

March 12, 2024

Mr. Kendall Breunig
Sunset Investors
10700 W Venture Dr, Suite G1
Franklin, WI 53132

RE: 324 N 15th Street, Milwaukee, WI

Mr. Breunig:

At your request, Spire Engineering, Inc. ("Spire") has analyzed the existing timber framing at 324 North 15th Street in Milwaukee, Wisconsin because of concerns over its capacity.

You had the wood species identified as Red Pine by the Forest Products Lab in Madison, Wisconsin. Then you hired Wood Science Consulting of Millbrook New York to advise us on design values to use for the Red Pine. Using those structural properties, we have analyzed the floor joists, beams and the roof for use as both residential and commercial. Per Section 1607 of the *2015 International Building Code*, the design load for Residential use is 40 pounds per square foot; for Office use it is 65 psf; and for Retail it is 100 psf. Because the floors are very unlevel, we have added 15 psf of dead load for a system of Styrofoam and 2" of gypcrete for leveling the floors.

The building is L-shaped. The main north building area facing St Paul Ave is about 8,500 sf, and the southern portion is about 4,400 sf. The framing spans are different in the two areas, so there are separate calculations for each area. The floor joists are uniform in size on all floors, but the beam sizes get smaller as you go up higher in the building. Also, there was a fire on the south side of the building in about the year 2000. About half of the floor joists have been replaced with wood truss joists (TJIs). Visual grading of the original wood joists will still be done, but based on the knots in the beams, they will not be graded any higher than No 1, which is what we have used for our analysis. Additionally, there are water damaged beams and joists that will require further evaluation.

The results are:

<u>Use</u>	<u>North Side</u>	<u>Residential Use</u>	<u>Office Use</u>	<u>Snow Loads</u>
Floor joists		Pass	Pass	
1 st floor beams		Pass	Fail	
2 nd floor beams		Pass	Fail	
3 rd floor beams		Pass	Fail	
4 th floor beams		Pass	Fail	
Roof beams		n/a	n/a	Fail



<u>South Side</u>	<u>Residential Use</u>	<u>Office Use</u>	<u>Snow Loads</u>
Floor joists	Pass	Fail	
TJI floor joists	Pass	Fail	
3 rd floor beams	Pass	Fail	
4 th floor beams	Pass	Fail	
Roof beams	n/a	n/a	Fail

No areas of the building capable of supporting Office floor loads, including the areas rebuilt with TJI's after the fire on the south side of the building. All floors of the building are capable of supporting Residential use. At one time, the building probably was capable of supporting an office load using a historical value of 50 psf for Live Load instead of the current required loading of 65 psf (50 psf Live Load plus 15 psf for Partitions per Section 1607.5). All of the roof framing beams will need to be reinforced.

There are no floor design loads that are less than residential.

Sincerely,

Spire Engineering, Inc.



Alan T. Rentmeester, P.E.
President | Senior Structural Engineer

ATR:bef

2024-03-12 timber structural analysis results.docx



Kendall Breunig

From: Arevalo Burbano, Jorge - FS, WI <Jorge.ArevaloBurbano@usda.gov>
Sent: Friday, February 16, 2024 12:45 PM
To: Kendall Breunig
Subject: Wood Identification Public Service
Attachments: Breunig.pdf

Dear Kendall Breunig,

Attached you will find our response regarding your submissions to the Wood Identification Public Service. Your specimen required more than the customary working time to identify.

Sincerely,



J. Rafael E. Arevalo B., PhD
Botanist-Collections Manager

Forest Service
Forest Products Laboratory, FPL-4715

p: 1-608-231-9492

Jorge.ArevaloBurbano@usda.gov

One Gifford Pinchot Drive
Madison, WI 53726

www.fs.fed.us



Caring for the land and serving people

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United States
Department of
Agriculture

Forest
Service

Forest
Products
Laboratory

One Gifford Pinchot Dr.
Madison, WI 53726-2398

Date: February 16, 2024

Kendall Breunig
10700 W Venture Dr #G1
Franklin, WI 53132

Dear Kendall Breunig,

I have identified the specimen(s) you submitted to the Center for Wood Anatomy Research wood identification service. Your specimen(s) was/were received on 14-Feb-24 and identification(s) was/were completed on 14-Feb-24 the identification(s) is/are as follows:

1. *Pinus* sp. (Red Pine Group) 1ST FLOOR BEAM
2. *Pinus* sp. (White Pine Group) BSMNT BEAM
3. *Pinus* sp. (Red Pine Group) JOISTS

Respectfully,

Alex C. Wiedenhoef, Ph.D.

The [Forest Products Laboratory's website](#) has a wealth of information about a broad range of topics related to wood.

By submitting specimens for identification, you have accepted the [terms and conditions](#) of the wood identification public service.



Kendall Breunig

From: Matt Anderson <matt@woodscienceconsulting.com>
Sent: Friday, February 16, 2024 2:30 PM
To: Kendall Breunig
Cc: Alan Rentmeester (atr@spireengineer.com)
Subject: Re: FW: Wood Identification Public Service

Below are the preliminary base design values for the timbers and joists. What would be very helpful for me to know before I prepare a proposal is what grade does not work for the desired loading conditions. The values provided below are base design values, seasoning adjustments of up to 20% may be applicable for the Fb in the timbers based upon the current moisture content levels in the timbers and joists.

Design Values for Red and White Pine Timbers (5x5 and larger)

Visual Grade	F _b (psi)	F _t (psi)	F _v (psi)	F _{c//} (psi)	F _{c⊥} (psi)	E (psi)	SG ³
SS	1,050	625	130	725	440	1,100,000	0.44
No. 1	875	450	130	600	440	1,100,000	
No. 2	575	300	130	375	440	900,000	

Design Values for Red and White Pine 12" Deep Joists (2" to 4" thick)

Visual Grade	F _b (psi)	F _t (psi)	F _v (psi)	F _{c//} (psi)	F _{c⊥} (psi)	E (psi)	SG ³
SS	1,300	575	135	1,200	335	1,300,000	0.36
No. 1	875	400	135	1,050	335	1,200,000	
No. 2	775	350	135	1,000	335	1,100,000	
No. 3	450	200	135	575	335	1,000,000	

Matt Anderson

Wood Science Consulting
PO Box 1381
20 Ciferri Drive
Millbrook, NY 12545
o: 845-605-1225 m: 914-489-6727
www.woodscienceconsulting.com

