

# Structural Calculations Cover Sheet

**Project Number:** 2023.102  
**Project Name:** Macintyre

**Date:** September 13, 2024

**Structural Design For:** Structural design for an addition and remodel

**Construction Type:** Conventional wood platform framing with conventional concrete foundations

## CODES

2018 International Building Code (IBC)  
2018 NDS  
ASCE 7-16



## LOADS

Dead Loads As required  
Floor Load 40 psf  
Roof Load 25 psf  
Wind 110 mph, Exposure C, Per ASCE 7-16 Section 28,  $K_{zt} = 1.6$   
Seismic Per ASCE 7-16 Section 12  
Peak Ground Accelerations (PGA) based on USGS Hazards Program 2003, by Lat/Lon.  
PGA 1 sec = .508    PGA .2 sec = 1.472    %V = .181 \* DL

## Material Design Values

Soil Parameters per the geotechnical report prepared by Cobalt geosciences, dated August 22, 2023.  
Concrete  $f_c=2,500$  psi; 5-1/2 sack mix, or alternate mix pre-approved by bldg. dept.  
Reinforcing Grade 60;  $F_y=60,000$  psi minimum  
Sawn Lumber Joists, Rafters: Hem-Fir #2 and better  
Beams, Posts: DF-L #2  
Studs & Plates: Hem-Fir Standard  
Glu-Lam Beams 24F-V4 for simple span beams, 24F-V8 for cantilevered beams  
Anchor Bolts ASTM A325 hold down bolts, F1554 Anchor Bolts, A307 other bolts

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 26-Jan-24

Architect:

Page number: R1

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

Roof Rafters

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	14 ft	Tributary Width:	2 ft	P Location:	14 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	210 lbs	DL Reaction 2:	210 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	350 lbs	SL Reaction 2:	350 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>560 lbs</b>	Total Reaction 2:	<b>560 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	978 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.7 in	Max LL defl:	0.47 in
Total defl. * I:	53.19 in^4	Required I:	75.99 in^4
LL defl. * I:	33.24 in^4	Required I:	71.24 in^4
Actual deflections: TOTAL:	0.3 in		0.19 in

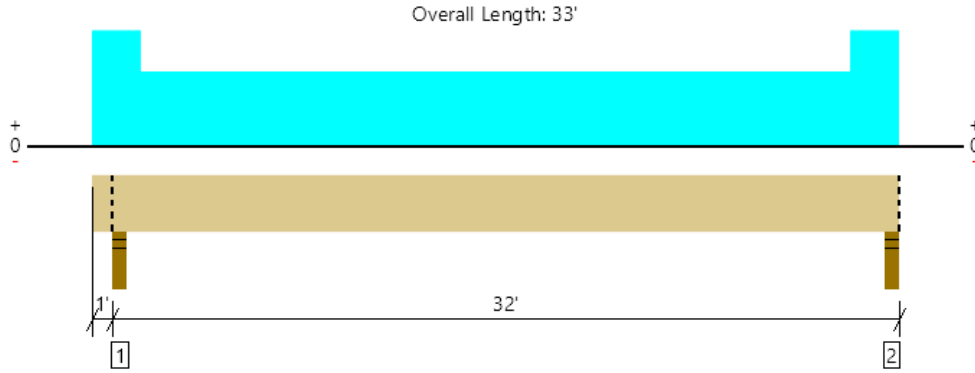
**Force analysis:**

Max. moment:	1960 ft-lb	Max Shear:	560 lbs
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**Selected Member: (1) HF #2 1.5 x 11.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	177.98 in^4	75.99 in^4
Section Modulus:	31.64 in^3	24.06 in^3
Section Area:	16.88 in^2	4.87 in^2
Bearing Area:		1.38 in^2
Minimum bearing dimensions:	1.5 in x	0.92 in

Roof, Beams Supporting Window/Rafters  
1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4163 @ 1' 1 3/4"	8181 (3.50")	Passed (51%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	3436 @ 2' 9 1/2"	21863	Passed (16%)	1.25	1.0 D + 1.0 Lr (All Spans)
Pos Moment (Ft-lbs)	30289 @ 17' 1/8"	67951	Passed (45%)	1.25	1.0 D + 1.0 Lr (Alt Spans)
Neg Moment (Ft-lbs)	-191 @ 1' 1 3/4"	57234	Passed (0%)	1.25	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Live Load Defl. (in)	0.883 @ 16' 11 15/16"	1.056	Passed (L/431)	--	1.0 D + 1.0 Lr (Alt Spans)
Total Load Defl. (in)	1.138 @ 16' 11 15/16"	1.584	Passed (L/334)	--	1.0 D + 1.0 Lr (Alt Spans)

System : Floor  
Member Type : Drop Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.92 that was calculated using length L = 31' 7 7/8".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 1' 2 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.78"	974	193	3189	4163	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.68"	915	184/-2	3000	3915	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	33' o/c	
Bottom Edge (Lu)	33' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Comments
0 - Self Weight (PLF)	0 to 33'	N/A	24.1	--	--	
1 - Uniform (PSF)	0 to 2' (Front)	3' 9"	15.0	25.0	-	Default Load
2 - Uniform (PLF)	2' to 31' (Front)	N/A	30.0	-	-	Glass
3 - Uniform (PSF)	0 to 33' (Front)	7' 6"	-	-	25.0	Rafters
4 - Uniform (PSF)	31' to 33' (Front)	3' 9"	15.0	25.0	-	

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

ForteWEB Software Operator	Job Notes
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Job number: 2023.102

Project: Macintyre

Date: 19-Dec-23

Architect:

Page number: R3

**Post Design (Combined Axial and Moment Loading)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

Full Height Post Supporting North Side of R2

Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:	

**Geometry and loads:**

Height	15 ft	w(d)	0 plf	M(d)	2100 ft-lbs
Axial Load	4163 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	15 ft	Le(b)	15 ft		

**Material Properties:**

Fb1	2400 psi	Fb(d)'	2760 psi
Fb2	2400 psi	Fb(b)'	2760 psi
Fc	2500 psi	Fc'	607.3 psi
E	1.8 msi	E'	1.8 msi
Emin	0.915 msi	Emin'	0.915 msi

**Selected Member:** PSL 5.25 x 5.25

**Member properties:**

Section Modulus (d):	24.1 in^3
Section Modulus (b):	24.1 in^3
Section Area:	27.6 in^2

**Variables:**

Rb(d)	5.86
Rb(b)	5.86
c	0.8

**Member stresses:** Provided

FcE(d)	640 psi	>
FcE(b)	640 psi	>
FbE	32025 psi	>
FbE	32025 psi	>

Required

fc	151 psi	OK
fc	151 psi	OK
fb(d)	1045 psi	OK
fb(b)	0 psi	OK

**Bending and Axial Compression Check:**

NDS 2018 EQ 3.9-3 0.56 < 1.0 **OK**

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Job number: 2023.102

Project: Macintyre

Date: 19-Dec-23

Architect:

Page number: R3a

**Post Design (Combined Axial and Moment Loading)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

Full Height Studs On North Wall

Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:	

**Geometry and loads:**

Height	15 ft	w(d)	18.62 plf	M(d)	0 ft-lbs
Axial Load		w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	15 ft	Le(b)	15 ft		

**Material Properties:**

Fb1	850 psi	Fb(d)'	977.5 psi
Fb2	850 psi	Fb(b)'	977.5 psi
Fc	1300 psi	Fc'	105.71 psi
E	1.3 msi	E'	1.3 msi
Emin	0.47 msi	Emin'	0.47 msi

**Selected Member:** HF #2 3 x 5.5

**Member properties:**

Section Modulus (d):	15.1 in^3
Section Modulus (b):	8.3 in^3
Section Area:	16.5 in^2

**Variables:**

Rb(d)	4.23
Rb(b)	10.49
c	0.8

**Member stresses: Provided**

FcE(d)	361 psi	>
FcE(b)	107 psi	>
FbE	5127 psi	>
FbE	5127 psi	>

**Required**

fc	0 psi	OK
fc	0 psi	OK
fb(d)	415 psi	OK
fb(b)	0 psi	OK

**Bending and Axial Compression Check:**

NDS 2018 EQ 3.9-3 0.43 < 1.0 **OK**



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Job number: 2023.102

Project: Macintyre

Date: 28-Aug-24

Architect:

Page number: R 5

**BEAM DESIGN (Cantilever, Uniform Load+Concentrated Load)**

2021 Seattle Building Code (SBC) (concentrated load at tip of cantilever) 2018 NDS

Beam Description: Entry Roof Rafters

Enter '1' for snow load: 1

Enter '1' for repetitive member:

Enter '1' for wet use:

**Geometry and Loads:**

Span:	5 ft	Tributary Width:	2 ft
DL unit load:	15 psf	LL unit load:	25 psf
Add'l unif. DL:	lb/ft	Add'l unif. LL:	lb/ft
Concentrated DL:	lbs	Concentrated LL:	lbs
Cantilever a:	2.5 ft		
		Total point load:	0 lbs
DL uniform load:	30 lb/ft	Max DL reaction:	169 lbs
LL uniform load:	50 lb/ft	Max LL reaction:	281 lbs
Total load:	80 lb/ft	Max Total reaction:	450 lbs
		Rsmall	150 lbs

**Material Properties:**

E	1.3 x 10 <sup>6</sup> psi	E'	1.3 x 10 <sup>6</sup> psi
Fb	850 psi	Fb'	1044 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	465.75 psi
Emin	0.47 x 10 <sup>6</sup> psi	Emin'	0.47 x 10 <sup>6</sup> psi

**Deflection analysis:**

	For total load: Allowed deflection criteria, span/	240	
	For LL only: Allowed deflection criteria, span/	480	
Max. allowed total defl:	0.25 in	Max LL defl:	0.125 in
Cantilever Deflections, TL:	0.25 in	LL:	0.125 in
Total Required I:	6 in <sup>4</sup>	LL Required I:	10 in <sup>4</sup>
Actual midspan δ:	TOTAL: 0.021 inches	LL	0.011 inches
Actual Cantilever δ:	TOTAL: 0.033 inches	LL	0.025 inches

**Force analysis:**

Max. moment:	250 ft-lb	Max Shear:	250 lbs
		Shear @ d =	202 lbs

**Selected Member: (1) HF#2 1.5 x 7.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	47.6 in <sup>4</sup>	9.5 in <sup>4</sup>
Section Modulus:	13.1 in <sup>3</sup>	2.9 in <sup>3</sup>
Section Area:	10.9 in <sup>2</sup>	1.8 in <sup>2</sup>
Bearing Area:		1.0 in <sup>2</sup>
Minimum bearing dimensions:	1.5 x	0.6 inches

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R6

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** Gable Entry Ridge Beam

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	12 ft	Tributary Width:	5.5 ft	P Location:	12 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	495 lbs	DL Reaction 2:	495 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	825 lbs	SL Reaction 2:	825 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1320 lbs</b>	Total Reaction 2:	<b>1320 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.6 in	Max LL defl:	0.4 in
Total defl. * I:	78.96 in^4	Required I:	131.59 in^4
LL defl. * I:	49.35 in^4	Required I:	123.37 in^4
Actual deflections:	TOTAL: 0.34 in		0.21 in

**Force analysis:**

Max. moment:	3960 ft-lb	Max Shear:	1320 lbs
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**Selected Member: (1) HF #2 3.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	230.84 in^4	131.59 in^4
Section Modulus:	49.91 in^3	40.51 in^3
Section Area:	32.38 in^2	11.48 in^2
Bearing Area:		3.26 in^2
Minimum bearing dimensions:	3.5 in x	0.93 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R6a

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** Gable Entry Roof Beams

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	12 ft	Tributary Width:	2.5 ft	P Location:	12 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	225 lbs	DL Reaction 2:	225 lbs	Note: Design automatically uses ASD load combinations
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	
SL Reaction 1:	375 lbs	SL Reaction 2:	375 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>600 lbs</b>	Total Reaction 2:	<b>600 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.6 in	Max LL defl:	0.4 in
Total defl. * I:	35.89 in^4	Required I:	59.82 in^4
LL defl. * I:	22.43 in^4	Required I:	56.08 in^4
Actual deflections: TOTAL:	0.16 in		0.1 in

**Force analysis:**

Max. moment:	1800 ft-lb	Max Shear:	600 lbs
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**Selected Member: (1) HF #2 3.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	230.84 in^4	59.82 in^4
Section Modulus:	49.91 in^3	18.41 in^3
Section Area:	32.38 in^2	5.22 in^2
Bearing Area:		1.48 in^2
Minimum bearing dimensions:	3.5 in x	0.42 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R6b

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** Beam receiveing Ridge Post Load

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	8.5 ft	Tributary Width:	2 ft	P Location:	4.25 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	495 lbs
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	825 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	375 lbs	DL Reaction 2:	375 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	625 lbs	SL Reaction 2:	625 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1000 lbs</b>	Total Reaction 2:	<b>1000 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.43 in	Max LL defl:	0.28 in
Total defl. * I:	29.68 in^4	Required I:	69.83 in^4
LL defl. * I:	18.55 in^4	Required I:	65.46 in^4
Actual deflections:	TOTAL: 0.13 in		0.08 in

**Force analysis:**

Max. moment:	3528 ft-lb	Max Shear:	1000 lbs
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**Selected Member: (1) HF #2 3.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	230.84 in^4	69.83 in^4
Section Modulus:	49.91 in^3	36.09 in^3
Section Area:	32.38 in^2	8.7 in^2
Bearing Area:		2.47 in^2
Minimum bearing dimensions:	3.5 in x	0.71 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R7

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

West Window Headers

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	5.8 ft	Tributary Width:	4.25 ft	P Location:	5.8 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	185 lbs	DL Reaction 2:	185 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	308 lbs	SL Reaction 2:	308 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>493 lbs</b>	Total Reaction 2:	<b>493 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1075 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.29 in	Max LL defl:	0.19 in
Total defl. * I:	3.33 in^4	Required I:	11.48 in^4
LL defl. * I:	2.08 in^4	Required I:	10.76 in^4
Actual deflections:	TOTAL: 0.02 in		0.01 in

**Force analysis:**

Max. moment:	715 ft-lb	Max Shear:	493 lbs
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**Selected Member: (2) HF #2 1.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	197.86 in^4	11.48 in^4
Section Modulus:	42.78 in^3	7.98 in^3
Section Area:	27.75 in^2	4.29 in^2
Bearing Area:		1.22 in^2
Minimum bearing dimensions:	3. in x	0.41 in

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Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R8

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

South Window Headers

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	4.5 ft	Tributary Width:	16.25 ft	P Location:	4.5 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	548 lbs	DL Reaction 2:	548 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	914 lbs	SL Reaction 2:	914 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1463 lbs</b>	Total Reaction 2:	<b>1463 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.23 in	Max LL defl:	0.15 in
Total defl. * I:	4.61 in^4	Required I:	20.5 in^4
LL defl. * I:	2.88 in^4	Required I:	19.22 in^4
Actual deflections:	TOTAL: 0.05 in		0.03 in

**Force analysis:**

Max. moment:	1645 ft-lb	Max Shear:	1463 lbs
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**Selected Member: (2) HF #2 1.5 x 7.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	95.27 in^4	20.5 in^4
Section Modulus:	26.28 in^3	16.83 in^3
Section Area:	21.75 in^2	12.72 in^2
Bearing Area:		3.61 in^2
Minimum bearing dimensions:	3. in x	1.2 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R9

