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# Lateral and Gravity Loads Analysis

## (ENGINEERING DESIGN)

(5/14/19)

Station 703, Squaw Creek Canyon  
(Door Remodel)  
17233 Buffalo Drive  
Sisters, Oregon

### PROJECT SPECIFICATIONS

Plan Evaluated: "Station 703" Squaw Creek Canyon (7/15/1998)  
Design Summary: Occupancy Group S-2, Construction Type VB.  
Drawings: A1, Cover Sheet (5/20/18)  
S1, Structural Details: (5/20/18)  
Orientation: Bottom of Plan Page is Front  
Structure Loads: Ultimate Wind Speed 110 MPH, Exp C [IBC-ASCE7-10].  
Soil Bearing (1500 psf) [IBC] default  
Design Ground Snow Load (25 psf) [SLAO - ASCE7-10, Deschutes].  
Design Roof Dead Load (17 psf) - Truss  
Design Floor Live Load (50 psf - w/ 2K point loads) 5" Concrete  
Design Floor Dead Load (63 psf)  
Seismic Design: (SDS = 0.44g - ASCE7-10 Zip Code).

**WARNING:** It is the responsibility of the user of this document to ensure that all the technical information is properly transferred to the applicable construction documents and that it is properly implemented during the construction of the structure. Failure to incorporate all of the requirements of this design may invalidate the integrity of the structure and release responsibility from the engineer of record.



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**WIND FORCE CALCULATION**

- 1. **Wind Pressure:** (Based on IBC and ASCE 7-10 Directional Procedure, Chapter 27.2)
  - 1. Risk Category IV:
  - 2. Ultimate Wind Speed (Vult): 115 mph (IBC).
  - 3. Wind Direction Factor (Kd): 0.85 (ASCE7-10, Table 26.6-1)  
Wind Exposure Category: B (ASCE7-10, 26.7)  
Topographic Factor (Kzt): 1 (H/L < .2). (ASCE7-10, Figure 26.8-1)  
Gust effect factor (G): 0.85 (ASCE7-10, 26.9)  
Enclosure Classification, Enclosed. (ASCE7-10, 26.1)  
Internal Pressure Coefficient (GCpi): 0.18 (ASCE7-10, 26.11)
  - 4. Velocity pressure coefficient (Kz): 0.62 (24') (ASCE7-10, Table 27.3-1)
  - 5. Velocity pressure:  $q_z = 17.96$  PSF
  - 6. External pressure coefficient: Cp: 0.8 (walls), 0.4 (roof) [ASCE7-10 Fig 27.4-1]
  - 7. Wind pressure:  $p = 15.44$  PSF (**Flat Walls use 16.0 PSF**)

**Direction F/B:**

Flat Wall Height: h = 20'  
Horizontal: 50'  
Wind Force Calculation: 16 psf x 20' x 50' = 16000 lb (ASCE7-10, 27.1.5)  
Slope Roof Height: h = 0' (roof pitch @ 1:12)  
Horizontal: 50'  
Wind Force Calculation: 15.44 psf x 0' x 50' = 0 lb  
Ave Wind Pressure: (16 psf)  
Total: 16000 lb (16.0 psf)

**Direction L/R:**

Flat Wall Height: h = 15'  
Horizontal: 36'  
Wind Force Calculation: 16 psf x 15' x 36' = 8640 lb (ASCE7-10, 27.1.5)  
Slope Roof Height: h = 9' (roof pitch @ 4:12)  
Horizontal: 36'  
Wind Force Calculation: 15.44 psf x 9' x 36' = 5003 lb  
Ave Wind Pressure:  
(8640 psf + 5003 psf) / (36'x24') = 14.5 psf  
Total: 13642 lb (13.6 psf)

**SEISMIC FORCE CALCULATION** (Sds = 0.44g)

Base Shear:  $V = (0.1012)W = 6050$  lb      W: 59800 lb

OK      Base Shear (6050 lb) > Wind Force:      16000 lb (F/B) - **Wind Governs**  
13642 lb (L/R) - **Wind Governs**

**FORCE CALCULATION** WL1/WL2 Wall Line

Wind Shear: 6821 lb  
Shear Walls: 14'  
Shear Force: 6821 lb / 14' = 487 plf

**WALL FRAMING:**

**Ext Walls: Min 2x6 DF#2 or steel stud @ 16" O.C. w/ solid blocking at mid plane and header line.**

**FOUNDATION FOOTINGS**

Note: The following footing and stem wall sizes are minimums and were used in the gravity loadings analysis.

**Exterior Front Wall:**

Footing:	12"W x 6" D (Existing)		
Stem Wall:	6" W x 24" T (Existing)		
Roof (3X):		126 plf	(75LL/51DL)
Wall (16')		160 plf	(0LL/160DL)
Total:		286 plf	(75LL/211DL)

**DOOR HEADERS**

Note: All the window and door headers were evaluated and calculations attached. Headers that are larger than 2-2x6 (Ext) or 4x6 (Int) and/or require special trimmer sizing and footings detailed below:

**H1** OHD Header  
Span: 12.5'  
Selection: 5 1/8" x 7 1/2" GLB (Upgrade to 10 1/2" for door hardware)  
Trimmers: (500 lb) Use 2x6 Trimmers  
Footings: 500 lb / 1500 psf = 1 sf **Reinforced Foundation Footing**

**H2** Interior Door Headers (3)  
Span: 3'  
Selection: **4x8 DF#2**  
Trimmers: (3380 lb) **Use 2x6 Trimmers**  
Footings: 3380 lb / 1500 psf = 2.2 sf **5" Concrete Floor**

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**ASCE 7-10 Wind Forces, Chapter 27, Part I**

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Description : Station 703 (Sisters)

**Station 703**

**Basic Values**

Risk Category 4 per ASCE 7-10 Table 1.5 Horizontal Dim. in North-South Direction (B 36.0 ft  
 V : Basic Wind Speed 115.0 Horizontal Dim. in East-West Direction (B c 50.0 ft  
 Kd : Directionality Factor 0.850 per ASCE 7-10 Table 26.6-1 h : Mean Roof height 20.0 ft  
 Exposure Category per ASCE 7-10 Section 26.7 Topographic Factor per ASCE 7-10 Sec 26.8 & Figure 26.8-1  
 North : Exposure B East : Exposure B North : K1 = K2 = 1.0 K3 = 1.0 Kzt = 1.000  
 South : Exposure B West : Exposure B South : K1 = K2 = 1.0 K3 = 1.0 Kzt = 1.000  
 East : K1 = K2 = 1.0 K3 = 1.0 Kzt = 1.000  
 West : K1 = K2 = 1.0 K3 = 1.0 Kzt = 1.000

