,475	
			(66) 0.148 x 2½	30	(76) 0.148 x 2½	34	6,475	
CMSTC16	54	16	(50) 0.148 x 3¼	20	(50) 0.148 x 3¼	25	4,690	
CS14	100	14	(26) 0.148 x 2½	15	(30) 0.148 x 2½	16	2,490	
			(30) 0.131 x 2½	16	(36) 0.131 x 2½	19	2,490	
SS CS16	150	16	(20) 0.148 x 2½	11	(22) 0.148 x 2½	13	1,705	
			(22) 0.131 x 2½	13	(26) 0.131 x 2½	15	1,705	
CS18	200	18	(16) 0.148 x 2½	9	(18) 0.148 x 2½	11	1,370	
			(18) 0.131 x 2½	11	(22) 0.131 x 2½	12	1,370	
CS20	250	20	(12) 0.148 x 2½	7	(14) 0.148 x 2½	9	1,030	
			(14) 0.131 x 2½	9	(16) 0.131 x 2½	9	1,030	
CS22	300	22	(10) 0.148 x 2½	6	(12) 0.148 x 2½	7	845	
			(12) 0.131 x 2½	7	(14) 0.131 x 2½	8	845	

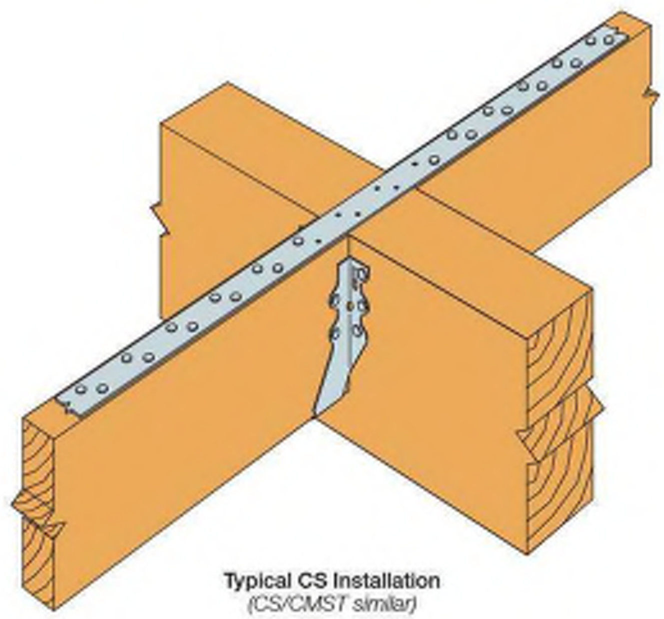
1. See pp. 276–277 for Straps and Ties General Notes.
2. Calculate the connector value for a reduced number of nails as follows:

$$\text{Allowable Load} = \frac{\text{No. of Nails Used}}{\text{No. of Nails in Table}} \times \text{Table Load}$$

Example: CMSTC16 in DF/SP with 40 nails total.
(Half of the nails in each member being connected)

$$\text{Allowable Load} = \frac{\text{40 Nails (Used)}}{\text{50 Nails (Table)}} \times 4{,}690 \text{ lb.} = 3{,}752 \text{ lb.}$$

3. See p. 285 for alternate nailing and lap splice information.
4. **Fasteners:** Nail dimensions are listed diameter by length. See pp. 23–24 for fastener information.

