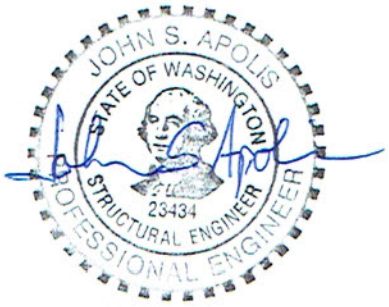
Structural Calculations Cover Sheet

Project Number: 2019.089 **Date:** January 3rd 2020
Project Name: 4270 Ardekani
REVISED 6/4/21

Structural Design For: Structural design for a new residence.
Construction Type: Conventional wood framed construction.

CODES

2015 International Building Code (IBC)
2015 NDS
ASCE 7-10



LOADS

Floor Live Load	40 psf
Dead Loads	As required
Roof snow Load	25 psf
Deck Load	60 psf
Wind	110 mph, Exposure C, Per ASCE 7-10 Section 28, Kzt = 1.0
Seismic	Per ASCE 7-10 Section 12

Peak Ground Accelerations (PGA) based on OSHPD, by Lat/Lon.
PGA 1 sec = .538 PGA .2 sec = 1.401 %V = .144 * DL

Material Design Values

Soils	Minimum 2,000 psf allowed bearing (subject to field verification)		
	Per Geotech report by GEO Group Northwest, Inc. dated Nov. 4th 2019		
Concrete	f'c=2,500 psi; 5-1/2 sack mix, or alternate mix pre-approved by bldg. dept.		
Reinforcing	Grade 40 or 60; Fy=40,000 psi minimum		
Sawn Lumber	Joists, Rafters:		Hem-Fir #2 and better
	Beams:	4x_:	DF-L #2
		6x_:	DF-L #2
		Posts:	DF-L #2
	Studs & Plates:	Hem-Fir Standard	
Glu-Lam Beams	24F-V4 for simple span beams, 24F-V8 for cantilevered beams		
Parallam Beams	2.0E PSL, Fb=2,900 psi, Fv=290 psi, E=2.0*10^6 psi (minimum)		
Microllam Beams	1.9E LVL, Fb=2,600 psi, Fv=285 psi, E=1.9*10^6 psi (minimum)		
Anchor Bolts	ASTM A325 hold down bolts, F1554 Anchor Bolts, A307 other bolts		

CONSULTING STRUCTURAL ENGINEERING SERVICES, INC.
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Structural Engineering Consulting and Design

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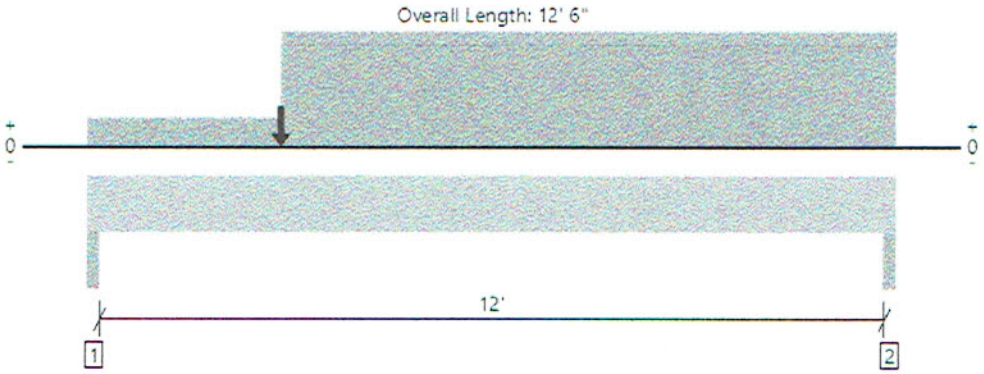
MEMBER REPORT

PASSED

R1

Roof, R1 12' Header

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5013 @ 12' 4 1/2"	10725 (3.00")	Passed (47%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4607 @ 1' 3"	13409	Passed (34%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	16086 @ 5' 10"	30360	Passed (53%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.195 @ 6' 2"	0.245	Passed (L/753)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.307 @ 6' 2"	0.613	Passed (L/479)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/600) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 6" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 6" o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 12' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	3.00"	3.00"	1.50"	1782	3075	4857	None
2 - Trimmer - SPF	3.00"	3.00"	1.50"	1817	3195	5012	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 12' 6"	N/A	16.0	--	
1 - Uniform (PSF)	3' to 12' 6"	16'	16.0	30.0	Default Load
2 - Uniform (PSF)	0 to 3'	4'	16.0	30.0	
3 - Point (lb)	3'	N/A	775	1350	

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

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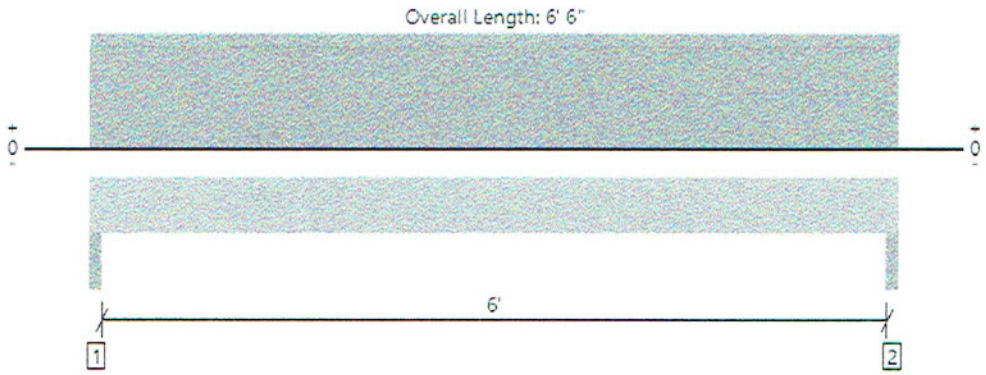
MEMBER REPORT

PASSED

R2

Roof, R2 6' Header

1 piece(s) 6 x 10 Hem-Fir No. 2



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)	2734 @ 1 1/2"	6683 (3.00")	Passed (41%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1858 @ 1' 1/2"	5608	Passed (33%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4108 @ 3' 3"	5352	Passed (77%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.043 @ 3' 3"	0.208	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.067 @ 3' 3"	0.313	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 6" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 6' 6" o/c based on loads applied, unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	3.00"	3.00"	1.50"	979	1755	2734	None
2 - Trimmer - SPF	3.00"	3.00"	1.50"	979	1755	2734	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	13.2	--	
1 - Uniform (PSF)	0 to 6' 6"	18'	16.0	30.0	Default Load

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File Name: 4270 Ardekani

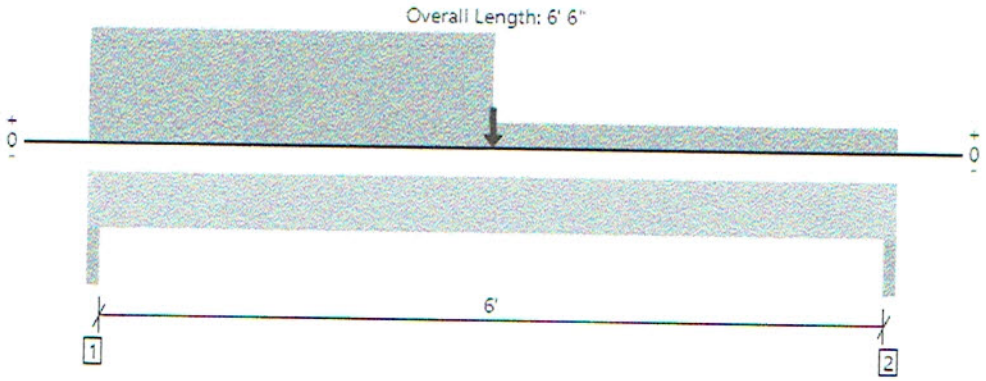
MEMBER REPORT

PASSED

R3

Roof, R3 6' Header @ Girder Truss

1 piece(s) 6 x 12 Hem-Fir No. 2



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3227 @ 1 1/2"	6683 (3.00")	Passed (48%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2208 @ 1' 2 1/2"	6789	Passed (33%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5635 @ 3' 3"	7842	Passed (72%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.029 @ 3' 2 1/16"	0.208	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.046 @ 3' 2 1/16"	0.313	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 6" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 6' 6" o/c based on loads applied, unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	3.00"	3.00"	1.50"	1163	2064	3227	None
2 - Trimmer - SPF	3.00"	3.00"	1.50"	785	1356	2141	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 3' 3"	18'	16.0	30.0	Default Load
2 - Uniform (PSF)	3' 3" to 6' 6"	4'	16.0	30.0	
3 - Point (lb)	3' 3"	N/A	700	1275	