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

Smaller South Window Headers

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	3 ft	Tributary Width:	16.25 ft	P Location:	3 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	366 lbs	DL Reaction 2:	366 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	609 lbs	SL Reaction 2:	609 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>975 lbs</b>	Total Reaction 2:	<b>975 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1271 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.15 in	Max LL defl:	0.1 in
Total defl. * I:	0.91 in^4	Required I:	6.08 in^4
LL defl. * I:	0.57 in^4	Required I:	5.7 in^4
Actual deflections:	TOTAL: 0.02 in		0.01 in

**Force analysis:**

Max. moment:	731 ft-lb	Max Shear:	975 lbs
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**Selected Member: (2) HF #2 1.5 x 5.5**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	41.59 in^4	6.08 in^4
Section Modulus:	15.13 in^3	6.91 in^3
Section Area:	16.5 in^2	8.48 in^2
Bearing Area:		2.41 in^2
Minimum bearing dimensions:	3. in x	0.8 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R10

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** 11' Long East Window Header

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	11 ft	Tributary Width:	7 ft	P Location:	11 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	578 lbs	DL Reaction 2:	578 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	963 lbs	SL Reaction 2:	963 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1540 lbs</b>	Total Reaction 2:	<b>1540 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1173 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.55 in	Max LL defl:	0.37 in
Total defl. * I:	70.95 in^4	Required I:	129. in^4
LL defl. * I:	44.35 in^4	Required I:	120.94 in^4
Actual deflections:	TOTAL: 0.31 in		0.19 in

**Force analysis:**

Max. moment:	4235 ft-lb	Max Shear:	1540 lbs
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**Selected Member: (1) HF #2 3.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	230.84 in^4	129. in^4
Section Modulus:	49.91 in^3	43.32 in^3
Section Area:	32.38 in^2	13.39 in^2
Bearing Area:		3.8 in^2
Minimum bearing dimensions:	3.5 in x	1.09 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R11

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** 3' Long East Window Header

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	3 ft	Tributary Width:	7 ft	P Location:	3 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	158 lbs	DL Reaction 2:	158 lbs	Note: Design automatically uses ASD load combinations
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	
SL Reaction 1:	263 lbs	SL Reaction 2:	263 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>420 lbs</b>	Total Reaction 2:	<b>420 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1271 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.15 in	Max LL defl:	0.1 in
Total defl. * I:	0.39 in^4	Required I:	2.62 in^4
LL defl. * I:	0.25 in^4	Required I:	2.45 in^4
Actual deflections:	TOTAL: 0.01 in		0.01 in

**Force analysis:**

Max. moment:	315 ft-lb	Max Shear:	420 lbs
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**Selected Member: (2) HF #2 1.5 x 5.5**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	41.59 in^4	2.62 in^4
Section Modulus:	15.13 in^3	2.97 in^3
Section Area:	16.5 in^2	3.65 in^2
Bearing Area:		1.04 in^2
Minimum bearing dimensions:	3. in x	0.35 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: R12

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** North Window Headers

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	6 ft	Tributary Width:	16.25 ft	P Location:	6 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	731 lbs	DL Reaction 2:	731 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	1219 lbs	SL Reaction 2:	1219 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1950 lbs</b>	Total Reaction 2:	<b>1950 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1075 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.3 in	Max LL defl:	0.2 in
Total defl. * I:	14.58 in^4	Required I:	48.6 in^4
LL defl. * I:	9.11 in^4	Required I:	45.56 in^4
Actual deflections:	TOTAL: 0.07 in		0.05 in

**Force analysis:**

Max. moment:	2925 ft-lb	Max Shear:	1950 lbs
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**Selected Member: (2) HF #2 1.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	197.86 in^4	48.6 in^4
Section Modulus:	42.78 in^3	32.64 in^3
Section Area:	27.75 in^2	16.96 in^2
Bearing Area:		4.81 in^2
Minimum bearing dimensions:	3. in x	1.6 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 12-Jan-24

Architect:

Page number: R13

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

Skylight Framing

Fully Supported:	1	Snow Load:	1	Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	2 ft	Tributary Width:	11 ft	P Location:	2 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	165 lbs	DL Reaction 2:	165 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	275 lbs	SL Reaction 2:	275 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>440 lbs</b>	Total Reaction 2:	<b>440 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1369 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.1 in	Max LL defl:	0.07 in
Total defl. * I:	0.12 in^4	Required I:	1.22 in^4
LL defl. * I:	0.08 in^4	Required I:	1.14 in^4
Actual deflections:	TOTAL: 0. in		0. in

**Force analysis:**

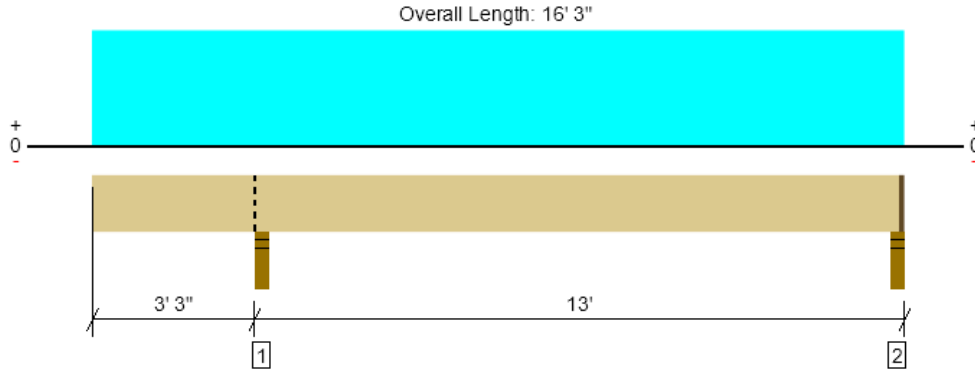
Max. moment:	220 ft-lb	Max Shear:	440 lbs
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**Selected Member: (1) HF #2 3.5 x 5.5**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	48.53 in^4	1.22 in^4
Section Modulus:	17.65 in^3	1.93 in^3
Section Area:	19.25 in^2	3.83 in^2
Bearing Area:		1.09 in^2
Minimum bearing dimensions:	3.5 in x	0.31 in

Roof, R14 Roof Rafter @ Skylight - North  
**1 piece(s) 2 x 10 HF No.2 @ 24" OC**

R 14



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	814 @ 3' 4 3/4"	2126 (3.50")	Passed (38%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	469 @ 4' 3 3/4"	1596	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1445 @ 10' 3/8"	2204	Passed (66%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.204 @ 9' 9 9/16"	0.422	Passed (L/742)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.315 @ 9' 9 15/16"	0.632	Passed (L/481)	--	1.0 D + 1.0 S (Alt Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

Member Length : 16' 1 3/4"  
 System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2018  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	305	509	814	Blocking
2 - Stud wall - SPF	3.50"	2.25"	1.50"	182	315	497	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 6" o/c	
Bottom Edge (Lu)	16' 2" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 16' 3"	24"	15.0	25.0	Default Load

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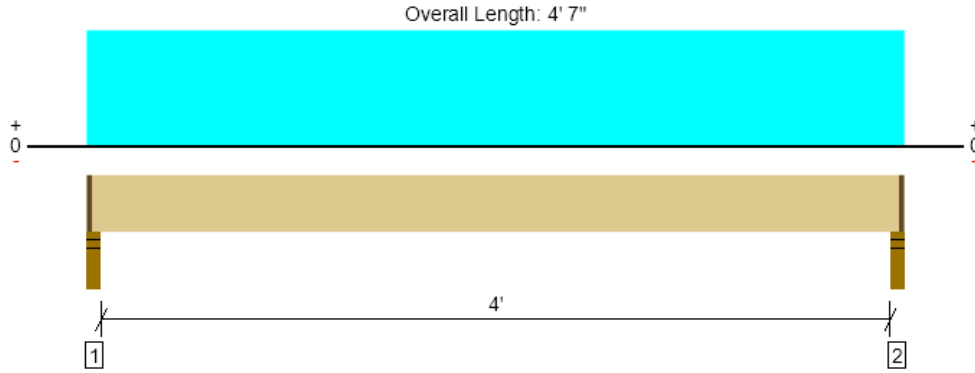
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	



9/13/2024 12:16:59 AM UTC  
 ForteWEB v3.8, Engine: V8.4.1.24, Data: V8.1.6.3  
 File Name: Macintyre

Roof, R15 Skylight Support @ skylight perpendicular to roof framing  
**2 piece(s) 2 x 10 HF No.2**



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	365 @ 2"	2734 (2.25")	Passed (13%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	205 @ 1' 3/4"	3191	Passed (6%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	377 @ 2' 3 1/2"	3833	Passed (10%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.003 @ 2' 3 1/2"	0.106	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.005 @ 2' 3 1/2"	0.213	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 4' 4 1/2"  
 System : Floor  
 Member Type : Flush Beam  
 Building Use : Residential  
 Building Code : IBC 2018  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - SPF	3.50"	2.25"	1.50"	153	229	382	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.50"	153	229	382	1 1/4" Rim Board

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

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 4' 5 3/4"	N/A	7.0	--	
1 - Uniform (PSF)	0 to 4' 7" (Front)	4'	15.0	25.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

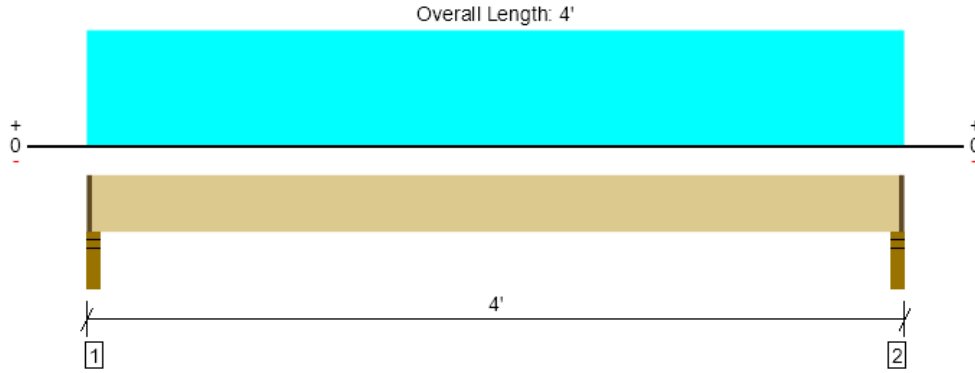
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	





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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	582 @ 2"	2734 (2.25")	Passed (21%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	288 @ 1' 3/4"	3191	Passed (9%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	516 @ 2'	3833	Passed (13%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.003 @ 2'	0.092	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.005 @ 2'	0.183	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 3' 9 1/2"  
System : Floor  
Member Type : Flush Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - SPF	3.50"	2.25"	1.50"	238	375	613	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.50"	238	375	613	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 10" o/c	
Bottom Edge (Lu)	3' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 3' 10 3/4"	N/A	7.0	--	
1 - Uniform (PSF)	0 to 4' (Front)	7' 6"	15.0	25.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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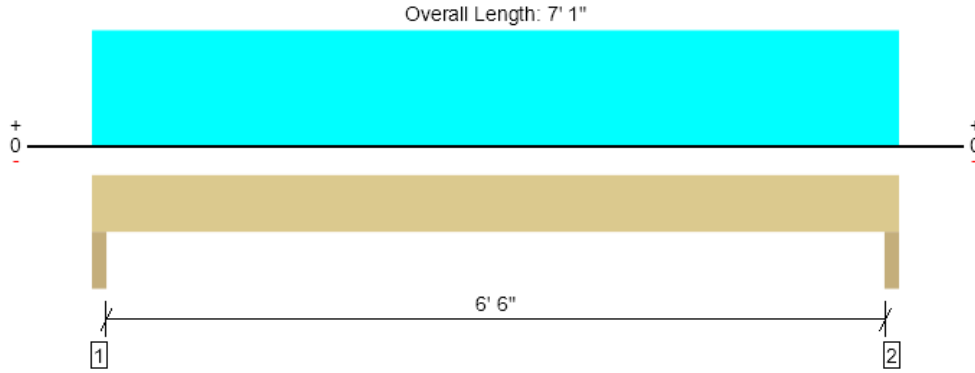
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	



Roof, R17 Header @ Stairs  
**1 piece(s) 4 x 8 HF No.2**

R 17



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1864 @ 2"	4961 (3.50")	Passed (38%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1393 @ 10 3/4"	2918	Passed (48%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2998 @ 3' 6 1/2"	3247	Passed (92%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.105 @ 3' 6 1/2"	0.225	Passed (L/771)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.170 @ 3' 6 1/2"	0.313	Passed (L/476)	--	1.0 D + 1.0 S (All Spans)

Member Length : 7' 1"  
 System : Wall  
 Member Type : Header  
 Building Use : Residential  
 Building Code : IBC 2018  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (5/16").
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Trimmer - SPF	3.50"	3.50"	1.50"	713	1151	1864	None
2 - Trimmer - SPF	3.50"	3.50"	1.50"	713	1151	1864	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 1" o/c	
Bottom Edge (Lu)	7' 1" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 7' 1"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 7' 1"	13'	15.0	25.0	Default Load

**Weyerhaeuser Notes**

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

ForteWEB Software Operator	Job Notes
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	



9/13/2024 12:16:59 AM UTC  
 ForteWEB v3.8, Engine: V8.4.1.24, Data: V8.1.6.3  
 File Name: Macintyre

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M1

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

Addition Floor Joists

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	12 ft	Tributary Width:	1.3333 ft	P Location:	12 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	120 lbs	DL Reaction 2:	120 lbs	Note: Design automatically uses
LL Reaction 1:	320 lbs	LL Reaction 2:	320 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>440 lbs</b>	Total Reaction 2:	<b>440 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	935 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.6 in	Max LL defl:	0.4 in
Total defl. * I:	26.32 in^4	Required I:	43.86 in^4
LL defl. * I:	19.14 in^4	Required I:	47.85 in^4
Actual deflections:	TOTAL: 0.27 in		0.19 in

**Force analysis:**

Max. moment:	1320 ft-lb	Max Shear:	440 lbs
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**Selected Member: (1) HF #2 1.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	98.93 in^4	47.85 in^4
Section Modulus:	21.39 in^3	16.94 in^3
Section Area:	13.88 in^2	4.4 in^2
Bearing Area:		1.09 in^2
Minimum bearing dimensions:	1.5 in x	0.72 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M2

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:**

South Typical Headers

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	3 ft	Tributary Width:	1.3333 ft	P Location:	3 ft
Add'l uniform DL:	240 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	400 lbs/ft	SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	390 lbs	DL Reaction 2:	390 lbs	Note: Design automatically uses ASD load combinations
LL Reaction 1:	80 lbs	LL Reaction 2:	80 lbs	
SL Reaction 1:	600 lbs	SL Reaction 2:	600 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>990 lbs</b>	Total Reaction 2:	<b>990 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1105 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.15 in	Max LL defl:	0.1 in
Total defl. * I:	1. in^4	Required I:	6.67 in^4
LL defl. * I:	0.64 in^4	Required I:	6.36 in^4
Actual deflections:	TOTAL: 0.02 in		0.02 in

**Force analysis:**

Max. moment:	742 ft-lb	Max Shear:	990 lbs
--------------	-----------	------------	---------

**Selected Member: (2) HF #2 1.5 x 5.5**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	41.59 in^4	6.67 in^4
Section Modulus:	15.13 in^3	8.06 in^3
Section Area:	16.5 in^2	9.9 in^2
Bearing Area:		2.44 in^2
Minimum bearing dimensions:	3. in x	0.81 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M3