Building Period & Flexibility Category

User has specified the building frequency is >= 1 Hz, therefore considered RIGID for both North-South and East-West direc

**Building Story Data**

Level Descriptk	hi ft	Story Ht ft	ER : X ft	ER : X ft
F/B	20.00	5.00	25.000	25.000
L/R	15.00	15.00	18.000	18.000

**Gust Factor**

For wind coming from direction indicated

North = 0.850 South = 0.850  
 East = 0.850 West = 0.850

**Enclosure**

Check if Building Qualifies as "Open"

	North Wall	South Wall	East Wall	West Wall	Roof	Total
Agross	998.0 ft^2	998.0 ft^2	540.0 ft^2	540.0 ft^2	342.0 ft^2	3,418.0 ft^2
Aopenings	ft^2	ft^2	ft^2	ft^2	ft^2	0.0 ft^2
Aopenings >= 0.8 * Agross :	No	No	No	No		

**All four Agross values must be non-zero Building does NOT qualify as "Open"**

**User has specified the Building is to be considered Enclosed when NORTH elevation receives positive external pressure**

South Elevation : Determine Enclosure Classification per ASCE Section 26.10

Reference area = smaller of 4 sq. ft. or 1% c = 4.0 ft^2 Is Ao > 1.10 \* Ac = No  
 Aoi = Ao-total - Ac = 0.0 ft^2 Is Ao > Reference Area = No  
 Agi = Ag-total - Aci = 2,420.0 ft^2 Is Aoi / Agi >= 0.20 = Yes  
 Aoi / Agi = 0.0

**Building is "Enclosed" when the South wall receives positive external pressure**

East Elevation : Determine Enclosure Classification per ASCE Section 26.10

Reference area = smaller of 4 sq. ft. or 1% c = 4.0 ft^2 Is Ao > 1.10 \* Ac = No  
 Aoi = Ao-total - Ac = 0.0 ft^2 Is Ao > Reference Area = No  
 Agi = Ag-total - Aci = 2,878.0 ft^2 Is Aoi / Agi >= 0.20 = Yes  
 Aoi / Agi = 0.0

**Building is "Enclosed" when the East wall receives positive external pressure**

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**West Elevation : Determine Enclosure Classification per ASCE Section 26.10**

Reference area = smaller of 4 sq. ft. or 1% c = 4.0 ft<sup>2</sup> Is Ao > 1.10 \* Ac = No  
 Aoi = Ao-total - Ac = 0.0 ft<sup>2</sup> Is Ao > Reference Area = No  
 Agi = Ag-total - Ac = 2,878.0 ft<sup>2</sup> Is Aoi / Agi >= 0.20 = Yes  
 Aoi / Agi = 0.0

**Building is "Enclosed" when the West wall receives positive external pressure**

**Velocity Pressures**

When the following walls experience leeward or sidewall pressures, the value of Kh shall be

North Wall = 0.6240 psf South Wall : 0.6240 psf East Wall = 0.6240psf West Wall = 0.6240 psf

When the following walls experience leeward or sidewall pressures, the value of qh shall be

North Wall = 17.956 psf South Wall : 17.956 psf East Wall = 17.956psf West Wall = 17.956 psf

**qz : Windward Wall Velocity Pressures at various heights per E**

Height Above Base (ft)	North Elevation		South Elevation		East Elevation		West Elevation	
	Kz	qz	Kz	qz	Kz	qz	Kz	qz
0.00	0.575	16.54	0.575	16.54	0.575	16.54	0.575	16.54
4.00	0.575	16.54	0.575	16.54	0.575	16.54	0.575	16.54
8.00	0.575	16.54	0.575	16.54	0.575	16.54	0.575	16.54
12.00	0.575	16.54	0.575	16.54	0.575	16.54	0.575	16.54
16.00	0.585	16.85	0.585	16.85	0.585	16.85	0.585	16.85
20.00	0.624	17.96	0.624	17.96	0.624	17.96	0.624	17.96

**Pressure Coefficients**

GCpi Values when elevation receives positive external pressure

GCpi : Internal pressure coefficient, per sec. 26.11 and Tab

North		South		East		West	
+/-	0.180	+/-	0.180	+/-	0.180	+/-	0.180

Specify Cp Values from Figure 27.4-1 for Windward, Leeward & Side Walls

Cp Values when elevation receives positive external pressure

	North	South	East	West
Windward Wall	0.80	0.80	0.80	0.80
Leeward Wall	-0.20	-0.20	-0.20	-0.20
Side Walls	-0.70	-0.70	-0.70	-0.70

**Wind Pressures**

**Wind Pressures when NORTH Elevation receives positive external wind pressure**

	Positive Internal	Negative Internal
Leeward Wall Pressure	-6.285 psf	0.1796 psf
Side Wall Pressures	-13.916 psf	-7.452 psf
Windward Wall Pressure:	Positive Internal	Negative Internal
Height Above Base (ft)	Pressure (psf)	Pressure (psf)
0.00		8.01
4.00		8.01
8.00		8.01
12.00		8.01
16.00		8.22
20.00		8.98
		14.48
		14.48
		14.48
		14.48
		14.69
		15.44

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**Wind Pressures when SOUTH Elevation receives positive external wind pressure**

	<u>Positive Internal</u>	<u>Negative Internal</u>	
<b>Leeward Wall Pressure</b>	-6.285 psf	0.1796 psf	
<b>Side Wall Pressures</b>	-13.916 psf	-7.452 psf	
<b>Windward Wall Pressures</b>	<u>Positive Internal</u>	<u>Negative Internal</u>	
Height Above Base (ft)	Pressure (psf)	Pressure (psf)	
0.00	8.01	14.48	
4.00	8.01	14.48	
8.00	8.01	14.48	
12.00	8.01	14.48	
16.00	8.22	14.69	
20.00	8.98	15.44	