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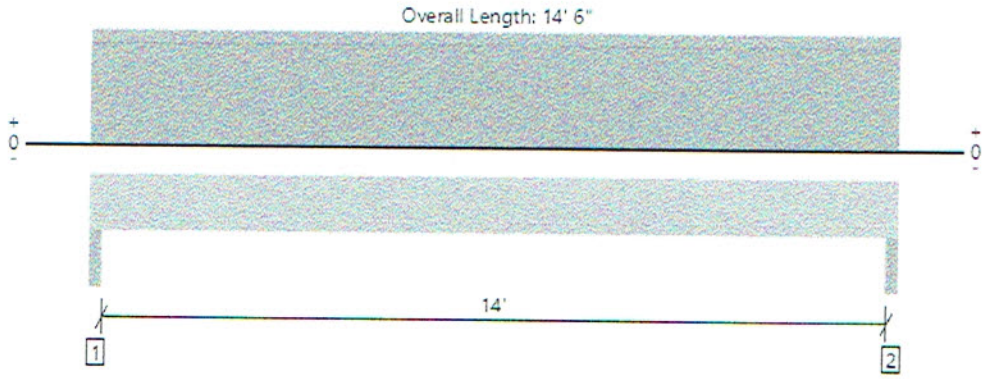
MEMBER REPORT

PASSED

R4

Roof, R4 14' Roof Beam

1 piece(s) 5 1/4" x 14" 2.0E Parallam® PSL



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)	6837 @ 1 1/2"	9844 (3.00")	Passed (69%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	5501 @ 1' 5"	16342	Passed (34%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	23936 @ 7' 3"	46854	Passed (51%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.256 @ 7' 3"	0.285	Passed (L/669)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.402 @ 7' 3"	0.712	Passed (L/425)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/600) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 14' 6" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 14' 6" o/c based on loads applied, unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	3.00"	3.00"	2.08"	2487	4350	6837	None
2 - Trimmer - SPF	3.00"	3.00"	2.08"	2487	4350	6837	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 14' 6"	N/A	23.0	--	
1 - Uniform (PSF)	0 to 14' 6"	20'	16.0	30.0	Default Load

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File Name: 4270 Ardekani

FORTE WEB

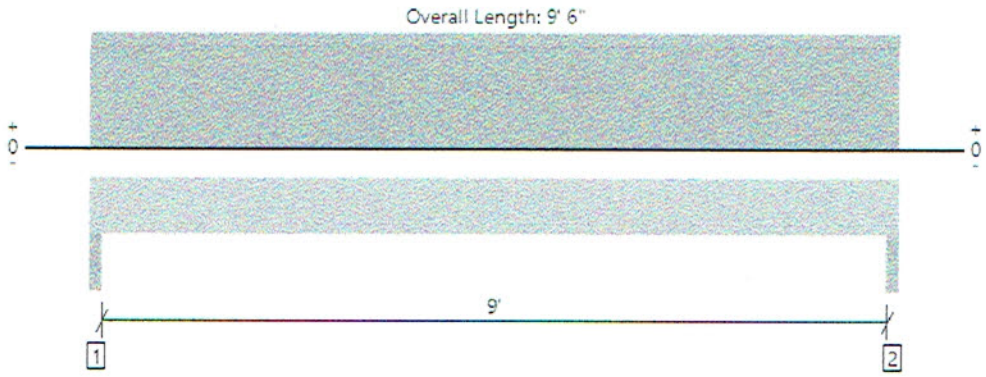
MEMBER REPORT

PASSED

R5

Roof, R5 9' Header

1 piece(s) 5 1/2" x 9" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4427 @ 1 1/2"	10725 (3.00")	Passed (41%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3495 @ 1'	10057	Passed (35%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	9968 @ 4' 9"	17078	Passed (58%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.164 @ 4' 9"	0.308	Passed (L/675)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.255 @ 4' 9"	0.463	Passed (L/435)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 9' 6" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 9' 6" o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 9' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - SPF	3.00"	3.00"	1.50"	1577	2850	4427	None
2 - Trimmer - SPF	3.00"	3.00"	1.50"	1577	2850	4427	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 9' 6"	N/A	12.0	--	
1 - Uniform (PSF)	0 to 9' 6"	20'	16.0	30.0	Default Load

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MEMBER REPORT

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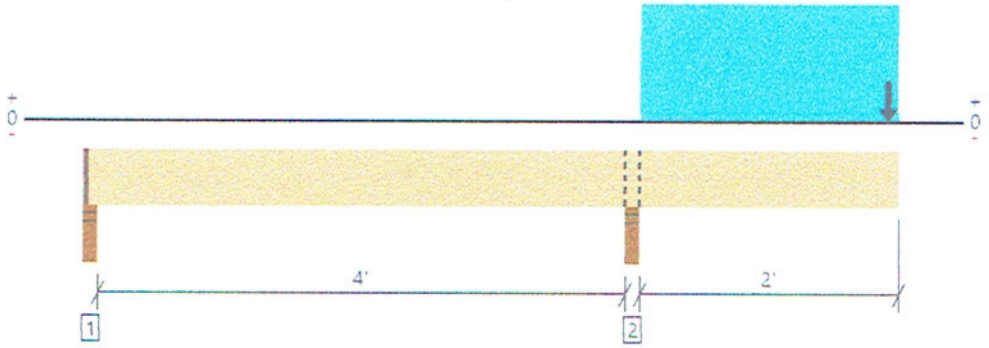
R6

Roof, R6 sistered cantilever joist

1 piece(s) 4 x 8 Hem-Fir No. 2 @ 24" OC

ROOF OVERHANG

Overall Length: 6' 7"



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)	384 @ 4' 5 1/4"	4961 (3.50")	Passed (8%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	220 @ 5' 2 1/4"	2918	Passed (8%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-402 @ 4' 5 1/4"	3734	Passed (11%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.014 @ 6' 7"	0.200	Passed (2L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.021 @ 6' 7"	0.215	Passed (2L/999+)	--	1.0 D + 1.0 S (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - SPF	3.50"	2.25"	1.50"	-33	-62	-95	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	3.50"	1.50"	134	251	385	Blocking

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

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	4' 6" to 6' 7"	24"	16.0	30.0	Default Load
2 - Point (PLF)	6' 6"	24"	16.0	30.0	

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File Name: 4270 Ardekani

FORTE WEB

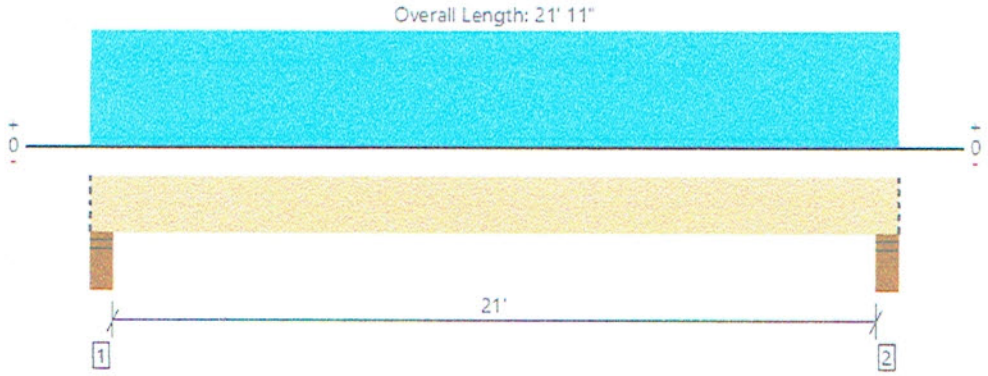
MEMBER REPORT

PASSED

R7

Roof, Floor: Drop Beam

1 piece(s) 7" x 16" 2.0E Parallam® PSL



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)	8954 @ 4"	16363 (5.50")	Passed (55%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	7490 @ 1' 9 1/2"	24901	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	46120 @ 10' 11 1/2"	80396	Passed (57%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.519 @ 10' 11 1/2"	0.708	Passed (L/491)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.832 @ 10' 11 1/2"	1.063	Passed (L/307)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - SPF	5.50"	5.50"	3.01"	3365	5589	8954	Blocking
2 - Stud wall - SPF	5.50"	5.50"	3.01"	3365	5589	8954	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	21' 11" o/c	
Bottom Edge (Lu)	21' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 21' 11"	N/A	35.1	--	
1 - Uniform (PSF)	0 to 21' 11" (Front)	17"	16.0	30.0	