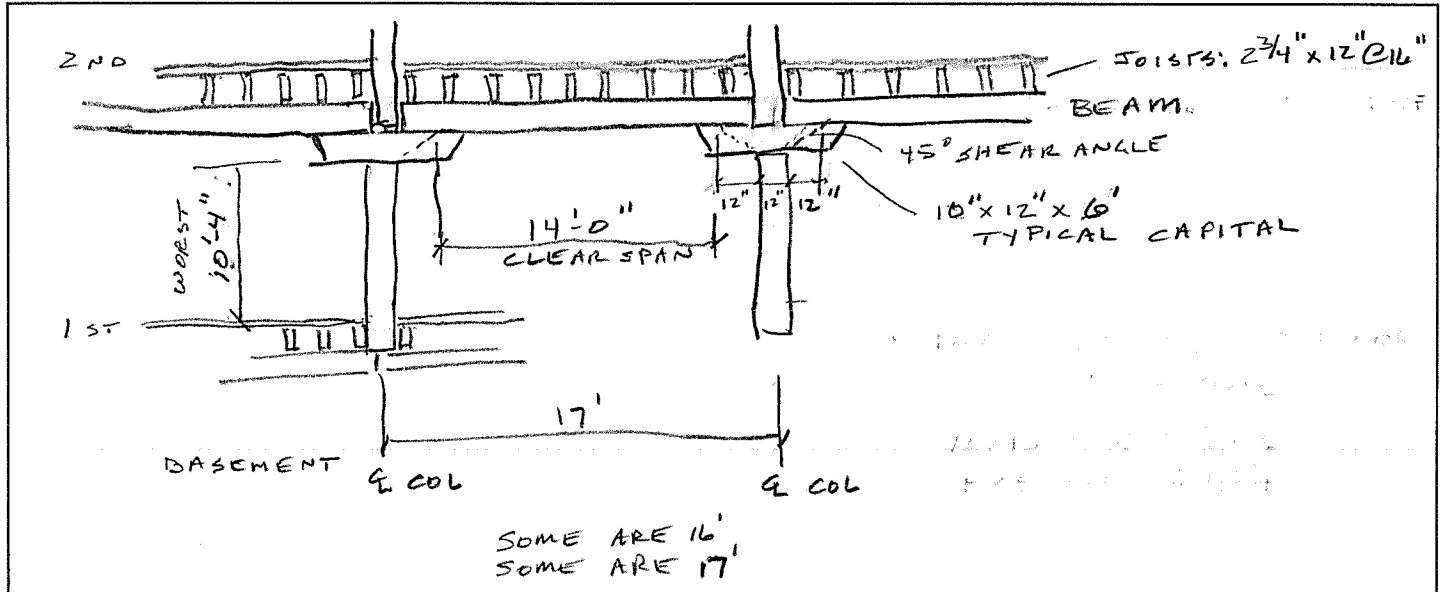
BRIAN JENDUSA



On Fri, Feb 16, 2024 at 3:08 PM Kendall Breunig <ken@sunsetinvestors.com> wrote:

Breunig Engineering, Inc.
 10700 W Venture Drive, Ste G1
 Franklin WI 53132-2804
 414-529-8352

JOB 324 N, 15th ST
 SHEET NO. _____ OF _____
 CALCULATED BY KLB DATE 2/5/24
 CHECKED BY _____ DATE _____
 SCALE _____



NORTH WING

	COLUMNS	BEAM	CAPITAL
1ST	10x12 ¹⁰	12x16	10x12x6'
2ND	12x14	12x16	12x12x6'
3RD	12x12	12x16	
4th	10x12	10x16	
ROOF	8x8	8x12	8"x12"x6'

2/28/24

SOUTH WING

SECTION SIMILAR
 COL CENTERS = 16' CLEAR SPAN = 13'
 JOIST SPANS = 17'

	BEAMS
3RD	12x16
4th	10x16
ROOF	8x12



SPIRE ENGINEERING, INC.

Project 15 th & St. Paul		Project Number 24011
By AJT	Date 3-8-24	Sheet Number

SOUTH SECTION

- Check floor framing for office loading vs residential loading

- Office

- DL = 35 psf (2" conc topping)
- LL = 65 psf (50 psf + 15 psf partition)

Roof Loading

- DL = 20 psf (assumed)
- SL = 25 psf (assumed)

Res

- DL = 35 psf (2" conc topping)
- LL = 40 psf

- Joist Design

Joist L = 17'-0"

Dim - 2 3/4" x 12" @ 16" OC

- Office - $\frac{fL}{F_b'} = 1.06$ - Fails

Res - $\frac{f_b}{F_b'} = 0.81$ - OK



SPIRE ENGINEERING, INC.

Project 15 th & S. Paul		Project Number 24011
By AJT	Date 3-8-24	Sheet Number

Beam Design

SOUTH SECTION

Beam L = 13'-0"

trib Width = 17'-0"

- Roof - 8" x 12"

4th - 10" x 16"

3rd - 12" x 16"

2nd - Steel Beam

Roof

$$8" \times 12" \quad - \frac{f_b}{F_b'} = 1.21 - \text{Failed}$$

4th

$$10 \times 16 \quad - \text{Office} - \frac{f_b}{F_b'} = 1.26 - \text{Fail}$$

$$- \text{Res} - \frac{f_b}{F_b'} = 0.94 - \text{OK}$$

3rd

$$12" \times 16" \quad - \text{office} - \frac{f_b}{F_b'} = 1.05 - \text{Fail}$$

$$- \text{res} - \frac{f_b}{F_b'} = 0.78 - \text{OK}$$

2nd

30" Steel Girder - Not checked



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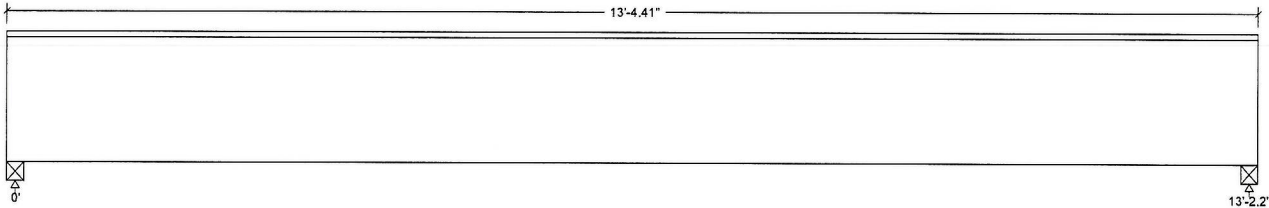
Beam_13ft (3rd - Office Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start End	Magnitude Start End	Unit
Load1	Dead	Full Area			35.00 (17,00')	psf
Load2	Live	Full Area			65.00 (17,00')	psf
Self-weight	Dead	Full UDL			40.5	plf

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



Unfactored:						
Dead	4244					4244
Live	7386					7386
Factored:						
Total	11629					11629
Bearing:						
Capacity						
Beam	11629					11629
Support	16519					16519
Des Ratio						
Beam	1.00					1.00
Support	0.70					0.70
Load comb	#2					#2
Length	2.20					2.20
Min req'd	2.20					2.20
Cb	1.00					1.00
Cb min	1.00					1.00
Cb support	1.00					1.00
Fcp sup	625					625

Special Lumber, Red & White, No.1, 12"x16" actual, 1-ply

Supports: All - Timber-soft Beam, D,Fir-L No.2
Total length: 13'-4.41"; Clear span: 13'; volume = 17.8 cu.ft.
Lateral support: top= full, bottom= at supports;

