

STRUCTURAL CALCULATIONS
for
CLACKAMAS FIRE DISTRICT #1 STATION #12 REMODEL
18081 S HARDING ROAD
OREGON CITY, OREGON

Project Number: 24238

December 20, 2024



EXPIRES: 12-31-2025

DESIGN PARAMETERS: 2022 Oregon Structural Specialty Code

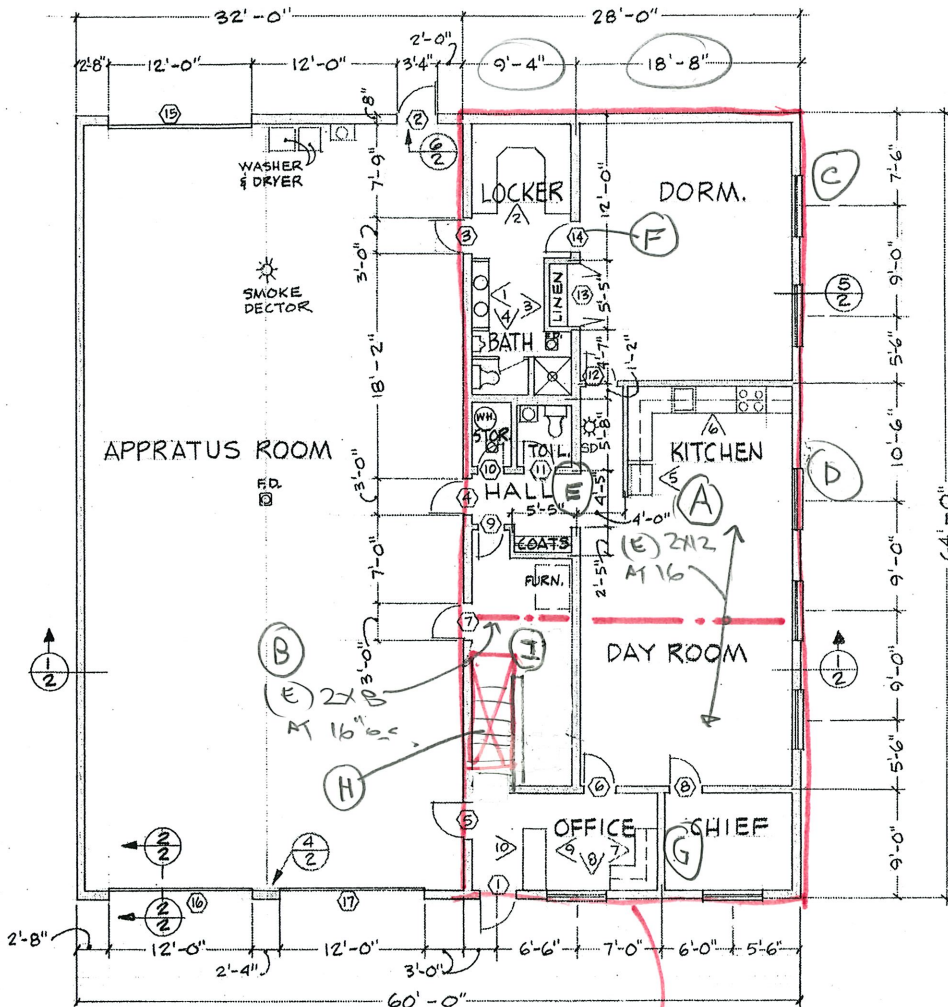
STRUCTURAL RISK CATEGORY: IV
ROOF LOAD 15 psf DL
..... 25 psf Snow ($p_{min} = 20 \text{ psf} \times I_s$)
GROUND SNOW 10 psf
IMPORTANCE $I_s = 1.2$
FLOOR LOAD
FITNESS ROOM 22 psf dL
..... 100 psf LL

CONTENTS:

FLOOR FRAMING FF-1 to FF-21

Job Name: **CFD #1 Station #12 Remodel**
 Client: **SEA**

Job No: **24238** Sheet No: **FF-1**
 Date: **Oct 2024** By: **DJD**



AN FLOOR PLAN

MEZZ
 FITNESS ROOM ABOVE
 FLOOR LOADINGS:

2x8 @ 16" o.c.	PLYND	2.3 PSF	} 9.9 PSF
2x12 @ 16" o.c.	JOISTS	3.3 PSF	
	CEILING	2.8 PSF	
	INSULATION	0.5 PSF	
	MISC.	1.0 PSF	} 22.2 PSF
	ADDED LOADS:		
	MAT	6.0 PSF	
	PLY	2.3 PSF	
	JOISTS	4.0 PSF	
17.1 PSF			

LIVE LOAD 100PSF

CHECK
 2x12 AT 16" o.c.
 $F_b = 1250 \text{ PSI} \times 1.15 \text{ REPEATIVE USE}$
 $= 1437 \text{ PSI}$ $EI = 320 \times 10^6$
 CLEAR SPAN = 18.5'