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

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

Weyerhaeuser

7/7/2020 5:36:31 PM UTC
ForteWEB v3.0, Engine: V8.1.1.11, Data: V8.0.0.0
File Name: 4270 Ardekani

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	9-Dec-19
Architect:		Page number:	R8

Post Design (Combined Axial and Moment Loading)

2015 INT. Building Code (IBC) **2015 NDS**

Beam Description: Exterior Post @ South

Enter '1' for **wind load**: 1
Enter '1' for **repetitive member**:
Enter '1' for **wet use**:

Geometry and loads:

Height	8 ft	w(d)	140.0 plf
P	6086 lbs	w(b)	0 plf
Le(d)	8 ft	Le(b)	8 ft

Material Properties:

Fb1	850 psi	Fb(d)'	977.5 psi
Fb2	850 psi	Fb(b)'	977.5 psi
Fc	1300 psi	Fc'	944 psi
E	1.3 x10^6psi	E'	1.3 x10^6psi
Emin	0.47 x10^6psi	Emin'	0.47 x10^6psi

Selected Member: HF#2 5.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.18
Section Modulus (b):	27.7 in^3	Rb(b)	4.18
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided		Required	
FcE(d)	1268 psi	>	fc	201 psi
FcE(b)	1268 psi	>	fc	201 psi
FbE	32313 psi	>	fb(d)	485 psi
FbE	32313 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3 0.63 < 1.0

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	9-Dec-19
Architect:		Page number:	R9

Post Design (Combined Axial and Moment Loading)

2015 INT Building Code (IBC) **2015 NDS**

Beam Description: Posts @ Stair Opening Exterior

Enter '1' for **wind load**: 1

Enter '1' for **repetitive member**:

Enter '1' for **wet use**:

Geometry and loads:

Height	20 ft	w(d)	52.0 plf
P	3000 lbs	w(b)	0 plf
Le(d)	20 ft	Le(b)	20 ft

Material Properties:

Fb1	2400 psi	Fb(d)'	2760 psi
Fb2	2400 psi	Fb(b)'	2760 psi
Fc	2500 psi	Fc'	383 psi
E	1.8 x10^6psi	E'	1.8 x10^6psi
Emin	0.91488 x10^6psi	Emin'	0.91488 x10^6psi

Selected Member: 1.8E PSL 5.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	6.61
Section Modulus (b):	27.7 in^3	Rb(b)	6.61
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided		Required	
FcE(d)	395 psi	>	fc	99 psi
FcE(b)	395 psi	>	fc	99 psi
FbE	25159 psi	>	fb(d)	1125 psi
FbE	25159 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3 0.61 < 1.0

FORTE WEB

MEMBER REPORT

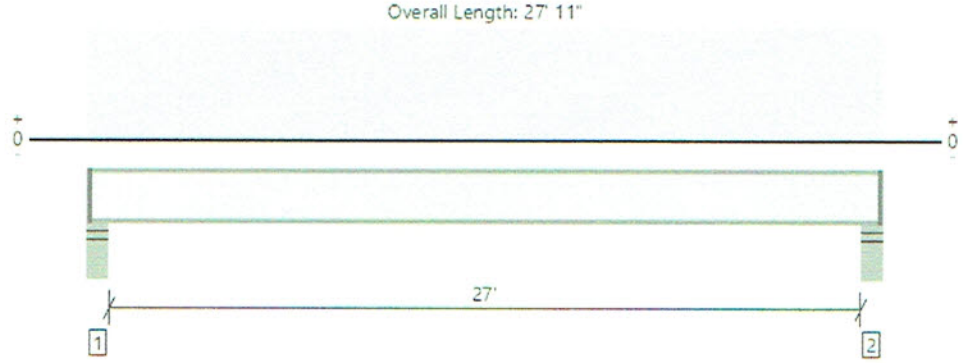
PASSED

U1

Upper, U1 Upper Floor Joists Long

1 piece(s) 16" TJI® 560 @ 16" OC

Overall Length: 27' 11"



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)	961 @ 4 1/2"	1725 (3.50")	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	936 @ 5 1/2"	2710	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6396 @ 13' 11 1/2"	12925	Passed (49%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.522 @ 13' 11 1/2"	0.679	Passed (L/625)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.678 @ 13' 11 1/2"	1.358	Passed (L/481)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	32	Any	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 8' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 27' 9" 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" Weyerhaeuser Edge™ 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 - Stud wall - SPF	5.50"	4.25"	1.75"	223	744	967	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	1.75"	223	744	967	1 1/4" Rim Board

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 27' 11"	16"	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
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/18/2019 4:41:16 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

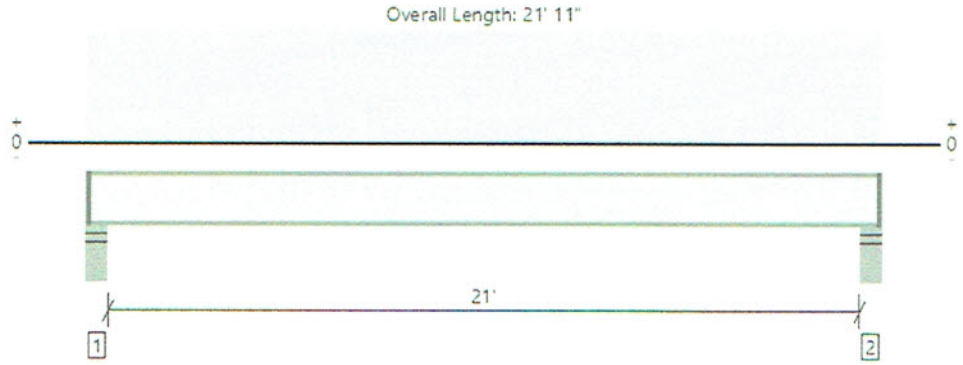
MEMBER REPORT

PASSED

U2

Upper, U2 Upper Floor Joists Typical

1 piece(s) 16" TJI® 110 @ 16" 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)	753 @ 4 1/2"	1375 (3.50")	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	728 @ 5 1/2"	2145	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3883 @ 10' 11 1/2"	4280	Passed (91%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.405 @ 10' 11 1/2"	0.529	Passed (L/628)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.526 @ 10' 11 1/2"	1.058	Passed (L/483)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	38	Any	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 3' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 21' 9" 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" Weyerhaeuser Edge™ 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 - Stud wall - SPF	5.50"	4.25"	1.75"	175	584	759	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	1.75"	175	584	759	1 1/4" Rim Board

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 21' 11"	16"	12.0	40.0	Default Load

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Weyerhaeuser

SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/18/2019 4:42:01 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

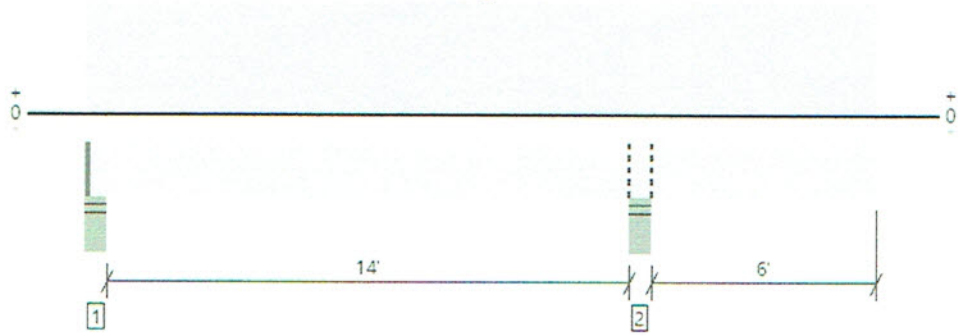
PASSED

U3

Upper, U3 Upper Floor Joists Cantilever

1 piece(s) 1 3/4" x 16" 2.0E Microllam® LVL @ 16" OC

Overall Length: 20' 11"



