PSE CONSULTING ENGINEERS INC.

STRUCTURAL ENGINEERING CALCULATIONS

PROJECT: WA JOHNSON PATIO

PROJECT LOCATION: 4520 86th Ave SE
Mercer Island, WA 98040

PSE PROJECT NUMBER: CUSTOM DECKS 223-002

DATE: March 31, 2023

Expires 07/26/2023

BY: Nabil Taha, Ph.D., P.E.
Julio Martinez E.I.T.
Danish Irfan.

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Table of Contents:

Expires 07/26/2023

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References:

1- Literature:

a. 2018 Washington State Building Code (SBCC), with reference to the 2018 International Building Code (IBC)

b. Design of Wood Structures, Donald E. Breyer 4th ED.

2- Software:

a. RISA 3D Version 19.0,
RISA Technologies,
26632 Towne Centre Drive, Suite 210
Foothill Ranch, CA 92610

b. Wood Works Design Office Version 12.0,
American Forest & Paper Association

PSE Consulting Engineers Inc.

Project #: custom deck 223-002

Design Criteria:

1- Location:	4520 86th Ave SE Mercer Island, WA 98040 (Lat 47.5649248 Lon -122.2239523)	
2- Seismic:	RC	II
	SDC	D
	Site Class	D
	S_S	1.43
	S_1	0.497
	S_{DS}	1.144
	S_{D1}	0.597
	I_E	1.0
	R	1.5
3- Wind:	Ultimate wind speed	110 mph (3 s. gust)
	Exposure	C
	RC	II
4- Snow:	25 psf (roof)	
5- Soil Bearing Capacity:	1500 psf (presumptive value from IBC)	
6- Gravity Loads:	DL Floor:	15 psf
7- Deflection Criteria:	Roof TL Deflection:	L/180

**Other criteria assumed as stated in design calculations.

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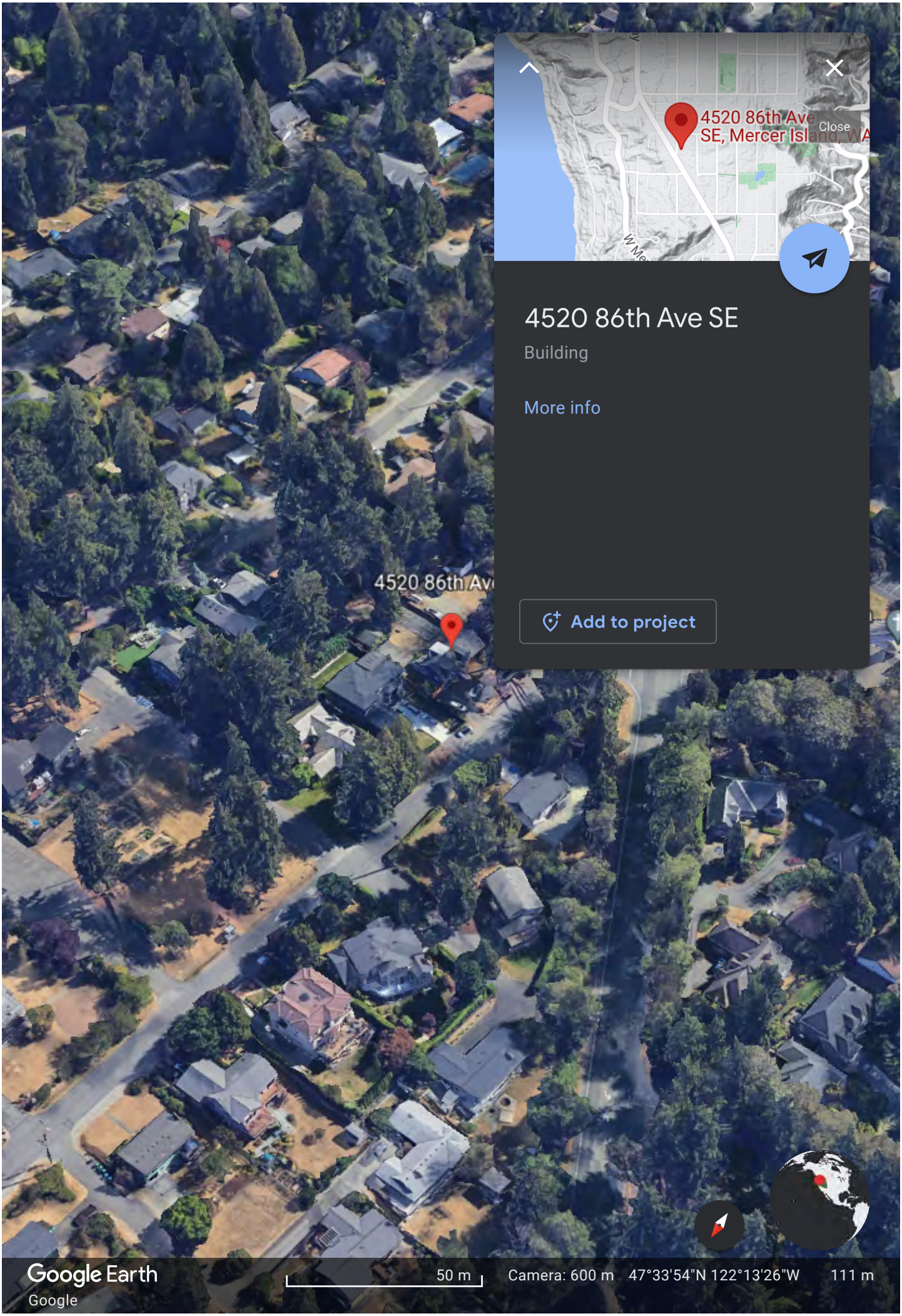
4520 86th Ave SE, Mercer Island, WA
Close
4520 86th Ave SE
Building
More info
Add to project
4520 86th Av
Google Earth
Google
50 m
Camera: 600 m 47°33'54"N 122°13'26"W 111 m

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

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

Hazards by Location

Search Information

Address:	4520 86th Ave SE, Mercer Island, WA 98040, USA
Coordinates:	47.5649248, -122.2239523
Elevation:	357 ft
Timestamp:	2023-02-22T14:52:44.615Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	II
Site Class:	D-default

Basic Parameters

Name	Value	Description
S_S	1.43	MCE_R ground motion (period=0.2s)
S_1	0.497	MCE_R ground motion (period=1.0s)
S_{MS}	1.716	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.144	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	0.898	Coefficient of risk (1.0s)
PGA	0.612	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.735	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.43	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.585	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.851	Factored deterministic acceleration value (0.2s)
S1RT	0.497	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.553	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.518	Factored deterministic acceleration value (1.0s)
PGAd	1.302	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.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

Disclaimer

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

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2018 IBC SEISMIC DESIGN

EQUIVALENT LATERAL FORCE PROCEDURE

JOB NUMBER Custom decks 223-002

DESIGNER DI

Design Information

DATA	VALUE	SOURCE
Site Class	D	Site conditions, geotech report
S_s=	1.43	Seismic Design Parameters (Software)
S_1=	0.497	Seismic Design Parameters (Software)
S_{MS}=	1.716	Seismic Design Parameters (Calculated)
S_{M1}=	0.896	Seismic Design Parameters (Calculated)
I_E	1.0	ASCE 7-16 Table 1.5-2
Risk Category	2	ASCE 7-16 Table 1.5-1
R	1.5	ASCE 7-16 Table 12.2-1
h_n	14.5	Height per ASCE 7-16
C_t	0.02	ASCE 7-16 Table 12.8-2
T_L	6	Long-period Transition period (Software)

S_{MS}: Max considered spectral response acceleration for short periods

S_{M1}: Max considered spectral response acceleration for 1-second period

I_E: Seismic importance factor

R: Response modification factor

1) Design spectral response acceleration

S_{DS}: 5% Damped spectral response acceleration at short periods

S_{D1}: 5% Damped spectral response acceleration at 1 second period

$S_{DS}=2/3(S_{ms})$ $S_{DS}=$ 2/3 X 1.716 $S_{DS}=$ 1.144 [ASCE 7-16 Eq. 11.4-3]

$S_{D1}=2/3(S_{m1})$ $S_{D1}=$ 2/3 X 0.896091 $S_{D1}=$ 0.597 [ASCE 7-16 Eq. 11.4-4]

2) Seismic design category

From Table 11.6-1 ASCE 7-16 = D

From Table 11.6-2 ASCE 7-16 = D

Governing Design Category D

3) Determine design base shear (V)

A. ASCE 7-16, 11.4.8 Exception

Ts= 0.5221976

$T = T_a = C_t (h_n^x)$ [ASCE 7-16, 12.8.2.1, Eq. 12.8-7]

T_a : Approximate Fundamental Period

$T= 0.020 \times 14.5^{0.75}$ T= 0.149

For Site Class D/D-Default: T is < 1.5 Ts

For site class D/-default Cs shall be calculated per Eq. 12.8-2

Equivalent Force Procedure
[ASCE 7-16, 12.8.1]

$V= C_s \times W$

C_s : Seismic Response Coefficient
W : Total dead load and other applicable loads

B. [ASCE 7-16, 12.8.1.1, Eq. 12.8-2]

$C_S = \frac{S_{DS}}{R / I}$ $C_S = \frac{1.144}{3} 1.0$ $C_S=$ 0.381

C. Nor greater than

$C_S = \frac{S_{D1}}{T (R / I)}$ [ASCE 7-16, 12.8.1.1, Eq. 12.8-3] **OR** $C_S = \frac{S_{D1} * T_L}{T^2 (R / I)}$ [ASCE 7-16, 12.8.1.1, Eq. 12.8-4]

$C_S = \frac{0.597 \times 1}{0.149 \times 3}$ $C_S=$ 1.340

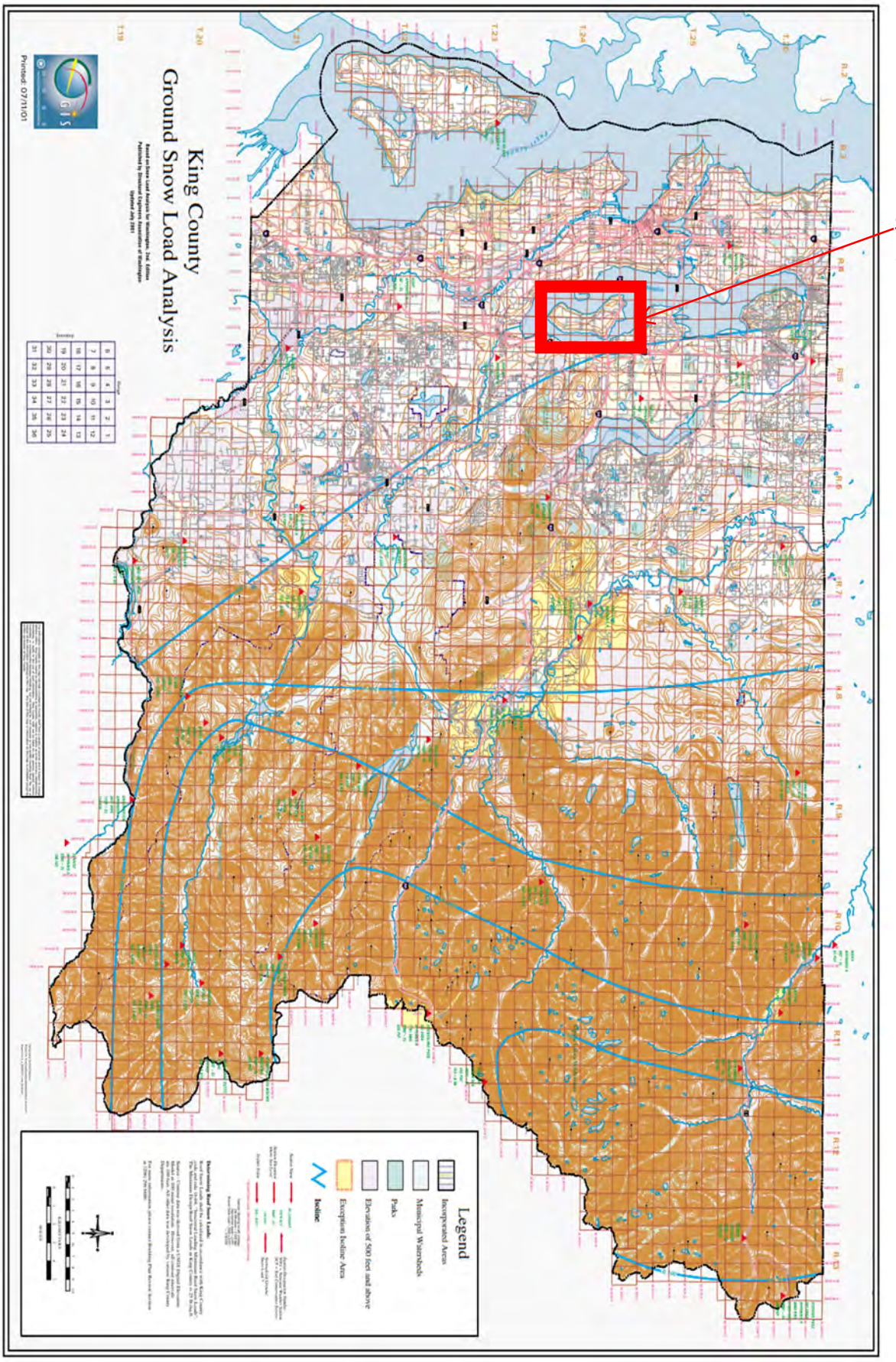
$C_S = \frac{0.597 \times 6 \times 1}{0.022 \times 3}$ $C_S=$ 54.098

