



Structural Calculations for: **61st Ave Residence**

Project Address:
3038 61st Ave SE
Mercer Island, WA 98040

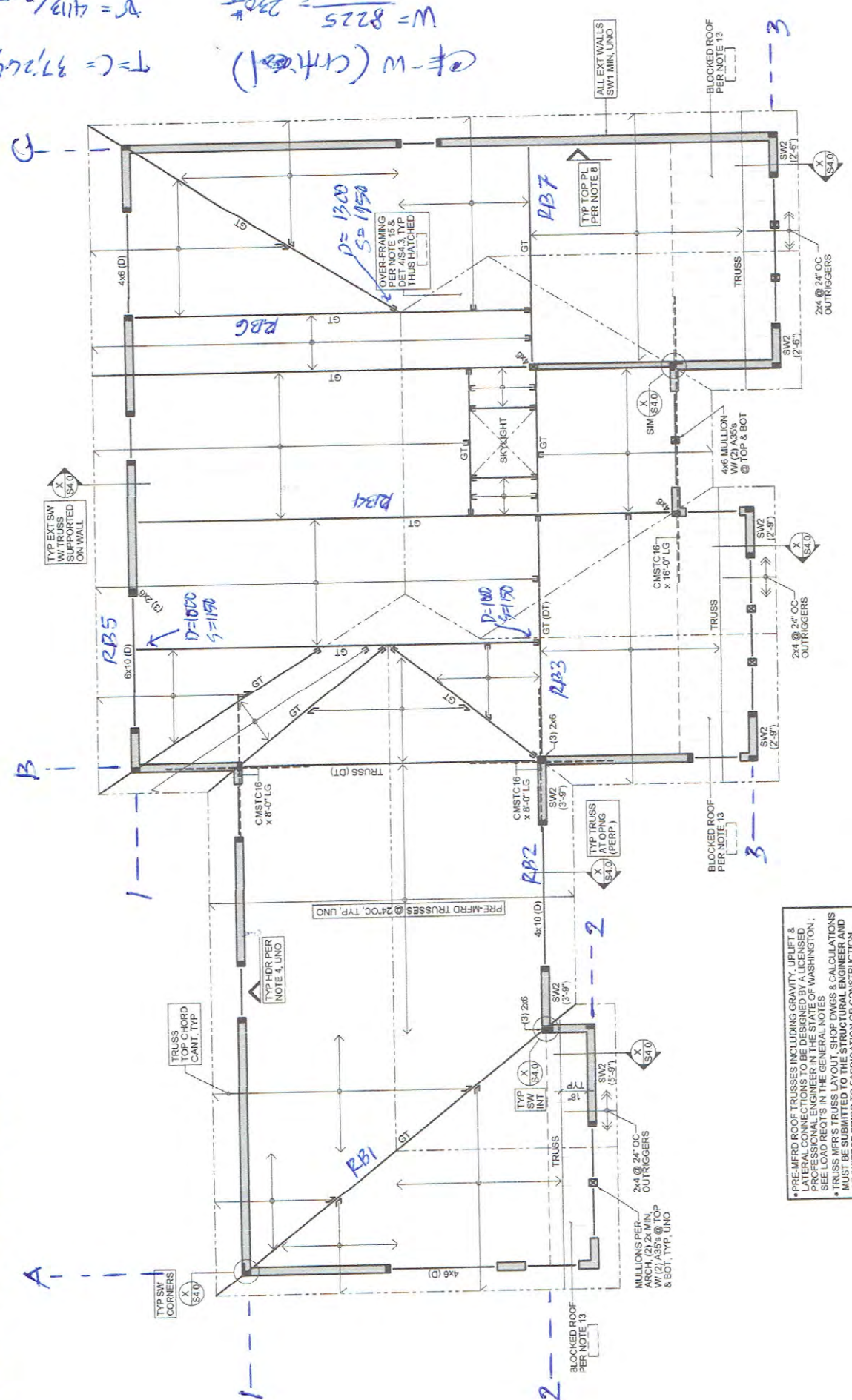
Design per
2018 International Building Code

Contents:

- Key Plans
- Framing Design
- Lateral Design



#2147
 3038 61st Ave, SE,
 Mercer Island, WA 98040



ROOF FRAMING PLAN

PRE-MFRD ROOF TRUSSES INCLUDING GRAVITY, UPLIFT & LATERAL CONNECTIONS TO BE DESIGNED BY A LICENSED PROFESSIONAL ENGINEER IN THE STATE OF WASHINGTON. SEE LOAD REQ'S IN THE GENERAL NOTES & CALCULATIONS.
 * TRUSS MEMB TRUSS LAYOUT, DIMENSIONS & CALCULATIONS PERFORMED BY THE STRUCTURAL ENGINEER AND ARCHITECT PRIOR TO FABRICATION OR CONSTRUCTION.
 * TRUSS PROFILE AND SLOPE PER ARCH, TYPICAL.

CEN-S (CRITICAL)