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)	1022 @ 14' 8 1/4"	4091 (5.50")	Passed (25%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	482 @ 13' 1 1/2"	5320	Passed (9%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1624 @ 7' 2 5/8"	16179	Passed (10%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.059 @ 20' 11"	0.311	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.060 @ 20' 11"	0.623	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)
TJ-Pro™ Rating	66	Any	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).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 20' 10" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 20' 10" o/c unless detailed otherwise.
- A 4% increase in the moment capacity has been added to account for repetitive member usage.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ 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 - Stud wall - SPF	5.50"	4.25"	1.50"	99	402/-67	501/-67	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	5.50"	1.50"	236	786	1022	Blocking

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 20' 11"	16"	12.0	40.0	Default Load

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SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
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12/10/2019 5:05:02 AM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

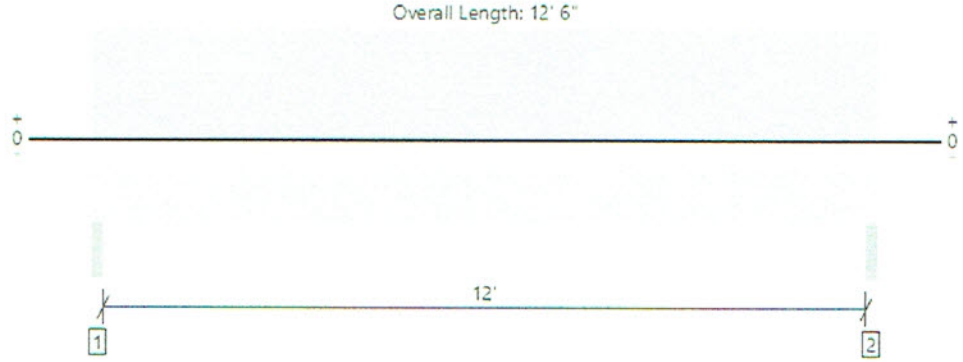
PASSED

U4

Upper, U4 12' Header

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam

Overall Length: 12' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4650 @ 1 1/2"	10725 (3.00")	Passed (43%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3720 @ 1' 3"	11660	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	13957 @ 6' 3"	26400	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.199 @ 6' 3"	0.408	Passed (L/739)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.264 @ 6' 3"	0.613	Passed (L/556)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 12' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 12' 6" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 12' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Trimmer - SPF	3.00"	3.00"	1.50"	1150	3500	4650	None
2 - Trimmer - SPF	3.00"	3.00"	1.50"	1150	3500	4650	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 6"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 12' 6"	14'	12.0	40.0	Default Load

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SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.084 4270

12/10/2019 6:42:05 AM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

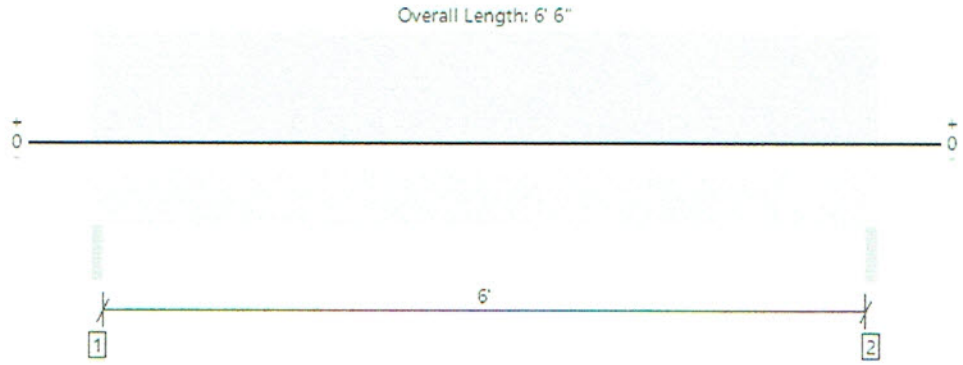
MEMBER REPORT

PASSED

U5

Upper, U5 6' Header

1 piece(s) 6 x 10 Hem-Fir No. 2



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)	2409 @ 1 1/2"	6683 (3.00")	Passed (36%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1637 @ 1' 1/2"	4877	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3619 @ 3' 3"	4654	Passed (78%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.044 @ 3' 3"	0.208	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.059 @ 3' 3"	0.313	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 6' 6" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Trimmer - SPF	3.00"	3.00"	1.50"	589	1820	2409	None
2 - Trimmer - SPF	3.00"	3.00"	1.50"	589	1820	2409	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	13.2	--	
1 - Uniform (PSF)	0 to 6' 6"	14'	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
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/10/2019 5:54:10 AM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

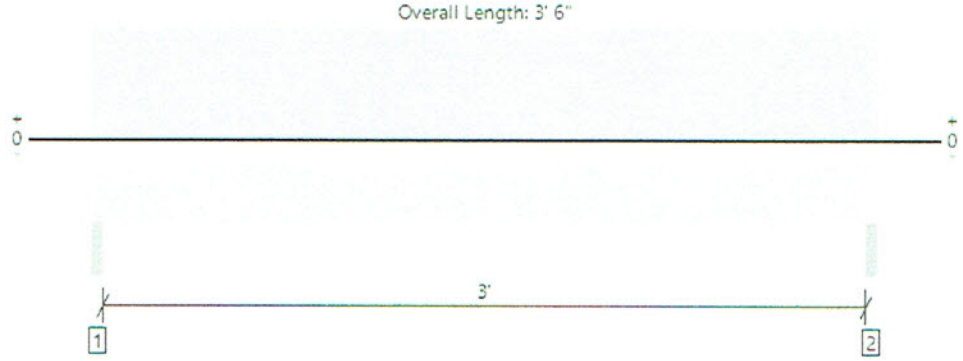
PASSED

U6

Upper, U6 Typical Header

2 piece(s) 2 x 8 Hem-Fir No. 2

Overall Length: 3' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1284 @ 1 1/2"	3645 (3.00")	Passed (35%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	657 @ 10 1/4"	2175	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	968 @ 1' 9"	2234	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.011 @ 1' 9"	0.108	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.015 @ 1' 9"	0.162	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 3' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 3' 6" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Trimmer - SPF	3.00"	3.00"	1.50"	304	980	1284	None
2 - Trimmer - SPF	3.00"	3.00"	1.50"	304	980	1284	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3' 6"	N/A	5.5	--	
1 - Uniform (PSF)	0 to 3' 6"	14'	12.0	40.0	Default Load

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Weyerhaeuser

SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/9/2019 6:55:08 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

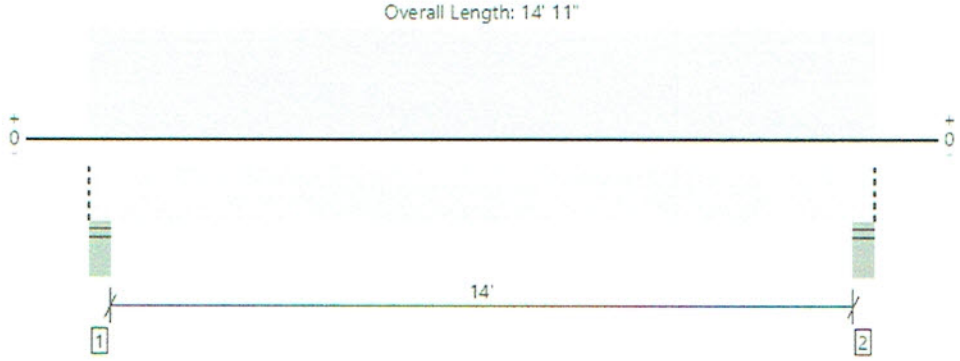
PASSED

U7

Upper, U7 West Floor Beam

1 piece(s) 5 1/2" x 13 1/2" 24F-V4 DF Glulam

Overall Length: 14' 11"



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)	6340 @ 4"	12856 (5.50")	Passed (49%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4994 @ 1' 7"	13118	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	21577 @ 7' 5 1/2"	33413	Passed (65%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.293 @ 7' 5 1/2"	0.475	Passed (L/585)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.389 @ 7' 5 1/2"	0.712	Passed (L/440)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 14' 11" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 14' 11" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 14' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	5.50"	2.71"	1567	4773	6340	Blocking
2 - Stud wall - SPF	5.50"	5.50"	2.71"	1567	4773	6340	Blocking

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 14' 11"	N/A	18.0	--	
1 - Uniform (PSF)	0 to 14' 11" (Front)	16'	12.0	40.0	Default Load