**Wind Pressures when EAST Elevation receives positive external wind pressure**

	<u>Positive Internal</u>	<u>Negative Internal</u>	
<b>Leeward Wall Pressure</b>	-6.285 psf	0.1796 psf	
<b>Side Wall Pressures</b>	-13.916 psf	-7.452 psf	
<b>Windward Wall Pressures</b>	<u>Positive Internal</u>	<u>Negative Internal</u>	
Height Above Base (ft)	Pressure (psf)	Pressure (psf)	
0.00	8.01	14.48	
4.00	8.01	14.48	
8.00	8.01	14.48	
12.00	8.01	14.48	
16.00	8.22	14.69	
20.00	8.98	15.44	

**Wind Pressures when WEST Elevation receives positive external wind pressure**

	<u>Positive Internal</u>	<u>Negative Internal</u>	
<b>Leeward Wall Pressure</b>	-6.285 psf	0.1796 psf	
<b>Side Wall Pressures</b>	-13.916 psf	-7.452 psf	
<b>Windward Wall Pressures</b>	<u>Positive Internal</u>	<u>Negative Internal</u>	
Height Above Base (ft)	Pressure (psf)	Pressure (psf)	
0.00	8.01	14.48	
4.00	8.01	14.48	
8.00	8.01	14.48	
12.00	8.01	14.48	
16.00	8.22	14.69	
20.00	8.98	15.44	

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**ASCE Seismic Base Shear**

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**Station 703 (Sisters)**

**Risk Category**

Calculations per ASCE 7-10

Risk Category of Building or Other Structure: "IV": Buildings and other structures designated as essential facilities. *ASCE 7-10, Page 2, Table 1.5-1*

Seismic Importance Factor = 1.5 *ASCE 7-10, Page 5, Table 1.5-2*

**Gridded S<sub>s</sub> & S<sub>1</sub> values ASCE-7-10 Standard**

*ASCE 7-10 11.4.1*

Max. Ground Motions, 5% Damping

S<sub>s</sub> = 0.4592 g, 0.2 sec response

S<sub>1</sub> = 0.2323 g, 1.0 sec response

Latitude = 44.323 deg North

Longitude = 121.549 deg West

Location Sisters, OR 97759

**Site Class, Site Coeff. and Design Category**

Site Classification "D": Shear Wave Velocity 600 to 1,200 ft/sec

=

**D**

*ASCE 7-10 Table 20.3-1*

Site Coefficients Fa & Fv

Fa = 1.43

*ASCE 7-10 Table 11.4-1 & 11.4-2*

(using straight-line interpolation from table val

Fv = 1.94

Maximum Considered Earthquake Accelerat

S<sub>MS</sub> = Fa \* S<sub>s</sub> = 0.658

*ASCE 7-10 Eq. 11.4-1*

S<sub>M1</sub> = Fv \* S<sub>1</sub> = 0.450

*ASCE 7-10 Eq. 11.4-2*

Design Spectral Acceleration

S<sub>DS</sub> = S<sub>MS</sub> \* 2/3 = 0.439

*ASCE 7-10 Eq. 11.4-3*

S<sub>D1</sub> = S<sub>M1</sub> \* 2/3 = 0.300

*ASCE 7-10 Eq. 11.4-4*

Seismic Design Category

= **D**

*ASCE 7-10 Table 11.6-1 & -2*

**Resisting System**

*ASCE 7-10 Table 12.2-1*

Basic Seismic Force Resisting System **Bearing Wall Systems**

**13.Light-frame (wood) walls sheathed w/wood structural panels rated for shear resistance.**

Response Modification Coefficient "I" = 6.50

Building height Limits:

System Overstrength Factor "Wo" = 3.00

Category "A & B" Limit: No Limit

Deflection Amplification Factor "Cd" = 4.00

Category "C" Limit: No Limit

Category "D" Limit: Limit = 65

Category "E" Limit: Limit = 65

Category "F" Limit: Limit = 65

*NOTE! See ASCE 7-10 for all applicable footnc*

**Lateral Force Procedure**

*ASCE 7-10 Section 12.8.2*

Equivalent Lateral Force Procedure

The "Equivalent Lateral Force Procedure" is being used according to the provisions of ASCE 7-10 12.8

**Determine Building Period**

*Use ASCE 12.8-7*

Structure Type for Building Period CalculatAll Other Structural Systems

"Ct" value = 0.020

"hn": Height from base to highest leve 24.0 ft

"x" value = 0.75

"Ta" Approximate fundamental period using Eq. 12.8-7: Ta = Ct \* (hn ^ x) = 0.217 sec

"TL": Long-period transition period per ASCE 7-10 Maps 22-12 -> 22-16 8.000 sec

Building Period "Ta" Calculated from Approximate Method sel= 0.217 sec

**"Cs" Response Coefficient**

*ASCE 7-10 Section 12.8.1.1*

S<sub>DS</sub>: Short Period Design Spectral Response = 0.439

From Eq. 12.8-2, Preliminary Cs = 0.101

"R": Response Modification Factor = 6.50

From Eq. 12.8-3 & 12.8-4, Cs need not excee = 0.319

"I": Seismic Importance Factor = 1.5

From Eq. 12.8-5 & 12.8-6, Cs not be less than = 0.029

User has selected ASCE 12.8.1.3: Regular structure,

Cs: Seismic Response Coefficient = 0.1012

Less than 5 Stories and with T <= 0.5 sec, SO Ss <= 1.5 for Cs calcul

**Seismic Base Shear**

*ASCE 7-10 Section 12.8.1*

Cs = 0.1012 from 12.8.1.1

W ( see Sum Wi below ) = 59.80 k

Seismic Base Shear V = Cs \* W = 6.05 k

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**Vertical Distribution of Seismic Forces**

ASCE 7-10 Section 12.8.3

"k" : hx exponent based on Ta = 1.00

Table of building Weights by Floor Level...