ALLOWABLE LIVE LOAD:
 4/4 PSF ALLOWABLE
 LIVE LOAD
 (53 PSF ALLOW. w/ (15) PL)

TRAY ADDING
 1 3/4 x 11 1/4 LVL $f_b = 2500 \text{ PSI}$
 $EI = 415 \times 10^6$
 $\frac{320}{320 + 415} = 43.5\% \text{ TO (E)}$
 $56.5\% \text{ TO LVL}$

$M = 6970^{14}$
 $(E) 2x12 \frac{6970 \times 0.435}{31.64 \text{ in}^2} = 3032^{14}$
 $F_b = \frac{3032^{14}(12)}{31.64 \text{ in}^2} = 1150 \text{ PSI}$
 $< 1437 \text{ PSI OK}$

LVL $6970 \times 0.565 = 3938^{14}$
 $F_b = \frac{3938^{14}(12)}{36.91 \text{ in}^2} = 1280^{14}$
 $\Delta = 0.58" = 1/385 \text{ TL OK}$
 $< 2500 \text{ PSI OK}$

OR 3x12 $EI = 475 \times 10^6$
 $F_b = 1035 \text{ PSI}$ $S = 52.73 \text{ in}^3$
 $\frac{320}{320 + 474} = 40\% \text{ TO (E)}$ $60\% \text{ TO NEWS}$
 $F_b = \frac{0.6(6374^{14})(12)}{52.73 \text{ in}^2} = 870 \text{ PSI OK}$

ADD (1) 1 3/4 x 11 1/4 LVL TO EA JOIST
 OR
 ADD (1) 3x12 TO EA JOIST

Job Name: CFD #1 Station #12 Remodel

Job No: 24238

Sheet No: FP-2

Client: SEA

Date: Oct 2024

By: DJD

CHB-C 2x8 @ 16" o.c.

$F_b = 1437 \text{ psi}$ CLEAR SPAN = 8.75'

100PSF ALLOWABLE LIVE LOAD:

NOT USED

NEW WINDOW IN WEST WALL

HEADER: SPAN 4'

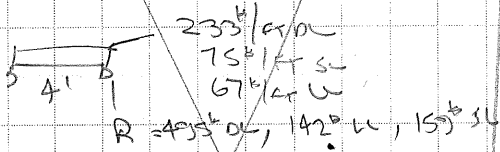
WF 3x15PSF = 45[#]/FT ROOF DL

3'x25PSF = 75[#]/FT ROOF SL

0.67'x12PSF = 8[#]/FT MEZZ DL

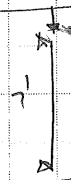
0.67'x100PSF = 67[#]/FT MEZZ UL

12'x15PSF = 180[#]/FT WALL DL



LISE (2) 13/4 x 5 1/2 LVL

TRIMMER STUD:



LISE (1) 2x6 TRIMMER STUD

KING STUD



$q_z = GCP + GCi$
 $q_p = 24.3 \text{ PSF} \times (1.0 + 0.18)$
 $\times 2.67' \text{ TRIM} = 70.6 \text{ #/FT}$

LISE (1) 2x6 KING STUD

FF-3



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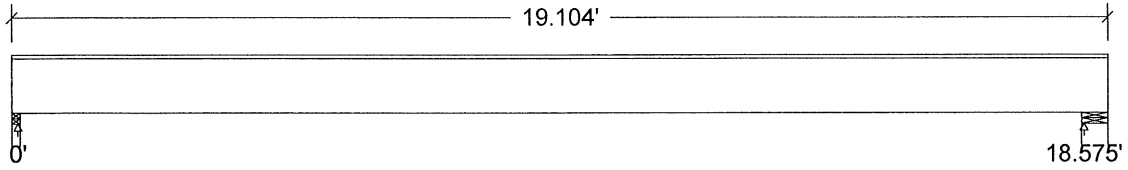
PROJECT
Existing 2x12 joists.wwb

Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude	Unit
				Start	End		
Load1	Dead	Full Area				22.20 (16.0")	psf
Load2	Live	Full Area				44.00 (16.0")	psf

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



Unfactored:			
Dead	278		287
Live	551		570
Factored:			
Total	829		857
Bearing:			
Capacity			
Joist	1641		5156
Support	2051		6445
Des ratio			
Joist	0.51		0.17
Support	0.40		0.13
Load comb	#2		#2
Length	1.75		5.50
Min req'd	0.88		0.91
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fcp sup	625		625

Bearing for wall supports is perpendicular-to-grain bearing on top plate. No stud design included.

Lumber-soft, D.Fir-L, No.1&Btr, 2x12 (1-1/2"x11-1/4")

Supports: All - Lumber Stud Wall, D.Fir-L No.2

Floor joist spaced at 16.0" c/c; Total length: 19.13'; Clear span: 18.5'; Volume = 2.2 cu.ft.