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Weyerhaeuser

SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/9/2019 5:53:26 AM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

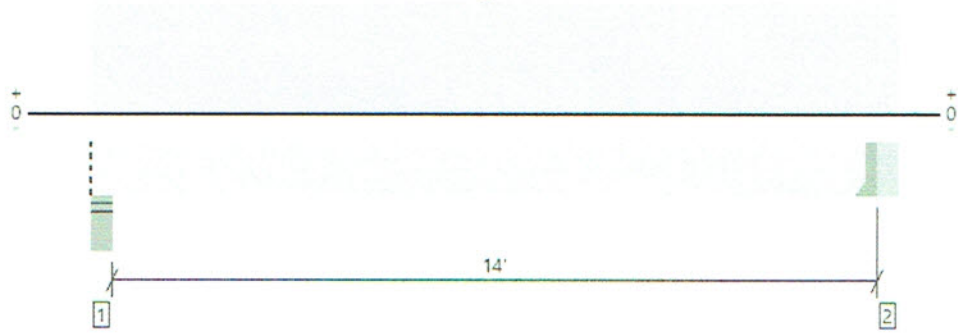
PASSED

U8

Upper, U8 East Floor Beam

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam

Overall Length: 14' 11"



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)	4520 @ 14' 5 1/2"	5363 (1.50")	Passed (84%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3880 @ 13' 5 1/2"	11660	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	15962 @ 7' 4 3/4"	26400	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.302 @ 7' 4 3/4"	0.471	Passed (L/562)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.402 @ 7' 4 3/4"	0.706	Passed (L/422)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 14' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 14' 6" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 14' 1 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	5.50"	2.03"	1184	3550	4734	Blocking
2 - Hanger on 12" SPF beam	5.50"	Hanger[1]	1.50"	1196	3610	4806	See note [1]

- 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.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	OHU612-SDS3	4.00"	N/A	16-SDS25300	8-SDS25300	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 14' 5 1/2"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 14' 11" (Front)	12'	12.0	40.0	Default Load

Member Notes

4806lb < 5185 lb HUCQ612-SDS Hanger

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

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/9/2019 6:01:10 AM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	8-Dec-19
Architect:		Page number:	**U9**

Post Design (Combined Axial and Moment Loading)

2015 INT. Building Code (IBC) **2015 NDS**

Beam Description: Interior Post

Enter '1' for **wind load**:
Enter '1' for **repetitive member**:
Enter '1' for **wet use**:

Geometry and loads:

Height	8 ft	w(d)	0.0 plf
P	12000 lbs	w(b)	0 plf
Le(d)	8 ft	Le(b)	8 ft

Material Properties:

Fb1	850 psi	Fb(d)'	850 psi
Fb2	850 psi	Fb(b)'	850 psi
Fc	1300 psi	Fc'	887 psi
E	1.3 x10^6psi	E'	1.3 x10^6psi
Emin	0.47 x10^6psi	Emin'	0.47 x10^6psi

Selected Member: HF#2 — 5.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.18
Section Modulus (b):	27.7 in^3	Rb(b)	4.18
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided		Required	
FcE(d)	1268 psi	>	fc	397 psi
FcE(b)	1268 psi	>	fc	397 psi
FbE	32313 psi	>	fb(d)	0 psi
FbE	32313 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3	0.20	<	1.0

FORTE WEB

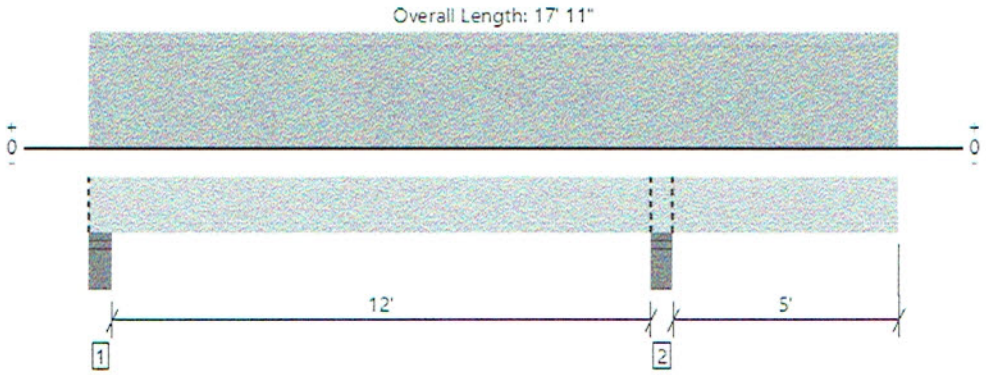
MEMBER REPORT

PASSED

U10

Upper, U10 Case 1 Cantilever Lower Roof Beam

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8259 @ 12' 8 1/4"	12856 (5.50")	Passed (64%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3996 @ 11' 5 1/2"	13409	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	9704 @ 5' 9 1/16"	30360	Passed (32%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-9024 @ 12' 8 1/4"	23403	Passed (39%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.121 @ 6' 3 9/16"	0.412	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.172 @ 6' 2 5/16"	0.618	Passed (L/861)	--	1.0 D + 1.0 S (Alt Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 11" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 11" o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 10' 10 1/8".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 7' 5 5/16".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - SPF	5.50"	5.50"	1.63"	1297	2502	3799	Blocking
2 - Stud wall - SPF	5.50"	5.50"	3.53"	3004	5255	8259	Blocking

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 17' 11"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 17' 11" (Front)	14'	16.0	30.0	Default Load

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ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

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5/12/2020 9:31:42 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

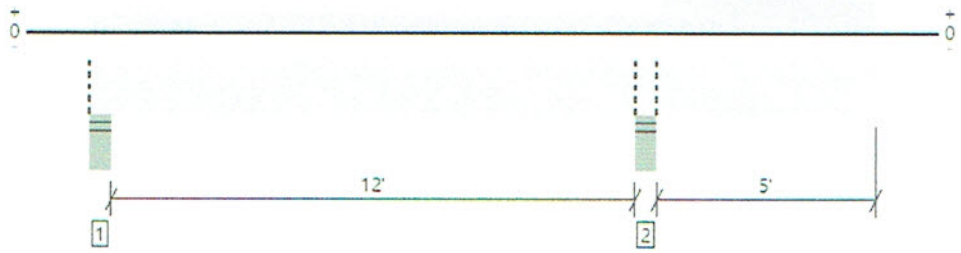
PASSED

U11

Upper, U11 Case 2 Cantilever Lower Roof Beam

1 piece(s) 5 1/2" x 12" 24F-V4 DF Glulam

Overall Length: 17' 11"



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)	4804 @ 12' 8 1/4"	12856 (5.50")	Passed (37%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2640 @ 13' 11"	13409	Passed (20%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	1079 @ 4' 5 1/4"	23760	Passed (5%)	0.90	1.0 D (All Spans)
Neg Moment (Ft-lbs)	-8998 @ 12' 8 1/4"	23403	Passed (38%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.197 @ 17' 11"	0.349	Passed (2L/638)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.246 @ 17' 11"	0.523	Passed (2L/510)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 11" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 11" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 8' 2 9/16".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 16' 7 1/4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - SPF	5.50"	5.50"	1.50"	568	-463	568/-463	Blocking
2 - Stud wall - SPF	5.50"	5.50"	2.06"	2276	2528	4804	Blocking

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 17' 11"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 13' (Front)	14'	8.0	-	Default Load
2 - Uniform (PSF)	13' to 17' 11" (Front)	14'	16.0	30.0	

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Weyerhaeuser

SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/9/2019 7:26:26 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

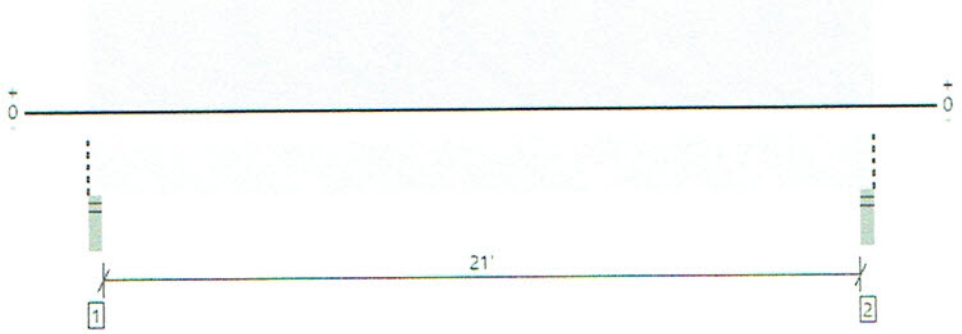
PASSED

U12

Upper, U12 North lower roof beam

1 piece(s) 3 1/2" x 16" 24F-V4 DF Glulam

Overall Length: 21' 7"