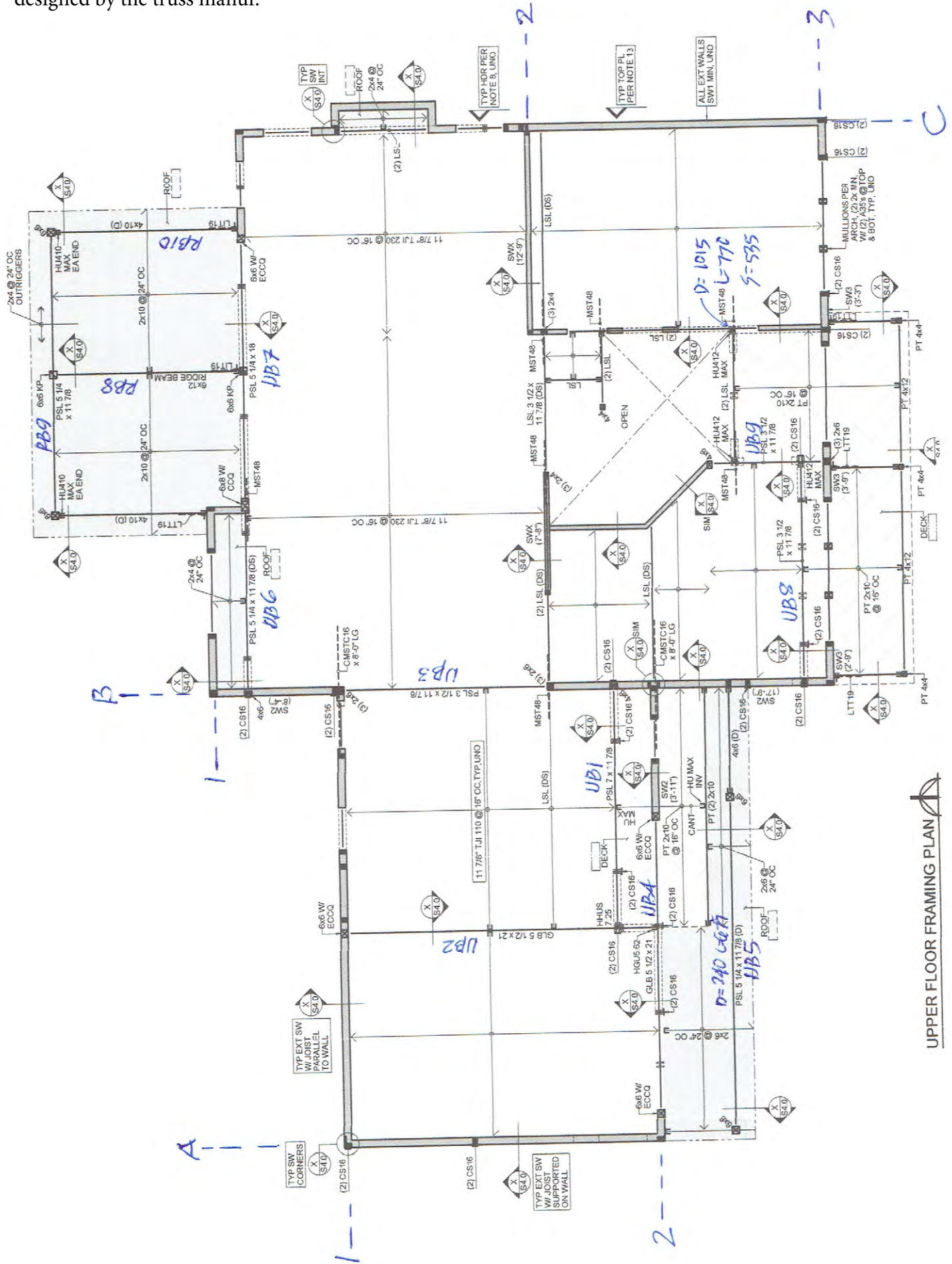
$$W = \frac{8225}{64} = 128 \text{ #}$$

$$M = 190(28)^2/8 = 12,740$$

$$T=C = 12740/18 = 707 \text{ #} \therefore \text{SAFE!}$$

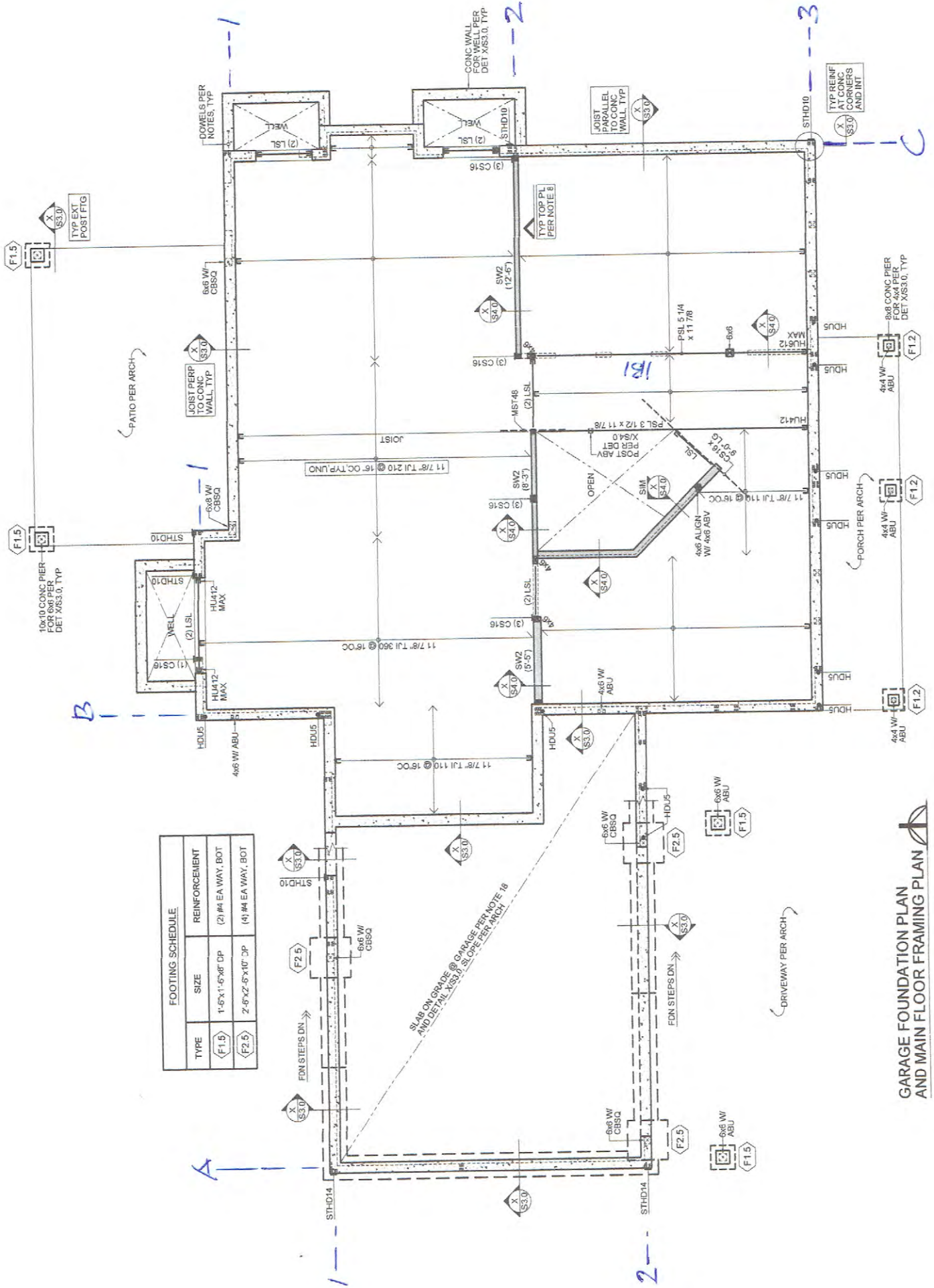
$$V = 4113/18 = 228 \text{ #} \therefore \text{DNBROK}$$

Calculations show design for manuf beams and joists, however it was decided to utilize premanuf trusses, to be designed by the truss manuf.

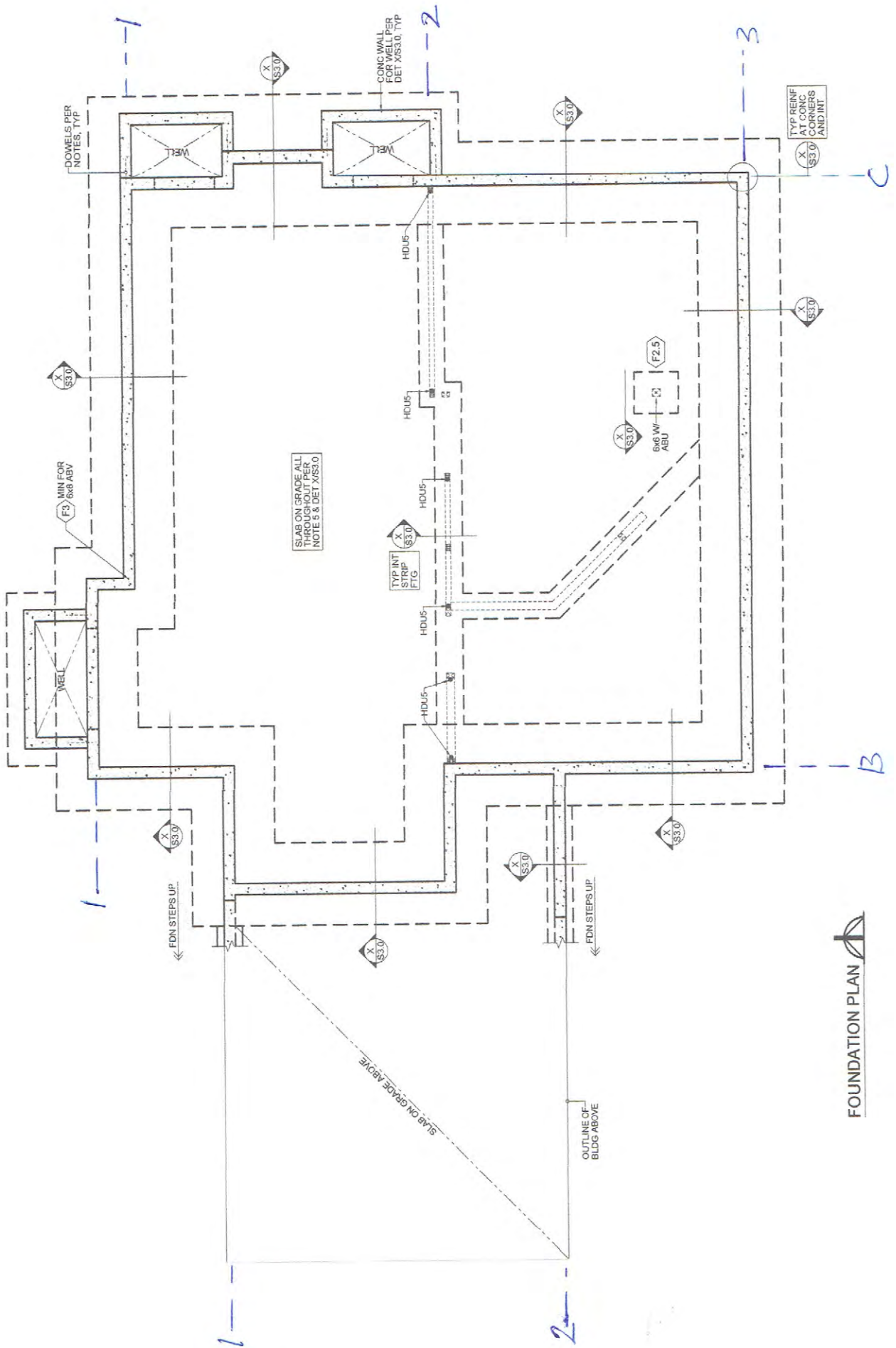


UPPER FLOOR FRAMING PLAN

Calculations show design for manuf beams and joists, however it was decided to utilize premanuf trusses, to be designed by the truss manuf.



GARAGE FOUNDATION PLAN AND MAIN FLOOR FRAMING PLAN



FOUNDATION PLAN

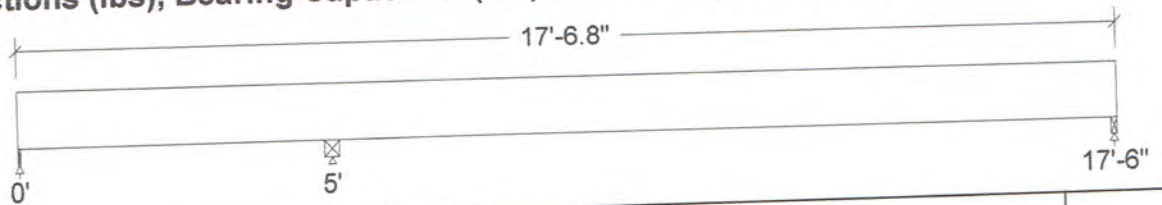


Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL	No			100.0		plf
Load2	Dead	Full UDL	No			100.0		plf
Load3	Dead	Full UDL	No			105.0		plf
Load4	Live	Full UDL	No			280.0		plf
Load5	Dead	Full UDL	No			105.0		plf
Load6	Snow	Full UDL	No			175.0		plf
Self-weight	Dead	Full UDL	No			14.9		plf

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



Unfactored:						2171
Dead	-191		5484			1431
Live	-125		3614			894
Snow	-78		2259			
Factored:						3915
Uplift	343					
Total			9888			
Bearing:						4370
Capacity						3915
Beam	1875		12444			
Supports	1680		9888			
Anal/Des						0.90
Beam	0.00		0.79			1.00
Support	0.00		1.00			#3
Load comb			#3			1.17
Length	0.50*		2.94			1.17**
Min req'd	0.50*		2.94**			1.00
Cb	1.00		1.13			1.00
Cb min	1.00		1.13			1.08
Cb support	1.08		1.08			625
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.

PSL Beam, 2.2, 2900, 5"x11"
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 17'-6.8";
Lateral support: top= at supports, bottom= at supports;

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 123$	$F_v' = 290$	$f_v/F_v' = 0.42$
Bending(+)	$f_b = 1075$	$F_b' = 2851$	$f_b/F_b' = 0.38$
Bending(-)	$f_b = 1245$	$F_b' = 2851$	$f_b/F_b' = 0.44$
Live Defl'n	$0.08 = <L/999$	$0.42 = L/360$	0.20
Total Defl'n	$0.24 = L/617$	$0.63 = L/240$	0.39

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.00	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2900	1.00	-	1.00	0.983	1.00	-	1.00	1.00	-	-	2
Fb'-	2900	1.00	-	1.00	0.983	1.00	-	1.00	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	3
E _{miny} '	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	3

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 5243, V design = 4514 lbs
 Bending(+): LC #2 = D+L, M = 9033 lbs-ft
 Bending(-): LC #2 = D+L, M = 10463 lbs-ft
 Deflection: LC #3 = D+.75(L+S) (live)
 LC #3 = D+.75(L+S) (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 2012

CALCULATIONS:

Deflection: EI = 1220e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



WoodWorks
SOFTWARE FOR WOOD DESIGN

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Dec. 21, 2021 11:13

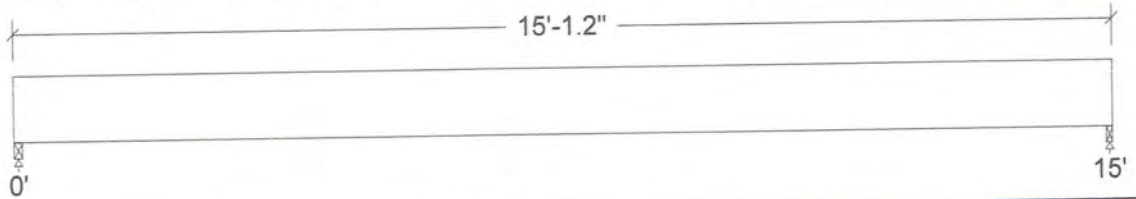
UB1

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				20.0		plf
Load2	Live	Full UDL				60.0		plf
Load3	Dead	Full UDL				100.0		plf
Load4	Dead	Full UDL				165.0		plf
Load5	Snow	Full UDL				275.0		plf
Load6	Earthquake	Point		3.56		7258		lbs
Load7	Earthquake	Point		11.56		-7258		lbs
Self-weight	Dead	Full UDL				20.9		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) : $P_F = 2903 \times 2.5$