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

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 65$	$F_v' = 180$	psi	$f_v/F_v' = 0.36$
Bending (+)	$f_b = 1444$	$F_b' = 1380$	psi	$f_b/F_b' = 1.05$
Dead Defl'n	$0.25 = L/900$			
Live Defl'n	$0.49 = L/454$	$0.62 = L/360$	in	0.79
Total Defl'n	$0.74 = L/302$	$0.93 = L/240$	in	0.79

Allowable
W @ 5% OVER
= 44 psf

ADD JOISTS
SEE FF-1

(53 psf A1 (5) 10 psf b.l.)

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	180	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	1200	1.00	1.00	1.00	1.000	1.000	-	1.15	1.00	1.00	2
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.8 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.66 million	1.00	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

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 7-16 2.4

CALCULATIONS:

V max = 820, V design = 734 (NDS 3.4.3.1(a)) lbs; M(+) = 3807 lbs-ft



EI = 320.36e06 lb-in²

"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Design Notes:

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

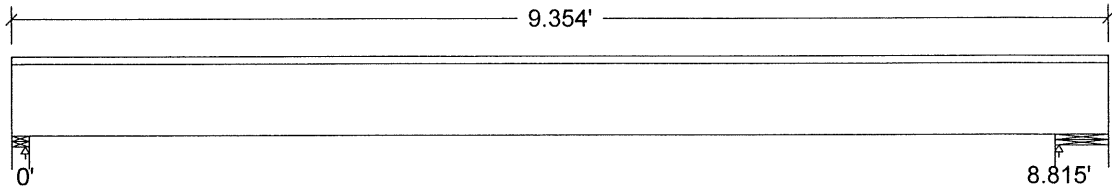
 <p>WoodWorks SOFTWARE FOR WOOD DESIGN</p>	<p>COMPANY</p> <p>Nov. 18, 2024 13:56</p>	<p>PROJECT</p>  <p>Existing 2x8 joists.wwb</p>
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Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude	Unit
				Start	End		
Load1	Dead	Full Area				17.10 (16.0")	psf
Load2	Live	Full Area				100.00 (16.0")	psf

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



Unfactored:			
Dead	103		110
Live	603		644
Factored:			
Total	706		755
Bearing:			
Capacity			
Joist	1641		5156
Support	2051		6445
Des ratio			
Joist	0.43		0.15
Support	0.34		0.12
Load comb	#2		#2
Length	1.75		5.50
Min req'd	0.75		0.80
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fcp sup	625		625

Bearing for wall supports is perpendicular-to-grain bearing on top plate. No stud design included.

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

Supports: All - Lumber Stud Wall, D.Fir-L No.2

Floor joist spaced at 16.0" c/c; Total length: 9.38'; Clear span: 8.75'; Volume = 0.7 cu.ft.

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

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 81	Fv' = 180	psi	fv/Fv' = 0.45
Bending(+)	fb = 1385	Fb' = 1380	psi	fb/Fb' = 1.0035
Dead Defl'n	0.04 = < L/999			
Live Defl'n	0.22 = L/472	0.29 = L/360	in	0.76
Total Defl'n	0.26 = L/403	0.44 = L/240	in	0.59

← okay at 100 psf

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	180	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	1000	1.00	1.00	1.00	1.000	1.200	-	1.15	1.00	1.00	2
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.7 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.62 million	1.00	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

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 7-16 2.4

CALCULATIONS:

V max = 688, V design = 589 (NDS 3.4.3.1(a)) lbs; M(+) = 1516 lbs-ft

EI = 80.98e06 lb-in²

"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Design Notes:

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



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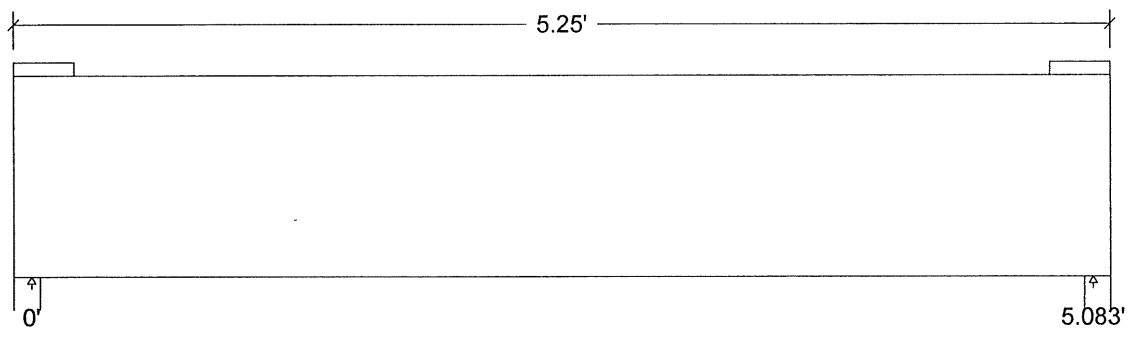
PROJECT
Existing Typ Exterior Window Header.wwb

Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Roof DL	Dead	Full UDL				175.0		plf
Roof SL	Snow	Full UDL				280.0		plf
Floor DL	Dead	Full UDL				205.0		plf
Floor LL	Live	Full UDL				925.0		plf