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)	3622 @ 2"	5206 (3.50")	Passed (70%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3076 @ 1' 7 1/2"	11377	Passed (27%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	18944 @ 10' 9 1/2"	34347	Passed (55%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.448 @ 10' 9 1/2"	0.708	Passed (L/569)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.716 @ 10' 9 1/2"	1.063	Passed (L/356)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 21' 7" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 21' 7" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 21' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - SPF	3.50"	3.50"	2.43"	1356	2266	3622	Blocking
2 - Stud wall - SPF	3.50"	3.50"	2.43"	1356	2266	3622	Blocking

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 21' 7"	N/A	13.6	--	
1 - Uniform (PSF)	0 to 21' 7" (Front)	7'	16.0	30.0	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
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.084 4270

12/9/2019 7:34:54 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

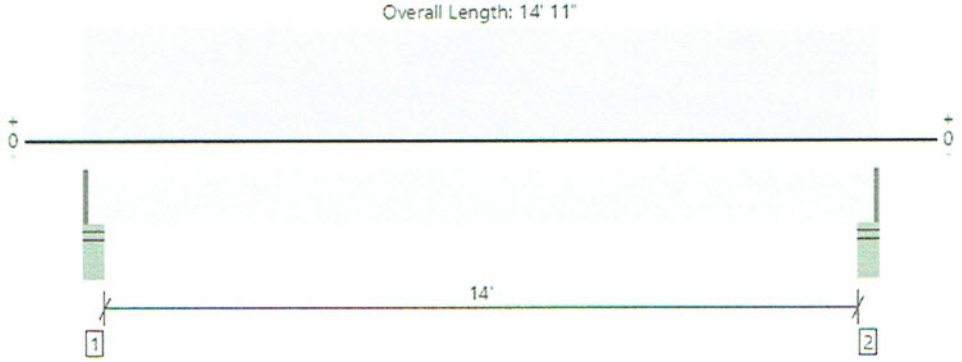
PASSED

U13

Upper, U13 South 14' Header

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 14' 11"



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)	4173 @ 4"	9483 (4.25")	Passed (44%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3411 @ 1' 5 3/8"	12053	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	14405 @ 7' 5 1/2"	29854	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.245 @ 7' 5 1/2"	0.356	Passed (L/698)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.386 @ 7' 5 1/2"	0.712	Passed (L/443)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
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 14' 9" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 14' 9" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	4.25"	1.87"	1546	2685	4231	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	1.87"	1546	2685	4231	1 1/4" Rim Board

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 14' 9 3/4"	N/A	19.5	--	
1 - Uniform (PSF)	0 to 14' 11" (Front)	9'	12.0	40.0	Default Load
2 - Uniform (PLF)	0 to 14' 11" (Front)	N/A	80.0	-	

Member Notes

4231 lb < 5185 lb HUCQ612-SDS Hanger

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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
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/9/2019 9:03:57 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	9-Dec-19
Architect:		Page number:	**U14**

Post Design (Combined Axial and Moment Loading)

2015 INT. Building Code (IBC) **2015 NDS**

Beam Description: Exterior Post @ South

Enter '1' for **wind load**: 1

Enter '1' for **repetitive member**:

Enter '1' for **wet use**:

Geometry and loads:

Height	8 ft	w(d)	140.0 plf
P	11000 lbs	w(b)	0 plf
Le(d)	8 ft	Le(b)	8 ft

Material Properties:

Fb1	850 psi	Fb(d)'	977.5 psi
Fb2	850 psi	Fb(b)'	977.5 psi
Fc	1300 psi	Fc'	944 psi
E	1.3 x10^6psi	E'	1.3 x10^6psi
Emin	0.47 x10^6psi	Emin'	0.47 x10^6psi

Selected Member: HF#2 — 5.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.18
Section Modulus (b):	27.7 in^3	Rb(b)	4.18
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided			Required
FcE(d)	1268 psi	>	fc	364 psi
FcE(b)	1268 psi	>	fc	364 psi
FbE	32313 psi	>	fb(d)	485 psi
FbE	32313 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3 0.84 < 1.0

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	9-Dec-19
Architect:		Page number:	**U15**

Post Design (Combined Axial and Moment Loading)

2015 INT Building Code (IBC) **2015 NDS**

Beam Description: Exterior Post @ South East

Enter '1' for **wind load**: 1

Enter '1' for **repetitive member**:

Enter '1' for **wet use**:

Geometry and loads:

Height	10 ft	w(d)	10.0 plf
P	7500 lbs	w(b)	0 plf
Le(d)	10 ft	Le(b)	10 ft

Material Properties:

Fb1	850 psi	Fb(d)'	977.5 psi
Fb2	850 psi	Fb(b)'	977.5 psi
Fc	1300 psi	Fc'	692 psi
E	1.3 x10^6psi	E'	1.3 x10^6psi
Emin	0.47 x10^6psi	Emin'	0.47 x10^6psi

Selected Member: HF#2 — 5.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.67
Section Modulus (b):	27.7 in^3	Rb(b)	4.67
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided		Required	
FcE(d)	812 psi	>	fc	248 psi
FcE(b)	812 psi	>	fc	248 psi
FbE	25850 psi	>	fb(d)	54 psi
FbE	25850 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3 0.21 < 1.0

FORTE WEB

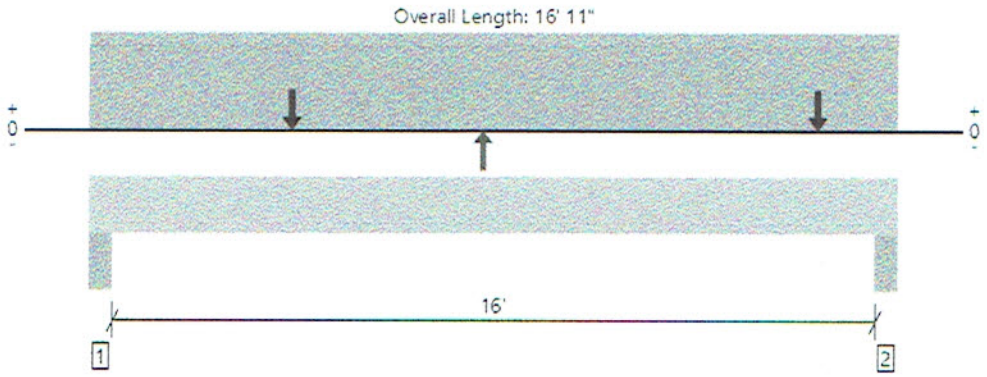
MEMBER REPORT

PASSED

U16

Upper, U16 N Wall - Upper Floor Shear Wall Beam Case 1

1 piece(s) 5 1/2" x 13 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8526 @ 4"	12856 (5.50")	Passed (66%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	6930 @ 1' 7"	15085	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	33273 @ 8' 5 1/2"	38424	Passed (87%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.487 @ 8' 5 1/2"	0.542	Passed (L/400)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.779 @ 8' 5 1/2"	0.813	Passed (L/250)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 16' 11" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 16' 11" o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 16' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Beam - SPF	5.50"	5.50"	3.65"	3198	677	5329	552/-552	9756/-552	None
2 - Beam - SPF	5.50"	5.50"	3.65"	3198	677	5329	1131/-1131	10335/-1131	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 16' 11"	N/A	18.0	--	--	--	
1 - Uniform (PSF)	0 to 16' 11" (Front)	21'	16.0	-	30.0	-	Default Load
2 - Uniform (PSF)	0 to 16' 11" (Front)	2'	12.0	40.0	-	-	
3 - Point (lb)	4' 3" (Front)	N/A	-	-	-	1683	UPLIFT See Page L2
4 - Point (lb)	8' 3" (Front)	N/A	-	-	-	-1683	UPLIFT See Page L2
5 - Point (lb)	15' 3" (Front)	N/A	-	-	-	1683	UPLIFT See Page L2

