STRUCTURAL CALCULATIONS

For

3- Season Porch

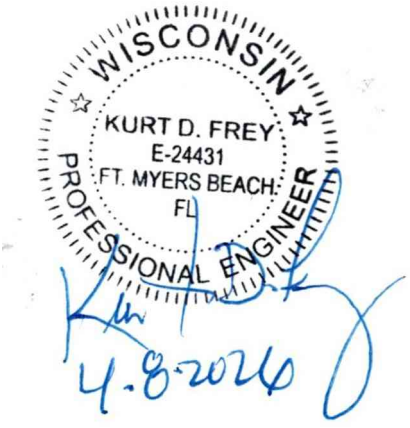
Residence

Madison, Wisconsin

by

ENNOVATION ENGINEERING SERVICES INC

Date: April 8, 2026



ENNOVATION ENGINEERING SERVICES INC

PROJECT 3-SEASON PORCH
DESCR.
REF. PROJ NO.
BY DATE SHEET NO.

DESIGN DATA INFO

DESIGN LOADS

ROOF

SNOW = 30.0 PSF + DRIFT
DEAD = 15.0 PSF

FLOOR

LIVE = 40 PSF
PARTITION = 15 PSF
DEAD = 15.0 PSF

DECK

LIVE = 60.0 PSF
DEAD = 10.0 PSF

WIND

MWFRS
(SERVICE LEVEL)

MWFRS = 16.0 PSF

COMPONENTS & CLADDING
(SERVICE LEVEL)

WALLS
(10 FT²)

NEG ZONE 4 = 19.0 PSF
NEG ZONE 5 = 23.5 PSF
POS. ZONE 4 & 5 = 17.5 PSF

SOILS

ALLOWABLE SOIL BRG
(PRESUMED)

$\alpha_{ALLOWABLE}$ = 2000 PSF

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Code Search

Code: International Building Code 2021

Occupancy:

Occupancy Group = R Residential

Risk Category & Importance Factors:

Risk Category =	II
Wind factor =	1.00
Snow factor =	1.00
Seismic factor =	1.00

Type of Construction:

Fire Rating:

Roof =	0.0 hr
Floor =	0.0 hr

Building Geometry:

Roof angle (θ)	4.00 / 12	18.4 deg
Building length	16.0 ft	
Least width	12.0 ft	
Mean Roof Ht (h)	10.0 ft	
Parapet ht above grd		
Minimum parapet ht		

Live Loads:

Roof 0 to 200 sf: 20 psf
200 to 600 sf: 24 - 0.02Area, but not less than 12 psf
over 600 sf: 12 psf

Floor:

Typical Floor

Partitions N/A

Storage areas above ceilings 20 psf

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Wind Loads : ASCE 7- 16

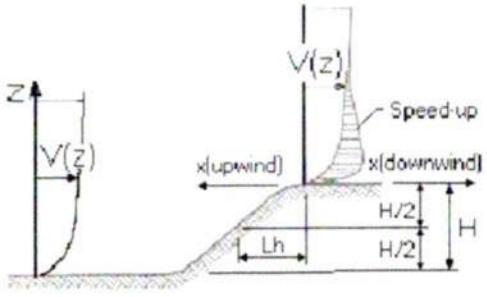
Ultimate Wind Speed	115 mph
Nominal Wind Speed	89.1 mph
Risk Category	II
Exposure Category	C
Enclosure Classif.	Enclosed Building
Internal pressure	+/-0.18
Directionality (Kd)	0.85
Kh case 1	0.849
Kh case 2	0.849
Type of roof	Gable

Topographic Factor (Kzt)

Topography		Flat
Hill Height	(H)	80.0 ft
Half Hill Length (Lh)		100.0 ft
Actual H/Lh	=	0.80
Use H/Lh	=	0.50
Modified Lh	=	160.0 ft
From top of crest: x =		50.0 ft
Bldg up/down wind?		downwind

H/Lh= 0.50 K_1 = 0.000
x/Lh = 0.31 K_2 = 0.792
z/Lh = 0.09 K_3 = 1.000

At Mean Roof Ht:
Kzt = $(1+K_1K_2K_3)^2$ = 1.00



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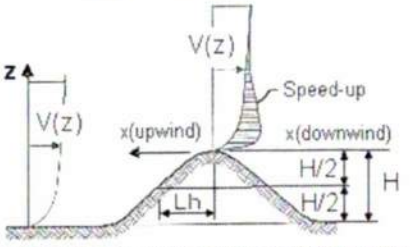

2D RIDGE or 3D AXISYMMETRICAL HILL

Gust Effect Factor

h =	10.0 ft
B =	12.0 ft
/z (0.6h) =	15.0 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).
If building h/B>4 then may be flexible and should be investigated.
h/B = 0.83 Rigid structure (low rise bldg)

G = 0.85 Using rigid structure formula

Rigid Structure

$\bar{e}$ =	0.20
ℓ =	500 ft
z_{min} =	15 ft
c =	0.20
g_Q, g_v =	3.4
L_z =	427.1 ft
Q =	0.95
I_z =	0.23
G =	**0.90** use G = 0.85

Flexible or Dynamically Sensitive Structure

Natural Frequency (η_1) =	0.0 Hz				
Damping ratio (β) =	0				
/b =	0.65				
/α =	0.15				
Vz =	97.1				
N_1 =	0.00				
R_n =	0.000				
R_h =	28.282	η =	0.000	h =	10.0 ft
R_B =	28.282	η =	0.000		
R_L =	28.282	η =	0.000		
g_R =	0.000				
R =	0.000				
Gf =	0.000				

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Enclosure Classification

Test for Enclosed Building: Ao < 0.01Ag or 4 sf, whichever is smaller

Test for Open Building: All walls are at least 80% open.
Ao ≥ 0.8Ag

Test for Partially Enclosed Building: Predominately open on one side only

	Input			Test	
Ao	500.0	sf	Ao ≥ 1.1Aoi	NO	
Ag	600.0	sf	Ao > 4' or 0.01Ag	YES	
Aoi	1000.0	sf	Aoi / Agi ≤ 0.20	YES	Building is NOT Partially Enclosed
Agi	10000.0	sf			

Conditions to qualify as Partially Enclosed Building. Must satisfy all of the following:
Ao ≥ 1.1Aoi
Ao > smaller of 4' or 0.01 Ag
Aoi / Agi ≤ 0.20
Where:
Ao = the total area of openings in a wall that receives positive external pressure.
Ag = the gross area of that wall in which Ao is identified.
Aoi = the sum of the areas of openings in the building envelope (walls and roof) not including Ao.
Agi = the sum of the gross surface areas of the building envelope (walls and roof) not including Ag.

Test for Partially Open Building: A building that does not qualify as open, enclosed or partially enclosed. (This type building will have same wind pressures as an enclosed building.

Reduction Factor for large volume partially enclosed buildings (Ri) :

If the partially enclosed building contains a single room that is unpartitioned , the internal pressure coefficient may be multiplied by the reduction factor Ri.

Total area of all wall & roof openings (Aog): 0 sf
Unpartitioned internal volume (Vi) : 0 cf
Ri = 1.00

Ground Elevation Factor (Ke)

Grd level above sea level = 0.0 ft
Constant = 0.00256 Adj Constant = 0.00256
Ke = 1.0000

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Wind Loads - MWFRS h≤60' (Low-rise Buildings) except for open buildings

Kz = Kh (case 1) = 0.85
Base pressure (qh) = **24.4 psf**
GCpi = +/-0.18

Edge Strip (a) = 3.0 ft
End Zone (2a) = 6.0 ft
Zone 2 length = 6.0 ft

Wind Pressure Coefficients

Surface	CASE A GCpf	CASE A θ = 18.4 deg w/-GCpi	CASE A w/+GCpi		CASE B GCpf	CASE B w/-GCpi	CASE B w/+GCpi
1	0.52	0.70	0.34		-0.45	-0.27	-0.63
2	-0.69	-0.51	-0.87		-0.69	-0.51	-0.87
3	-0.47	-0.29	-0.65		-0.37	-0.19	-0.55
4	-0.42	-0.24	-0.60		-0.45	-0.27	-0.63
5					0.40	0.58	0.22
6					-0.29	-0.11	-0.47
1E	0.78	0.96	0.60		-0.48	-0.30	-0.66
2E	-1.07	-0.89	-1.25		-1.07	-0.89	-1.25
3E	-0.67	-0.49	-0.85		-0.53	-0.35	-0.71
4E	-0.62	-0.44	-0.80		-0.48	-0.30	-0.66
5E					0.61	0.79	0.43
6E					-0.43	-0.25	-0.61

Ultimate Wind Surface Pressures (psf)

1	17.0	8.2		-6.6	-15.4
2	-12.5	-21.3		-12.5	-21.3
3	-7.0	-15.8		-4.6	-13.4
4	-5.8	-14.5		-6.6	-15.4
5				14.2	5.4
6				-2.7	-11.5
1E	23.5	14.7		-7.3	-16.1
2E	-21.7	-30.5		-21.7	-30.5
3E	-12.1	-20.8		-8.6	-17.3
4E	-10.7	-19.5		-7.3	-16.1
5E				19.3	10.5
6E				-6.1	-14.9

Parapet

Windward parapet = 0.0 psf (GCpn = +1.5)
Leeward parapet = 0.0 psf (GCpn = -1.0)

Windward roof overhangs = 17.1 psf (upward) add to windward roof pressure

Horizontal MWFRS Simple Diaphragm Pressures (psf)

Transverse direction (normal to L)

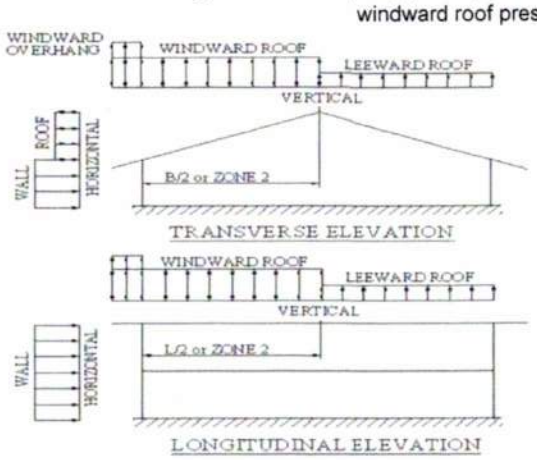
Interior Zone: Wall 22.8 psf
Roof -5.4 psf **
End Zone: Wall 34.2 psf
Roof -9.7 psf **

Longitudinal direction (parallel to L)

Interior Zone: Wall 16.9 psf
End Zone: Wall 25.4 psf

** NOTE: Total horiz force shall not be less than that determined by neglecting roof forces (except for MWFRS moment frames).

The code requires the MWFRS be designed for a min ultimate force of 16 psf multiplied by the wall area plus an 8 psf force applied to the vertical projection of the roof.