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



Unfactored:			
Dead	998		998
Live	2428		2428
Snow	735		735
Factored:			
Total	3426		3426
Bearing:			
Capacity			
Beam	5156		5156
Support	12251		12251
Des ratio			
Beam	0.66		0.66
Support	0.28		0.28
Load comb	#2		#2
Length	1.50		1.50
Min req'd	1.00		1.00
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fc sup	1350		1350

Timber-soft, D.Fir-L, No. 1, 6x12 (5-1/2"x11-1/2")

Supports: All - Lumber n-ply Column, D.Fir-L No.2
 Total length: 5.25'; Clear span: 5.0'; Volume = 2.3 cu.ft.; Beam or stringer
 Lateral support: top = at supports, bottom = at supports;
This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 48	Fv' = 170	psi	fv/Fv' = 0.28
Bending(+)	fb = 417	Fb' = 1343	psi	fb/Fb' = 0.31
Dead Defl'n	0.01 = < L/999			
Live Defl'n	0.01 = < L/999	0.17 = L/360	in	0.07
Total Defl'n	0.02 = < L/999	0.25 = L/240	in	0.07

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	170	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	1350	1.00	1.00	1.00	0.995	1.000	-	1.00	1.00	1.00	2
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.6 million		1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.58 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

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 7-16 2.4

CALCULATIONS:

V max = 3317, V design = 2012 (NDS 3.4.3.1(a)) lbs; M(+) = 4215 lbs-ft

EI = 1115.29e06 lb-in²



"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Lateral stability(+): Lu = 5.06' Le = 10.50' RB = 6.9

Design Notes:

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

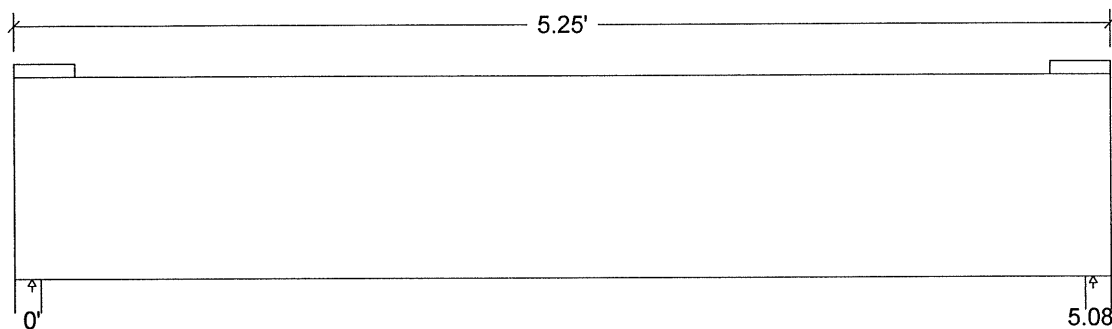
 WoodWorks <small>SOFTWARE FOR WOOD DESIGN</small>	COMPANY Nov. 20, 2024 13:28	PROJECT  Existing Exterior Window Header at wall.wwb
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Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Roof DL	Dead	Full UDL				175.0		plf
Roof SL	Snow	Full UDL				280.0		plf
Floor DL	Dead	Partial UDL		0.00	3.25	205.0	205.0	plf
Floor LL	Live	Partial UDL		0.00	3.25	925.0	925.0	plf
Wall	Dead	Point		3.25		1200		lbs
E FL DL	Dead	Partial UDL		3.25	5.00	111.0	111.0	plf
E FL LL	Live	Partial UDL		3.25	5.00	370.0	370.0	plf

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



Unfactored:			
Dead	1413		1566
Live	2224		1430
Snow	734		736
Factored:			
Total	3637		3190
Bearing:			
Capacity			
Beam	5156		5156
Support	12251		12251
Des ratio			
Beam	0.71		0.58
Support	0.30		0.24
Load comb	#2		#3
Length	1.50		1.50
Min req'd	1.06		0.87
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fc sup	1350		1350

Timber-soft, D.Fir-L, No. 1, 6x12 (5-1/2"x11-1/2")
 Supports: All - Lumber n-ply Column, D.Fir-L No.2
 Total length: 5.25'; Clear span: 5.0'; Volume = 2.3 cu.ft.; Beam or stringer
 Lateral support: top = at supports, bottom = at supports;
This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 56$	$F_v' = 170$	psi	$f_v/F_v' = 0.33$
Bending(+)	$f_b = 473$	$F_b' = 1343$	psi	$f_b/F_b' = 0.35$
Dead Defl'n	$0.01 = < L/999$			
Live Defl'n	$0.01 = < L/999$	$0.17 = L/360$	in	0.06
Total Defl'n	$0.02 = < L/999$	$0.25 = L/240$	in	0.08

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
F_v'	170	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
$F_b'+$	1350	1.00	1.00	1.00	0.995	1.000	-	1.00	1.00	1.00	2
F_{cp}'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.6 million		1.00	1.00	-	-	-	-	1.00	1.00	3
E_{min}'	0.58 million		1.00	1.00	-	-	-	-	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 + S) (live)
 LC #3 = D + 0.75(L + S) (total)
 Bearing : Support 1 - LC #2 = D + L
 Support 2 - LC #3 = D + 0.75(L + S)