Member Notes

1131 lb < 1705 lb CS16 Strap

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

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

Weyerhaeuser

5/12/2020 9:33:26 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

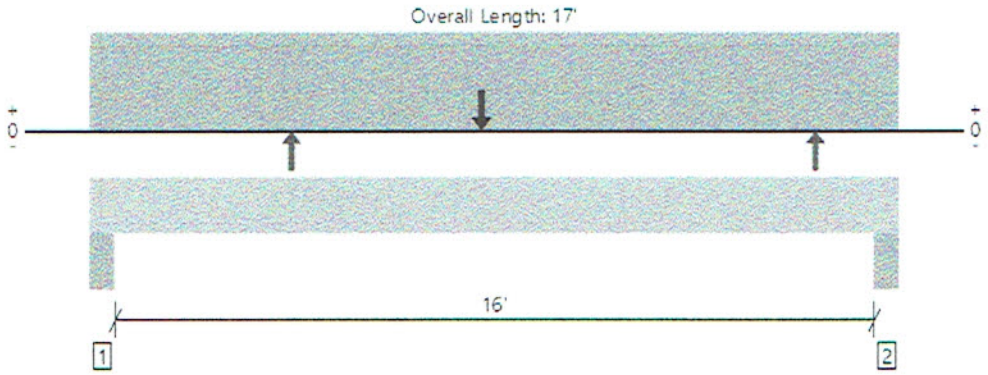
MEMBER REPORT

PASSED

U17

Upper, U17 N Wall - Upper Floor Shear Wall Beam Case 2

1 piece(s) 5 1/2" x 13 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9218 @ 16' 7 1/2"	14025 (6.00")	Passed (66%)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	6930 @ 1' 7 1/2"	15085	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	33273 @ 8' 6"	38424	Passed (87%)	1.15	1.0 D + 1.0 S (All Spans)
Neg Moment (Ft-lbs)	-391 @ 15' 3"	41209	Passed (1%)	1.60	0.6 D + 0.7 E (All Spans)
Live Load Defl. (in)	0.487 @ 8' 6"	0.542	Passed (L/400)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.779 @ 8' 6"	0.813	Passed (L/250)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 16' 3".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 1' 6 3/8".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Beam - SPF	6.00"	6.00"	3.67"	3213	680	5355	1392/-1392	10640/-1392	None
2 - Beam - SPF	6.00"	6.00"	3.94"	3213	680	5355	2816/-2816	12064/-2816	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 17'	N/A	18.0	--	--	--	
1 - Uniform (PSF)	0 to 17' (Front)	21'	16.0	-	30.0	-	Default Load
2 - Uniform (PSF)	0 to 17' (Front)	2'	12.0	40.0	-	-	
3 - Point (lb)	4' 3" (Front)	N/A	-	-	-	-4208	2.5 x UPLIFT See Page L2
4 - Point (lb)	8' 3" (Front)	N/A	-	-	-	4208	2.5 x UPLIFT See Page L2
5 - Point (lb)	15' 3" (Front)	N/A	-	-	-	-4208	2.5 x UPLIFT See Page L2

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

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

Weyerhaeuser

5/12/2020 9:34:05 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

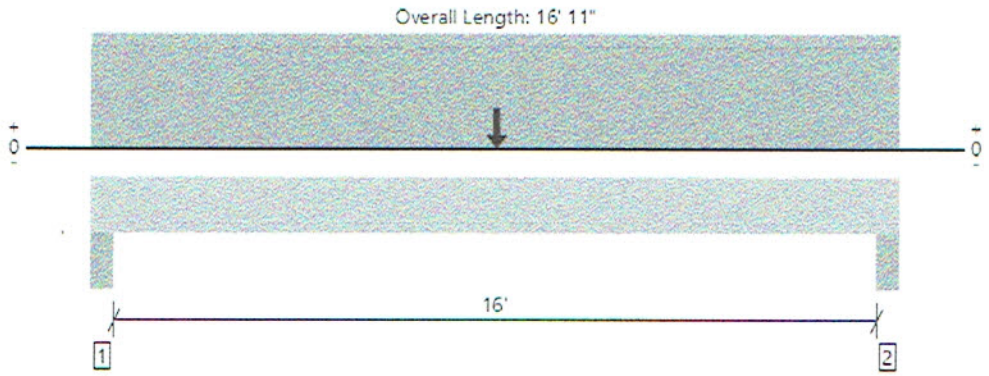
MEMBER REPORT

PASSED

U18

Upper, U18 SE Wall - Upper Floor Shear Wall Beam Case 1

1 piece(s) 5 1/2" x 13 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8526 @ 4"	12856 (5.50")	Passed (66%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	6930 @ 1' 7"	15085	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	33273 @ 8' 5 1/2"	38424	Passed (87%)	1.15	1.0 D + 1.0 S (All Spans)
Neg Moment (Ft-lbs)	-1263 @ 8' 6"	41209	Passed (3%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.535 @ 8' 5 1/2"	0.542	Passed (L/365)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.827 @ 8' 5 1/2"	0.813	Passed (L/236)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 16' 11" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 16' 11" o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 16' 3".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 2' 8 7/8".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Beam - SPF	5.50"	5.50"	3.65"	3198	677	5329	1531/-1531	10735/-1531	None
2 - Beam - SPF	5.50"	5.50"	3.65"	3198	677	5329	1546/-1546	10750/-1546	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 16' 11"	N/A	18.0	--	--	--	
1 - Uniform (PSF)	0 to 16' 11" (Front)	21'	16.0	-	30.0	-	Default Load
2 - Uniform (PSF)	0 to 16' 11" (Front)	2'	12.0	40.0	-	-	
3 - Point (lb)	8' 6" (Front)	N/A	-	-	-	3077	UPLIFT See Page L4 (TOP)

Member Notes

1546 lb < 1705 lb CS16 Strap

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

Weyerhaeuser

5/12/2020 9:34:40 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

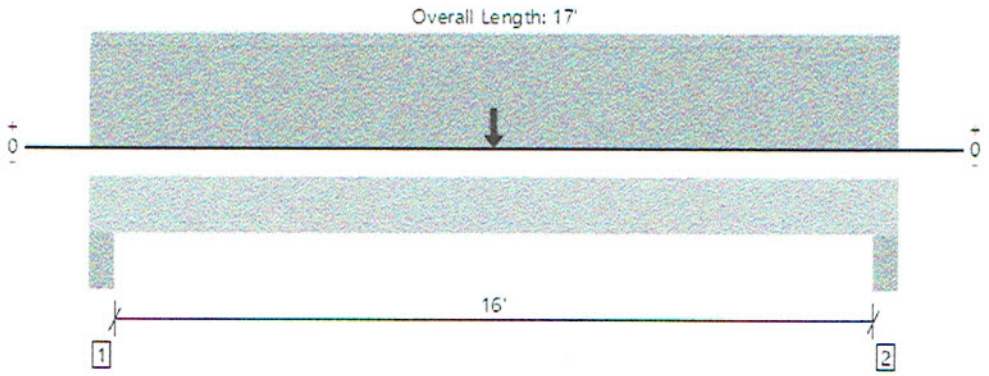
MEMBER REPORT

~~FAILED~~ OK

U19

Upper, U19 SE Wall - Upper Floor Shear Wall Beam Case 2

1 piece(s) 5 1/2" x 14" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9765 @ 4 1/2"	14025 (6.00")	Passed (70%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	6893 @ 1' 8"	15644	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	46485 @ 8' 6"	57493	Passed (81%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Neg Moment (Ft-lbs)	-14377 @ 8' 6"	44318	Passed (32%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.645 @ 8' 6"	0.542	Failed (L/302)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.907 @ 8' 6"	0.813	Failed (L/215)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 16' 3".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 16' 3".
- -761 lbs uplift at support located at 4 1/2". Strapping or other restraint may be required.
- -761 lbs uplift at support located at 16' 7 1/2". Strapping or other restraint may be required.
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

SHEAR / MOMENT OK BY CALCULATION

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Beam - SPF	6.00"	6.00"	4.18"	3219	680	5355	3847/-3847	13101/-3847	None
2 - Beam - SPF	6.00"	6.00"	4.18"	3219	680	5355	3847/-3847	13101/-3847	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 17'	N/A	18.7	--	--	--	
1 - Uniform (PSF)	0 to 17' (Front)	21'	16.0	-	30.0	-	Default Load
2 - Uniform (PSF)	0 to 17' (Front)	2'	12.0	40.0	-	-	
3 - Point (lb)	8' 6" (Front)	N/A	-	-	-	7693	2.5x UPLIFT See Page L4 (TOP)