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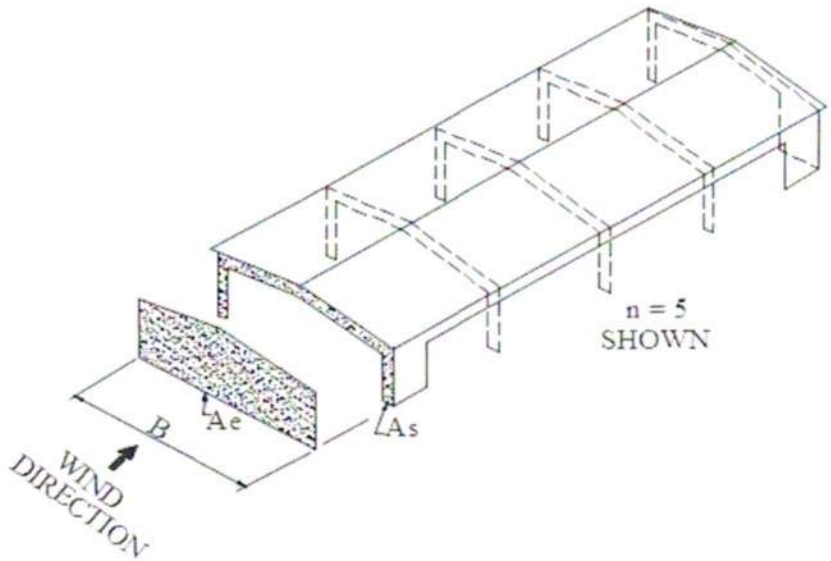
Wind Loads - h≤60' Longitudinal Direction MWFRS On Open or Partially Enclosed Buildings with Transverse Frames and Pitched Roofs

ASCE 7-16 procedure

Base pressure (qh) = **24.4 psf**
GCpi = +/-0.18 Enclosed bldg, procdure doesn't apply
Roof Angle (θ) = 18.4 deg



B=	12.0 ft
# of frames (n) =	5
Solid are of end wall including fascia (As) =	1,500.0 sf
Roof ridge height =	11.0 ft
Roof eave height =	9.0 ft
Total end wall area if soild (Ae) =	120.0 sf

Longidinal Directional Force (F) = pAe
p= qh [(GCpf)windward -(GCpf)leeward] K_B K_S

Solidarity ratio (Φ) =	12.500
n =	5
KB =	1.68
KS =	118.601
Zones 5 & 6 area =	92 sf
5E & 6E area =	29 sf
(GCpf) windward - (GCpf) leeward] =	0.773
p =	3763.1 psf

Total force to be resisted by MWFRS (F) = **451.6 kips** applied at the centroid of the end wall area Ae

Note: The longidudinal force acts in combination with roof loads calculated elsewhere for an open or partially enclosed building.

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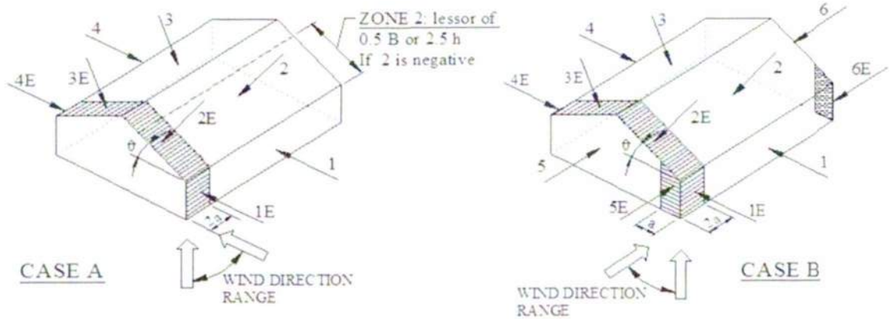
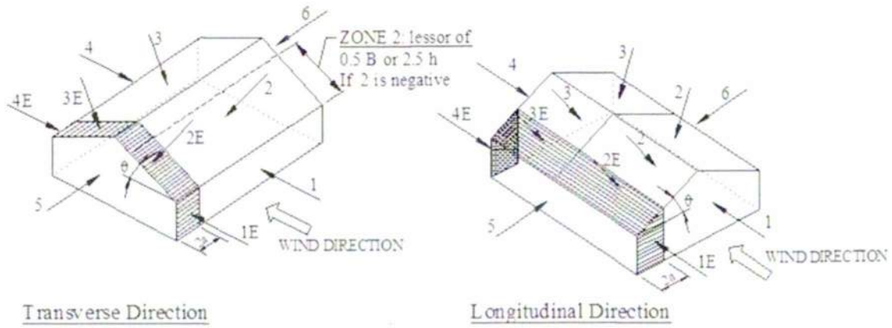


NOTE: Torsional loads are 25% of zones 1 - 6. See code for loading diagram.
Exception: One story buildings h<30' and 1 to 2 storybuildings framed with light-frame construction or with flexible diaphragms need not be designed for the torsional load case.

ASCE 7-98 & ASCE 7-10 (& later) - MWFRS wind pressure zones



NOTE: Torsional loads are 25% of zones 1 - 4. See code for loading diagram.
Exception: One story buildings h<30' and 1 to 2 storybuildings framed with light-frame construction or with flexible diaphragms need not be designed for the torsional load case.

ASCE 7-02 and ASCE 7-05 - MWFRS wind pressure zones

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Ultimate Wind Pressures

Wind Loads - Components & Cladding : h ≤ 60'

Kh (case 2) =	0.85	h =	10.0 ft
Base pressure (qh) =	**24.4 psf**	a =	3.0 ft
Minimum parapet ht =	0.0 ft	GCpi =	+/-0.18
Roof Angle (θ) =	18.4 deg	qi = qh =	24.4 psf
Type of roof =	Gable		

Roof

Area	Surface Pressure (psf) 2 sf	10 sf	20 sf	50 sf	75 sf	100 sf	200 sf	250 sf	User input 10 sf	150 sf
Negative Zone 1 & 2e	-53.3	-53.3	-53.3	-32.4	-23.2	-16.6	-16.6	-16.6	-53.3	-16.6
Negative Zone 2n, 2r &3e	-77.7	-77.7	-67.2	-53.3	-47.1	-42.7	-32.2	-28.8	-77.7	-36.6
Negative Zone 3r	-92.3	-92.3	-79.1	-61.6	-53.9	-48.4	-48.4	-48.4	-92.3	-48.4
Positive All Zones	21.5	17.5	16	16	16.0	16.0	16.0	16.0	17.5	16.0
Overhang Zone 1 & 2e	-61.1	-61.1	-61.1	-47.2	-41.0	-36.6	-36.6	-36.6	-61.1	-36.6
Overhang Zone 2n & 2r	-85.5	-85.5	-77.6	-67.2	-62.6	-59.3	-51.4	-48.9	-85.5	-54.7
Overhang Zone 3e	-100.2	-100.2	-86.5	-68.4	-60.4	-54.7	-41.0	-36.6	-100.2	-46.7
Overhang Zone 3r	-114.8	-114.8	-97.2	-73.8	-63.5	-56.2	-56.2	-56.2	-114.8	-56.2

Overhang pressures in the table above assume an internal pressure coefficient (Gcpi) of 0.0
Overhang soffit pressure equals adj wall pressure (which includes internal pressure of 4.4 psf)

Parapet

qp = 0.0 psf

Solid Parapet Pressure		Surface Pressure (psf) 10 sf	20 sf	50 sf	100 sf	250 sf	500 sf	User input 20 sf
CASE A:	Zone 2e :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Zone 2n, 2r & 3e :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Zone 3r :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CASE B:	Interior zone :	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Corner zone :	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Walls

Area	GCp +/- GCpi 10 sf	100 sf	200 sf	500 sf	Surface Pressure at h 10 sf	100 sf	200 sf	500 sf	User input 20 sf	55 sf
Negative Zone 4	-1.28	-1.10	-1.05	-0.98	-31.3	-27.0	-25.7	-23.9	-30.0	-28.1
Negative Zone 5	-1.58	-1.23	-1.12	-0.98	-38.6	-30.0	-27.4	-23.9	-36.0	-32.2
Positive Zone 4 & 5	1.18	1.00	0.95	0.88	28.8	24.5	23.2	21.5	27.5	25.6

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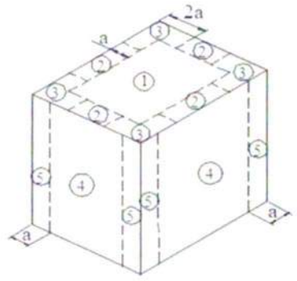
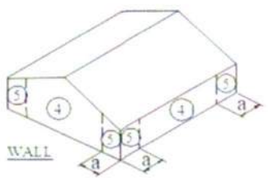
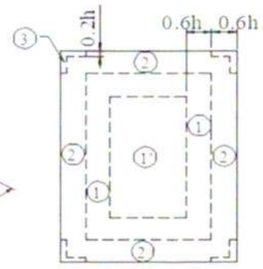
Location of C&C Wind Pressure Zones - ASCE 7-16



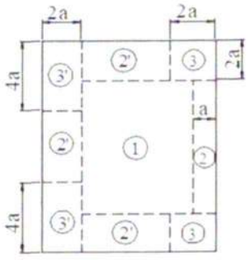
Roofs w/ $\theta \le 10°$ and all walls
h > 60'



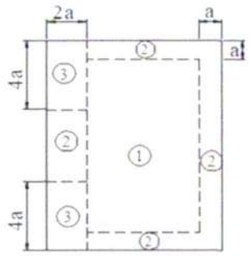
Walls h ≤ 60' & alt design h<90'



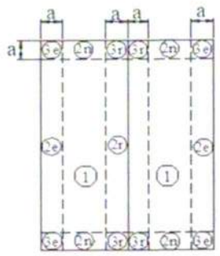
Gable, Sawtooth and Multispan Gable $\theta \le 7$ degrees & Monoslope ≤ 3 degrees
h ≤ 60' & alt design h<90'



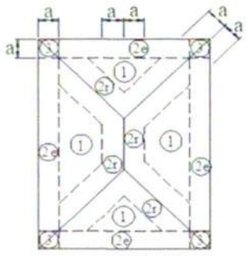
Monoslope roofs
$3° < \theta \le 10°$
h ≤ 60' & alt design h<90'



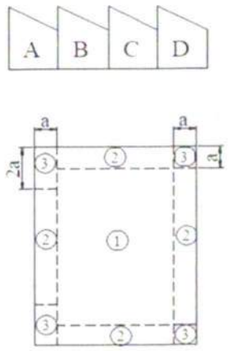
Monoslope roofs
$10° < \theta \le 30°$
h ≤ 60' & alt design h<90'



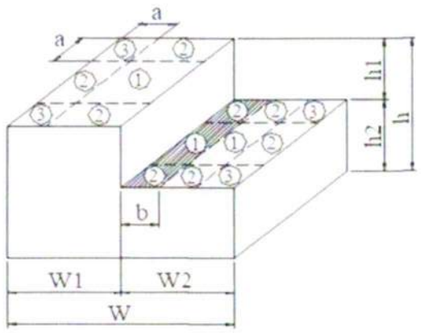
Multispan Gable & Gable $7° < \theta \le 45°$

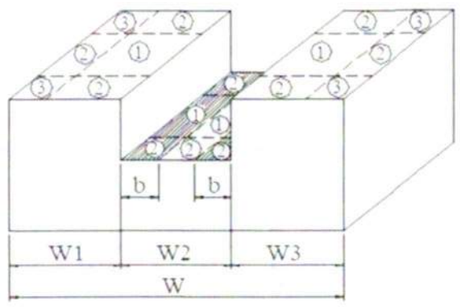


Hip $7° < \theta \le 27°$



Sawtooth $10° < \theta \le 45°$
h ≤ 60' & alt design h<90'





Stepped roofs $\theta \le 3°$
h ≤ 60' & alt design h<90'

Note: The stepped roof zones above are as shown in ASCE 7-16 (except the upper roof zones 1 and 2 are shown at the inside edge per the notes). Prior editions didn't show zones, but the notes sent you to the low slope gable figure. The note in ASCE 7-16 still sends you to the low slope gable figure, but for some reasons the zones shown are per editions prior to ASCE 7-16. Therefore, the above zones may be a code mistake and the correct zone locations may be per the low slope gable roof shown at the top of this page.

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Snow Loads : ASCE 7- 16

Nominal Snow Forces

Roof slope		=	18.4 deg
Horiz. eave to ridge dist (W)		=	6.0 ft
Roof length parallel to ridge (L)		=	16.0 ft
Type of Roof			Hip and gable w/ rafters
Ground Snow Load	Pg	=	30.0 psf
Risk Category		=	II
Importance Factor	I	=	1.0
Thermal Factor	Ct	=	1.30
Exposure Factor	Ce	=	1.1
Pf = 0.7*Ce*Ct*I*Pg		=	30.0 psf
Unobstructed Slippery Surface			no
Sloped-roof Factor	Cs	=	1.00
Balanced Snow Load		=	**30.0 psf**
Rain on Snow Surcharge Angle			0.12 deg
Code Maximum Rain Surcharge			5.0 psf
Rain on Snow Surcharge		=	0.0 psf
Ps plus rain surcharge		=	30.0 psf
Minimum Snow Load	Pm	=	0.0 psf
Uniform Roof Design Snow Load		=	**30.0 psf**

Near ground level surface balanced snow load = **30.0 psf**

NOTE: Alternate spans of continuous beams shall be loaded with half the design roof snow load so as to produce the greatest possible effect - see code for loading diagrams and exceptions for gable roofs..