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 7-16 2.4

CALCULATIONS:

$V_{max} = 2363$, $V_{design} = 2363$ (NDS 3.4.3.1(a)) lbs; $M(+)$ = 4779 lbs-ft

$EI = 1115.29e06$ lb-in²

"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Lateral stability(+): $L_u = 5.06'$ $L_e = 10.44'$ $RB = 6.9$

Design Notes:

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



COMPANY

PROJECT

Nov. 21, 2024 08:13

Existing Interior Header at post.wwb

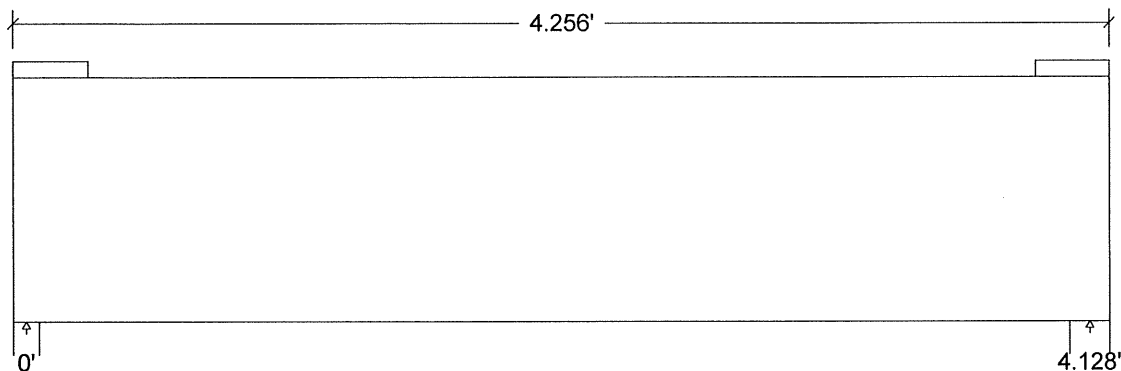
(E)

Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Roof DL	Dead	Point		3.00		2288		lbs
Roof SL	Snow	Point		3.00		3688		lbs
Floor DL	Dead	Partial UDL		0.00	3.25	310.0	310.0	plf
Floor LL	Live	Partial UDL		0.00	3.25	1400.0	1400.0	plf
Wall	Dead	Point		3.25		2200		lbs
E FL DL	Dead	Partial UDL		3.25	4.00	168.0	168.0	plf
E FL LL	Live	Partial UDL		3.25	4.00	560.0	560.0	plf
Self-weight	Dead	Full UDL				17.0		plf

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



Unfactored:			
Dead	1822		3869
Live	2870		2100
Snow	1052		2636
Factored:			
Total	4764		7421
Bearing:			
Capacity			
Beam	4692		7421
Support	9291		16898
Des ratio			
Beam	1.00		1.00
Support	0.51		0.44
Load comb	#3		#3
Length	1.19		1.88
Min req'd	1.19		1.88
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fc sup	1350		1350

LVL n-ply, 2.0E, 2500Fb, 1-3/4"x11-1/4", 3-ply (5-1/4"x11-1/4")

Supports: All - Lumber n-ply Column, D.Fir-L No.2
 Total length: 4.25'; Clear span: 4.0'; 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 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv* = 168	Fv' = 328	psi	fv*/Fv' = 0.51
Bending(+)	fb = 852	Fb' = 2886	psi	fb/Fb' = 0.30
Dead Defl'n	0.01 = < L/999			
Live Defl'n	0.02 = < L/999	0.10 = L/480	in	0.16
Total Defl'n	0.03 = < L/999	0.14 = L/360	in	0.22

*The effect of point loads within a distance d of the support has been included as per NDS 3.4.3.1

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cf _{rt}	Ci	LC#
Fv'	285	1.15	-	1.00	-	-	-	-	1.00	-	3
Fb'+	2500	1.15	-	1.00	0.995	1.009	-	1.00	1.00	-	3
F _{cp} '	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	2.1 million	-	-	1.00	-	-	-	-	1.00	-	3
E _{miny} '	1.06 million	-	-	1.00	-	-	-	-	1.00	-	3

CRITICAL LOAD COMBINATIONS:

Shear : LC #3 = D + 0.75(L + S)
 Bending(+): LC #3 = D + 0.75(L + S)
 Deflection: LC #3 = D + 0.75(L + S) (live)
 LC #3 = D + 0.75(L + S) (total)
 Bearing : Support 1 - LC #3 = D + 0.75(L + S)
 Support 2 - LC #3 = D + 0.75(L + S)

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 7-16 2.4

CALCULATIONS:

V max = 7421, V design* = 6610 (NDS 3.4.3.1(a)) lbs; M(+) = 7862 lbs-ft

EI = 436.04e06 lb-in²/ply GA = 7.75e06 lb

"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Lateral stability(+): Lu = 4.13' Le = 8.50' RB = 6.5; b = full member width