This section FAILS the design check

WARNING: This section violates the following design criteria: **Bending**

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 70$	$F_v' = 130$	psi	$f_v/F_v' = 0.54$
Bending(+)	$f_b = 886$	$F_b' = 847$	psi	$f_b/F_b' = 1.05$
Live Defl'n	$0.17 = L/949$	$0.44 = L/360$	in	0.38
Total Defl'n	$0.31 = L/509$	$0.66 = L/240$	in	0.47

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cprt	Ci	Cn	LC#
F_v'	130	1.00	1.00	1.00	1.00	-	-	1.00	1.00	1.00	2	
F_b'	875	1.00	1.00	1.00	1.000	0.969	1.00	1.00	1.00	-	2	
F_{cp}'	440	-	1.00	1.00	-	-	-	1.00	1.00	-	-	
E'	1.1 million	1.00	1.00	-	-	-	-	1.00	1.00	-	2	

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 11473, V design = 8993 lbs
Bending(+): LC #2 = D+L, M = 37815 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 4506e06 lb-in²
"Live" deflection = Deflection from all non-dead loads (live, wind, snow.)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING:** Joists, wall studs, and multi-ply members are not rated for fire endurance.



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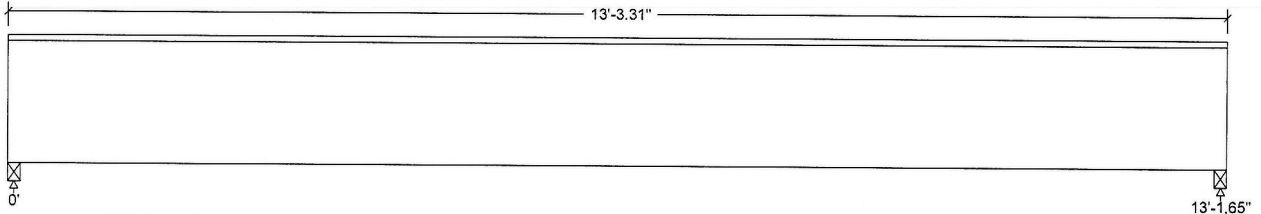
Beam_13ft (3rd - Res Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00	(17.00')	psf
Load2	Live	Full Area				40.00	(17.00')	psf
Self-weight	Dead	Full UDL				40.5		plf

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



Unfactored:			
Dead	4216		4216
Live	4514		4514
Factored:			
Total	8729		8729
Bearing:			
Capacity			
Beam	8729		8729
Support	12400		12400
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	1.65		1.65
Min req'd	1.65		1.65
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red & White, No.1, 12"x16" actual, 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 13'-3.31"; Clear span: 13'; volume = 17.7 cu.ft.
Lateral support: top= full, bottom= at supports;

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 53$	$F_v' = 130$	psi	$f_v/F_v' = 0.41$
Bending(+)	$f_b = 665$	$F_b' = 847$	psi	$f_b/F_b' = 0.78$
Live Defl'n	0.10 = $<L/999$	0.44 = $L/360$	in	0.23
Total Defl'n	0.24 = $L/648$	0.66 = $L/240$	in	0.37

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfxt	Ci	Cn	LC#
F_v'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
$F_b'+$	875	1.00	1.00	1.00	1.000	0.969	1.00	1.00	1.00	1.00	-	2
F_{cp}'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 8642, V design = 6797 lbs

Bending(+): LC #2 = D+L, M = 28383 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: $EI = 4506e06 \text{ lb-in}^2$

"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



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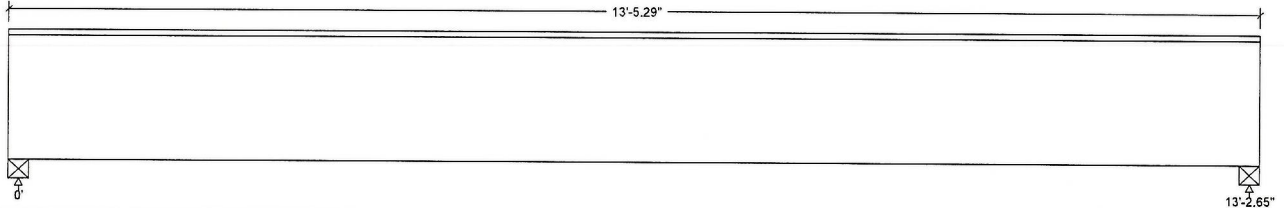
Beam_13ft (4th - Office Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft.]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00	(17.00')	psf
Load2	Live	Full Area				65.00	(17.00')	psf
Self-weight	Dead	Full UDL				33.8		plf

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



Unfactored:								
Dead	4222							4222
Live	7427							7427
Factored:								
Total	11649							11649
Bearing:								
Capacity								
Beam	11649							11649
Support	16546							16546
Des ratio								
Beam	1.00							1.00
Support	0.70							0.70
Load comb	#2							#2
Length	2.65							2.65
Min req'd	2.65							2.65
Cb	1.00							1.00
Cb min	1.00							1.00
Cb support	1.00							1.00
Fcp sup	625							625

Special Lumber, Red & White, No.1, 10"x16" actual, 1-ply
 Supports: All - Timber-soft Beam, D.Fir-L No.2
 Total length: 13'-5.29"; Clear span: 13'; volume = 14.9 cu.ft.
 Lateral support: top= full, bottom= at supports;

This section FAILS the design check

WARNING: This section violates the following design criteria: Bending

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	Fv = 84	Fv' = 130	psi	Fv/Fv' = 0.65
Bending(+)	fb = 1065	Fb' = 847	psi	fb/Fb' = 1.26
Live Defl'n	0.20 = L/784	0.44 = L/350	in	
Total Defl'n	0.37 = L/423	0.66 = L/240	in	0.57

Additional Data:

FACTORS: F/E(psi)CD CM Ct CL CF Cfu Cr Cfrt Ci Cn LC#
 Fv' 130 1.00 1.00 1.00 - - - 1.00 1.00 1.00 2
 Fb' 875 1.00 1.00 1.00 1.000 0.969 1.00 1.00 1.00 - 2
 Fcp' 440 - 1.00 1.00 - - - 1.00 1.00 - -
 E' 1.1 million 1.00 1.00 - - - 1.00 1.00 - 2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 11461, V design = 8958 lbs
 Bending(+): LC #2 = D+L, M = 37881 lbs-ft
 Deflection: LC #2 = D+L (live)
 LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 3755e06 lb-in²

"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING:** Joists, wall studs, and multi-ply members are not rated for fire endurance.