Unfactored:			
Dead	2311		2306
Live	454		453
Snow	2079		2074
Earthquake	3871		-3871
Factored:			
Uplift			1264
Total	6242		4380
Bearing:			
Capacity			
Beam	7491		5256
Supports	6242		4380
Anal/Des			
Beam	0.83		0.83
Support	1.00		1.00
Load comb	#5		#4
Length	1.43		1.00
Min req'd	1.43**		1.00**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.00		1.00
Fcp sup	625		625

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

PSL Beam, 2.2, 2900, 7"x11"
 Supports: All - Timber-soft Beam, D.Fir-L No.2
 Total length: 15'-1.2";
 Lateral support: top= at supports, bottom= at supports;

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 110$	$F_v' = 464$	$f_v/F_v' = 0.24$
Bending(+)	$f_b = 1389$	$F_b' = 3299$	$f_b/F_b' = 0.42$
Live Defl'n	$0.18 = L/981$	$0.50 = L/360$	0.37
Total Defl'n	$0.49 = L/367$	$0.75 = L/240$	0.65

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.60	-	1.00	-	-	-	-	1.00	-	1.00	5
Fb'+	2900	1.15	-	1.00	0.989	1.00	-	1.00	1.00	-	-	4
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	4
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	4

CRITICAL LOAD COMBINATIONS:

Shear : LC #5 = $D+0.75(L+S+1.7E)$, $V = 6211$, $V_{design} = 5667$ lbs

Bending(+): LC #4 = $D+S$, $M = 16337$ lbs-ft

Deflection: LC #4 = $D+S$ (live)

LC #4 = $D+S$ (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 2012

CALCULATIONS:

Deflection: $EI = 1708e06$ lb-in²

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

Total Deflection = $1.50(\text{Dead Load Deflection}) + \text{Live Load Deflection}$.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
- Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
- FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



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PROJECT

Dec. 21, 2021 11:15

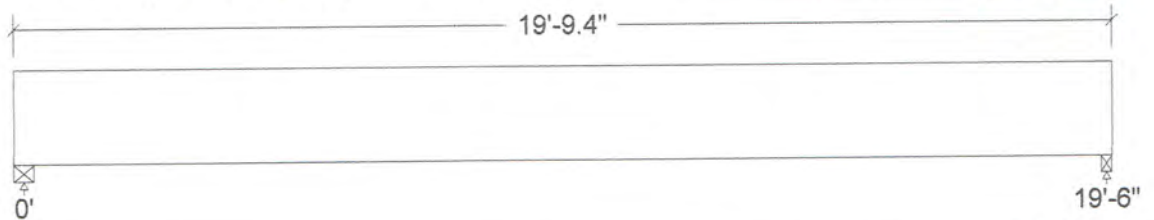
UB2

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Point		2.68		1959		lbs
Load2	Snow	Point		2.68		2833		lbs
Load3	Dead	Partial UDL		0.18	2.68	100.0	100.0	plf
Load4	Dead	Point		2.68		2306		lbs
Load5	Live	Point		2.68		453		lbs
Load6	Snow	Point		2.68		2074		lbs
Load7	Dead	Partial UDL		2.68	19.68	210.0	210.0	plf
Load8	Live	Partial UDL		2.68	19.68	560.0	560.0	plf
Load9	Earthquake	Point		2.68		7258		lbs
Self-weight	Dead	Full UDL				26.6		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) : $P_F = 2903 \times 2.5$



Unfactored:			
Dead	5768		2836
Live	4545		5428
Snow	4278		629
Earthquake	6327		931
Factored:			
Total	15706		8264
Bearing:			
Capacity			
Beam	15706		8264
Supports	16132		8488
Anal/Des			
Beam	1.00		1.00
Support	0.97		0.97
Load comb	#5		#2
Length	4.39		2.31
Min req'd	4.39		2.31
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.07		1.07
Fcp sup	625		625

Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x21"

14 laminations, 5-1/2" maximum width,

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

Total length: 19'-9.4";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 157$	$F_v' = 305$	$f_v/F_v' = 0.52$
Bending(+)	$f_b = 1273$	$F_b' = 2186$	$f_b/F_b' = 0.58$
Live Defl'n	$0.28 = L/850$	$0.65 = L/360$	0.42
Total Defl'n	$0.51 = L/460$	$0.97 = L/240$	0.52

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Notes	Cn*Cvr	LC#
Fv'	265	1.15	1.00	1.00	-	-	-	-	1.00	1.00	1.00	3
Fb'+	2400	1.00	1.00	1.00	0.911	0.946	1.00	1.00	1.00	1.00	-	2
Fcp'	650	-	1.00	1.00	-	-	-	-	1.00	-	-	-
E'	1.8 million	1.00	1.00	1.00	-	-	-	-	1.00	-	-	5
Eminy'	0.85 million	1.00	1.00	1.00	-	-	-	-	1.00	-	-	5

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #3 = $D+0.75(L+S)$, $V = 12385$, V design = 12094 lbs

Bending(+): LC #2 = $D+L$, $M = 42867$ lbs-ft

Deflection: LC #5 = $D+0.75(L+S+0.7E)$ (live)

LC #5 = $D+0.75(L+S+0.7E)$ (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 2012

CALCULATIONS:

Deflection: $EI = 7640e06$ lb-in²

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

Total Deflection = $1.50(\text{Dead Load Deflection}) + \text{Live Load Deflection}$.

Design Notes:

- WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
- GLULAM: bxd = actual breadth x actual depth.
- Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
- GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).



COMPANY

PROJECT

Dec. 16, 2021 20:05

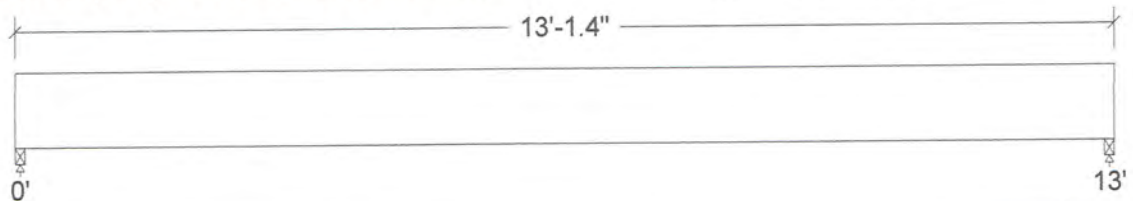
UB3

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				120.0		plf
Load2	Live	Full UDL				320.0		plf
Self-weight	Dead	Full UDL				8.9		plf

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



Unfactored:			
Dead	845		845
Live	2099		2099
Factored:			
Total	2944		2944
Bearing:			
Capacity			
Beam	3140		3140
Supports	2944		2944
Anal/Des			
Beam	0.94		0.94
Support	1.00		1.00
Load comb	#2		#2
Length	1.40		1.40
Min req'd	1.40**		1.40**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.13		1.13
Fcp sup	625		625

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

PSL Beam, 2.2, 2900, 3"x11"

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

Total length: 13'-1.4";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 113$	$F_v' = 290$	$f_v/F_v' = 0.39$
Bending(+)	$f_b = 1881$	$F_b' = 2628$	$f_b/F_b' = 0.72$
Live Defl'n	$0.28 = L/555$	$0.43 = L/360$	0.65
Total Defl'n	$0.45 = L/346$	$0.65 = L/240$	0.69

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.00	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2900	1.00	-	1.00	0.906	1.00	-	1.00	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	2
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+L, V = 2918, V design = 2480 lbs

Bending(+): LC #2 = D+L, M = 9484 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 2012

CALCULATIONS:

Deflection: EI = 732e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



WoodWorks
SOFTWARE FOR WOOD DESIGN

COMPANY

PROJECT

Dec. 21, 2021 11:28

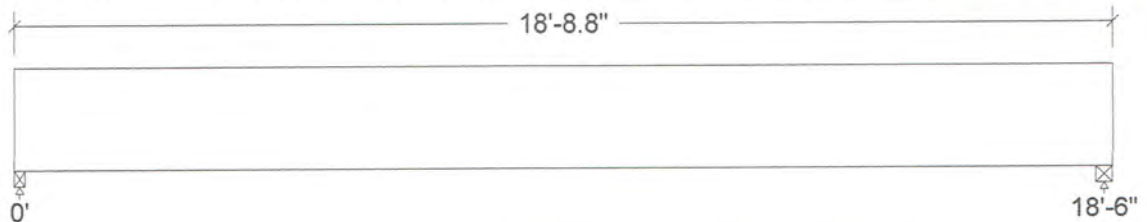
UB4

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Point		12.09		5768		lbs
Load2	Live	Point		12.09		4545		lbs
Load3	Snow	Point		12.09		4278		lbs
Load4	Dead	Full UDL				38.0		plf
Load5	Snow	Full UDL				63.0		plf
Load6	Dead	Partial UDL		0.09	12.09	100.0	100.0	plf
Load7	Dead	Partial UDL		0.09	12.09	23.0	23.0	plf
Load8	Snow	Partial UDL		0.09	12.09	38.0	38.0	plf
Load9	Earthquake	Point		12.09		7258		lbs
Self-weight	Dead	Full UDL				26.6		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) : $P_E = 2903 \times 2.5$



Unfactored:			
Dead	3625		4823
Live	1597		2948
Snow	2400		3514
Earthquake	2550		4708
Factored:			
Total	7961		12142
Bearing:			
Capacity			
Beam	7961		12142
Supports	8177		12471
Anal/Des			
Beam	1.00		1.00
Support	0.97		0.97
Load comb	#5		#5
Length	2.23		3.40
Min req'd	2.23		3.40
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.07		1.07
Fcp sup	625		625

Glulam-Bal., West Species, 24F-1.8E WS, 5-1/2"x21"

14 laminations, 5-1/2" maximum width,

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

Total length: 18'-8.8";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 123	Fv' = 305	fv/Fv' = 0.40
Bending(+)	fb = 2270	Fb' = 2960	fb/Fb' = 0.77
Live Defl'n	0.30 = L/741	0.62 = L/360	0.49
Total Defl'n	0.61 = L/365	0.93 = L/240	0.66

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Notes	Cn*Cvr	LC#
Fv'	265	1.15	1.00	1.00	-	-	-	-	1.00	1.00	1.00	3
Fb'+	2400	1.60	1.00	1.00	0.771	0.951	1.00	1.00	1.00	1.00	-	5
Fcp'	650	-	1.00	1.00	-	-	-	-	1.00	-	-	-
E'	1.8 million	1.00	1.00	1.00	-	-	-	-	1.00	-	-	5
Eminy'	0.85 million	1.00	1.00	1.00	-	-	-	-	1.00	-	-	5

Only the lesser of CL and CV is applied, as per NDS 5.3.6

CRITICAL LOAD COMBINATIONS:

Shear : LC #3 = D+.75(L+S), V = 9658, V design = 9433 lbs

Bending(+): LC #5 = D+.75(L+S+.7E), M = 76479 lbs-ft

Deflection: LC #5 = D+.75(L+S+.7E) (live)

LC #5 = D+.75(L+S+.7E) (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 2012

CALCULATIONS:

Deflection: EI = 7640e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- Glulam design values are for materials conforming to ANSI 117-2010 and manufactured in accordance with ANSI A190.1-2007
- GLULAM: bxd = actual breadth x actual depth.
- Glulam Beams shall be laterally supported according to the provisions of NDS Clause 3.3.3.
- GLULAM: bearing length based on smaller of Fcp(tension), Fcp(comp'n).