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) fastened together securely at intervals not exceeding 4 times the depth 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
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COMPANY

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PROJECT



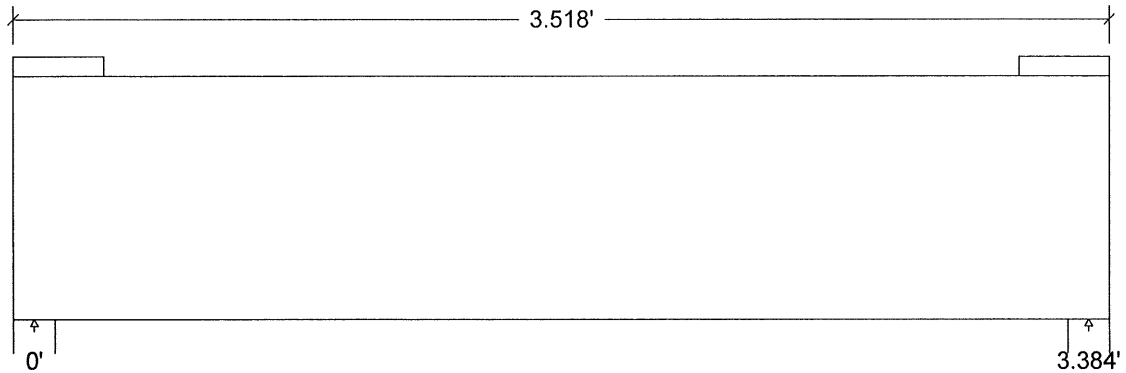
Existing Interior Header.wwb

Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Floor DL	Dead	Full UDL				310.0		plf
Floor LL	Live	Full UDL				1400.0		plf
Self-weight	Dead	Full UDL				6.6		plf

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



Unfactored:			
Dead	557		557
Live	2463		2463
Factored:			
Total	3020		3020
Bearing:			
Capacity			
Beam	3020		3020
Support	7501		7501
Des ratio			
Beam	1.00		1.00
Support	0.40		0.40
Load comb	#2		#2
Length	1.61		1.61
Min req'd	1.61		1.61
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fc sup	1350		1350

Lumber n-ply, D.Fir-L, No.2, 2x10, 2-ply (3"x9-1/4")

Supports: All - Lumber n-ply Column, D.Fir-L No.2
 Total length: 3.5'; Clear span: 3.25'; Volume = 0.7 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 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 79	Fv' = 180	psi	fv/Fv' = 0.44
Bending (+)	fb = 689	Fb' = 983	psi	fb/Fb' = 0.70
Dead Defl'n	0.00 = < L/999			
Live Defl'n	0.01 = < L/999	0.11 = L/360	in	0.12
Total Defl'n	0.02 = < L/999	0.17 = L/240	in	0.09

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	180	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Fb'+	900	1.00	1.00	1.00	0.993	1.100	-	1.00	1.00	1.00	2
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-
E'	1.6 million	1.00	1.00	1.00	-	-	-	-	1.00	1.00	2
Emin'	0.58 million	1.00	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

D=dead L=live

All LC's are listed in the Analysis output

Load combinations: ASD Basic from ASCE 7-16 2.4

CALCULATIONS:

V max = 2905, V design = 1466 (NDS 3.4.3.1(a)) lbs; M(+) = 2458 lbs-ft

EI = 158.29e06 lb-in²/ply


"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Lateral stability(+): Lu = 3.38' Le = 7.00' RB = 9.3; b = full member width

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.
4. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) fastened together securely at intervals not exceeding 4 times the depth and that each ply is equally top-loaded. Where beams are side-loaded, special fastening details may be required.

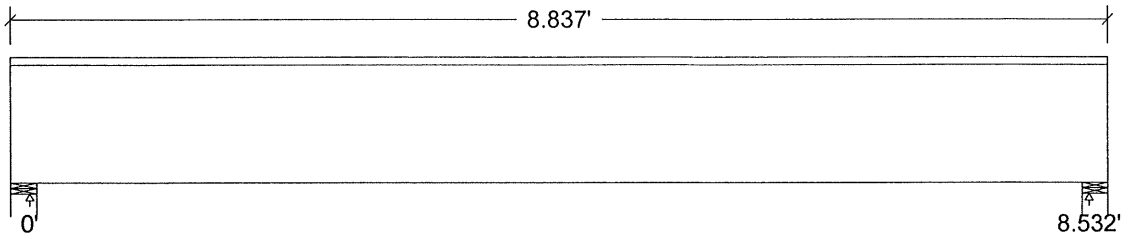
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Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				12.00	(14.00')	psf
Load2	Live	Full Area				40.00	(14.00')	psf
Self-weight	Dead	Full UDL				11.3		plf

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



Unfactored:			
Dead	791		791
Live	2474		2474
Factored:			
Total	3265		3265
Bearing:			
Capacity			
Beam	6562		6562
Support	6055		6055
Des ratio			
Beam	0.50		0.50
Support	0.54		0.54
Load comb	#2		#2
Length	2.50		2.50
Min req'd	1.35**		1.35**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fcp sup	625		625

