BEYLER CONSULTING
5920 100th Street, Suite 25, Lakewood, WA 98499
(253) 984-2900
beylerconsulting.com
Plan. Design. Manage.

Date: 2/13/20
Design by: AEL

Structural calculations for vertical and lateral design

Project & Location:

Structural Calculations for

Hedstrom Residence

XXXX NE Lincoln Rd
Poulsbo, WA 98370
Kitsap County

Client: **Coval Homes, LLC**
2023 125th St E
Tacoma, WA 98445

Structural Engineer: **Beyler Consulting, LLC.**
5920 100th Street SW, Suite 25
Lakewood, WA 98499
Elizabeth Emerick, P.E.
elizabeth@beylerconsulting.com

Project Number: 20.00044.00

Code: 2015 IBC

02/13/2020

Loads:

I. Vertical Loads:
- Roof (Snow) 25 PSF
- Floor (Live) 40 PSF

II. Lateral Loads:
- Wind: Exposure "C"
  Speed: 110 mph
  K_{zt} = 1.00
- Seismic: Site Class: D
  Seismic Spectral Response: S_{DS} = 0.8647
  S_{D1} = 0.5180
  V_a = 0.0950(ASD)

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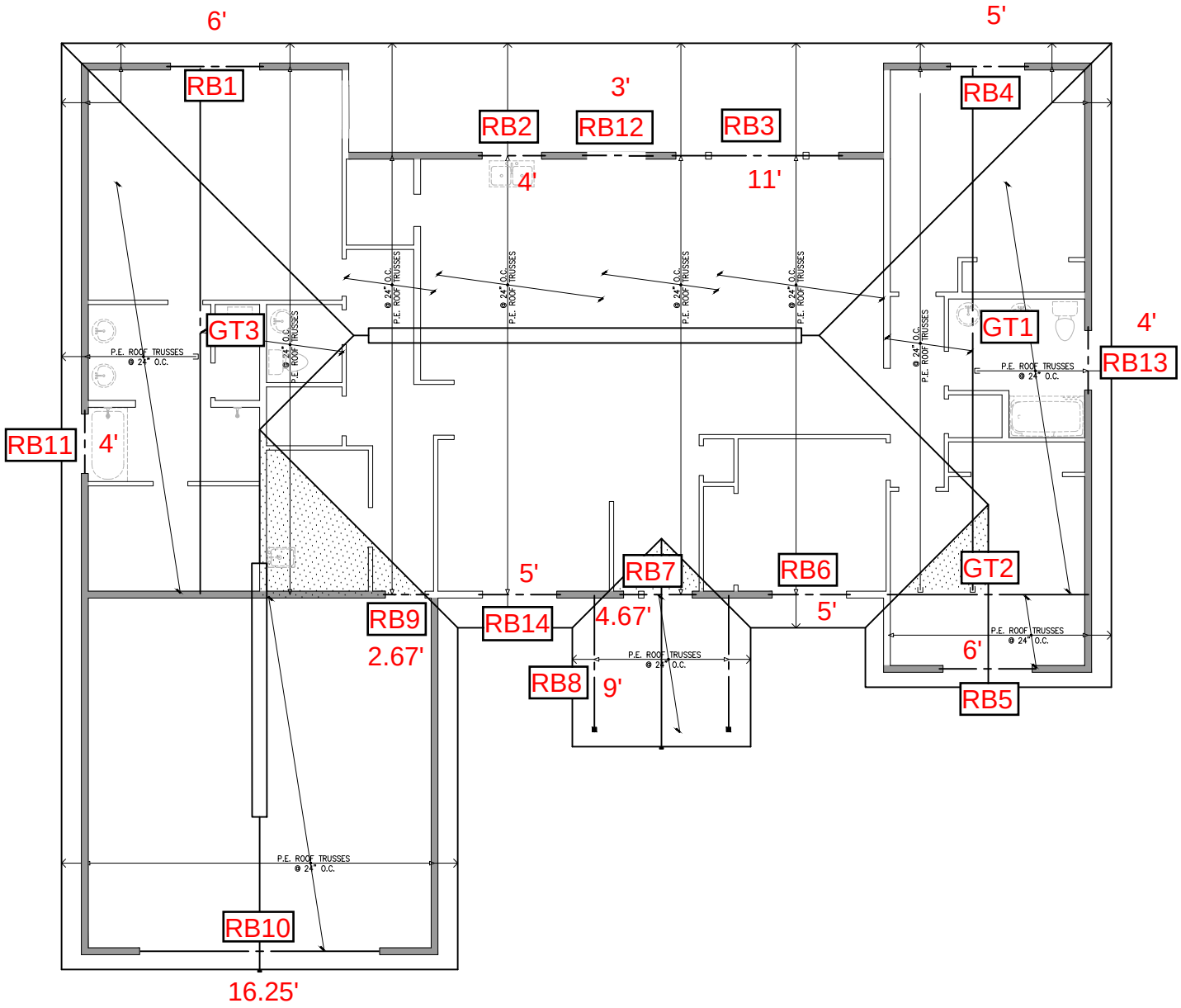
VERTICAL DESIGN

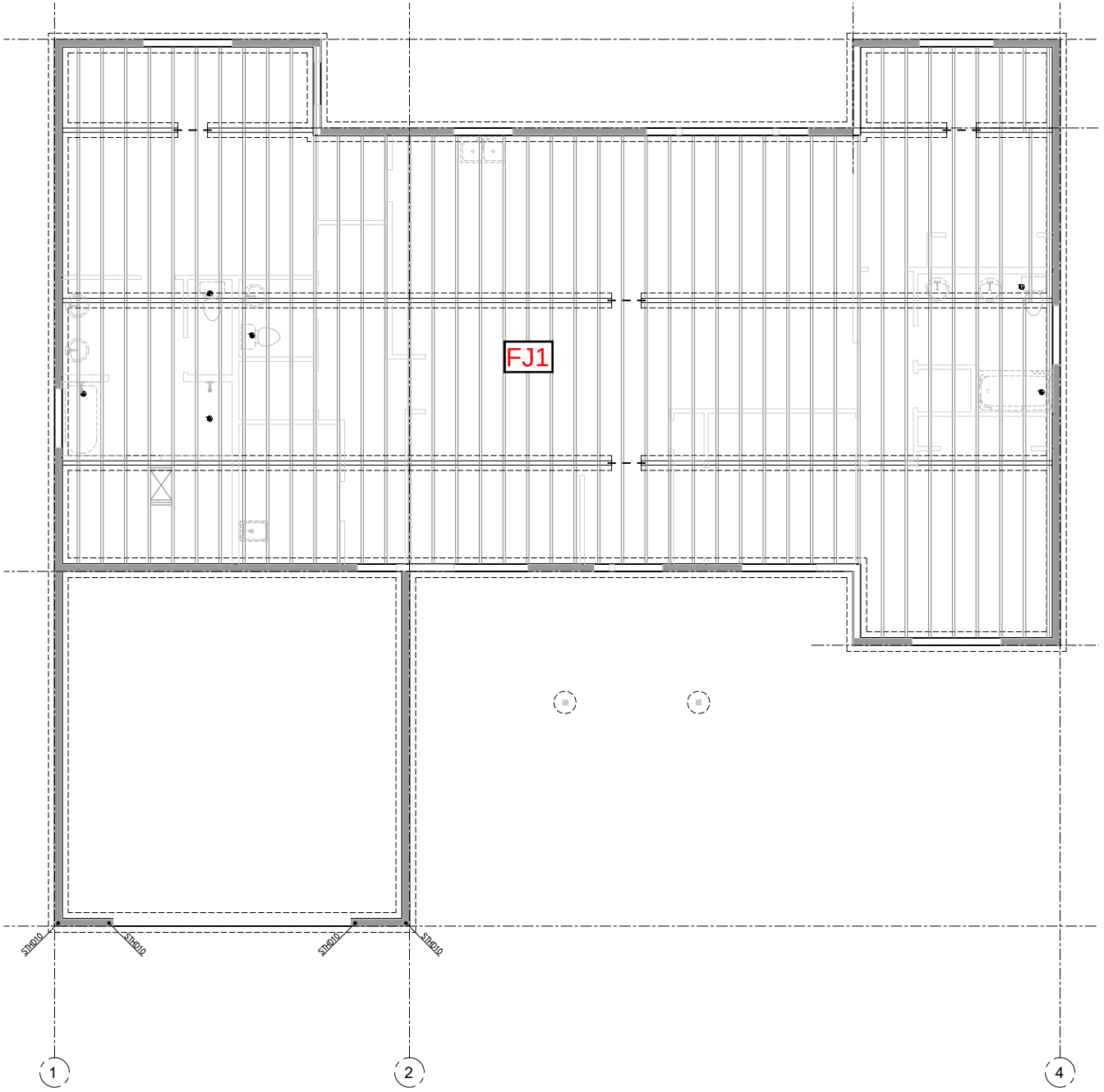
By: AEL



Roof Framing Plan

SCALE 1/4"=1'-0"

Permit Number: 20-01074



Foundation / Crawlspace Framing Plan

SCALE 1/4"=1'-0"

Permit Number: 20-01074

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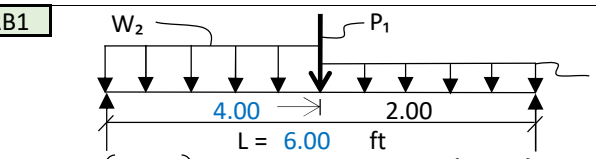
LOADS ONLY

RB1



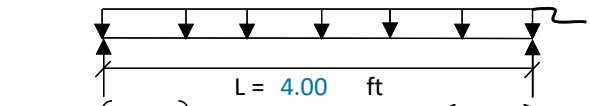
R_1 = DL 1.31, SL 2.06 k, ∑ 3.36 k

R_2 = DL 1.50, SL 2.20 k, ∑ 3.69 k

		Roof PSF	Roof Tributary		Floor PSF	Floor Tributary		PLF
W_1 =	DL	15	3.46	+ DL 0 Wall +	DL 0	0.00	= DL	52
	SL	25	3.46		SL 0	0.00	SL	28
W_2 =	DL	15	19.46	+ DL 0 Wall +	DL 0	0.00	= DL	292
	SL	25	19.46		SL 0	0.00	SL	487

		GT3		n/a	
P_1 =	DL	1.53	+	DL 0.00	= DL 1.53
	SL	2.25 k		SL 0.00	SL 2.25 k

RB2



R_1 = DL 0.69, SL 1.15, ∑ 1.85 k

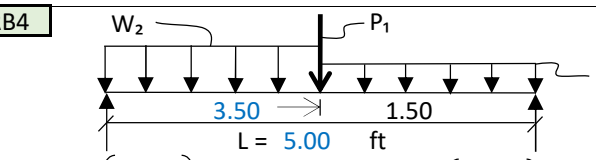
R_2 = DL 0.69, SL 1.15, ∑ 1.85 k

		Roof PSF	Roof Tributary		Roof PSF	Roof Tributary		PLF
W_1 =	DL	15	23.06	+ DL 0 Wall +	DL 0	0.00	= DL	346
	SL	25	23.06		SL 0	0.00	SL	577
							∑	923

RB3

SEE ENERCALC CALCULATIONS

RB4



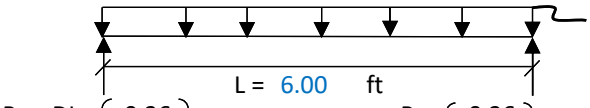
R_1 = DL 0.64, SL 0.98 k, ∑ 1.62 k

R_2 = DL 1.51, SL 2.30 k, ∑ 3.81 k

		Roof PSF	Roof Tributary		Floor PSF	Floor Tributary		PLF
W_1 =	DL	15	19.46	+ DL 0 Wall +	DL 0	0.00	= DL	292
	SL	25	19.46		SL 0	0.00	SL	487
W_2 =	DL	15	3.46	+ DL 0 Wall +	DL 0	0.00	= DL	52
	SL	25	3.46		SL 0	0.00	SL	87

		GT1		n/a	
P_1 =	DL	1.53	+	DL 0.00	= DL 1.53
	SL	2.25 k		SL 0.00	SL 2.25 k

RB5

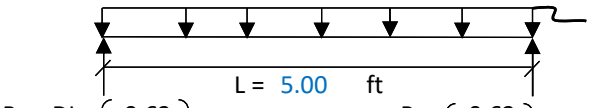


R_1 = DL 0.26, SL 0.18, ∑ 0.45 k

R_2 = DL 0.26, SL 0.18, ∑ 0.45 k

		Roof PSF	Roof Tributary		Roof PSF	Roof Tributary		PLF
W_1 =	DL	15	2.46	+ DL 50 Wall +	DL 0	0.00	= DL	87
	SL	25	2.46		SL 0	0.00	SL	62
							∑	149