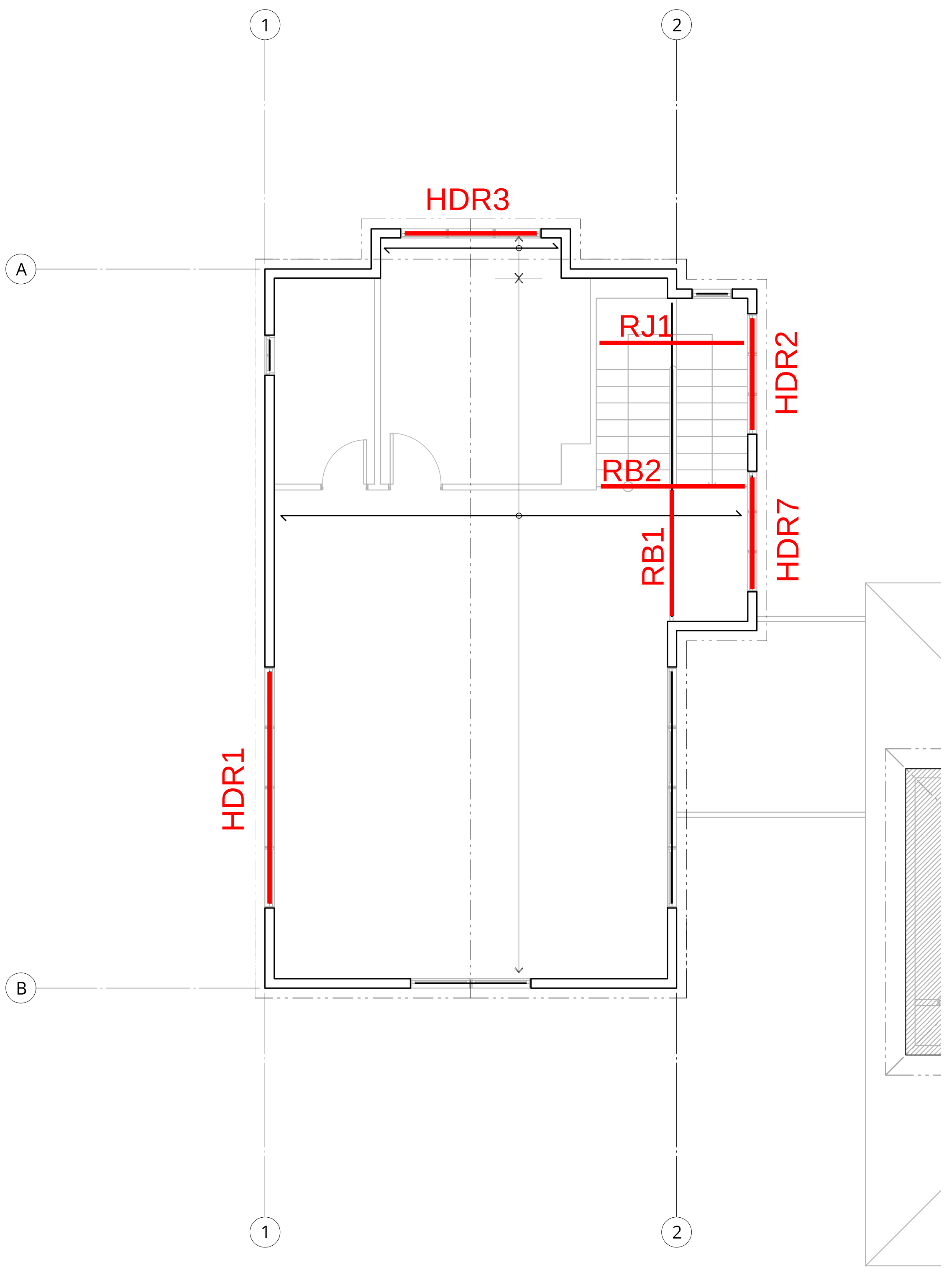


Typical CS Installation
(CS/CMST similar)

Straps and Ties

L19

FRAMING KEY PLAN - ROOF



ROOF FRAMING

HDR1

L = 12 ft

DL = 20 psf
S = 25 psf
DL_{WALL} = 20 psf

w = (20 psf + 25 psf) 21.5 ft/2 + 20 psf (1.33 ft)
= 510 lb/ft

USE 3½" × 9½" PSL, MIH
Mmax = 9180 lb·ft   Mall = 13,055 lb·ft
R = 3060 lb   Vall = 6130 lb

Δ_{TOT} = 0.48 in = L/303 → OK

HDR2

L = 6 ft

DL = 20 psf
DL_{WALL} = 20 psf
S = 25 psf

w = (20 psf + 25 psf) 7.583 ft/2 + 20 psf (1 ft)
= 191 lb/ft

USE (2) 2×8, MIH
Mmax = 860 lb·ft   fb = 392 psi
R = 573 lb   fv = 40 psi

Δ_{TOT} = 0.04 in = L/1601

HDR3

L = 7 ft

DL = 20 psf
DL_{WALL} = 20 psf
S = 25 psf

w = (20 psf + 25 psf) (1.5 ft) + 20 psf (4 ft/3)
= 94 lb/ft.

USE (2) 2×8, MIH
Mmax = 576 lb·ft   fb = 263 psi
R = 329 lb   fv = 23 psi

C_D = 1.15 C_F = 1.2
Fb' = 1.15 (1.2) 850 psi = 1173 psi
Fv' = 1.15 (150 psi) = 172 psi

Δ_{TOT} = 0.04 in = L/2049 → OK

RJ1

L = 7'-7"

DL = 20 psf
S = 25 psf
SPACE ROOF JOISTS AT 24" O.C.
w = (20 psf + 25 psf) 2 ft = 90 lb/ft

USE 2×8 @ 24" O.C. (MIH)
M = 647 lb·ft   fb = 591 psi
R = 341 lb   fv = 47 psi

C_D = 1.15 C_F = 1.2 C_r = 1.15
Fb' = 1.15 (1.2) (1.15) 850 psi = 1348 psi
Fv' = 1.15 (150 psi) = 172 psi

Δ_{TOT} = 0.11 in = L/841 → OK

RB1

L = 6'-9"

DL = 20 psf
S = 25 psf
w = (20 psf + 25 psf) 23.67 ft/2 = 533

USE 4×12, MIH
M = 3036 lb·ft   fb = 493 psi
R = 1799 lb   fv = 69 psi

C_D = 1.15 C_F = 1.1
Fb' = 1.15 (1.1) 900 psi = 1138 psi
Fv' = 1.15 (180 psi) = 207 psi

Δ_{TOT} = 0.04 in = L/2162 → OK

ROOF FRAMING, CONT.