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

LVL n-ply, 2.0E, 2500Fb, 1-3/4"x11-1/4", 2-ply (3-1/2"x11-1/4")

Supports: All - Lumber n-ply Wall, D.Fir-L No.2
 Total length: 8.81'; Clear span: 8.438'; Volume = 2.4 cu.ft.
 Lateral support: top = continuous, bottom = at supports;
This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 92$	$F_v' = 285$	psi	$f_v/F_v' = 0.32$
Bending(+)	$f_b = 1094$	$F_b' = 2522$	psi	$f_b/F_b' = 0.43$
Dead Defl'n	$0.03 = < L/999$			
Live Defl'n	$0.09 = < L/999$	$0.21 = L/480$	in	0.43
Total Defl'n	$0.12 = L/854$	$0.28 = L/360$	in	0.42

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'+	2500	1.00	-	1.00	1.000	1.009	-	1.00	1.00	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	2.1 million	-	-	1.00	-	-	-	-	1.00	-	2
Eminy'	1.06 million	-	-	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

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 7-16 2.4

CALCULATIONS:

V max = 3154, V design = 2420 (NDS 3.4.3.1(a)) lbs; M(+) = 6728 lbs-ft

EI = 436.04e06 lb-in²/ply GA = 5.17e06 lb

"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) fastened together securely at intervals not exceeding 4 times the depth 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 $G = E/16$.



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Stair stringers.wwb

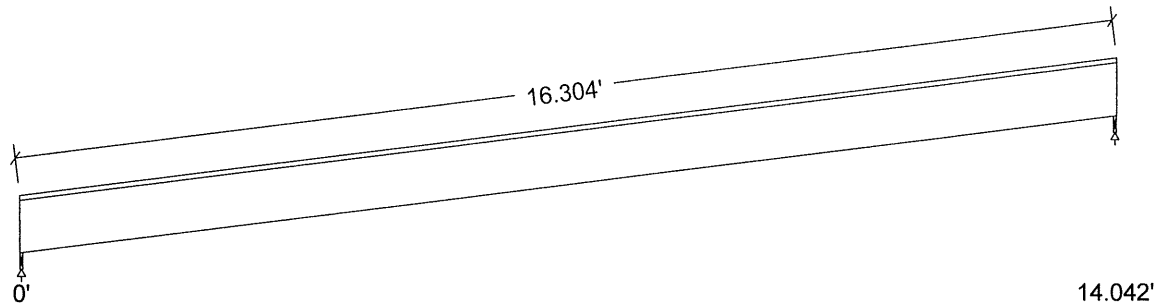


Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude	Unit
				Start	End		
Load1	Dead	Full Area				12.00 (8.0")	psf
Load2	Live	Full Area				100.00 (8.0")	psf

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



Unfactored:			
Dead	65		65
Live	469		469
Factored:			
Total	535		535
Bearing:			
F'theta	916		916
Capacity			
Joist	802		802
Support	664		664
Des ratio			
Joist	0.67		0.67
Support	0.81		0.81
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	1.21		1.21
Fcp sup	625		625

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

LVL n-ply, 2.0E, 2500Fb, 1-3/4"x8", 1-ply

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

Floor joist spaced at 8" c/c; Total length: 16.69'; Clear span(horz): 14'; Volume = 1.6 cu.ft.; Pitch: 7/12

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

This section PASSES the design code check.

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

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	$f_v = 45$	$F_v' = 285$	psi	$f_v/F_v' = 0.16$
Bending(+)	$f_b = 1203$	$F_b' = 2747$	psi	$f_b/F_b' = 0.44$
Dead Defl'n	$0.07 = < L/999$			
Live Defl'n	$0.52 = L/378$	$0.54 = L/360$	in	0.95
Total Defl'n	$0.59 = L/332$	$0.81 = L/240$	in	0.72

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'+	2500	1.00	-	1.00	1.000	1.057	-	1.04	1.00	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	2.1 million	-	-	1.00	-	-	-	-	1.00	-	2
E _{miny} '	1.06 million	-	-	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

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 7-16 2.4

CALCULATIONS:

V max = 460, V design = 422 (NDS 3.4.3.1(a)) lbs; M(+) = 1871 lbs-ft

EI = 156.80e06 lb-in² GA = 1.84e06 lb



"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Bearing: Allowable bearing at an angle F'theta calculated for each support as per NDS 3.10.3

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. System factor KH may not apply to field-assembled multi-ply beams.
4. SLOPED BEAMS: level bearing is required for all sloped beams.
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.