Unbalanced Snow Loads - for Hip & Gable roofs only

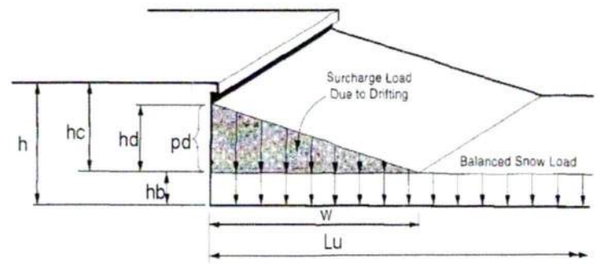
Required if slope is between 7 on 12 =			30.26 deg
and 2.38 deg =			2.38 deg **Unbalanced snow loads must be applied**
Windward snow load =			0.0 psf
Leeward snow load =			30.0 psf 0.0 psf

Windward Snow Drifts 1 - Against walls, parapets, etc

Up or downwind fetch	lu	=	16.0 ft
Projection height	h	=	12.0 ft
Projection width/length	lp	=	12.0 ft
Snow density	g	=	17.9 pcf
Balanced snow height	hb	=	1.68 ft
	hd	=	1.08 ft
	hc	=	10.32 ft
hc/hb >0.2 = 6.2	**lp <15', drift not req'd**		
Drift height (hd)		=	1.08 ft
Drift width	w	=	4.31 ft
Surcharge load:	pd = γ*hd	=	**19.3 psf**
Balanced Snow load:		=	30.0 psf
			49.3 psf

Windward Snow Drifts 2 - Against walls, parapets, etc

Up or downwind fetch	lu	=	16.0 ft
Projection height	h	=	12.0 ft
Projection width/length	lp	=	
Snow density	g	=	17.9 pcf
Balanced snow height	hb	=	1.68 ft
	hd	=	1.08 ft
	hc	=	10.32 ft
hc/hb >0.2 = 6.2	**lp <15', drift not req'd**		
Drift height (hd)		=	1.08 ft
Drift width	w	=	4.31 ft
Surcharge load:	pd = γ*hd	=	**19.3 psf**
Balanced Snow load:		=	30.0 psf
			49.3 psf



Note: If bottom of projection is at least 2 feet above hb then snow drift is not required.

ENNOVATION ENGINEERING SERVICES INC

PROJECT 3-SEASON PORCH

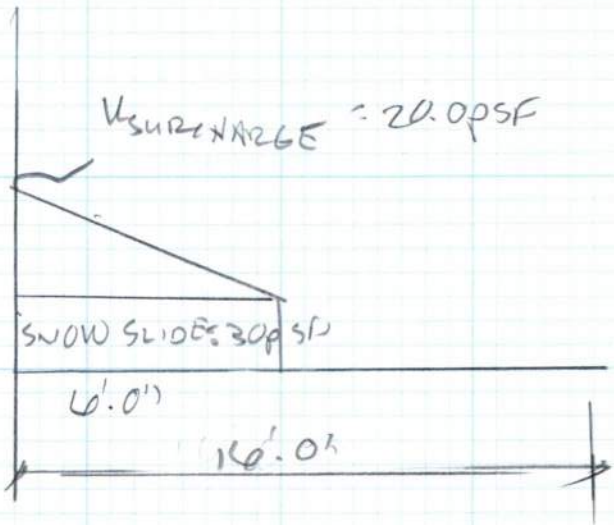
DESCR.

REF. PROJ NO.

BY DATE SHEET NO.

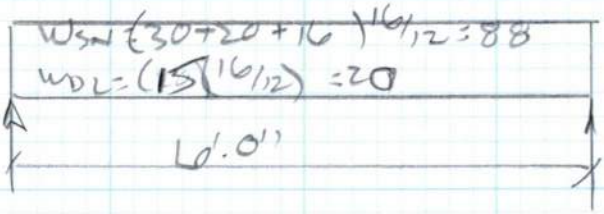
ROOF FRAMING

SNOW DRIFT

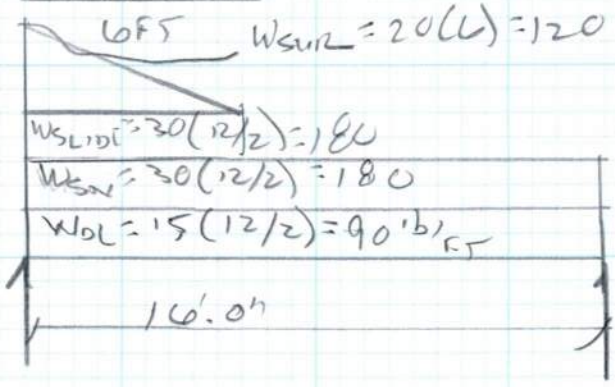


ROOF RAFTERS

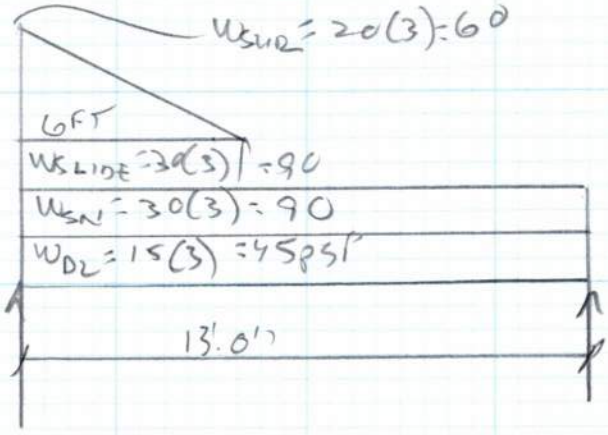
SPACING = 16" O.C



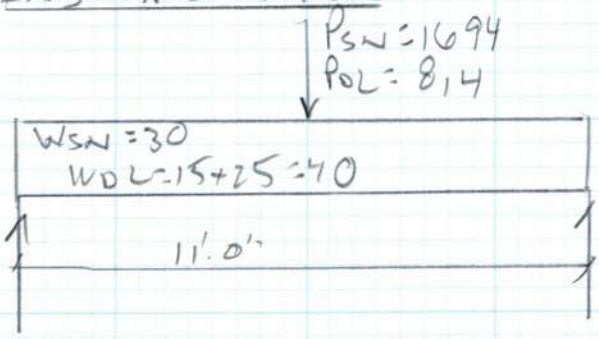
RIDGE BEAM



SIDE WALL HEADER



END WALL HEADER



WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 03:38	Typical Roof Rafter - 16 inches o.c.

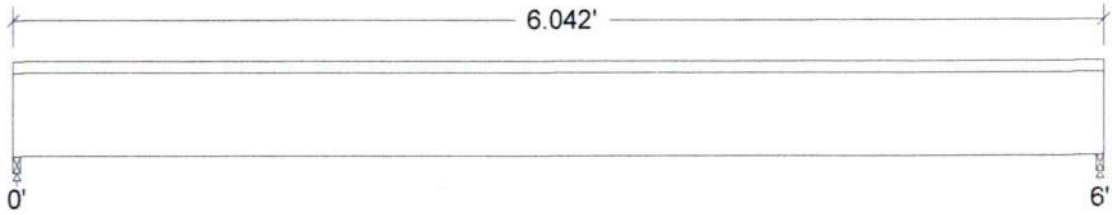
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL				20.0		plf
Load2	Snow	Full UDL				88.0		plf
Self-weight	Dead	Full UDL				1.7		plf

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



Unfactored:			
Dead	65		65
Snow	266		266
Factored:			
Combined	252		252
Bearing:			
Capacity			
Joist	319		319
Support	586		586
Des ratio			
Joist	0.79		0.79
Support	0.43		0.43
Load comb	#2		#2
Length	0.50*		0.50*
Min req'd	0.50*		0.50*
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.25		1.25
Fcp sup	625		625

*Minimum bearing length setting used: 1/2" for end supports

Roof Rafter - 16" o.c.

Lumber-soft, S-P-F, No.1/No.2, 2x6 (1-1/2"x5-1/2")

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

Roof joist spaced at 24.0" c/c; Total length: 6.04'; Clear span: 5.958'; Volume = 0.3 cu.ft.

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 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 210	Vr = 854	lbs	V/Vr = 0.25
Bending(+)	fb = 595	Fb' = 1504	psi	fb/Fb' = 0.40
Live Defl'n	0.06 = < L/999	0.30 = L/240	in	0.21
Total Defl'n	0.09 = L/763	0.40 = L/180	in	0.24

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	135	1.15	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	875	1.15	1.00	1.00	1.000	1.300	-	1.15	1.00	1.00	2
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	2

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D + 0.7S
Bending(+): LC #2  = D + 0.7S
Deflection: LC #2  = D + 0.7S  (live)
            LC #2  = D + 0.7S  (total)
Bearing   : Support 1 - LC #2 = D + 0.7S
            Support 2 - LC #2 = D + 0.7S
Load Types: D=dead S=snow
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 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 1, V max = 250 lbs M(+) = 375 lbs-ft
EI = 29.12e06 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 2024) and the National Design Specification (NDS 2024), 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.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 03:41	Ridge Beam

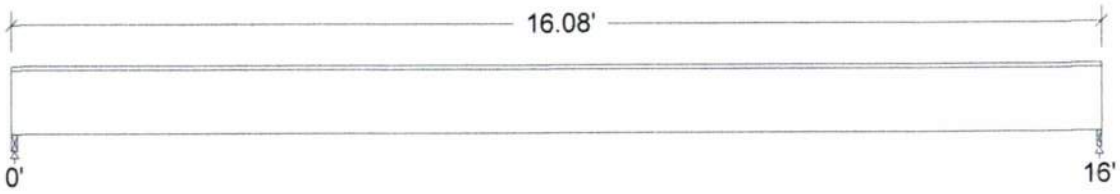
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL				90.0		plf
Load2	Snow	Full UDL				180.0		plf
Load3	Snow	Partial UDL		0.05	6.05	180.0	180.0	plf
Load4	Snow	Triangular		0.05	6.05	120.0	0.0	plf
Self-weight	Dead	Full UDL				11.3		plf

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



Unfactored:			
Dead	815		814
Snow	2641		1694
Factored:			
Combined	2666		2001
Bearing:			
Capacity			
Beam	2890		2169
Support	2666		2001
Des ratio			
Beam	0.92		0.92
Support	1.00		1.00
Load comb	#2		#2
Length	1.10		0.83
Min req'd	1.10**		0.83**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.11		1.11
Fcp sup	625		625

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

Ridge Beam

LVL n-ply, 1.8E, 2600Fb, 1-3/4"x11-1/4", 2-ply (3-1/2"x11-1/4")

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

Total length: 16.08'; Clear span: 15.92'; Volume = 4.4 cu.ft.