WoodWorks
SOFTWARE FOR WOOD DESIGN

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PROJECT

Dec. 16, 2021 22:20

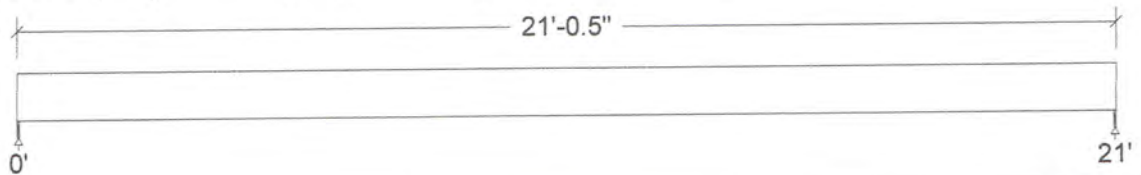
UB5

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				60.0		plf
Load2	Snow	Full UDL				100.0		plf
Self-weight	Dead	Full UDL				14.9		plf

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



Unfactored:			
Dead	788		788
Snow	1052		1052
Factored:			
Total	1840		1840
Bearing:			
Capacity			
Beam	2054		2054
Supports	1840		1840
Anal/Des			
Beam	0.90		0.90
Support	1.00		1.00
Load comb	#2		#2
Length	0.55		0.55
Min req'd	0.55**		0.55**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.08		1.08
Fcp sup	625		625

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

PSL Beam, 2.2, 2900, 5"x11"

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

Total length: 21'-0.5";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 46$	$F_v' = 334$	$f_v/F_v' = 0.14$
Bending(+)	$f_b = 1147$	$F_b' = 3190$	$f_b/F_b' = 0.36$
Live Defl'n	$0.36 = L/702$	$0.70 = L/360$	0.51
Total Defl'n	$0.76 = L/330$	$1.05 = L/240$	0.73

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2900	1.15	-	1.00	0.957	1.00	-	1.00	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	2
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 1836, V design = 1672 lbs

Bending(+): LC #2 = D+S, M = 9641 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 1220e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



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PROJECT

Dec. 16, 2021 22:21

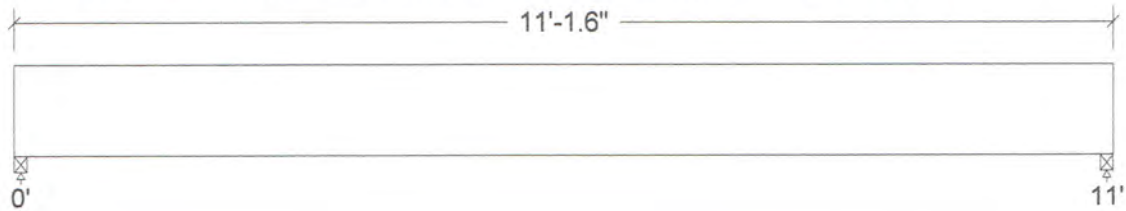
UB6

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat- tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				143.0		plf
Load2	Live	Full UDL				380.0		plf
Load3	Dead	Full UDL				100.0		plf
Load4	Dead	Full UDL				180.0		plf
Load5	Snow	Full UDL				300.0		plf
Self-weight	Dead	Full UDL				14.9		plf

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



Unfactored:			
Dead	2436		2436
Live	2115		2115
Snow	1670		1670
Factored:			
Total	5274		5274
Bearing:			
Capacity			
Beam	5888		5888
Supports	5274		5274
Anal/Des			
Beam	0.90		0.90
Support	1.00		1.00
Load comb	#3		#3
Length	1.57		1.57
Min req'd	1.57**		1.57**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.08		1.08
Fcp sup	625		625

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

PSL Beam, 2.2, 2900, 5"x11"

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

Total length: 11'-1.6";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 117$	$F_v' = 334$	$f_v/F_v' = 0.35$
Bending(+)	$f_b = 1706$	$F_b' = 3277$	$f_b/F_b' = 0.52$
Live Defl'n	$0.14 = L/958$	$0.37 = L/360$	0.38
Total Defl'n	$0.32 = L/418$	$0.55 = L/240$	0.57

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	3
Fb'+	2900	1.15	-	1.00	0.983	1.00	-	1.00	1.00	-	-	3
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	3
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	3

CRITICAL LOAD COMBINATIONS:

Shear : LC #3 = D+.75(L+S), V = 5213, V design = 4283 lbs

Bending(+): LC #3 = D+.75(L+S), M = 14337 lbs-ft

Deflection: LC #3 = D+.75(L+S) (live)

LC #3 = D+.75(L+S) (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 2012

CALCULATIONS:

Deflection: EI = 1220e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



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Dec. 21, 2021 11:21

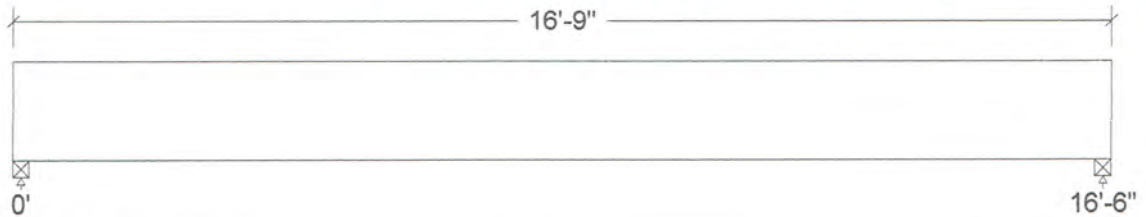
UB7

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				150.0		plf
Load2	Live	Full UDL				400.0		plf
Load3	Dead	Full UDL				100.0		plf
Load4	Dead	Full UDL				195.0		plf
Load5	Snow	Full UDL				325.0		plf
Load6	Dead	Point		8.12		1175		lbs
Load7	Snow	Point		8.12		1811		lbs
Load8	Earthquake	Point		5.12		1218		lbs
Load9	Earthquake	Point		8.12		-1218		lbs
Load10	Earthquake	Point		13.62		1218		lbs
Self-weight	Dead	Full UDL				24.4		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) : $P_F = 487 \times 2.5$



Unfactored:			
Dead	4533		4498
Live	3350		3350
Snow	3655		3600
Earthquake	443		775
Factored:			
Total	10019		10118
Bearing:			
Capacity			
Beam	11184		11294
Supports	10019		10118
Anal/Des			
Beam	0.90		0.90
Support	1.00		1.00
Load comb	#5		#5
Length	2.98		3.01
Min req'd	2.98**		3.01**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.08		1.08
Fcp sup	625		625

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

PSL Beam, 2.2, 2900, 5"x18" actual

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

Total length: 16'-9.0";

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

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 134$	$F_v' = 334$	$f_v/F_v' = 0.40$
Bending(+)	$f_b = 1995$	$F_b' = 3091$	$f_b/F_b' = 0.65$
Live Defl'n	$0.22 = L/913$	$0.55 = L/360$	0.39
Total Defl'n	$0.49 = L/404$	$0.82 = L/240$	0.59

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cf _{rt}	Ci	Cn	LC#
F _v '	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	3
F _b ' ⁺	2900	1.15	-	1.00	0.927	1.00	-	1.00	1.00	-	-	3
F _{cp} '	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	5
E _{miny} '	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	5

CRITICAL LOAD COMBINATIONS:

Shear : LC #3 = D+.75(L+S), V = 9663, V design = 8018 lbs

Bending(+): LC #3 = D+.75(L+S), M = 44886 lbs-ft

Deflection: LC #5 = D+.75(L+S+.7E) (live)

LC #5 = D+.75(L+S+.7E) (total)

D=dead L=live S=snow W=wind I=impact L_r=roof live L_c=concentrated E=earthquake

All LC's are listed in the Analysis output

Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 5346e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
- Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
- FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



WoodWorks
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PROJECT

Dec. 21, 2021 11:23

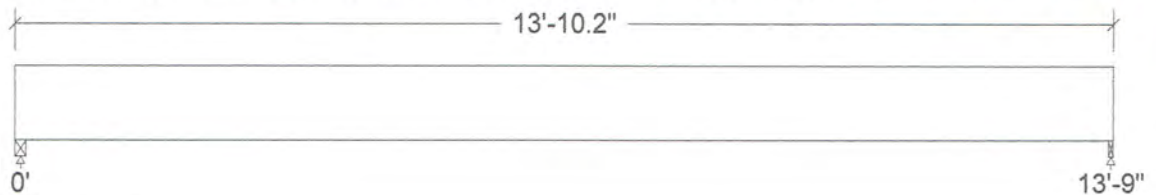
UB8

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				100.0		plf
Load2	Dead	Full UDL				20.0		plf
Load3	Live	Full UDL				60.0		plf
Load4	Dead	Full UDL				25.0		plf
Load5	Snow	Full UDL				40.0		plf
Load6	Earthquake	Point		2.32		5380		lbs
Load7	Earthquake	Point		11.32		-5380		lbs
Self-weight	Dead	Full UDL				8.9		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) : $P_F = 2152 \times 2.5$



Unfactored:			
Dead	1068		1063
Live	417		414
Snow	278		276
Earthquake	3521		-3521
Factored:			
Uplift			1803
Total	3533		1581
Bearing:			
Capacity			
Beam	3769		1686
Supports	3533		1581
Anal/Des			
Beam	0.94		0.94
Support	1.00		1.00
Load comb	#8		#3
Length	1.68		0.75
Min req'd	1.68**		0.75**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.13		1.13
Fcp sup	625		625

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

PSL Beam, 2.2, 2900, 3"x11"

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

Total length: 13'-10.2";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 153$	$F_v' = 464$	$f_v/F_v' = 0.33$
Bending(+)	$f_b = 1495$	$F_b' = 3288$	$f_b/F_b' = 0.45$
Live Defl'n	$0.09 = <L/999$	$0.46 = L/360$	0.19
Total Defl'n	$0.34 = L/490$	$0.69 = L/240$	0.49

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cf _{rt}	Ci	Cn	LC#
F _v '	290	1.60	-	1.00	-	-	-	-	1.00	-	1.00	8
F _b '	2900	1.60	-	1.00	0.709	1.00	-	1.00	1.00	-	-	8
F _{cp} '	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	3
E _{miny} '	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	3

CRITICAL LOAD COMBINATIONS:

Shear : LC #8 = D+.7E, V = 3523, V design = 3377 lbs

Bending(+): LC #8 = D+.7E, M = 7538 lbs-ft

Deflection: LC #5 = D+.75(L+S+.7E) (live)

LC #3 = D+.75(L+S) (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 2012

CALCULATIONS:

Deflection: EI = 732e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
- Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
- FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.