RB6



R_1 = DL 0.62, SL 1.03, ∑ 1.65 k

R_2 = DL 0.62, SL 1.03, ∑ 1.65 k

		Roof PSF	Roof Tributary		Roof PSF	Roof Tributary		PLF
W_1 =	DL	15	16.46	+ DL 0 Wall +	DL 0	0.00	= DL	247
	SL	25	16.46		SL 0	0.00	SL	412
							∑	659

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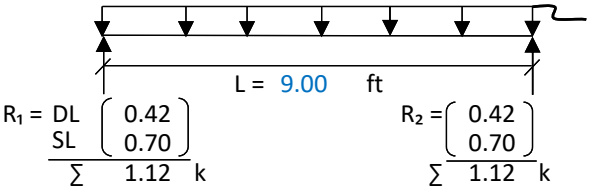
LOADS ONLY

RB7 SEE ENERCALC CALCULATIONS

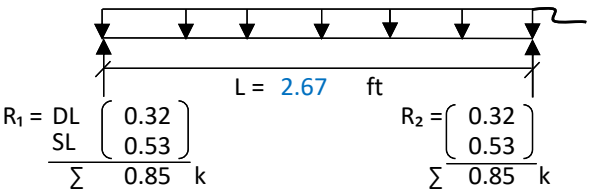
RB8



	Roof PSF	Tributary	+		Roof PSF	Tributary	=	PLF
W_1 = DL	15	6.21	+ DL	0	0	0.00	= DL	93
SL	25	6.21	Wall		0	0.00	SL	155
							∑	249

R_1 = DL	0.42	R_2 = 0.42
SL	0.70	0.70
∑	1.12 k	∑ 1.12 k

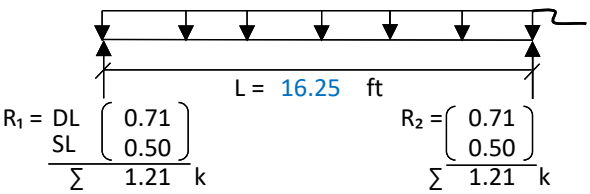
RB9



	Roof PSF	Tributary	+		Roof PSF	Tributary	=	PLF
W_1 = DL	15	16.00	+ DL	0	0	0.00	= DL	240
SL	25	16.00	Wall		0	0.00	SL	400
							∑	640

R_1 = DL	0.32	R_2 = 0.32
SL	0.53	0.53
∑	0.85 k	∑ 0.85 k

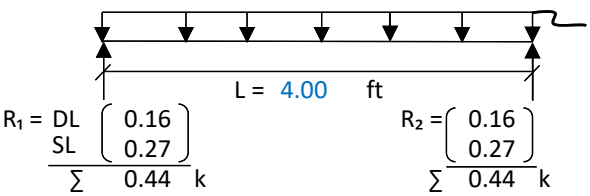
RB10



	Roof PSF	Tributary	+		Roof PSF	Tributary	=	PLF
W_1 = DL	15	2.46	+ DL	50	0	0.00	= DL	87
SL	25	2.46	Wall		0	0.00	SL	62
							∑	149

R_1 = DL	0.71	R_2 = 0.71
SL	0.50	0.50
∑	1.21 k	∑ 1.21 k

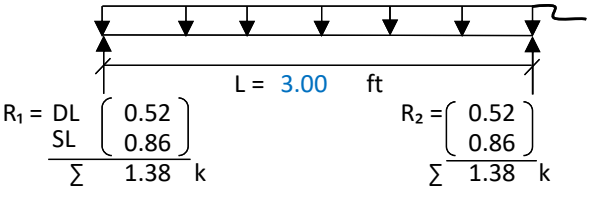
RB11



	Roof PSF	Tributary	+		Roof PSF	Tributary	=	PLF
W_1 = DL	15	5.46	+ DL	0	0	0.00	= DL	82
SL	25	5.46	Wall		0	0.00	SL	137
							∑	219

R_1 = DL	0.16	R_2 = 0.16
SL	0.27	0.27
∑	0.44 k	∑ 0.44 k

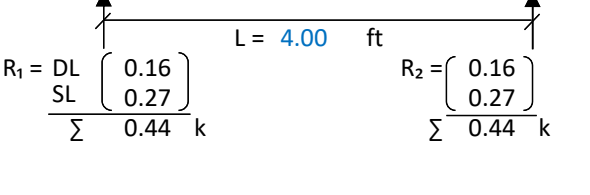
RB12



	Roof PSF	Tributary	+		Roof PSF	Tributary	=	PLF
W_1 = DL	15	23.06	+ DL	0	0	0.00	= DL	346
SL	25	23.06	Wall		0	0.00	SL	577
							∑	923

R_1 = DL	0.52	R_2 = 0.52
SL	0.86	0.86
∑	1.38 k	∑ 1.38 k

RB13



	Roof PSF	Tributary	+		Roof PSF	Tributary	=	PLF
W_1 = DL	15	5.46	+ DL	0	0	0.00	= DL	82
SL	25	5.46	Wall		0	0.00	SL	137
							∑	219

R_1 = DL	0.16	R_2 = 0.16
SL	0.27	0.27
∑	0.44 k	∑ 0.44 k

Description : Roof Beams RB1-RB13

Wood Beam Design : RB1

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **3.125x9, GLB, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : DF/DF — Wood Grade : 24F-V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.20 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

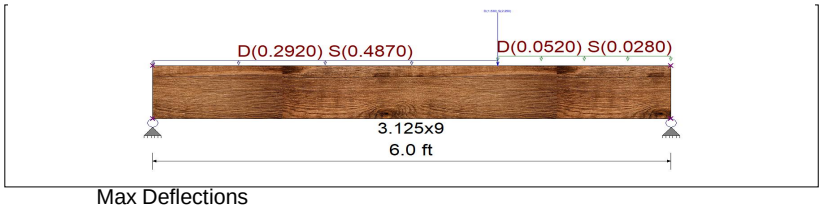
Applied Loads

Unif Load: D = 0.2920, S = 0.4870 k/ft, 0.0 ft to 4.0 ft, Trib= 1.0 ft
Unif Load: D = 0.0520, S = 0.0280 k/ft, 4.0 to 6.0 ft, Trib= 1.0 ft
Point: D = 1.530, S = 2.250 k @ 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.762** : 1
fb : Actual : 2,054.83 psi at 4.000 ft in Span # 1
Fb : Allowable : 2,698.00 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.646** : 1
fv : Actual : 196.91 psi at 6.000 ft in Span # 1
Fv : Allowable : 304.75 psi
Load Comb : +D+S+H



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.31			2.06			
Right Support	1.50			2.20			

Max Deflections

Transient Downward	0.076 in	Total Downward	0.126 in
Ratio	947	Ratio	571
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : RB2

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **4x8, Sawn, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : Hem-Fir — Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.830 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

Unif Load: D = 0.3460, S = 0.5770 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.573** : 1
fb : Actual : 722.47 psi at 2.000 ft in Span # 1
Fb : Allowable : 1,261.25 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.633** : 1
fv : Actual : 109.12 psi at 0.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.69			1.15			
Right Support	0.69			1.15			

Max Deflections

Transient Downward	0.023 in	Total Downward	0.037 in
Ratio	2075	Ratio	1297
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Beyler Consulting
5920 100th St SW, Suite 25
Lakewood, WA 98499
(253) 984-2900

Project Title: Alderwood
Engineer:
Project ID: 2288
Project Descr:

Printed: 15 OCT 2019, 12:35PM

Wood Beam

File = P:\2019\19.00352 CH1973 DiMatteo\5Structural Engineering\Engineering Files\Gravity\Beams.ec6 .

Lic. # : KW-06011448 — Beyler Consulting, LLC

DESCRIPTION: RB3 w/int support

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2015

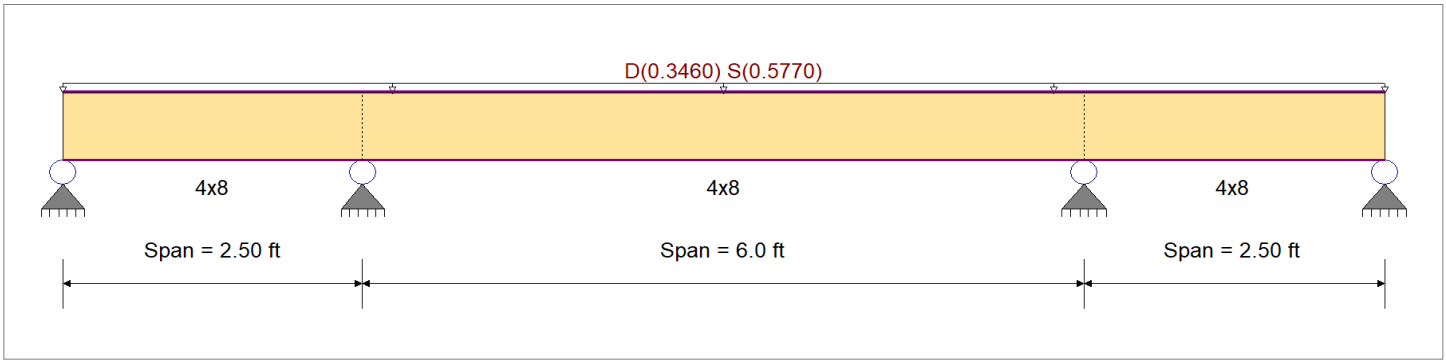
Wood Species : Hem Fir
Wood Grade : No.2

Fb +	850 psi
Fb -	850 psi
Fc - Prll	1300 psi
Fc - Perp	405 psi
Fv	150 psi
Ft	525 psi

E : Modulus of Elasticity

Ebend- xx	1300 ksi
Eminbend - xx	470 ksi
Density	26.84 pcf

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Loads on all spans...
Uniform Load on ALL spans : D = 0.3460, S = 0.5770 k/ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.716 : 1	Maximum Shear Stress Ratio	=	0.773 : 1
Section used for this span		4x8	Section used for this span		4x8
	=	909.47 psi		=	133.42 psi
	=	1,270.75 psi		=	172.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	2.500 ft	Location of maximum on span	=	2.500 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.039 in	Ratio =	1869 >=360
Max Upward Transient Deflection	-0.004 in	Ratio =	7973 >=360
Max Downward Total Deflection	0.062 in	Ratio =	1168 >=240
Max Upward Total Deflection	-0.006 in	Ratio =	4984 >=240

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.343	0.370	0.90	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	994.50	0.85	50.02	135.00
Length = 6.0 ft	2	0.343	0.370	0.90	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	994.50	0.85	50.02	135.00
Length = 2.50 ft	3	0.343	0.370	0.90	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	994.50	0.58	50.02	135.00
+D+L+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.309	0.333	1.00	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1105.00	0.85	50.02	150.00
Length = 6.0 ft	2	0.309	0.333	1.00	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1105.00	0.85	50.02	150.00
Length = 2.50 ft	3	0.309	0.333	1.00	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1105.00	0.58	50.02	150.00
+D+Lr+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.247	0.267	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1381.25	0.85	50.02	187.50
Length = 6.0 ft	2	0.247	0.267	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1381.25	0.85	50.02	187.50
Length = 2.50 ft	3	0.247	0.267	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1381.25	0.58	50.02	187.50
+D+S+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

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Project Title: Alderwood
Engineer:
Project ID: 2288
Project Descr:

Printed: 15 OCT 2019, 12:35PM

Wood Beam

Lic. # : KW-06011448 — Beyler Consulting, LLC

DESCRIPTION: RB3 w/int support

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 2.50 ft	1	0.716	0.773	1.15	1.300	1.00	1.00	1.00	1.00	1.00	2.32	909.47	1270.75	2.26	133.42	172.50
Length = 6.0 ft	2	0.716	0.773	1.15	1.300	1.00	1.00	1.00	1.00	1.00	2.32	909.47	1270.75	2.26	133.42	172.50
Length = 2.50 ft	3	0.716	0.773	1.15	1.300	1.00	1.00	1.00	1.00	1.00	2.32	909.47	1270.75	1.54	133.42	172.50
+D+0.750Lr+0.750L+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.247	0.267	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1381.25	0.85	50.02	187.50
Length = 6.0 ft	2	0.247	0.267	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1381.25	0.85	50.02	187.50
Length = 2.50 ft	3	0.247	0.267	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1381.25	0.58	50.02	187.50
+D+0.750L+0.750S+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.604	0.653	1.15	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1270.75	1.90	112.57	172.50
Length = 6.0 ft	2	0.604	0.653	1.15	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1270.75	1.90	112.57	172.50
Length = 2.50 ft	3	0.604	0.653	1.15	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1270.75	1.30	112.57	172.50
+D+0.60W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.85	50.02	240.00
Length = 6.0 ft	2	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.85	50.02	240.00
Length = 2.50 ft	3	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.58	50.02	240.00
+D+0.70E+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.85	50.02	240.00
Length = 6.0 ft	2	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.85	50.02	240.00
Length = 2.50 ft	3	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.58	50.02	240.00
+D+0.750Lr+0.750L+0.450W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.85	50.02	240.00
Length = 6.0 ft	2	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.85	50.02	240.00
Length = 2.50 ft	3	0.193	0.208	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.87	340.93	1768.00	0.58	50.02	240.00
+D+0.750L+0.750S+0.450W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.434	0.469	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1768.00	1.90	112.57	240.00
Length = 6.0 ft	2	0.434	0.469	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1768.00	1.90	112.57	240.00
Length = 2.50 ft	3	0.434	0.469	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1768.00	1.30	112.57	240.00
+D+0.750L+0.750S+0.5250E+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.434	0.469	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1768.00	1.90	112.57	240.00
Length = 6.0 ft	2	0.434	0.469	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1768.00	1.90	112.57	240.00
Length = 2.50 ft	3	0.434	0.469	1.60	1.300	1.00	1.00	1.00	1.00	1.00	1.96	767.33	1768.00	1.30	112.57	240.00
+0.60D+0.60W+0.60H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.116	0.125	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.52	204.56	1768.00	0.51	30.01	240.00
Length = 6.0 ft	2	0.116	0.125	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.52	204.56	1768.00	0.51	30.01	240.00
Length = 2.50 ft	3	0.116	0.125	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.52	204.56	1768.00	0.35	30.01	240.00
+0.60D+0.70E+0.60H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 2.50 ft	1	0.116	0.125	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.52	204.56	1768.00	0.51	30.01	240.00
Length = 6.0 ft	2	0.116	0.125	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.52	204.56	1768.00	0.51	30.01	240.00
Length = 2.50 ft	3	0.116	0.125	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.52	204.56	1768.00	0.35	30.01	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S+H	-0.0059	1.639
+D+S+H	2	0.0616	3.025		0.0000	1.639
	3	0.0000	3.025	+D+S+H	-0.0060	0.882

Vertical Reactions

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum	0.224	4.852	4.852	0.224
Overall MINimum	0.140	3.033	3.033	0.140
+D+H	0.084	1.819	1.819	0.084
+D+L+H	0.084	1.819	1.819	0.084
+D+Lr+H	0.084	1.819	1.819	0.084
+D+S+H	0.224	4.852	4.852	0.224
+D+0.750Lr+0.750L+H	0.084	1.819	1.819	0.084
+D+0.750L+0.750S+H	0.189	4.094	4.094	0.189
+D+0.60W+H	0.084	1.819	1.819	0.084
+D+0.70E+H	0.084	1.819	1.819	0.084
+D+0.750Lr+0.750L+0.450W+H	0.084	1.819	1.819	0.084
+D+0.750L+0.750S+0.450W+H	0.189	4.094	4.094	0.189

Wood Beam

DESCRIPTION: RB3 w/int support

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
+D+0.750L+0.750S+0.5250E+H	0.189	4.094	4.094	0.189
+0.60D+0.60W+0.60H	0.050	1.091	1.091	0.050
+0.60D+0.70E+0.60H	0.050	1.091	1.091	0.050
D Only	0.084	1.819	1.819	0.084
Lr Only				
L Only				
S Only	0.140	3.033	3.033	0.140
W Only				
E Only				
H Only				

Wood Beam Design : RB4

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **3.125x9, GLB, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : DF/DF — Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

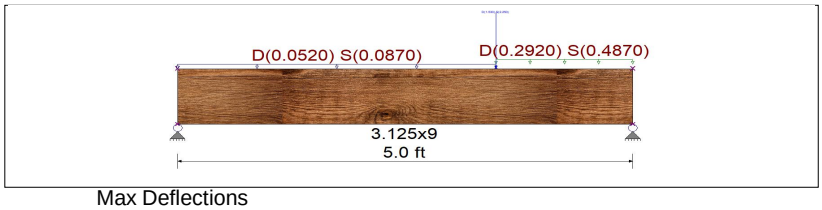
Unif Load: D = 0.0520, S = 0.0870 k/ft, 0.0 ft to 3.50 ft, Trib= 1.0 ft
Unif Load: D = 0.2920, S = 0.4870 k/ft, 3.50 to 5.0 ft, Trib= 1.0 ft
Point: D = 1.530, S = 2.250 k @ 3.50 ft

Design Summary

Max fb/Fb Ratio = **0.508** : 1
fb : Actual : 1,376.11 psi at 3.500 ft in Span # 1
Fb : Allowable : 2,709.70 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.667** : 1
fv : Actual : 203.17 psi at 5.000 ft in Span # 1
Fv : Allowable : 304.75 psi
Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.64			0.98			
Right Support	1.51			2.30			



Max Deflections

Transient Downward	0.031 in	Total Downward	0.051 in
Ratio	1945	Ratio	1170
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : RB5

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **2-2x8, Sawn, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : Hem Fir — Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

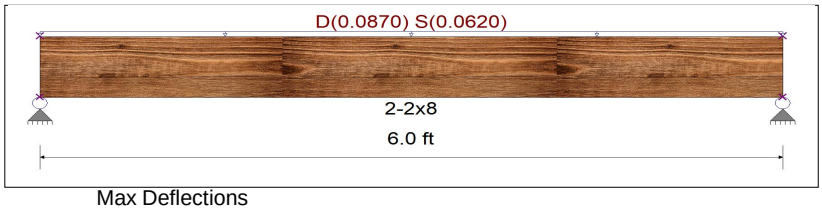
Unif Load: D = 0.0870, S = 0.0620 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.265** : 1
fb : Actual : 306.15 psi at 3.000 ft in Span # 1
Fb : Allowable : 1,155.77 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.179** : 1
fv : Actual : 30.83 psi at 0.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.26			0.19			
Right Support	0.26			0.19			



Max Deflections

Transient Downward	0.015 in	Total Downward	0.035 in
Ratio	4906	Ratio	2041
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : RB6

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **4x8, Sawn, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : Hem Fir — Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

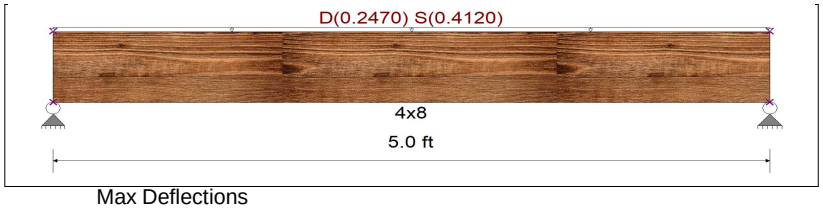
Applied Loads

Unif Load: D = 0.2470, S = 0.4120 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.640** : 1
fb : Actual : 805.98 psi at 2.500 ft in Span # 1
Fb : Allowable : 1,258.94 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.565** : 1
fv : Actual : 97.39 psi at 5.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S+H



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.62			1.03			
Right Support	0.62			1.03			

Max Deflections

Transient Downward	0.040 in	Total Downward	0.064 in
Ratio	1488	Ratio	930
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : RB8

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **4x8, Sawn, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : Hem Fir — Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.840 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

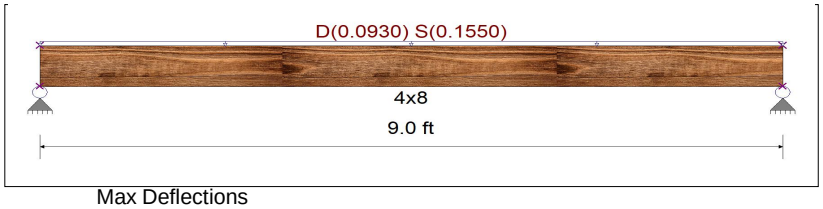
Applied Loads

Unif Load: D = 0.0930, S = 0.1550 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.787** : 1
fb : Actual : 982.73 psi at 4.500 ft in Span # 1
Fb : Allowable : 1,248.77 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.382** : 1
fv : Actual : 65.97 psi at 0.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S+H



Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.42			0.70			
Right Support	0.42			0.70			

Max Deflections

Transient Downward	0.159 in	Total Downward	0.255 in
Ratio	678	Ratio	423
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam

Lic. # : KW-06011448 — Beyler Consulting, LLC

DESCRIPTION: RB7 w/int support

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10
Load Combination Set : IBC 2015

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2015

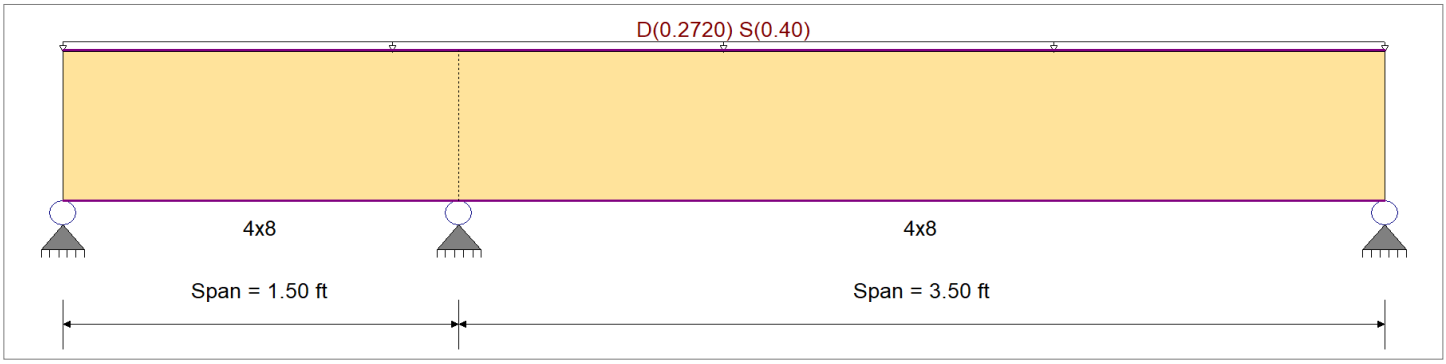
Wood Species : Hem Fir
Wood Grade : No.2

Fb +	850.0 psi
Fb -	850.0 psi
Fc - Prll	1,300.0 psi
Fc - Perp	405.0 psi
Fv	150.0 psi
Ft	525.0 psi

E : Modulus of Elasticity

Ebend- xx	1,300.0 ksi
Eminbend - xx	470.0 ksi
Density	26.840 pcf

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Loads on all spans...
Uniform Load on ALL spans : D = 0.2720, S = 0.40 k/ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.239 : 1	Maximum Shear Stress Ratio	=	0.479 : 1
Section used for this span		4x8	Section used for this span		4x8
	=	304.10 psi		=	82.64 psi
	=	1,270.75 psi		=	172.50 psi
Load Combination		+D+S+H	Load Combination		+D+S+H
Location of maximum on span	=	1.500 ft	Location of maximum on span	=	1.500 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.005 in	Ratio =	8072 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.009 in	Ratio =	4804 >=240
Max Upward Total Deflection	-0.001 in	Ratio =	21384 >=240

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
+D+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.124	0.248	0.90	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	994.50	0.57	33.45	135.00
Length = 3.50 ft	2	0.124	0.248	0.90	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	994.50	0.57	33.45	135.00
+D+L+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.111	0.223	1.00	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1105.00	0.57	33.45	150.00
Length = 3.50 ft	2	0.111	0.223	1.00	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1105.00	0.57	33.45	150.00
+D+Lr+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.089	0.178	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1381.25	0.57	33.45	187.50
Length = 3.50 ft	2	0.089	0.178	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1381.25	0.57	33.45	187.50
+D+S+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.239	0.479	1.15	1.300	1.00	1.00	1.00	1.00	1.00	0.78	304.10	1270.75	1.40	82.64	172.50
Length = 3.50 ft	2	0.239	0.479	1.15	1.300	1.00	1.00	1.00	1.00	1.00	0.78	304.10	1270.75	1.40	82.64	172.50
+D+0.750Lr+0.750L+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00