RB2

L = 7'-7"

DL = 20 psf

S = 25 psf

w = (20psf + 25psf) 1 ft = 45 lb/ft

P = 1800 lb (SEE RB1)

USE 4x12 (MIH)

M = 3740 lb·ft   fb = 607 psi

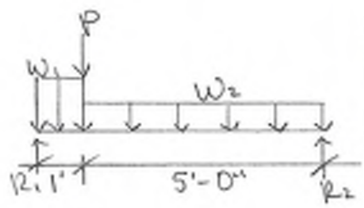
R = 1070 lb.   fv = 41 psi

Fb' = 1138 psi
Fv' = 207 psi } SEE RB1

Δ_{TOT} = 0.05 in = L/1911 → OK

HDR7

L = 6 ft



DL = 20 psf

DLwall = 20 psf

S = 25 psf

w_1 = 191 lb/ft (SEE HDR2)

w_2 = (20psf + 25psf) 3.75ft/2 + 20psf (1ft)
= 104 lb/ft

P = 1070 lb (SEE RB2)

USE (2) 2x8, MIH

M = 1190 lb·ft   fb = 544 psi

R1 = 1280 lb.   fv = 88 psi

R2 = 498 lb.

Fb' = 1173 psi
Fv' = 172 psi } SEE HDR3

Δ_{TOT} = 0.06 in = L/1228 → OK

BEAMBOY V2.2 REPORT

RB2

BEAM PROPERTIES

Beam Length = 7.58 ft.
Moment of Inertia = 415 in^4
Modulus of Elasticity = 1600000 psi
Distance From Neutral Axis to Furthest Fiber = 5.62 in.

LOAD CONFIGURATION

Point Loads

1800 lb., x=3.79 ft.

Distributed Loads

Start=45 lb./ft., x=0 ft.; End=45 lb./ft., x=7.58 ft.

Moments

Supports

Simple support; 0 ft., Reaction=1070 lb.
Simple support; 7.58 ft., Reaction=1070 lb.

MAXIMUM VALUES

Maximum Bending Moment = 3740 lb.-ft. at x=3.79 ft.
Maximum Bending Stress = 607 psi at x=3.79 ft.
Maximum Deflection = -0.0476 in. at x=3.79 ft.
Maximum Slope = 0.0905 degrees at x=7.58 ft.

8/1/2024

BEAMBOY V2.2 REPORT

HDR7

BEAM PROPERTIES

Beam Length = 6 ft.
Moment of Inertia = 95.3 in^4
Modulus of Elasticity = 1300000 psi
Distance From Neutral Axis to Furthest Fiber = 3.62 in.

LOAD CONFIGURATION

Point Loads

1070 lb., x=1 ft.

Distributed Loads

Start=191 lb./ft., x=0 ft.; End=191 lb./ft., x=1 ft.
Start=104 lb./ft., x=1 ft.; End=104 lb./ft., x=6 ft.