D. Nor less than [ASCE 7-16, 12.8.1.1, Eq. 12.8-5]

$C_S = 0.044 (S_{DS}) (I)$ $C_S = 0.044 \times 1.144 \times 1$ $C_S=$ 0.0503

Governing C_s = 0.381

V= Cs x W V = 0.381 X W Refer to sheet two for W and Calculated V



SNOW LOAD=
25 PSF

ASCE 7-16 SNOW LOAD

Sheet #

Date

SLOPED ROOF

PROJECT NUMBER: Custom Decks 223-002

DESIGNER: D.I

ELEVATION REVIEWED BY:

LOCATION (STATE): WA

P_s : Sloped roof snow load (PSF)

C_S : Slope factor [ASCE 7-16, Fig 7-2]

P_f : Flat roof snow load (PSF)

C_e : Exposure factor [ASCE 7-16, Table 7-2]

C_t : Thermal factor [ASCE 7-16 Table 7-3]

I : Snow load importance factor [ASCE 7-16, Table 1.5-2]

P_g : Ground snow load

δ: Density of snow

h_d: Drift Height [ASCE 7-16, Fig 7-9, l_u=W from windward si

S: roof slope for a rise of 1 = 3

Enter values from Code

Calculated Values

1) Flat Roof Snow Load

$P_f = 0.7 \times C_e \times C_t \times I \times P_g$ [ASCE 7-16, Eq 7.3-1]

I = 1.0

P_g = 25

	Cat.	Exposure
C_e =	C-Sheltered	**1.1**

C_t = 1.2

P_f = **23.1** (PSF)

2) Sloped Roof Snow Load (Upper Roof)

$P_s = C_S \times P_f$ [ASCE-7-16, Eq 7.4-1]

Roof slope = 4 / 12 = 18.4 °

Is roof unobstructed and slippery? No (choose N/A if unknown)

Is roof ventilated? Yes (ignore if Thermal Factor, Ct is 1.1, 1.2, or 1.3; choose N/A if unknown)

Roof R-Value N/A ft^2 hr °F/Btu (ignore if Thermal Factor, Ct is 1.1, 1.2, or 1.3; choose N/A if unknown)

Figure: **7-2c** [ASCE 7-16, Fig. 7-2]

Line: **Solid** [ASCE 7-16, Fig. 7-2]

C_s = **1.000** [ASCE 7-16, Fig. 7-2]

P_s = **23.1** (PSF)

ASCE 7-16 SNOW LOAD

LOWER SLOPED ROOF

PROJECT NUMBER: Custom Decks 223-002

DESIGNER: D.I ELEVATION REVIEWED BY: 0

2a) Sloped Roof Snow Load (Lower Roof if present)

$P_s = C_S \times P_f$ [ASCE-7-16, Eq 7.4-1]

Lower Roof slope = 4 / 12 = 18.4 °

Is lower roof unobstructed and slippery? No (choose N/A if unknown)

Is lower roof ventilated? Yes (ignore if Thermal Factor, Ct is 1.1, 1.2, or 1.3; choose N/A if unknown)

Lower roof R-Value N/A ft^2 hr °F/Btu (ignore if Thermal Factor, Ct is 1.1, 1.2, or 1.3; choose N/A if unknown)

Figure: **7-2c** [ASCE 7-16, Fig. 7-2]

Line: **Solid** [ASCE 7-16, Fig. 7-2]

C_s = **1.000** [ASCE 7-16, Fig. 7-2]

P_s = **23.1** (PSF)

Enter values from Code

Calculated Values

ASCE 7-16 SNOW LOAD

Unbalanced Snow for Hip and Gable Roofs

PROJECT NUMBER: Custom Decks 223-002

DESIGNER: D.I ELEVATION REVIEWED BY: 0

3) Unbalanced Snow Load

Unbalanced Snow Load [ASCE 7-16, Sec. 7.6.1]

If Slope > 30.2° or < 2.38° NOT REQUIRED — **Required**

W = 25 ft

Is Member Prismatic? Y or N: N

$\gamma = 0.13*P_g+14$, but not more than 30 = **17.3** (PCF)

$h_d = 0.43*(W)^{1/3}*(P_g+10)^{1/4}-1.5$ = **1.56** (FT)

Leeward Pu = I x P_g = **N/A** (PSF)

Leeward Pu = P_s + Surcharge

P_s = **23.1** (PSF)

Surcharge Load = $h_d*\gamma/S^{1/2}$ = **15.5** (PSF)

Surcharge Length = $8*h_d*(S)^{1/2}/3$ = **5.8** (FT)

Windward Pu = 0 or $0.3*P_s$ = **7** (PSF)

Enter values from Code

Calculated Values

ASCE 7-16 SNOW LOAD

Drift on Lower Roof

PROJECT NUMBER: Custom Decks 223-002

DESIGNER: D.I

ELEVATION REVIEWED BY: 0

4) Drift on Lower Roof

h:	Height from lower to upper roof	0 (FT)	
l_u=	Length of Upper Roof	30 (FT)	(20 ft is used if less than 20 ft)
l_l=	Length of Lower Roof	50 (FT)	(20 ft is used if less than 20 ft)
h_b=	P_s/γ (Height of balanced snow load)	**1.34** (FT)	
h_c=	$h-h_b$ (Clear height from top of balanced snow load)	**-1.34** (FT)	
Drift Analysis Required or Not?		**Not Required**	
Lh_d=	Leeward Drift Height	**N/A** (FT)	
Wh_d=	Windward Drift Height	**N/A** (FT)	
Gh_d=	Governing Drift Height	**N/A** (FT)	
w=	Theoretical Width of Drift	**N/A** (FT)	
w_{max}=	$8*h_c$ (Maximum Drift Width)	**N/A** (FT)	
w_d=	Design Drift Width	**N/A** (FT)	
h_d=	Design Drift Height	**N/A** (FT)	
P_{dmax}=	Maximum Drift Surcharge Weight	**N/A** (PSF)	
P_{dmin}=	Minimum Drift Surcharge Weight	**N/A** (PSF)	
w=	Actual Width of Drift	**N/A** (FT)	

Enter values from Code

Calculated Values

ASCE 7-16 SNOW LOAD

Sliding Snow on Lower Roof

PROJECT NUMBER: Custom Decks 223-002

DESIGNER: D.I ELEVATION REVIEWED BY: 0

5) Sliding Snow on Lower Roof

Sliding Snow Load [ASCE 7-16, Sec. 7.9]

Is upper roof slippery? Y or N: Y **Required**

REQUIRED if Slope > 1/4 on 12 and upper roof is slippery or if Slope > 2 on 12 for other roofs

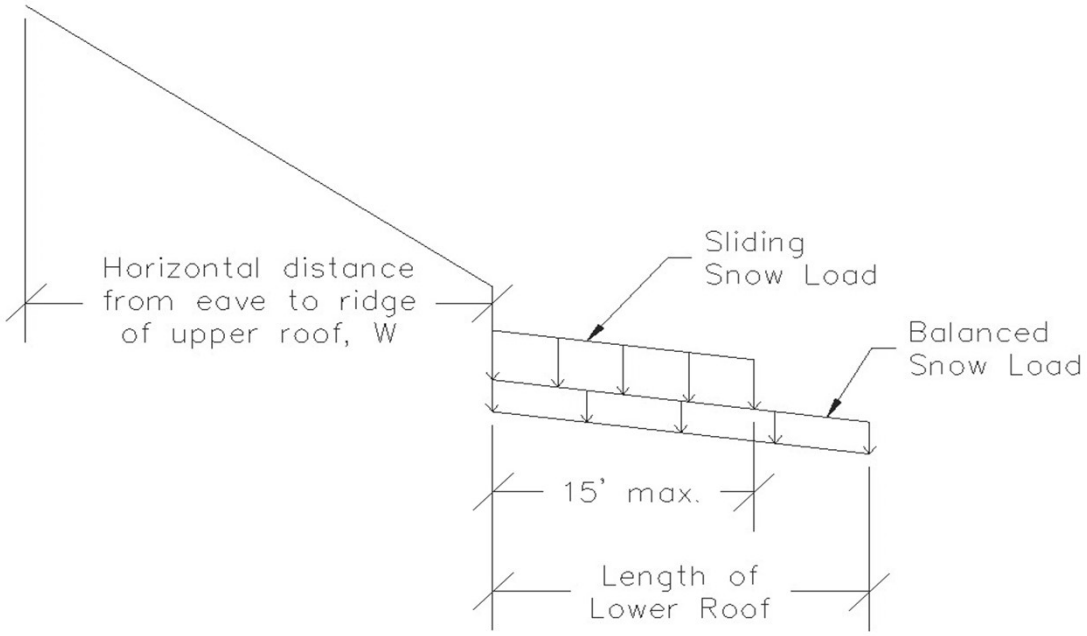
Total sliding Load per unit length of eave = $0.4*P_f*W$ = **231.0** plf

(if lower roof length < 15ft, the total sliding snow is reduced proportionally)

Sliding snow distributed over 15ft length = **15.4** psf

Enter values from Code

Calculated Values



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.

Hazards by Location

Search Information

Address: 4520 86th Ave SE, Mercer Island, WA 98040, USA

Coordinates: 47.5649248, -122.2239523

Elevation: 357 ft

Timestamp: 2023-02-22T14:51:39.160Z

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	104 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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MecaWind v2392

Calculations Prepared by:
PSE Consulting Engineers
Date: Mar 02, 2023

File Location:
\\force\ENG\PRO\KF2023 Mult\Custom Decks\223-002 WA Johnson Patio\Dsgn Engineering\
Admin\Meca Wqind Report.wnd

Basic Wind Parameters

Wind Load Standard	= ASCE 7-16	Exposure Category	= C
Wind Design Speed	= 110.0 mph	Risk Category	= II
Structure Type	= Building	Building Type	= Open

General Wind Settings

Incl_LF	= Include ASD Load Factor of 0.6 in Pressures	= False
DynType	= Dynamic Type of Structure	= Flexible
NF	= Natural Frequency of Structure (Mode 1)	= 1.000 Hz
Bs	= Structural Damping (Used for Flexible Only)	= 0.0100
Zg	= Altitude (Ground Elevation) above Sea Level	= 357.000 ft
Bdist	= Base Elevation of Structure	= 0.000 ft
SDB	= Simple Diaphragm Building	= True
MWFRSType	= MWFRS Method Selected	= Ch 27 Pt 1

Topographic Factor per Fig 26.8-1

Topo	= Topographic Feature	= None
Kzt	= Topographic Factor	= 1.000

Building Inputs

RoofType:	Roof Type	= Monoslope	h	: Mean Roof Height	= 12.500 ft
L	: Width Normal to Ridge	= 23.000 ft	D	: Length Along Ridge	= 13.000 ft
WindFlow:	Wind Flow Method	= Clear	Slope	: Slope of Roof	= 18.43 Deg
Frames	: Incl Transverse Frames	= False	n	: Number of Frames	= 2
e	: Solidity Ratio	= 0.350			

Exposure Constants per Table 26.11-1:

Alpha:	Table 26.11-1 Const	= 9.500	Zg:	Table 26.11-1 Const	= 900.000 ft
At:	Table 26.11-1 Const	= 0.105	Bt:	Table 26.11-1 Const	= 1.000
Am:	Table 26.11-1 Const	= 0.154	Bm:	Table 26.11-1 Const	= 0.650
C:	Table 26.11-1 Const	= 0.200	Eps:	Table 26.11-1 Const	= 0.200

Gust Factor Calculation:

Gust Factor Category I Rigid Structures - Simplified Method

G1	= For Rigid Structures (Nat. Freq.>1 Hz) use 0.85	= 0.85

Gust Factor Category II Rigid Structures - Complete Analysis

Zm	= 0.6 * Ht	= 15.000 ft
Izm	= Cc * (33 / Zm) ^ 0.167	= 0.228
Lzm	= L * (Zm / 33) ^ Epsilon	= 427.057
Q	= (1 / (1 + 0.63 * ((B + Ht) / Lzm)^0.63))^0.5	= 0.951
G2	= 0.925*((1+1.7*lzm*3.4*Q)/(1+1.7*3.4*lzm))	= 0.899

Gust Factor Used in Analysis

G	= Lessor Of G1 Or G2	= 0.850

Main Wind Force Resisting System (MWFRS) Calculations per Ch 27 Part 1:

LF	= Load Factor based upon STRENGTH Design	= 1.00
h	= Mean Roof Height above grade	= 12.500 ft
Kh	= Z < 15 ft [4.572 m]--> (2.01 * (15/zg)^(2/Alpha) {Table 26.10-1}	= 0.849
Kzt	= Topographic Factor is 1 since no Topographic feature specified	= 1.000
Kd	= Wind Directionality Factor per Table 26.6-1	= 0.85
qh	= (0.00256 * Kh * Kzt * Kd * Ke * V^2) * LF	= 22.06 psf

MWFRS Pressures per Fig 27.3-4 on Pitched Free Roof - Wind Dir 0 Deg
All wind pressures include a load factor of 1.0

Load Case	Cnw	Cnl	Pnw psf	Pnl psf
Load Case A	1.100	-0.170	20.63	-3.19
Load Case B	0.010	-0.960	0.19	-18.00

Notes:
Pnw = Pressure on windward portion of roof: qh*G*Cnw*LF {Eqn 27.3-4}
Pnl = Pressure On Leeward portion Of roof: qh*G*Cnl*LF [Eqn 27.3-4]
All wind pressures include a load factor of 1.0
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

Open Building Along Ridge Pressures per Fig 27.3-7 - Wind 90 Deg
All wind pressures include a load factor of 1.0

Roof Var	Start Dist ft	End Dist ft	CnA	CnB	Pressure PnA psf	Pressure PnB psf
Roof_1	0.000	12.500	-0.800	0.800	-15.00	15.00
Roof_2	12.500	25.000	-0.600	0.500	-11.25	9.38

Notes Roof Pressures:
Start Dist = Start Dist from Windward Edge End Dist = End Dist from Windward Edge
CnA = Cn for Load Case A CnB = Cn for Load Case B
PnA = qh*G*CnA {Eqn 27.4-3} PnB = qh*g*CnB {Eqn 27.4-3]
+ Pressures Acting TOWARD Surface - Pressures Acting AWAY from Surface

ROOF FRAMING ANALYSIS & DESIGN:

Pages 1,000 - 1,999

250-A Main Street
Klamath Falls, OR. 97601

E-Mail: info@structure1.com
Web: www.structure1.com

ph. (541) 850-6300
fax (541) 850-6233

PSE Consulting Engineers Inc.