Wood Beam

Lic. # : KW-06011448 — Beyler Consulting, LLC

DESCRIPTION: RB7 w/int support

Load Combination / Segment Length	Span #	Max Stress Ratios M	V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	fb	F'b	Shear Values V	fv	F'v
Length = 1.50 ft	1	0.089	0.178	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1381.25	0.57	33.45	187.50
Length = 3.50 ft	2	0.089	0.178	1.25	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1381.25	0.57	33.45	187.50
+D+0.750L+0.750S+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.204	0.408	1.15	1.300	1.00	1.00	1.00	1.00	1.00	0.66	258.84	1270.75	1.19	70.34	172.50
Length = 3.50 ft	2	0.204	0.408	1.15	1.300	1.00	1.00	1.00	1.00	1.00	0.66	258.84	1270.75	1.19	70.34	172.50
+D+0.60W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.070	0.139	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1768.00	0.57	33.45	240.00
Length = 3.50 ft	2	0.070	0.139	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1768.00	0.57	33.45	240.00
+D+0.70E+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.070	0.139	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1768.00	0.57	33.45	240.00
Length = 3.50 ft	2	0.070	0.139	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1768.00	0.57	33.45	240.00
+D+0.750Lr+0.750L+0.450W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.070	0.139	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1768.00	0.57	33.45	240.00
Length = 3.50 ft	2	0.070	0.139	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.31	123.09	1768.00	0.57	33.45	240.00
+D+0.750L+0.750S+0.450W+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.146	0.293	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.66	258.84	1768.00	1.19	70.34	240.00
Length = 3.50 ft	2	0.146	0.293	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.66	258.84	1768.00	1.19	70.34	240.00
+D+0.750L+0.750S+0.5250E+H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.146	0.293	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.66	258.84	1768.00	1.19	70.34	240.00
Length = 3.50 ft	2	0.146	0.293	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.66	258.84	1768.00	1.19	70.34	240.00
+0.60D+0.60W+0.60H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.042	0.084	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.19	73.85	1768.00	0.34	20.07	240.00
Length = 3.50 ft	2	0.042	0.084	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.19	73.85	1768.00	0.34	20.07	240.00
+0.60D+0.70E+0.60H					1.300	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 1.50 ft	1	0.042	0.084	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.19	73.85	1768.00	0.34	20.07	240.00
Length = 3.50 ft	2	0.042	0.084	1.60	1.300	1.00	1.00	1.00	1.00	1.00	0.19	73.85	1768.00	0.34	20.07	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S+H	-0.0008	0.947
+D+S+H	2	0.0087	1.936		0.0000	0.947

Vertical Reactions

Support notation : Far left is #1 — Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	-0.014	2.420	0.954
Overall MINimum	-0.006	1.440	0.568
+D+H	-0.006	0.980	0.386
+D+L+H	-0.006	0.980	0.386
+D+Lr+H	-0.006	0.980	0.386
+D+S+H	-0.014	2.420	0.954
+D+0.750Lr+0.750L+H	-0.006	0.980	0.386
+D+0.750L+0.750S+H	-0.012	2.060	0.812
+D+0.60W+H	-0.006	0.980	0.386
+D+0.70E+H	-0.006	0.980	0.386
+D+0.750Lr+0.750L+0.450W+H	-0.006	0.980	0.386
+D+0.750L+0.750S+0.450W+H	-0.012	2.060	0.812
+D+0.750L+0.750S+0.5250E+H	-0.012	2.060	0.812
+0.60D+0.60W+0.60H	-0.003	0.588	0.232
+0.60D+0.70E+0.60H	-0.003	0.588	0.232
D Only	-0.006	0.980	0.386
Lr Only			
L Only			
S Only	-0.008	1.440	0.568
W Only			
E Only			
H Only			

Wood Beam Design : RB9

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **4x8, Sawn, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : Hem-Fir — Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.830 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

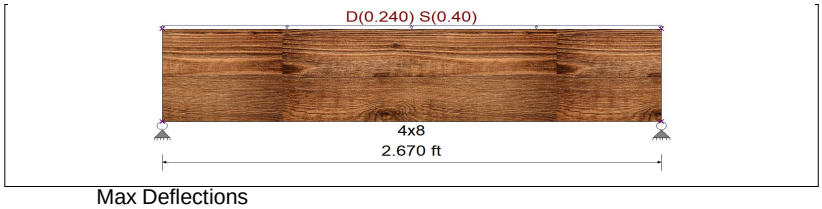
Unif Load: D = 0.240, S = 0.40 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.176** : 1
fb : Actual : 223.20 psi at 1.335 ft in Span # 1
Fb : Allowable : 1,264.68 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.293** : 1
fv : Actual : 50.51 psi at 0.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.32			0.53			
Right Support	0.32			0.53			



Max Deflections

Transient Downward	0.003 in	Total Downward	0.005 in
Ratio	9999	Ratio	6292
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : RB10

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **3.125x9, GLB, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : DF/DF — Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

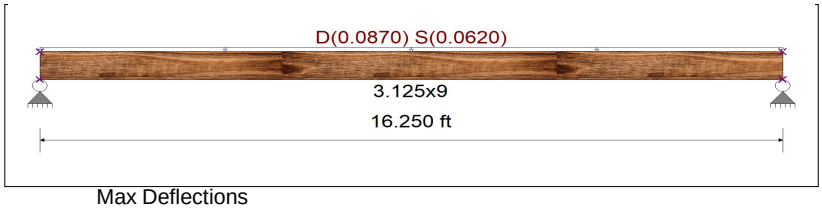
Unif Load: D = 0.0870, S = 0.0620 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.570** : 1
fb : Actual : 1,398.94 psi at 8.125 ft in Span # 1
Fb : Allowable : 2,455.89 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.212** : 1
fv : Actual : 64.57 psi at 0.000 ft in Span # 1
Fv : Allowable : 304.75 psi
Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.71			0.50			
Right Support	0.71			0.50			



Max Deflections

Transient Downward	0.286 in	Total Downward	0.688 in
Ratio	681	Ratio	283
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : RB11

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **4x8, Sawn, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : Hem-Fir — Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.830 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

Unif Load: D = 0.0820, S = 0.1370 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.136** : 1
fb : Actual : 171.42 psi at 2.000 ft in Span # 1
Fb : Allowable : 1,261.25 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.150** : 1
fv : Actual : 25.89 psi at 0.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.16			0.27			
Right Support	0.16			0.27			

Max Deflections

Transient Downward	0.005 in	Total Downward	0.009 in
Ratio	8742	Ratio	5469
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Wood Beam Design : RB12

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **4x8, Sawn, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : Hem-Fir — Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.830 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

Unif Load: D = 0.3460, S = 0.5770 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.322** : 1
fb : Actual : 406.39 psi at 1.500 ft in Span # 1
Fb : Allowable : 1,263.86 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.474** : 1
fv : Actual : 81.84 psi at 3.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.52			0.87			
Right Support	0.52			0.87			

Max Deflections

Transient Downward	0.007 in	Total Downward	0.012 in
Ratio	4920	Ratio	3075
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Beyler Consulting
5920 100th St SW, Suite 25
Lakewood, WA 98499
(253) 984-2900

Project Title: Alderwood
Engineer:
Project ID: 2288
Project Descr:

Printed: 9 JAN 2020, 8:29AM

Multiple Simple Beam

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Wood Beam Design : RB13

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

BEAM Size : **4x8, Sawn, Fully Unbraced**
Using Allowable Stress Design with IBC 2015 Load Combinations, Major Axis Bending
Wood Species : Hem-Fir — Wood Grade : No.2

Fb - Tension	850.0 psi	Fc - Prll	1,300.0 psi	Fv	150.0 psi	Ebend- xx	1,300.0 ksi	Density	26.830 pcf
Fb - Compr	850.0 psi	Fc - Perp	405.0 psi	Ft	525.0 psi	Eminbend - xx	470.0 ksi		

Applied Loads

Unif Load: D = 0.0820, S = 0.1370 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.136** : 1
fb : Actual : 171.42 psi at 2.000 ft in Span # 1
Fb : Allowable : 1,261.25 psi
Load Comb : +D+S+H

Max fv/FvRatio = **0.150** : 1
fv : Actual : 25.89 psi at 0.000 ft in Span # 1
Fv : Allowable : 172.50 psi
Load Comb : +D+S+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.16			0.27			
Right Support	0.16			0.27			

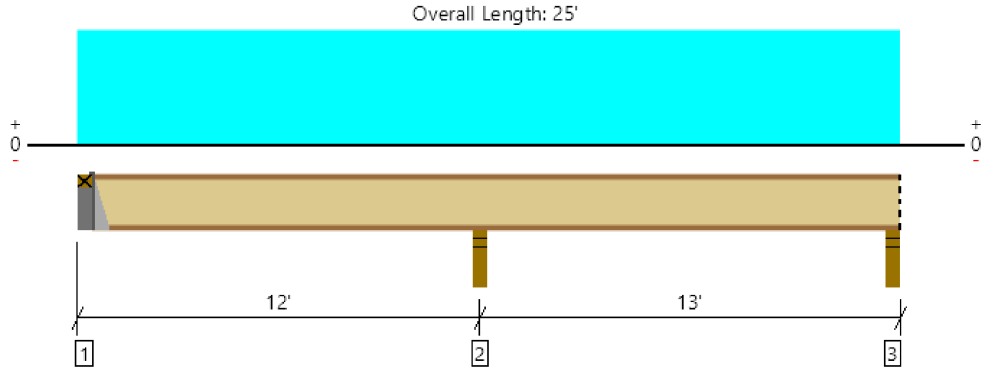
Max Deflections

Transient Downward	0.005 in	Total Downward	0.009 in
Ratio	8742	Ratio	5469
	LC: S Only		LC: +D+S+H
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
	LC:		LC:

Permit Number: 20-01074

Level, Floor: J1

1 piece(s) 9 1/2" TJI® 110 @ 19.2" OC



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)	1276 @ 12'	1935 (3.50")	Passed (66%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	608 @ 12' 1 3/4"	1342	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-1570 @ 12'	2500	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.158 @ 18' 9 1/16"	0.320	Passed (L/971)	–	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.192 @ 18' 10 1/8"	0.640	Passed (L/798)	–	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	43	40	Passed	–	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 4' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 3' 11" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on Single 2X HF plate	3.50"	Hanger[1]	1.75" / - [2]	87	349/-40	436/-40	See note [1]
2 - Stud wall - SPF	3.50"	3.50"	3.50"	294	982	1276	None
3 - Stud wall - SPF	3.50"	3.50"	1.75"	98	369/-41	467/-41	Blocking

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	ITS1.81/9.5	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip	

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 25'	19.2"	12.0	40.0	Default Load

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

Weyerhaeuser SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Oleg Kondratyuk Beyler Consulting (253) 984-2900 oleg@andersonchase.com	

6/25/2019 6:34:25 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: Floor Joists

Permit Number: 20-01074

BEYLER CONSULTING
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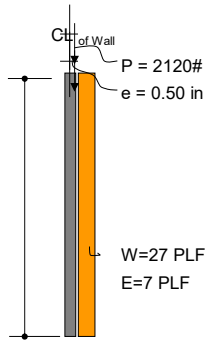
Page#:

DESIGNED: AEL

PROJECT:

STUD WALL DESIGN

2x6 Stud Capacity — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	596
P_{SL} (#/ft) =	994
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	1590
e (IN) =	0.5
TRIB. (IN) =	16

LATERAL LOADS W	
W (PSF) =	20.20
E (PSF) =	5.00
TRIB. (IN) =	16

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 5.25 405 = $F_{c\perp}$ (psi

Use: (1) 2" X 6" @ 16" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	1	A =	8.25 in^2
b =	1.5 in	S =	7.56 in^3
d =	5.5 in	I =	20.80 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	4	10	8	125	99	
$M_{applied}$ (ft-#) =	17	44	37	300	260	
$P_{applied}$ (#) =	795	2120	1789	795	1789	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	
V_{allow} (#) =	825	949	949	1320	1320	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	425	489	489	681	681	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	4904	5295	5295	6084	6084	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.07	0.28	0.21	0.51	0.58	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.10	0.27	0.23	0.10	0.23	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	3341	3341	3341	3341	3341	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	2126	2126	2126	2126	2126	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/678	L/904	$L/(I * E / 15 * L * M_{applied})$
240	0.00	0.00	0.00	0.16	0.12	(1.0) x W Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.4%	1.0%	0.9%	9.5%	7.5%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	3.9%	9.0%	7.6%	44.1%	38.1%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	16.2%	40.0%	33.8%	13.1%	29.4%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	7.0%	28.5%	21.3%	50.8%	58.3%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	10.3%	27.4%	23.1%	10.3%	23.1%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	23.8%	63.4%	53.5%	23.8%	53.5%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	37.4%	99.7%	84.1%	37.4%	84.1%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	35.4%	26.6%	
Overall Check	OK	OK	OK	OK	OK	

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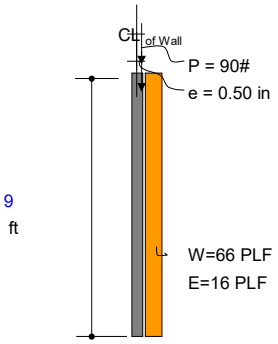
DESIGNED: AEL

PROJECT:

STUD WALL DESIGN

Opening jamb_(1)2x6 — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	34
P_{SL} (#/ft) =	56
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	90
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	20.20
E (PSF) =	5.00
TRIB. (IN) =	39