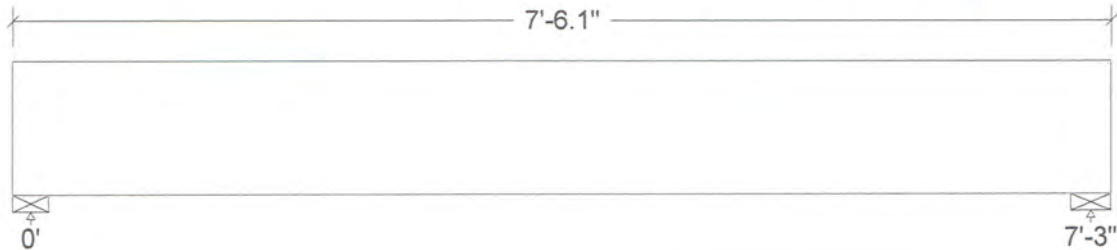


Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				105.0		plf
Load2	Live	Full UDL				280.0		plf
Load3	Dead	Point		5.62		1015		lbs
Load4	Live	Point		5.62		770		lbs
Load5	Snow	Point		5.62		535		lbs
Load6	Snow	Point		5.62		2772		lbs
Load7	Dead	Point		5.62		2216		lbs
Load8	Dead	Point		1.62		1063		lbs
Load9	Live	Point		1.62		414		lbs
Load10	Snow	Point		1.62		276		lbs
Load11	Snow	Point		1.62		100		lbs
Load12	Earthquake	Point		1.71		5380		lbs
Self-weight	Dead	Full UDL				8.9		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) : $P_F = 2152 \times 2.5$



Unfactored:			
Dead	2049		3098
Live	1564		1723
Snow	1096		2587
Earthquake	4205		1175
Factored:			
Total	6252		6948
Bearing:			
Capacity			
Beam	6669		7411
Supports	6252		6948
Anal/Des			
Beam	0.94		0.94
Support	1.00		1.00
Load comb	#5		#5
Length	2.96		3.29
Min req'd	2.96**		3.29**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.13		1.13
Fcp sup	625		625

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

PSL Beam, 2.2, 2900, 3"x11"

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

Total length: 7'-6.1";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 270$	$F_v' = 334$	$f_v/F_v' = 0.81$
Bending(+)	$f_b = 2084$	$F_b' = 3178$	$f_b/F_b' = 0.66$
Live Defl'n	$0.10 = L/915$	$0.24 = L/360$	0.39
Total Defl'n	$0.19 = L/463$	$0.36 = L/240$	0.52

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cf _{rt}	Ci	Cn	LC#
Fv'	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	3
Fb'+	2900	1.15	-	1.00	0.953	1.00	-	1.00	1.00	-	-	3
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	5
E _{miny} '	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	5

CRITICAL LOAD COMBINATIONS:

Shear : LC #3 = D+.75(L+S), V = 6288, V design = 5947 lbs

Bending(+): LC #3 = D+.75(L+S), M = 10507 lbs-ft

Deflection: LC #5 = D+.75(L+S+.7E) (live)

LC #5 = D+.75(L+S+.7E) (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 2012

CALCULATIONS:Deflection: EI = 732e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
- Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
- FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



WoodWorks
SOFTWARE FOR WOOD DESIGN

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PROJECT

Dec. 14, 2021 17:20

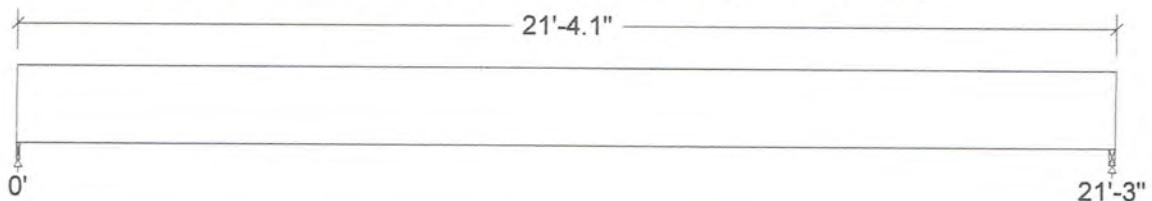
RB1

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Triangular		0.03	21.28	0.0	240.0	plf
Load2	Snow	Triangular		0.03	21.28	0.0	400.0	plf
Self-weight	Dead	Full UDL				24.4		plf

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



Unfactored:			
Dead	1109		1959
Snow	1417		2833
Factored:			
Total	2526		4792
Bearing:			
Capacity			
Beam	2819		5350
Supports	2526		4792
Anal/Des			
Beam	0.90		0.90
Support	1.00		1.00
Load comb	#2		#2
Length	0.75		1.43
Min req'd	0.75**		1.43**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.08		1.08
Fcp sup	625		625

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

~~PSL Beam, 2.2, 2900, 5"x18" actual~~

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

Total length: 21'-4.1";

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

DSE ET. Design by MTR2
© CALCS FOR END REACTIONS ONLY

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 64	Fv' = 334	fv/Fv' = 0.19
Bending(+)	fb = 883	Fb' = 2943	fb/Fb' = 0.30
Live Defl'n	0.17 = <L/999	0.71 = L/360	0.24
Total Defl'n	0.36 = L/713	1.06 = L/240	0.34

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2900	1.15	-	1.00	0.882	1.00	-	1.00	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	2
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 4792, V design = 3827 lbs

Bending(+): LC #2 = D+S, M = 19858 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 5346e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



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PROJECT

Dec. 14, 2021 17:51

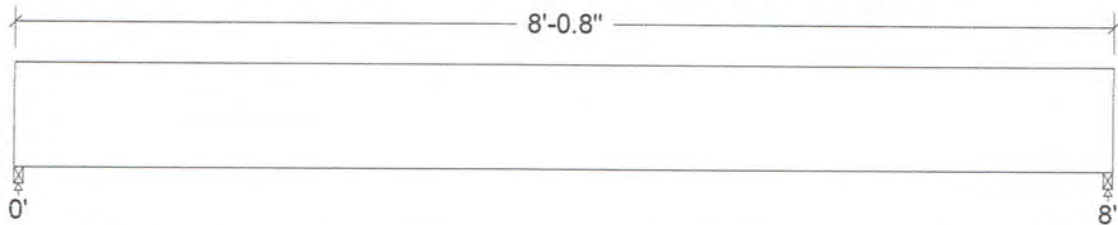
RB2

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				165.0		plf
Load2	Snow	Full UDL				275.0		plf
Self-weight	Dead	Full UDL				7.7		plf

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



Unfactored:			
Dead	696		696
Snow	1109		1109
Factored:			
Total	1806		1806
Bearing:			
Capacity			
Beam	1806		1806
Supports	1999		1999
Anal/Des			
Beam	1.00		1.00
Support	0.90		0.90
Load comb	#2		#2
Length	0.83		0.83
Min req'd	0.83		0.83
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.11		1.11
Fcp sup	625		625

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

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

Total length: 8'-0.8";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 66	Fv' = 207	fv/Fv' = 0.32
Bending(+)	fb = 861	Fb' = 1357	fb/Fb' = 0.63
Live Defl'n	0.06 = <L/999	0.27 = L/360	0.24
Total Defl'n	0.13 = L/765	0.40 = L/240	0.31

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	180	1.15	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	1000	1.15	1.00	1.00	0.983	1.200	1.00	1.00	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	-	2
Emin'	0.62 million	-	1.00	1.00	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 1791, V design = 1430 lbs

Bending(+): LC #2 = D+S, M = 3582 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 392e06 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 2012), the National Design Specification (NDS 2012), 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.



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Dec. 14, 2021 19:00

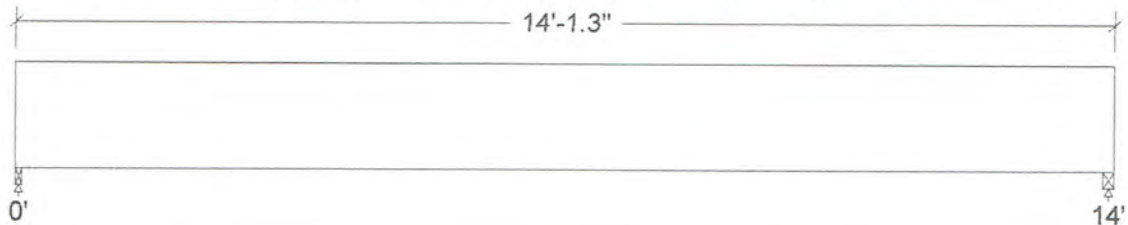
RB3

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Partial UDL		7.04	14.04	180.0	180.0	plf
Load2	Snow	Partial UDL		7.04	14.04	300.0	300.0	plf
Load3	Dead	Point		7.00		1000		lbs
Load4	Snow	Point		7.00		1150		lbs
Self-weight	Dead	Full UDL				13.0		plf

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



Unfactored:			
Dead	909		1533
Snow	1103		2147
Factored:			
Total	2012		3680
Bearing:			
Capacity			
Beam	2146		3925
Supports	2012		3680
Anal/Des			
Beam	0.94		0.94
Support	1.00		1.00
Load comb	#2		#2
Length	0.95		1.74
Min req'd	0.95**		1.74**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.13		1.13
Fcp sup	625		625