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** East Typical Header

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	6 ft	Tributary Width:	6 ft	P Location:	6 ft
Add'l uniform DL:	60 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	100 lbs/ft	SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	450 lbs	DL Reaction 2:	450 lbs	Note: Design automatically uses ASD load combinations
LL Reaction 1:	720 lbs	LL Reaction 2:	720 lbs	
SL Reaction 1:	300 lbs	SL Reaction 2:	300 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1215 lbs</b>	Total Reaction 2:	<b>1215 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1020 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.3 in	Max LL defl:	0.2 in
Total defl. * I:	10.99 in^4	Required I:	36.64 in^4
LL defl. * I:	7.63 in^4	Required I:	38.13 in^4
Actual deflections:	TOTAL: 0.12 in		0.08 in

**Force analysis:**

Max. moment:	1823 ft-lb	Max Shear:	1215 lbs
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**Selected Member: (2) HF #2 1.5 x 7.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	95.27 in^4	38.13 in^4
Section Modulus:	26.28 in^3	21.44 in^3
Section Area:	21.75 in^2	12.15 in^2
Bearing Area:		3. in^2
Minimum bearing dimensions:	3. in x	1. in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M4

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** ADU Bath Header

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	2.75 ft	Tributary Width:	15 ft	P Location:	2.75 ft
Add'l uniform DL:	60 lbs/ft	DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	100 lbs/ft	SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	392 lbs	DL Reaction 2:	392 lbs	Note: Design automatically uses
LL Reaction 1:	825 lbs	LL Reaction 2:	825 lbs	ASD load combinations
SL Reaction 1:	138 lbs	SL Reaction 2:	138 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1217 lbs</b>	Total Reaction 2:	<b>1217 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1105 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.14 in	Max LL defl:	0.09 in
Total defl. * I:	0.98 in^4	Required I:	7.09 in^4
LL defl. * I:	0.69 in^4	Required I:	7.56 in^4
Actual deflections:	TOTAL: 0.02 in		0.02 in

**Force analysis:**

Max. moment:	837 ft-lb	Max Shear:	1217 lbs
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**Selected Member: (2) HF #2 1.5 x 5.5**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	41.59 in^4	7.56 in^4
Section Modulus:	15.13 in^3	9.09 in^3
Section Area:	16.5 in^2	12.17 in^2
Bearing Area:		3. in^2
Minimum bearing dimensions:	3. in x	1. in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M5

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** East Header with Post Load From R11

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	5.75 ft	Tributary Width:	6 ft	P Location:	2.5 ft
Add'l uniform DL:	97.5 lbs/ft	DL unit load:	15 psf	Concentrated DL:	158 lbs
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	162.5 lbs/ft	SL unit load:		Concentrated SL:	267 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	628 lbs	DL Reaction 2:	608 lbs	Note: Design automatically uses
LL Reaction 1:	690 lbs	LL Reaction 2:	690 lbs	ASD load combinations
SL Reaction 1:	618 lbs	SL Reaction 2:	583 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1609 lbs</b>	Total Reaction 2:	<b>1563 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	935 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.29 in	Max LL defl:	0.19 in
Total defl. * I:	13.35 in^4	Required I:	46.44 in^4
LL defl. * I:	8.99 in^4	Required I:	46.9 in^4
Actual deflections:	TOTAL: 0.07 in		0.05 in

**Force analysis:**

Max. moment:	2495 ft-lb	Max Shear:	1609 lbs
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**Selected Member: (2) HF #2 1.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	197.86 in^4	46.9 in^4
Section Modulus:	42.78 in^3	32.02 in^3
Section Area:	27.75 in^2	16.09 in^2
Bearing Area:		3.97 in^2
Minimum bearing dimensions:	3. in x	1.32 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M6

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** Southeast Header with R9 Post Load

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	3 ft	Tributary Width:	1.3333 ft	P Location:	2 ft
Add'l uniform DL:	240 lbs/ft	DL unit load:	15 psf	Concentrated DL:	366 lbs
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	375 lbs/ft	SL unit load:		Concentrated SL:	609 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	634 lbs	DL Reaction 2:	512 lbs	Note: Design automatically uses
LL Reaction 1:	80 lbs	LL Reaction 2:	80 lbs	ASD load combinations
SL Reaction 1:	969 lbs	SL Reaction 2:	766 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1602 lbs</b>	Total Reaction 2:	<b>1277 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1020 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.15 in	Max LL defl:	0.1 in
Total defl. * I:	1.59 in^4	Required I:	10.61 in^4
LL defl. * I:	0.99 in^4	Required I:	9.92 in^4
Actual deflections:	TOTAL: 0.02 in		0.01 in

**Force analysis:**

Max. moment:	1285 ft-lb	Max Shear:	1602 lbs
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**Selected Member: (2) HF #2 1.5 x 7.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	95.27 in^4	10.61 in^4
Section Modulus:	26.28 in^3	15.12 in^3
Section Area:	21.75 in^2	16.02 in^2
Bearing Area:		3.96 in^2
Minimum bearing dimensions:	3. in x	1.32 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M7

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** Southwest Header with R8 Post Load

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	3 ft	Tributary Width:	1.3333 ft	P Location:	0.5 ft
Add'l uniform DL:	240 lbs/ft	DL unit load:	15 psf	Concentrated DL:	548 lbs
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	375 lbs/ft	SL unit load:		Concentrated SL:	914 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	847 lbs	DL Reaction 2:	481 lbs	Note: Design automatically uses
LL Reaction 1:	80 lbs	LL Reaction 2:	80 lbs	ASD load combinations
SL Reaction 1:	1324 lbs	SL Reaction 2:	715 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>2171 lbs</b>	Total Reaction 2:	<b>1196 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	935 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.15 in	Max LL defl:	0.1 in
Total defl. * I:	1.5 in^4	Required I:	10.02 in^4
LL defl. * I:	0.94 in^4	Required I:	9.37 in^4
Actual deflections:	TOTAL: 0.01 in		0. in

**Force analysis:**

Max. moment:	1127 ft-lb	Max Shear:	2171 lbs
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**Selected Member: (2) HF #2 1.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	197.86 in^4	10.02 in^4
Section Modulus:	42.78 in^3	14.46 in^3
Section Area:	27.75 in^2	21.71 in^2
Bearing Area:		5.36 in^2
Minimum bearing dimensions:	3. in x	1.79 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M8

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** North Header with R12 Post Load

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	8 ft	Tributary Width:	1.3333 ft	P Location:	2 ft
Add'l uniform DL:	240 lbs/ft	DL unit load:	15 psf	Concentrated DL:	731 lbs
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:	375 lbs/ft	SL unit load:		Concentrated SL:	1219 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1588 lbs	DL Reaction 2:	1223 lbs	Note: Design automatically uses
LL Reaction 1:	213 lbs	LL Reaction 2:	213 lbs	ASD load combinations
SL Reaction 1:	2414 lbs	SL Reaction 2:	1805 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>4002 lbs</b>	Total Reaction 2:	<b>3027 lbs</b>	

**Material Properties:**

E	1.8 msi	E'	1.8 msi
Fb	2400 psi	Fb'	2400 psi
Fv	265 psi	Fv'	265 psi
Fc perp	650 psi	Fc perp'	650 psi
Emin	0.95 msi	Emin'	0.95 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.4 in	Max LL defl:	0.27 in
Total defl. * I:	49.2 in^4	Required I:	122.99 in^4
LL defl. * I:	30.65 in^4	Required I:	114.95 in^4
Actual deflections:	TOTAL: 0.23 in		0.14 in

**Force analysis:**

Max. moment:	7217 ft-lb	Max Shear:	4002 lbs
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**Selected Member: (1) GLB 3.5 x 9**

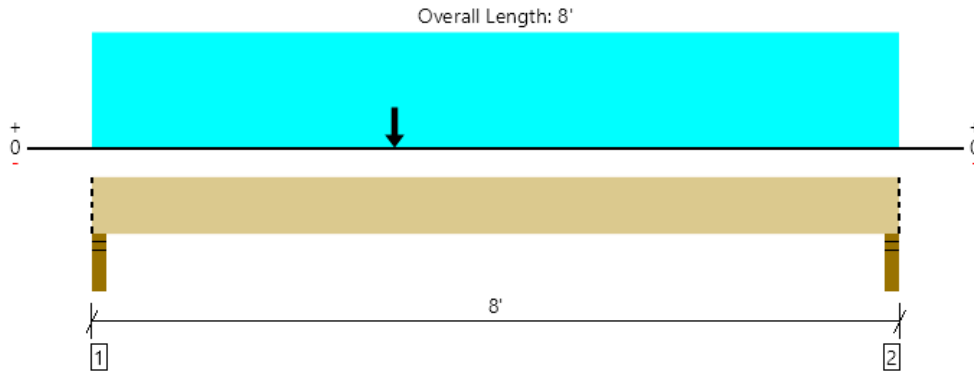
<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	212.63 in^4	122.99 in^4
Section Modulus:	47.25 in^3	36.09 in^3
Section Area:	31.5 in^2	22.66 in^2
Bearing Area:		6.16 in^2
Minimum bearing dimensions:	3.5 in x	1.76 in

Main, North Header With Strap From Above (Overstrength Loading)  
1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam

~~FAILED~~  
M9

**OK PER  
STRUCTURAL  
PLANS**

~~An excessive uplift of -3312 lbs at support located at 2" failed this product.  
An excessive uplift of -1672 lbs at support located at 7' 10" failed this product.~~



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5053 @ 2"	8181 (3.50")	Passed (62%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	4770 @ 1' 1/2"	13992	Passed (34%)	1.60	1.0 D + 0.7 E (All Spans)
Pos Moment (Ft-lbs)	13097 @ 3'	23760	Passed (55%)	1.60	1.0 D + 0.7 E (All Spans)
Neg Moment (Ft-lbs)	-10117 @ 3'	18315	Passed (55%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.052 @ 3' 11 15/16"	0.256	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.087 @ 3' 11 15/16"	0.383	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

System : Floor  
Member Type : Drop Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 7' 8".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 7' 8".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	2.16"	1088	213	1600	5664/-5664	5053/-3312	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	1088	213	1600	3321/-3321	3412/-1672	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' o/c	
Bottom Edge (Lu)	8' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 8'	N/A	12.0	--	--	--	
1 - Uniform (PSF)	0 to 8' (Front)	1' 4"	15.0	40.0	-	-	Floor Load
2 - Point (lb)	3' (Front)	N/A	-	-	-	8985	L2 w/2.5 overstrength Factor
3 - Uniform (PLF)	0 to 8' (Front)	N/A	240.0	-	400.0	-	Roof Framing

**Weyerhaeuser Notes**

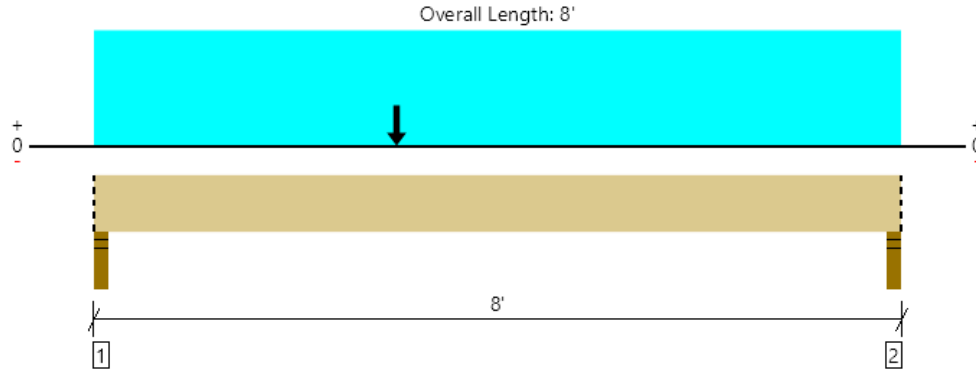
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Demetri Dalas CSES (425) 736-3569 demetri@cse-engineering.com	



Main, North Header With Strap From Above (w/out Overstrength Loading)  
1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2688 @ 2"	8181 (3.50")	Passed (33%)	--	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	1988 @ 1' 1/2"	10931	Passed (18%)	1.25	1.0 D + 1.0 Lr (All Spans)
Pos Moment (Ft-lbs)	6356 @ 3'	23760	Passed (27%)	1.60	1.0 D + 0.7 E (All Spans)
Neg Moment (Ft-lbs)	-3376 @ 3'	18315	Passed (18%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.052 @ 3' 11 15/16"	0.256	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.087 @ 3' 11 15/16"	0.383	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

System : Floor  
Member Type : Drop Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 7' 8".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 7' 8".
- -933 lbs uplift at support located at 2". Strapping or other restraint may be required.
- -277 lbs uplift at support located at 7' 10". Strapping or other restraint may be required.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	1088	213	1600	2266/-2266	2688/-933	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	1088	213	1600	1328/-1328	2688/-277	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' o/c	
Bottom Edge (Lu)	8' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 8'	N/A	12.0	--	--	--	
1 - Uniform (PSF)	0 to 8' (Front)	1' 4"	15.0	40.0	-	-	Floor Load
2 - Point (lb)	3' (Front)	N/A	-	-	-	3594	L2 w/2.5 overstrength Factor
3 - Uniform (PLF)	0 to 8' (Front)	N/A	240.0	-	400.0	-	Roof Framing

**Weyerhaeuser Notes**

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ForteWEB Software Operator	Job Notes
Demetri Dalas CSES (425) 736-3569 demetri@cses-engineering.com	



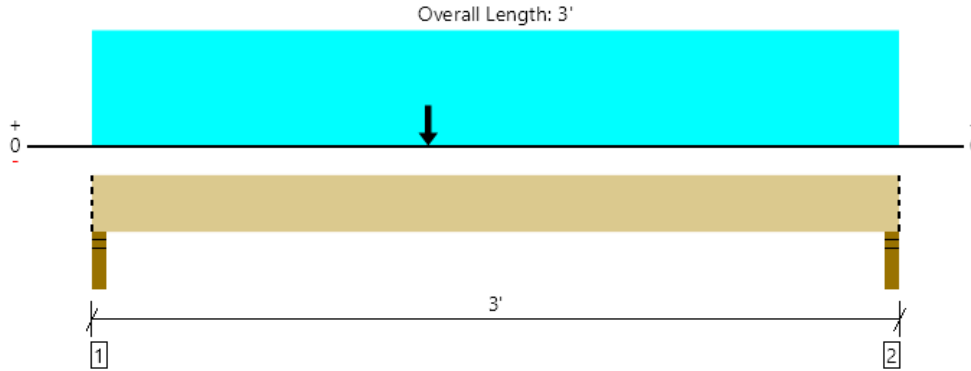
Main, South Header With Strap From Above (Overstrength Loading)  
1 piece(s) 4 x 10 DF No.2

~~FAILED~~  
M10

OK PER  
STRUCTURAL  
PLANS

~~An excessive uplift of -2883 lbs at support located at 2" failed this product.~~

~~An excessive uplift of -1897 lbs at support located at 2' 10" failed this product.~~



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3527 @ 2"	5206 (3.50")	Passed (68%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	3242 @ 1' 3/4"	6216	Passed (52%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	3615 @ 1' 3"	7187	Passed (50%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	0.001 @ 1' 6 1/16"	0.089	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.002 @ 1' 6 1/16"	0.133	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

System : Floor  
Member Type : Drop Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	2.37"	402	80	600	4464/-4464	3527/-2883	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.71"	402	80	600	3054/-3054	2540/-1897	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' o/c	
Bottom Edge (Lu)	3' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 3'	N/A	8.2	--	--	--	
1 - Uniform (PSF)	0 to 3' (Front)	1' 4"	15.0	40.0	-	-	Floor Load
2 - Point (lb)	1' 3" (Front)	N/A	-	-	-	7518	L3 w/2.5 overstrength Factor
3 - Uniform (PLF)	0 to 3' (Front)	N/A	240.0	-	400.0	-	Roof Framing