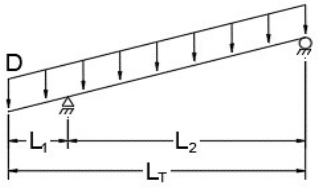
Project Number	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-02
Subject		Checked by		Date	

Rafters @ (A-B, 1-3)

L_1(Overhang): 2 ft

L_2: 9.5 ft

L_T: 11.5 ft



Distributed Load (D):

Tributary Width. 2 ft

Dead Load =	15	psf	*	2	=	30	plf
Snow Load + Sliding=	38.5	psf	*	2	=	77	plf
Wind Load =	-20.63	psf	*	2	=	-41.26	plf

Pg-112-113

Uplift (Wind) = 29 lbs Pg-1001

USE	**2x8 DF #2 Rafter @24" O.C**
Connection	Simpson LUS28 HANGER

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Mar. 2, 2023 21:57	Rafter@(A,B-1-3)

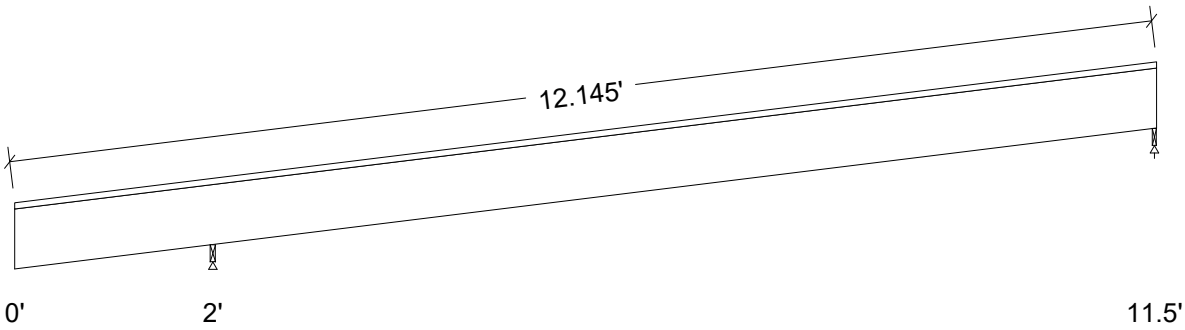
Design Check Calculation Sheet

WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Dead	Dead	Full Area	No			15.00(24.0")		psf
Snow Load	Snow	Full Area	Yes			38.50(24.0")		psf
Wind Uplift	Wind	Full Area	No			-20.63(24.0")		psf
Self-weight	Dead	Full UDL	No			2.6		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:					
Dead			238		157
Snow			534		360
Wind			-287		-188
Factored:					
Uplift			-29		-19
Total			773		517
Bearing:					
F'theta			666		666
Capacity					
Joist			1033		517
Support			773		607
Des ratio					
Joist			0.75		1.00
Support			1.00		0.85
Load comb			#2		#7
Length			0.66		0.52
Min req'd			0.66**		0.52
Cb			1.57		1.00
Cb min			1.57		1.00
Cb support			1.25		1.25
Fcp sup			625		625

**Minimum bearing length governed by the required width of the supporting member.

Rafter@(A-B,1-3)

Lumber-soft, D.Fir-L, No.2, 2x8 (1-1/2"x7-1/4")

Supports: All - Timber-soft Beam, D.Fir-L No.2

Roof joist spaced at 24.0" c/c; Total length: 12.38'; Clear span(horz): 2.0', 9.438'; Volume = 0.9 cu.ft.; Pitch: 4/12

Lateral support: top = continuous, bottom = at supports; Repetitive factor: applied where permitted (refer to online help);

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 64	Fv' = 207	psi	fv/Fv' = 0.31
Bending(+)	fb = 1082	Fb' = 1428	psi	fb/Fb' = 0.76
Bending(-)	fb = 203	Fb' = 995	psi	fb/Fb' = 0.20
Deflection:				
Interior Live	0.19 = L/616	0.50 = L/240	in	0.39
Total	0.32 = L/378	0.67 = L/180	in	0.48
Cantil. Live	-0.12 = L/203	0.21 = L/120	in	0.59
Total	-0.20 = L/127	0.28 = L/90	in	0.70

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	180	1.15	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	900	1.15	1.00	1.00	1.000	1.200	-	1.15	1.00	1.00	7
Fb'-	900	1.15	1.00	1.00	0.696	1.200	-	1.15	1.00	1.00	2
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.6 million	1.00	1.00	-	-	-	-	1.00	1.00	7
Emin'	0.58 million	1.00	1.00	-	-	-	-	1.00	1.00	7

CRITICAL LOAD COMBINATIONS:

```
 Shear     : LC #2  = D + S
 Bending(+): LC #7  = D + S (pattern: sS)
 Bending(-): LC #2  = D + S
 Deflection: LC #7  =   (live)
             LC #7  =   (total)
 Bearing   : Support 1 - LC #2 = D + S
             Support 2 - LC #7 = D + S (pattern: sS)
 Uplift    : Support 1 - LC #4 = 0.6D + 0.6W
             Support 2 - LC #4 = 0.6D + 0.6W
 D=dead S=snow W=wind
 All LC's are listed in the Analysis output
 Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
 Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
 V max = 524, V design = 461 (NDS 3.4.3.1(a)) lbs; M(+) = 1184 lbs-ft; M(-) = 223 lbs-ft
 EI = 76.21e06 lb-in^2
 "Live" deflection is due to all non-dead loads (live, wind, snow…)
 Total deflection = 1.50 permanent + "live"
 Bearing: Allowable bearing at an angle F'theta  calculated for each support
 as per NDS 3.10.3
 Lateral stability(-):  Lu = 10.00'  Le = 16.25'  RB = 25.1; Lu based on full span
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.
4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
5. SLOPED BEAMS: level bearing is required for all sloped beams.

PSE Consulting Engineers Inc.

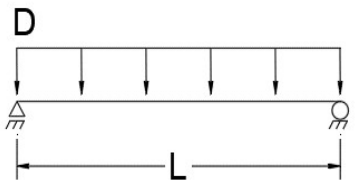
Project Numb	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-02
Subject		Checked by		Date	

Beam @(A- B-1)

L: 11.5 ft

Loads From Rafter **Pg-1001**

Dead Load=	238	lbs	/	2	=	119 plf
Snow Load=	534	lbs	/	2	=	267 plf
Wind Load(Uplift) =	-287	lbs	/	2	=	-144 plf



Uplift Reaction= -47 lb Pg- **1004**

USE: **6X10DF#1**

CONNECTION:	Simpson ECCLL666 Corner Column Caps

	COMPANY	PROJECT
WoodWorks® SOFTWARE FOR WOOD DESIGN		
	Mar. 2, 2023 22:05	Beam @(A-B,1)

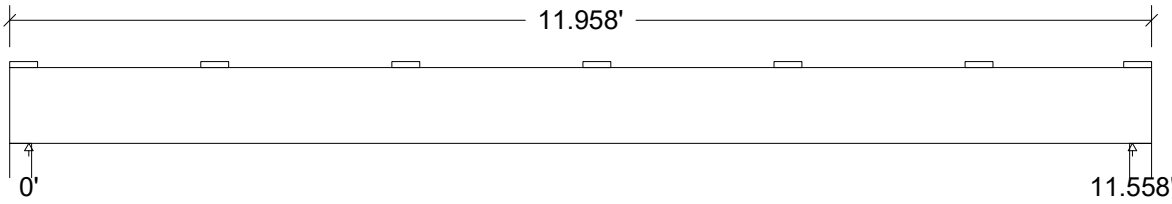
Design Check Calculation Sheet

WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Dead	Dead	Full UDL				119.0		plf
Snow	Snow	Full UDL				267.0		plf
Wind	Wind	Full UDL				-144.0		plf
Self-weight	Dead	Full UDL				12.4		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:			
Dead	783		783
Snow	1596		1596
Wind	-861		-861
Factored:			
Uplift	-47		-47
Total	2380		2380
Bearing:			
Capacity			
Beam	9453		9453
Support	13393		13393
Des ratio			
Beam	0.25		0.25
Support	0.18		0.18
Load comb	#2		#2
Length	2.75		2.75
Min req'd	0.69		0.69
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fc sup	700		700

Beam@ (A-B,1)

Timber-soft, D.Fir-L, No. 1, 6x10 (5-1/2"x9-1/2")

Supports: All - Timber-soft Column, D.Fir-L No.2

Total length: 11.94'; Clear span: 11.5'; Volume = 4.3 cu.ft.; Beam or stringer

Lateral support: top = 2'-0 bottom = at supports; (in);

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 57	Fv' = 195	psi	fv/Fv' = 0.29
Bending(+)	fb = 965	Fb' = 1552	psi	fb/Fb' = 0.62
Bending(-)	fb = 18	Fb' = 2160	psi	fb/Fb' = 0.01
Live Defl'n	0.17 = L/813	0.39 = L/360	in	0.44
Total Defl'n	0.30 = L/467	0.58 = L/240	in	0.51

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	170	1.15	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	1350	1.15	1.00	1.00	1.000	1.000	-	1.00	1.00	1.00	2
Fb'-	1350	1.60	1.00	1.00	1.000	1.000	-	1.00	1.00	1.00	4
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.6 million	1.00	1.00	-	-	-	-	1.00	1.00	2	

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D + S
Bending(+): LC #2  = D + S
Bending(-): LC #4  = 0.6D + 0.6W
Deflection: LC #2  = D + S  (live)
            LC #2  = D + S  (total)
Bearing   : Support 1 - LC #2 = D + S
            Support 2 - LC #2 = D + S
Uplift    : Support 1 - LC #4 = 0.6D + 0.6W
            Support 2 - LC #4 = 0.6D + 0.6W
D=dead S=snow W=wind
All LC's are listed in the Analysis output
Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
V max = 2302, V design = 1975 (NDS 3.4.3.1(a)) lbs; M(+) = 6653 lbs-ft; M(-) = 126 lbs-ft
EI = 628.73e06 lb-in^2
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

PSE Consulting Engineers Inc.

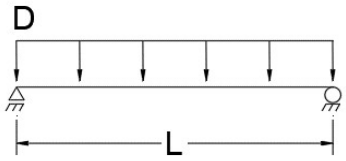
Project Numb	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-02
Subject		Checked by		Date	

Ridge Beam @(A- B,2)

L: 11.5 ft

Loads From Rafter **Pg-1001**

Dead Load=	157	lbs	/	2 *	2	=	157 plf
Snow Load=	360	lbs	/	2 *	2	=	360 plf
Wind Load(Uplift) =	-188	lbs	/	2 *	2	=	-188 plf



Uplift Reaction= -68 lb Pg- **Pg-1007**

USE:	**6X10 DF#1**
CONNECTION:	EPC6Z POST CAP AT POST & STUB

COMPANY	PROJECT
Mar. 2, 2023 22:11	Ridge Beam @(A-B,2)

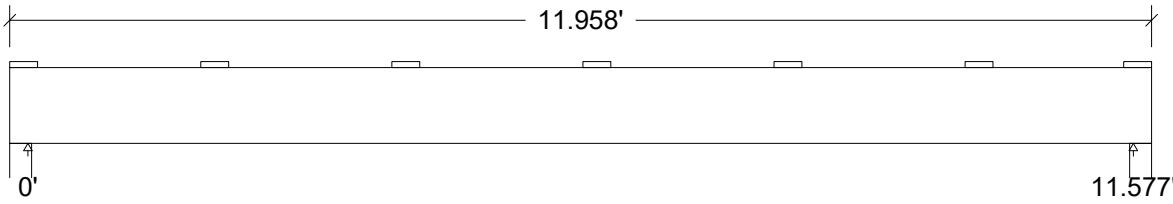
Design Check Calculation Sheet

WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	Location [ft] End	Magnitude Start	Magnitude End	Unit
Dead	Dead	Full UDL				157.0		plf
Snow	Snow	Full UDL				360.0		plf
Wind	Wind	Full UDL				-188.0		plf
Self-weight	Dead	Full UDL				12.4		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:			
Dead	1011		1011
Snow	2152		2152
Wind	-1124		-1124
Factored:			
Uplift	-68		-68
Total	3163		3163
Bearing:			
Capacity			
Beam	9453		9453
Support	13393		13393
Des ratio			
Beam	0.33		0.33
Support	0.24		0.24
Load comb	#2		#2
Length	2.75		2.75
Min req'd	0.92		0.92
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fc sup	700		700

Ridge Beam@ (A-B,2)

Timber-soft, D.Fir-L, No. 1, 6x10 (5-1/2"x9-1/2")

Supports: All - Timber-soft Column, D.Fir-L No.2

Total length: 11.94'; Clear span: 11.5'; Volume = 4.3 cu.ft.; Beam or stringer

Lateral support: top = 2'-0 bottom = at supports; (in);

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 75	Fv' = 195	psi	fv/Fv' = 0.39
Bending(+)	fb = 1286	Fb' = 1552	psi	fb/Fb' = 0.83
Bending(-)	fb = 27	Fb' = 2160	psi	fb/Fb' = 0.01
Live Defl'n	0.23 = L/600	0.39 = L/360	in	0.60
Total Defl'n	0.39 = L/351	0.58 = L/240	in	0.68

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	170	1.15	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	1350	1.15	1.00	1.00	1.000	1.000	-	1.00	1.00	1.00	2
Fb'-	1350	1.60	1.00	1.00	1.000	1.000	-	1.00	1.00	1.00	4
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.6 million	1.00	1.00	-	-	-	-	1.00	1.00	2	

CRITICAL LOAD COMBINATIONS:

```
 Shear     : LC #2  = D + S
 Bending(+): LC #2  = D + S
 Bending(-): LC #4  = 0.6D + 0.6W
 Deflection: LC #2  = D + S  (live)
             LC #2  = D + S  (total)
 Bearing   : Support 1 - LC #2 = D + S
             Support 2 - LC #2 = D + S
 Uplift    : Support 1 - LC #4 = 0.6D + 0.6W
             Support 2 - LC #4 = 0.6D + 0.6W
 D=dead S=snow W=wind
 All LC's are listed in the Analysis output
 Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
 V max = 3064, V design = 2625 (NDS 3.4.3.1(a)) lbs; M(+) = 8869 lbs-ft; M(-) = 187 lbs-ft
 EI = 628.73e06 lb-in^2
 "Live" deflection is due to all non-dead loads (live, wind, snow…)
 Total deflection = 1.50 permanent + "live"
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

PSE Consulting Engineers Inc.