Level #	Wi : Weight	Hi : Height	(Wi * Hi^k)	Cvx	Fx=Cvx * V	Sum Story Shear	Sum Story Moment
2	33.00	20.00	660.00	0.7666	4.64	4.64	0.00
1	26.80	7.50	201.00	0.2334	1.41	6.05	57.99
Sum Wi =	59.80 k	Sum Wi * Hi =	861.00 k-ft	Total Base Shear =	6.05 k	Base Moment =	103.4 k-ft

**Diaphragm Forces : Seismic Design Category "B" to "F"**

ASCE 7-10 12.10.1.1

Level #	Wi	Fi	Sum Fi	Sum Wi	Fpx : Calcd	Fpx : Min	Fpx : Max	Fpx	Dsgn. Force
2	33.00	4.64	4.64	33.00	4.64	4.34	8.68	4.64	4.64
1	26.80	1.41	6.05	59.80	2.71	3.53	7.05	3.53	3.53

Wpx ..... Weight at level of diaphragm and other structure elements attached to it.  
 Fi ..... Design Lateral Force applied at the level.  
 Sum Fi ..... Sum of "Lat. Force" of current level plus all levels above  
 MIN Req'd Force @ Level . . .  $0.20 * S_{DS} * I * W_{px}$   
 MAX Req'd Force @ Level . . .  $0.40 * S_{DS} * I * W_{px}$   
 Fpx : Design Force @ Level .  $W_{px} * \frac{\sum(x > n) F_i}{\sum(x > n) w_i}$ , x = Current level, n = Top Level



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**Wood Shear Wall**

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Line: 7 KW: 12/11/11

Description: Station 703: WL1/WL2 3' wide x 15' tall shear panel design (FHSP)

**General Information**

Total Wall Length 3 ft  
 Number of Stories 1  
 Story #1 Height 15.0 ft

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-10

**Framing & Chord Material:**

Wood Species: Douglas Fir - Larch  
 Wood Grade: No.2  
 Fc - Prll = 600.0 psi Ft - Tension 425.0 psi  
 Fc - Perp = 625.0 psi E 1,300.0 ksi  
 Specific Gravity = 0.50  
 SDC : Seismic Design Category : D

**Some Shear Panel Aspect Ratios Exceed Limits, Panel Size Changes REQUIRED**

**Sheathing**

Main Sheathing

SDPWS 2005 Construction Table: 4.3A  
 Wood Structural Panels, Struct I, 7/16" Thk, 1-3/8" Min

Nominal Seismic Shear Capacities (plf):  
 6" Spac. 510 3" Spac. 1010  
 4" Spac. 790 2" Spac. 1340

Nominal Wind Shear Capacities (plf):  
 6" Spac. 715 3" Spac. 1415  
 4" Spac. 1105 2" Spac. 1875

**Chord Data**

Chord Member Size for each level:

See Chord Summary Tables for number of Chords required at each panel end.

Level 1 Chord Size : 2x6 Chord Cf: Comp: 1.0 Tens: 1.0 Max. Allow Stress Ratio 1.0 : 1  
 Chord Area = 8.250 in^2

All chords treated as fully braced about both axes

Opening ID	Dist to Left Edge	Opening Width	Dist to Bottom	Opening Height
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft



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## Wood Shear Wall

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Description : Station 703: WL1/WL2 3' wide x 15' tall shear panel design (FHSP)

### Applied Distributed Vertical Loads

Load Location (ft)			Load Magnitude (klf)					
Start Location	End Location	Height of Application	Dead	Roof Live	Live	Snow	Wind	Seismic
0.0	3.0	15.0	0.0510	0.0	0.0	0.0750	0.0	0.0

### Applied Concentrated Lateral Loads

Load "Y" Location (ft)		Load Magnitude (kips)					
Start Location	End Location	Dead	Roof Live	Live	Snow	Wind	Seismic
0.0	15.0	0.0	0.0	0.0	0.0	1.461	0.6480

### Shear Panel Summary

Panel ID	Level #	Max Shear (kips)	Load Comb	# Sides Used	Shear Summary & Attachment			Height/Width Ratio		
					Actual (plf)	Allow	Status	Actual	Allow	Notes
P1	1	0.001	+0.60D+0.910E	1	0.0	0.0	NG	5.00	3.50	Ratio NG

### Shear Panel Detail by Panel ID

Panel ID	Load Combination	Story	Shear Forces			Capacity Factors			Allowable Panel Shears (plf @ Edge Spac (in))				
			Trib Wid (ft)	Trib %	V (kip)	Panel Width (ft)	v-max (plf)	Aspect	Spec Grav	6"	4"	3"	2"
P1		0											
	D Only	0		1.000		3.00		0.50		1.000			
	+D+S	0		1.000		3.00		0.50		1.000			
	+D+0.750S	0		1.000		3.00		0.50		1.000			
	+D+0.60W	0		1.000		3.00		0.50		1.000			
	+D-0.60W	0		1.000		3.00		0.50		1.000			
	+D+0.910E	0		1.000		3.00		0.50		1.000			
	+D-0.910E	0		1.000		3.00		0.50		1.000			
	+D+0.450W	0		1.000		3.00		0.50		1.000			
	+D-0.450W	0		1.000		3.00		0.50		1.000			
	+D+0.750S+0.450W	0		1.000		3.00		0.50		1.000			
	+D+0.750S-0.450W	0		1.000		3.00		0.50		1.000			
	+D+0.750S+0.6825E	0		1.000		3.00		0.50		1.000			
	+D+0.750S-0.6825E	0		1.000		3.00		0.50		1.000			
	+0.60D+0.60W	0		1.000		3.00		0.50		1.000			
	+0.60D-0.60W	0		1.000		3.00		0.50		1.000			
	+0.60D+0.910E	0		1.000		3.00		0.50		1.000			
	+0.60D-0.910E	0		1.000		3.00		0.50		1.000			

### Chord Summary

Chord ID	Level #	Dist from Left (ft)	Force (kips)	Load Comb	CHORD DESIGN SUMMARY				
					# Req'd @ Location	Member Size	Stress Ratio	Governs	Status
C1	1	0.00	0.0	+D-0.60W	2	2x6	0.60	Tension	OK

Comp Values : Max. Down : 4.7 k Load Comb +D-0.60W Max fc = 283 psi Allow F'c = 600 psi  
 Tens Values : Max. Uplift : 4.2 k Load Comb +0.60D+0.60W Max ft = 255 psi Allow F't = 425 psi

User-specified anchorage device : \_\_\_\_\_

Title Block Line 1  
 You can change this area  
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 Title Block" selection.  
 Title Block Line 6

Project Title:  
 Engineer:  
 Project ID:  
 Project Descr:

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**Wood Shear Wall**

File = C:\Users\Public\DOCUME~1\ENERCA~2\polebarns.ec6  
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 Licensee : STEVEN G. BANTON, LPE

Location: R70-6803-323

Description : Station 703: WL1/WL2 3' wide x 15' tall shear panel design (FHSP)

**Chord Summary**

				CHORD DESIGN SUMMARY					
Chord ID	Level #	Dist from Left (ft)	Force (kips)	Load Comb	# Req'd @ Location	Member Size	Stress Ratio	Governs	Status
C2	1	3.00	0.0	+D+0.60W	2	2x6	0.60	Tension	OK
Comp Values : Max. Down :			4.7 k	Load Comb +D+0.60W	Max fc =		283 psi	Allow F'c =	600 psi
Tens Values : Max. Uplift :			4.2 k	Load Comb +0.60D-0.60W	Max ft =		255 psi	Allow F't =	425 psi

User-specified anchorage device : \_\_\_\_\_

Chord Naming Informa C : Item is a Chord L : Followed by level nur # : Followed by chord number from left  
 WL : Indicates Chord is on left edge of wa WR : Indicates Chord is on right edge of w

**Footing Information**

**Footing Dimensions**

Dist. Left	4.0 ft	fc	2.50 ksi	Rebar Cover	3.0 in
Wall Length	3 ft	Fy	40.0 ksi	Footing Thickness	18.0 in
Dist. Right	4.0 ft			Width	1.0 ft
Total Ftg Length	11.0 ft				

**Max Factored Soil Pressures**

@ Left Side of Footing 622.75 psf  
 .... governing load comb +D  
 @ Right Side of Footing 643.62 psf  
 .... governing load comb +D+0.50S+W

**Max UNfactored Soil Pressures**

@ Left Side of Footing 465.273 psf  
 .... governing load comb +D+S  
 @ Right Side of Footing 504.99 psf  
 .... governing load comb +D+0.750S+0.450W

**Footing One-Way Shear Check...**

vu @ Left End of Footing 11.193 psi  
 vu @ Right End of Footing 11.193 psi  
 vn \* phi : Allowable 85.0 psi

**Overturning Stability @ Left End of Ftg**

Overturning Moment 1.205 k-ft  
 Resisting Moment 1.376 k-ft  
 Stability Ratio 1.142 : 1  
 .... governing load comb +0.60D+0.60W

**@ Right End of Ftg**

Overturning Moment 1.205 k-ft  
 Resisting Moment 1.315 k-ft  
 Stability Ratio 1.091 : 1  
 .... governing load comb +0.60D+0.60W

**Footing Bending Design... @ Left End**

Mu 4.982 k-ft  
 Ru 24.602 psi  
 As % Req'd 0.00180 in^2  
 As Req'd in Footing Width 0.3240 in^2

**@ Right End**

Mu 4.982 k-ft  
 Ru 24.602 psi  
 As % Req'd 0.00180 in^2  
 As Req'd in Footing Width 0.3240 in^2

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## Wood Shear Wall

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Lic # : NW 06005393

License : STEVEN G. BASTON, LPE

Description : Station 703: WL1/WL2 4' wide x 15' tall shear panel design (FHSP)

### General Information

Total Wall Length 4 ft  
 Number of Stories 1  
 Story #1 Height 15.0 ft

Calculations per NDS 2005, IBC 2009, CBC 2010, ASCE 7-10

### Framing & Chord Material :

Wood Species : Douglas Fir - Larch  
 Wood Grade : No.2  
 Fc - Prll = 600.0 psi Ft - Tension 425.0 psi  
 Fc - Perp = 625.0 psi E 1,300.0 ksi  
 Specific Gravity = 0.50  
 SDC : Seismic Design Category : D

### Some Shear Panel Aspect Ratios Exceed Limits, Panel Size Changes REQUIRED

#### Sheathing

##### Main Sheathing

SDPWS 2005 Construction Table : 4.3A  
 Wood Structural Panels, Struct I, 7/16" Thk, 1-3/8" Min

##### Nominal Seismic Shear Capacities (plf) :

6" Spac.	510	3" Spac.	1010
4" Spac.	790	2" Spac.	1340

##### Nominal Wind Shear Capacities (plf) :

6" Spac.	715	3" Spac.	1415
4" Spac.	1105	2" Spac.	1875

#### Chord Data

Chord Member Size for each level :

Level 1 Chord Size :2x6	Chord Cf: Comp: 1.0	Tens: 1.0	Max. Allow Stress Ratio	1.0 : 1
Chord Area = 8.250 in^2				

See Chord Summary Tables for number of Chords required at each panel end.

All chords treated as fully braced about both axes

Opening ID	Dist to Left Edge	Opening Width	Dist to Bottom	Opening Height
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft
				ft



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 Engineer:  
 Project ID:  
 Project Descr:

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### Wood Shear Wall

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Lic. #: KY-05005998

Licensee: STEVEN G. BANTON, LPE

Description: Station 703: WL1/WL2 4' wide x 15' tall shear panel design (FHSP)

#### Applied Distributed Vertical Loads

Load Location (ft)			Load Magnitude (klf)						
Start Location	End Location	Height of Application	Dead	Roof Live	Live	Snow	Wind	Seismic	
0.0	4.0	15.0	0.0510	0.0	0.0	0.0750	0.0	0.0	

#### Applied Concentrated Lateral Loads

Load "Y" Location (ft)		Load Magnitude (kips)						
		Dead	Roof Live	Live	Snow	Wind	Seismic	
15.0		0.0	0.0	0.0	0.0	1.948	0.8640	

#### Shear Panel Summary

Panel ID	Level #	Max Shear (kips)	Load Comb	# Sides Used	Shear Summary & Attachment			Height/Width Ratio		
					Actual (plf)	Allow	Status	Actual	Allow	Notes
P1	1	0.001	+0.60D+0.910E	1	0.0	0.0	NG	3.75	3.50	Ratio NG