Lateral support: top = continuous, bottom = at supports;

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 2237	Vr = 8603	lbs	V/Vr = 0.26
Bending(+)	fb = 1419	Fb' = 3017	psi	fb/Fb' = 0.47
Live Defl'n	0.34 = L/560	0.80 = L/240	in	0.43
Total Defl'n	0.64 = L/298	1.07 = L/180	in	0.60

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	LC#
Fv'	285	1.15	-	1.00	-	-	-	-	1.00	-	2
Fb'+	2600	1.15	-	1.00	1.000	1.009	-	1.00	1.00	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	1.9 million		-	1.00	-	-	-	-	1.00	-	2
Eminy'	0.95 million		-	1.00	-	-	-	-	1.00	-	2

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D + 0.7S
Bending(+): LC #2  = D + 0.7S
Deflection: LC #2  = D + 0.7S  (live)
            LC #2  = D + 0.7S  (total)
Bearing   : Support 1 - LC #2 = D + 0.7S
            Support 2 - LC #2 = D + 0.7S
Load Types: D=dead S=snow
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 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 1, V max = 2654 lbs M(+) = 8729 lbs-ft
EI = 392.44e06 lb-in^2/ply GA = 4.65e06 lb
"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 2024) and the National Design Specification (NDS 2024), 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. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.
4. SCL: Structural composite lumber design has assumed: - dry service conditions - no preservative or fire-retardant treatment - no notches
5. BUILT-UP SCL: Contact manufacturer for connection details when side-loaded or when loads are not applied equally to all plies.
6. SCL: Shear deflection is calculated using true modulus of elasticity E and shear modulus G = E/16.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 03:44	Sidewall Header

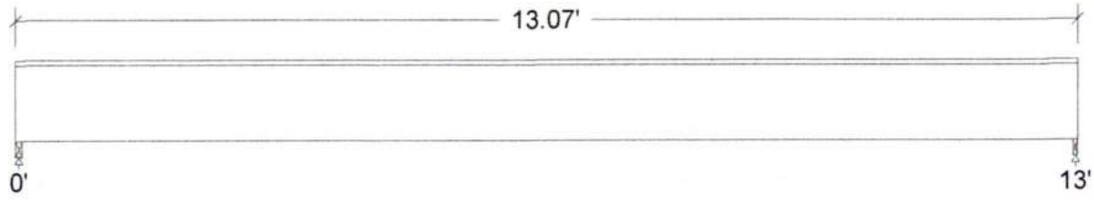
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL				45.0		plf
Load2	Snow	Full UDL				90.0		plf
Load3	Snow	Partial UDL		0.05	6.05	90.0	90.0	plf
Load4	Snow	Triangular		0.04	6.04	120.0	0.0	plf
Self-weight	Dead	Full UDL				6.8		plf

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



Unfactored:			
Dead	339		338
Snow	1308		768
Factored:			
Combined	1256		876
Bearing:			
Capacity			
Beam	1256		876
Support	2077		1450
Des ratio			
Beam	1.00		1.00
Support	0.60		0.60
Load comb	#2		#2
Length	0.98		0.69
Min req'd	0.98		0.69
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.12		1.12
Fcp sup	625		625

Sidewall Header

Lumber n-ply, S-P-F, No.1/No.2, 2x12, 2-ply (3"x11-1/4")

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

Total length: 13.07'; Clear span: 12.93'; Volume = 3.1 cu.ft.

Lateral support: top = continuous, bottom = at supports;

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 1006	Vr = 3493	lbs	V/Vr = 0.29
Bending(+)	fb = 628	Fb' = 1006	psi	fb/Fb' = 0.62
Live Defl'n	0.13 = < L/999	0.65 = L/240	in	0.21
Total Defl'n	0.23 = L/666	0.87 = L/180	in	0.27

ENNOVATION ENGINEERING SERVICES INC

PROJECT 3-SEASON PORCH

DESCR.

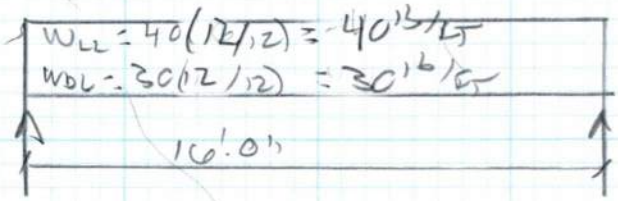
REF. PROJ NO.

BY DATE SHEET NO.

FLOOR FRAMING

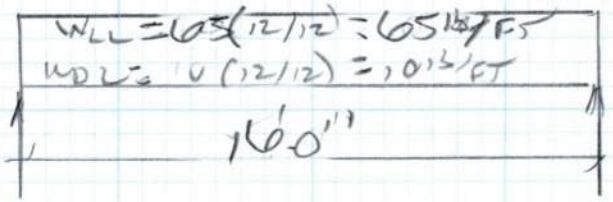
3-SEASON PORCH JOIST

SPACING = 12" O.C



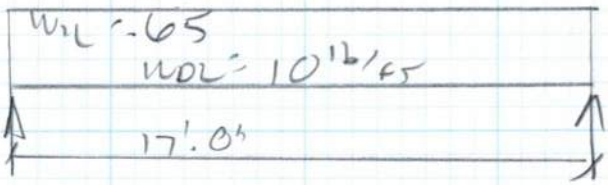
DECK JOIST

SPACING = 12" O.C

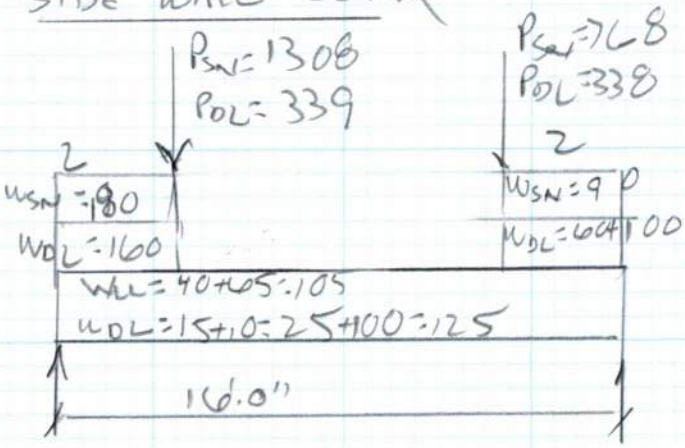


17 FT. DECK JOIST

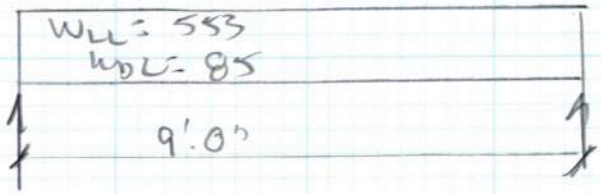
SPACING = 8" O.C



SIDE WALL BEAM



DECK BEAM



WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 03:54	3- Season Porch Joist - 16 inches o.c.

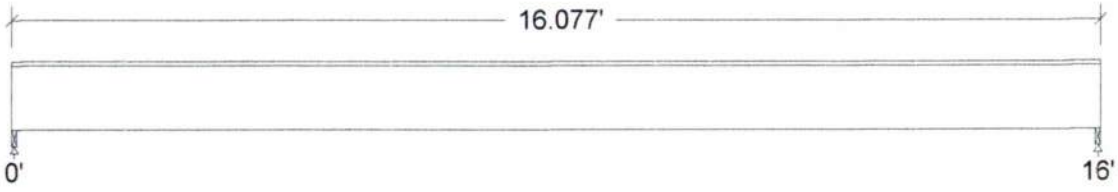
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL				30.0		plf
Load2	Live	Full UDL				40.0		plf
Self-weight	Dead	Full UDL				3.4		plf

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



Unfactored:			
Dead	268		268
Live	322		322
Factored:			
Combined	590		590
Bearing:			
Capacity			
Joist	590		590
Support	1085		1085
Des ratio			
Joist	1.00		1.00
Support	0.54		0.54
Load comb	#2		#2
Length	0.93		0.93
Min req'd	0.93		0.93
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.25		1.25
Fcp sup	625		625

3- Season Porch Joist

Lumber-soft, S-P-F, No.1/No.2, 2x12 (1-1/2"x11-1/4")

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

Floor joist spaced at 16.0" c/c; Total length: 16.08'; Clear span: 15.923'; Volume = 1.9 cu.ft.

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 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 516	Vr = 1519	lbs	V/Vr = 0.34
Bending(+)	fb = 891	Fb' = 1006	psi	fb/Fb' = 0.89
Live Defl'n	0.24 = L/811	0.53 = L/360	in	0.44
Total Defl'n	0.53 = L/360	0.80 = L/240	in	0.67

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	135	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	-	1.15	1.00	1.00	2
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	2

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #2  = D + L
Bending(+): LC #2  = D + L
Deflection: LC #2  = D + L  (live)
            LC #2  = D + L  (total)
Bearing    : Support 1 - LC #2 = D + L
             Support 2 - LC #2 = D + L
Load Types: D=dead L=live
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 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 1, V max = 587 lbs M(+) = 2349 lbs-ft
EI = 249.17e06 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 2024) and the National Design Specification (NDS 2024), 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.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 04:00	Deck Joist - 12 inches o.c.

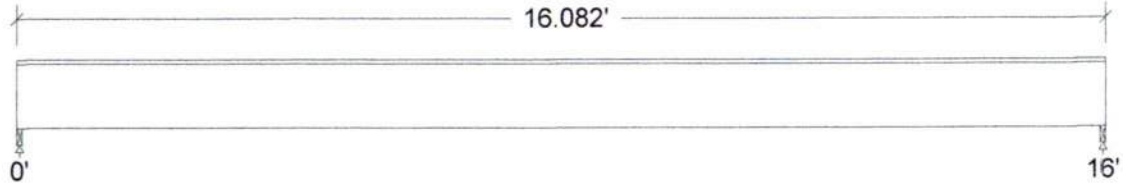
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL				10.0		plf
Load2	Live	Full UDL				65.0		plf
Self-weight	Dead	Full UDL				3.4		plf

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



Unfactored:			
Dead	108		108
Live	523		523
Factored:			
Combined	630		630
Bearing:			
Capacity			
Joist	630		630
Support	1159		1159
Des ratio			
Joist	1.00		1.00
Support	0.54		0.54
Load comb	#2		#2
Length	0.99		0.99
Min req'd	0.99		0.99
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.25		1.25
Fcp sup	625		625

Deck Joist - 12" o.c.

Lumber-soft, S-P-F, No.1/No.2, 2x12 (1-1/2"x11-1/4")

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

Floor joist spaced at 16.0" c/c; Total length: 16.08'; Clear span: 15.918'; Volume = 1.9 cu.ft.

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 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 551	Vr = 1519	lbs	V/Vr = 0.36
Bending(+)	fb = 952	Fb' = 1006	psi	fb/Fb' = 0.95
Live Defl'n	0.38 = L/499	0.53 = L/360	in	0.72
Total Defl'n	0.50 = L/381	0.80 = L/240	in	0.63

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	135	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	-	1.15	1.00	1.00	2
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	2

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #2  = D + L
Bending(+): LC #2  = D + L
Deflection: LC #2  = D + L  (live)
            LC #2  = D + L  (total)
Bearing    : Support 1 - LC #2 = D + L
             Support 2 - LC #2 = D + L
Load Types: D=dead L=live
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 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 1, V max = 627 lbs M(+) = 2509 lbs-ft
EI = 249.17e06 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 2024) and the National Design Specification (NDS 2024), 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.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 04:03	17 ft Deck Joist - 12 inches o.c.

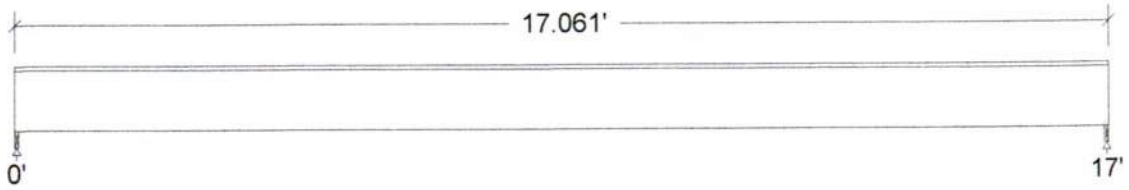
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL				7.0		plf
Load2	Live	Full UDL				44.0		plf
Self-weight	Dead	Full UDL				3.4		plf

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



Unfactored:			
Dead	89		89
Live	375		375
Factored:			
Combined	464		464
Bearing:			
Capacity			
Joist	464		464
Support	853		853
Des ratio			
Joist	1.00		1.00
Support	0.54		0.54
Load comb	#2		#2
Length	0.73		0.73
Min req'd	0.73		0.73
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.25		1.25
Fcp sup	625		625

17 ft Deck Joist - 8" o.c.

Lumber-soft, S-P-F, No.1/No.2, 2x12 (1-1/2"x11-1/4")

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

Floor joist spaced at 8.0" c/c; Total length: 17.06'; Clear span: 16.939'; Volume = 2.0 cu.ft.