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 5.25 405 = $F_{c\perp}$ (psi

Use: (1) 2" X 6" @ 39" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	1	A =	8.25 in^2
b =	1.5 in	S =	7.56 in^3
d =	5.5 in	I =	20.80 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	0	0	0	296	222	
$M_{applied}$ (ft-#) =	1	2	2	667	502	
$P_{applied}$ (#) =	34	90	76	34	76	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	
V_{allow} (#) =	825	949	949	1320	1320	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	425	489	489	681	681	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	4904	5295	5295	6084	6084	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.00	0.00	0.00	0.98	0.74	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.00	0.01	0.01	0.00	0.01	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	3341	3341	3341	3341	3341	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	2126	2126	2126	2126	2126	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/278	L/371	L/(I * E / 15 * L *$M_{applied}$)
240	0.00	0.00	0.00	0.39	0.29	(1.0) x W Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.0%	0.0%	0.0%	22.4%	16.8%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	0.2%	0.4%	0.3%	97.9%	73.7%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	0.7%	1.7%	1.4%	0.6%	1.2%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	0.2%	0.4%	0.3%	98.4%	74.5%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	0.4%	1.2%	1.0%	0.4%	1.0%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	1.0%	2.7%	2.3%	1.0%	2.3%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	1.6%	4.2%	3.6%	1.6%	3.6%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	86.3%	64.7%	
Overall Check	OK	OK	OK	OK	OK	

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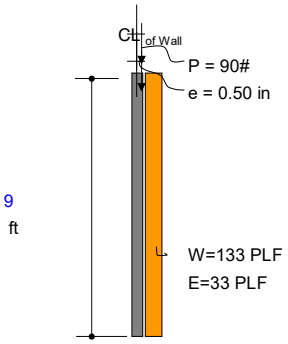
STUD WALL DESIGN

Opening jamb_(2)2x6 — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	34
P_{SL} (#/ft) =	56
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	90
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	20.20
E (PSF) =	5.00
TRIB. (IN) =	79

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 10.5 405 = $F_{c\perp}$ (psi

Use: (2) 2" X 6" @ 79" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	2	A =	16.50 in^2
b =	1.5 in	S =	15.13 in^3
d =	5.5 in	I =	41.59 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	0	0	0	599	449	
$M_{applied}$ (ft-#) =	1	2	2	1348	1013	
$P_{applied}$ (#) =	34	90	76	34	76	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	
V_{allow} (#) =	1650	1898	1898	2640	2640	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	851	978	978	1361	1361	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	19614	21180	21180	24337	24337	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.00	0.00	0.00	0.99	0.75	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.00	0.01	0.00	0.00	0.00	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	6683	6683	6683	6683	6683	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	4253	4253	4253	4253	4253	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/275	L/366	$L/(I * E / 15 * L * M_{applied})$
240	0.00	0.00	0.00	0.39	0.29	(1.0) x W Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.0%	0.0%	0.0%	22.7%	17.0%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	0.1%	0.2%	0.2%	99.0%	74.4%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	0.2%	0.4%	0.4%	0.1%	0.3%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	0.1%	0.2%	0.2%	99.3%	74.8%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	0.2%	0.6%	0.5%	0.2%	0.5%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	0.5%	1.3%	1.1%	0.5%	1.1%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	0.8%	2.1%	1.8%	0.8%	1.8%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	87.4%	65.6%	
Overall Check	OK	OK	OK	OK	OK	

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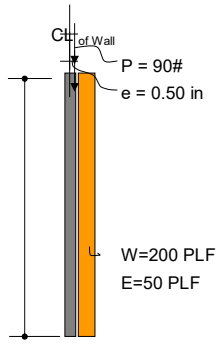
STUD WALL DESIGN

Opening jamb_(3)2x6 — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	34
P_{SL} (#/ft) =	56
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	90
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	20.20
E (PSF) =	5.00
TRIB. (IN) =	119

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 15.75 405 = $F_{c\perp}$ (psi

Use: (3) 2" X 6" @ 119" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	3	A =	24.75 in^2
b =	1.5 in	S =	22.69 in^3
d =	5.5 in	I =	62.39 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	0	0	0	902	676	
$M_{applied}$ (ft-#) =	1	2	2	2030	1525	
$P_{applied}$ (#) =	34	90	76	34	76	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	
V_{allow} (#) =	2475	2846	2846	3960	3960	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	1276	1468	1468	2042	2042	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	44132	47656	47656	54759	54759	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.00	0.00	0.00	1.00	0.75	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.00	0.00	0.00	0.00	0.00	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	10024	10024	10024	10024	10024	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	6379	6379	6379	6379	6379	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/273	L/365	L/(I * E / 15 * L *$M_{applied}$)
240	0.00	0.00	0.00	0.39	0.30	(1.0) x W Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W	DL+0.75(LL+SL+W)	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.0%	0.0%	0.0%	22.8%	17.1%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	0.1%	0.1%	0.1%	99.4%	74.7%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	0.1%	0.2%	0.2%	0.1%	0.1%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	0.1%	0.1%	0.1%	99.6%	74.9%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	0.1%	0.4%	0.3%	0.1%	0.3%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	0.3%	0.9%	0.8%	0.3%	0.8%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	0.5%	1.4%	1.2%	0.5%	1.2%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	87.8%	65.8%	
Overall Check	OK	OK	OK	OK	OK	

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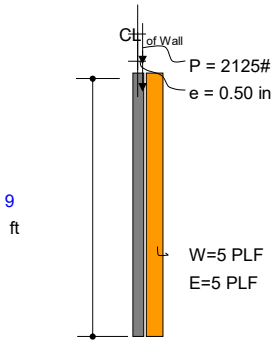
STUD WALL DESIGN

4x_Header_(1)Bearing Stud — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	797
P_{SL} (#/ft) =	1328
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	2125
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	5.00
E (PSF) =	5.00
TRIB. (IN) =	12

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 5.25 405 = $F_{c\perp}$ (psi

Use: (1) 2" X 6" @ 12" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	1	A =	8.25 in^2
b =	1.5 in	S =	7.56 in^3
d =	5.5 in	I =	20.80 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	4	10	8	26	25	
$M_{applied}$ (ft-#) =	17	44	37	69	79	
$P_{applied}$ (#) =	797	2125	1793	797	1793	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
V_{allow} (#) =	825	949	949	1320	1320	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	425	489	489	681	681	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	4904	5295	5295	6084	6084	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.07	0.29	0.21	0.13	0.24	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.10	0.27	0.23	0.10	0.23	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	3341	3341	3341	3341	3341	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	2126	2126	2126	2126	2126	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/3652	L/4869	$L/(I * E / 15 * L * M_{applied})$
240	0.00	0.00	0.00	0.03	0.02	(1.0) x W or E Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+Wor	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.4%	1.0%	0.9%	2.0%	1.9%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	3.9%	9.0%	7.6%	10.2%	11.6%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	16.3%	40.1%	33.9%	13.1%	29.5%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	7.0%	28.6%	21.4%	13.0%	23.7%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	10.3%	27.5%	23.2%	10.3%	23.2%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	23.8%	63.6%	53.7%	23.8%	53.7%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	37.5%	99.9%	84.3%	37.5%	84.3%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	6.6%	4.9%	
Overall Check	OK	OK	OK	OK	OK	

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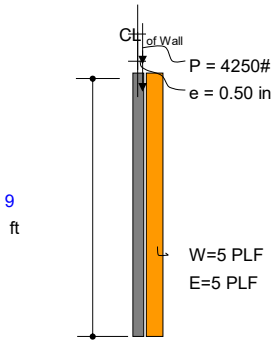
STUD WALL DESIGN

4x_Header_(2)Bearing Stud — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	1594
P_{SL} (#/ft) =	2656
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	4250
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	5.00
E (PSF) =	5.00
TRIB. (IN) =	12

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 10.5 405 = $F_{c\perp}$ (psi

Use: (2) 2" X 6" @ 12" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	2	A =	16.50 in^2
b =	1.5 in	S =	15.13 in^3
d =	5.5 in	I =	41.59 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	7	20	17	30	33	
$M_{applied}$ (ft-#) =	33	89	75	86	116	
$P_{applied}$ (#) =	1594	4250	3586	1594	3586	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
V_{allow} (#) =	1650	1898	1898	2640	2640	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	851	978	978	1361	1361	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	19614	21180	21180	24337	24337	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.05	0.17	0.13	0.07	0.13	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.10	0.27	0.23	0.10	0.23	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	6683	6683	6683	6683	6683	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	4253	4253	4253	4253	4253	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/7303	L/9738	L/(I * E / 15 * L *$M_{applied}$)
240	0.00	0.00	0.00	0.01	0.01	(1.0) x W or E Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+Wor	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.4%	1.0%	0.9%	1.1%	1.3%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	3.9%	9.0%	7.6%	6.3%	8.5%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	8.1%	20.1%	16.9%	6.5%	14.7%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	5.0%	16.5%	12.8%	7.5%	13.3%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	10.3%	27.5%	23.2%	10.3%	23.2%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	23.8%	63.6%	53.7%	23.8%	53.7%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	37.5%	99.9%	84.3%	37.5%	84.3%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	3.3%	2.5%	
Overall Check	OK	OK	OK	OK	OK	

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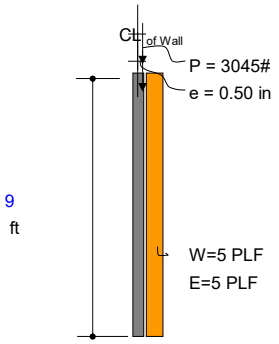
STUD WALL DESIGN

3-1/8 GLB_Header_(1)Bearing Stud — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	1142
P_{SL} (#/ft) =	1903
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	3045
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	5.00
E (PSF) =	5.00
TRIB. (IN) =	12

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 4.6875 650 = $F_{c\perp}$ (psi

Use: (1) 2" X 6" @ 12" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	1	A =	8.25 in^2
b =	1.5 in	S =	7.56 in^3
d =	5.5 in	I =	20.80 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	5	14	12	28	29	
$M_{applied}$ (ft-#) =	24	63	54	77	96	
$P_{applied}$ (#) =	1142	3045	2569	1142	2569	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
V_{allow} (#) =	825	949	949	1320	1320	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	425	489	489	681	681	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	4904	5295	5295	6084	6084	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.12	0.54	0.40	0.17	0.39	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.15	0.39	0.33	0.15	0.33	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	3341	3341	3341	3341	3341	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	3047	3047	3047	3047	3047	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/3652	L/4869	$L/(I * E / 15 * L * M_{applied})$
240	0.00	0.00	0.00	0.03	0.02	(1.0) x W or E Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+Wor	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.6%	1.5%	1.3%	2.1%	2.2%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	5.6%	13.0%	10.9%	11.3%	14.1%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	23.3%	57.5%	48.5%	18.8%	42.2%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	12.0%	54.5%	39.9%	16.8%	39.0%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	14.8%	39.3%	33.2%	14.8%	33.2%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	34.2%	91.1%	76.9%	34.2%	76.9%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	37.5%	99.9%	84.3%	37.5%	84.3%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	6.6%	4.9%	
Overall Check	OK	OK	OK	OK	OK	

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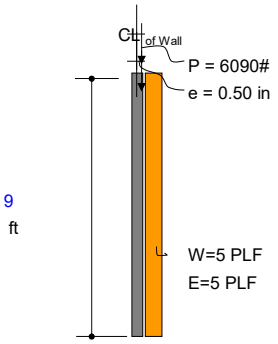
STUD WALL DESIGN

3-1/8 GLB_Header_(2)Bearing Stud — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	2284
P_{SL} (#/ft) =	3806
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	6090
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	5.00
E (PSF) =	5.00
TRIB. (IN) =	12

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 9.375 650 = $F_{c\perp}$ (psi

Use: (2) 2" X 6" @ 12" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	2	A =	16.50 in^2
b =	1.5 in	S =	15.13 in^3
d =	5.5 in	I =	41.59 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	+0.75(LL+SL+WorE)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	11	28	24	33	41	
$M_{applied}$ (ft-#) =	48	127	107	101	150	
$P_{applied}$ (#) =	2284	6090	5138	2284	5138	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	+0.75(LL+SL+WorE)	
V_{allow} (#) =	1650	1898	1898	2640	2640	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	851	978	978	1361	1361	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	19614	21180	21180	24337	24337	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.08	0.30	0.22	0.10	0.21	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.15	0.39	0.33	0.15	0.33	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	6683	6683	6683	6683	6683	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	6094	6094	6094	6094	6094	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/7303	L/9738	L/(I * E / 15 * L *$M_{applied}$)
240	0.00	0.00	0.00	0.01	0.01	(1.0) x W or E Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	+0.75(LL+SL+Wor	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.6%	1.5%	1.3%	1.3%	1.5%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	5.6%	13.0%	10.9%	7.4%	11.0%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	11.6%	28.8%	24.3%	9.4%	21.1%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	7.9%	29.6%	22.3%	9.6%	20.9%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	14.8%	39.3%	33.2%	14.8%	33.2%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\text{^}applied}/P_{c\perp allow}$	34.2%	91.1%	76.9%	34.2%	76.9%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\text{^}applied}/P_{c\perp allow}$	37.5%	99.9%	84.3%	37.5%	84.3%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	3.3%	2.5%	
Overall Check	OK	OK	OK	OK	OK	