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ForteWEB Software Operator	Job Notes
Demetri Dalas CSES (425) 736-3569 demetri@cses-engineering.com	

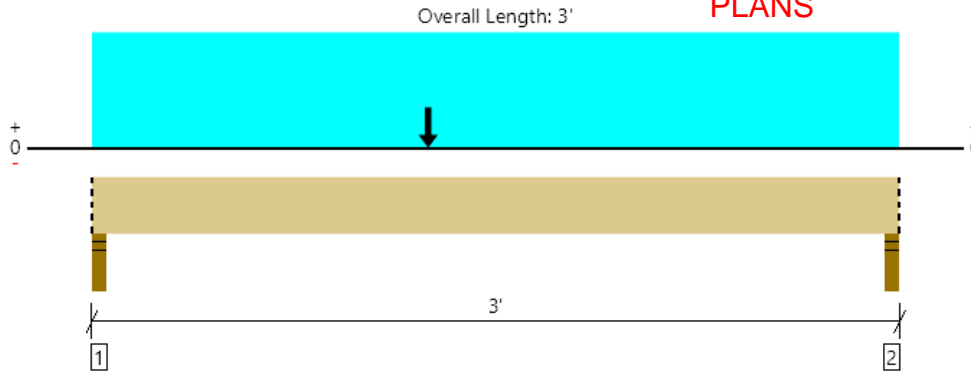


Main, South Header With Strap From Above (w/out Overstrength Loading)  
1 piece(s) 4 x 10 DF No.2

~~FAILED~~  
M10a

~~An excessive uplift of ~1000 lbs at support located at 2" failed this product.~~

**OK PER  
STRUCTURAL  
PLANS**



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

Design Results	Actual @ Location	Allowed	Result	LDf	Load: Combination (Pattern)
Member Reaction (lbs)	1652 @ 2"	5206 (3.50")	Passed (32%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	1367 @ 1' 3/4"	6216	Passed (22%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	1584 @ 1' 3"	7187	Passed (22%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	0.001 @ 1' 6 1/16"	0.089	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)
Total Load Defl. (in)	0.002 @ 1' 6 1/16"	0.133	Passed (L/999+)	--	1.0 D + 1.0 Lr (All Spans)

System : Floor  
Member Type : Drop Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -614 lbs uplift at support located at 2' 10". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	402	80	600	1785/-1785	1652/-1008	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	402	80	600	1222/-1222	1257/-614	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' o/c	
Bottom Edge (Lu)	3' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 3'	N/A	8.2	--	--	--	
1 - Uniform (PSF)	0 to 3' (Front)	1' 4"	15.0	40.0	-	-	Floor Load
2 - Point (lb)	1' 3" (Front)	N/A	-	-	-	3007	L3
3 - Uniform (PLF)	0 to 3' (Front)	N/A	240.0	-	400.0	-	Roof Framing

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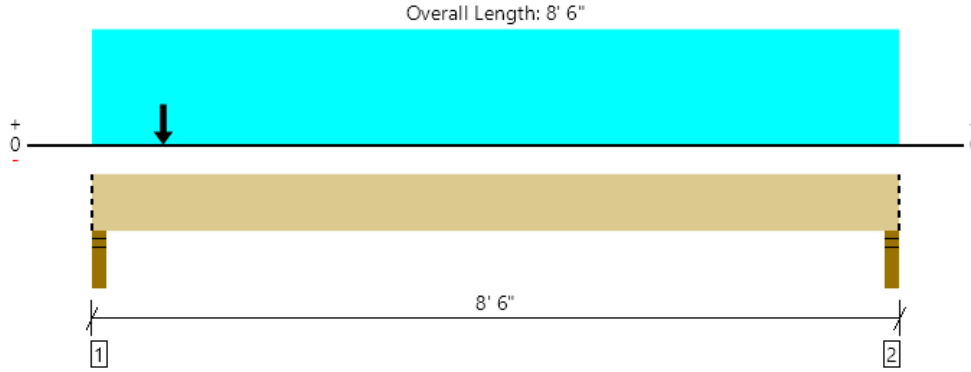


Main, Northernly Garage Door Header w/Strap Overstrength  
 1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam

~~FAILED~~  
**M11**

**OK PER  
 STRUCTURAL  
 PLANS**

~~An excessive uplift of -2591 lbs at support located at 2" failed this product.~~



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

Design Results	Actual @ Location	Allowed	Result	LDf	Load: Combination (Pattern)
Member Reaction (lbs)	4944 @ 2"	5206 (3.50")	Passed (95%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2186 @ 1' 2"	6493	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	5910 @ 4' 3"	12863	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Neg Moment (Ft-lbs)	-1551 @ 9"	15864	Passed (10%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.076 @ 4' 3 1/16"	0.272	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.117 @ 4' 3 1/16"	0.408	Passed (L/839)	--	1.0 D + 1.0 L (All Spans)

System : Floor  
 Member Type : Drop Beam  
 Building Use : Residential  
 Building Code : IBC 2018  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 2".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 3' 3 7/8".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	3.32"	1058	1955	478	4609/-4609	4944/-2591	Blocking
2 - Stud wall - SPF	3.50"	3.50"	2.03"	1058	1955	478	355/-355	3013	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	8' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	8.9	--	--	--	
1 - Uniform (PSF)	0 to 8' 6" (Front)	11' 6"	15.0	40.0	-	-	Floor Load
2 - Point (lb)	9" (Front)	N/A	-	-	-	4963	L4 w/2.5 Overstrength Factor
3 - Uniform (PSF)	0 to 8' 6" (Front)	4' 6"	15.0	-	25.0	-	Roof Load

**Weyerhaeuser Notes**

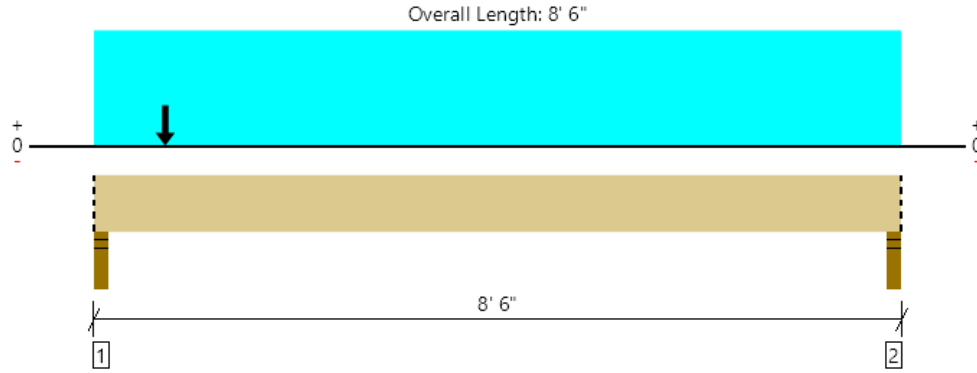
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Demetri Dalas CSES (425) 736-3569 demetri@cses-engineering.com	



Main, Northernly Garage Door Header w/out Strap Overstrength  
1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3492 @ 2"	5206 (3.50")	Passed (67%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2186 @ 1' 2"	6493	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	5910 @ 4' 3"	12863	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Neg Moment (Ft-lbs)	-422 @ 9"	15864	Passed (3%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.076 @ 4' 3 1/16"	0.272	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.117 @ 4' 3 1/16"	0.408	Passed (L/839)	--	1.0 D + 1.0 L (All Spans)

System : Floor  
Member Type : Drop Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 2".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 1' 3 15/16".
- -655 lbs uplift at support located at 2". Strapping or other restraint may be required.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	2.35"	1058	1955	478	1843/-1843	3492/-655	Blocking
2 - Stud wall - SPF	3.50"	3.50"	2.03"	1058	1955	478	142/-142	3013	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	8' 6" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	8.9	--	--	--	
1 - Uniform (PSF)	0 to 8' 6" (Front)	11' 6"	15.0	40.0	-	-	Floor Load
2 - Point (lb)	9" (Front)	N/A	-	-	-	1985	L4
3 - Uniform (PSF)	0 to 8' 6" (Front)	4' 6"	15.0	-	25.0	-	Roof Load

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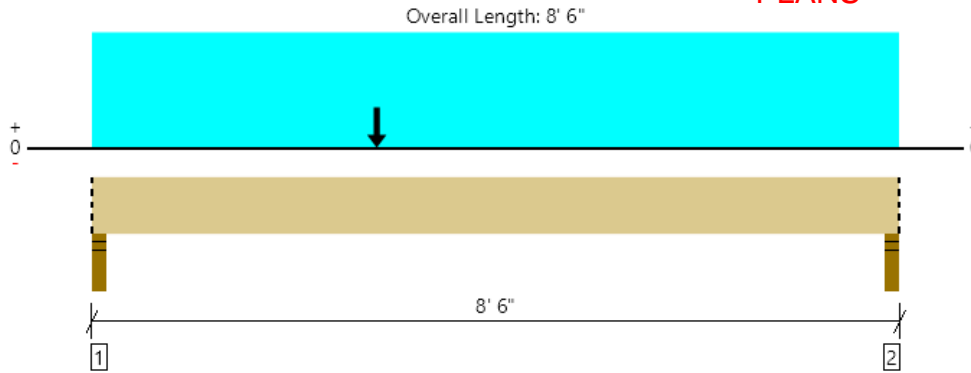


Main, Southernly Garage Door Header w/Strap Overstrength  
 1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam

~~FAILED~~  
 M12

~~An excessive uplift of -1634 lbs at support located at 2" failed this product.~~

**OK PER  
 STRUCTURAL  
 PLANS**



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

Design Results	Actual @ Location	Allowed	Result	LDf	Load: Combination (Pattern)
Member Reaction (lbs)	4226 @ 2"	5206 (3.50")	Passed (81%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	3533 @ 1' 2"	10388	Passed (34%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	5910 @ 4' 3"	12863	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Neg Moment (Ft-lbs)	-5300 @ 3'	15864	Passed (33%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.076 @ 4' 3"	0.272	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.117 @ 4' 3"	0.408	Passed (L/839)	--	1.0 D + 1.0 L (All Spans)

System : Floor  
 Member Type : Drop Beam  
 Building Use : Residential  
 Building Code : IBC 2018  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 2".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 2".
- -571 lbs uplift at support located at 8' 4". Strapping or other restraint may be required.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	2.84"	1058	1955	478	3241/-3241	4226/-1634	Blocking
2 - Stud wall - SPF	3.50"	3.50"	2.30"	1058	1955	478	1722/-1722	3428/-571	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	8' 6" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	8.9	--	--	--	
1 - Uniform (PSF)	0 to 8' 6" (Front)	11' 6"	15.0	40.0	-	-	Floor Load
2 - Point (lb)	3' (Front)	N/A	-	-	-	4963	L4 w/2.5 overstrength factor
3 - Uniform (PSF)	0 to 8' 6" (Front)	4' 6"	15.0	-	25.0	-	Roof Load

**Weyerhaeuser Notes**

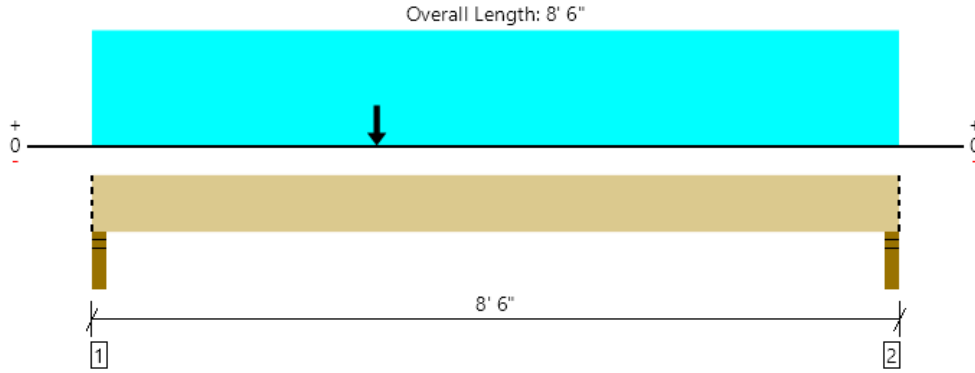
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Demetri Dalas CSES (425) 736-3569 demetri@cses-engineering.com	



Main, Southernly Garage Door Header w/out Strap Overstrength  
1 piece(s) 3 1/2" x 10 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3205 @ 2"	5206 (3.50")	Passed (62%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2186 @ 1' 2"	6493	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	5910 @ 4' 3"	12863	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Neg Moment (Ft-lbs)	-1443 @ 3'	15864	Passed (9%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.076 @ 4' 3"	0.272	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.117 @ 4' 3"	0.408	Passed (L/839)	--	1.0 D + 1.0 L (All Spans)

System : Floor  
Member Type : Drop Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 8' 2".
- Critical negative moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 6' 5 7/16".
- -273 lbs uplift at support located at 2". Strapping or other restraint may be required.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	2.15"	1058	1955	478	1296/-1296	3205/-273	Blocking
2 - Stud wall - SPF	3.50"	3.50"	2.03"	1058	1955	478	689/-689	3013	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 6" o/c	
Bottom Edge (Lu)	8' 6" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (non-snow: 1.25)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	8.9	--	--	--	
1 - Uniform (PSF)	0 to 8' 6" (Front)	11' 6"	15.0	40.0	-	-	Floor Load
2 - Point (lb)	3' (Front)	N/A	-	-	-	1985	L4
3 - Uniform (PSF)	0 to 8' 6" (Front)	4' 6"	15.0	-	25.0	-	Roof Load

**Weyerhaeuser Notes**

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

ForteWEB Software Operator	Job Notes
Demetri Dalas CSES (425) 736-3569 demetri@cses-engineering.com	



John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M13

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** Structure 1 West Header

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	6.3333 ft	Tributary Width:	6.125 ft	P Location:	6.3333 ft
Add'l uniform DL:		DL unit load:	30 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	65 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	582 lbs	DL Reaction 2:	582 lbs	Note: Design automatically uses
LL Reaction 1:	1261 lbs	LL Reaction 2:	1261 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>1843 lbs</b>	Total Reaction 2:	<b>1843 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	935 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.32 in	Max LL defl:	0.21 in
Total defl. * I:	16.2 in^4	Required I:	51.17 in^4
LL defl. * I:	11.09 in^4	Required I:	52.51 in^4
Actual deflections:	TOTAL: 0.08 in		0.06 in

**Force analysis:**

Max. moment:	2917 ft-lb	Max Shear:	1843 lbs
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**Selected Member: (2) HF #2 1.5 x 9.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	197.86 in^4	52.51 in^4
Section Modulus:	42.78 in^3	37.44 in^3
Section Area:	27.75 in^2	18.43 in^2
Bearing Area:		4.55 in^2
Minimum bearing dimensions:	3. in x	1.52 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M14

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** Structure 1 East Headers

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	11 ft	Tributary Width:	6.125 ft	P Location:	11 ft
Add'l uniform DL:		DL unit load:	30 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	65 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1011 lbs	DL Reaction 2:	1011 lbs	Note: Design automatically uses
LL Reaction 1:	2190 lbs	LL Reaction 2:	2190 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>3200 lbs</b>	Total Reaction 2:	<b>3200 lbs</b>	

**Material Properties:**

E	1.8 msi	E'	1.8 msi
Fb	2400 psi	Fb'	2400 psi
Fv	265 psi	Fv'	265 psi
Fc perp	650 psi	Fc perp'	650 psi
Emin	0.95 msi	Emin'	0.95 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.55 in	Max LL defl:	0.37 in
Total defl. * I:	106.49 in^4	Required I:	193.62 in^4
LL defl. * I:	72.86 in^4	Required I:	198.71 in^4
Actual deflections:	TOTAL: 0.5 in		0.34 in