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

~~PSL Beam, 2.2, 2900, 3"x16" actual~~

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

Total length: 14'-1.3";

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

DSE GT, Design by Mfr.
Calcs for end reactions only

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 94$	$F_v' = 334$	$f_v/F_v' = 0.28$
Bending(+)	$f_b = 1283$	$F_b' = 2185$	$f_b/F_b' = 0.59$
Live Defl'n	$0.11 = <L/999$	$0.47 = L/360$	0.23
Total Defl'n	$0.23 = L/720$	$0.70 = L/240$	0.33

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cf _{rt}	C _i	C _n	LC#
F _v '	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	2
F _b ' ⁺	2900	1.15	-	1.00	0.655	1.00	-	1.00	1.00	-	-	2
F _{cp} '	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	2
E _{miny} '	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 3680, V design = 3021 lbs

Bending(+): LC #2 = D+S, M = 13689 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 2253e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



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Dec. 14, 2021 17:58

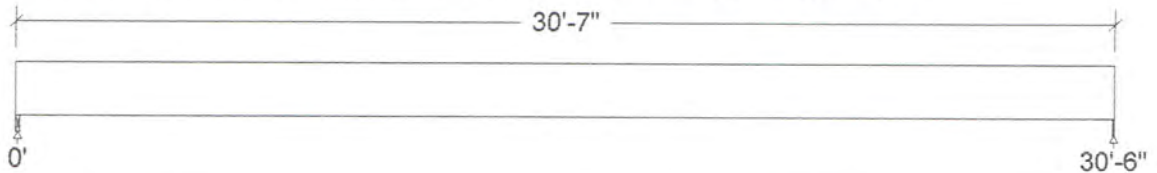
RB4

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Partial UDL		0.06	7.56	105.0	105.0	plf
Load2	Snow	Partial UDL		0.06	7.56	175.0	175.0	plf
Load3	Dead	Point		7.56		1530		lbs
Load4	Snow	Point		7.56		2150		lbs
Self-weight	Dead	Full UDL				24.4		plf

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



Unfactored:			
Dead	2216		845
Snow	2772		690
Factored:			
Total	4989		1535
Bearing:			
Capacity			
Beam	5569		1875
Supports	4989		1680
Anal/Des			
Beam	0.90		0.82
Support	1.00		0.91
Load comb	#2		#2
Length	1.49		0.50*
Min req'd	1.49**		0.50*
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.08		1.08
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.

~~PSL Beam, 2.2, 2900, 5"x18" actual~~

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

Total length: 30'-7.0";

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

*DSE GT, Design by mfr.
Ⓢ Calc's for end reactions only*

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 75	Fv' = 334	fv/Fv' = 0.23
Bending(+)	fb = 1282	Fb' = 2470	fb/Fb' = 0.52
Live Defl'n	0.37 = L/981	1.02 = L/360	0.37
Total Defl'n	0.89 = L/412	1.52 = L/240	0.58

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2900	1.15	-	1.00	0.741	1.00	-	1.00	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	2
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 4989, V design = 4524 lbs

Bending(+): LC #2 = D+S, M = 28854 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 5346e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



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Dec. 14, 2021 18:02

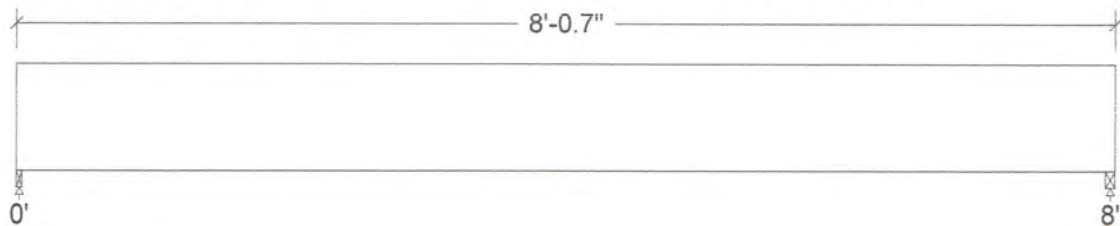
RB5

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Triangular		0.02	4.52	0.0	90.0	plf
Load2	Snow	Triangular		0.02	4.52	0.0	150.0	plf
Load3	Dead	Point		4.52		1000		lbs
Load4	Snow	Point		4.52		1150		lbs
Load5	Dead	Partial UDL		4.52	8.02	195.0	195.0	plf
Load6	Snow	Partial UDL		4.52	8.02	325.0	325.0	plf
Self-weight	Dead	Full UDL				12.1		plf

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



Unfactored:			
Dead	762		1220
Snow	963		1662
Factored:			
Total	1725		2882
Bearing:			
Capacity			
Beam	1725		2882
Supports	1842		3079
Anal/Des			
Beam	1.00		1.00
Support	0.94		0.94
Load comb	#2		#2
Length	0.50		0.84
Min req'd	0.50		0.84
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.07		1.07
Fcp sup	625		625

Timber-soft, D.Fir-L, No. 1, 6x10 (5-1/2"x9-1/4")

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

Total length: 8'-0.7";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 73$	$F_v' = 195$	$f_v/F_v' = 0.37$
Bending(+)	$f_b = 1044$	$F_b' = 1552$	$f_b/F_b' = 0.67$
Live Defl'n	$0.07 = <L/999$	$0.27 = L/360$	0.25
Total Defl'n	$0.14 = L/677$	$0.40 = L/240$	0.35

Additional Data:

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

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 2882, V design = 2474 lbs

Bending(+): LC #2 = D+S, M = 6826 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 580e06 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 2012), the National Design Specification (NDS 2012), 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.



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Dec. 14, 2021 18:43

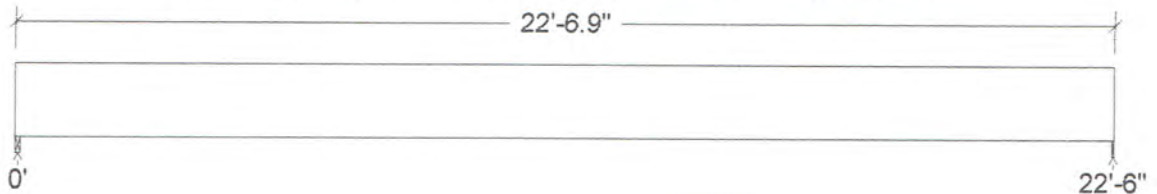
RB6

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Point		7.55		1300		lbs
Load2	Wind	Point		7.55		1950		lbs
Load3	Dead	Partial UDL		0.05	7.55	75.0	75.0	plf
Load4	Snow	Partial UDL		0.05	7.55	125.0	125.0	plf
Self-weight	Dead	Full UDL				14.6		plf

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



Unfactored:			
Dead	1500		692
Snow	781		156
Wind	1300		650
Factored:			
Total	2671		1101
Bearing:			
Capacity			
Beam	2849		1175
Supports	2671		1101
Anal/Des			
Beam	0.94		0.94
Support	1.00		1.00
Load comb	#3		#3
Length	1.27		0.52
Min req'd	1.27**		0.52**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.13		1.13
Fcp sup	625		625

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

~~PSL Beam, 2.2, 2900, 3"x18" actual~~ *DSE GT. Design by mfr.*
 Supports: All - Timber-soft Beam, D.Fir-L No.2 *© Cals for end*
 Total length: 22'-6.9"; *Reactions only*
 Lateral support: top= at supports, bottom= at supports;

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 54$	$F_v' = 334$	$f_v/F_v' = 0.16$
Bending(+)	$f_b = 1102$	$F_b' = 1350$	$f_b/F_b' = 0.82$
Live Defl'n	$0.14 = <L/999$	$0.75 = L/360$	0.18
Total Defl'n	$0.44 = L/609$	$1.13 = L/240$	0.39

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2900	1.60	-	1.00	0.291	1.00	-	1.00	1.00	-	-	3
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	3
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	3

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 2281, V design = 1959 lbs

Bending(+): LC #3 = D+.75(S+.6W), M = 14874 lbs-ft

Deflection: LC #3 = D+.75(S+.6W) (live)

LC #3 = D+.75(S+.6W) (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 2012

CALCULATIONS:

Deflection: EI = 3208e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



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Dec. 16, 2021 10:31

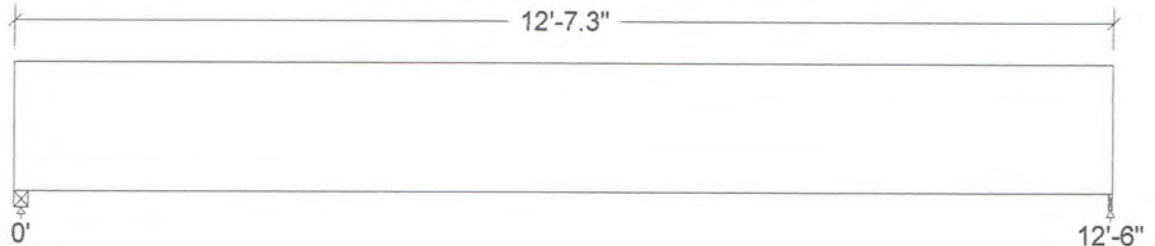
RB7

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Partial UDL		0.08	3.08	180.0	180.0	plf
Load2	Snow	Partial UDL		0.08	3.08	300.0	300.0	plf
Load3	Dead	Point		3.08		2900		lbs
Load4	Snow	Point		3.08		780		lbs
Self-weight	Dead	Full UDL				14.6		plf

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



Unfactored:			
Dead	2771		852
Snow	1385		295
Factored:			
Total	4155		1147
Bearing:			
Capacity			
Beam	4433		1224
Supports	4155		1147
Anal/Des			
Beam	0.94		0.94
Support	1.00		1.00
Load comb	#2		#2
Length	1.97		0.54
Min req'd	1.97**		0.54**
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.13		1.13
Fcp sup	625		625

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

~~PSL Beam, 2.2, 2900, 3"x18" actual~~ *USE GT. Design by mfr.*
 Supports: All - Timber-soft Beam, D.Fir-L No.2 *⊕ Cals for end reactions only*
 Total length: 12'-7.3";
 Lateral support: top= at supports, bottom= at supports;

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 95$	$F_v' = 334$	$f_v/F_v' = 0.28$
Bending(+)	$f_b = 759$	$F_b' = 2111$	$f_b/F_b' = 0.36$
Live Defl'n	$0.02 = <L/999$	$0.42 = L/360$	0.04
Total Defl'n	$0.09 = <L/999$	$0.63 = L/240$	0.15