Moments

Supports

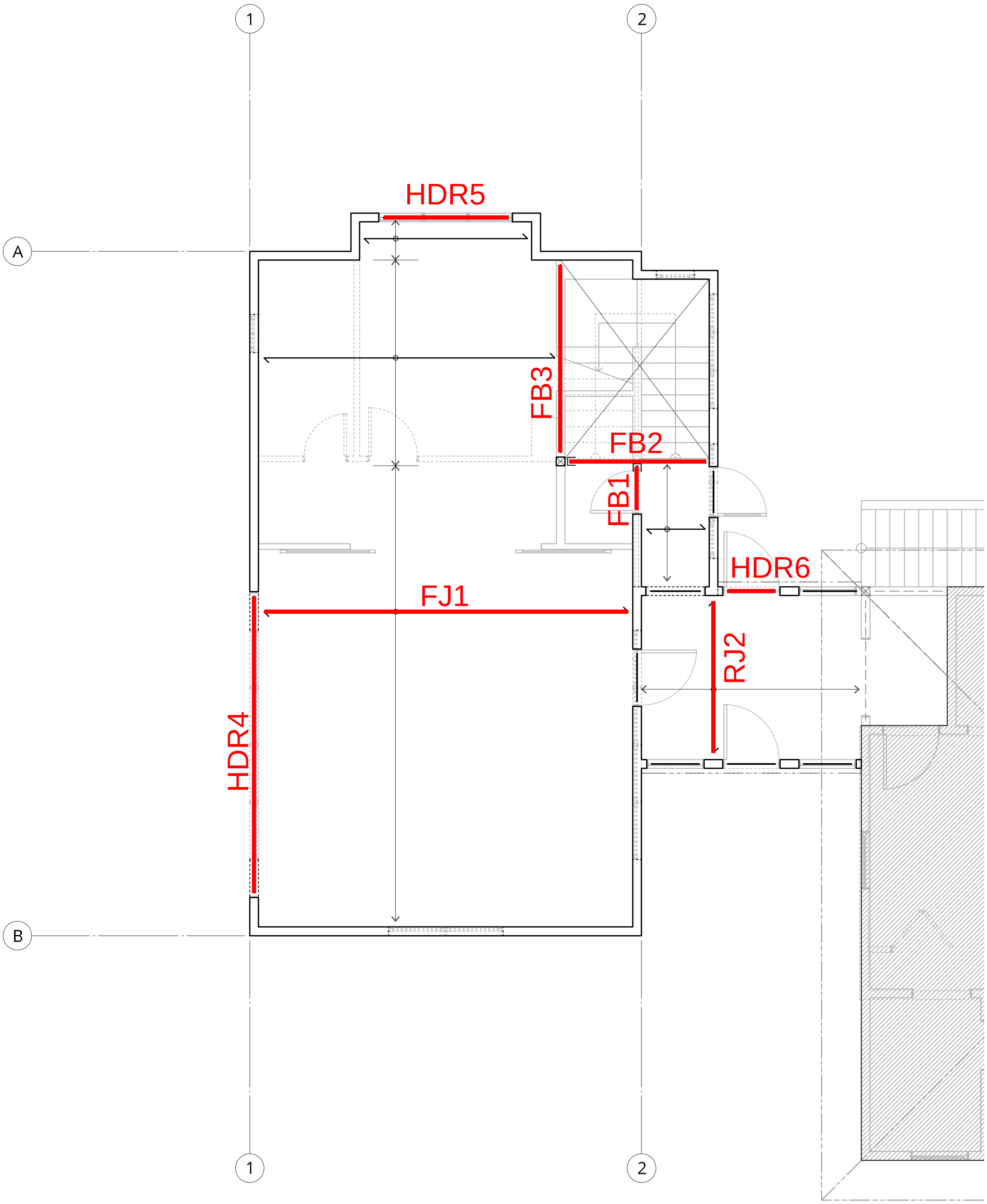
Simple support; 0 ft., Reaction=1280 lb.
Simple support; 6 ft., Reaction=498 lb.

MAXIMUM VALUES

Maximum Bending Moment = 1190 lb.-ft. at x=1.22 ft.
Maximum Bending Stress = 544 psi at x=1.22 ft.
Maximum Deflection = -0.0586 in. at x=2.76 ft.
Maximum Slope = -0.176 degrees at x=0.0006 ft.

8/1/2024

FRAMING KEY PLAN - 2nd FLOOR/LOW ROOF



2nd FLR / LOW ROOF FRAMING

FJ1

L = 19'-7"

DL = 15 psf
LL = 40 psf

USE 11 7/8" TJI 560 @ 16" O.C.

M_{max} = 3545 lb-ft M_{all} = 9500 lb-ft
R = 721 lb. V_{all} = 1265 lb

Δ_{TOT} = 0.10 in = L/595 → OK

FB1

L = 2'-9"

DL = 15 psf
LL = 40 psf
w = (15 psf + 40 psf) 23.67 ft/2 = 651 lb/ft

USE 1 3/4" x 11 7/8" LSL, MIN

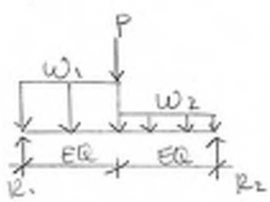
M_{max} = 615 lb-ft M_{all} = 7975 lb-ft
R = 895 lb V_{all} = 4295 lb

Δ_{TOT} = 0.002 in = L/14,911 → OK

FB2

L = 7'-7"

DL = 15 psf
LL = 40 psf



w_1 = (15 psf + 40 psf)(10.5 ft/2 + 8/12 ft) = 325 lb/ft
w_2 = (15 psf + 40 psf) 8/12 ft = 37 lb/ft
P = 895 lb   (SEE FB1)

USE 1 3/4" x 11 7/8" LSL, MIN

M = 3000 lb-ft M_{all} = 7975 lb-ft
R_1 = 1410 lb. V_{all} = 4295 lb.
R_2 = 861 lb.