**Force analysis:**

Max. moment:	8801 ft-lb	Max Shear:	3200 lbs
--------------	------------	------------	----------

**Selected Member: (1) GLB 3.5 x 9**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	212.63 in^4	198.71 in^4
Section Modulus:	47.25 in^3	44. in^3
Section Area:	31.5 in^2	18.11 in^2
Bearing Area:		4.92 in^2
Minimum bearing dimensions:	3.5 in x	1.41 in

John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 18-Dec-23

Architect:

Page number: M15

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** Main Entrance Header

Fully Supported:	1	Snow Load:		Wind Load:	
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	6.3333 ft	Tributary Width:	6.125 ft	P Location:	3.16665 ft
Add'l uniform DL:		DL unit load:	30 psf	Concentrated DL:	495 lbs
Add'l uniform LL:		LL unit load:	65 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	895 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	829 lbs	DL Reaction 2:	829 lbs	Note: Design automatically uses
LL Reaction 1:	1261 lbs	LL Reaction 2:	1261 lbs	ASD load combinations
SL Reaction 1:	448 lbs	SL Reaction 2:	448 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	<b>2111 lbs</b>	Total Reaction 2:	<b>2111 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	935 psi
Fv	150 psi	Fv'	150 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	240		
For LL only: Allowed deflection criteria, span/	360		
Max. allowed total defl:	0.32 in	Max LL defl:	0.21 in
Total defl. * I:	25.98 in^4	Required I:	82.05 in^4
LL defl. * I:	17.38 in^4	Required I:	82.34 in^4
Actual deflections:	TOTAL: 0.06 in		0.04 in

**Force analysis:**

Max. moment:	4265 ft-lb	Max Shear:	2111 lbs
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**Selected Member: (1) HF #2 3.5 x 11.25**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	415.28 in^4	82.34 in^4
Section Modulus:	73.83 in^3	54.74 in^3
Section Area:	39.38 in^2	21.11 in^2
Bearing Area:		5.21 in^2
Minimum bearing dimensions:	3.5 in x	1.49 in

**John S. Apolis, P.E.**      **CSES, Inc.**

Job number: **2023.102**

**Project:            Macintyre**

Date: 20-Dec-23

**Architect:**

Page number:    M16

**BEAM DESIGN (Uniform Load+Concentrated Load)**

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**John S. Apolis, P.E.**      **CSES, Inc.**

Job number: **2023.102**

**Project:            Macintyre**

Date: 20-Dec-23

**Architect:**

Page number:    M17

**BEAM DESIGN (Uniform Load+Concentrated Load)**

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**John S. Apolis, P.E.**      **CSES, Inc.**

Job number: **2023.102**

**Project:            Macintyre**

Date: 20-Dec-23

**Architect:**

Page number:    M18

**BEAM DESIGN (Uniform Load+Concentrated Load)**

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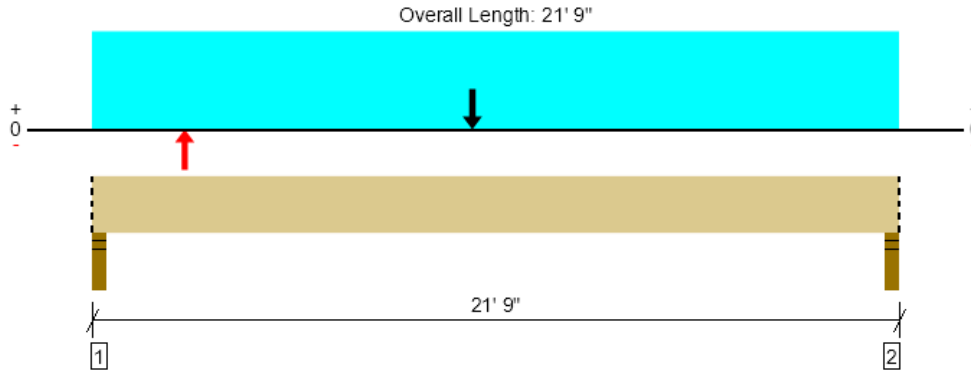


**OKAY PER  
DETAILING**

~~**FAILED**~~  
**M 19**

An excessive uplift of -1156 lbs at support located at 2" failed this product.

An excessive uplift of -1156 lbs at support located at 21' 7" failed this product.



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	7687 @ 2"	8181 (3.50")	Passed (94%)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	6027 @ 1' 8"	16033	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	37529 @ 10' 10 1/2"	47914	Passed (78%)	1.00	1.0 D + 1.0 L (All Spans)
Neg Moment (Ft-lbs)	-20818 @ 10' 3"	60588	Passed (34%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.588 @ 10' 10 1/2"	0.714	Passed (L/437)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.836 @ 10' 10 1/2"	1.071	Passed (L/307)	--	1.0 D + 1.0 L (All Spans)

Member Length : 21' 9"  
System : Floor  
Member Type : Drop Beam  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.96 that was calculated using length L = 21' 5".
- Critical negative moment adjusted by a volume/size factor of 0.98 that was calculated using length L = 16' 8 3/16".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Seismic	Factored	
1 - Stud wall - SPF	3.50"	3.50"	3.29"	2116	5003	3465/-3465	7687/-1156	Blocking
2 - Stud wall - SPF	3.50"	3.50"	3.29"	2116	5003	3465/-3465	7687/-1156	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	21' 9" o/c	
Bottom Edge (Lu)	21' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

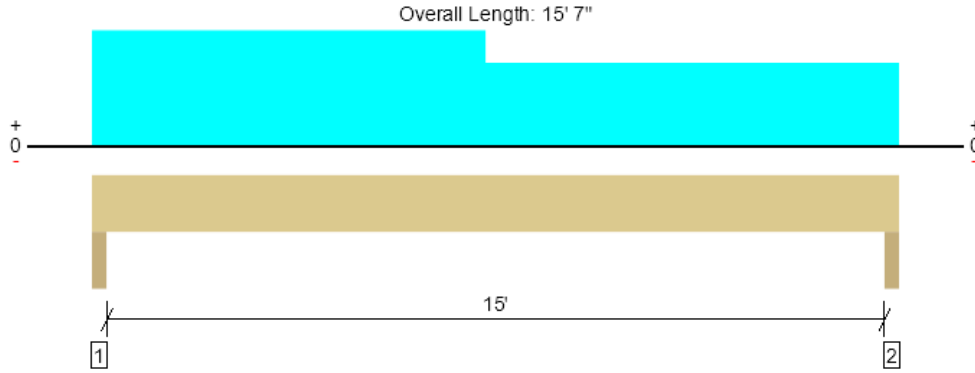
Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 21' 9"	N/A	22.1	--	--	
1 - Uniform (PSF)	0 to 21' 9" (Front)	11' 6"	15.0	40.0	-	Upper
2 - Point (lb)	2' 6" (Front)	N/A	-	-	-9575	2.5xuplift
3 - Point (lb)	10' 3" (Front)	N/A	-	-	9575	2.5xuplift

• Side loads are assumed to not induce cross-grain tension.

Forteweb Software Operator	Job Notes
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cse-engineering.com	



Main, M20 Wind Girder @ west Wall Windows  
**1 piece(s) 6 x 6 DF No.2 (Plank)**



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	736 @ 2"	12031 (3.50")	Passed (6%)	--	1.0 D + 0.6 W (All Spans)
Shear (lbs)	660 @ 9"	5485	Passed (12%)	1.60	1.0 D + 0.6 W (All Spans)
Moment (Ft-lbs)	2554 @ 7' 3 1/4"	3235	Passed (79%)	1.60	1.0 D + 0.6 W (All Spans)
Live Load Defl. (in)	0.981 @ 7' 8 1/4"	0.508	Failed (L/187)	--	1.0 D + 0.6 W (All Spans)
Total Load Defl. (in)	1.075 @ 7' 8 3/8"	0.313	Failed (L/170)	--	1.0 D + 0.6 W (All Spans)

Member Length : 15' 7"  
System : Wall  
Member Type : Header  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (5/16").
- Member has been designed in flat (plank) orientation.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

**> L/120,  
OK**

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Wind	Factored	
1 - Trimmer - SPF	3.50"	3.50"	1.50"	60	1127	736	None
2 - Trimmer - SPF	3.50"	3.50"	1.50"	60	952	631	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	15' 7" o/c	
Bottom Edge (Lu)	15' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Wind (1.60)	Comments
0 - Self Weight (PLF)	0 to 15' 7"	N/A	7.7	--	
1 - Uniform (PSF)	0 to 7' 7 3/16"	5'	-	31.2	Default Load
2 - Uniform (PSF)	7' 7 3/16" to 15' 7"	5'	-	22.4	

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

ForteWEB Software Operator	Job Notes
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	



John S. Apolis, P.E. CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 12-Sep-24

Architect:

Page number: M 20a

**BEAM DESIGN (Uniform Load+Concentrated Load)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** West post supporting wind girt

Fully Supported:	1	Snow Load:		Wind Load:	1
Repetitive Member:		P.T. Lumber:		Wet Use:	

**Geometry and Loads:**

Span:	10 ft	Tributary Width:	1 ft	P Location:	7 ft
Add'l uniform DL:		DL unit load:	0.01 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:	31.2 psf	Concentrated WL:	1127 lbs

DL Reaction 1:	0 lbs	DL Reaction 2:	0 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	945 lbs	WL Reaction 2:	494 lbs	
Total Reaction 1:	<b>945 lbs</b>	Total Reaction 2:	<b>494 lbs</b>	

**Material Properties:**

E	1.3 msi	E'	1.3 msi
Fb	875 psi	Fb'	1960 psi
Fv	170 psi	Fv'	272 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.47 msi	Emin'	0.47 msi

**Deflection analysis:**

For total load: Allowed deflection criteria, span/	120		
For LL only: Allowed deflection criteria, span/	120		
Max. allowed total defl:	1. in	Max LL defl:	1. in
Total defl. * I:	30.43 in^4	Required I:	30.43 in^4
LL defl. * I:	0. in^4	Required I:	0. in^4
Actual deflections: TOTAL:	0.4 in		0. in

**Force analysis:**

Max. moment:	2694 ft-lb	Max Shear:	945 lbs
--------------	------------	------------	---------

**Selected Member: (1) DF #2 5.5 x 5.5**

<b>Member properties:</b>	<b>Provided:</b>	<b>Required:</b>
Moment of inertia:	76.26 in^4	30.43 in^4
Section Modulus:	27.73 in^3	16.5 in^3
Section Area:	30.25 in^2	5.21 in^2
Bearing Area:		1.51 in^2
Minimum bearing dimensions:	5.5 in x	0.27 in

John S. Apolis, P.E.

CSES, Inc.

Job number: 2023.102

Project: Macintyre

Date: 12-Sep-24

Architect:

Page number: M 20b

**Post Design (Combined Axial and Moment Loading)**

2018 International Building Code (IBC)

2018 NDS

**Beam Description:** West post supporting wind girt - gravity check

Snow Load:	1	Wind Load:	1
Repetitive Member:		P.T. Lumber:	

**Geometry and loads:**

Height	10 ft	w(d)	0 plf	M(d)	2694 ft-lbs
Axial Load	3000 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	10 ft	Le(b)	1 ft		

**Material Properties:**

Fb1	875 psi	Fb(d)'	1400 psi
Fb2	875 psi	Fb(b)'	1400 psi
Fc	1350 psi	Fc'	880.38 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

**Selected Member:** DF #2 5.5 x 5.5

**Member properties:**

Section Modulus (d):	27.7 in^3
Section Modulus (b):	27.7 in^3
Section Area:	30.3 in^2

**Variables:**

Rb(d)	4.67
Rb(b)	1.48
c	0.8

**Member stresses:** Provided

FcE(d)	1002 psi	>
FcE(b)	100153 psi	>
FbE	31900 psi	>
FbE	31900 psi	>

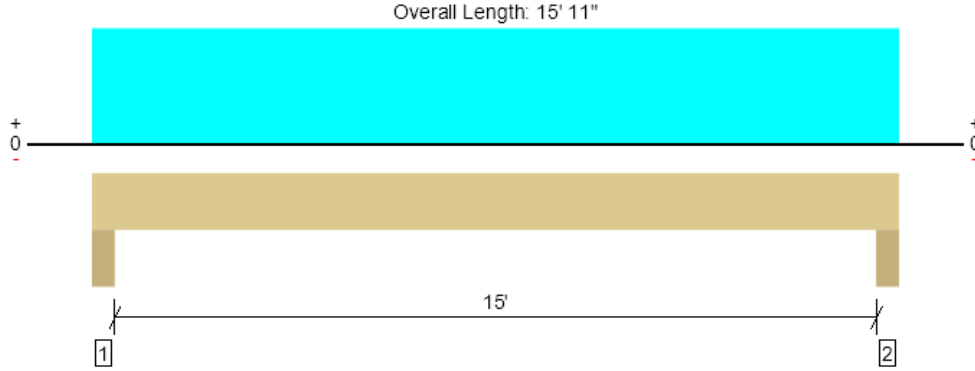
Required

fc	99 psi	OK
fc	99 psi	OK
fb(d)	1166 psi	OK
fb(b)	0 psi	OK

**Bending and Axial Compression Check:**

NDS 2018 EQ 3.9-3 0.94 < 1.0 **OK**

Main, M21 15' West window header  
**1 piece(s) 6 x 10 DF No.2**



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1697 @ 4"	18906 (5.50")	Passed (9%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1430 @ 1' 3"	6810	Passed (21%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6199 @ 7' 11 1/2"	6937	Passed (89%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.298 @ 7' 11 1/2"	0.508	Passed (L/615)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.508 @ 7' 11 1/2"	0.762	Passed (L/360)	--	1.0 D + 1.0 S (All Spans)

Member Length : 15' 11"  
 System : Wall  
 Member Type : Header  
 Building Use : Residential  
 Building Code : IBC 2018  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Trimmer - SPF	5.50"	5.50"	1.50"	702	995	1697	None
2 - Trimmer - SPF	5.50"	5.50"	1.50"	702	995	1697	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	15' 11" o/c	
Bottom Edge (Lu)	15' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 15' 11"	N/A	13.2	--	
1 - Uniform (PSF)	0 to 15' 11"	5'	15.0	25.0	Default Load

**Weyerhaeuser Notes**

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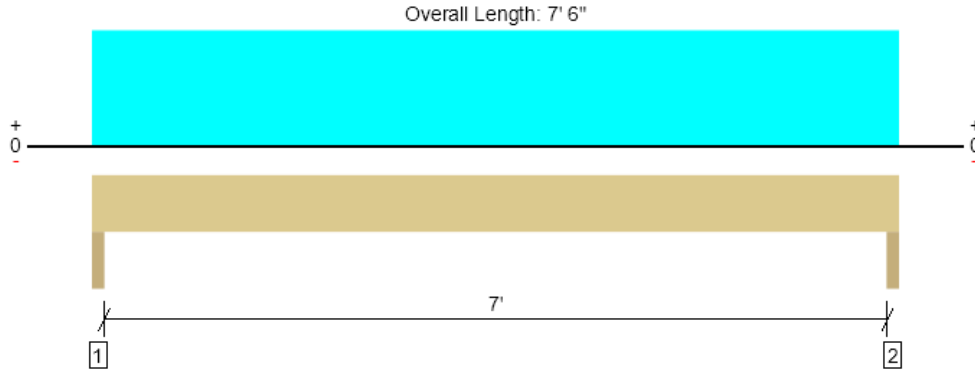
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	