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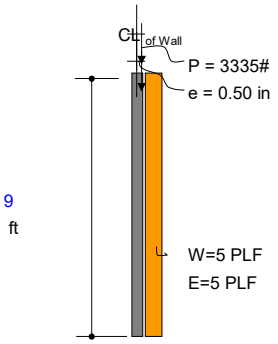
STUD WALL DESIGN

Girder Truss Support_(1) Stud — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	1251
P_{SL} (#/ft) =	2084
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	3335
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	5.00
E (PSF) =	5.00
TRIB. (IN) =	12

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 8.25 405 = $F_{c\perp}$ (psi

Use: (1) 2" X 6" @ 12" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	1	A =	8.25 in^2
b =	1.5 in	S =	7.56 in^3
d =	5.5 in	I =	20.80 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	6	15	13	28	30	
$M_{applied}$ (ft-#) =	26	69	59	80	102	
$P_{applied}$ (#) =	1251	3335	2814	1251	2814	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b^* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'_b (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c^* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
V_{allow} (#) =	825	949	949	1320	1320	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	425	489	489	681	681	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	4904	5295	5295	6084	6084	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.14	0.65	0.47	0.18	0.45	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.16	0.43	0.36	0.16	0.36	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	3341	3341	3341	3341	3341	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	3341	3341	3341	3341	3341	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/3652	L/4869	$L/(I * E / 15 * L * M_{applied})$
240	0.00	0.00	0.00	0.03	0.02	(1.0) x W or E Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+Wor	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.7%	1.6%	1.4%	2.1%	2.3%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	6.1%	14.2%	12.0%	11.7%	15.0%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	25.5%	63.0%	53.1%	20.6%	46.2%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	13.8%	64.6%	47.1%	18.2%	44.9%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	16.2%	43.1%	36.4%	16.2%	36.4%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	37.4%	99.8%	84.2%	37.4%	84.2%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	37.4%	99.8%	84.2%	37.4%	84.2%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	6.6%	4.9%	
Overall Check	OK	OK	OK	OK	OK	

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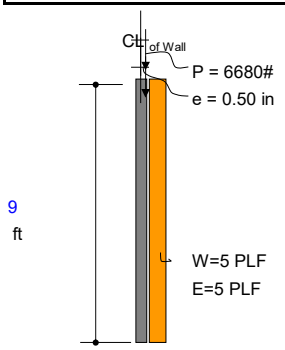
Page#:

DESIGNED: AEL

PROJECT:

STUD WALL DESIGN

Girder Truss Support_(2) Studs — 2015 NDS/2015 IBC



9 ft

AXIAL LOADS P	
P_{DL} (#/ft) =	2505
P_{SL} (#/ft) =	4175
P_{LL} (#/ft) =	0
P_{TOT} (#/ft) =	6680
e (IN) =	0.5
TRIB. (IN) =	12

LATERAL LOADS W	
W (PSF) =	5.00
E (PSF) =	5.00
TRIB. (IN) =	12

DESIGN VALUES		
F_b (psi) =	675	Hem Fir
F_v (psi) =	150	Stud Grade
F_c (psi) =	800	Bending X-X axis
$F_{c\perp}$ (psi) =	405	405
E (psi) =	1.20E+06	Incised, No
E_{min} (psi) =	4.40E+05	Wet Use, No
C_r =	1	Repetive, No
L_u (in) =	48	Full Bracing, Yes
c =	0.8	(Sawn Lumber)
K_e =	1	(Appendix G)
C_b =	1.00	(Bearing Area Factor)

Bearing wall Fire rated ? No

Fire Retardant FirePRO? No

Header Bearing Area (in^2) = 16.5 405 = $F_{c\perp}$ (psi

Use: (2) 2" X 6" @ 12" O.C. OK

MEMBER SIZE		SECTION PROPERTIES	
QUANITY	2	A =	16.50 in^2
b =	1.5 in	S =	15.13 in^3
d =	5.5 in	I =	41.59 in^4

	(Eq. 16-9)	(Eq. 16-10)	(Eq. 16-11)	(Eq. 16-12)	(Eq. 16-13)	
LOAD CASES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
L_u (ft) =	9	9	9	9	9	
$V_{applied}$ (#) =	12	31	26	34	43	
$M_{applied}$ (ft-#) =	52	139	117	106	161	
$P_{applied}$ (#) =	2505	6680	5636	2505	5636	
C_D =	1	1.15	1.15	1.6	1.6	
BENDING STESS CALCS		F_{bE} (psi)= 17476		C_{bF} = 1		(Table 4a Bending)
F_b* (psi)=	675	776	776	1080	1080	(Eq 3.7-1)
C_L =	1	1	1	1	1	(Eq 3.7-1)
F'$_b$ (psi)=	675	776	776	1080	1080	(Table 4.3.1)
AXIAL STESS CALCS		F_{cE} = 938		C_{cF} = 1		(Table 4a Compression)
L_e/d =	19.64	19.64	19.64	19.64	19.64	(3.7.1.4) <50 Le = (Ke)L
F_c* (psi)=	800	920	920	1280	1280	(Eq 3.7-1)
C_P =	0.742970896	0.697636299	0.697636299	0.576163928	0.576163928	(Eq 3.7-1)
F'c (psi)=	594	642	642	737	737	(Table 4.3.1)
ALLOWABLES	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+WorE)	
V_{allow} (#) =	1650	1898	1898	2640	2640	$V_{allow} = A * F_v * C_D / 1.5$
M_{allow} (ft - #) =	851	978	978	1361	1361	$M_{allow} = S*F_b*C_D*C_F*C_L*C_r$
P_{allow} (#) =	19614	21180	21180	24337	24337	$P_{allow} = A * F_c * C_D * C_F * C_P$
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$ =	0.09	0.35	0.26	0.10	0.24	(Eq 3.9-3)
$(f_c/F_{cE}) + (f_b/F_{bE})^2$ =	0.16	0.43	0.36	0.16	0.36	(Eq 3.9-4)
$P_{c\perp allow}$ on PL (#) =	6683	6683	6683	6683	6683	$P_{c\perp allow} = A * Fc * C_b$
$P_{c\perp allow}$ on Beam (#) =	6683	6683	6683	6683	6683	$P_{c\perp allow} = A * Fc$
Deflection L/	NA	NA	NA	L/7303	L/9738	L/(I * E / 15 * L *$M_{applied}$)
240	0.00	0.00	0.00	0.01	0.01	(1.0) x W or E Table 1604.3(f)
CHECKS	DL + LL	DL + SL	DL+0.75(LL+SL)	DL + W or E	DL+0.75(LL+SL+Wor	Actual △
SHEAR V	OK	OK	OK	OK	OK	
$V_{applied}/V_{allow}$	0.7%	1.6%	1.4%	1.3%	1.6%	
MOMENT M	OK	OK	OK	OK	OK	
$M_{applied}/M_{allow}$	6.1%	14.2%	12.0%	7.8%	11.8%	
AXIAL P	OK	OK	OK	OK	OK	
$P_{applied}/P_{allow}$	12.8%	31.5%	26.6%	10.3%	23.2%	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	OK	OK	OK	OK	OK	
$(f_c/F_c')^2 + f_b/(F_b(1-(f_c/F_{cE})$	8.9%	35.0%	26.0%	10.3%	23.9%	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	OK	OK	OK	OK	OK	
$(f_c/F_{cE}) + (f_b/F_{bE})^2$	16.2%	43.2%	36.4%	16.2%	36.4%	
AXIAL $P_\perp$ on PL	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	37.5%	100.0%	84.3%	37.5%	84.3%	
AXIAL $P_\perp$ on Beam	OK	OK	OK	OK	OK	
$P_{c\perp applied}/P_{c\perp allow}$	37.5%	100.0%	84.3%	37.5%	84.3%	
DEFLECTION	OK	OK	OK	OK	OK	
$D_{actual}/D_{allowed}$	0.0%	0.0%	0.0%	3.3%	2.5%	
Overall Check	OK	OK	OK	OK	OK	

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LATERAL DESIGN

By: AEL

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Job # 2288
Designed: AEL
Date: 10/15/19

Project: Alderwood

WIND ANALYSIS:

IBC 2015 / ASCE 7-10

Risk Category II I, II, III or IV Figure 26.5-1A I_W= 1.00 (ASCE Table 1.5-2)

110 Typical

Basic Wind Speed, V= 110 mph Section 26.5.1 **Exposure Category:** C Section 26.7.2
Mean Roof Height, h= 12.00 feet Alpha = 9.5
Parapet Height above roof, p= - feet Z_g = 900
Building Width, B= 60.00 feet
Building Length, L= 68.00 feet Enclosed Building
Natural Period = 0.0951 sec GCpi =+/- 0.18 Table 26.11-1
Natural Frequency = 10.5152 Hz >= 1 Hz Therefore, Rigid Structure per Section 26.9
G = 0.8500 gust effect factor defined in section 26.9
$K_z = 2.01\ (z/z_g)^{2/alpha}$ (ASCE 7-10 **Table 27.3-1**) Section 27.3.1
$K_{zt} = (1 + K_1 K_2 K_3)^2$ = 1.00 (ASCE 7-10 **Eq. 26.8-1**) Section 26.8.2
K_d = 0.85 (ASCE 7-10 **Table 26-1**) Section 26.6
I = 1.00 (ASCE 7-10 **Table 1.5-2**)

Windward: P = qGCp - qi(GCpi) (ASCE 7-10) **(Eq. 27.4-1)**
C_p = 0.8 (windward) Figure 27.4-1

	Table 27.3-1	Eq. 27.3-1	Eq. 27.4-1a	Eq. 27.4-1b	Eq. 27.4-1	Eq. 27.4-1
h	Sec. 27.3.1	Sec. 27.3.2	External	Internal	Total	Total
feet	K_z	q_z (psf)	$q_z GC_p$	$-q_i(GC_{pi})$	q G Cp + qi	q G Cp - qi(GCpi)
15	0.85	22.35	15.20	3.84	19.04	11.36
12	0.81	21.33	14.50	3.84	18.34	10.66
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-
12	$q=q_h=q_i$=	21.33	14.50	3.84	19.04	10.66
0	$q=q_p$=	0.00	-	-	-	Parapet

Totals

Windward + Leeward		h
Along B	Along L	feet
23.8 (14.3)	24.3 (14.6)	15
23.1 (13.8)	23.6 (14.1)	12
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
-	-	-
23.1 (13.8)	23.6 (14.1)	12
0.0 (0.0)	0.0 (0.0)	Parapet

( ) values are ASD = ULT x 0.6

Leeward: P = qGCp - qi(GCpi) (ASCE 7-10) **(Eq.27.4-1)** Figure 27.4-1

	External	Internal	Total	Total	
q_h (psf)	$q_h GC_p$	$-q_i(GC_{pi})$	q G Cp - qi(	q G Cp + qi(GCpi)	
21.33	-9.06	3.84	-5.22	-12.90	Along L
21.33	-8.58	3.84	-4.74	-12.42	Along B

C_p = -0.5 (Leeward along L)
C_p = -0.47 (Leeward along B)

Parapet: $P_p = q_p GC_{pn}$ (ASCE 7-10) **(Eq. 27.4-4)** Section 27.4.5

	Windward	Leeward
q_p(psf)	$q_p GC_{pn}$	$q_p GC_{pn}$
0.00	0.00	0.00

GC_{pn} = 1.5 (Windward Parapet)
GC_{pn} = -1.0 (Leeward Parapet)

Walls: P = q_h [(GC_p)-(GC_{pi})] (ASCE 7-10) **(Eq. 30.4-1)** h ≤ 60 ft Table 26.11-1

Area (ft^2)	GC_p(4&5)	Windward	GC_p(4)	Leeward	GC_p(5)	Leeward
10	1.00	25.2 (15.1)	-1.10	-27.3 (-16.4)	-1.40	-33.7 (-20.2)
25	0.93	23.7 (14.2)	-1.03	-25.9 (-15.5)	-1.26	-30.8 (-18.5)
50	0.88	22.6 (13.6)	-0.98	-24.7 (-14.8)	-1.16	-28.5 (-17.1)
200	0.77	20.3 (12.2)	-0.87	-22.4 (-13.4)	-0.94	-24.0 (-14.4)