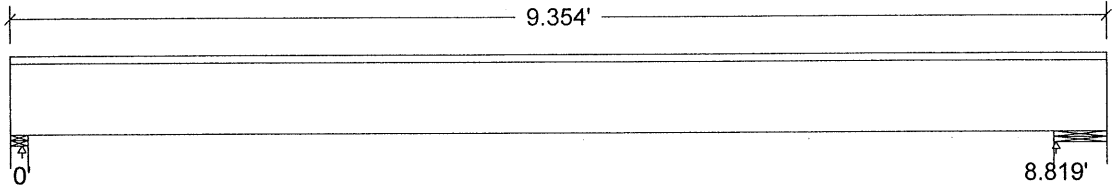
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Design Check Calculation Sheet
WoodWorks Sizer 2023

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full Area				12.00	(1.00')	psf
Load2	Live	Full Area				40.00	(1.00')	psf
Stair DL	Dead	Partial UDL		0.00	3.50	98.0	98.0	plf
Stair LL	Live	Partial UDL		0.00	3.50	705.0	705.0	plf
Load5	Dead	Point		3.50		116		lbs
Load6	Live	Point		3.50		388		lbs

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



Unfactored:			
Dead	404		167
Live	2423		806
Factored:			
Total	2827		974
Bearing:			
Capacity			
Beam	4594		14437
Support	4238		13320
Des ratio			
Beam	0.62		0.07
Support	0.67		0.07
Load comb	#2		#2
Length	1.75		5.50
Min req'd	1.17**		0.50*
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	-		-
Fcp sup	625		625

*Minimum bearing length setting used: 1/2" for end supports
 **Minimum bearing length governed by the required width of the supporting member.

LVL n-ply, 2.0E, 2500Fb, 1-3/4"x7-1/4", 2-ply (3-1/2"x7-1/4")
 Supports: All - Lumber Stud Wall, D.Fir-L No.2
 Total length: 9.38'; Clear span: 8.75'; Volume = 1.6 cu.ft.
 Lateral support: top = continuous, bottom = at supports;
This section PASSES the design code check.

Analysis vs. Allowable Stress and Deflection using NDS 2018 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 130	Fv' = 285	psi	fv/Fv' = 0.46
Bending(+)	fb = 1724	Fb' = 2677	psi	fb/Fb' = 0.64
Dead Defl'n	0.04 = < L/999			
Live Defl'n	0.21 = L/504	0.29 = L/360	in	0.71
Total Defl'n	0.25 = L/423	0.44 = L/240	in	0.57

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'+	2500	1.00	-	1.00	1.000	1.071	-	1.00	1.00	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-
E'	2.1 million	-	-	1.00	-	-	-	-	1.00	-	2
Eminy'	1.06 million	-	-	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

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 7-16 2.4

CALCULATIONS:

V max = 2744, V design = 2206 (NDS 3.4.3.1(a)) lbs; M(+) = 4404 lbs-ft

EI = 116.70e06 lb-in²/ply GA = 3.33e06 lb

"Live" deflection is due to all non-dead loads (live, wind, snow...)

Total deflection = 1.00 permanent + "live"

Design Notes:

1. Analysis and design are in accordance with the ICC International Building Code (IBC 2021) and the National Design Specification (NDS 2018), using Allowable Stress Design (ASD). Design values are from the NDS Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. BUILT-UP BEAMS: it is assumed that each ply is a single continuous member (that is, no butt joints are present) fastened together securely at intervals not exceeding 4 times the depth 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.

Job Name: Clackamas Fire District Station #12

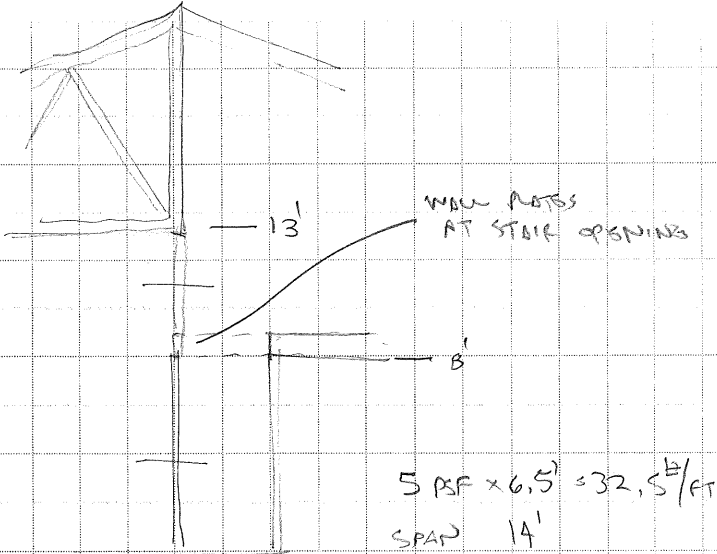
Job No: 24238

Sheet No: FF-21

Client: Clackamas Fire District

Date: 12/2024

By: DJD



$32.5 \text{ lb/ft} \times 14' = 455 \text{ lb}$
 $M = 796 \text{ lb-ft}$
 $\frac{1}{2} \times 140 = 70''$
 $I_R = 25.1 \text{ in}^4$
 (2) 2x6 TOP PLATES
 $M_A = 2254 \text{ lb-ft}$ OK
 $I = 41.6 \text{ in}^4$ OK