Δ_{TOT} = 0.07 in = L/1250 → OK

FB3

L = 10'-4"

DL = 15 psf
LL = 40 psf
w = (15 psf + 40 psf)(15.75 ft/2) = 433 lb/ft

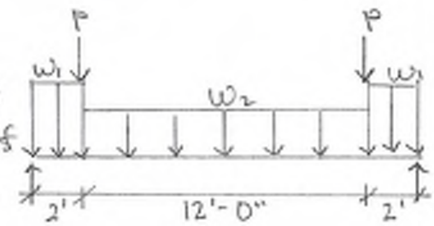
USE 1 3/4" x 11 7/8" LSL, MIN

M_{max} = 5776 lb-ft M_{all} = 7975 lb-ft
R = 2236 lb. V_{all} = 4295 lb.

Δ_{TOT} = 0.29 in = L/423 → OK

HDR4

L = 16 ft



DL_{ROOF} = 20 psf
DL_{WALL} = 20 psf
DL_{FLR} = 15 psf
S = 25 psf
LL = 40 psf

$w_{1,D}$ = 20 psf (21.5 ft/2 + 10 ft) + 15 psf (19.58 ft/2)
= 562 lb/ft

$w_{1,L}$ = 40 psf (19.583 ft/2) = 392 lb/ft
$w_{1,S}$ = 25 psf (21.5 ft/2) = 269 lb/ft

$w_{2,D}$ = 20 lb/ft (4 ft) + 15 psf (19.58 ft/2)
= 227 lb/ft

$w_{2,L}$ = $w_{1,L}$ = 392 lb/ft

P_D = 3060 lb (20/45) = 1360 lb
P_S = 3060 lb (25/45) = 1700 lb
} SEE HDR1

LOAD COMBO 2:

w_1 = 562 lb/ft + 392 lb/ft = 954 lb/ft
w_2 = 227 lb/ft + 392 lb/ft = 619 lb/ft
P = 1360 lb.

M = 23,200 lb-ft
R = 6980 lb.

LOAD COMBO 3:

w_1 = 562 lb/ft + 269 lb/ft = 831 lb/ft

HDR4, CONT.

$w_2 = 227$ lb/ft
P = 3060 lb.

M = 14,600 lb·ft
R = 6080 lb.

LOAD COMBO 4:
$w_1 = 562$ lb/ft + 0.75(392 lb/ft + 269 lb/ft)
= 1058 lb/ft
$w_2 = 227$ lb/ft + 0.75(392 lb/ft) = 521 lb/ft
P = 1360 lb + 0.75(1700 lb) = 2635 lb.

M = 23,000 lb·ft
R = 7880

USE 5 1/4" x 14" PSL
$C_V = \left(\frac{12}{14}\right)^{0.111} = 0.98$
$C_D = 1.15$
C_L: $l_e = 1.63 l_u + 3d$
$= 1.63(192in) + 3(14in)$
$= 355$ in
$R_B = \sqrt{\frac{355in(14in)}{(5.25in)^2}} = 13.43$
$F_{bE} = \frac{1.2(1,016,535)}{13.43^2} = 6761$ psi
$F_b^* = 1.15(2900\text{ psi}) = 3335$ psi
$C_L = 1.59 - \sqrt{1.59^2 + 2.13} = 0.96$

$M_{all} = 0.98(1.15)(0.96)\,40,745 = 44,082$ lb·ft
$V_{all} = 1.15(14,210\text{ lb}) = 16,342$ lb.

$\Delta_{TOT} = 0.46in = L/420 \rightarrow$ OK

HDR5
L = 7 ft

DL = 15 psf
DL_{WALL} = 20 psf
LL = 40 psf

w = (15 psf + 40 psf) 8/12 ft + 20 psf(5.5 ft)
= 147 lb/ft.

USE (2) 2x8, MIN
M = 900 lb·ft $f_b = 411$ psi
R = 515 lb $f_v = 35$ psi

$F_b' = 1173$ psi
$F_v' = 172$ psi } SEE HDR3

$\Delta_{TOT} = 0.06in = L/1310 \rightarrow$ OK

HDR6
L = 3.25 ft

DL = 15 psf
DL_{WALL} = 20 psf
S = 25 psf
w = (15 psf + 25 psf) 10 ft/2 + 20 psf (1.5 ft)
= 230 lb/ft

USE 2x8 RIM JOIST AS HDR, MIN
M = 304 lb·ft $f_b = 277$ psi
R = 374 lb. $f_v = 52$ psi

$F_b' = 1173$ psi
$F_v' = 172$ psi } SEE HDR3

$\Delta_{TOT} = 0.01 in = L/4183 \rightarrow$ OK

RJ2
L = 8'-8"

DL = 15 psf
S = 25 psf
w = (15 psf + 25 psf) 2 ft = 80 lb/ft

USE 2x8, MIN
M = 752 lb·ft $f_b = 686$ psi
R = 347 lb. $f_v = 48$ psi

$C_D = 1.15$ $C_F = 1.2$ $C_r = 1.15$
$F_b' = 1.15(1.2)(1.15)\,850\text{ psi} = 1348$ psi
$F_v' = 172$ psi (SEE HDR3)
$\Delta_{TOT} = 0.16in = L/633 \rightarrow$ OK