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2900	1.15	-	1.00	0.633	1.00	-	1.00	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	2
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 4155, V design = 3421 lbs

Bending(+): LC #2 = D+S, M = 10240 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 3208e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
- Please verify that the default deflection limits are appropriate for your application.
- SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
- Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
- FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



WoodWorks
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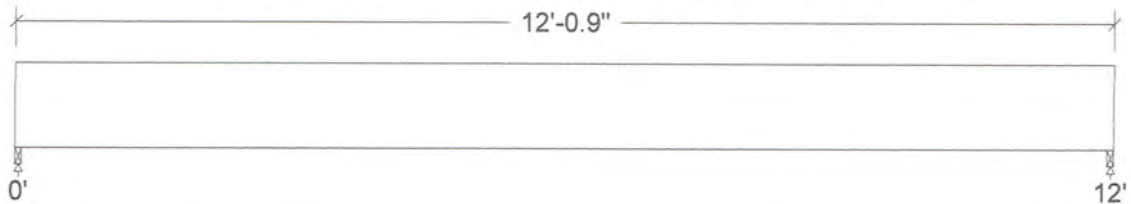
RB8

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				180.0		plf
Load2	Snow	Full UDL				300.0		plf
Self-weight	Dead	Full UDL				14.7		plf

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



Unfactored:			
Dead	1175		1175
Snow	1811		1811
Factored:			
Total	2986		2986
Bearing:			
Capacity			
Beam	2986		2986
Supports	3189		3189
Anal/Des			
Beam	1.00		1.00
Support	0.94		0.94
Load comb	#2		#2
Length	0.87		0.87
Min req'd	0.87		0.87
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.07		1.07
Fcp sup	625		625

Timber-soft, D.Fir-L, No. 1, 6x12 (5-1/2"x11-1/4")

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

Total length: 12'-0.9";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 60$	$F_v' = 195$	$f_v/F_v' = 0.31$
Bending(+)	$f_b = 921$	$F_b' = 1531$	$f_b/F_b' = 0.60$
Live Defl'n	$0.13 = <L/999$	$0.40 = L/360$	0.34
Total Defl'n	$0.26 = L/544$	$0.60 = L/240$	0.44

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	170	1.15	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	1350	1.15	1.00	1.00	0.986	1.000	1.00	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+S, V = 2968, V design = 2486 lbs

Bending(+): LC #2 = D+S, M = 8905 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 1044e06 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 2012), the National Design Specification (NDS 2012), 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.



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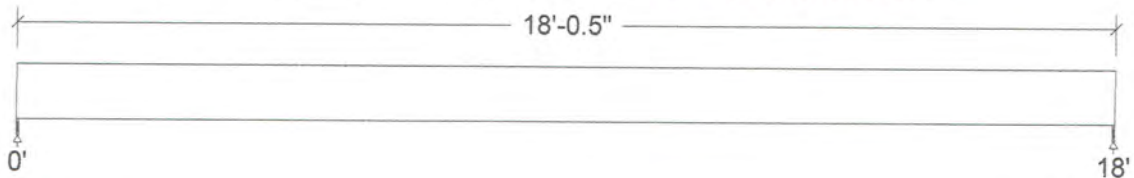
RB9

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Point		9.02		1175		lbs
Load2	Snow	Point		9.02		1811		lbs
Self-weight	Dead	Full UDL				14.9		plf

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



Unfactored:			
Dead	722		722
Snow	906		906
Factored:			
Total	1627		1627
Bearing:			
Capacity			
Beam	1875		1875
Supports	1680		1680
Anal/Des			
Beam	0.87		0.87
Support	0.97		0.97
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	1.08		1.08
Fcp sup	625		625

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

PSL Beam, 2.2, 2900, 5"x11"

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

Total length: 18'-0.5";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	fv = 44	Fv' = 334	fv/Fv' = 0.13
Bending(+)	fb = 1671	Fb' = 3222	fb/Fb' = 0.52
Live Defl'n	0.31 = L/693	0.60 = L/360	0.52
Total Defl'n	0.66 = L/328	0.90 = L/240	0.73

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CV	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	290	1.15	-	1.00	-	-	-	-	1.00	-	1.00	2
Fb'+	2900	1.15	-	1.00	0.966	1.00	-	1.00	1.00	-	-	2
Fcp'	750	-	-	1.00	-	-	-	-	1.00	-	-	-
E'	2.2 million	-	-	1.00	-	-	-	-	1.00	-	-	2
Eminy'	1.14 million	-	-	1.00	-	-	-	-	1.00	-	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 1613, V design = 1613 lbs

Bending(+): LC #2 = D+S, M = 14040 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 1220e06 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 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. SCL-BEAMS (Structural Composite Lumber): the attached SCL selection is for preliminary design only. For final member design contact your local SCL manufacturer.
4. Size factors vary from one manufacturer to another for SCL materials. They can be changed in the database editor.
5. FIRE RATING: LVL, PSL and LSL are not rated for fire endurance.



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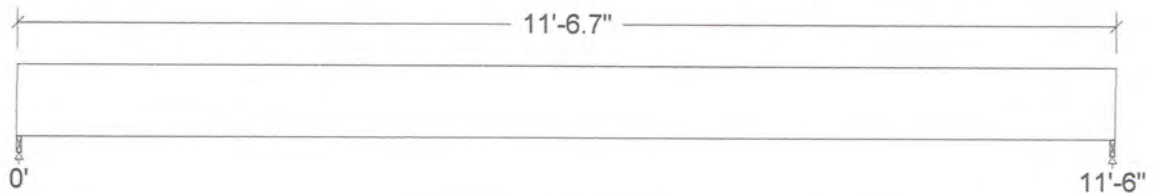
RB10

Design Check Calculation Sheet
WoodWorks Sizer 10.2

Loads:

Load	Type	Distribution	Pat-tern	Location [ft]		Magnitude		Unit
				Start	End	Start	End	
Load1	Dead	Full UDL				90.0		plf
Load2	Snow	Full UDL				150.0		plf
Self-weight	Dead	Full UDL				7.7		plf

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



Unfactored:			
Dead	564		564
Snow	867		867
Factored:			
Total	1431		1431
Bearing:			
Capacity			
Beam	1431		1431
Supports	1584		1584
Anal/Des			
Beam	1.00		1.00
Support	0.90		0.90
Load comb	#2		#2
Length	0.65		0.65
Min req'd	0.65		0.65
Cb	1.00		1.00
Cb min	1.00		1.00
Cb support	1.11		1.11
Fcp sup	625		625

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

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

Total length: 11'-6.7";

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

Analysis vs. Allowable Stress (psi) and Deflection (in) using NDS 2012 :

Criterion	Analysis Value	Design Value	Analysis/Design
Shear	$f_v = 57$	$F_v' = 207$	$f_v/F_v' = 0.27$
Bending(+)	$f_b = 984$	$F_b' = 1344$	$f_b/F_b' = 0.73$
Live Defl'n	$0.15 = L/917$	$0.38 = L/360$	0.39
Total Defl'n	$0.30 = L/464$	$0.57 = L/240$	0.52

Additional Data:

FACTORS:	F/E (psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	180	1.15	1.00	1.00	-	-	-	-	1.00	1.00	1.00	2
Fb'+	1000	1.15	1.00	1.00	0.974	1.200	1.00	1.00	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	-	2
Emin'	0.62 million	-	1.00	1.00	-	-	-	-	1.00	1.00	-	2

CRITICAL LOAD COMBINATIONS:

Shear : LC #2 = D+S, V = 1424, V design = 1227 lbs

Bending(+): LC #2 = D+S, M = 4095 lbs-ft

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

LC #2 = D+S (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 2012

CALCULATIONS:

Deflection: EI = 392e06 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 2012), the National Design Specification (NDS 2012), 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.

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Page : 1
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Restrained Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

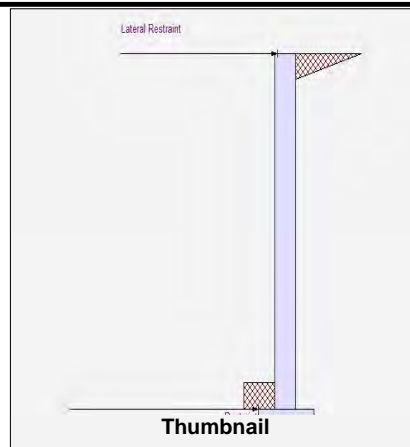
Criteria

Retained Height = 9.00 ft
Wall height above soil = 0.00 ft
Total Wall Height = 9.00 ft

Top Support Height = 9.00 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 8.00 in

Soil Data

Allow Soil Bearing = 2,000.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 45.0 psf/ft
= 350.0 psf/ft
Passive Pressure = 350.0 psf/ft
Soil Density = 110.00 pcf
Footing||Soil Frictior = 0.525
Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
>>>Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
Used for Sliding & Overturning

Uniform Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft

Load Type = Wind (W)
(Strength Level)

Adjacent Footing Load

Adjacent Footing Load = 0.0 lbs
Footing Width = 0.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 0.00 ft
Footing Type = Line Load
Base Above/Below Soil at Back of Wall = 0.0 ft
Poisson's Ratio = 0.300

Axial Load Applied to Stem

Axial Dead Load = 0.0 lbs
Axial Live Load = 0.0 lbs
Axial Load Eccentricity = 0.0 in

Wind on Exposed Stem = 0.0 psf

K_h Soil Density Multiplier = 0.200 g Added seismic per unit area = 138.6 psf

Earth Pressure Seismic Load

Design Summary

Total Bearing Load = 1,856 lbs
...resultant ecc. = 2.65 in

Soil Pressure @ Toe = 314 psf OK
Soil Pressure @ Heel = 1,542 psf OK
Allowable = 2,000 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 377 psf
ACI Factored @ Heel = 1,850 psf
Footing Shear @ Toe = 0.3 psi OK
Footing Shear @ Heel = 2.0 psi OK
Allowable = 75.0 psi
Reaction at Top = 1,225.2 lbs
Reaction at Bottom = 2,191.8 lbs

Concrete Stem Construction

Thickness = 8.00 in F_y = 60,000 psi
Wall Weight = 100.0 psf f'_c = 2,500 psi
Stem is FREE to rotate at top of footing