Project Number	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-02
Subject		Checked by		Date	

Stub @(B,2)

L: 5 ft

Loads From Ridge Beam **Pg-1007**

Dead Load =	1011	lb
SnowLoad =	2152	lb
Uplift Wind Load =	-1124	lb

Uplift Reaction= -1124 lb **Pg-1010**

USE:	**6x6 DF #2 Post**
Connection:	Simpson PC6Z AT CROSS BEAM AT BASE

POST @(A,2)

L: 14.70 ft

Loads From Ridge Beam **Pg-1007**

Dead Load =	1011	lb
SnowLoad =	2152	lb
Uplift Wind Load =	-1124	lb

Uplift Reaction= -1124 lb **Pg-1012**

USE:	**6x6 DF #2 Post**

	COMPANY	PROJECT
WoodWorks® SOFTWARE FOR WOOD DESIGN		
	Mar. 2, 2023 22:24	Stub@(B,2)

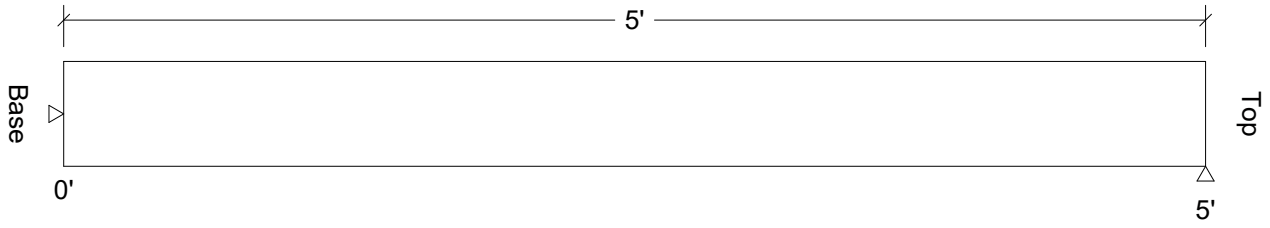
Design Check Calculation Sheet

WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Location [ft] Start	End	Magnitude Start	End	Unit
Dead	Dead	Axial	(Ecc. = 0.92")		1011		lbs
Snow Load	Snow	Axial	(Ecc. = 0.92")		2152		lbs
Wind Load	Wind	Axial	(Ecc. = 0.92")		-1124		lbs
Self-weight	Dead	Axial			36		lbs

Reactions (lbs):



Unfactored:			
Lateral:			
Dead	15		-15
Snow	33		-33
Wind	-17		17
Axial:			
Dead	1047		1047
Snow	2152		2152
Wind	-1124		-1124
Factored:			
R->L	-1		-48
Load comb	#4		#2
L->R	48		1
Load comb	#2		#4

Stub@(B,2)

Timber-soft, D.Fir-L, No.2, 6x6 (5-1/2"x5-1/2")

Support: Non-wood

Total length: 5.0'; Volume = 1.1 cu.ft.; Post or timber

Pinned base; Load face = width(b); Ke x Lb: 1.0 x 5.0 = 5.0 ft; Ke x Ld: 1.0 x 5.0 = 5.0 ft;

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 2	Fv' = 195	psi	fv/Fv' = 0.01
Bending(+)	fb = 105	Fb' = 862	psi	fb/Fb' = 0.12
Bending(-)	fb = 2	Fb' = 1200	psi	fb/Fb' = 0.00
Axial	fc = 106	Fc' = 759	psi	fc/Fc' = 0.14
Combined	(axial + eccentric moment)			Eq.15.4-3 = 0.15
Axial Bearing	fc = 106	Fc* = 805	psi	fc/Fc* = 0.13
Combined	(axial compression + side load bending)			Eq.3.9-3 = 0.00
Live Defl'n	0.00 = < L/999	0.50 = L/120	in	0.01
Total Defl'n	0.01 = < L/999	0.50 = L/120	in	0.02

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL/CP	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	170	1.15	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	750	1.15	1.00	1.00	1.000	1.000	-	1.00	1.00	1.00	2
Fb'-	750	1.60	1.00	1.00	1.000	1.000	-	1.00	1.00	1.00	4
Fc'	700	1.15	1.00	1.00	0.943	1.000	-	-	1.00	1.00	2
Fc'comb	700	1.60	-	-	0.915	-	-	-	-	-	4
E'	1.3 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.47 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Eminy'	0.47 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Fc*	700	1.15	1.00	1.00	-	1.000	-	-	1.00	1.00	2

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D + S
Bending(+): LC #2  = D + S
Bending(-): LC #4  = 0.6D + 0.6W
Deflection: LC #2  = D + S  (live)
            LC #2  = D + S  (total)
Axial     : LC #2  = D + S
Combined  : LC #4  = 0.6D + 0.6W
Combined  : LC #4  = 0.6D + 0.6W;
D=dead S=snow W=wind
All LC's are listed in the Analysis output
Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
V = 48 lbs; M(+) = 242 lbs-ft; M(-) = 5 lbs-ft; P = 3199 lbs, (1 - fc/FcE) = 1.00
EI = 99.13e06 lb-in^2
Combined: Fb' = 1200 psi; fb = 0 psi; fbe = (P x e)/S = fc(6e/d) = 2 psi;
FcE = 3246 psi
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Axial b used, l/b = 10.9, l/d = 10.9
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. FIRE RATING: may be conservative relative to approved code provisions for "short" columns.
4. Axial load eccentricity applied in direction of load face only. It is the designers responsibility to check for effect of eccentricity in the other direction.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Mar. 2, 2023 22:17	Post@(A,2)

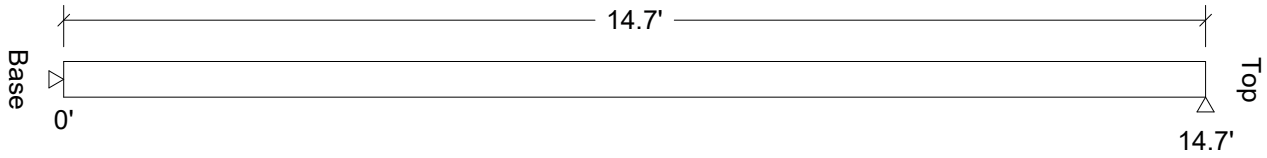
Design Check Calculation Sheet

WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Location [ft] Start	End	Magnitude Start	End	Unit
Dead	Dead	Axial	(Ecc. = 0.92")		1011		lbs
Snow Load	Snow	Axial	(Ecc. = 0.92")		2152		lbs
Wind Load	Wind	Axial	(Ecc. = 0.92")		-1124		lbs
Self-weight	Dead	Axial			106		lbs

Reactions (lbs):



Unfactored:			
Lateral:			
Dead	5		-5
Snow	11		-11
Wind	-6		6
Axial:			
Dead	1117		1117
Snow	2152		2152
Wind	-1124		-1124
Factored:			
R->L	-0		-16
Load comb	#4		#2
L->R	16		0
Load comb	#2		#4

Post@(A,2)

Timber-soft, D.Fir-L, No.2, 6x6 (5-1/2"x5-1/2")

Support: Non-wood

Total length: 14.69'; Volume = 3.1 cu.ft.; Post or timber

Pinned base; Load face = width(b); Ke x Lb: 1.0 x 14.7 = 14.7 ft; Ke x Ld: 1.0 x 14.7 = 14.7 ft;

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 1	Fv' = 195	psi	fv/Fv' = 0.00
Bending(+)	fb = 105	Fb' = 862	psi	fb/Fb' = 0.12
Bending(-)	fb = 2	Fb' = 1200	psi	fb/Fb' = 0.00
Axial	fc = 108	Fc' = 330	psi	fc/Fc' = 0.33
Combined	(axial + eccentric moment)			Eq.15.4-3 = 0.29
Axial Bearing	fc = 108	Fc* = 805	psi	fc/Fc* = 0.13
Combined	(axial compression + side load bending)			Eq.3.9-3 = 0.00
Live Defl'n	0.04 = < L/999	1.47 = L/120	in	0.03
Total Defl'n	0.07 = < L/999	1.47 = L/120	in	0.05

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL/CP	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	170	1.15	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	750	1.15	1.00	1.00	1.000	1.000	-	1.00	1.00	1.00	2
Fb'-	750	1.60	1.00	1.00	1.000	1.000	-	1.00	1.00	1.00	4
Fc'	700	1.15	1.00	1.00	0.410	1.000	-	-	1.00	1.00	2
Fc'comb	700	1.60	-	-	0.308	-	-	-	-	-	4
E'	1.3 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.47 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Eminy'	0.47 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Fc*	700	1.15	1.00	1.00	-	1.000	-	-	1.00	1.00	2

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D + S
Bending(+): LC #2  = D + S
Bending(-): LC #4  = 0.6D + 0.6W
Deflection: LC #2  = D + S  (live)
            LC #2  = D + S  (total)
Axial     : LC #2  = D + S
Combined  : LC #4  = 0.6D + 0.6W
Combined  : LC #4  = 0.6D + 0.6W;
D=dead S=snow W=wind
All LC's are listed in the Analysis output
Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
V = 16 lbs; M(+) = 242 lbs-ft; M(-) = 5 lbs-ft; P = 3269 lbs, (1 - fc/FcE) = 1.00
EI = 99.13e06 lb-in^2
Combined: Fb' = 1200 psi; fb = 0 psi; fbe = (P x e)/S = fc(6e/d) = 2 psi;
FcE = 376 psi
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Axial b used, l/b = 32.1, l/d = 32.1
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Axial load eccentricity applied in direction of load face only. It is the designers responsibility to check for effect of eccentricity in the other direction.

PSE Consulting Engineers Inc.

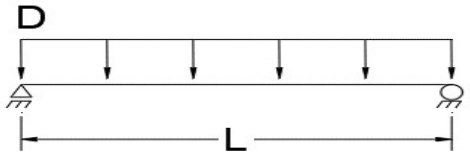
Project Numb	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-02
Subject		Checked by		Date	

Cross Beam @(A- B-1)

L: 19 ft

Reaction From Stub

Dead Load =	1047	lb	**Pg-1010**
SnowLoad =	2152	lb	
Uplift Wind Load =	-1124	lb	



Uplift Reaction= -562 lb Pg- **Pg-1015**

USE: **5-1/8"X12". Glulam -Unbalanced 24F-1.8E WS.**

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Mar. 2, 2023 22:28	Cross Beam@ (B,1-3)

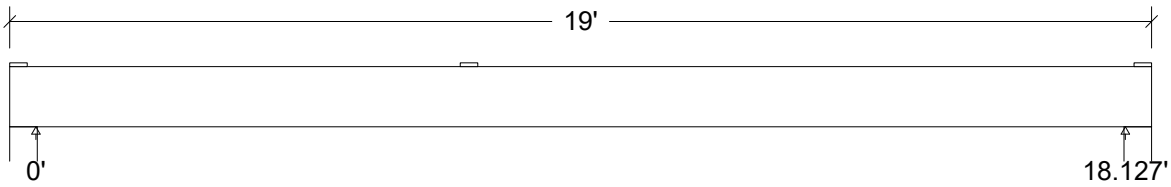
Design Check Calculation Sheet

WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Dead Load	Dead	Point		9.50		1047		lbs
Snow Load	Snow	Point		9.50		2152		lbs
Wind Load	Wind	Point		9.50		-1124		lbs
Self-weight	Dead	Full UDL				14.2		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:			
Dead	652		652
Snow	1076		1076
Wind	-562		-562
Factored:			
Total	1728		1728
Bearing:			
Capacity			
Beam	18322		18322
Support	22691		22691
Des ratio			
Beam	0.09		0.09
Support	0.08		0.08
Load comb	#2		#2
Length	5.50		5.50
Min req'd	0.52		0.52
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fc sup	700		700

Cross Beam@ (B,1-3)

Glulam-Unbalan., West Species, 24F-1.8E WS, 5-1/8"x12"

Supports: All - Timber-soft Column, D.Fir-L No.2

Total length: 19.0'; Clear span: 18.063'; Volume = 8.1 cu.ft.; 8 laminations, 5-1/8" maximum width,

Lateral support: top = 7'-6 bottom = at supports; (in);

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 42	Fv' = 305	psi	fv/Fv' = 0.14
Bending(+)	fb = 1471	Fb' = 2721	psi	fb/Fb' = 0.54
Live Defl'n	0.35 = L/626	0.91 = L/240	in	0.38
Total Defl'n	0.64 = L/340	0.91 = L/240	in	0.71

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Notes	Cvr	LC#
Fv'	265	1.15	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	2400	1.15	1.00	1.00	0.986	1.000	-	-	1.00	1.00	-	2
Fcp'	650	-	1.00	1.00	-	-	-	-	1.00	-	-	-
E'	1.8 million		1.00	1.00	-	-	-	-	1.00	-	-	2
Eminy'	0.85 million		1.00	1.00	-	-	-	-	1.00	-	-	2