9/13/2024 12:20:16 AM UTC  
 ForteWEB v3.8, Engine: V8.4.1.24, Data: V8.1.6.3  
 File Name: Macintyre

Main, M22 Gridline B Typical Headers  
**1 piece(s) 3 1/2" x 7 1/2" 24F-V4 DF Glulam**



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3087 @ 1 1/2"	6825 (3.00")	Passed (45%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2366 @ 10 1/2"	5333	Passed (44%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	5408 @ 3' 9"	7547	Passed (72%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.144 @ 3' 9"	0.242	Passed (L/603)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.231 @ 3' 9"	0.363	Passed (L/377)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 7' 6"  
System : Wall  
Member Type : Header  
Building Use : Residential  
Building Code : IBC 2018  
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 1.00 that was calculated using length L = 7' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Trimmer - SPF	3.00"	3.00"	1.50"	1160	1350	1219	3087	None
2 - Trimmer - SPF	3.00"	3.00"	1.50"	1160	1350	1219	3087	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 6" o/c	
Bottom Edge (Lu)	7' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 7' 6"	N/A	6.4	--	--	
1 - Uniform (PSF)	0 to 7' 6"	13'	15.0	-	25.0	Default Load
2 - Uniform (PSF)	0 to 7' 6"	9'	12.0	40.0	-	

**Weyerhaeuser Notes**

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

ForteWEB Software Operator	Job Notes
Isabella Cabullos CSES Engineering (206) 291-7007 isabella@cses-engineering.com	



FOOTING SUPPORTING RZ POST:

3915# +  
2x1987# = 3.9' < 4'

2000psf

USE 24" x 24" x 12" DEEP FOOTING  
W/ (3) #4 BARS EACH WAY

FOOTINGS FOR ENTRANCE AWNING POSTS:

$$\frac{600\# + 1000\#}{2000\text{psf}} = 115.2\text{in}^2 < 18\text{in} \times 18\text{in} = 324\text{in}^2 \checkmark \text{OK}$$

USE 18" x 18" x 12" DEEP FOOTING W/ (2) #4  
BARS EACH WAY

**CONSULTING STRUCTURAL ENGINEERING SERVICES**

Residential and Commercial Structural Design

6311 17th Avenue NE, Seattle, WA 98115

Phone: (206)527-1288 Email: john@cses-engineering.com

Project No. 2023.102 Date 4/18/24

Project Name MACINTYRE

Comments \_\_\_\_\_

Revision \_\_\_\_\_ Page F1

Project Title:  
 Engineer:  
 Project ID:  
 Project Descr:

## Cantilevered Retaining Wall

Project File: Macintyre East Retaining Wall.ec6

LIC# : KW-06018259, Build:20.22.8.17

CSES, Inc

(c) ENERCALC INC 1983-2022

**DESCRIPTION:** Macintyre East Retaining Wall

### Code Reference:

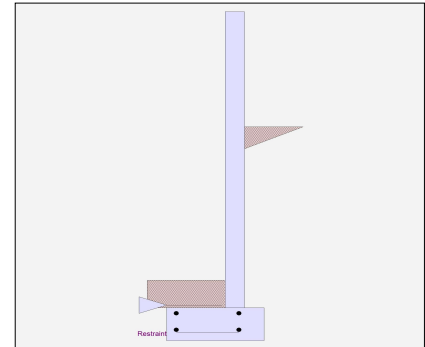
Calculations per IBC 2012 1807.3, CBC 2013, ASCE 7-10

#### Criteria

Retained Height	=	5.50 ft
Wall height above soil	=	3.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	10.00 in
Water height over heel	=	0.0 ft

#### Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing  Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



#### Surcharge Loads

Surcharge Over Heel	=	40.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	40.0
NOT Used for Sliding & Overturning		

#### Axial Load Applied to Stem

Axial Dead Load	=	203.0 lbs
Axial Live Load	=	439.0 lbs
Axial Load Eccentricity	=	0.0 in

#### Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	7.000
(Multiplier used on soil density)		

#### 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) (Service Level)
Wind on Exposed Stem	=	0.0 psf (Strength Level)

Uniform Seismic Force	=	45.500
Total Seismic Force	=	295.750

#### 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:  
 Engineer:  
 Project ID:  
 Project Descr:

## Cantilevered Retaining Wall

Project File: Macintyre East Retaining Wall.ec6

LIC# : KW-06018259, Build:20.22.8.17

CSES, Inc

(c) ENERCALC INC 1983-2022

### DESCRIPTION: Macintyre East Retaining Wall

#### Design Summary

##### Wall Stability Ratios

Overturning	=	1.54	OK
Slab Resists All Sliding !			
Global Stability	=	1.93	
Total Bearing Load	=	2,583 lbs	
...resultant ecc.	=	3.47 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	1,499 psf	OK
Soil Pressure @ Heel	=	270 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,156 psf	
ACI Factored @ Heel	=	389 psf	
Footing Shear @ Toe	=	11.4 psi	OK
Footing Shear @ Heel	=	7.0 psi	OK
Allowable	=	75.0 psi	

##### Sliding Calcs

Lateral Sliding Force	=	1,019.2 lbs
-----------------------	---	-------------

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

##### Load Factors

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

#### Stem Construction

##### Design Height Above Ftg

ft =	Stem OK	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	SD
Thickness	=	6.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

##### Design Data

fb/FB + fa/Fa	=	0.695
---------------	---	-------

##### Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	1,195.8

##### Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	2,512.1

Moment.....Allowable	=	3,612.6
----------------------	---	---------

##### Shear.....Actual

Service Level	psi =	
Strength Level	psi =	23.4

Shear.....Allowable	psi =	75.0
---------------------	-------	------

Anet (Masonry)	in2 =	
----------------	-------	--

Wall Weight	psf =	75.0
-------------	-------	------

Rebar Depth 'd'	in =	4.25
-----------------	------	------

##### Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

##### Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Project Title:  
 Engineer:  
 Project ID:  
 Project Descr:

## Cantilevered Retaining Wall

Project File: Macintyre East Retaining Wall.ec6

LIC# : KW-06018259, Build:20.22.8.17

CSES, Inc

(c) ENERCALC INC 1983-2022

### DESCRIPTION: Macintyre East Retaining Wall

#### Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>	
Bottom Stem			
As (based on applied moment) :	0.142 in <sup>2</sup> /ft		
(4/3) * As :	0.1893 in <sup>2</sup> /ft	Min Stem T&S Reinf Area 1.296 in <sup>2</sup>	
200bd/fy : 200(12)(4.25)/60000 :	0.17 in <sup>2</sup> /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.144 in <sup>2</sup> /ft	
0.0018bh : 0.0018(12)(6) :	0.1296 in <sup>2</sup> /ft	Horizontal Reinforcing Options :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.17 in <sup>2</sup> /ft	#4@ 16.67 in	#4@ 33.33 in
Provided Area :	0.2 in <sup>2</sup> /ft	#5@ 25.83 in	#5@ 51.67 in
Maximum Area :	0.5757 in <sup>2</sup> /ft	#6@ 36.67 in	#6@ 73.33 in

#### Footing Data

Toe Width	=	1.50 ft
Heel Width	=	1.00
Total Footing Width	=	2.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	2.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0012
Cover @ Top 2.00	@ Btm.=	3.00 in

#### Footing Design Results

	<u>Toe</u>	<u>Heel</u>
Factored Pressure	= 2,156	389 psf
Mu' : Upward	= 2,028	63 ft-#
Mu' : Downward	= 415	430 ft-#
Mu: Design	= 1,613 OK	367 ft-# OK
phiMn	= 7,663	2,500 ft-#
Actual 1-Way Shear	= 11.37	7.04 psi
Allow 1-Way Shear	= 75.00	40.00 psi
Toe Reinforcing	= # 4 @ 12.00 in	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	
Footing Torsion, Tu	=	0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs

**If torsion exceeds allowable, provide supplemental design for footing torsion.**

#### Other Acceptable Sizes & Spacings

Toe: #4@ 13.88 in, #5@ 21.52 in, #6@ 30.55 in, #7@ 41.66 in, #8@ 54.86 in, #9@ 69.44 in, #10@ 88.19 in

Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm

Key: No key defined

Min footing T&S reinf Area      0.65 in<sup>2</sup>  
 Min footing T&S reinf Area per foot      0.26 in<sup>2</sup>/ft

#### If one layer of horizontal bars:

#4@ 9.26 in  
 #5@ 14.35 in  
 #6@ 20.37 in

#### If two layers of horizontal bars:

#4@ 18.52 in  
 #5@ 28.70 in  
 #6@ 40.74 in

## Cantilevered Retaining Wall

Project File: Macintyre East Retaining Wall.ec6

LIC# : KW-06018259, Build:20.22.8.17

CSES, Inc

(c) ENERCALC INC 1983-2022

### DESCRIPTION: Macintyre East Reatining Wall

#### Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	739.4	2.17	1,602.0	Soil Over HL (ab. water tbl)	343.8	2.25	773.4
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.25	773.4
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =	72.8	3.25	236.6	Surcharge Over Heel =	20.0	2.25	45.0
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	203.0	1.75	355.3
Added Lateral Load =				* Axial Live Load on Stem =	439.0	1.75	768.3
Load @ Stem Above Soil =				Soil Over Toe =	156.3	0.75	117.2
Seismic Earth Load =	207.0	3.25	672.8	Surcharge Over Toe =			
=				Stem Weight(s) =	675.0	1.75	1,181.3
<b>Total</b> =	<b>1,019.2</b>	<b>O.T.M.</b>	<b>2,511.4</b>	Earth @ Stem Transitions =			
				Footing Weight =	375.0	1.25	468.8
				Key Weight =		2.00	
				Vert. Component =	370.9	2.50	927.2
				<b>Total =</b>	<b>2,143.9 lbs</b>	<b>R.M.=</b>	<b>3,868.1</b>
<b>Resisting/Overturning Ratio</b>		=	<b>1.54</b>				
Vertical Loads used for Soil Pressure =		2,582.9 lbs					

\* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS considered in the calculation of Overturning Resistance.

#### Tilt

##### Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci  
 Horizontal Defl @ Top of Wall (approximate only) 0.150 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

Project Title:  
Engineer:  
Project ID:  
Project Descr:

## Cantilevered Retaining Wall

Project File: Macintyre East Retaining Wall.ec6

LIC# : KW-06018259, Build:20.22.8.17

CSES, Inc

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**DESCRIPTION:** Macintyre East Reatining Wall

### Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment =	18.72 in
Development length for #4 bar specified in this stem design segment =	14.40 in
Hooked embedment length into footing for #4 bar specified in this stem design segment =	7.14 in
As Provided =	0.2000 in <sup>2</sup> /ft
As Required =	0.1700 in <sup>2</sup> /ft

Project Title:  
Engineer:  
Project ID:  
Project Descr:

# Cantilevered Retaining Wall

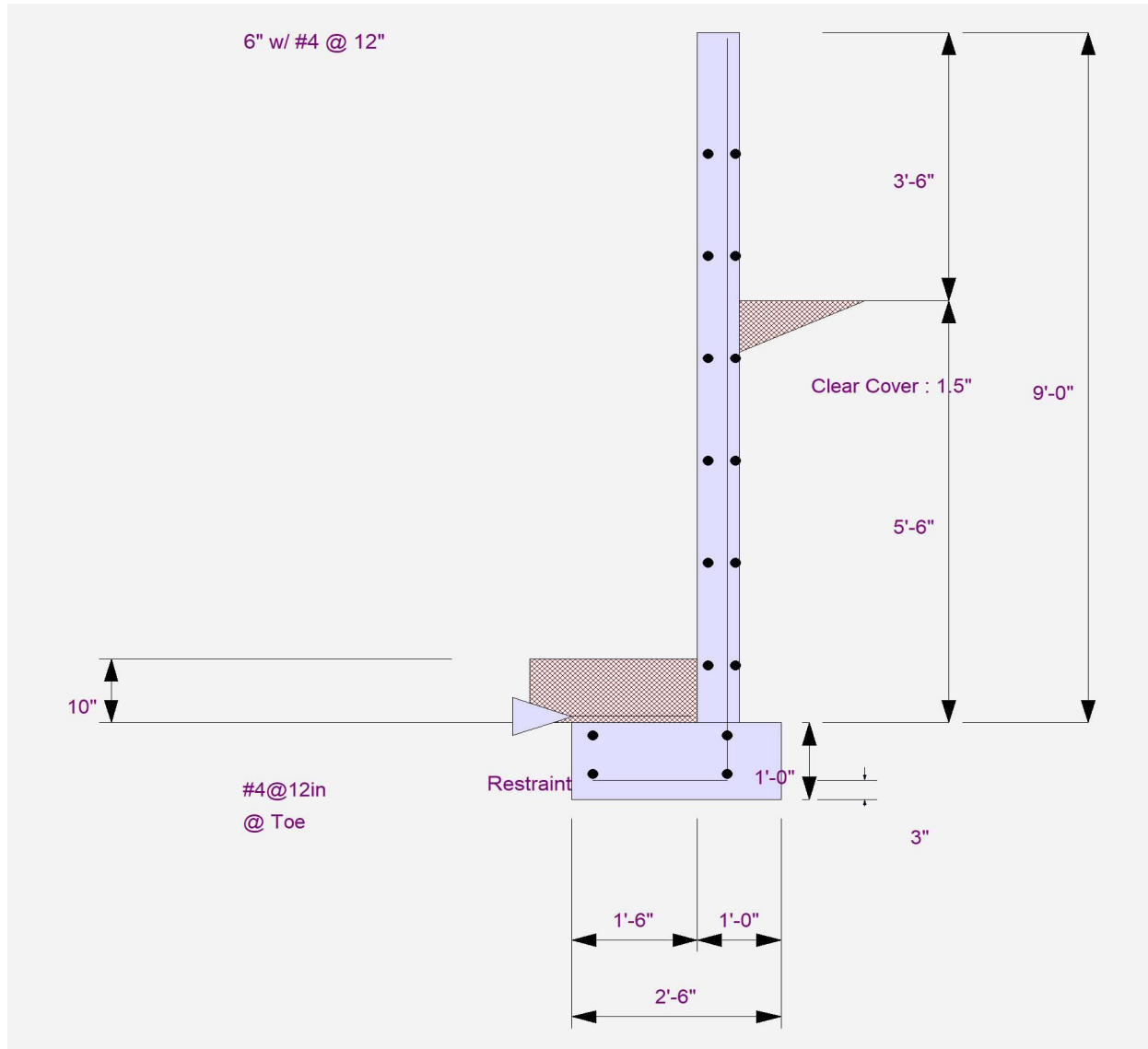
Project File: Macintyre East Retaining Wall.ec6