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 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 410	Vr = 1519	lbs	V/Vr = 0.27
Bending(+)	fb = 745	Fb' = 1006	psi	fb/Fb' = 0.74
Live Defl'n	0.33 = L/614	0.57 = L/360	in	0.59
Total Defl'n	0.45 = L/453	0.85 = L/240	in	0.53

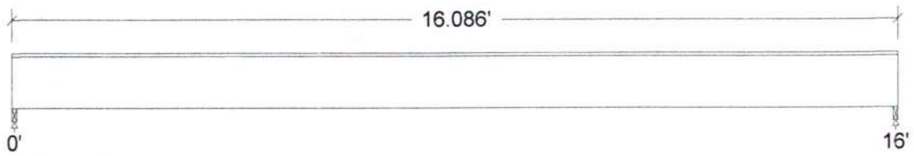
WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 04:12	Side Wall Floor Beam

Design Check Calculation Sheet
WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL				125.0		plf
Load2	Live	Full UDL				105.0		plf
Load3	Dead	Point		2.04		339		lbs
Load4	Snow	Point		2.04		1308		lbs
Load5	Snow	Point		14.04		768		lbs
Load6	Dead	Point		14.04		338		lbs
Self-weight	Dead	Full UDL				13.6		plf

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



Unfactored:			
Dead	1454		1452
Live	845		844
Snow	1240		836
Factored:			
Combined	2738		2524
Bearing:			
Capacity			
Beam	2738		2524
Support	4027		3712
Des ratio			
Beam	1.00		1.00
Support	0.68		0.68
Load comb	#3		#3
Length	1.07		0.99
Min req'd	1.07		0.99
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Side Wall Floor Beam
Lumber n-ply, S-P-F, No.1/No.2, 2x12, 4-ply (6"x11-1/4")
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 16.09'; Clear span: 15.914'; Volume = 7.5 cu.ft.
Lateral support: top = continuous, bottom = at supports; Repetitive factor: applied where permitted (refer to online help);
This section PASSES the design code check.

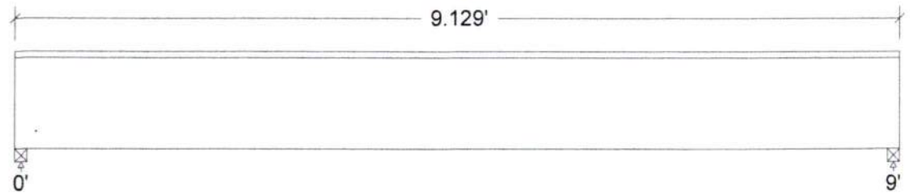
WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 04:15	Deck Beam

Design Check Calculation Sheet
WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL				85.0		plf
Load2	Live	Full UDL				553.0		plf
Self-weight	Dead	Full UDL				10.2		plf

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



Unfactored:			
Dead	434		434
Live	2524		2524
Factored:			
Combined	2958		2958
Bearing:			
Capacity			
Beam	2958		2958
Support	4713		4713
Des ratio			
Beam	1.00		1.00
Support	0.63		0.63
Load comb	#2		#2
Length	1.55		1.55
Min req'd	1.55		1.55
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.08		1.08
Fcp sup	625		625

Deck Beam
Lumber n-ply, S-P-F, No.1/No.2, 2x12, 3-ply (4-1/2"x11-1/4")
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 9.13'; Clear span: 8.871'; Volume = 3.2 cu.ft.
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 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 2268	Vr = 4556	lbs	V/Vr = 0.50
Bending(+)	fb = 830	Fb' = 1006	psi	fb/Fb' = 0.82
Live Defl'n	0.11 = L/988	0.30 = L/360	in	0.36
Total Defl'n	0.14 = L/785	0.45 = L/240	in	0.31

ENNOVATION ENGINEERING SERVICES INC

PROJECT 3-SEASON PORCH

DESCR.

REF. PROJ NO.

BY DATE SHEET NO.

DRILLED PIER @ PORCH/DECK

LOAD SUMMARY

ROOF: P_{SN} = 2000 lb

P_{DL} = 1100 lb

FLOOR

P_{LL} = 4000 lb

P_{DL} = 2500 lb

P_{TOTAL} = 9600 lb

ALLOWABLE BEARING = 2000 psf

$A_{REQ} = \frac{9600}{2000} = 4.8 \text{ FT}^2$

$A = \pi d^2/4$ $\quad 4.8 = \pi\left(\frac{d^2}{4}\right)$

2.4

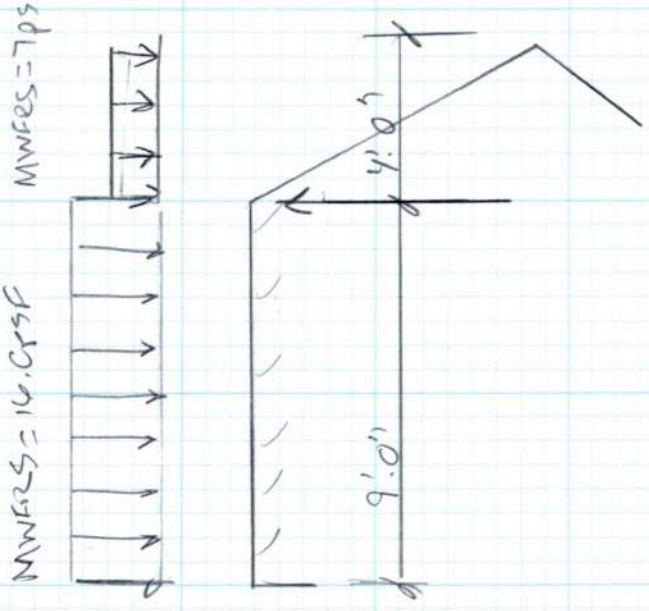
USE 30" ϕ

ENNOVATION ENGINEERING SERVICES INC

PROJECT 3-SEASON PORCH.
DESCR.
REF. PROJ NO.
BY DATE SHEET NO.

END WALL SHEAR WALL

SIDEWALL WIND LOADING

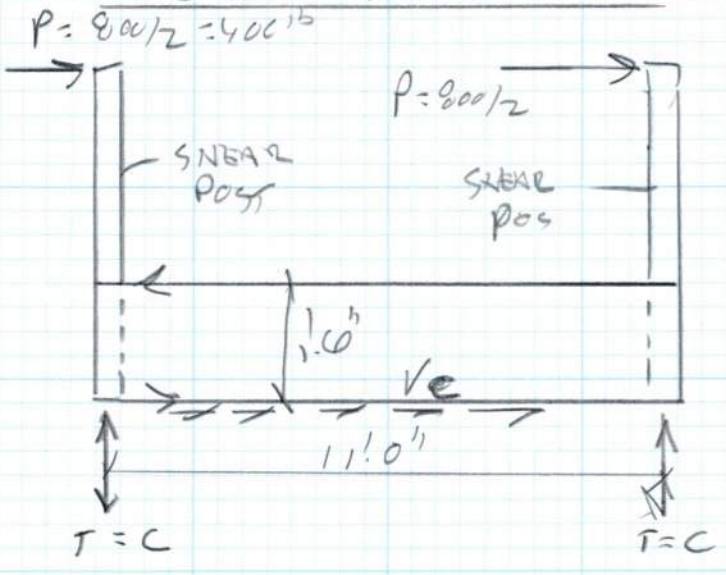


WIND LOAD TO END WALL

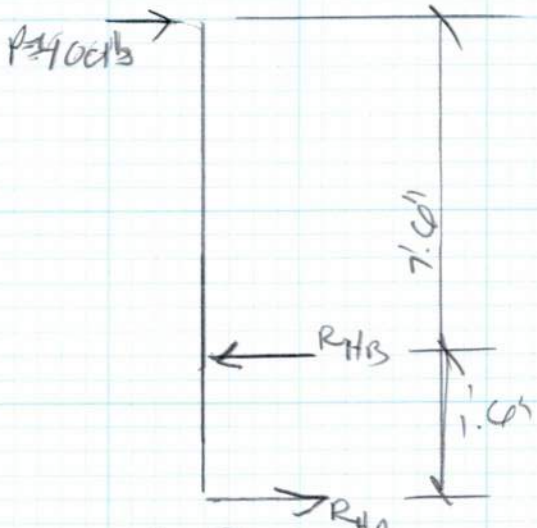
$$P_W = \left[16.0\,psf\left(9/2\right) + 7\,psf\,(4)\right] 16/2$$

$$= 800\,lb$$

END WALL SHEAR PANEL



SHEAR POST LOADING DIAGRAM



$$R_{HA} = \frac{400(7.5^{FT})}{1.5} = 2000\,lb$$

$$R_{HB} = 400/9^{FT}/1.5 = 2400\,lb$$

CRITICAL $V_c = \frac{2400\,lb}{11\,FT} = 218\,lb/FT$

7/16 OSB SHEATHING
W/ 8d NAILS @ 6" O.C

TENSION TIE @ RHB (2400 lb)

USE CS14 (L=16")
30-0.148" ⌀ x 2 1/2" NAILS

$$T = C = 800\,lb\,(9)/11 = 655\,lb$$

SIMPSON DTT2Z
W/ 1/2" ⌀ LAG SCREW

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 7, 2026 13:58	Shear Panel End Post

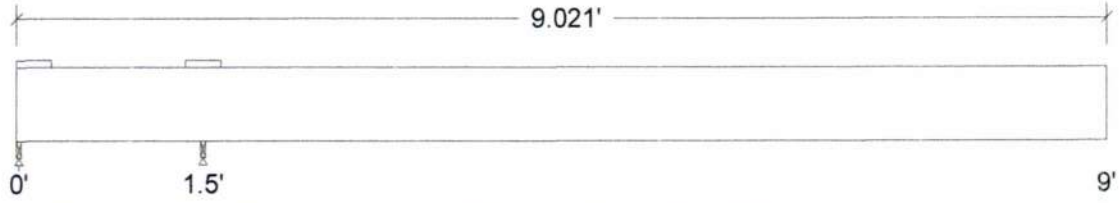
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Wind	Point	No	9.02		400		lbs
Self-weight	Dead	Full UDL	No			11.0		plf

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



Unfactored:					
Wind	-2000		2400		
Factored:					
Uplift	-1318				
Combined			1618		
Bearing:					
Capacity					
Beam	1969		3445		
Support	1758		1758		
Des ratio					
Beam	0.00		0.50		
Support	0.00		0.99		
Load comb	#1		#2		
Length	0.50*		0.50*		
Min req'd	0.50*		0.50*		
Cb	1.00		1.75		
Cb min	1.00		1.75		
Cb support	1.07		1.07		
Fcp sup	625		625		

*Minimum bearing length setting used: 1/2" for end supports and 1/2" for interior supports

Shear Panel Corner Post

LVL n-ply, 1.8E, 2600Fb, 1-3/4"x7-1/4", 3-ply (5-1/4"x7-1/4")

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

Total length: 9.02'; Clear span: 1.458', 7.479'; Volume = 2.4 cu.ft.

Lateral support: top = at supports, 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 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 1407	Vr = 11571	lbs	V/Vr = 0.12
Bending(-)	fb = 550	Fb' = 2933	psi	fb/Fb' = 0.19
Deflection:				
Interior Live	-0.00 = < L/999	0.05 = L/360	in	0.04
Total	-0.00 = < L/999	0.08 = L/240	in	0.03
Cantil. Live	0.26 = L/350	0.50 = L/180	in	0.51
Total	0.28 = L/323	0.75 = L/120	in	0.37

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	LC#
Fv'	285	1.60	-	1.00	-	-	-	-	1.00	-	3
Fb'-	2600	1.60	-	1.00	0.633	1.071	-	1.04	1.00	-	3
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	1.9 million		-	1.00	-	-	-	-	1.00	-	2
Eminy'	0.95 million		-	1.00	-	-	-	-	1.00	-	2

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #3  = D + 0.6W
Bending(-): LC #3  = D + 0.6W
Deflection: LC #2  = 0.6D + 0.6W  (live)
            LC #3  = D + 0.6W  (total)
Bearing    : Support 1 - LC #1 = D only
             Support 2 - LC #2 = 0.6D + 0.6W
Uplift     : Support 1 - LC #2 = 0.6D + 0.6W
Load Types: W=wind
All LC's are listed in the Analysis output
Load combinations: ASD Basic from ASCE 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 2, V max = 1414 lbs M(-) = 2109 lbs-ft
EI = 105.03e06 lb-in^2/ply GA = 4.50e06 lb
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(-):  Lu = 7.50'  Le = 12.63'  RB = 18.9; b = single ply width
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2024) and the National Design Specification (NDS 2024), 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. System factor KH may not apply to field-assembled multi-ply beams.
4. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.
5. SCL: Structural composite lumber design has assumed: - dry service conditions - no preservative or fire-retardant treatment - no notches
6. BUILT-UP SCL: Contact manufacturer for connection details when side-loaded or when loads are not applied equally to all plies.
7. SCL: Shear deflection is calculated using true modulus of elasticity E and shear modulus G = E/16.