CRITICAL LOAD COMBINATIONS:

```
 Shear     : LC #2  = D + S
 Bending(+): LC #2  = D + S
 Deflection: LC #2  = D + S  (live)
             LC #2  = D + S  (total)
 Bearing   : Support 1 - LC #2 = D + S
             Support 2 - LC #2 = D + S
 D=dead S=snow W=wind
 All LC's are listed in the Analysis output
 Load Patterns: s=S/2,  X=L+S or L+Lr,  _=no pattern load in this span
 Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
 V max = 1714, V design = 1714 (NDS 3.4.3.1(a)) lbs; M(+) = 15078 lbs-ft
 EI = 1328.38e06 lb-in^2
 "Live" deflection is due to all non-dead loads (live, wind, snow…)
 Total deflection = 1.50 permanent + "live"
 Lateral stability(+):  Lu = 7.50'  Le = 15.25'  RB = 9.1
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Glulam design values are for materials conforming to ANSI 117-2015 and manufactured in accordance with ANSI A190.1-2012
4. GLULAM: bxd = actual breadth x actual depth.
5. Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
6. GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).

PSE Consulting Engineers Inc.

Project Number	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-31
Subject		Checked by		Date	

POST@(A,1)

L: 9.7 ft

Load From the Beam **Pg-1004**

Dead Load= 783 lbs

Snow Load= 1596 lbs

Wind Load= -831 lbs

USE **6X6 #1 DF POST W/ AWP66 AT BASE & EPC6Z AT TOP**

	COMPANY	PROJECT
WoodWorks® SOFTWARE FOR WOOD DESIGN	Mar. 31, 2023 20:50	Post@(A,1)

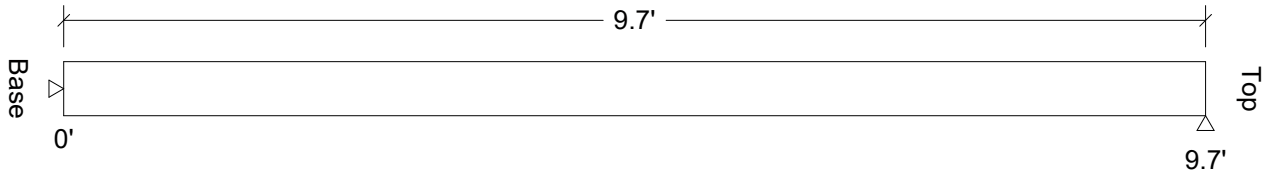
Design Check Calculation Sheet

WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Location [ft] Start	End	Magnitude Start	End	Unit
Dead	Dead	Axial	(Ecc. = 0.92")		783		lbs
Snow Load	Snow	Axial	(Ecc. = 0.92")		1596		lbs
Wind Load	Wind	Axial	(Ecc. = 0.92")		-861		lbs
Self-weight	Dead	Axial			70		lbs

Reactions (lbs):



Unfactored:			
Lateral:			
Dead	6		-6
Snow	13		-13
Wind	-7		7
Axial:			
Dead	853		853
Snow	1596		1596
Wind	-861		-861
Factored:			
R->L	-0		-19
Load comb	#4		#2
L->R	19		0
Load comb	#2		#4

Post@(B,1)

Timber-soft, D.Fir-L, No.1, 6x6 (5-1/2"x5-1/2")

Support: Non-wood

Total length: 9.69'; Volume = 2.0 cu.ft.; Post or timber

Pinned base; Load face = width(b); Incised; Ke x Lb: 1.0 x 9.7 = 9.7 ft; Ke x Ld: 1.0 x 9.7 = 9.7 ft;

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 1	Fv' = 156	psi	fv/Fv' = 0.01
Bending(+)	fb = 79	Fb' = 1104	psi	fb/Fb' = 0.07
Bending(-)	fb = 2	Fb' = 1536	psi	fb/Fb' = 0.00
Axial	fc = 81	Fc' = 611	psi	fc/Fc' = 0.13
Combined	(axial + eccentric moment)			Eq.15.4-3 = 0.10
Axial Bearing	fc = 81	Fc* = 920	psi	fc/Fc* = 0.09
Combined	(axial compression + side load bending)			Eq.3.9-3 = 0.00
Live Defl'n	0.01 = < L/999	0.97 = L/120	in	0.01
Total Defl'n	0.02 = < L/999	0.97 = L/120	in	0.02

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL/CP	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	170	1.15	1.00	1.00	-	-	-	-	1.00	0.80	2
Fb'+	1200	1.15	1.00	1.00	1.000	1.000	-	1.00	1.00	0.80	2
Fb'-	1200	1.60	1.00	1.00	1.000	1.000	-	1.00	1.00	0.80	4
Fc'	1000	1.15	1.00	1.00	0.664	1.000	-	-	1.00	0.80	2
Fc'comb	1000	1.60	-	-	0.539	-	-	-	-	-	4
E'	1.6 million		1.00	1.00	-	-	-	-	1.00	0.95	2
Emin'	0.58 million		1.00	1.00	-	-	-	-	1.00	0.95	2
Eminy'	0.58 million		1.00	1.00	-	-	-	-	1.00	0.95	2
Fc*	1000	1.15	1.00	1.00	-	1.000	-	-	1.00	0.80	2

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D + S
Bending(+): LC #2  = D + S
Bending(-): LC #4  = 0.6D + 0.6W
Deflection: LC #2  = D + S  (live)
            LC #2  = D + S  (total)
Axial     : LC #2  = D + S
Combined  : LC #4  = 0.6D + 0.6W
Combined  : LC #4  = 0.6D + 0.6W;
D=dead S=snow W=wind
All LC's are listed in the Analysis output
Load combinations: ASD Basic from ASCE 7-16 2.4
```