GC_{pi} = 0.18 (Windward)
GC_{pi} = -0.18 (Leeward)
q_h(psf) = 21.33

( ) values are ASD = ULT x 0.6

Hazards by Location

Search Information

Coordinates: 47.75206943, -122.60971445

Elevation: 360 ft

Timestamp: 2020-01-30T20:30:09.475Z

Hazard Type: Wind

ASCE 7-16

MRI 10-Year	67 mph
MRI 25-Year	74 mph
MRI 50-Year	78 mph
MRI 100-Year	83 mph
Risk Category I	92 mph
Risk Category II	98 mph
Risk Category III	105 mph
Risk Category IV	108 mph

ASCE 7-10

MRI 10-Year	72 mph
MRI 25-Year	79 mph
MRI 50-Year	85 mph
MRI 100-Year	91 mph
Risk Category I	100 mph
Risk Category II	110 mph
Risk Category III-IV	115 mph

ASCE 7-05

ASCE 7-05 Wind Speed	85 mph

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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Job # 2288 **Sheet:**
Designed: AEL **Date:** 2/10/20
Checked: **Date:**
Project: Alderwood

SEISMIC ANALYSIS:

IBC 2015 / ASCE 7-10

Site Class:

Site Class: D (IBC 1613.3.2, ASCE Table 20.3-1)

Site Location:

Latitude: 47.75207 Longitude: -122.60971

Site Coefficients: (USGS Open-File Report 01-437)

S_S =	1.297	F_a =	1.00
S_1 =	0.518	F_V =	1.50
$S_{MS} = F_a * S_S$ =	1.297	(IBC Eq.16-37)	
$S_{M1} = F_V * S_1$ =	0.777	(IBC Eq.16-38)	

Spectral Response Parameters:

$S_{DS} = 2/3 * S_{MS}$ =	0.8647	(IBC Eq.16-39)
$S_{D1} = 2/3 * S_{M1}$ =	0.5180	(IBC Eq.16-40)

Structure Period:

$T_a = C_t * (h_n)^x$ =	0.1039	(ASCE Eq. 12.8-7)
h_n =	9	Ft.
C_t =	0.02	(ASCE Table 12.8-2)
x =	0.75	(ASCE Table 12.8-2)
C_u =	1.4	(ASCE Table 12.8-1)
$T_{(MAX)} = C_u * T_a$ =	0.1455	(ASCE 12.8.2)

Seismic Use Group:

Risk Category: I or II I or II, III, IV (ASCE7 11.5.1) I = 1.00 (ASCE Table 1.5-2)

Seismic Design Category:

Seismic Design Category:	D	(IBC 1613.3.5, ASCE 11.6)
Seismic Design Category(S_{DS}):	D	IBC Table 1613.3.5(1), ASCE Table 11.6-1 Short Period (S_{DS})
Seismic Design Category(S_{D1}):	D	IBC Table 1613.3.5(2), ASCE Table 11.6-2 1 Second Period (S_{D1})

Seismic Response Coefficients

$C_S = S_{DS}/(R/I_E)$ =	0.1330	(ASCE Eg 12.8-2)		
R =	6.50	(ASCE 7 Table 12.2-1)	wood shear wall	
I_E =	1.00	(ASCE Table 1.5-2)		
CS(Max) =	0.7668			
$S_{D1} / ((R / I_E) * Ta)$ =	0.7668	(ASCE Eq 12.8-3)	for T <= T_L OK	T_L= 4
$S_{D1} * T_L / ((R / I_E) * Ta^2)$=	29.5157	(ASCE Eq 12.8-4)	for T <= T_L OK	ASCE Section 12.8 & 11.4.5
CS(Min) =	0.04			(ASCE fig. 22-12 thru 22-16)
0.044 S_{DS} I >=.01 =	0.04	(ASCE Eq 12.8-5)		
Not Required S1<=0.6g		(ASCE Eq 12.8-6)		
$V = C_S * W$ =	0.1330	W (Ultimate Strength)		
$V_a = C_S/1.4 * W$ =	0.0950	W (Allowable Stress)		

Hazards by Location

Search Information

Coordinates: 47.75206943, -122.60971445

Elevation: 360 ft

Timestamp: 2020-01-30T20:31:32.742Z

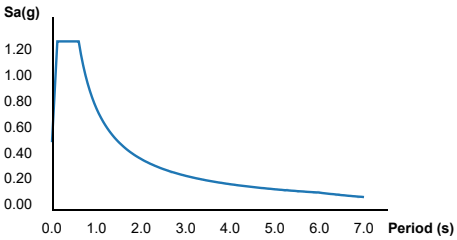
Hazard Type: Seismic

Reference Document: ASCE7-10

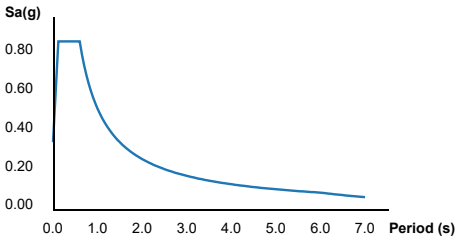
Risk Category: II

Site Class: D

MCER Horizontal Response Spectrum



Design Horizontal Response Spectrum



Basic Parameters

Name	Value	Description
S_S	1.297	MCE_R ground motion (period=0.2s)
S_1	0.518	MCE_R ground motion (period=1.0s)
S_{MS}	1.297	Site-modified spectral acceleration value
S_{M1}	0.777	Site-modified spectral acceleration value
S_{DS}	0.865	Numeric seismic design value at 0.2s SA
S_{D1}	0.518	Numeric seismic design value at 1.0s SA

Additional Information

Name	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2s
F_v	1.5	Site amplification factor at 1.0s
CR_S	0.996	Coefficient of risk (0.2s)
CR_1	0.955	Coefficient of risk (1.0s)
PGA	0.5	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.5	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.297	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.302	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.5	Factored deterministic acceleration value (0.2s)
S1RT	0.518	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.543	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	0.6	Factored deterministic acceleration value (1.0s)
PGAd	0.5	Factored deterministic acceleration value (PGA)

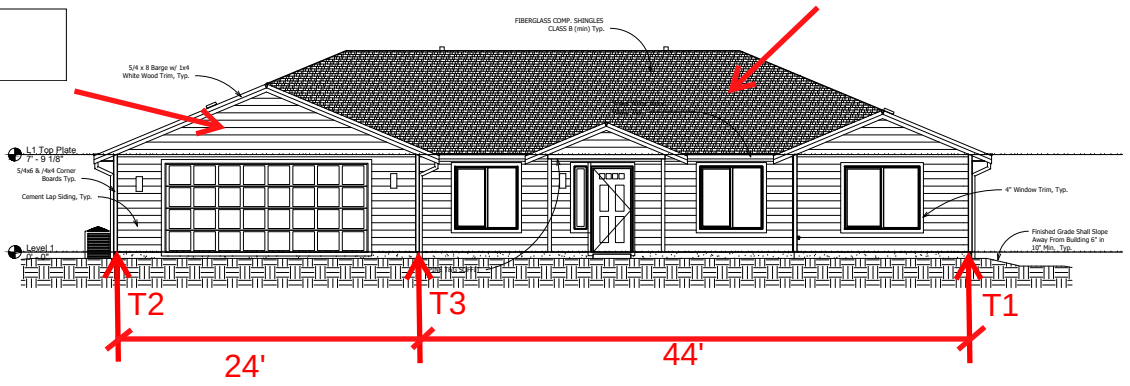
The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

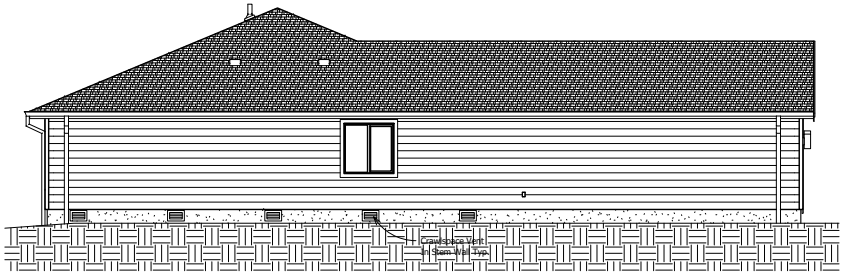
Windward
9psf(77ft^2/24'+8'/2)=65plf

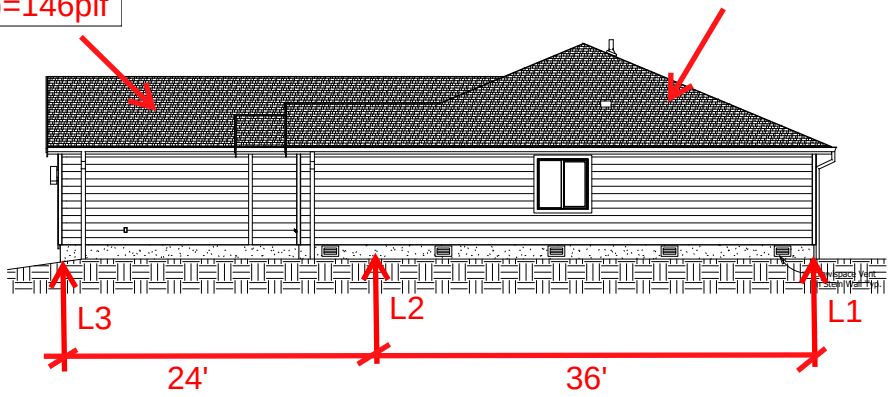
14.6psf(444ft^2/68'+8'/2)=154plf

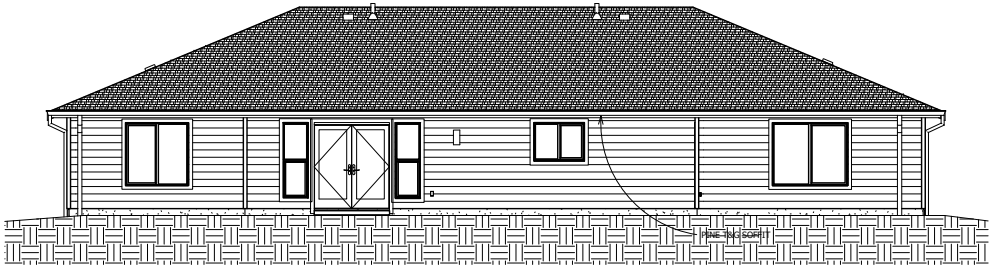


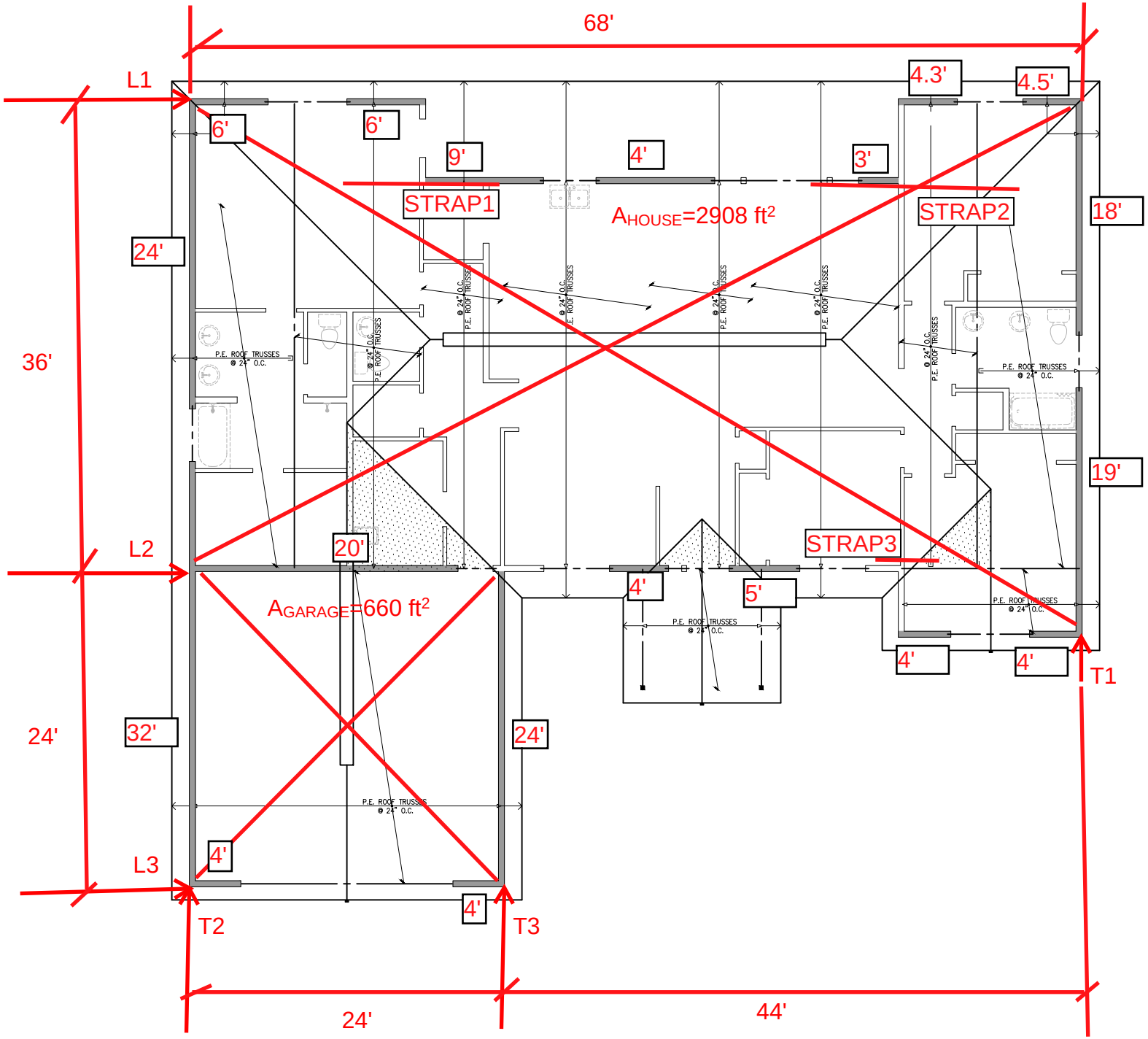
14.6psf(248ft^2/41'+8'/2)=146plf

14.6psf(6'+8'/2)=146plf









Roof Framing Plan

SCALE 1/4"=1'-0"