TABLE 1

ALLOWABLE SHEAR (POUNDS PER FOOT) FOR APA PANEL SHEAR WALLS WITH FRAMING OF DOUGLAS-FIR, LARCH, OR SOUTHERN PINE[a] FOR WIND OR SEISMIC LOADING[b,h,i,j,k] (See also IBC Table 2306.4.1)

			Panels Applied Direct to Framing					Panels Applied Over 1/2" or 5/8" Gypsum Sheathing			
Panel Grade	Minimum Nominal Panel Thickness (in.)	Minimum Nail Penetration in Framing (in.)	Nail Size (common or galvanized box)[k]	Nail Spacing at Panel Edges (in.) 6	4	3	2[e]	Nail Size (common or galvanized box)	Nail Spacing at Panel Edges (in.) 6	4	3	2[e]
APA STRUCTURAL I grades	5/16	1-1/4	6d (0.113" dia.)	200	300	390	510	8d (0.131" dia.)	200	300	390	510
	3/8	1-3/8	8d (0.131" dia.)	230[d]	360[d]	460[d]	610[d]	10d (0.148" dia.)	280	430	550[f]	730
	7/16			255[d]	395[d]	505[d]	670[d]					
	15/32			280	430	550	730					
	15/32	1-1/2	10d (0.148" dia.)	340	510	665[f]	870		—	—	—	—
APA RATED SHEATHING; APA RATED SIDING[g] and other APA grades except Species Group 5	5/16 or 1/4[c]	1-1/4	6d (0.113" dia.)	180	270	350	450	8d (0.131 dia.)	180	270	350	450
	3/8			200	300	390	510		200	300	390	510
	3/8	1-3/8	8d (0.131" dia.)	220[d]	320[d]	410[d]	530[d]	10d (0.148" dia.)	260	380	490[f]	640
	7/16			240[d]	350[d]	450[d]	585[d]					
	15/32			260	380	490	640					
	15/32	1-1/2	10d (0.148" dia.)	310	460	600[f]	770	—	—	—	—	—
	19/32			340	510	665[f]	870	—	—	—	—	—
APA RATED SIDING[g] and other APA grades except Species Group 5			Nail Size (galvanized casing)					Nail Size (galvanized casing)				
	5/16[c]	1-1/4	6d (0.113" dia.)	140	210	275	360	8d (0.131" dia.)	140	210	275	360
	3/8	1-3/8	8d (0.131" dia.)	160	240	310	410	10d (0.148" dia.)	160	240	310[f]	410

(a) For framing of other species: Find specific gravity for species of lumber in the AF&PA National Design Specification (NDS). Find shear value from table above for nail size for actual grade and multiply value by the following adjustment factor: Specific Gravity Adjustment Factor = [1 – (0.5 – SG)], where SG = Specific Gravity of the framing lumber. This adjustment shall not be greater than 1.

(b) Panel edges backed with 2 inch nominal or wider framing. Install panels either horizontally or vertically. Space fasteners maximum 6 inches on center along intermediate framing members for 3/8 inch and 7/16 inch panels installed on studs spaced 24 inches on center. For other conditions and panel thicknesses, space nails maximum 12 inches on center on intermediate supports.

(c) 3/8 inch panel thickness or siding with a span rating of 16 inches on center is the minimum recommended where applied direct to framing as exterior siding.

(d) Allowable shear values are permitted to be increased to values shown for 15/32 inch sheathing with same nailing provided (1) studs are spaced a maximum of 16 inch on center, or (2) panels are applied with long dimension across studs.

(e) Framing at adjoining panel edges shall be 3 inch nominal or wider, and nails shall be staggered where nails are spaced 2 inch on center.

(f) Framing at adjoining panel edges shall be 3 inch nominal or wider, and nails shall be staggered where both the following conditions are met: (1) 10d (3 inch x 0.148 inch) nails having penetration into framing of more than 1-1/2 inch and (2) nails are spaced 3 inch on center.

(g) Values apply to all-veneer plywood. Thickness at point of fastening on panel edges governs shear values.

(h) Where panels applied on both faces of a wall and nail spacing is less than 6 inches o.c. on either side, panel joints shall be offset to fall on different framing members, or framing shall be 3 inch nominal or thicker at adjoining panel edges and nails on each side shall be staggered.

(i) In Seismic Design Category D, E or F, where shear design values exceed 350 pounds per lineal foot, all framing members receiving edge nailing from abutting panels shall not be less than a single 3 inch nominal member, or two 2 inch nominal members fastened together in accordance with IBC Section 2306.1 to transfer the design shear value between framing members. Wood structural panel joint and sill plate nailing shall be staggered in all cases. See IBC Section 2305.3.11 for sill plate size and anchorage requirements.

(j) Galvanized nails shall be hot dipped or tumbled.

(k) For shear loads of normal or permanent load duration as defined by the AF&PA NDS, the values in the table above shall be multiplied by 0.63 or 0.56, respectively.

Typical Layout for Shear Walls

MPBZ™

Moment Post Base

The patent-pending MPBZ is specifically designed to provide moment resistance for columns or posts. An innovative overlapping sleeve design encapsulates the post, helping to resist rotation around its base. It is available for 4x4, 6x6 and 8x8 posts. The MPBZ is ideal for outdoor structures, such as carports, fences and decks. Built-in stand-off tabs provide the required 1" stand-off to resist decay of the post while eliminating multiple parts and assembly. Additionally, the MPBZ is available in ZMAX® as the standard finish to meet exposure conditions in many environments. For 10" stemwalls or round footings, see engineering letters, L-C-10MPBZ and L-C-MPBZ at **strongtie.com**.

Features:

- Internal top-of-concrete tabs
- 1" standoff tabs
- Additional holes provided to attach trim material
- Weep hole provided for water drainage

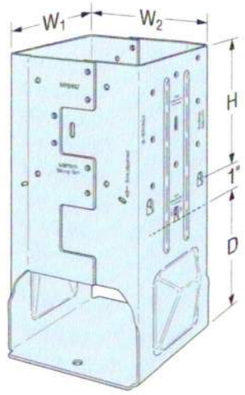
Material: 12 gauge

Finish: ZMAX coating

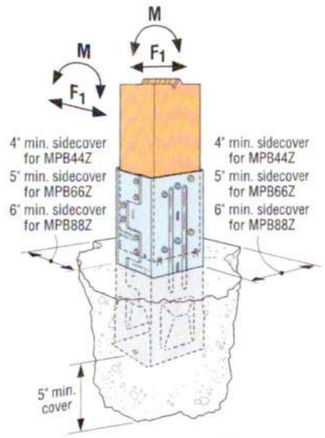
Installation:

- Use all specified fasteners; see General Notes.
- Install MPBZ before concrete is placed using embedment level indicators and form board attachment holes.
- Place post on tabs 1" above top of concrete.
- Install Strong-Drive® SDS Heavy-Duty Connector screws, which are supplied with the MPBZ. (Lag screws will not achieve the same load.)
- Concrete level inside the part must not exceed ¼" above embedment line to allow for water drainage.
- Annual inspection of connectors used in outdoor application is advised. If significant corrosion is apparent or suspected, then the wood, fasteners and connectors should be evaluated by a qualified engineer or inspector.

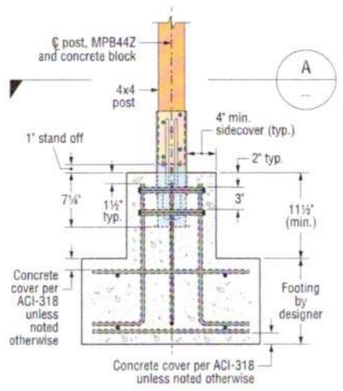
Codes: See p. 13 for Code Reference Key Chart

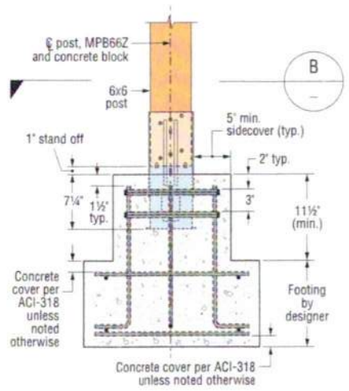


MPB88Z
(MPB44Z, MPB66Z similar)
US Patent 11,072,940

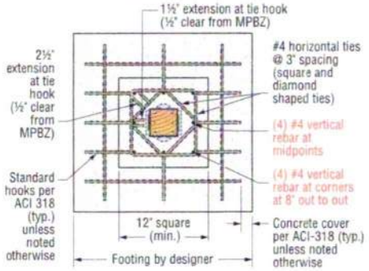


Typical MPB66Z Nonreinforced Installation
(others similar)



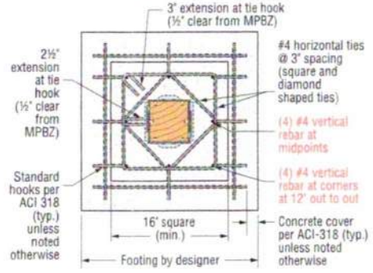


SECTION A



MPB44Z
Reinforced Concrete Footing
Footing (size and reinforcement) by designer. Standard hook geometry in accordance with ACI 318 unless noted otherwise.

SECTION B



MPB66Z
Reinforced Concrete Footing
Footing (size and reinforcement) by designer. Standard hook geometry in accordance with ACI 318 unless noted otherwise.

These reinforced MPBZ details are available on **strongtie.com/mpbz**.

Simpson Strong-Tie® Wood Construction Connectors

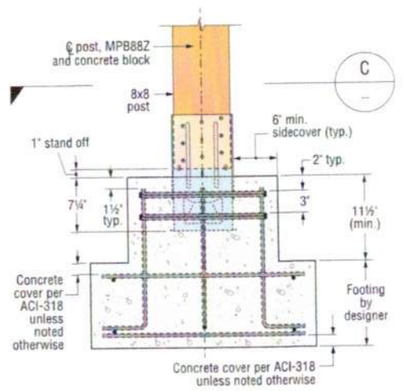
MPBZ™

Moment Post Base (cont.)

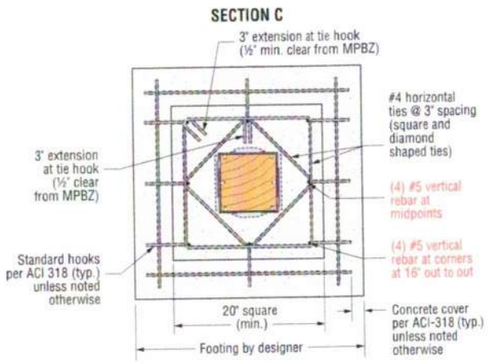
These products are available with additional corrosion protection. For more information, see p. 16.