LIC# : KW-06018259, Build:20.22.8.17

CSES, Inc

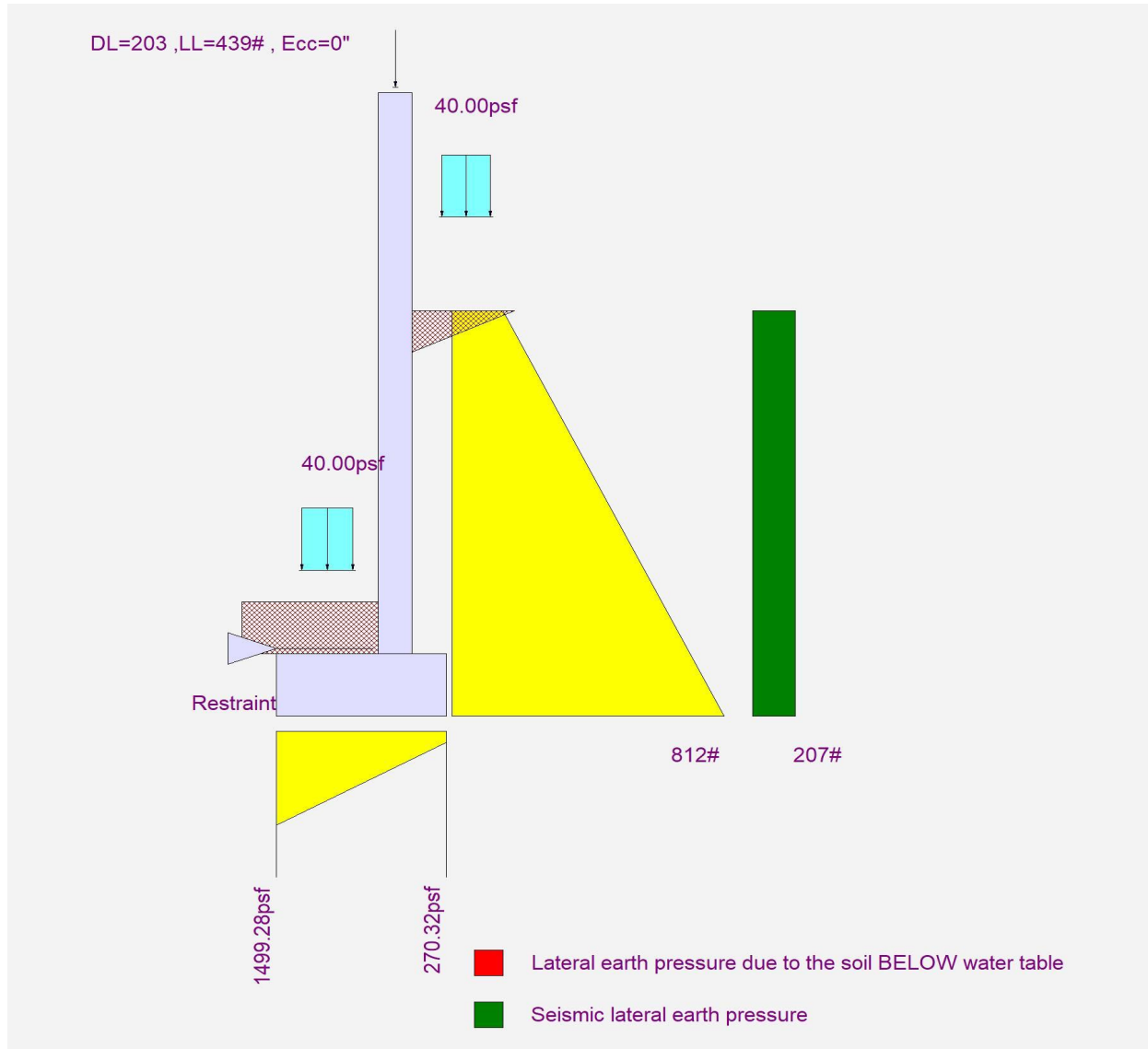
(c) ENERCALC INC 1983-2022

**DESCRIPTION:** Macintyre East Retaining Wall



# Cantilevered Retaining Wall

**DESCRIPTION:** Macintyre East Retaining Wall



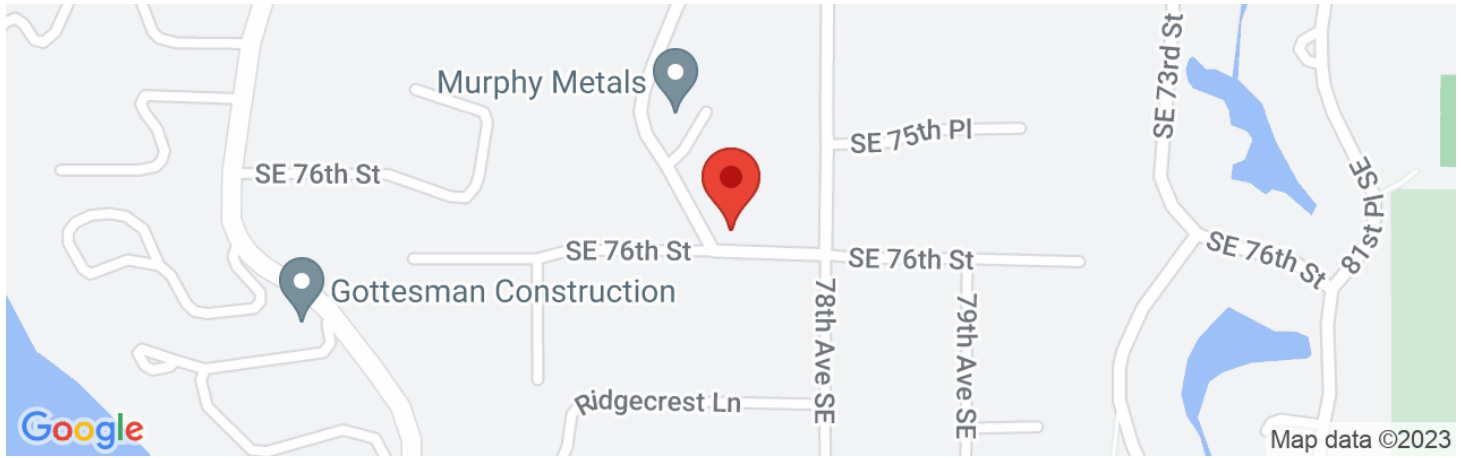
USGS web services were down for some period of time and as a result this tool wasn't operational, resulting in *timeout error*.  
 USGS web services are now operational so this tool should work as expected.



# Macintyre

7520 Mercer Terrace Dr, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.53499, -122.2360069



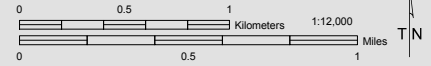
<b>Date</b>	12/13/2023, 1:32:47 PM
<b>Design Code Reference Document</b>	ASCE7-16
<b>Risk Category</b>	II
<b>Site Class</b>	D - Default (See Section 11.4.3)

Type	Value	Description
S <sub>S</sub>	1.472	MCE <sub>R</sub> ground motion. (for 0.2 second period)
S <sub>1</sub>	0.508	MCE <sub>R</sub> ground motion. (for 1.0s period)
S <sub>MS</sub>	1.767	Site-modified spectral acceleration value
S <sub>M1</sub>	null -See Section 11.4.8	Site-modified spectral acceleration value
S <sub>DS</sub>	1.178	Numeric seismic design value at 0.2 second SA
S <sub>D1</sub>	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F <sub>a</sub>	1.2	Site amplification factor at 0.2 second
F <sub>v</sub>	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.63	MCE <sub>G</sub> peak ground acceleration
F <sub>PGA</sub>	1.2	Site amplification factor at PGA
PGA <sub>M</sub>	0.756	Site modified peak ground acceleration
T <sub>L</sub>	6	Long-period transition period in seconds
SsRT	1.472	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.633	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	4.293	Factored deterministic acceleration value. (0.2 second)
S1RT	0.508	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.566	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.636	Factored deterministic acceleration value. (1.0 second)

# Mercer Island Wind Exposure and Wind Speed-Up (Topographic Effect)

by Development Services Group (DSG), City of Mercer Island  
April 2009



## WIND EXPOSURE CATEGORIES & WIND SPEED-UP FACTORS (ICC Section 1609 & ASCE 7-05 Chapter 6)

It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the  $K_{zt}$  factor to be utilized for each specific project. The  $K_{zt}$  factors and wind exposure categories indicated on this map are the minimum values accepted by the City of Mercer Island without requiring the design professional to submit additional calculations and supporting topographic documentation (to verify the values utilized in their wind load determination).

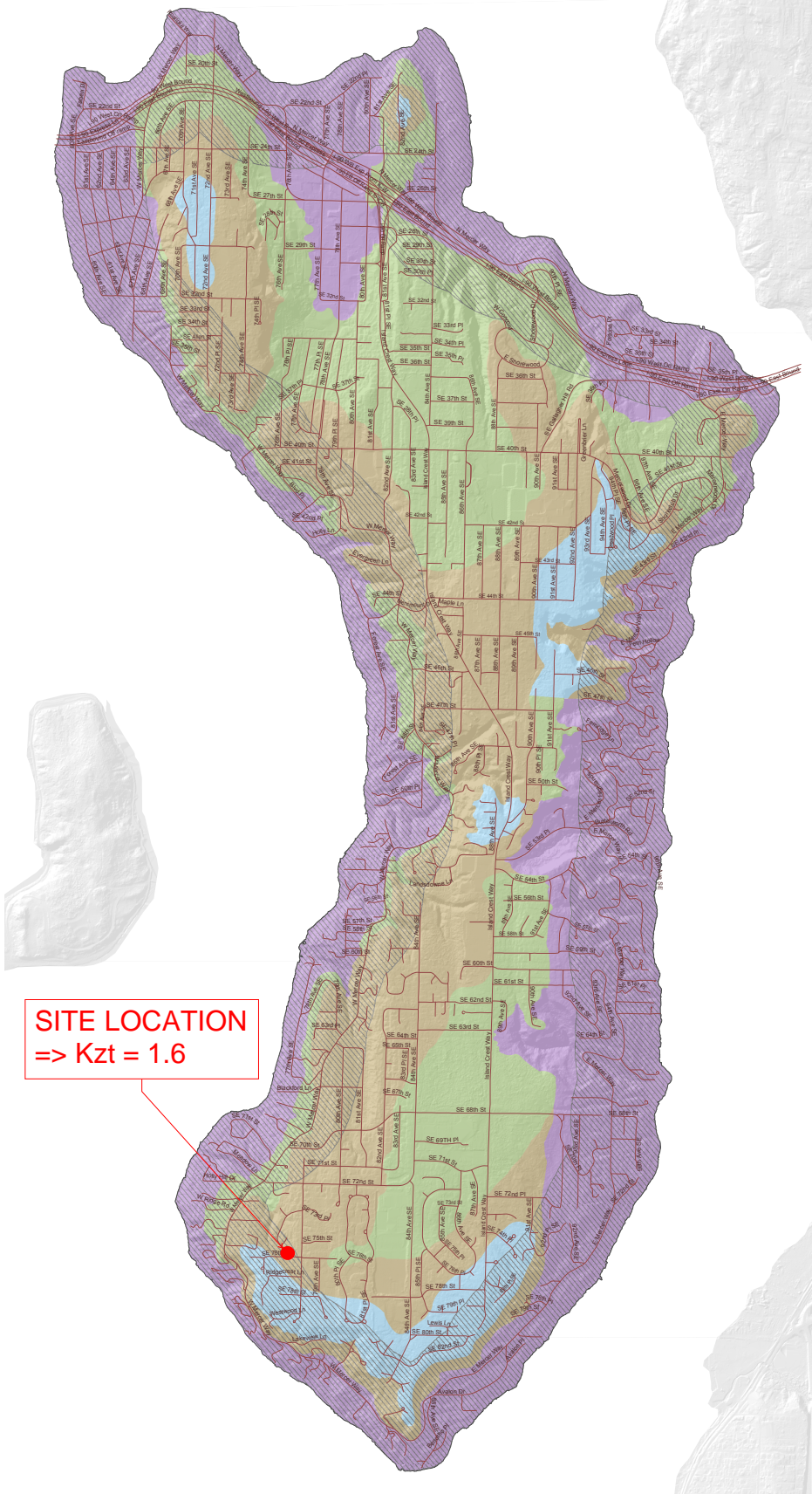
Please note – The  $K_{zt}$  values indicated on this map are approximations based upon periodic calculations of representative samplings around Mercer Island. These values are intended for City of Mercer Island's plan review purposes only.

### WIND EXPOSURE CATEGORIES:

Wind Exposure Category		Exposure 'C' (1500 feet from Lake)
		Exposure 'B' (all other areas)

### WIND SPEED-UP (TOPOGRAPHIC EFFECT) - $K_{zt}$ Factor :

$K_{zt}$ Factor		$K_{zt} = 1.0$
		$K_{zt} = 1.3$
		$K_{zt} = 1.6$
		$K_{zt} = 1.9$



**SITE LOCATION**  
=>  $K_{zt} = 1.6$

### GENERAL NOTES FOR WIND EXPOSURE AND WIND SPEED-UP MAP

This map is the Wind Exposure Category and Wind Speed-up (Topographic Effects) Map for the City of Mercer Island. This map shows the minimum wind exposure category and the minimum wind speed-up,  $K_{zt}$  factor, which will be accepted without site specific documentation and calculation.

Other wind speed phenomena may occur on Mercer Island that is not specifically identified on this map. It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the appropriate design wind speed and exposure category for their specific project and location.

This map is for the sole use of the staff of the City of Mercer Island's Development Services Group (DSG) for the purposes of permit application evaluation. This map provides DSG staff a general assessment of Wind Exposure Category and Wind Speed-up (Topographic Effects). All areas have not been specifically evaluated and there may be locations that are not correctly represented on this map. It is the responsibility of individual property owners and map users to evaluate risk associated with their proposed development. No site-specific assessment of risk is implied or otherwise indicated by the City of Mercer Island with this map.

Information about data used for the map, references, and data limitation are all described the associated "Read Me" document. The digital version of this map is accompanied by a meta data file containing pertinent information about map construction. This data map is available on the City of Mercer Island website.

The City of Mercer Island is using guidance provided within ICC Section 1609 & ASCE 7-05 Chapter 6 regarding definitions used when creating this map.

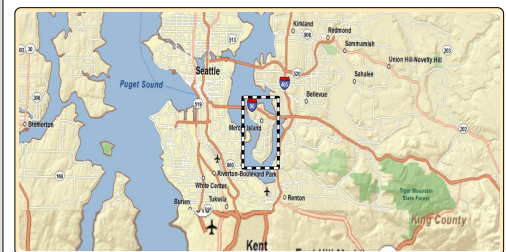
### DEFINITIONS:

**$K_{zt}$  factor:** The topographic effect of wind speed-up at isolated hills, ridges, and escarpments constituting abrupt changes in the general topography, located in any exposure category, that meet all of the conditions noted in ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, Section 6.5.7.

**Exposure B:** The wind exposure category that applies where the site in question is located a minimum of 1500 feet from the shoreline and the mean roof height is less than or equal to 30 feet per IBC 2006 section 1609.4.3.

**Exposure C:** The wind exposure category that applies where the site in question is located within 1500 feet from the shoreline per IBC 2006 section 1609.4.3.