Permit Number: 20-01074

Seismic Weights

1 Story	2288								
Alderwood									
House	DL(PSF)	∑Area (ft^2)		W(kips)		∑Total W (kips)			
Roof:	15.0	2908.0		43.6					
				0.0					
		∑L(ft)	H/2(ft)	W(kips)			Va=Cs/1.4*W	/ L(ft) =	PLF
Walls:	12.0	216.0	4.5	11.7		Cs/1.4=	0.0950		
Below →				0.0		**55.3**	***5.25***	36.00	***146*** "L"
	12.0	204.0	4.5	11.0					
Below →				0.0		**54.6**	***5.19***	68.00	***76*** "T"

Garage	DL(PSF)	∑Area (ft^2)		W(kips)		∑Total W (kips)			
Roof:	15.0	660.0		9.9					
				0.0					
		∑L(ft)	H/2(ft)	W(kips)					
Walls:	12.0	48.0	4.5	2.6					"L"
Below →				0.0		**12.5**	***1.19***	24.00	***49***
	12.0	48.0	4.5	2.6					
Below →				0.0		**12.5**	***1.19***	24.00	***49*** "T"

L1												
Level	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Vw Each	**Vw Total(k)**
Roof	146	18.0									2628	**2.63**

L1	House											
Level	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Vs Each	**Vs Total (k)**
Roof	146	18.0									2628	**2.63**

L2												
Level	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Vw Each	**Vw Total(k)**
Roof	146	18.0	146	12.0							4380	**4.38**

L2	House		Garage									
Level	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Vs Each	**Vs Total (k)**
Roof	146	18.0	49	12.0							3216	**3.22**

L3												
Level	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Vw Each	**Vw Total(k)**
Roof	146	12.0									1752	**1.75**

L3	Garage											
Level	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Vs Each	**Vs Total (k)**
Roof	49	12.0									588	**0.59**

T1												
Level	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Vw Each	**Vw Total(k)**
Roof	154	34.0									5236	**5.24**

T1	House											
Level	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Vs Each	**Vs Total (k)**
Roof	76	34.0									2584	**2.58**

T2												
Level	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Vw Each	**Vw Total(k)**
Roof	154	34.0									5236	**5.24**

T2	House		Garage									
Level	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Vs Each	**Vs Total (k)**
Roof	76	34.0	49	12.0							3172	**3.17**

T3												
Level	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Wind PLF	Trib (ft)	Vw Each	**Vw Total(k)**
Roof	65	12.0									780	**0.78**

T3	Garage											
Level	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Seismic PLF	Trib (ft)	Vs Each	**Vs Total (k)**
Roof	49	12.0									588	**0.59**

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Job # 2288
Designed: AEL **Date:** 2/10/20
Checked: **Date:**

Project: Alderwood

L1

0.5 (ft) holdown dist from end

Roof:																						
W1				Wind (ASD):	2.63	kips	71	#/ft													75	#/ft
				Seismic (ASD):	2.63	kips	71	#/ft													75	#/ft
	6	ft	6	ft	9	ft	4	ft	3	ft	4.3	ft	4.5	ft		ft		ft	9	ft		
Distribution L	6	ft	6	ft	9	ft	3.556	ft	2	ft	4.109	ft	4.5	ft	0	ft	0	ft	36.8	Actual		
h/b_s =	1.5	W1	1.5	W1	1	W1	2.25	W1	3	W1	2.093	W1	2	W1					35.164	Distribu		
DL w (plf) =	117		292		426		426		426		292		117									
$0.6M_R$ (#-ft) =	1264		3154		10352		2045		1150		1620		711		0		0					
	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E				
PLF	75	75	75	75	75	75	66	66	50	50	71	71	75	75	0	0	0	0				
M_{ot} (#-ft) =	4036	4036	4036	4036	6054	6054	2392	2392	1345	1345	2764	2764	3027	3027	0	0	0	0				
F (#) =	504	504	160	160	-506	-506	99	99	78	78	301	301	579	579	0	0	0	0				
Holdown	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-				
1.05	No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK					

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Plan. Design. Manage

Job # 2288
Designed: AEL **Date:** 2/10/20
Checked: **Date:**

Project: Alderwood

L2

0.5 (ft) holdown dist from end

Roof:																						
W1			Wind (ASD):	4.38	kips	118	#/ft														123	#/ft
			Seismic (ASD):	3.22	kips	87	#/ft														90	#/ft
	20	ft		4	ft	5	ft	4	ft	4	ft		ft		ft		ft		ft		9 ft	
																					37	Actual
Distribution L	20	ft		3.556	ft	5	ft	3.556	ft	3.556	ft	0	ft	0	ft	0	ft	0	ft		35.667	Distribu
h/b_s =	0.45	W1		2.25	W1	1.8	W1	2.25	W1	2.25	W1											
DL w (plf) =	110			327		327		117		117												
0.6M_R (#-ft) =	13200			1570		2453		562		562		0		0		0		0				
	W	E		W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E			
PLF	123	90		109	80	123	90	109	80	109	80	0	0	0	0	0	0	0	0			
M_{ot} (#-ft) =	22105	16230		3930	2885	5526	4058	3930	2885	3930	2885	0	0	0	0	0	0	0	0			
F (#) =	457	155		674	376	683	357	962	664	962	664	0	0	0	0	0	0	0	0			
Holdown	1000	-		1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-			
1.05	No Holdown OK			No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK				

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Job # 2288

Designed: AEL **Date:** 2/10/20

Checked: **Date:**

Project: Alderwood

L3

0.5 (ft) holdown dist from end

Roof:																					
W1			Wind (ASD):	1.75 kips	219 #/ft															246 #/ft	
			Seismic (ASD):	0.59 kips	74 #/ft															83 #/ft	
	4 ft		4 ft		ft		ft		ft		ft		ft		ft		ft		ft	9 ft	
Distribution L	3.556 ft		3.556 ft		0 ft		0 ft		0 ft		0 ft		0 ft		0 ft		0 ft		0 ft	8	Actual
h/b_s =	2.25	W1	2.25	W1																7.1111	Distribu
DL w (plf) =	117		117																		
$0.6M_R$ (#-ft) =	562		562		0		0		0		0		0		0		0				
	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E			
PLF	219	74	219	74	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
M_{ot} (#-ft) =	7884	2646	7884	2646	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
F (#) =	2092	596	2092	596	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Holdown	2640	ST1	2640	ST1	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-			
1.05	STHD10 OK		STHD10 OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK				

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Job # 2288

Designed: AEL **Date:** 2/10/20

Checked: **Date:**

Project: Alderwood

T1

0.5 (ft) holdown dist from end

Roof:																					
W1				Wind (ASD):	5.24 kips		142 #/ft													142 #/ft	
				Seismic (ASD):	2.58 kips		70 #/ft													70 #/ft	
																				9 ft	
	18 ft		19 ft		ft		ft		ft		ft		ft		ft		ft		ft	37	Actual
Distribution L	18 ft		19 ft		0 ft		0 ft		0 ft		0 ft		0 ft		0 ft		0 ft		0 ft	37	Distribu
h/b_s =	0.5	W1	0.474	W1																	
DL w (plf) =	162		162																		
$0.6M_R$ (#-ft) =	15746		17545		0		0		0		0		0		0		0				
	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E			
PLF	142	70	142	70	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
M_{ot} (#-ft) =	22925	11314	24199	11942	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
F (#) =	410	-253	360	-303	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Holdown	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-			
1.05	No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK				

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Job # 2288

Designed: AEL **Date:** 2/10/20

Checked: **Date:**

Project: Alderwood

T2

0.5 (ft) holdown dist from end

Roof:			Wind (ASD):	5.24 kips	94 #/ft									94 #/ft	
W1			Seismic (ASD):	3.17 kips	57 #/ft									57 #/ft	
	32 ft		24 ft		ft		ft		ft		ft		ft		9 ft
Distribution L	32 ft		24 ft		0 ft		0 ft		0 ft		0 ft		0 ft		56
h/b_s =	0.281 W1		0.375 W1												
DL w (plf) =	162		162												
0.6M_R (#-ft) =	49766		27994		0		0		0		0		0		0
	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E	W	E
PLF	94	57	94	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M_{ot} (#-ft) =	26928	16313	20196	12235	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F (#) =	-725	-1062	-332	-671	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Holdown	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-
1.05	No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK			

Actual
Distribu

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Job # 2288
Designed: AEL **Date:** 2/10/20
Checked: **Date:**

Project: Alderwood

T3

0.5 (ft) holdown dist from end

Roof:			Wind (ASD):	0.78 kips	33 #/ft								33 #/ft	
W1			Seismic (ASD):	0.59 kips	25 #/ft								25 #/ft	
	24 ft		ft		ft		ft		ft		ft		ft	9 ft
Distribution L	24 ft		0 ft		0 ft		0 ft		0 ft		0 ft		0 ft	24 Actual / 24 Distribu
h/b_s =	0.375 W1													
DL w (plf) =	282													
0.6M_R (#-ft) =	48730		0		0		0		0		0		0	
	W	E	W	E	W	E	W	E	W	E	W	E	W	E
PLF	33	25	0	0	0	0	0	0	0	0	0	0	0	0
M_{ot} (#-ft) =	7020	5292	0	0	0	0	0	0	0	0	0	0	0	0
F (#) =	-1775	-1848	0	0	0	0	0	0	0	0	0	0	0	0
Holdown	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-	1000	-
1.05	No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK		No Holdown OK	

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DRAG STRAP CALCULATIONS

STRAP1

CHORD FORCE

Diaphragm Width (l) : 68 ft Diaphragm Depth (D) : 30 ft Wind Load: 154 plf

M = AT 18' = 69.0 kft

F = $\frac{M}{D}$ = 1.15 kips

SHEAR TRANSFER

Shearwall Length 1:	6 ft	Shear Force 1	75 plf
Shearwall Length 2:	6 ft	Shear Force 2	75 plf

F = ∑Shearwall LengthXShear Force = 1.35 kips

Blocking Capacity: 240 plf

Blkg= 6 ft

STRAP2

CHORD FORCE

Diaphragm Width (l) : 68 ft Diaphragm Depth (D) : 30 ft Wind Load: 154 plf

M = AT 14' = 58.0 kft

F = $\frac{M}{D}$ = 0.967 kips

SHEAR TRANSFER

Shearwall Length 1:	4.3 ft	Shear Force 1	71 plf
Shearwall Length 2:	4.5 ft	Shear Force 2	75 plf
Shearwall Length 3:	ft	Shear Force 2	plf

F = ∑Shearwall LengthXShear Force = 0.643 kips

Blocking Capacity: 240 plf

Blkg= 4 ft

STRAP3

CHORD FORCE

Diaphragm Width (l) : 68 ft Diaphragm Depth (D) : 30 ft Wind Load: 154 plf

M = AT 14' = 58.0 kft

F = $\frac{M}{D}$ = 0.967 kips

SHEAR TRANSFER

Shearwall Length 1:	4 ft	Shear Force 1	109 plf
Shearwall Length 2:	4 ft	Shear Force 2	109 plf

F = ∑Shearwall LengthXShear Force = 1.308 kips