Model No.	Nominal Column Size	Dimensions (in.)			Strong-Drive® SDS Screws	Concrete Allowable Loads						Wood Assembly DF/SP Allowable Loads			Rotational Stiffness (in.-lb./rad.)	Code Ref.
						Uplift		Lateral F_1		Moment M (ft.-lb.)		Download (100)	Download (160)	Moment M (ft.-lb.) (160)		
		W_1 / W_2	D	H		Uncracked	Cracked	Uncracked	Cracked	Uncracked	Cracked					
Nonreinforced Concrete																
Wind and Seismic Design Category A&B																
MPB44Z	4x4	3⅜	7¼	7¼	(16) ¼" x 2½"	4,900	3,820	1,750	1,225	1,350	945	6,240	6,410	1,520	1,245,000	IBC®, FL, LA
MPB66Z	6x6	5⅜	7¼	7¼	(24) ¼" x 2½"	5,815	5,815	3,435	2,405	2,680	1,875	9,360	10,855	3,730	2,405,000	
MPB88Z	8x8	7⅜	7¼	7¼	(36) ¼" x 3"	11,860	9,315	7,200	5,560	4,160	2,910	15,120	17,690	4,560	5,515,000	
Seismic Design Category C–F																
MPB44Z	4x4	3⅜	7¼	7¼	(16) ¼" x 2½"	4,785	3,350	1,535	1,075	1,180	830	6,240	6,410	1,520	1,245,000	IBC, FL, LA
MPB66Z	6x6	5⅜	7¼	7¼	(24) ¼" x 2½"	5,815	5,815	3,015	2,110	2,055	1,645	9,360	10,855	3,730	2,405,000	
MPB88Z	8x8	7⅜	7¼	7¼	(36) ¼" x 3"	10,155	8,165	6,965	4,875	3,470	2,550	15,120	17,690	4,560	5,515,000	
Reinforced Concrete																
Wind and Seismic Design Category A&B																
MPB44Z	4x4	3⅜	7¼	7¼	(16) ¼" x 2½"	4,900	3,820	1,750	1,225	1,520	1,520	6,240	6,410	1,520	1,245,000	IBC, FL, LA
MPB66Z	6x6	5⅜	7¼	7¼	(24) ¼" x 2½"	5,815	5,815	3,435	2,405	3,730	3,190	9,360	10,855	3,730	2,405,000	
MPB88Z	8x8	7⅜	7¼	7¼	(36) ¼" x 3"	11,860	9,315	7,200	5,560	4,560	4,560	15,120	17,690	4,560	5,515,000	
Seismic Design Category C–F																
MPB44Z	4x4	3⅜	7¼	7¼	(16) ¼" x 2½"	4,785	3,350	1,535	1,075	1,520	1,520	6,240	6,410	1,520	1,245,000	IBC, FL, LA
MPB66Z	6x6	5⅜	7¼	7¼	(24) ¼" x 2½"	5,815	5,815	3,015	2,110	3,350	2,795	9,360	10,855	3,730	2,405,000	
MPB88Z	8x8	7⅜	7¼	7¼	(36) ¼" x 3"	10,155	8,165	6,965	4,875	4,560	4,560	15,120	17,690	4,560	5,515,000	

1. Loads may not be increased for duration of load.
2. Higher download can be achieved by solidly packing grout in the 1" standoff area before installation of the post. Allowable download shall be based on either the wood post design or the concrete design calculated per code.
3. Concrete shall have a minimum compressive strength of f'_c = 2,500 psi.
4. Tabulated rotational stiffness accounts for the rotation of the base assembly attributable to deflection of the connector, fastener slip, and post deformation. Designer must account for additional deflection attributable to bending of the post.
5. Multiply seismic and wind ASD uplift and lateral load values by 1.43 or 1.67, respectively, to obtain LRFD capacities.
6. In accordance with IBC, Section 1613.1, detached one- and two-family dwellings in Seismic Design Category (SDC) C may use "Wind and SDC A&B" allowable loads.
7. Foundation dimensions are for anchorage only. Foundation design (size and reinforcement) by designer.
8. Allowable load shall be the lesser of the wood assembly or concrete allowable load.
9. For loading simultaneously in more than one direction, the allowable load must be evaluated using the following equation: (Design Uplift / Allowable Uplift, or Design Download / Allowable Download) + (Design Moment / Allowable Moment) + (Design Lateral / Allowable Lateral) ≤ 1.0.
10. To account for shrinkage up to 3%, multiply rotational stiffness by 0.75. Reduction may be linearly interpolated for shrinkage less than 3%.
11. Tabulated load values may be used for rough sawn lumber or larger size posts without reduction factors. Rough-size and larger-size posts shall be planed uniformly on all four sides such that centerline of post is concentric with the center line of MPBZ.



SECTION C



MPB88Z
Reinforced Concrete Footing
Footing (size and reinforcement) by designer. Standard hook geometry in accordance with ACI 318 unless noted otherwise.

Bases and Caps

ENNOVATION ENGINEERING SERVICES INC

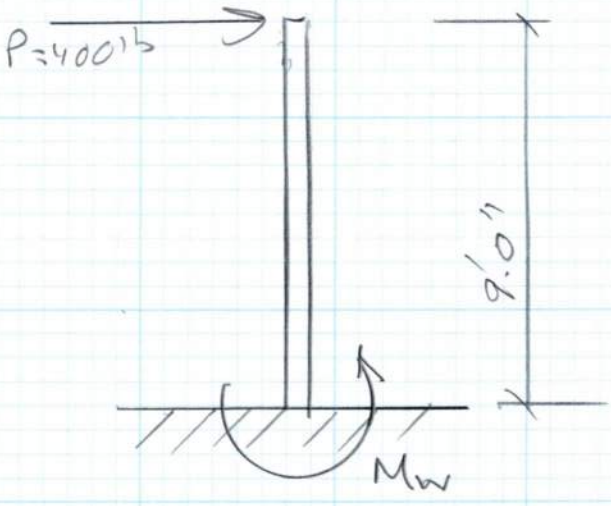
PROJECT 3-SEASON PORCH

DESCR.

REF. PROJ NO.

BY DATE SHEET NO.

LATERAL LOAD TRANSFER TO DECK POSTS



$M_W = 4000(9) = 3600$ Ft. lb

Try 8x8 POST

$F_b = 875(1.20)$ ← LOAD DURATION FACTOR

ADJ. $F_b = 1050$

$S_{req} = \frac{3600(12)}{1050} = 41.1 in^3$

$S_{8x8} = \frac{7.25(7.25)^2}{6} = 63.5$

8x8 POST O.K

BASE CONNECTION

$M_W = 3600$ Ft. lb

USE SIMPSON MPB88Z MOMENT POST BASE ALLOW 4,560 F.lb

a2

ENNOVATION ENGINEERING SERVICES INC

PROJECT 3-SEASON PORCH

DESCR.

REF. PROJ NO.

BY DATE SHEET NO.

CHECK EXISTING HEADERS

EXISTING LINE LOADS @ EXT. WALL

ROOF

W_{SN} = 30psf (9) = 270

W_{DL} = 20psf (9) = 180

2ND FLOOR

W_{LL} = 40 (9) = 360

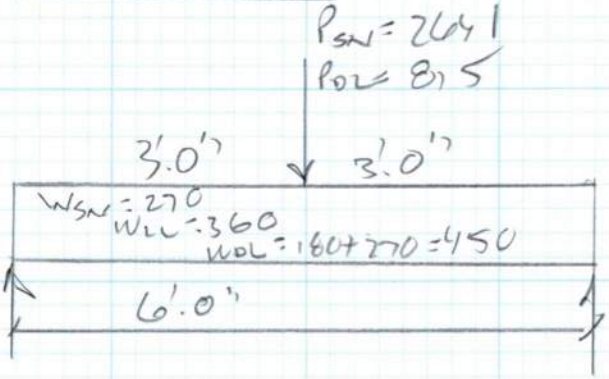
W_{DL} = (15+15)(9) = 270

1ST FLOOR

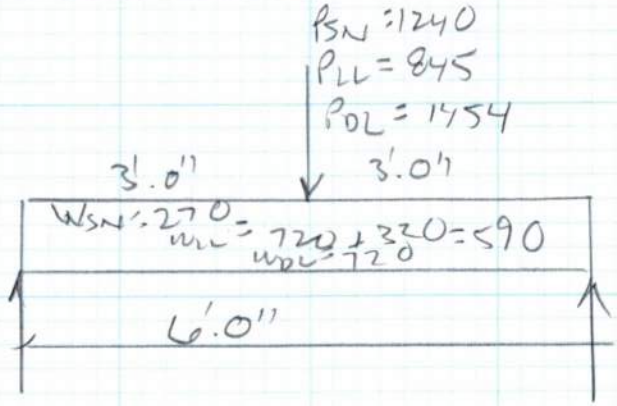
W_{LL} = 40 (9) = 360

W_{DL} = 30 (9) = 270

2ND FLOOR HEADER



1ST FLOOR HEADER



WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 8, 2026 01:26	Existing 2nd Floor Header Check

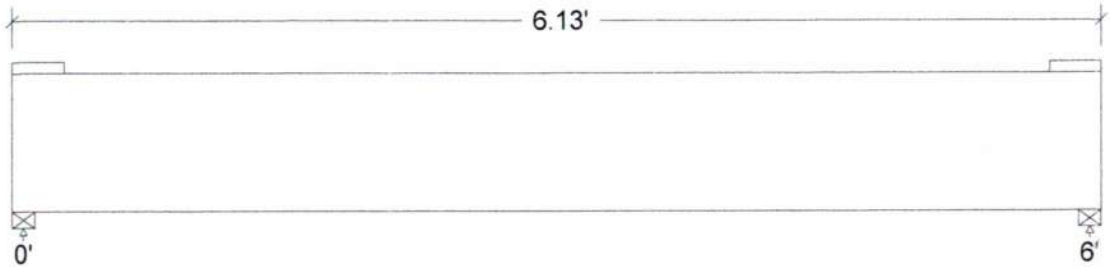
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Snow	Point		3.00		2642		lbs
Load2	Dead	Point		3.00		815		lbs
Load3	Dead	Full UDL				450.0		plf
Load4	Live	Full UDL				360.0		plf
Load5	Snow	Full UDL				270.0		plf
Self-weight	Dead	Full UDL				9.3		plf

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



Unfactored:			
Dead	1824		1806
Live	1104		1103
Snow	2177		2120
Factored:			
Combined	3799		3750
Bearing:			
Capacity			
Beam	4117		4064
Support	3799		3750
Des ratio			
Beam	0.92		0.92
Support	1.00		1.00
Load comb	#3		#3
Length	1.57		1.55
Min req'd	1.57**		1.55**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.11		1.11
Fcp sup	625		625

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

Existing 2nd Floor Header

LVL n-ply, 1.8E, 2600Fb, 1-3/4"x9-1/4", 2-ply (3-1/2"x9-1/4")

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

Total length: 6.13'; Clear span: 5.87'; Volume = 1.4 cu.ft.