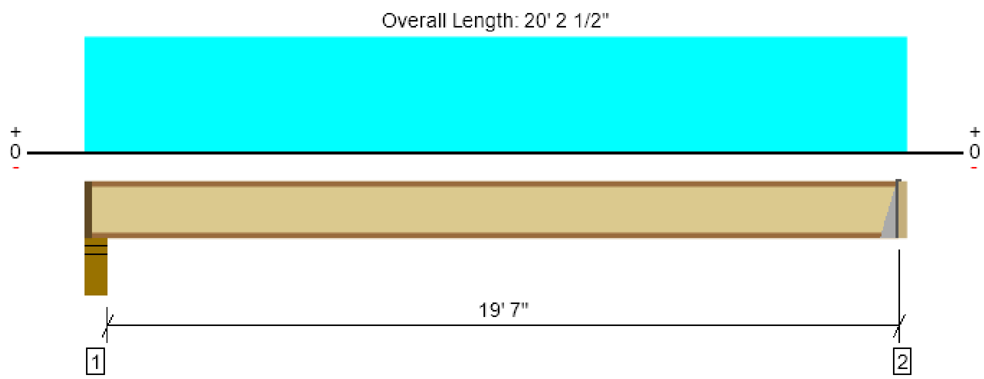
FORTEWEB

MEMBER REPORT

PASSED

2nd Flr/Low Roof, FJ1

1 piece(s) 11 7/8" TJI® 560 @ 16" OC



Drawing is Conceptual. All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal (typ.).

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	721 @ 20' 1/2"	1265 (1.75")	Passed (57%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	721 @ 20' 1/2"	2050	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3545 @ 10' 2 1/2"	9500	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.289 @ 10' 2 1/2"	0.492	Passed (L/818)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.397 @ 10' 2 1/2"	0.983	Passed (L/595)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	45	45	Passed	--	--

Member Length : 19' 10 3/4"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	5.50"	3.75"	1.75"	204	544	749	1 3/4" Rim Board
2 - Hanger on 11 7/8" PSL beam	2.00"	Hanger[1]	1.75" / - [2]	200	533	733	See note [1]

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' 5" o/c	
Bottom Edge (Lu)	19' 11" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Top Mount Hanger	ITS3.56/11.88	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 20' 2 1/2"	16"	15.0	40.0	Default Load

Member Notes
Typical floor joists

ForteWEB Software Operator	Job Notes
Casey Held Buker Engineering (123) 456-7890 casey@bukerengineering.com	

Weyerhaeuser

7/31/2024 6:01:49 PM UTC

ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.9.2

F9

File Name: Hinckley Residence

BEAMBOY V2.2 REPORT

FB2

BEAM PROPERTIES

Beam Length = 7.58 ft.
Moment of Inertia = 244 in^4
Modulus of Elasticity = 1550000 psi
Distance From Neutral Axis to Furthest Fiber = 5.94 in.

LOAD CONFIGURATION

Point Loads

895 lb., x=3.79 ft.

Distributed Loads

Start=325 lb./ft., x=0 ft.; End=325 lb./ft., x=3.79 ft.
Start=37 lb./ft., x=3.79 ft.; End=37 lb./ft., x=7.58 ft.

Moments

Supports

Simple support; 0 ft., Reaction=1410 lb.
Simple support; 7.58 ft., Reaction=861 lb.

MAXIMUM VALUES

Maximum Bending Moment = 3000 lb.-ft. at x=3.79 ft.
Maximum Bending Stress = 875 psi at x=3.79 ft.
Maximum Deflection = -0.0728 in. at x=3.68 ft.
Maximum Slope = -0.149 degrees at x=0.000758 ft.

7/31/2024

BEAMBOY V2.2 REPORT

HDR4 LC2

BEAM PROPERTIES

Beam Length = 16 ft.
Moment of Inertia = 1200 in^4
Modulus of Elasticity = 2000000 psi
Distance From Neutral Axis to Furthest Fiber = 7 in.

LOAD CONFIGURATION

Point Loads

1360 lb., x=2 ft.
1360 lb., x=14 ft.

Distributed Loads

Start=954 lb./ft., x=0 ft.; End=954 lb./ft., x=2 ft.
Start=619 lb./ft., x=2 ft.; End=619 lb./ft., x=14 ft.
Start=954 lb./ft., x=14 ft.; End=954 lb./ft., x=16 ft.

Moments

Supports

Simple support; 0 ft., Reaction=6980 lb.
Simple support; 16 ft., Reaction=6980 lb.

MAXIMUM VALUES

Maximum Bending Moment = 23200 lb.-ft. at x=8 ft.
Maximum Bending Stress = 1620 psi at x=8 ft.
Maximum Deflection = -0.457 in. at x=8 ft.
Maximum Slope = -0.445 degrees at x=0.0016 ft.