#### Shear Panel Detail by Panel ID

Panel ID	Load Combination	Story	Shear Forces			Capacity Factors			Allowable Panel Shears (plf, @ Edge Spac (in))				
			Trib Wid (ft)	Trib %	V (kip)	Panel Width (ft)	v-max (plf)	Aspect	Spec Grav	6"	4"	3"	2"
P1		0											
	D Only	0	1.000		4.00	4.00	0.50		1.000				
	+D+S	0	1.000		4.00	4.00	0.50		1.000				
	+D+0.750S	0	1.000		4.00	4.00	0.50		1.000				
	+D+0.60W	0	1.000		4.00	4.00	0.50		1.000				
	+D-0.60W	0	1.000		4.00	4.00	0.50		1.000				
	+D+0.910E	0	1.000		4.00	4.00	0.50		1.000				
	+D-0.910E	0	1.000		4.00	4.00	0.50		1.000				
	+D+0.450W	0	1.000		4.00	4.00	0.50		1.000				
	+D-0.450W	0	1.000		4.00	4.00	0.50		1.000				
	+D+0.750S+0.450W	0	1.000		4.00	4.00	0.50		1.000				
	+D+0.750S-0.450W	0	1.000		4.00	4.00	0.50		1.000				
	+D+0.750S+0.6825E	0	1.000		4.00	4.00	0.50		1.000				
	+D+0.750S-0.6825E	0	1.000		4.00	4.00	0.50		1.000				
	+0.60D+0.60W	0	1.000		4.00	4.00	0.50		1.000				
	+0.60D-0.60W	0	1.000		4.00	4.00	0.50		1.000				
	+0.60D+0.910E	0	1.000		4.00	4.00	0.50		1.000				
	+0.60D-0.910E	0	1.000		4.00	4.00	0.50		1.000				

#### Chord Summary

Chord ID	Level #	Dist from Left (ft)	Force (kips)	Load Comb	CHORD DESIGN SUMMARY				
					# Req'd @ Location	Member Size	Stress Ratio	Governs	Status
C1	1	0.00	0.0	+D-0.60W	2	2x6	0.59	Tension	OK

Comp Values : Max. Down : 4.8 k Load Comb +D-0.60W Max fc = 288 psi Allow F'c = 600 psi  
 Tens Values : Max. Uplift : 4.2 k Load Comb +0.60D+0.60W Max ft = 252 psi Allow F't = 425 psi

User-specified anchorage device : \_\_\_\_\_

Title Block Line 1  
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 Title Block Line 6

Project Title:  
 Engineer:  
 Project ID:  
 Project Descr:

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## Wood Shear Wall

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Licensee: STEVEN S. BAYTON, P.E.

Description : Station 703: WL1/WL2 4' wide x 15' tall shear panel design (FHSP)

### Chord Summary

					CHORD DESIGN SUMMARY				
Chord ID	Level #	Dist from Left (ft)	Force (kips)	Load Comb	# Req'd @ Location	Member Size	Stress Ratio	Governs	Status
C2	1	4.00	0.0	+D+0.60W	2	2x6	0.59	Tension	OK
Comp Values : Max. Down :			4.8 k	Load Comb +D+0.60W	Max fc =		288 psi	Allow F'c =	600 psi
Tens Values : Max. Uplift :			4.2 k	Load Comb +0.60D-0.60W	Max ft =		252 psi	Allow F't =	425 psi

User-specified anchorage device : \_\_\_\_\_

Chord Naming Informa C : Item is a Chord L : Followed by level number  
 WL : Indicates Chord is on left edge of wall # : Followed by chord number from left  
 WR : Indicates Chord is on right edge of wall

### Footing Information

#### Footing Dimensions

Dist. Left	4.0 ft	fc	2.50 ksi	Rebar Cover	3.0 in
Wall Length	4 ft	Fy	40.0 ksi	Footing Thickness	18.0 in
Dist. Right	4.250 ft			Width	1.0 ft
Total Ftg Length	12.250 ft				

#### Max Factored Soil Pressures

@ Left Side of Footing 638.35 psf  
 .... governing load combination 1.40D  
 @ Right Side of Footing 665.64 psf  
 .... governing load combination 1.20D+0.50S+W

#### Max UNfactored Soil Pressures

@ Left Side of Footing 480.582 psf  
 .... governing load combination 1.2D+S  
 @ Right Side of Footing 521.76 psf  
 .... governing load combination 1.0D+0.750S+0.450W

#### Footing One-Way Shear Check...

vu @ Left End of Footing 11.472 psi  
 vu @ Right End of Footing 12.540 psi  
 vn \* phi : Allowable 85.0 psi

#### Overturning Stability @ Left End of Ftg

Overturning Moment 1.607 k-ft  
 Resisting Moment 1.745 k-ft  
 Stability Ratio 1.086 : 1  
 .... governing load combination +0.60D+0.60W

#### @ Right End of Ftg

Overturning Moment 1.607 k-ft  
 Resisting Moment 1.674 k-ft  
 Stability Ratio 1.041 : 1  
 .... governing load combination +0.60D+0.60W

#### Footing Bending Design... @ Left End

Mu 5.106 k-ft  
 Ru 25.215 psi  
 As % Req'd 0.00180 in^2  
 As Req'd in Footing Width 0.3240 in^2

#### @ Right End

Mu 5.763 k-ft  
 Ru 28.457 psi  
 As % Req'd 0.00180 in^2  
 As Req'd in Footing Width 0.3240 in^2

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Project ID:

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**Wall Footing**

File = C:\Users\Steve\Documents\ENERCALC-1\ENERCALC-1.EC6

ENERCALC (INC) 1999-2017, 800d:10,17,32,10, Ver:10.17.12-10

Lic. #: KW-06006298

Licensee: STEVEN G. BANTON, L.P.E.

Description: Squaw Creek Fire Station front wall footing.