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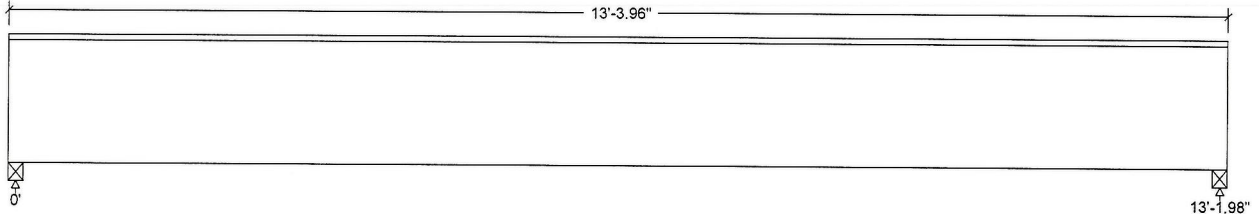
Beam_13ft (4th - Res Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00 (17.00')		psf
Load2	Live	Full Area				40.00 (17.00')		psf
Self-weight	Dead	Full UDL				33.8		plf

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



Unfactored:								
Dead	4188							4188
Live	4532							4532
Factored:								
Total	8721							8721
Bearing:								
Capacity								
Beam	8721							8721
Support	12387							12387
Des ratio								
Beam	1.00							1.00
Support	0.70							0.70
Load comb	#2							#2
Length	1.98							1.98
Min req'd	1.98							1.98
Cb	1.00							1.00
Cb min	1.00							1.00
Cb support	1.00							1.00
Fcp sup	625							625

Special Lumber, Red & White, No.1, 10"x16" actual, 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 13'-3.96"; Clear span: 13'; volume = 14.8 cu.ft.
Lateral support: top= full, bottom= at supports;

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 63$	$F_v' = 130$	psi	$F_v/F_v' = 0.49$
Bending(+)	$f_b = 797$	$F_b' = 847$	psi	$f_b/F_b' = 0.94$
Live Defl'n	0.12 = $<L/999$	0.44 = $L/360$	in	0.28
Total Defl'n	0.29 = $L/540$	0.66 = $L/240$	in	0.44

Additional Data:

FACTORS: F/E (psi) CD CM Ct CL CF Cfu Cr Cfrt Ci Cn LC#
 F_v' 130 1.00 1.00 1.00 - - - - 1.00 1.00 1.00 2
 F_b' 875 1.00 1.00 1.00 1.000 0.969 1.00 1.00 1.00 1.00 - 2
 F_{cp}' 440 - 1.00 1.00 - - - - 1.00 1.00 - -
 F' 1.1 million 1.00 1.00 - - - - 1.00 1.00 - 2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 8615, V design = 6762 lbs
 Bending(+): LC #2 = D+L, M = 28355 lbs-ft
 Deflection: LC #2 = D+L (live)
 LC #2 = D+L (total)
 D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
 All LC's are listed in the Analysis output
 Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: $EI = 3755e06 \text{ lb-in}^2$
 "Live" deflection = Deflection from all non-dead loads (live, wind, snow...)
 Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



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PROJECT

Mar. 8, 2024 15:48

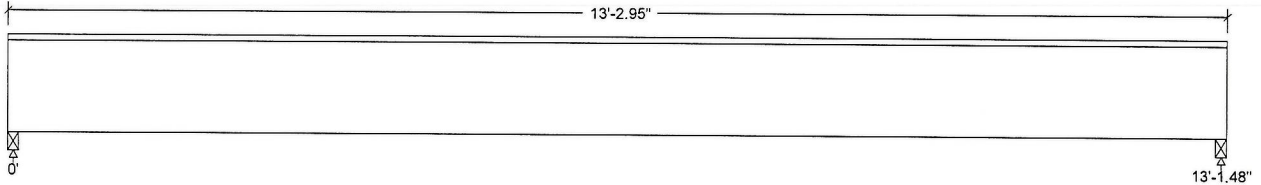
Beam_13ft (Roof Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				20.00	(17.00')	psf
Load2	Live	Full Area				25.00	(17.00')	psf
Self-weight	Dead	Full UDL				20.3		plf

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



Unfactored:			
Dead	2385		2385
Live	2815		2815
Factored:			
Total	5200		5200
Bearing:			
Capacity			
Beam	5200		5200
Support	7386		7386
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	1.48		1.48
Min req'd	1.48		1.48
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red & White, No.1, 8"x12" actual, 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 13'-2.95"; Clear span: 13'; volume = 8.8 cu.ft.
Lateral support: top= full, bottom= at supports;

This section FAILS the design check

WARNING: This section violates the following design criteria: Bending

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	Fv = 67	Fv' = 130	psi	Fv/Fv' = 0.52
Bending(+)	Fb = 1057	Fb' = 875	psi	Fb/Fb' = 1.21
Live Defl'n	0.22 = L/703	0.44 = L/360	in	0.51
Total Defl'n	0.51 = L/309	0.66 = L/240	in	0.77

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrc	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 5153, V design = 4319 lbs

Bending(+): LC #2 = D+L, M = 16905 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 1267e06 lb-in²

"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design 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. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

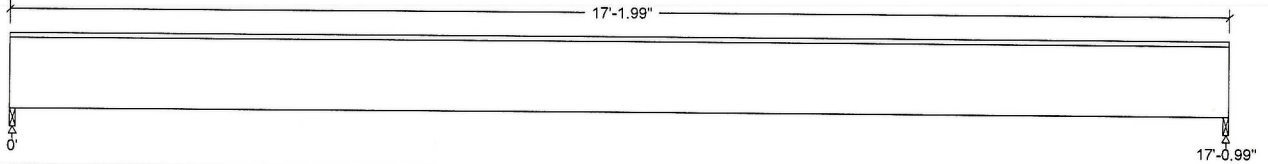


Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00 (1.33')		psf
Load2	Live	Full Area				65.00 (1.33')		psf
Self-weight	Dead	Full UDL				7.0		plf

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



Unfactored:			
Dead	460		460
Live	744		744
Factored:			
Total	1204		1204
Bearing:			
Capacity			
Beam	1204		1204
Support	1943		1943
Des ratio			
Beam	1.00		1.00
Support	0.62		0.62
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	1.14		1.14
Fcp sup	625		625

Special Lumber, Red & White, No.1, 2-3/4"x12", 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 17'-1.99"; Clear span: 17'; volume = 3.9 cu.ft.
Lateral support: top= full, bottom= at supports; Repetitive factor: applied where permitted (refer to online help);

This section FAILS the design check

WARNING: This section violates the following design criteria: Bending
WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 48	Fv' = 130	psi	Fv/Fv' = 0.37
Bending(+)	fb = 931	Fb' = 875	psi	fb/Fb' = 1.06
Live Defl'n	0.38 = L/537	0.57 = L/360	in	0.67
Total Defl'n	0.74 = L/278	0.85 = L/240	in	0.86

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrr	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	-	2
Emin'	0.57 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 1198, V design = 1052 lbs
Bending(+): LC #2 = D+L, M = 5118 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 436e06 lb-in²
"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



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Mar. 8, 2024 15:47

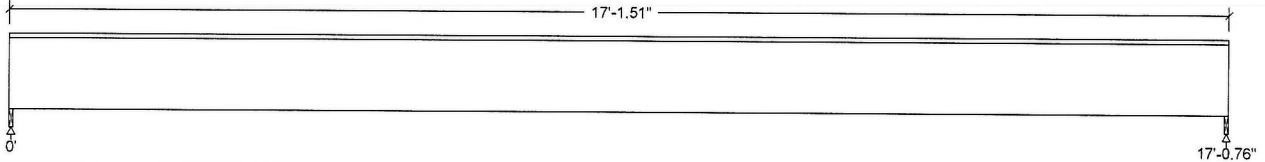
Joist_17ft (Res Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00	(1.33')	psf
Load2	Live	Full Area				40.00	(1.33')	psf
Self-weight	Dead	Full UDL				7.0		plf

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



Unfactored:								
Dead	459							459
Live	457							457
Factored:								
Total	916							916
Bearing:								
Capacity								
Beam	916							916
Support	1478							1478
Des ratio								
Beam	1.00							1.00
Support	0.62							0.62
Load comb	#2							#2
Length	0.76							0.76
Min req'd	0.76							0.76
Cb	1.00							1.00
Cb min	1.00							1.00
Cb support	1.14							1.14
Fcp sup	625							625

Special Lumber, Red & White, No.1, 2-3/4"x12", 1-ply

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

Total length: 17'-1.51"; Clear span: 17'; volume = 3.9 cu.ft.