7/31/2024

BEAMBOY V2.2 REPORT

HDR4 LC4

BEAM PROPERTIES

Beam Length = 16 ft.
Moment of Inertia = 488 in^4
Modulus of Elasticity = 2000000 psi
Distance From Neutral Axis to Furthest Fiber = 5.94 in.

LOAD CONFIGURATION

Point Loads

2640 lb., x=2 ft.
2640 lb., x=14 ft.

Distributed Loads

Start=1060 lb./ft., x=0 ft.; End=1060 lb./ft., x=2 ft.
Start=521 lb./ft., x=2 ft.; End=521 lb./ft., x=14 ft.
Start=1060 lb./ft., x=14 ft.; End=1060 lb./ft., x=16 ft.

Moments

Supports

Simple support; 0 ft., Reaction=7880 lb.
Simple support; 16 ft., Reaction=7880 lb.

MAXIMUM VALUES

Maximum Bending Moment = 23000 lb.-ft. at x=8 ft.
Maximum Bending Stress = 3360 psi at x=8 ft.
Maximum Deflection = -1.14 in. at x=8 ft.
Maximum Slope = -1.13 degrees at x=0.0016 ft.

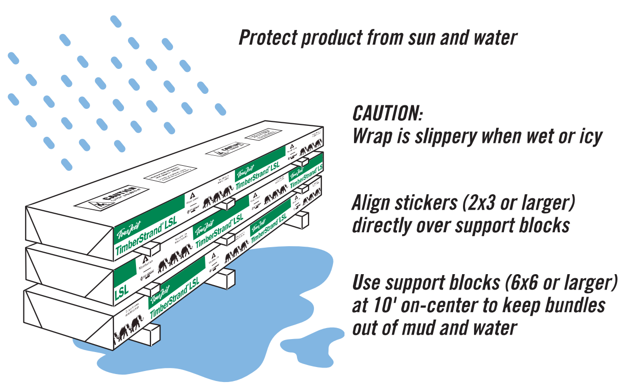
Allowable Design Properties[(1)] (100% Load Duration)

Grade	Width	Design Property	Depth											
			4⅜"	5½"	5½" Plank Orientation	7¼"	9¼"	9½"	11¼"	11⅞"	14"	16"	18"	20"
TimberStrand® LSL														
1.3E	3½"	Moment (ft-lbs)	1,735	2,685	1,780	4,550								
		Shear (lbs)	4,340	5,455	1,925	7,190								
		Moment of Inertia (in.⁴)	24	49	20	111								
		Weight (plf)	4.5	5.6	5.6	7.4								
1.55E	1¾"	Moment (ft-lbs)						5,210		7,975	10,920	14,090		
		Shear (lbs)						3,435		4,295	5,065	5,785		
		Moment of Inertia (in.⁴)						125		244	400	597		
		Weight (plf)						5.2		6.5	7.7	8.8		
	3½"	Moment (ft-lbs)						10,420		15,955	21,840	28,180		
		Shear (lbs)						6,870		8,590	10,125	11,575		
		Moment of Inertia (in.⁴)						250		488	800	1,195		
		Weight (plf)						10.4		13	15.3	17.5		
Microllam® LVL														
2.0E	1¾"	Moment (ft-lbs)		2,125		3,555	5,600	5,885	8,070	8,925	12,130	15,555	19,375	23,580
		Shear (lbs)		1,830		2,410	3,075	3,160	3,740	3,950	4,655	5,320	5,985	6,650
		Moment of Inertia (in.⁴)		24		56	115	125	208	244	400	597	851	1,167
		Weight (plf)		2.8		3.7	4.7	4.8	5.7	6.1	7.1	8.2	9.2	10.2
Parallam® PSL														
2.0E	3½"	Moment (ft-lbs)					12,415	13,055	17,970	19,900	27,160	34,955	43,665	
		Shear (lbs)					6,260	6,430	7,615	8,035	9,475	10,825	12,180	
		Moment of Inertia (in.⁴)					231	250	415	488	800	1,195	1,701	
		Weight (plf)					10.1	10.4	12.3	13.0	15.3	17.5	19.7	
	5¼"	Moment (ft-lbs)					18,625	19,585	26,955	29,855	40,745	52,430	65,495	
		Shear (lbs)					9,390	9,645	11,420	12,055	14,210	16,240	18,270	
		Moment of Inertia (in.⁴)					346	375	623	733	1,201	1,792	2,552	
		Weight (plf)					15.2	15.6	18.5	19.5	23.0	26.3	29.5	
	7"	Moment (ft-lbs)					24,830	26,115	35,940	39,805	54,325	69,910	87,330	
		Shear (lbs)					12,520	12,855	15,225	16,070	18,945	21,655	24,360	
		Moment of Inertia (in.⁴)					462	500	831	977	1,601	2,389	3,402	
		Weight (plf)					20.2	20.8	24.6	26.0	30.6	35.0	39.4	

(1) For product in beam orientation, unless otherwise noted.