**Code References**

Calculations per ACI 318-08, IBC 2009, CBC 2010, ASCE 7-10

Load Combinations Used: IBC 2012

**General Information**

**Material Properties**

$f_c$ : Concrete 28 day strength = 2.50 ksi  
 $f_y$ : Rebar Yield = 40.0 ksi  
 $E_c$ : Concrete Elastic Modulus = 3,122.0 ksi  
 Concrete Density = 145.0 pcf  
 $\phi$  Values Flexure = 0.90  
 Shear = 0.750

**Analysis Settings**

Min Steel % Bending Reinf. =  
 Min Allow % Temp Reinf. = 0.00180  
 Min. Overturning Safety Factor = 1.50:1  
 Min. Sliding Safety Factor = 1.50:1  
 AutoCalc Footing Weight as DL No

**Soil Design Values**

Allowable Soil Bearing = 1.50 ksf  
 Increase Bearing By Footing Weight = No  
 Soil Passive Resistance (for Sliding) = 200.0 pcf  
 Soil/Concrete Friction Coeff. = 0.30

**Increases based on footing Depth**

Reference Depth below Surface = 0.50 ft  
 Allow. Pressure Increase per foot of depth when base footing is below = 1.10 ksf/ft

**Increases based on footing Width**

Allow. Pressure Increase per foot of width when footing is wider than = ksf/ft

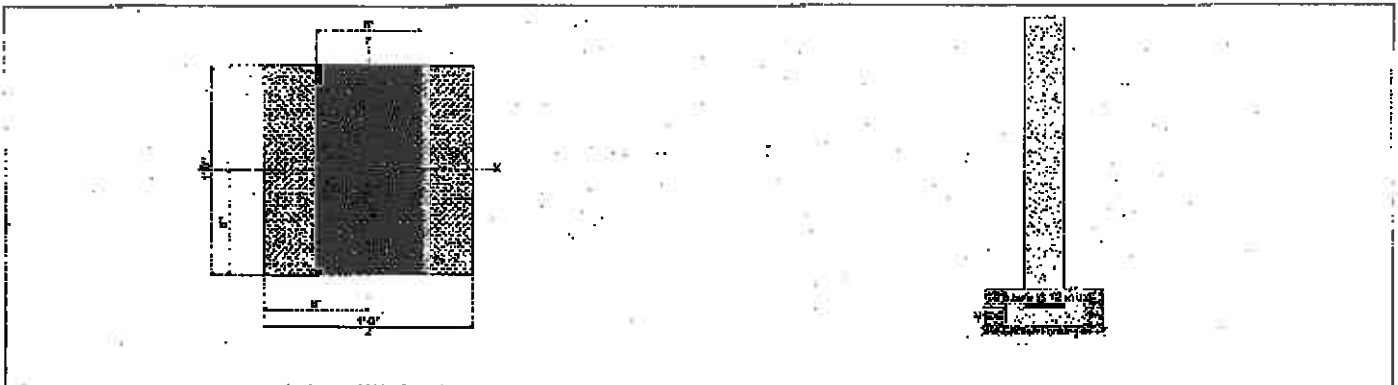
Adjusted Allowable Bearing Pressure = 1.50 ksf

**Dimensions**

Footing Width = 1.0 ft  
 Wall Thickness = 6.0 in  
 Wall center offset from center of footing = 0 in

**Reinforcing**

Footing Thickness = 6.0 in  
 Rebar Centerline to Edge of Concrete... at Bottom of footing = 3.0 in  
 Bars along X-X Axis  
 Bar spacing = 12.00  
 Reinforcing Bar Size = # 5



**Applied Loads**

	D	Lr	L	S	W	E	H
P: Column Load	= 0.211		0.0	0.0750			k
OB: Overburden	=						ksf
V-x	=						k
M-zz	=						k-ft
Vx applied	=	in above top of footing					

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 and then using the "Printing &  
 Title Block" selection.

Project Title:  
 Engineer:  
 Project Descr:

Project ID:

Printed: 21 MAY 2018, 12:11AM

**Wall Footing**

File: C:\Users\Steve\Documents\ENERCALC-1\POLEBA-1.EC6  
 ENERCALC, INC. 1983-2017, Build: 10.17.12.10, Ver: 10.17.12.10  
 Licensee: STEVEN G. BANTON, LPE

Lic. #: KW-06005898

Description: Squaw Creek Fire Station front wall footing.

**DESIGN SUMMARY** Design OK

Factor of Safety	Item	Applied	Capacity	Governing Load Combination	
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
Utilization Ratio	Item	Applied	Capacity	Governing Load Combination	
PASS	0.1907	Soil Bearing	0.2860 ksf	1.50 ksf	+D+S+H
PASS	0.004548	Z Flexure (+X)	0.01166 k-ft	2.564 k-ft	+1.20D+0.50L+1.60S+1
PASS	0.002314	Z Flexure (-X)	0.005933 k-ft	2.564 k-ft	+0.90D+E+0.90H
PASS	n/a	1-way Shear (+X)	0.0 psi	75.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a

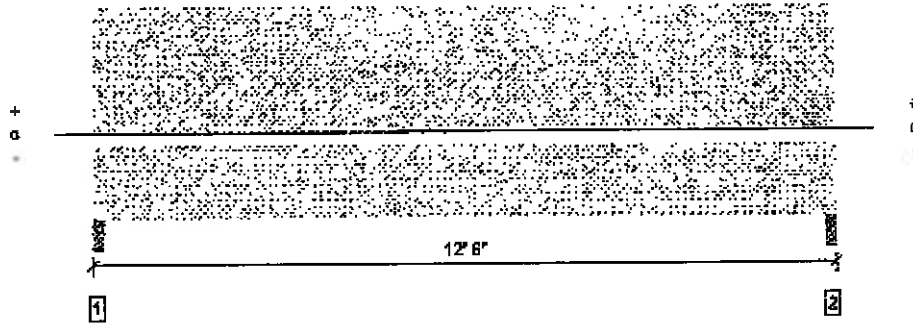
**Detailed Results**

**Soil Bearing**

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress		Actual / Allowable Ratio
			-X	+X	
+D+H	1.50 ksf	0.0 in	0.2110 ksf	0.2110 ksf	0.141
+D+L+H	1.50 ksf	0.0 in	0.2110 ksf	0.2110 ksf	0.141
+D+Lr+H	1.50 ksf	0.0 in	0.2110 ksf	0.2110 ksf	0.141
+D+S+H	1.50 ksf	0.0 in	0.2860 ksf	0.2860 ksf	0.181
+D+0.750Lr+0.750L+H	1.50 ksf	0.0 in	0.2110 ksf	0.2110 ksf	0.141
+D+0.750L+0.750S+H	1.50 ksf	0.0 in	0.2673 ksf	0.2673 ksf	0.178
+D+0.60W+H	1.50 ksf	0.0 in	0.2110 ksf	0.2110 ksf	0.141
+D+0.70E+H	1.50 ksf	0.0 in	0.2110 ksf	0.2110 ksf	0.141
+D+0.750Lr+0.750L+0.450W+H	1.50 ksf	0.0 in	0.2110 ksf	0.2110 ksf	0.141
+D+0.750L+0.750S+0.450W+H	1.50 ksf	0.0 in	0.2673 ksf	0.2673 ksf	0.178
+D+0.750L+0.750S+0.5250E+H	1.50 ksf	0.0 in	0.2673 ksf	0.2673 ksf	0.178
+0.80D+0.60W+0.80H	1.50 ksf	0.0 in	0.1266 ksf	0.1266 ksf	0.084
+0.80D+0.70E+0.60H	1.50 ksf	0.0 in	0.1266 ksf	0.1266 ksf	0.084