CALCULATIONS:

```
V = 19 lbs; M(+) = 182 lbs-ft; M(-) = 4 lbs-ft; P = 2449 lbs, (1 - fc/FcE) = 1.00
EI = 122.01e06 lb-in^2
Combined: Fb' = 1536 psi; fb = 0 psi; fbe = (P x e)/S = fc(6e/d) = 2 psi;
FcE = 852 psi
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Axial b used, l/b = 21.2, l/d = 21.2
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Axial load eccentricity applied in direction of load face only. It is the designers responsibility to check for effect of eccentricity in the other direction.

FOUNDATION ANALYSIS & DESIGN:

Pages 2,000 - 2,999

250-A Main Street
Klamath Falls, OR. 97601

E-Mail: info@structure1.com
Web: www.structure1.com

ph. (541) 850-6300
fax (541) 850-6233

PSE Consulting Engineers Inc.

Project Number	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-02
Subject		Checked by		Date	

Footing (B,1)

Reaction From The Post **Pg-3008**

Forces = 4213 lbs

USE	**2'-0" Dia X 2'-0" Deep Footing**

Circular Footing Bearing and Uplift Capacity (Load Combination)

Project:

DATA NEEDED:

	Inputs	
Concrete Unit Weight	150	pcf
Diameter	2	ft
Total Height of Pier	2	ft
Friction Depth Per Geotech Report	2	ft
Skin Friction Per GeoTech Report/Min. per IBC	250	**psf** (If no soil report value shall not exceed 1/6th of bearing capacity) IBC 1810.3.3.1.4.
Bearing Capacity @ Bottom Per GeoTech Report/Min. per IBC	1500	psf (net)
Downward Axial Force from Structure(ASD Max Gravity)	4213	lb **Pg-3008**
Uplift Force from Structure (ASD max uplift)	0	lb
Use of Skin friction allowed for downward force resistance per Geotech report?	0	type 0 for no, 1 for yes

CHECK FOR BEARING (DOWNWARD)

	Outputs		
Bottom Bearing Area (ft^2)	3.14	pi*(Dia./2)^2	
Side Contact Area (ft^2)	12.57	2*pi*(Dia./2)*Depth	
Weight of Footing (lb)	942	pi*(Dia./2)^2*Height*Unit Weight	
Downward Side Friction (lb)	1571	SideArea*Friction/2 (IBC 1810.3.3.1.5)	
Downward Axial Capacity (lb)	4712	IF(Use of Skin friction is allowed, **then**, Bearing*BottomArea+DownFric **otherwise** BottomArea*Bearing)	Safe for Bearing

CHECK FOR UPLIFT

	Outputs		
Side Contact Area (ft^2)	12.57	2*pi*(Dia./2)*Depth	
Weight of Footing (lb)	942	pi*(Dia./2)^2*Height*Unit Weight	
Uplift Side Friction (lb)	1571	SideArea*Friction/2 (IBC 1810.3.3.1.5)	
Uplift Capacity (lb)	2136	(0.6*Weight)+Side Friction	Safe for Uplift

PSE Consulting Engineers Inc.

Project Number	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-31
Subject		Checked by		Date	

Footing (A,1)

Reaction From The Post **Pg-1018**

Dead Load=	853	lbs
Snow Load=	1596	lbs
Wind Load=	-861	lbs

USE **3'-0 X 2'-6" X 1'6" Deep Footing W/ #4 Bars @ 6" O.C.**

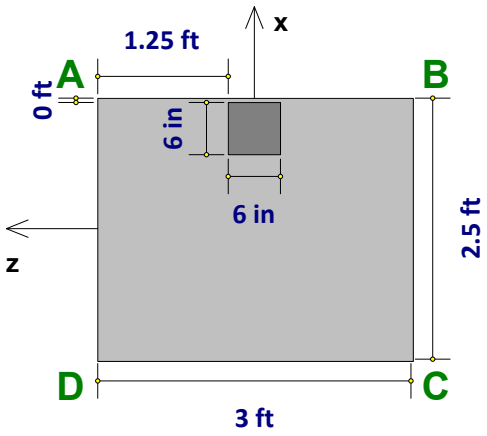
Company :
Designer :
Job Number :

March 31, 2023

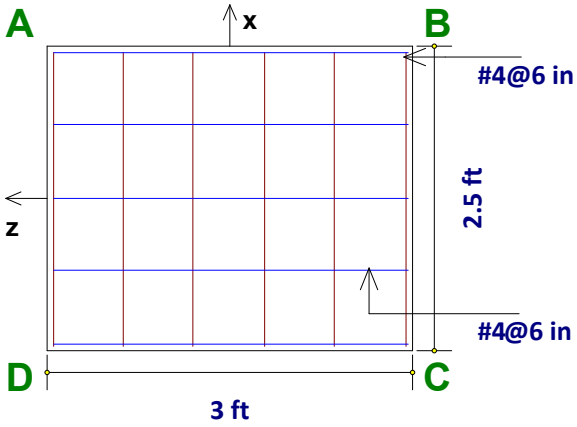
Footing 1 - N1

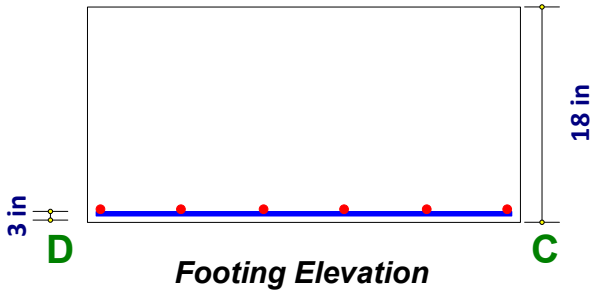
Checked By:_____

Sketch



Details



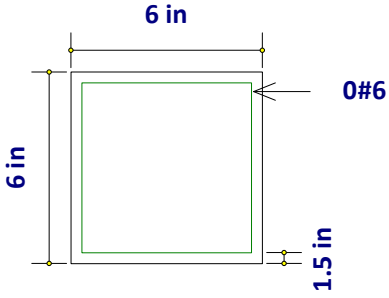


Footing Elevation

x Dir. Steel: 1.18 in^2 (6 #4)

z Dir. Steel: 0.98 in^2 (5 #4)

Bottom Rebar Plan



Pedestal Rebar Plan

Company :
Designer :
Job Number :

March 31, 2023

Footing 1 - N1

Checked By:_____

Geometry, Materials and Criteria

Length	: **3 ft**	eX	: **12 in**	Gross Allow. Bearing	: **1.5 ksf (gross)**	Steel fy	: **60 ksi**
Width	: **2.5 ft**	eZ	: **0 in**	Concrete Weight	: **0.145 k/ft^3**	Minimum Steel	: **.0018**
Thickness	: **18 in**	pX	: **6 in**	Concrete f'c	: **3 ksi**	Maximum Steel	: **.0075**
Height	: **0 in**	pZ	: **6 in**	Design Code	: **ACI 318-19**		
Rot. Angle	: **0 deg**						

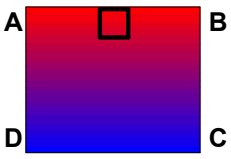
Footing Top Bar Cover	: **1.5 in**	Overturning / Sliding SF	: **VARIES**	Phi for Flexure	: **0.9**
Footing Bottom Bar Cover	: **3 in**	Coefficient of Friction	: **0.3**	Phi for Shear	: **0.75**
Pedestal Longitudinal Bar Cover	: **1.5 in**	Passive Resistance of Soil	: **0 k**		**0.65**

Loads

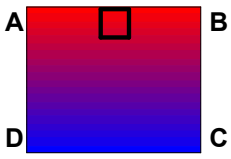
	P (k)	Vx (k)	Vz (k)	Mx (k-ft)	Mz (k-ft)	Overburden (ksf)
DL	**0.853**					**0.1**
WL	**-0.861**					
SL	**1.596**					

Soil Bearing

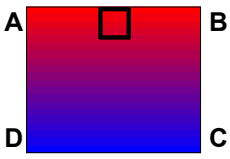
Description	Categories and Factors	Gross Allow.(ksf)	Max Bearing (ksf)	Max/Allowable Ratio
IBC 16-8	**1DL**	**1.5**	**0.704 (A)**	**0.469**
IBC 16-9	**1DL+1HL+1LL+1LLS**	**1.5**	**0.704 (A)**	**0.469**
IBC 16-10 (a)	**1DL+1HL+1RLL**	**1.5**	**0.704 (A)**	**0.469**
IBC 16-10 (b)	**1DL+1HL+1SL+0.75SLN**	**1.5**	**1.445 (A)**	**0.963**
IBC 16-10 (c)	**1DL+1HL+1RL**	**1.5**	**0.704 (A)**	**0.469**
IBC 16-11 (a)	**1DL+1HL+0.75LL+0.75LLS..**	**1.5**	**0.704 (A)**	**0.469**
IBC 16-11 (b)	**1DL+1HL+0.75LL+0.75LLS..**	**1.5**	**1.251 (A)**	**0.834**
IBC 16-11 (c)	**1DL+1HL+0.75LL+0.75LLS..**	**1.5**	**0.704 (A)**	**0.469**
IBC 16-12 (a)	**1DL+1HL+0.6WL**	**1.5**	**0.47 (A)**	**0.313**
IBC 16-13 (a)	**1DL+1HL+0.45WL+0.75LL+..**	**1.5**	**0.529 (A)**	**0.352**
IBC 16-13 (b)	**1DL+1HL+0.45WL+0.75LL+..**	**1.5**	**1.071 (A)**	**0.714**
IBC 16-13 (c)	**1DL+1HL+0.45WL+0.75LL+..**	**1.5**	**0.529 (A)**	**0.352**
IBC 16-15	**0.6DL+1HL+0.6WL**	**1.5**	**0.191 (C)**	**0.128**



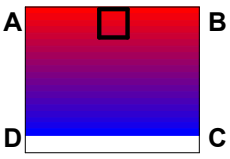
1DL
QA: 0.704 ksf
QB: 0.704 ksf
QC: 0.158 ksf
QD: 0.158 ksf
NAZ: -1 in
NAX: 38.698 in



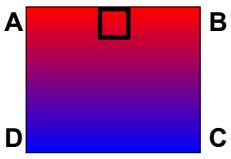
1DL+1HL+1LL+1..
QA: 0.704 ksf
QB: 0.704 ksf
QC: 0.158 ksf
QD: 0.158 ksf
NAZ: -1 in
NAX: 38.698 in



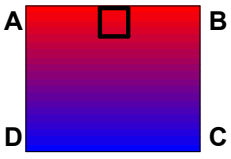
1DL+1HL+1RLL
QA: 0.704 ksf
QB: 0.704 ksf
QC: 0.158 ksf
QD: 0.158 ksf
NAZ: -1 in
NAX: 38.698 in



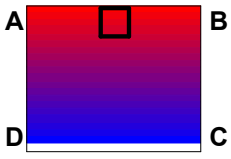
1DL+1HL+1SL+0..
QA: 1.445 ksf
QB: 1.445 ksf
QC: 0 ksf
QD: 0 ksf
NAZ: -1 in
NAX: 26.748 in



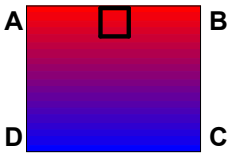
1DL+1HL+1RL
QA: 0.704 ksf
QB: 0.704 ksf
QC: 0.158 ksf
QD: 0.158 ksf
NAZ: -1 in
NAX: 38.698 in



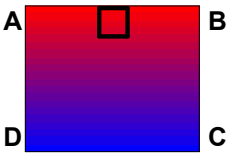
1DL+1HL+0.75L..
QA: 0.704 ksf
QB: 0.704 ksf
QC: 0.158 ksf
QD: 0.158 ksf
NAZ: -1 in
NAX: 38.698 in



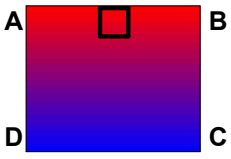
1DL+1HL+0.75L..
QA: 1.251 ksf
QB: 1.251 ksf
QC: 0 ksf
QD: 0 ksf
NAZ: -1 in
NAX: 28.346 in



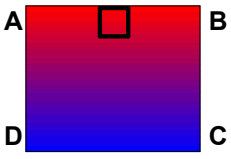
1DL+1HL+0.75L..
QA: 0.704 ksf
QB: 0.704 ksf
QC: 0.158 ksf
QD: 0.158 ksf
NAZ: -1 in
NAX: 38.698 in



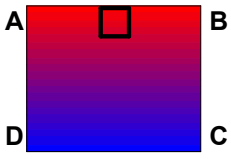
1DL+1HL+0.6WL
QA: 0.47 ksf
QB: 0.47 ksf
QC: 0.255 ksf
QD: 0.255 ksf
NAZ: -1 in
NAX: 65.491 in



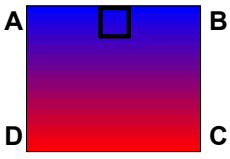
1DL+1HL+0.45W..
QA: 0.529 ksf
QB: 0.529 ksf
QC: 0.231 ksf
QD: 0.231 ksf
NAZ: -1 in
NAX: 53.218 in



1DL+1HL+0.45W..
QA: 1.071 ksf
QB: 1.071 ksf
QC: 0.007 ksf
QD: 0.007 ksf
NAZ: -1 in
NAX: 30.202 in



1DL+1HL+0.45W..
QA: 0.529 ksf
QB: 0.529 ksf
QC: 0.231 ksf
QD: 0.231 ksf
NAZ: -1 in
NAX: 53.218 in



0.6DL+1HL+0.6WL
QA: 0.188 ksf
QB: 0.188 ksf
QC: 0.191 ksf
QD: 0.191 ksf
NAZ: -1 in
NAX: 1869.102 in

Company :
Designer :
Job Number :

March 31, 2023

Footing 1 - N1

Checked By:_____

Footing Flexure Design (Bottom Bars)

As-min x-dir (Top Flexure): **0 in^2**
As-min z-dir (Top Flexure): **0 in^2**
As-min x-dir (Bot Flexure): **1.166 in^2**
As-min z-dir (Bot Flexure): **0.972 in^2**