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

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 36	Fv' = 130	psi	fv/Fv' = 0.28
Bending(+)	fb = 708	Fb' = 875	psi	fb/Fb' = 0.81
Live Defl'n	0.23 = L/876	0.57 = L/360	in	0.41
Total Defl'n	0.59 = L/349	0.85 = L/240	in	0.69

Additional Data:

FACTORS:	F/E	(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrr	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	1.00	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	-	-	-	-	-	-	1.00	1.00	-	2
Emin'	0.57 million	1.00	1.00	-	-	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 913, V design = 802 lbs

Bending(+): LC #2 = D+L, M = 3893 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 436e06 lb-in²

"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)

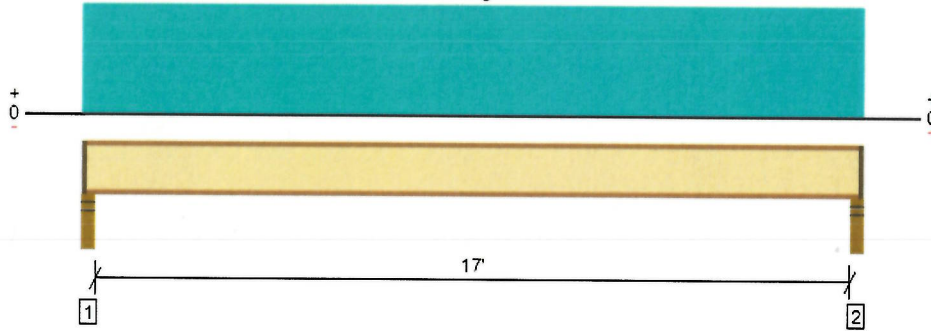
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design 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. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

Level, Floor: Joist
1 piece(s) 11 7/8" TJI® 360 @ 16" OC

Overall Length: 17' 7"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	869 @ 2 1/2"	1202 (2.25")	Passed (72%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	850 @ 3 1/2"	1705	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3684 @ 8' 9 1/2"	6180	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.245 @ 8' 9 1/2"	0.429	Passed (L/841)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.460 @ 8' 9 1/2"	0.858	Passed (L/448)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	46	40	Passed	--	--

Member Length : 17' 4 1/2"
 System : Floor
 Member Type : Joist
 Building Use : Residential
 Building Code : IBC 2021
 Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - SPF	3.50"	2.25"	1.75"	410	469	879	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.75"	410	469	879	1 1/4" Rim Board

• Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 10" o/c	
Bottom Edge (Lu)	17' 5" o/c	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 17' 7"	16"	35.0	40.0	Default Load

Weyerhaeuser Notes
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 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Adam Tuchscherer Spire (920) 312-3157 ajtuchscherer@gmail.com	





SPIRE ENGINEERING, INC.

Project 15 th + St Paul		Project Number 24011
By ATT	Date	Sheet Number

NORTH SECTION

Joists
 $L = 15' - 2''$
 Spacing = 16" OC

Loading - Res
 $DL = 35 \text{ psf}$
 $LL = 40 \text{ psf}$

Loading - Office
 $DL = 35 \text{ psf}$
 $LL = 65 \text{ psf}$

Roof (Assumed)
 $DL = 20 \text{ psf}$
 $SL = 25 \text{ psf}$

Office - OK

$$\frac{f_b}{F_b'} = 0.85$$

Res - OK

$$\frac{f_b}{F_b'} = 0.64$$

Beam

$L = 14' - 0''$
trib width = 14' - 8"

Roof 8" x 12"

$$\frac{f_b}{F_b'} = 1.20 \text{ - Failed}$$

4th

10" x 16"

$$\left[\begin{array}{l} \text{office} - \frac{f_b}{F_b'} = 1.26 \text{ - Fail} \\ \text{- Res} - \frac{f_b}{F_b'} = 0.94 \text{ - OK} \end{array} \right.$$

3rd

11" x 16"

$$\left[\begin{array}{l} \text{office} - \frac{f_b}{F_b'} = 1.14 \text{ - Fail} \\ \text{Res} - \frac{f_b}{F_b'} = 0.86 \text{ - OK} \end{array} \right.$$

2nd

12" x 16"

$$\left[\begin{array}{l} \text{office} - \frac{f_b}{F_b'} = 1.05 \text{ - Fail} \\ \text{Res} - \frac{f_b}{F_b'} = 0.79 \text{ - OK} \end{array} \right.$$

1st - See 2nd floor results



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Feb. 20, 2024 15:17

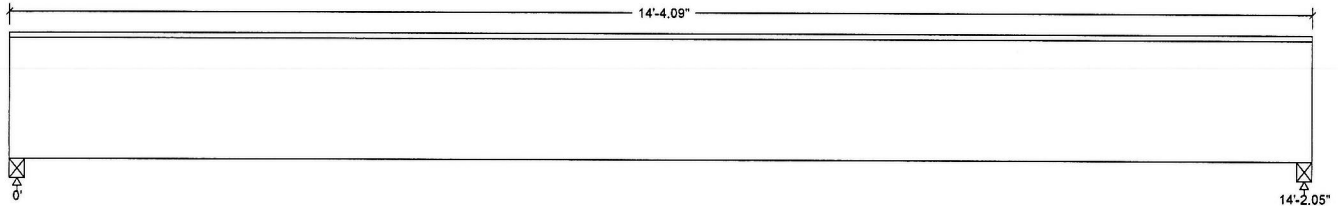
Beam_14ft (2nd - Office Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start End	Magnitude Start End	Unit
Load1	Dead	Full Area			35.00 (14.67')	psf
Load2	Live	Full Area			65.00 (14.67')	psf
Self-weight	Dead	Full UDL			40.5	plf

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



Unfactored:			
Dead	3968		3968
Live	6836		6836
Factored:			
Total	10804		10804
Bearing:			
Capacity			
Beam	10804		10804
Support	15346		15346
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	2.05		2.05
Min req'd	2.05		2.05
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red&White, No.1, 12"x16" actual, 1-ply
Supports: All - Timber-soft Beam, D,Fir-L No.2
Total length: 14'-4.09"; Clear span: 14'; volume = 19.1 cu.ft.
Lateral support: top= full, bottom= at supports;