**Wind Speed:** Minimum 85 mph 3-second gust per IRC Figure R301.2(4)



**Lateral Loads Design per ASCE 7-16, Wind: Section 28 Seismic: Section 12**

**(Simplified Envelope Procedure Part 2)**

2018 International Building Code (IBC)

**WIND LOADS** 110 mph Basic Wind Speed 2015 NDS

Ps = lambda \* Kzt \* Ps(30) \* 0.6 Exposure C Roof Slope: 5.50 : 12 = 24.6  
 Least Horizontal Dimension, feet: 53 Mean Roof Ht, feet: 24 (degrees)  
 lambda = 1.34 a = 5.3 ft, 2a = 10.6 ft  
 Iw = 1.00 KzT = 1.60

<u>Tabulated Ps(30):</u>	<u>Zone</u>	<u>Tabulated Wind Pressure</u>	<u>Calc'd Design Pressure</u>	<u>Min Design Pressure</u>	(Per section 28.6.4 minimum wind pressure is 16 PSF for zones A,C, and 8 PSF for zones B, D)
(Refer to ASCE 7-16, Figure 28.6-1)			(*lambda*KzT*0.6)		
(horizontal)	A	24.3	psf 31.2	31.2	
"	B	3.1	psf 4.0	10.3	
"	C	17.4	psf 22.4	22.4	
"	D	3.4	psf 4.4	10.3	
(vertical)	E	-11.7	psf -15.0		
"	F	-14.7	psf -18.9		
"	G	-8.3	psf -10.7		
"	H	-11.7	psf -15.1		
(uplift on overhangs)	E(oh)	-20.8	psf -26.8		
"	G(oh)	-17.6	psf -22.6		

**(Equivalent Lateral Force Procedure, Section 12.8)**

**SEISMIC LOADS** Ie 1.0 R = 6.5 ASCE 7-16, Table 12.2.1  
 Seismic Parameters Group I Site Class: D  
 per ASCE 7-16) PGA (.2 sec) 1.472 Fa = 1.20 ASCE 7-16 Table 11.4-1  
 PGA (1 sec) 0.508 Fv = 1.50 ASCE 7-16 Table 11.4-2

**Seismic Design Categories per ASCE 7-16 Tables 11.6-1, 11.6-2**

Based on Sds: D Based on Sd1: D

PGA's based on peak ground accelerations per latest USGS Hazards Program (based on lat/lon).

Ss = 1.4720 Sms = Fa \* Ss = 1.77 Equation 11.4-1

S1 = 0.5080 Sm1 = Fv \* S1 = 0.76 Equation 11.4-2

Equations 11.4-3, 11.4-4

Sds = 2/3 \* Sms = 1.18 Sd1 = 2/3 \* Sm1 = 0.51

Equation 12.14-11 Cs (or %V) = (Sds / (R/I)) = 0.181 Building period < 0.5 s per IBC eq 12.8-7

**Base Shear = %V \* W \* 0.7 = 5.83 psf**, uniformly distributed over floor area

(0.7 reduction factor per ASCE 7-16, Section 2.4.1, Eq 5. (seismic vertical distribution per IBC eqs 12.8-11 & 12)

	<u>Roof or Floor Wall DL (psf)</u>	<u>Story Height Above Base (ft)</u>	<u>Lateral Load (psf)</u>
Base = top of foundation	<u>DL (psf)</u>	<u>dist. over floor area</u>	
Top Framing	12	12	3.96
Upper Floor	12	9	1.87
Lower Floor			
<b>Total Seismic DL:</b>	<b>46</b>	Sum	<b>5.83</b>

## WALL ALONG GRIDLINE "B":

ROOF:  $L_{TOTAL} = 13.5'$ ,  $(L_{TOTAL} - L_{OPENING}) = 13.5' - 6' = 7.5'$

$$P_W = (66.7 \text{ ft}^2)(10.3 \text{ psf}) + (94.66 \text{ ft}^2 / 2)(22.4 \text{ psf}) + (16')(9.33')(10.3 \text{ psf}) + (1.5'/2)(16')(22.4 \text{ psf}) = 3554 \#$$

$$P_E = (4.06 \text{ psf})(196 \text{ ft}^2 + (1567 \text{ ft}^2 / 2) + (1017 \text{ ft}^2 / 2)) = 6064 \#$$

$$V = 6064 \# / 7.5' = 806 \text{ plf} < 910 \text{ plf SW5}$$

$$V_{PLZFT} = \frac{6064 \#}{13.5'} \times 8' = 3594 \# < 4690 \# \text{ CM5TC16} \\ < 4340 \# \text{ HDU5}$$

MAIN FLOOR:  $L = 12.5' + 3.5' + 2.33' = 18.33'$

$$P_W = 10.3 \text{ psf}(16' \times 10') + 22.4 \text{ psf}(16' \times 4.5' + 13' \times 8.6') + 3,554 \text{ lb} = 9,319 \text{ lb}$$

$$P_E = 6064 \# + 1.87 \text{ psf} \times 1207 \text{ sqft} = 8,321 \text{ lb}$$

$$ARF = 1.25 - 0.125(9/3.5) = 0.929$$

$$V = 9,319 \text{ lb} / 18.33' = 508 \text{ plf} < 710 \text{ PLF SW3X}$$

$$< 710 \text{ plf} \times (1.25 - 0.125 \times (7.67 / 2.33')) = 595 \text{ plf OK}$$

$$V_{PLZFT} = 555 \text{ PLF} \times 7.67' = 3,900 \text{ LB} < 4,340 \text{ LB}$$

5# HDU5

### CONSULTING STRUCTURAL ENGINEERING SERVICES

Residential and Commercial Structural Design

6311 17th Avenue NE, Seattle, WA 98115

Phone: (206)527-1288 Email: john@cses-engineering.com

Project No. 2023.102 Date 12/11/23

Project Name MACINTYRE

Comments \_\_\_\_\_

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Page L2

Main, Main Floor Post supporting Roof Beam and used in Shear Wall  
1 piece(s) 4 x 6 DF No.2

Post Height: 9'



Design Results	Actual	Allowed	Result	LDF	Load: Combination
Slenderness	31	50	Passed (62%)	--	--
Compression (lbs)	4065	9178	Passed (44%)	1.60	1.0 D + 0.7 E
Base Bearing (lbs)	4065	7796	Passed (52%)	--	1.0 D + 0.7 E
Bending/Compression	0.43	1	Passed (43%)	1.25	1.0 D + 1.0 Lr

- Input axial load eccentricity for this design is 16.67% of applicable member side dimension.
- Applicable calculations are based on NDS.

Supports	Type	Material
Base	Plate	Hem Fir

Member Type : Free Standing Post  
Building Code : IBC 2018  
Design Methodology : ASD

Max Unbraced Length	Comments
Full Member Length	No bracing assumed.

Drawing is Conceptual

Vertical Load	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Seismic (1.60)	Comments
1 - Point (lb)	915	184	3000	4500	Default Load

**Weyerhaeuser Notes**

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

ForteWEB Software Operator	Job Notes
Demetri Dalas CSES (425) 736-3569 demetri@cses-engineering.com	



SOUTH WALL:

ROOF: L = 13.67'

$$P_W = (71ft^2)(103psf) + (94.66ft^2/2)(31.2psf) = 2208\#$$

$$P_E = (4.06psf)((1567ft^2/2) + 126ft^2) = 3977\#$$

$$V = 3977\# / 13.67' = 291 \text{ p/f} < 350 \text{ p/f} \quad \underline{SW 2}$$

$$V_{ALYFT} = 291 \text{ p/f} \times 7.75' = 2255\# < 4340\# \quad \underline{HDOS}$$

$$< 1600\# \quad \underline{COST 16}$$

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EAST SHGAR WALL - ROOF L = 10'

$$P_w = 31.2 \text{ psf} (10.6') \times 4.5' + 22.4 \text{ psf} (3' \times 4.5' + 13.9' \times 2.67') + 10.3 \text{ psf} (15.5' \times 5' + 13.9' \times 7.75') = \underline{4,530 \text{ lb}}$$

$$P_e = 3.96 \text{ psf} (15' \times 27.5' + 14.33' \times 32.75') = 3,492 \text{ lb}$$

$$V = \frac{4,530 \text{ lb}}{10'} = 453 \text{ plf} < 550 \text{ plf} \therefore \underline{SW3}$$

$$\text{Uplift} = 453 \text{ plf} \times 7.67' = 3,474 \text{ lb} < 4,340 \text{ lb} \therefore \underline{\text{HOUVS}}$$

(GIRDLING 3.1)

INTERIOR SHGAR WALL - ROOF L = 7.75'

$$P_w = 31.2 \text{ psf} (13' \times 2.67') + 22.4 \text{ psf} (26.2' \times 2.67') + 10.3 \text{ psf} (27.5' \times 7.75') = \underline{3,870 \text{ lb}}$$

$$P_e = 3.96 \text{ psf} (27.5' \times 32.67') = 3,558 \text{ lb}$$

$$V = \frac{3,870 \text{ lb}}{7.75'} = 499 \text{ plf} < 550 \text{ plf} \therefore \underline{SW3}$$

$$\text{Uplift} = 499 \text{ plf} \times 7.67' = 3,830 \text{ lb} < 3,900 \text{ lb} \therefore \underline{\text{MSTCUB3}}$$

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WEST WALL:

ROOF:  $L_{TOTAL} = 11.75'$ ,  $L_{WITHOUT\ OPENINGS} = 11.75' - 3' = 8.75'$

$P_w = (103\text{psf})(60.48) + (31.2\text{psf})(2.67 \times 9.5) = 1414 \#$

$P_E = 3.96\text{psf}(12.75 \times 32.67) = 1649 \#$

$V = \frac{1649}{8.75} = 188\text{plf} < 230\text{plf}$

SW1

$UPLIFT = \left( \frac{1649 \#}{11.75'} \right) \times 7.75' = 1087 \# < 3900 \#$  MSTC48B3

MAIN:  $L = 6.75' + 2.17' = 8.92'$  ARF =  $7/2.17 = 3.23$

$P_w = 1414\# + 3,870\#(4.5/23.25) + 31.2\text{psf}(10.6' \times 7.75') + 22.4\text{psf}(1' \times 7.75') = 4,900\#$

$P_E = 1649 + 3558(4.5/23.25) + (1.87\text{psf})(26' \times 11.5') = 2896 \#$

$V = \frac{4900}{8.92} = 549\text{plf} < 710\text{plf SW } 3X$   
 $710(1.25 - 0.125 \times 3.23) = 601\text{ PLF OK}$

$UPLIFT = 549 \times 7' + (4900/26') \times 2' = 4,220\text{ LB}$   $\# < 4340$  HABS w/

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GRIDLINE 2 SHEAR WALL - MAIN L = 18.67'

$$P_w = 22.4 \text{ psf} (27.5' \times 8.167') = \underline{5,441 \text{ lb}}$$

$$P_E = 1.87 \text{ psf} (20.5' \times 26' + 6.83' \times 23.25') = 1,294 \text{ lb}$$

$$V = \frac{5,441 \text{ lb}}{18.167'} = 286 \text{ plf} < 350 \text{ plf} \therefore \underline{\text{SW2}}$$

$$\text{uplift} = 286 \text{ plf} \times 5' = 1,430 \text{ lb} < 4,340 \text{ lb} \therefore \underline{\text{HDUS}}$$

GARAGE EAST SHEAR WALL - MAIN L = 13.5'

$$P_w = 3,870 \text{ lb} (18.75' / 23.25') + 22.4 \text{ psf} (12' \times 8.75') = \underline{5,473 \text{ lb}}$$

$$P_E = 3,558 \text{ lb} (18.75' / 23.25') + 1.87 \text{ psf} (20.5' \times 26') = 3,866 \text{ lb}$$

$$V = \frac{5,473 \text{ lb}}{13.5'} = 405 \text{ plf} < 550 \text{ plf} \therefore \underline{\text{SW3}}$$

$$\text{uplift} = 405 \text{ plf} \times 7.75' = 3,142 \text{ lb} < 4,340 \text{ lb} \therefore \underline{\text{HDUS}}$$

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NORTH WALL:  $L = 12.5'$

$$P_W = (10.3 \text{ pcf}) \left( \frac{32'}{2} \right) (9.5') + (9' / 2) \left[ \frac{10.6'}{2} \right] (21.2 \text{ pcf}) + (5.4') (22.1 \text{ pcf}) = 3598 \#$$

$$P_E = (4.06 \text{ pcf}) \left( \frac{10.17' + 9'}{2} \right) = 2065 \#$$

$$V = 3598 \# / 12.5' = 288 \text{ pft} < 350 \text{ pft SW/2}$$

$$UPLIFT = 288 \text{ pft} \times 15' = 4317 \# < 5645 \# \text{ HOUS w/ DF\#2 4x6 post}$$

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NORTH STRUCTURE - EAST SHEAR WALL L=8'

$$P_w = 31.2 \text{ psf} (5.3' \times 6.83') + 22.4 \text{ psf} (11.2' \times 12.1') = \underline{4,165 \text{ lb}}$$

$$P_e = 1.87 \text{ psf} (17.5' \times 33') = 1,080 \text{ lb}$$

$$V = \frac{4,165 \text{ lb}}{8'} = 521 \text{ plf} < 550 \text{ plf} \therefore \underline{\text{SW3}}$$

$$\text{UPLIFT} = 521 \text{ plf} \times 8' = 4,165 \text{ lb} < 4,340 \text{ lb} \therefore \underline{\text{HDU5}}$$

NORTH STRUCTURE - WEST SHEAR WALL,

$$L = 3' + 5.5' = 8.5'$$

$$P_w = 31.2 \text{ psf} (5.3' \times 7.33') + 22.4 \text{ psf} (7' \times 11.5') = \underline{3,015 \text{ lb}}$$

$$P_e = 1.87 \text{ psf} (13.33' \times 33') = 823 \text{ lb}$$

$$V = \frac{3,015 \text{ lb}}{8.5'} = 355 \text{ plf} < 550 \text{ plf} \therefore \underline{\text{SW3}}$$

$$< 550 \text{ PLF} \times (1.25 - .125(6.67/3)) = 534 \text{ PLF OK}$$

$$\text{UPLIFT} = 355 \text{ PLF} \times (3' + 6.67') = 3,432 \text{ LB} < 4,340 \text{ LB} \underline{\text{HDU5}}$$

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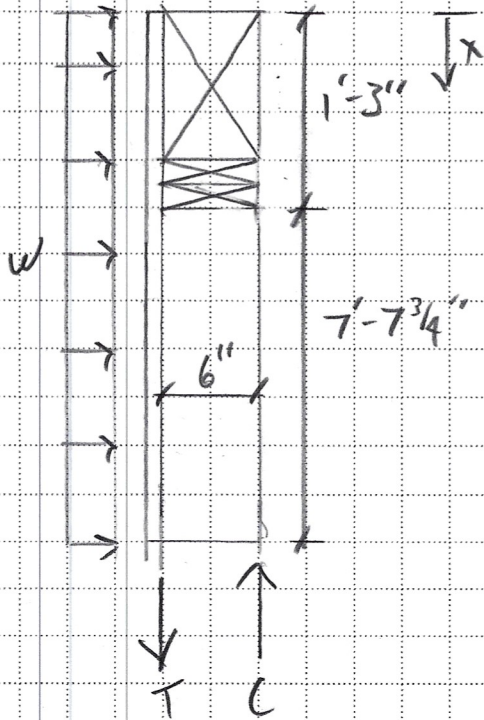
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## EAST WALL CONNECTION DESIGN:

$$w = \frac{8.25' \times 22.4 \text{ psf}}{2} = 92.4 \text{ plf}$$



$$M_x = \frac{wx}{2} (L-x)$$

$$M(1') = \frac{92.4 \times 1 (8.9' - 1')}{2}$$

$$M(1') = 365 \text{ ft-lb}$$

$$T = C = \frac{365 \text{ ft-lb}}{(6'')} = 730 \#$$

$$\frac{730 \#}{\text{ft}} \times 1.33' = 971 \#$$

0.131"  $\phi$  8d COMMON WIRE NAEL  $V = 73 \#$

$$73 \# \times 17 = 1241 \# > 971 \# \text{ OK}$$

USE 8d COMMON WIRE NAEL @ 6" O.C.  
ALONG EACH STUD IN INDICATED WALL

$$1765 \# > 611 \# \text{ OK}$$

$\Rightarrow$  USE C516 @ EACH STUD TO ATTACH  
BEAMS TO STUD

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Project No. 2023.10Z Date 1/8/24

Project Name MACINTYRE

Comments \_\_\_\_\_

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