As-min x-dir (T & S): **1.166 in^2**
As-min z-dir (T & S): **0.972 in^2**

Description	Categories and Factors	Mu-xx UC Max	Mu-xx (k-ft)	z-Dir As Required (in^2)	z-Dir As Provided (in^2)	Mu-zz UC Max	Mu-zz (k-ft)	x-Dir As Required (in^2)	x-Dir As Provided (in^2)
IBC 16-1	1.4DL	0.00499	0.31	0.005	0.982	0	0	0	1.178
IBC 16-2 (a..	1.2DL+1.6LL+1.6L..	0.00427	0.27	0.004	0.982	0	0	0	1.178
IBC 16-2 (b..	1.2DL+1.6LL+1.6L..	0.00761	0.47	0.007	0.982	0	0	0	1.178
IBC 16-2 (c..	1.2DL+1.6LL+1.6L..	0.00427	0.27	0.004	0.982	0	0	0	1.178
IBC 16-3 (a..	1.2DL+1.6RLL+1.6..	0.00427	0.27	0.004	0.982	0	0	0	1.178
IBC 16-3 (b..	1.2DL+1.6RLL+1.6..	0.00248	0.15	0.002	0.982	0	0	0	1.178
IBC 16-3 (c..	1.2DL+1.6SL+1.6S..	0.01494	0.93	0.014	0.982	0	0	0	1.178
IBC 16-3 (d..	1.2DL+1.6SL+1.6S..	0.01314	0.82	0.013	0.982	0	0	0	1.178
IBC 16-3 (e..	1.2DL+1.6RL+1.6H..	0.00427	0.27	0.004	0.982	0	0	0	1.178
IBC 16-3 (f..	1.2DL+1.6RL+1.6H..	0.00248	0.15	0.002	0.982	0	0	0	1.178
IBC 16-4 (a..	1.2DL+1WL+0.5LL+..	0.00068	0.04	0.001	0.982	0	0	0	1.178
IBC 16-4 (b..	1.2DL+1WL+0.5LL+..	0.00401	0.25	0.004	0.982	0	0	0	1.178
IBC 16-4 (c..	1.2DL+1WL+0.5LL+..	0.00068	0.04	0.001	0.982	0	0	0	1.178
IBC 16-6	0.9DL+1WL+1.6HL	0	0	0	0.982	0.00012	0.01	0	1.178

Footing Flexure Design (Top Bars)

Description	Categories and Factors	Mu-xx (k-ft)	z Dir As (in^2)	Mu-zz (k-ft)	x Dir As (in^2)
SW+OB	1SW+1OB-(IBC 16-6,IBC 16-6)	0.086	0	0.182	0

Moment Capacity of Plain Concrete Section Along xx and zz= **17.527k-ft,21.033k-ft** Per Chapter 22 of ACI 318.

Footing Shear Check

Two Way (Punching) Vc: **134.902 k** One Way (x Dir. Cut) Vc **25.002 k** One Way (z Dir. Cut) Vc: **30.003 k**

Description	Categories and Factors	Punching Vu(k)	Punching Vu/⌀Vc	x Dir. Cut Vu(k)	x Dir. Cut Vu/⌀Vc	z Dir. Cut Vu(k)	z Dir. Cut Vu/⌀Vc
IBC 16-1	1.4DL	0.493	0.005	0.017	0	0.242	0.011
IBC 16-2 (a)	1.2DL+1.6LL+1.6LLS+1.6..	0.422	0.004	0.014	0	0.207	0.009
IBC 16-2 (b)	1.2DL+1.6LL+1.6LLS+1.6..	0.751	0.007	0.025	0.001	0.369	0.016
IBC 16-2 (c)	1.2DL+1.6LL+1.6LLS+1.6..	0.422	0.004	0.014	0	0.207	0.009
IBC 16-3 (a)	1.2DL+1.6RLL+1.6HL+0.5..	0.422	0.004	0.014	0	0.207	0.009
IBC 16-3 (b)	1.2DL+1.6RLL+1.6HL+0.5WL	0.245	0.002	0.008	0	0.12	0.005
IBC 16-3 (c)	1.2DL+1.6SL+1.6SLN+1.6..	1.444	0.014	0.05	0.003	0.697	0.031
IBC 16-3 (d)	1.2DL+1.6SL+1.6SLN+1.6..	1.28	0.013	0.044	0.002	0.626	0.028
IBC 16-3 (e)	1.2DL+1.6RL+1.6HL+0.5L..	0.422	0.004	0.014	0	0.207	0.009
IBC 16-3 (f)	1.2DL+1.6RL+1.6HL+0.5WL	0.245	0.002	0.008	0	0.12	0.005
IBC 16-4 (a)	1.2DL+1WL+0.5LL+1LLS+1..	0.067	0	0.002	0	0.033	0.001
IBC 16-4 (b)	1.2DL+1WL+0.5LL+1LLS+1..	0.396	0.004	0.013	0	0.195	0.009
IBC 16-4 (c)	1.2DL+1WL+0.5LL+1LLS+1..	0.067	0	0.002	0	0.033	0.001
IBC 16-6	0.9DL+1WL+1.6HL	NA	NA	0.001	0	0.019	0

Overturning Check (Service)

Description	Categories and Factors	Mo-xx (k-ft)	Ms-xx (k-ft)	Mo-zz (k-ft)	Ms-zz (k-ft)	OSF-xx	OSF-zz
IBC 16-8	**1DL**	**0**	**4.851**	**0**	**3.19**	**NA**	**NA**
IBC 16-9	**1DL+1HL+1LL+1LLS**	**0**	**4.851**	**0**	**3.19**	**NA**	**NA**
IBC 16-10 (a)	**1DL+1HL+1RLL**	**0**	**4.851**	**0**	**3.19**	**NA**	**NA**
IBC 16-10 (b)	**1DL+1HL+1SL+0.75..**	**0**	**7.245**	**0**	**3.589**	**NA**	**NA**
IBC 16-10 (c)	**1DL+1HL+1RL**	**0**	**4.851**	**0**	**3.19**	**NA**	**NA**
IBC 16-11 (a)	**1DL+1HL+0.75LL+0..**	**0**	**4.851**	**0**	**3.19**	**NA**	**NA**
IBC 16-11 (b)	**1DL+1HL+0.75LL+0..**	**0**	**6.647**	**0**	**3.489**	**NA**	**NA**
IBC 16-11 (c)	**1DL+1HL+0.75LL+0..**	**0**	**4.851**	**0**	**3.19**	**NA**	**NA**
IBC 16-12 (a)	**1DL+1HL+0.6WL**	**0.775**	**4.851**	**1.162**	**4.896**	**6.261**	**4.212**
IBC 16-13 (a)	**1DL+1HL+0.45WL+0..**	**0.581**	**4.851**	**0.872**	**4.896**	**8.348**	**5.616**
IBC 16-13 (b)	**1DL+1HL+0.45WL+0..**	**0.581**	**6.647**	**0.872**	**7.589**	**11.437**	**8.705**
IBC 16-13 (c)	**1DL+1HL+0.45WL+0..**	**0.581**	**4.851**	**0.872**	**4.896**	**8.348**	**5.616**
IBC 16-15	**0.6DL+1HL+0.6WL**	**0.775**	**2.911**	**1.162**	**2.937**	**3.756**	**2.527**

Mo-xx: Governing Overturning Moment about AD or BC
Ms-xx: Governing Stablizing Moment about AD or BC
OSF-xx: Ratio of Ms-xx to Mo-xx

Sliding Check (Service)

Description	Categories and Factors	Va-xx (k)	Vr-xx (k)	Va-zz (k)	Vr-zz (k)	SR-xx	SR-zz
IBC 16-8	**1DL**	**0**	**0.963**	**0**	**0.963**	**NA**	**NA**
IBC 16-9	**1DL+1HL+1LL+1LLS**	**0**	**0.963**	**0**	**0.963**	**NA**	**NA**
IBC 16-10 (a)	**1DL+1HL+1RLL**	**0**	**0.963**	**0**	**0.963**	**NA**	**NA**
IBC 16-10 (b)	**1DL+1HL+1SL+0.75..**	**0**	**1.442**	**0**	**1.442**	**NA**	**NA**
IBC 16-10 (c)	**1DL+1HL+1RL**	**0**	**0.963**	**0**	**0.963**	**NA**	**NA**
IBC 16-11 (a)	**1DL+1HL+0.75LL+0..**	**0**	**0.963**	**0**	**0.963**	**NA**	**NA**
IBC 16-11 (b)	**1DL+1HL+0.75LL+0..**	**0**	**1.322**	**0**	**1.322**	**NA**	**NA**
IBC 16-11 (c)	**1DL+1HL+0.75LL+0..**	**0**	**0.963**	**0**	**0.963**	**NA**	**NA**
IBC 16-12 (a)	**1DL+1HL+0.6WL**	**0**	**0.808**	**0**	**0.808**	**NA**	**NA**
IBC 16-13 (a)	**1DL+1HL+0.45WL+0..**	**0**	**0.847**	**0**	**0.847**	**NA**	**NA**
IBC 16-13 (b)	**1DL+1HL+0.45WL+0..**	**0**	**1.206**	**0**	**1.206**	**NA**	**NA**
IBC 16-13 (c)	**1DL+1HL+0.45WL+0..**	**0**	**0.847**	**0**	**0.847**	**NA**	**NA**
IBC 16-15	**0.6DL+1HL+0.6WL**	**0**	**0.423**	**0**	**0.423**	**NA**	**NA**

Va-xx: Applied Lateral Force to Cause Sliding Along xx Axis
Vr-xx: Resisting Lateral Force Against Sliding Along xx Axis
SR-xx: Ratio of Vr-xx to Va-xx

LATERAL ANALYSIS & DESIGN:

Pages 3,000 - 3,999

250-A Main Street
Klamath Falls, OR. 97601

E-Mail: info@structure1.com
Web: www.structure1.com

ph. (541) 850-6300
fax (541) 850-6233

PSE Consulting Engineers Inc.

Project Number	223-002				
Project Name	Custom decks	Designed by	DI	Date	2023-03-02
Subject		Checked by		Date	

Lateral Analysis- Patio frame

Dead Load From Stub **Pg-1010**

Dead Load=	1047	lbs
Snow Load=	2152	lbs
Wind Load=	-1124	lbs

Dead Load From Beam **Pg-1004**

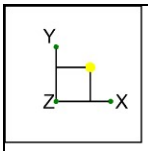
Dead Load=	783	lbs
Snow Load=	1596	lbs
Wind Load=	-861	lbs

Wind Lateral

Lateral Wind Load= 20.63 Psf cos(71.57) x19ft*(13ft/2)

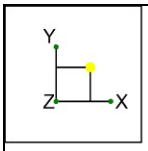
= 805.48 lbs

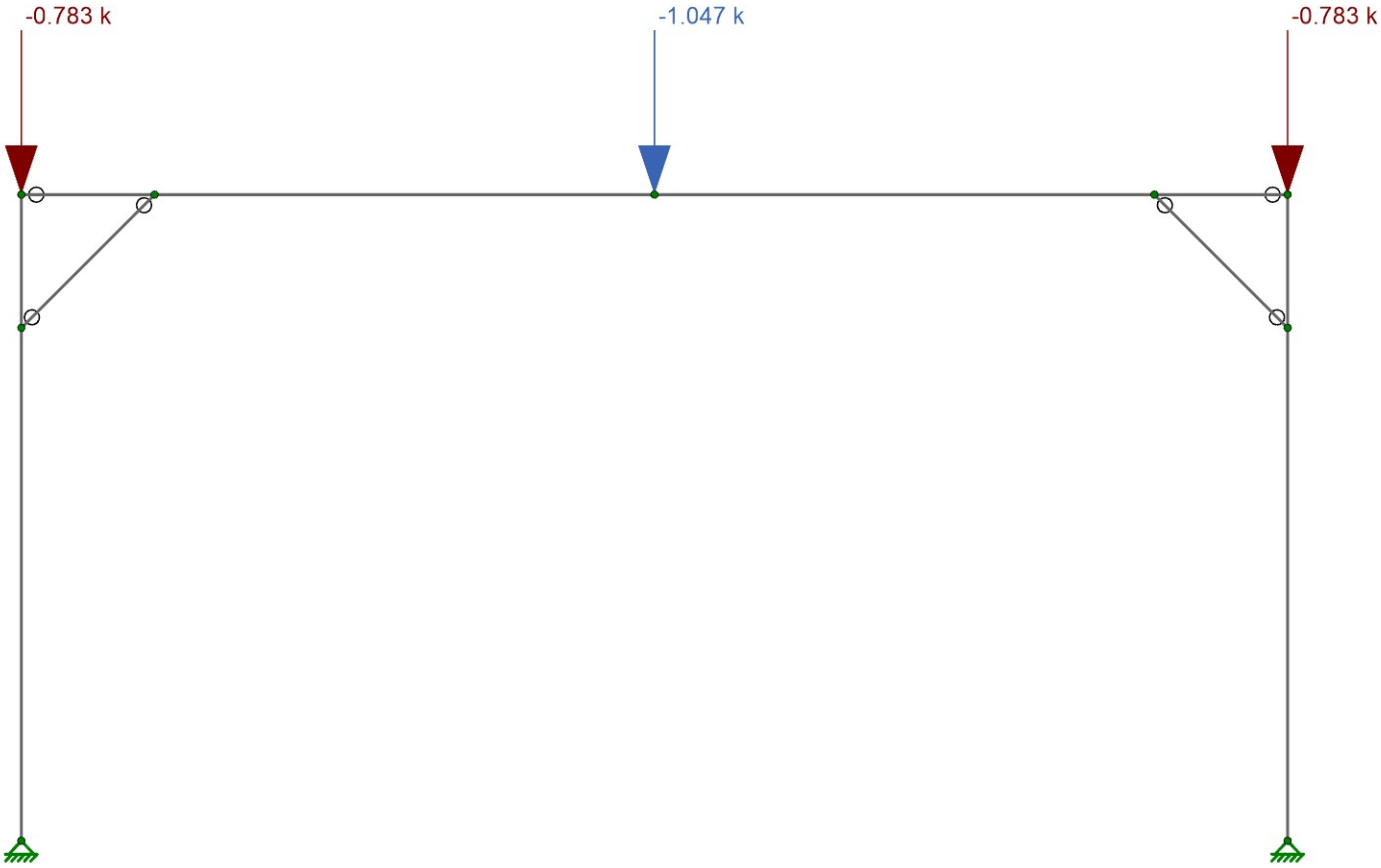
Lateral Wind Load= 806lb / 2 = 403 lb/post



Envelope Only Solution

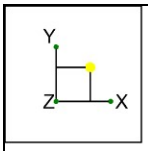
PSE Consulting Engineers, Inc		SK-2
D.I		Mar 02, 2023
		Patio Frame.r3d

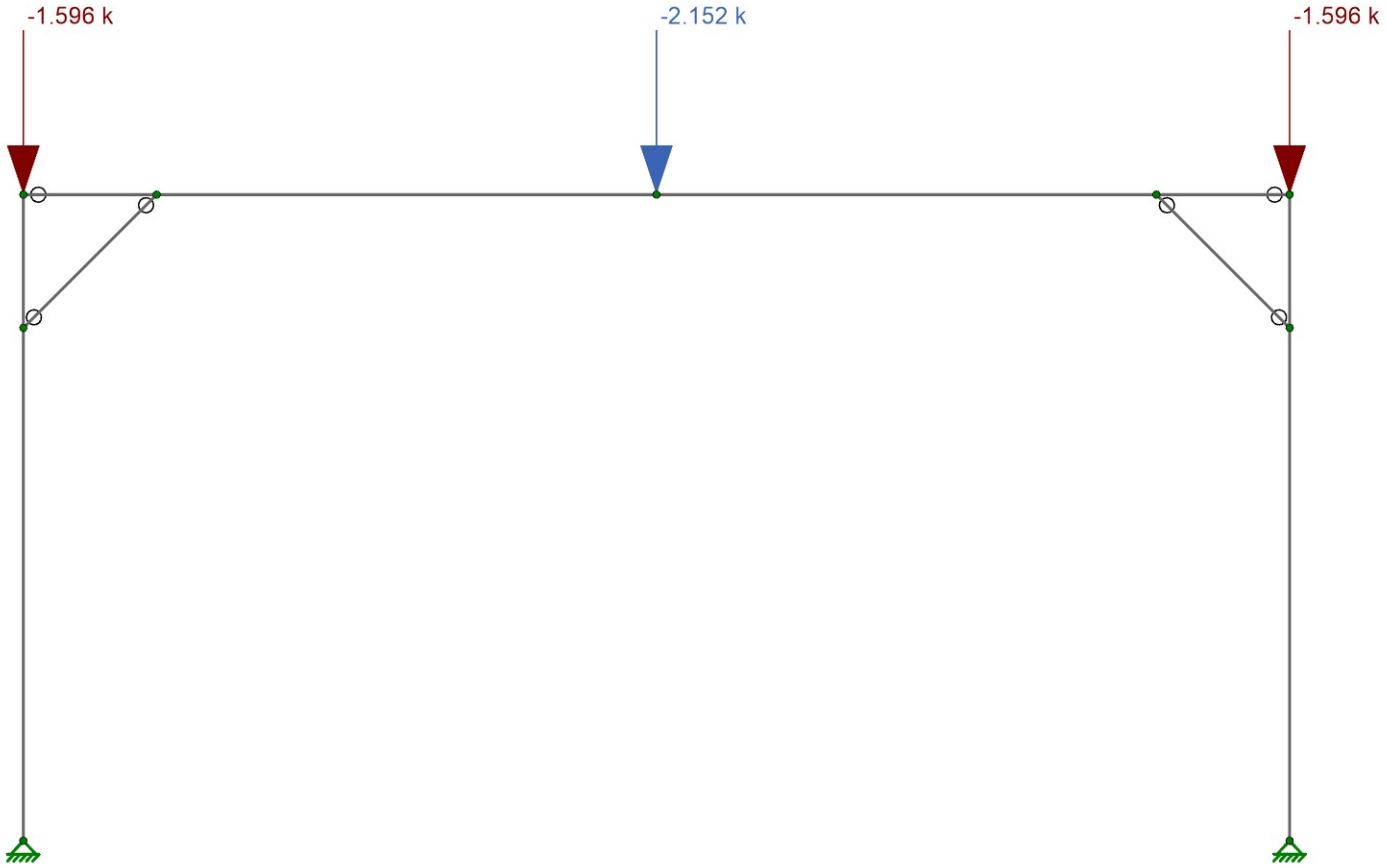




Loads: BLC 1, Dead Load
Envelope Only Solution

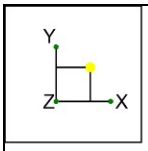
PSE Consulting Engineers, Inc		SK-3
D.I		Mar 02, 2023
		Patio Frame.r3d

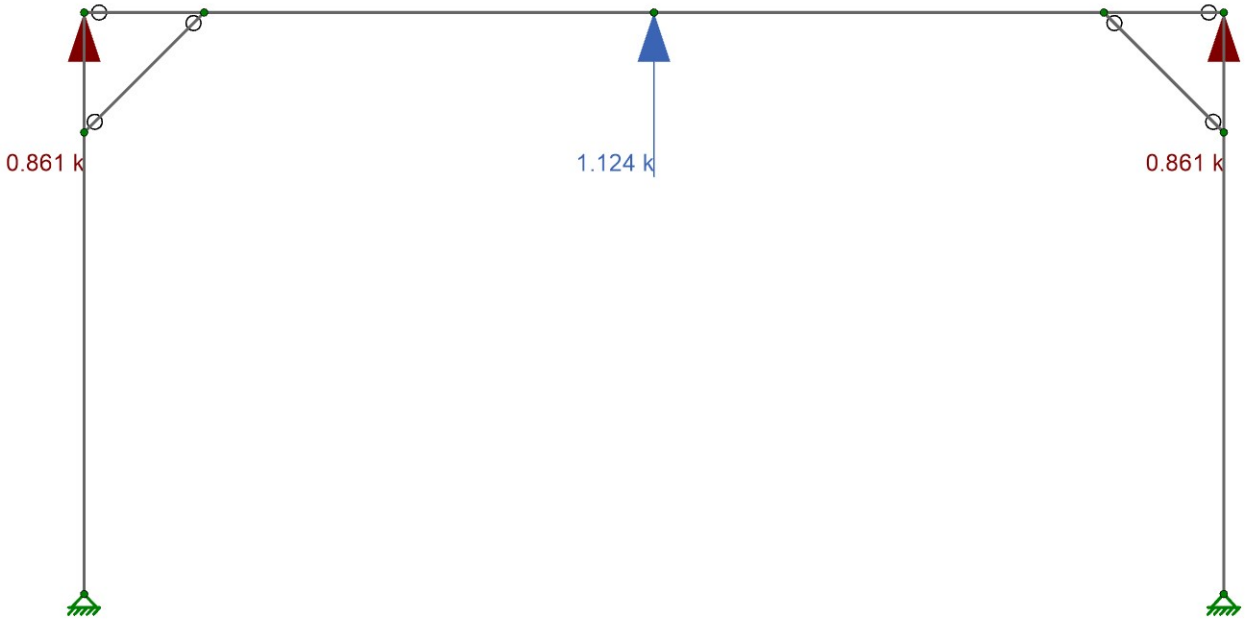




Loads: BLC 2, Snow Load
Envelope Only Solution

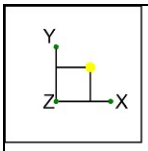
PSE Consulting Engineers, Inc		SK-4
D.I		Mar 02, 2023
		Patio Frame.r3d

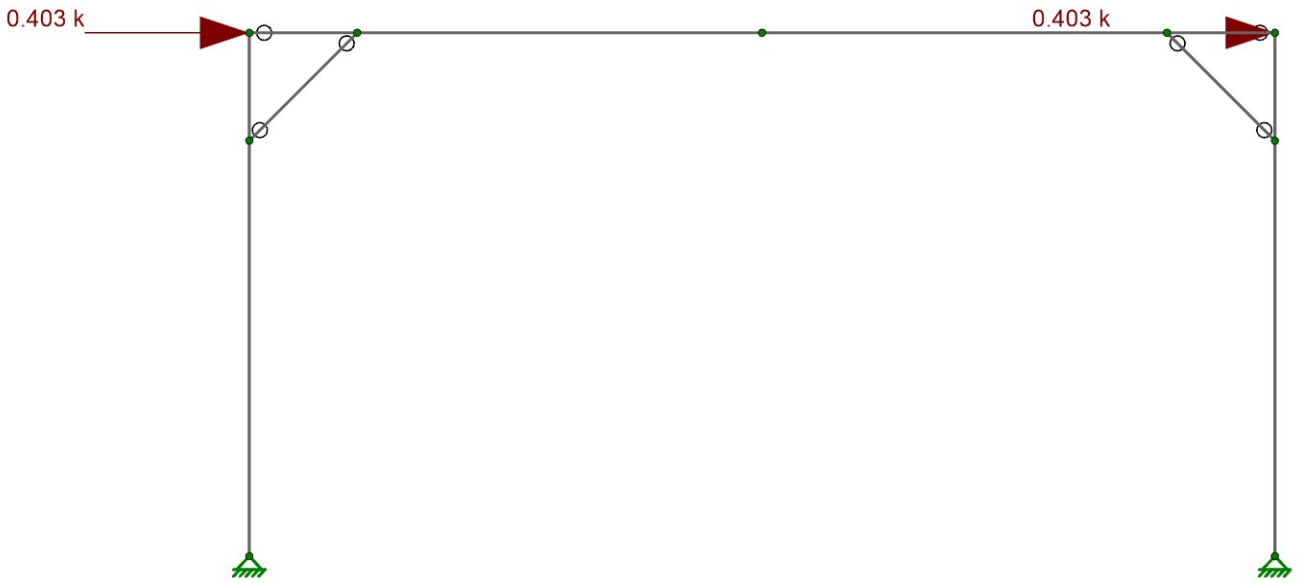




Loads: BLC 3, Wind Load Uplift Envelope Only Solution

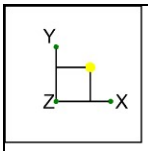
PSE Consulting Engineers, Inc		SK-7
D.I		Mar 02, 2023
		Patio Frame.r3d

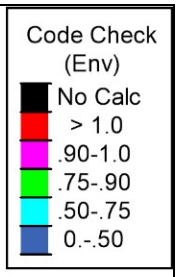




Loads: BLC 4, Wind X
Envelope Only Solution