This section FAILS the design check

WARNING: This section violates the following design criteria: Bending

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 67$	$F_v' = 130$	psi	$f_v/F_v' = 0.51$
Bending(+)	$f_b = 887$	$F_b' = 847$	psi	$f_b/F_b' = 1.05$
Live Defl'n	$0.19 = L/885$	$0.47 = L/360$	in	0.41
Total Defl'n	$0.36 = L/473$	$0.71 = L/240$	in	0.51

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	0.969	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	-	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 10679, V design = 8541 lbs

Bending(+): LC #2 = D+L, M = 37832 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live LC=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 4506e06 lb-in²

Live deflection = Deflection from all non-dead loads (live, wind, snow...)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design 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. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

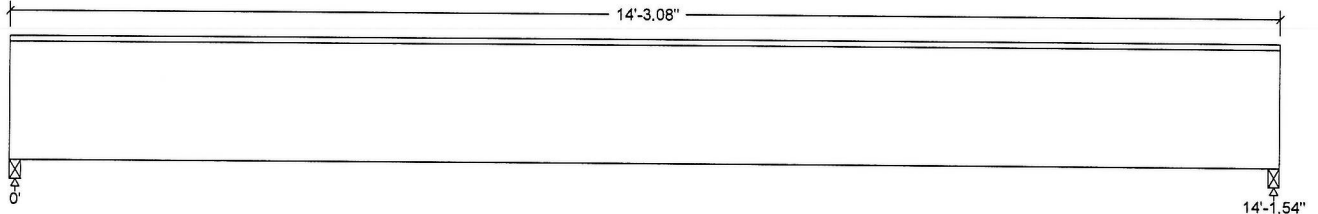


Design Check Calculation Sheet

WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00 (14.67')		psf
Load2	Live	Full Area				40.00 (14.67')		psf
Self-weight	Dead	Full UDL				40.5		plf

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

Unfactored:			
Dead	3945		
Live	4182		3945
Factored:			
Total	8127		8127
Bearing:			
Capacity			
Beam	8127		8127
Support	11544		11544
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	1.54		1.54
Min req'd	1.54		1.54
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red&White, No.1, 12"x16" actual, 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
 Total length: 14'-3.08"; Clear span: 14'; volume = 19.0 cu.ft.
 Lateral support: top= full, bottom= at supports;

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	Fv = 50	Fv' = 130	psi	Fv/Fv' = 0.39
Bending(+)	fb = 667	Fb' = 847	psi	fb/Fb' = 0.79
Live Defl'n	0.12 = <L/999	0.47 = L/360	in	0.25
Total Defl'n	0.28 = L/601	0.71 = L/240	in	0.40

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	0.969	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	-	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 8057, V design = 6463 lbs

Bending(+): LC #2 = D+L, M = 28457 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 4506e06 lb-in²

"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



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Feb. 20, 2024 15:15

Beam_14ft (3rd - Office Loading)

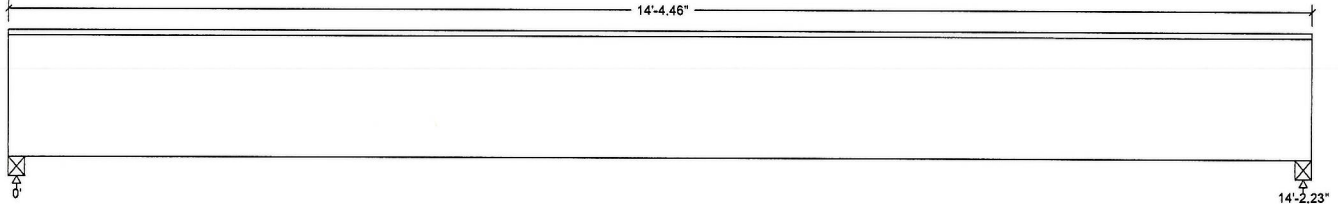
Design Check Calculation Sheet

WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start End	Magnitude Start End	Unit
Load1	Dead	Full Area			35.00 (14.67')	psf
Load2	Live	Full Area			65.00 (14.67')	psf
Self-weight	Dead	Full UDL			37.1	plf

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



Unfactored:			
Dead	3952		3952
Live	6851		6851
Factored:			
Total	10803		10803
Bearing:			
Capacity			
Beam	10803		10803
Support	15345		15345
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	2.23		2.23
Min req'd	2.23		2.23
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red&White, No.1, 11"x16" actual, 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 14'-4.46"; Clear span: 14'; volume = 17.6 cu.ft.
Lateral support: top= full, bottom= at supports;

This section FAILS the design check

WARNING: This section violates the following design criteria: Bending

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 73$	$F_v' = 130$	psi	$f_v/F_v' = 0.56$
Bending(+)	$f_b = 967$	$F_b' = 847$	psi	$f_b/F_b' = 1.14$
Live Defl'n	0.21 = L/809	0.47 = L/360	in	0.44
Total Defl'n	0.39 = L/433	0.71 = L/240	in	0.55

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	0.969	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	-	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 10667, V design = 8522 lbs

Bending(+): LC #2 = D+L, M = 37830 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 4130e06 lb-in²

Live deflection = Deflection from all non-dead loads (live, wind, snow...)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design 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. FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



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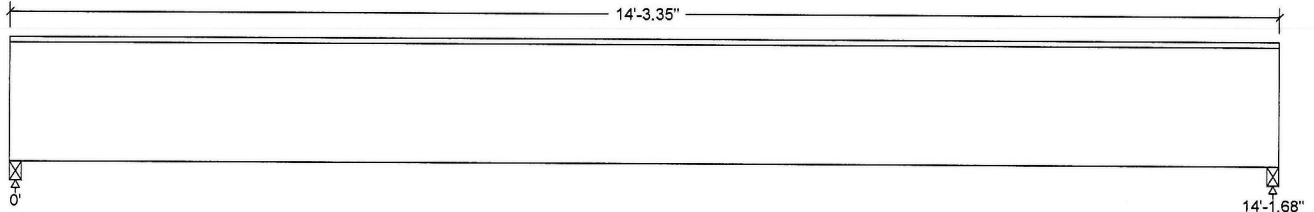
Beam_14ft (3rd - Res Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start End	Magnitude Start End	Unit
Load1	Dead	Full Area			35.00 (14.67')	psf
Load2	Live	Full Area			40.00 (14.67')	psf
Self-weight	Dead	Full UDL			37.1	plf

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



Unfactored:			
Dead	3928		3928
Live	4189		4189
Factored:			
Total	8116		8116
Bearing:			
Capacity			
Beam	8116		8116
Support	11529		11529
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	1.68		1.68
Min req'd	1.68		1.68
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red&White, No.1, 11"x16" actual, 1-ply

Supports: A|| - Timber-soft Beam, D,Fir-L No.2
Total length: 14'-3.35"; Clear span: 14'; volume = 17.5 cu.ft.
Lateral support: top= full, bottom= at supports;