Some sizes may not be available in your region.

PRODUCT STORAGE



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Design Stresses[1] (100% Load Duration)

Grade	Orientation	G Shear Modulus of Elasticity (psi)	E Modulus of Elasticity[2] (psi)	E_{min} Adjusted Modulus of Elasticity[3] (psi)	F_b Flexural Stress[4] (psi)	F_t Tension Stress[5] (psi)	$F_{c\perp}$ Compression Perpendicular to Grain[6] (psi)	$F_{c\parallel}$ Compression Parallel to Grain (psi)	F_v Horizontal Shear Parallel to Grain (psi)	SG Equivalent Specific Gravity[7]
TimberStrand® LSL										
1.3E	Beam/Column	81,250	1.3 x 10^6	660,750	1,700	1,300	710	1,835	425	0.50[8]
1.3E	Plank	81,250	1.3 x 10^6	660,750	1,900[9]	1,300	670	1,835	150	0.50[8]
1.55E	Beam	96,875	1.55 x 10^6	787,815	2,325	1,290[10]	900	2,170	310[10]	0.50[8]
Microllam® LVL										
2.0E	Beam	125,000	2.0 x 10^6	1,016,535	2,600	1,895	750	2,510	285	0.50
Parallam® PSL										
1.8E	Column	112,500	1.8 x 10^6	914,880	2,400[11]	1,995	545[11]	2,500	190[11]	0.50
2.0E	Beam	125,000	2.0 x 10^6	1,016,535	2,900	2,300	625[12]	2,900[13]	290	0.50

(1) Unless otherwise noted, adjustment to the design stresses for duration of load are permitted in accordance with the applicable code.

(2) To properly calculate deflections for the full range of typical SCL span and loading applications, bending and shear deflection must be considered. Use the following equation for simple span, uniformly loaded beams:

$$\Delta = \frac{270\ wL^4}{Ebd^3} + \frac{28.8\ wL^2}{Ebd}$$

Where: Δ = deflection (in.) w = uniform load (plf)
L = span (feet) b = beam thickness (in.)
d = beam depth (in.) E = modulus of elasticity (psi)

For other span and loading conditions, use engineering mechanics to account for both bending and shear deflection or use ForteWEB™ software.

(3) Reference modulus of elasticity for beam and column stability calculations, per NDS®.

(4) For 12" depth. For other depths, multiply F_b by the appropriate factor as follows:
– TimberStrand® LSL $\left[\frac{12}{d}\right]^{0.092}$ – Microllam® LVL $\left[\frac{12}{d}\right]^{0.136}$ – Parallam® PSL $\left[\frac{12}{d}\right]^{0.111}$

(5) Reference tension design values are based on a standard length of 4 feet. For lengths longer than 4 feet, multiply F_t by the following adjustment (where L is length in feet):
– TimberStrand® LSL $(4/L)^{0.083}$ – Parallam® PSL $(4/L)^{0.056}$ – Microllam® LVL $(4/L)^{0.085}$

(6) $F_{c\perp}$ may not be increased for duration of load.

(7) For lateral connection design only.

(8) Specific gravity of 0.58 may be used for bolts installed perpendicular to face and loaded perpendicular to grain.

(9) Values are for thickness up to 3½".

(10) Value accounts for large hole capabilities. See **Allowable Holes** on page 26.

(11) Value shown is for plank orientation.

(12) Use 750 psi for Parallam® PSL identified with plant number 0579.

(13) For column applications, use $F_{c\parallel}$ of 500 psi. Alternatively, refer to ESR-1387, Table 1, footnote 13.

General Assumptions for Trus Joist® Beams

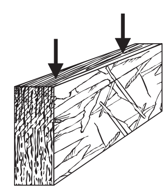
- Lateral support is required at bearing and along the span at 24" on-center, maximum.
- Bearing lengths are based on each product's bearing stress for applicable grade and orientation.
- All members 7¼" and less in depth are restricted to a maximum deflection of ⁵⁄₁₆" (for window header installation).
- Beams that are 1¾" x 16" and deeper require multiple plies. Some exceptions allowed when using Weyerhaeuser software.
- No camber.
- Beams and columns must remain straight to within $5L^2/4608$ (in.) of true alignment. L is the unrestrained length of the member in feet.

For applications not covered in this brochure, contact your Weyerhaeuser representative.

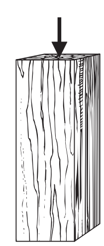
See pages 28-30 for multiple-member beam connections.

TimberStrand® LSL, Microllam® LVL, and untreated Parallam® PSL are intended for dry-use applications

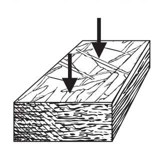
Beam Orientation



Column Orientation



Plank Orientation



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