PSE Consulting Engineers, Inc		SK-9
D.I		Mar 02, 2023
		Patio Frame.r3d





Member Code Checks Displayed (Enveloped)
Envelope Only Solution

PSE Consulting Engineers, Inc		SK-10
D.I		Mar 02, 2023
		Patio Frame.r3d

Company : PSE Consulting Engineers, Inc
Designer : D.I
Job Number :
Model Name :

3/2/2023
10:56:44 PM
Checked By : _____

Wood Properties

	Label	Type	Database	Species	Grade	Cm	Ci	Emod	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]
1	DF	Solid Sawn	Visually Graded	Douglas Fir-Larch	No.1			1	0.3	0.3	0.035
2	SP	Solid Sawn	Visually Graded	Southern Pine	No.1			1	0.3	0.3	0.035
3	HF	Solid Sawn	Visually Graded	Hem-Fir	No.1			1	0.3	0.3	0.035
4	SPF	Solid Sawn	Visually Graded	Spruce-Pine-fir	No.1			1	0.3	0.3	0.035
5	24F-1.8E DF Balanced	Glulam	NDS Table 5A	24F-1.8E_DF_BAL	na			1	0.3	0.3	0.035
6	24F-1.8E DF Unbalanced	Glulam	NDS Table 5A	24F-1.8E_DF_UNBAL	na			1	0.3	0.3	0.035
7	24F-1.8E SP Balanced	Glulam	NDS Table 5A	24F-1.8E_SP_BAL	na			1	0.3	0.3	0.035
8	24F-1.8E SP Unbalanced	Glulam	NDS Table 5A	24F-1.8E_SP_UNBAL	na			1	0.3	0.3	0.035
9	1.3E-1600F_VERSALAM	SCL	Boise Cascade	1.3E-1600F_VERSALAM	na			1	0.3	0.3	0.035
10	1.35E LSL_SolidStart	SCL	Louisiana Pacific	1.35E LSL_SolidStart	na			1	0.3	0.3	0.035
11	1.3E_RIGIDLAM LVL	SCL	Roseburg Forest Products	1.3E_RIGIDLAM LVL	na			1	0.3	0.3	0.035
12	2.0E_DF Parallam PSL	SCL	TrusJoist	2.0E_DF Parallam PSL	na			1	0.3	0.3	0.035
13	LVL_PRL_1.5E_2250F	Custom	N/A	LVL_PRL_1.5E_2250F	na			1	0.3	0.3	0.035
14	LVL_Microlam_1.9E_2600F	Custom	N/A	LVL_Microllam_1.9E_2600F	na			1	0.3	0.3	0.035
15	PSL_Parallam_2.0E_2900F	Custom	N/A	PSL_Parallam_2.0E_2900F	na			1	0.3	0.3	0.035
16	LSL_TimberStrand_1.55E_2325F	Custom	N/A	LSL_TimberStrand_1.55E_2325F	na			1	0.3	0.3	0.035

Wood Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	Column	6X6	Beam	Rectangular	DF	Typical	30.25	76.255	76.255	128.871
2	Beam	5.125X12FS	Beam	Glulam_Western	24F-1.8E DF Balanced	Typical	61.5	134.611	738	393.972
3	Knee Brace	6X6	HBrace	Rectangular	DF	Typical	30.25	76.255	76.255	128.871

Member Primary Data

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N3	Column	Beam	Rectangular	DF	Typical
2	M2	N4	N5	Column	Beam	Rectangular	DF	Typical
3	M3	N3	N5	Beam	Beam	Glulam_Western	24F-1.8E DF Balanced	Typical
4	M4	N6	N8	Knee Brace	HBrace	Rectangular	DF	Typical
5	M5	N7	N9	Knee Brace	HBrace	Rectangular	DF	Typical

Wood Design Parameters

	Label	Shape	Length [ft]	le-bend top [ft]	Cr	y sway	z sway
1	M1	Column	9.7	Lbyy			
2	M2	Column	9.7	Lbyy			
3	M3	Beam	19	Lbyy			
4	M4	Knee Brace	2.828	Lbyy			
5	M5	Knee Brace	2.828	Lbyy			

Node Coordinates

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	0	0	
2	N3	0	9.7	0	
3	N4	19	0	0	
4	N5	19	9.7	0	
5	N6	2	9.7	0	
6	N7	17	9.7	0	
7	N8	0	7.7	0	
8	N9	19	7.7	0	

Node Coordinates (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
9	N10	9.5	9.7	0	

Node Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]
1	N1	Reaction	Reaction	Reaction
2	N4	Reaction	Reaction	Reaction
3	N3			Reaction
4	N10			Reaction
5	N5			Reaction

Basic Load Cases

	BLC Description	Category	Y Gravity	Nodal	Point
1	Dead Load	DL	-1	2	1
2	Snow Load	SL		2	1
3	Wind Load Uplift	WLY		2	1
4	Wind X	WLX		2	

Load Combinations

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1										
2	Deflection 2	Yes	Y	LL	1										
3	Deflection 3	Yes	Y	DL	1	LL	1								
4	IBC 16-8	Yes	Y	DL	1										
5	IBC 16-9	Yes	Y	DL	1	LL	1	LLS	1						
6	IBC 16-10 (b)	Yes	Y	DL	1	SL	1	SLN	1						
7	IBC 16-11 (b)	Yes	Y	DL	1	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75		
8	IBC 16-12 (a) (a)	Yes	Y	DL	1	WLY	0.6								
9	IBC 16-12 (a) (b)	Yes	Y	DL	1	WLX	0.6								
10	IBC 16-13 (a) (a)	Yes	Y	DL	1	WLY	0.45	LL	0.75	LLS	0.75				
11	IBC 16-13 (a) (b)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75				
12	IBC 16-13 (b) (a)	Yes	Y	DL	1	WLY	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
13	IBC 16-13 (b) (b)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
14	IBC 16-15 (a)	Yes	Y	DL	0.6	WLY	0.6								
15	IBC 16-15 (b)	Yes	Y	DL	0.6	WLX	0.6								

Envelope Node Reactions

	Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	0.25	6	4.213	6	0	15	0	15	0	15	0	15
2		min	-0.188	15	0	2	0	1	0	1	0	1	0	1
3	N4	max	0	2	4.213	6	0	15	0	15	0	15	0	15
4		min	-0.391	13	0	2	0	1	0	1	0	1	0	1
5	N3	max	0	15	0	15	0	15	0	15	0	15	0	15
6		min	0	1	0	1	0	1	0	1	0	1	0	1
7	N10	max	0	15	0	15	0	15	0	15	0	15	0	15
8		min	0	1	0	1	0	1	0	1	0	1	0	1
9	N5	max	0	15	0	15	0	15	0	15	0	15	0	15
10		min	0	1	0	1	0	1	0	1	0	1	0	1
11	Totals:	max	0	6	8.425	6	0	15						
12		min	-0.484	9	0	2	0	1						

Envelope Maximum Member Section Forces

	Member		Axial[k]	Loc[ft]	LC	y Shear[k]	Loc[ft]	LC	z Shear[k]	Loc[ft]	LC	Torque[k-ft]	Loc[ft]	LC	y-y Moment[k-ft]	Loc[ft]	LC	z-z Moment[k-ft]	Loc[ft]	LC
1	M1	max	4.213	0	6	0.986	9.7	6	0	9.7	15	0	9.7	15	0	9.7	15	1.967	7.679	6
2		min	-0.004	9.7	14	-0.744	7.78	15	0	0	1	0	0	1	0	0	1	-1.483	7.679	15
3	M2	max	4.213	0	6	0.42	7.679	13	0	9.7	15	0	9.7	15	0	9.7	15	0	9.7	15
4		min	-0.34	9.7	15	-1.618	7.78	13	0	0	1	0	0	1	0	0	1	-3.226	7.679	13
5	M3	max	0.988	1.979	15	1.71	2.177	6	0	19	15	0	19	15	0	19	15	1.623	17.021	15
6		min	-1.791	17.021	13	-1.71	16.823	6	0	0	1	0	0	1	0	0	1	-13.479	9.5	6
7	M4	max	1.72	2.828	6	0.007	0	9	0	2.828	15	0	2.828	15	0	2.828	15	0	2.828	15
8		min	-1.324	0	15	-0.007	2.828	13	0	0	1	0	0	1	0	0	1	-0.005	1.414	9
9	M5	max	2.824	2.828	13	0.007	0	13	0	2.828	15	0	2.828	15	0	2.828	15	0	2.828	15
10		min	0	0	2	-0.007	2.828	11	0	0	1	0	0	1	0	0	1	-0.005	1.414	13

Envelope Member End Reactions

	Member	Member End		Axial[k]	LC	y Shear[k]	LC	z Shear[k]	LC	Torque[k-ft]	LC	y-y Moment[k-ft]	LC	z-z Moment[k-ft]	LC
1	M1	I	max	4.213	6	0.193	15	0	15	0	15	0	15	0	15
2			min	0	2	-0.256	6	0	1	0	1	0	1	0	1
3		J	max	3.208	13	0.986	6	0	15	0	15	0	15	0	15
4			min	-0.004	14	-0.744	15	0	1	0	1	0	1	0	1
5	M2	I	max	4.213	6	0.42	13	0	15	0	15	0	15	0	15
6			min	0	2	0	2	0	1	0	1	0	1	0	1
7		J	max	2.928	6	0	2	0	15	0	15	0	15	0	15
8			min	-0.34	15	-1.618	13	0	1	0	1	0	1	0	1
9	M3	I	max	0.988	15	1.229	13	0	15	0	15	0	15	0	15
10			min	-0.969	6	0	2	0	1	0	1	0	1	0	1
11		J	max	0	2	0.811	15	0	15	0	15	0	15	0	15
12			min	-1.791	13	-0.543	6	0	1	0	1	0	1	0	1
13	M4	I	max	1.705	6	0.007	9	0	15	0	15	0	15	0	15
14			min	-1.324	15	0	2	0	1	0	1	0	1	0	1
15		J	max	1.72	6	0	2	0	15	0	15	0	15	0	15
16			min	-1.315	15	-0.007	13	0	1	0	1	0	1	0	1
17	M5	I	max	2.809	13	0.007	13	0	15	0	15	0	15	0	15
18			min	0	2	0	2	0	1	0	1	0	1	0	1
19		J	max	2.824	13	0	2	0	15	0	15	0	15	0	15
20			min	0	2	-0.007	11	0	1	0	1	0	1	0	1

Envelope AWC NDS-18: ASD Member Wood Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Fc' [ksi]	Ft' [ksi]	Fb1' [ksi]	Fb2' [ksi]	Fv' [ksi]	RB	CL	CP	Eqn
1	M1	6X6	0.74	7.679	6	0.25	9.7	y	6	0.766	0.949	1.38	1.38	0.196	4.6	1	0.666	3.9-3
2	M2	6X6	0.84	7.679	13	0.295	9.7	y	13	0.867	1.32	1.92	1.92	0.272	4.6	1	0.542	3.9-3
3	M3	5.125X12FS	0.487	9.5	6	0.137	16.823	y	6	0.343	1.265	2.708	1.667	0.305	10.206	0.981	0.187	3.9-3
4	M4	6X6	0.05	2.828	6	0.002	2.828	y	4	1.128	0.949	1.38	1.38	0.153	2.484	1	0.981	3.6.3
5	M5	6X6	0.06	2.828	13	0.002	2.828	y	4	1.556	1.32	1.92	1.92	0.153	2.484	1	0.973	3.6.3