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 55$	$F_v' = 130$	psi	$F_v/F_v' = 0.42$
Bending(+)	$f_b = 727$	$F_b' = 847$	psi	$f_b/F_b' = 0.86$
Live Defl'n	0.13 = $<L/999$	0.47 = $L/360$	in	0.27
Total Defl'n	0.31 = $L/551$	0.71 = $L/240$	in	0.44

Additional Data:

FACTORS:	F/E(ksi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrr	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	0.969	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	-	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 8039, V design = 6444 lbs
Bending(+): LC #2 = D+L, M = 28419 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 4130e06 lb-in²
"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

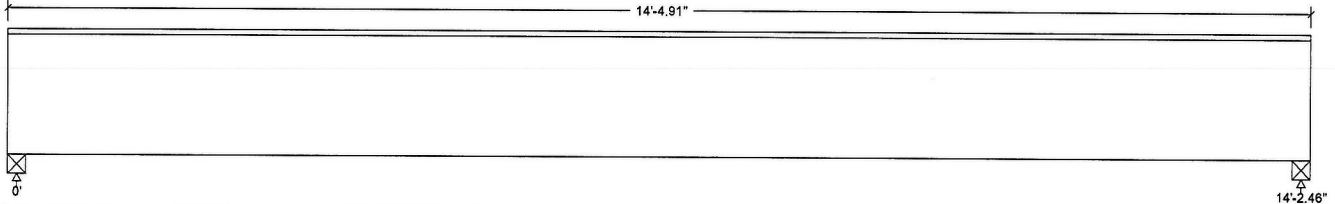


Design Check Calculation Sheet

WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00	(14.67')	psf
Load2	Live	Full Area				65.00	(14.67')	psf
Self-weight	Dead	Full UDL				33.8		plf

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

Unfactored:			
Dead	3938		3938
Live	6869		6869
Factored:			
Total	10807		10807
Bearing:			
Capacity			
Beam	10807		10807
Support	15351		15351
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	2.46		2.46
Min req'd	2.46		2.46
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red&White, No.1, 10"x16" actual, 1-ply

Supports: All - Timber-soft Beam, D, Fir-L No.2
 Total length: 14'-4.91"; Clear span: 14'; volume = 16.0 cu.ft.
 Lateral support: top= full, bottom= at supports;

This section FAILS the design check

WARNING: This section violates the following design criteria: Bending

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 80$	$F_v' = 130$	psi	$f_v/F_v' = 0.61$
Bending(+)	$f_b = 1064$	$F_b' = 847$	psi	$f_b/F_b' = 1.26$
Live Defl'n	$0.23 = L/732$	$0.47 = L/360$	in	0.49
Total Defl'n	$0.43 = L/393$	$0.71 = L/240$	in	0.61

Additional Data:

FACTORS:	F/E	psi	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
F_v'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2	
F_b'	875	1.00	1.00	1.00	1.000	0.969	1.00	1.00	1.00	1.00	-	2	
F_{cp}'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-	
E'	1.1 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	-	2	

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 10657, V design = 8503 lbs

Bending(+): LC #2 = D+L, M = 37844 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: $EI = 3755e06 \text{ lb-in}^2$

"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



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PROJECT

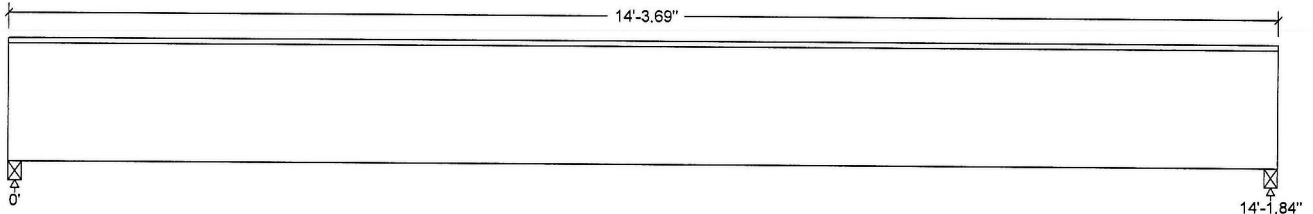
Beam_14ft (4th - Res Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start End	Magnitude Start End	Unit
Load1	Dead	Full Area			35.00 (14.67')	psf
Load2	Live	Full Area			40.00 (14.67')	psf
Self-weight	Dead	Full UDL			33.8	plf

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



Unfactored:			
Dead	3911		3911
Live	4197		4197
Factored:			
Total	8108		8108
Bearing:			
Capacity			
Beam	8108		8108
Support	11517		11517
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	1.84		1.84
Min req'd	1.84		1.84
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red&White, No.1, 10"x16" actual, 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 14'-3.69"; Clear span: 14'; volume = 15.9 cu.ft.
Lateral support: top= full, bottom= at supports;

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	Fv = 60	Fv' = 130	psi	Fv/Fv' = 0.46
Bending(+)	fb = 798	Fb' = 847	psi	fb/Fb' = 0.94
Live Defl'n	0.14 = <L/999	0.47 = L/360	in	0.30
Total Defl'n	0.34 = L/501	0.71 = L/240	in	0.48

Additional Data:

FACTORS: F/E(psi)CD CM Ct CL CF Cfu Cr Cfrt Ci Cn LC#
Fv' 130 1.00 1.00 1.00 - - - - 1.00 1.00 1.00 2
Fb'+ 875 1.00 1.00 1.00 1.000 0.969 1.00 1.00 1.00 1.00 - 2
Fcp' 440 - 1.00 1.00 - - - - 1.00 1.00 - -
E' 1.1 million 1.00 1.00 - - - - 1.00 1.00 - 2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 8023, V design = 6425 lbs
Bending(+): LC #2 = D+L, M = 28390 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 3755e06 lb-in²
"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.



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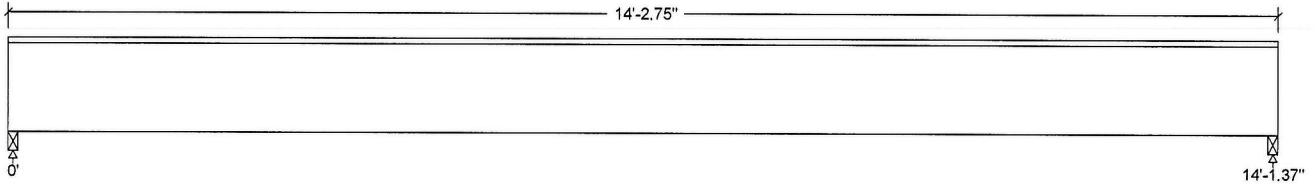
Beam_14ft (Roof - Office Loading)

Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start End	Magnitude Start End	Unit
Load1	Dead	Full Area			20.00(14.67')	psf
Load2	Live	Full Area			25.00(14.67')	psf
Self-weight	Dead	Full UDL			20.3	plf

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



Unfactored:			
Dead	2230		2230
Live	2609		2609
Factored:			
Total	4839		4839
Bearing:			
Capacity			
Beam	4839		4839
Support	6873		6873
Des ratio			
Beam	1.00		1.00
Support	0.70		0.70
Load comb	#2		#2
Length	1.37		1.37
Min req'd	1.37		1.37
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

Special Lumber, Red&White, No.1, 8"x12" actual, 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 14'-2.75"; Clear span: 14'; volume = 9,5 cu.ft.
Lateral support: top= full, bottom= at supports;

This section FAILS the design check

WARNING: This section violates the following design criteria: Bending

WARNING: this CUSTOM SIZE is not in the database. Refer to online help.