Sliding Calcs

Lateral Sliding Force = 2,191.8 lbs

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
Design Height Above Ftg	9.00 ft	4.08 ft	0.00 ft
Rebar Size	# 4	# 4	# 4
Rebar Spacing	12.00 in	10.00 in	12.00 in
Rebar Placed at	Edge	Edge	Edge
Rebar Depth 'd'	5.50 in	6.00 in	5.50 in
Design Data			
fb/FB + fa/Fa	0.000	0.865	0.000
Mu....Actual	0.0 ft-#	5,340.7 ft-#	0.0 ft-#
Mn * Phi.....Allowable	4,737.6 ft-#	6,174.1 ft-#	4,737.6 ft-#
Shear Force @ this height	1,863.0 lbs		2,835.0 lbs
Shear.....Actual	28.23 psi		42.95 psi
Shear.....Allowable	75.00 psi		75.00 psi

Design Data

Other Acceptable Sizes & Spacings:

Toe: None Spec'd -or- Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'_c} * S_m$
Heel: None Spec'd -or- Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'_c} * S_m$
Key: No key defined -or- No key defined

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code IBC 2018,ACI
Dead Load 1.200
Live Load 1.600
Earth, H 1.600
Wind, W 1.000
Seismic, E 1.000

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Restrained Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 1.728 in2
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.7451 in2/ft	#6@ 27.50 in #6@ 55.00 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.2089 in2/ft	
(4/3) * As :	0.2785 in2/ft	Min Stem T&S Reinf Area 0.944 in2
200bd/fy : 200(12)(6)/60000 :	0.24 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.24 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.24 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8128 in2/ft	#6@ 27.50 in #6@ 55.00 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.784 in2
200bd/fy : 200(12)(5.5)/60000 :	0.22 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.7451 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Strengths & Dimensions

Toe Width	=	0.67 ft
Heel Width	=	1.33
Total Footing Width	=	2.00
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	=	2.00 in
	@ Btm.	= 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 377	1,850 psf
Mu' : Upward	= 122	372 ft-#
Mu' : Downward	= 53	294 ft-#
Mu: Design	= 68	-78 ft-#
Actual 1-Way Shear	= 0.31	1.97 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Min footing T&S reinf Area	0.43	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 11.11 in		#4@ 22.22 in
#5@ 17.22 in		#5@ 34.44 in
#6@ 24.44 in		#6@ 48.89 in

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Restrained Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Forces on Footing : Slab RESISTS sliding, stem is PINNED at footing

Forces acting on footing soil pressure

(taking moments about front of footing to find eccentricity)

Surcharge Over Heel	=	lbs	ft	ft-#
Axial Dead Load on Stem	=	lbs	ft	ft-#
Soil Over Toe	=	49.1 lbs	0.34 ft	16.5ft-#
Adjacent Footing Load	=	lbs	ft	ft-#
Surcharge Over Toe	=	lbs	ft	ft-#
Stem Weight	=	900.0lbs	1.00 ft	903.0ft-#
Soil Over Heel	=	656.7lbs	1.67 ft	1,095.6ft-#
Footing Weight	=	250.0lbs	1.00 ft	250.0ft-#
Total Vertical Force	=	1,855.8lbs	Moment =	2,265.1 ft-#
Net Mom. at Stem/Ftg Interface =				-409.2 ft-#
Allow. Mom. @ Stem/Ftg Interface =				2,961.0 ft-#
Allow. Mom. Exceeds Applied Mom.?				Yes
Therefore Uniform Soil Pressure =				927.9 psf

Vertical component of active lateral soil pressure IS NOT considered in
the calculation of Sliding Resistance.

Seismic Design Loads (ASCE 7-10)

for a Wood Framed Structure

RISK CATEGORY II Table 1-1
 IMP. FACTOR 1 Table 11.5-1
 SITE CLASS D Table 20.3-1
 R = 6.5 Table 12.2-1
 h = 30 ft

$S_s = 1.408$ 2010 ASCE 7 Standard (<http://earthquake.usgs.gov/research/hazmaps/design/>)

$S_1 = 0.490$ 2010 ASCE 7 Standard (<http://earthquake.usgs.gov/research/hazmaps/design/>)

$F_a = 1$ Table 11.4-1

$F_v = 1.5$ Table 11.4-2

$S_{DS} = 1.127$

$S_{D1} = 0.490$

Period, T = 0.26 Eqn. 12.8-7

$C_s = 0.173$ Eqn. 12.8-2

$C_{smax} = 0.29$ Eqn. 12.8-3

$C_{smin} = 0.01$ Eqn. 12.8-5

$V_{allow} = 0.7 * C_s * W$ 0.7 per Chapter C11 of ASCE 7-10 - see page 468

Base Shear, V = 17262 lbs

Shearwalls	DL (psf)	A (sq.ft.)	W (#'s)	h_x (ft)	$W * h_x$	C_{vx}	Lat. Load (lbs)
3rd Floor SW's	20	2075	41500	30	1245000	0.48	8225
2nd Floor SW's	20	2450	49000	20	980000	0.38	6474
1st Floor SW's	20	1940	38800	10	388000	0.15	2563
Shear Walls = SW's							
		Sum=	129300	Sum=	2613000		

Diaphragm Forces (per ASCE 7-10, Section 12.10.1.1)						
level	lower limit	upper limit	sum F	sum W	calc'd force	Diaphragm Load (lbs)
Roof	6548	13096	8225	41500	8225	8225
3rd	7731	15462	14699	90500	7959	7959
2nd	6122	12244	17262	129300	5180	6122

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Wind Design Loads (ASCE 7-10)

Method 2 - Analytical Procedure

Exposure C
 $1.0 \cdot V = 97$ mph
 $K_d = 0.85$
 $G = 0.85$

Table 26.6-1
 Section 26.9.1

Roof Angle = 27 degrees
 Ground to top of roof 30 ft
 Bottom of roof to top of roof 8 ft
 (mean roof height) $h = 26$ ft

Topography from Figure 26.8-1

Terrain = escarpment (ridge, hill, escarpment)

Site = up (UPwind or DOWNwind)

$H =$ ft height of topography
 $L_n =$ ft distance from $H/2$ to crest > 0
 $x =$ ft distance from crest to site
 $z =$ ft Height from bottom of topo. to site

$\mu =$
 $\gamma =$
 K_1 value =

K_{1-}

K_{2-}

K_{3-}

$K_{zt} = (1 + K_1 K_2 K_3)^2 = 1.00$ Per Mercer Island Wind Map

Pressure Coefficients from Figure 27.4-1:

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

*Note = C_p values are conservative
 worst case values

Pressures:					
Ht	K_z	$0.6 \cdot q_z$	$P_{ww\ walls}$	$P_{lw\ walls}$	$P_{walls} \text{ (psf)}$
0-15	0.85	10.44	7.10	5.12	12.22
15-20	0.9	11.06	7.52	5.12	12.63
20-25	0.94	11.55	7.85	5.12	12.97
25-30	0.98	12.04	8.19	5.12	13.30
30-40	1.04	12.78	8.69	5.12	13.80

P roof (psf)
 8.83

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Wind Forces

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L3

EAST TO WEST

LEVEL

NORTH TO SOUTH

LEVEL	Pressures	Wind Area	Force
Second Floor Shearwalls	Proof =	250.00	2208
	P ₁₅₋₂₀ =	125.00	1579
	P ₀₋₁₅ =	0.00	0
	SUM	SUM	3787
First Floor Shearwalls	Pressures	Wind Area	Force
	P ₁₅₋₂₀ =	90.00	1137
	P ₀₋₁₅ =	350.00	4277
	SUM	SUM	5414

EAST TO WEST

NORTH TO SOUTH

LEVEL	Pressures	Wind Area	Force
Second Floor Shearwalls	Proof =	490.00	4327
	P ₁₅₋₂₀ =	190.00	2401
	P ₀₋₁₅ =	0.00	0
	SUM	SUM	6727
First Floor Shearwalls	Pressures	Wind Area	Force
	P ₁₅₋₂₀ =	140.00	1768
	P ₀₋₁₅ =	570.00	6965
	SUM	SUM	8734

FORCE DISTRIBUTION
third floor seawalls and roof diaphragm

grid	V _{seismic} (lbs)	V _{wind} (lbs)	Σ l _{wall,S} (ft)	Σ l _{wall,W} (ft)	V _{u,S} (plf)	V _{u,W} (plf)	SW	h (ft)	story shears:		holdown
									V _s = 8225	V _w = 3787	
E to W	2056	947	38.00	38.00	54	25	SW1	9.00	487	224	N/A
	4113	1894	12.75	12.75	323	149	SW2	9.00	2903	1337	(2) CS16
	2056	947	8.60	8.60	239	110	SW1	9.00	2152	991	(2) CS16
N to S	2056	1682	8.25	8.25	249	204	SW1	9.00	2243	1835	(2) CS16
	4113	3363	14.75	14.75	279	228	SW2	9.00	2510	2052	(2) CS16
	2056	1682	34.75	34.75	59	48	SW1	9.00	532	436	N/A

FORCE DISTRIBUTION
second floor shearwalls and third floor diaphragm

grid	V _{seismic} (lbs)	V _{wind} (lbs)	Σ l _{wall,S} (ft)	Σ l _{wall,W} (ft)	V _{u,S} (plf)	V _{u,W} (plf)	SW	h (ft)	story shears:		holdown
									V _s = 14699	V _w = 9201	
E to W	3675	2300	24.60	24.60	149	93	SW1	9.00	1831	1066	STHD10
	7349	4601	24.30	24.30	302	189	SW2	9.00	5625	3041	HDU5
	3675	2300	8.40	8.40	438	274	SW3	9.00	6089	3455	HDU5
N to S	3675	3865	20.00	20.00	184	193	SW1	9.00	3897	3574	STHD14
	7349	7731	26.00	26.00	283	297	SW2	9.00	5054	4728	HDU5
	3675	3865	20.00	20.00	184	193	SW1	9.00	2186	2175	STHD10

FORCE DISTRIBUTION
first floor shearwalls and second floor diaphragm

grid	V _{seismic} (lbs)	V _{wind} (lbs)	Σ l _{wall,S} (ft)	Σ l _{wall,W} (ft)	V _{u,S} (plf)	V _{u,W} (plf)	SW	h (ft)	story shears:		holdown
									V _s = 17262	V _w = N/A	
E to W	4315	N/A	N/A	N/A	N/A	N/A	CONC	8.00	N/A	N/A	N/A
	8631	N/A	N/A	N/A	N/A	N/A	CONC	8.00	N/A	N/A	N/A
	4315	N/A	N/A	N/A	N/A	N/A	CONC	8.00	N/A	N/A	N/A
N to S	4315	N/A	N/A	N/A	N/A	N/A	CONC	8.00	N/A	N/A	N/A
	8631	N/A	N/A	N/A	N/A	N/A	CONC	8.00	N/A	N/A	N/A
	4315	N/A	N/A	N/A	N/A	N/A	CONC	8.00	N/A	N/A	N/A