Overall Length: 12' 6"



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)	846 @ 1 1/2"	9994 (3.00')	Passed (8%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	727 @ 10 1/2"	7809	Passed (9%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	2539 @ 6' 3"	11051	Passed (23%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.117 @ 6' 3"	0.406	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.211 @ 6' 3"	0.613	Passed (L/695)	--	1.0 D + 1.0 S (All Spans)

System : Wall  
 Member Type : Header  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lb): Bottom compression edge must be braced at 12' 6" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 12' 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	Beaming Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - DF	3.00'	3.00'	1.50'	377	469	846	None
2 - Trimmer - DF	3.00'	3.00'	1.50'	377	469	846	None

Loads	Location (Side)	Tributary Width	Dead (0.98)	Snow (1.45)	Comments
D - Self Weigh. (PLF)	0 to 12' 6"	N/A	9.3		
1 - Unif. (PSF)	0 to 12' 6"	3'	17.0	25.0	Roof (25U/17DL)

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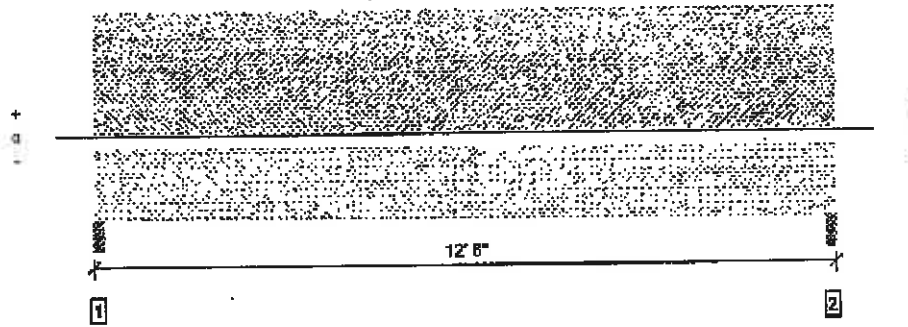
The product application, input design loads, dimensions and support information have been provided by Forte Software Operator.



Forte Software Operator	Job Notes
Steve Benton Benton Engineering & Design Inc. (541) 719-1281 mash@benton-engineering.com	

**1 piece(s) 5 1/8" x 7 1/2" 24F-V4 DF Glulam**

Overall Length: 12' 6"



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)	846 @ 1 1/2"	9994 (3.00")	Passed (8%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	727 @ 10 1/2"	7808	Passed (9%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	2539 @ 6' 3"	11052	Passed (23%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.117 @ 6' 3"	0.408	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.211 @ 6' 3"	0.613	Passed (L/695)	--	1.0 D + 1.0 S (All Spans)

System : Wall  
 Member Type : Header  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lw): Bottom compression edge must be braced at 12' 6" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 12' 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	Snow	Total	
1 - Trimmer - DF	3.00'	3.00"	1.50"	377	469	846	None
2 - Trimmer - DF	3.00'	3.00"	1.50"	377	469	846	None

Loads	Location (Side)	Tripartite Joints	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 12' 6"	N/A	9.3		
1 - Uniform (PSF)	0 to 12' 6"	3'	17.0	25.0	Roof (25LL/17DL)

**Weyerhaeuser Notes**

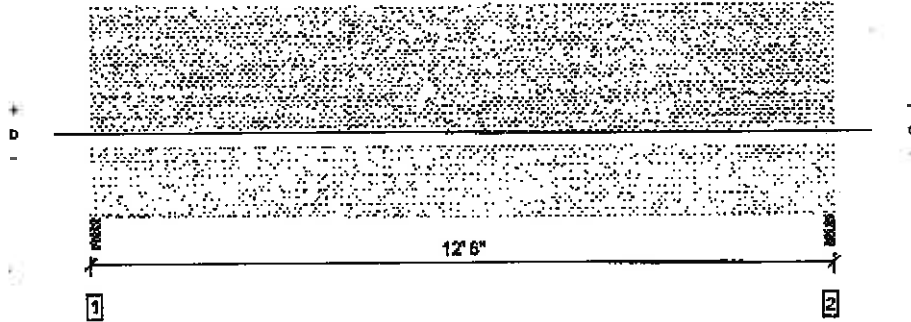
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The product application, input design loads, dimensions and support information have been provided by Forte Software Operator.



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Design Results	Actual @ Location	Allowed	Result	LDF	Load Combination (Pattern)
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Pos Moment (Ft-lbs)	2539 @ 6' 3"	11051	Passed (23%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.117 @ 6' 3"	0.408	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.211 @ 6' 3"	0.613	Passed (L/695)	--	1.0 D + 1.0 S (All Spans)

System : Wall  
 Member Type : Header  
 Building Use : Residential  
 Building Code : IBC 2015  
 Design Methodology : ASD

- Deflection criteria: LL (L/960) and TL (L/240).
- Top Edge Bracing (LU): Top compression edge must be braced at 12' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (LB): Bottom compression edge must be braced at 12' 6" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 12' 3".
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- Applicable calculations are based on NDS.

Supports	Beaming Length			Loads by Supports (lbs)			Accessories
	Total	Applicable	Required	Dead	Snow	Total	
1 - Trimmer - DF	3.00'	3.00'	1.50'	377	469	846	None
2 - Trimmer - DF	3.00'	3.00'	1.50'	377	468	846	None

Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 12' 6"	N/A	9.3		
1 - Uniform (PSF)	0 to 12' 6"	3'	17.0	25.0	Roof (25L/170L)

**Weyerhaeuser Notes**

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