WARNING: Your custom section is too thick for the lumber grade properties from Table 4A/B. Select a timber material with properties from Table 4D instead.

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 64$	$F_v' = 130$	psi	$F_v/F_v' = 0.49$
Bending(+)	$f_b = 1059$	$F_b' = 875$	psi	$f_b/F_b' = 1.21$
Live Defl'n	$0.26 = L/655$	$0.47 = L/360$	in	0.55
Total Defl'n	$0.59 = L/287$	$0.71 = L/240$	in	0.84

Additional Data:

FACTORS:	F/E	(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cf _{rt}	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	1.00	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	-	-	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 4801, V design = 4082 lbs
Bending(+): LC #2 = D+L, M = 16940 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: $EI = 1267e06 \text{ lb-in}^2$
"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

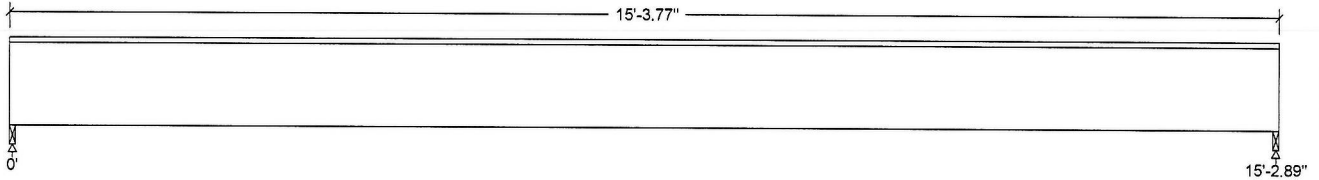


Design Check Calculation Sheet

WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00 (1.33')		psf
Load2	Live	Full Area				65.00 (1.33')		psf
Self-weight	Dead	Full UDL				7.0		plf

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

Unfactored:			
Dead	410		410
Live	663		663
Factored:			
Total	1074		1074
Bearing:			
Capacity			
Beam	1074		1074
Support	1733		1733
Des ratio			
Beam	1.00		1.00
Support	0.62		0.62
Load comb	#2		#2
Length	0.89		0.89
Min req'd	0.89		0.89
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.14		1.14
Fcp sup	625		625

Special Lumber, Red&White, No.1, 2-3/4"x12", 1-ply

Supports: All - Timber-soft Beam, D.Fir-L No.2
 Total length: 15'-3.77"; Clear span: 15'-2"; volume = 3.5 cu.ft.
 Lateral support: top= full, bottom= at supports;

WARNING: Member length exceeds typical stock length of 0.0 [ft]

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 42$	$F_v' = 130$	psi	$f_v/F_v' = 0.32$
Bending(+)	$f_b = 740$	$F_b' = 875$	psi	$f_b/F_b' = 0.85$
Live Defl'n	0.24 = L/757	0.51 = L/360	in	0.48
Total Defl'n	0.47 = L/392	0.76 = L/240	in	0.61

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cft	Ci	Cn	LC#
Fv'	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	875	1.00	1.00	1.00	1.000	1.000	1.00	1.00	1.00	1.00	-	2
Fcp'	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	-	-	-	-	-	1.00	1.00	-	2
Emin'	0.57 million	1.00	1.00	-	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 1069, V design = 923 lbs

Bending(+): LC #2 = D+L, M = 4073 lbs-ft

Deflection: LC #2 = D+L (live)

LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 436e06 lb-in²

"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)

Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING: Joists, wall studs, and multi-ply members are not rated for fire endurance.

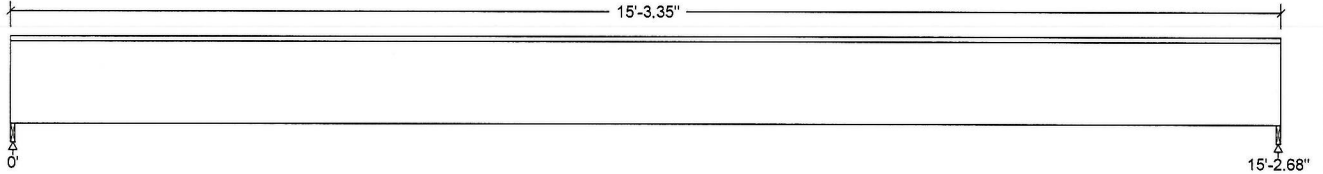


Design Check Calculation Sheet
WoodWorks Sizer 11.1

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				35.00	(1.33')	psf
Load2	Live	Full Area				40.00	(1.33')	psf
Self-weight	Dead	Full UDL				7.0		plf

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



Unfactored:			
Dead	409		409
Live	407		407
Factored:			
Total	817		817
Bearing:			
Capacity			
Beam	817		817
Support	1319		1319
Des ratio			
Beam	1.00		1.00
Support	0.62		0.62
Load comb	#2		#2
Length	0.68		0.68
Min req'd	0.68		0.68
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.14		1.14
Fcp sup	625		625

Special Lumber, Red&White, No.1, 2-3/4"x12", 1-ply

Supports: All - Timber-soft Beam, D,Fir-L No.2
Total length: 15'-3.35"; Clear span: 15'-2"; volume = 3.5 cu.ft.
Lateral support: top= full, bottom= at supports;

WARNING: Member length exceeds typical stock length of 0.0 [ft]

Analysis vs. Allowable Stress and Deflection using NDS 2015 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 32$	$F_v' = 130$	psi	$f_v/F_v' = 0.25$
Bending(+)	$f_b = 563$	$F_b' = 875$	psi	$f_b/F_b' = 0.64$
Live Defl'n	$0.15 = <L/999$	$0.51 = L/360$	in	0.29
Total Defl'n	$0.37 = L/492$	$0.76 = L/240$	in	0.49

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cf _{rt}	Ci	Cn	LC#
F _v '	130	1.00	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
F _b '+	875	1.00	1.00	1.00	1.000	1.000	1.00	1.00	1.00	1.00	-	2
F _{cp} '	440	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.1 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	-	2
E _{min} '	0.57 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V max = 814, V design = 704 lbs
Bending(+): LC #2 = D+L, M = 3098 lbs-ft
Deflection: LC #2 = D+L (live)
LC #2 = D+L (total)

D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2015

CALCULATIONS:

Deflection: EI = 436e06 lb-in²
"Live" deflection = Deflection from all non-dead loads (live, wind, snow...)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2015), the National Design Specification (NDS 2015), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
- FIRE RATING:** Joists, wall studs, and multi-ply members are not rated for fire endurance.