Lateral support: top = at supports, bottom = at supports;

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 3010	Vr = 7074	lbs	V/Vr = 0.43
Bending(+)	fb = 1736	Fb' = 2284	psi	fb/Fb' = 0.76
Live Defl'n	0.07 = < L/999	0.20 = L/360	in	0.33
Total Defl'n	0.15 = L/470	0.30 = L/240	in	0.51

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	LC#
Fv'	285	1.15	-	1.00	-	-	-	-	1.00	-	3
Fb'+	2600	1.15	-	1.00	0.737	1.036	-	1.00	1.00	-	3
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	1.9 million		-	1.00	-	-	-	-	1.00	-	3
Eminy'	0.95 million		-	1.00	-	-	-	-	1.00	-	3

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #3  = D + 0.75(L + 0.7S)
Bending(+): LC #3  = D + 0.75(L + 0.7S)
Deflection: LC #3  = D + 0.75(L + 0.7S)  (live)
            LC #3  = D + 0.75(L + 0.7S)  (total)
Bearing    : Support 1 - LC #3 = D + 0.75(L + 0.7S)
             Support 2 - LC #3 = D + 0.75(L + 0.7S)
Load Types: D=dead L=live S=snow
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 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 1, V max = 3738 lbs M(+) = 7220 lbs-ft
EI = 218.14e06 lb-in^2/ply GA = 3.82e06 lb
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 6.00'  Le = 12.06'  RB = 20.9; b = single ply width
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2024) and the National Design Specification (NDS 2024), 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. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.
4. SCL: Structural composite lumber design has assumed: - dry service conditions - no preservative or fire-retardant treatment - no notches
5. BUILT-UP SCL: Contact manufacturer for connection details when side-loaded or when loads are not applied equally to all plies.
6. SCL: Shear deflection is calculated using true modulus of elasticity E and shear modulus G = E/16.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 8, 2026 01:27	Existing 1st Floor Header Check

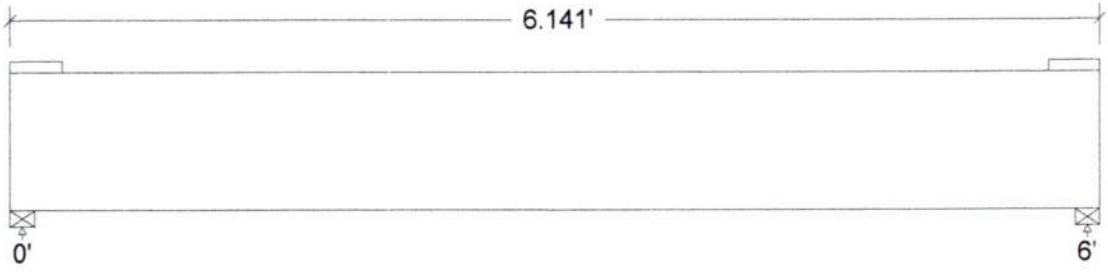
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Snow	Point		3.07		1240		lbs
Load2	Live	Point		3.00		845		lbs
Load3	Dead	Full UDL				720.0		plf
Load4	Live	Full UDL				720.0		plf
Load5	Snow	Full UDL				270.0		plf
Load6	Live	Point		3.00		590		lbs
Load7	Dead	Point		3.07		1454		lbs
Self-weight	Dead	Full UDL				14.0		plf

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



Unfactored:			
Dead	2980		2980
Live	2945		2911
Snow	1449		1449
Factored:			
Combined	5954		5928
Bearing:			
Capacity			
Beam	6668		6639
Support	5954		5928
Des ratio			
Beam	0.89		0.89
Support	1.00		1.00
Load comb	#3		#3
Length	1.69		1.69
Min req'd	1.69**		1.69**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.07		1.07
Fcp sup	625		625

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

Existing 1st Floor Header

LVL n-ply, 1.8E, 2600Fb, 1-3/4"x9-1/4", 3-ply (5-1/4"x9-1/4")

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

Total length: 6.14'; Clear span: 5.859'; Volume = 2.1 cu.ft.

Lateral support: top = at supports, 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 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 4600	Vr = 9227	lbs	V/Vr = 0.50
Bending(+)	fb = 1735	Fb' = 2201	psi	fb/Fb' = 0.79
Live Defl'n	0.07 = < L/999	0.20 = L/360	in	0.33
Total Defl'n	0.16 = L/448	0.30 = L/240	in	0.54

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	LC#
Fv'	285	1.00	-	1.00	-	-	-	-	1.00	-	2
Fb'+	2600	1.00	-	1.00	0.786	1.036	-	1.04	1.00	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	1.9 million		-	1.00	-	-	-	-	1.00	-	3
Eminy'	0.95 million		-	1.00	-	-	-	-	1.00	-	3

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D + L
Bending(+): LC #2  = D + L
Deflection: LC #3  = D + 0.75(L + 0.7S)  (live)
            LC #3  = D + 0.75(L + 0.7S)  (total)
Bearing   : Support 1 - LC #3 = D + 0.75(L + 0.7S)
            Support 2 - LC #3 = D + 0.75(L + 0.7S)
Load Types: D=dead L=live S=snow
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 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 1, V max = 5823 lbs M(+) = 10826 lbs-ft
EI = 218.14e06 lb-in^2/ply GA = 5.74e06 lb
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 6.00'  Le = 12.06'  RB = 20.9; b = single ply width
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2024) and the National Design Specification (NDS 2024), 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. System factor KH may not apply to field-assembled multi-ply beams.
4. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.
5. SCL: Structural composite lumber design has assumed: - dry service conditions - no preservative or fire-retardant treatment - no notches
6. BUILT-UP SCL: Contact manufacturer for connection details when side-loaded or when loads are not applied equally to all plies.
7. SCL: Shear deflection is calculated using true modulus of elasticity E and shear modulus G = E/16.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 8, 2026 01:28	Existing 1st Floor Header Check-11.25 inch LVL Opition

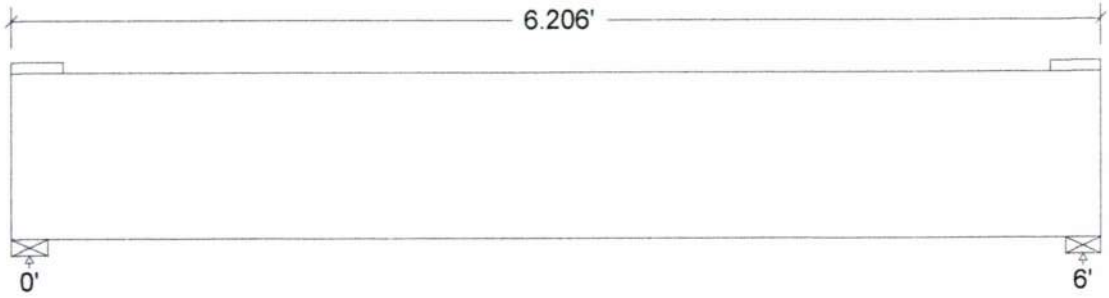
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Snow	Point		3.10		1240		lbs
Load2	Live	Point		3.00		845		lbs
Load3	Dead	Full UDL				720.0		plf
Load4	Live	Full UDL				720.0		plf
Load5	Snow	Full UDL				270.0		plf
Load6	Live	Point		3.00		590		lbs
Load7	Dead	Point		3.10		1454		lbs
Self-weight	Dead	Full UDL				11.3		plf

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



Unfactored:			
Dead	2995		2995
Live	2977		2927
Snow	1458		1458
Factored:			
Combined	6000		5961
Bearing:			
Capacity			
Beam	6503		6461
Support	6000		5961
Des ratio			
Beam	0.92		0.92
Support	1.00		1.00
Load comb	#3		#3
Length	2.48		2.46
Min req'd	2.48**		2.46**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.11		1.11
Fcp sup	625		625

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

Existing 1st Floor Header - 11 1/4" LVL Option

LVL n-ply, 1.8E, 2600Fb, 1-3/4"x11-1/4", 2-ply (3-1/2"x11-1/4")

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

Total length: 6.21'; Clear span: 5.794'; Volume = 1.7 cu.ft.

Lateral support: top = at supports, bottom = at supports;

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 4313	Vr = 7481	lbs	V/Vr = 0.58
Bending(+)	fb = 1754	Fb' = 1865	psi	fb/Fb' = 0.94
Live Defl'n	0.06 = < L/999	0.20 = L/360	in	0.30
Total Defl'n	0.15 = L/487	0.30 = L/240	in	0.49

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	LC#
Fv'	285	1.00	-	1.00	-	-	-	-	1.00	-	2
Fb'+	2600	1.00	-	1.00	0.711	1.009	-	1.00	1.00	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	1.9 million		-	1.00	-	-	-	-	1.00	-	3
Eminy'	0.95 million		-	1.00	-	-	-	-	1.00	-	3

CRITICAL LOAD COMBINATIONS:

```
Shear     : LC #2  = D + L
Bending(+): LC #2  = D + L
Deflection: LC #3  = D + 0.75(L + 0.7S)  (live)
            LC #3  = D + 0.75(L + 0.7S)  (total)
Bearing   : Support 1 - LC #3 = D + 0.75(L + 0.7S)
            Support 2 - LC #3 = D + 0.75(L + 0.7S)
Load Types: D=dead L=live S=snow
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 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 1, V max = 5823 lbs M(+) = 10790 lbs-ft
EI = 392.44e06 lb-in^2/ply GA = 4.65e06 lb
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 6.00'  Le = 12.38'  RB = 23.3; b = single ply width
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2024) and the National Design Specification (NDS 2024), 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. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.
4. SCL: Structural composite lumber design has assumed: - dry service conditions - no preservative or fire-retardant treatment - no notches
5. BUILT-UP SCL: Contact manufacturer for connection details when side-loaded or when loads are not applied equally to all plies.
6. SCL: Shear deflection is calculated using true modulus of elasticity E and shear modulus G = E/16.

WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
	Apr. 8, 2026 01:24	Existing 1st Floor Header Check-2.5 Ft Window

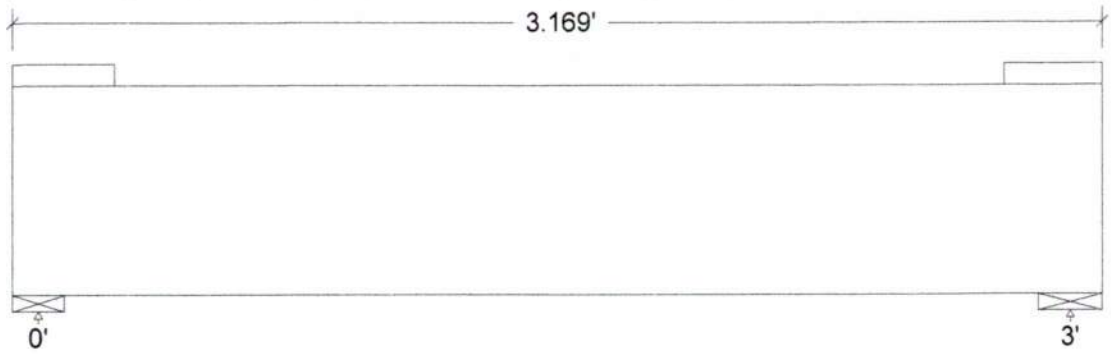
Design Check Calculation Sheet

WoodWorks Sizer 13.3

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	Location [ft] End	Magnitude Start	Magnitude End	Unit
Load3	Dead	Full UDL				720.0		plf
Load4	Live	Full UDL				720.0		plf
Load5	Snow	Full UDL				270.0		plf
Load6	Live	Point		3.00		590		lbs
Self-weight	Dead	Full UDL				4.4		plf

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



Unfactored:			
Dead	1140		1155
Live	1134		1738
Snow	425		431
Factored:			
Combined	2274		2893
Bearing:			
Capacity			
Beam	2274		2893
Support	3761		4786
Des ratio			
Beam	1.00		1.00
Support	0.60		0.60
Load comb	#2		#2
Length	1.78		2.27
Min req'd	1.78		2.27
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.12		1.12
Fcp sup	625		625

Existing 1st Floor Header Check-2.5 Ft Window

Lumber n-ply, S-P-F, No.1/No.2, 2x8, 2-ply (3"x7-1/4")

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

Total length: 3.17'; Clear span: 2.831'; Volume = 0.5 cu.ft.

Lateral support: top = at supports, bottom = at supports;

This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2024 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	V = 1180	Vr = 1957	lbs	V/Vr = 0.60
Bending(+)	fb = 742	Fb' = 1017	psi	fb/Fb' = 0.73
Live Defl'n	0.01 = < L/999	0.10 = L/360	in	0.10
Total Defl'n	0.02 = < L/999	0.15 = L/240	in	0.16

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	135	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	0.968	1.200	-	1.00	1.00	1.00	2
Fcp'	425	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.4 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.51 million		1.00	1.00	-	-	-	-	1.00	1.00	2

CRITICAL LOAD COMBINATIONS:

```
Shear      : LC #2  = D + L
Bending(+): LC #2  = D + L
Deflection: LC #2  = D + L  (live)
            LC #2  = D + L  (total)
Bearing    : Support 1 - LC #2 = D + L
             Support 2 - LC #2 = D + L
Load Types: D=dead L=live S=snow
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 7-22 2.4
```

CALCULATIONS:

```
V design from NDS 3.4.2.2(a) at support 1, V max = 2167 lbs M(+) = 1625 lbs-ft
EI = 66.69e06 lb-in^2/ply
"Live" deflection is due to all non-dead loads (live, wind, snow…)
Total deflection = 1.50 permanent + "live"
Lateral stability(+):  Lu = 3.00'  Le = 6.19'  RB = 15.5; b = single ply width
```

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2024) and the National Design Specification (NDS 2024), 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.
4. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.