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

Weyerhaeuser

5/12/2020 9:35:20 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

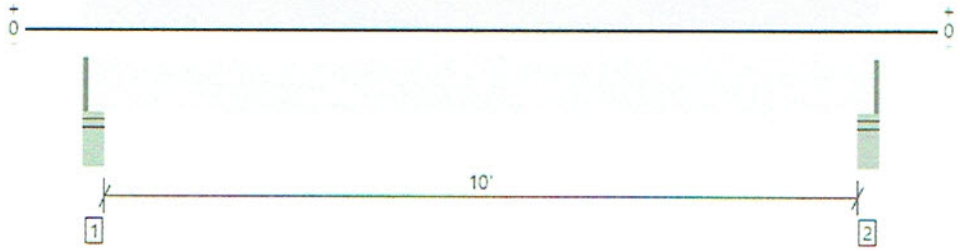
PASSED

U20

Upper, U20 Stair Opening Beam

2 piece(s) 1 3/4" x 16" 2.0E Microllam® LVL

Overall Length: 10' 11"



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)	3985 @ 4"	6322 (4.25")	Passed (63%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2729 @ 1' 9 1/2"	10640	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	9775 @ 5' 5 1/2"	31114	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.073 @ 5' 5 1/2"	0.256	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.097 @ 5' 5 1/2"	0.512	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
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 10' 9" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 10' 9" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	4.25"	2.68"	1004	3057	4061	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	2.68"	1004	3057	4061	1 1/4" Rim Board

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 10' 9 3/4"	N/A	16.3	--	
1 - Uniform (PSF)	0 to 10' 11" (Front)	14'	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
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

FORTE WEB

MEMBER REPORT

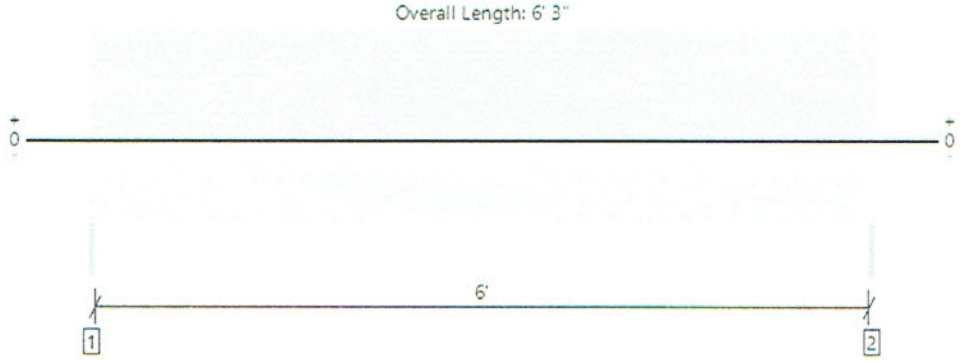
PASSED

U21

Upper, U21 North 6' Header

2 piece(s) 2 x 8 Hem-Fir No. 2

Overall Length: 6' 3"



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)	1317 @ 0	1823 (1.50")	Passed (72%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1010 @ 8 3/4"	2175	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2058 @ 3' 1 1/2"	2234	Passed (92%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.089 @ 3' 1 1/2"	0.208	Passed (L/845)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.117 @ 3' 1 1/2"	0.313	Passed (L/642)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 6' 3" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Trimmer - SPF	1.50"	1.50"	1.50"	317	1000	1317	None
2 - Trimmer - SPF	1.50"	1.50"	1.50"	317	1000	1317	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 3"	N/A	5.5	--	
1 - Uniform (PSF)	0 to 6' 3"	8'	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
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/10/2019 5:55:25 AM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

FORTE WEB

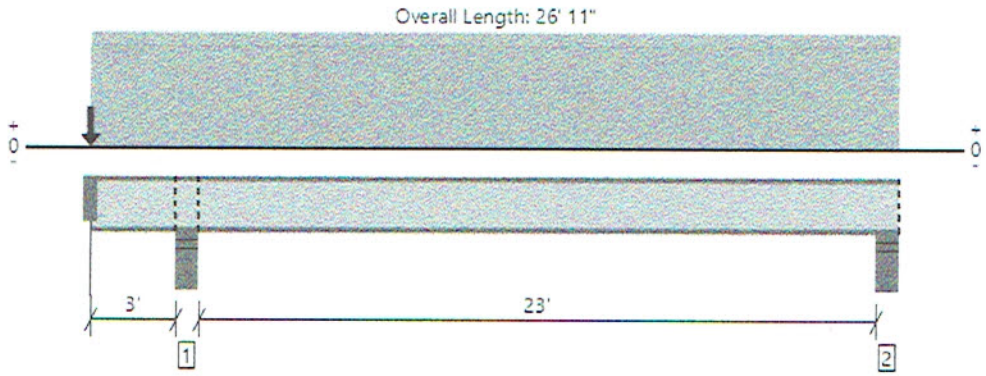
MEMBER REPORT

PASSED

M1

Main, M1 Long Cantilever Floor Joists

1 piece(s) 16" TJI® 560 @ 16" 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)	3153 @ 3' 2 3/4"	3973 (5.25")	Passed (79%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2195 @ 3'	3117	Passed (70%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-6836 @ 3' 2 3/4"	14864	Passed (46%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.202 @ 0	0.200	Passed (2L/382)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.285 @ 0	0.323	Passed (2L/272)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
TJ-Pro™ Rating	44	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).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 11' 3" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' o/c based on loads applied, 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" Weyerhaeuser Edge™ 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	Snow	Total	
1 - Stud wall - SPF	5.50"	5.50"	3.50"	1089	1626	1127	3842	Blocking
2 - Stud wall - SPF	5.50"	5.50"	1.75"	86	642/-112	-137	728/-249	Blocking

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

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 26' 11"	16"	12.0	40.0	-	Default Load
2 - Point (lb)	0	N/A	528	-	990	Roof
3 - Point (lb)	0	N/A	216	720	-	Floor

- Web stiffeners required at location 0 due to loads.

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

LEDGER DESIGN:

$11.5' \times (40\ psf + 12\ psf) = 600\ plf$

$600\ plf < (2 \times 670\ lb)/16/12 = 1005\ plf$ ✓ $Z_L = 670\ lb$ 3½" HEM FIR TO CONCRETE

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

Weyerhaeuser

5/12/2020 9:38:41 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

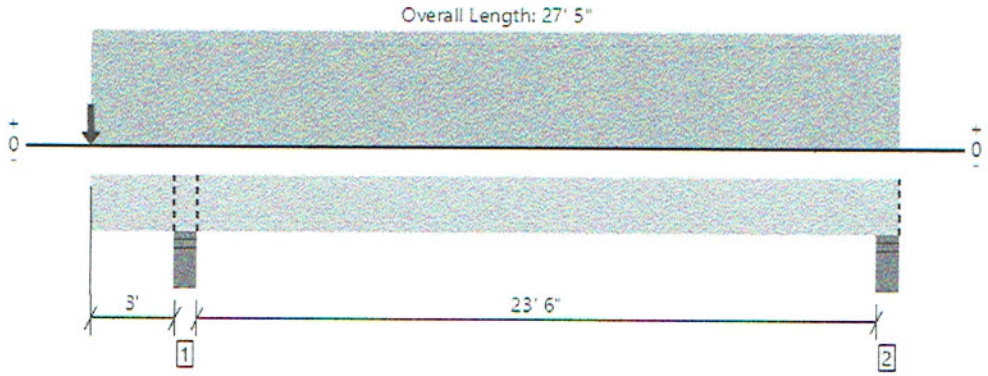
MEMBER REPORT

PASSED

M2

Main, M2 Cantilever Floor Beams Case 1

1 piece(s) 5 1/4" x 16" 2.0E Parallam® PSL



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)	7202 @ 3' 2 3/4"	12272 (5.50")	Passed (59%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	4387 @ 1' 8"	18676	Passed (23%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-14153 @ 3' 2 3/4"	60297	Passed (23%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.186 @ 0	0.215	Passed (2L/418)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.230 @ 0	0.323	Passed (2L/338)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 27' 5" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 27' 5" o/c based on loads applied, unless detailed otherwise.
- -208 lbs uplift at support located at 27' 1". Strapping or other restraint may be required.

748 lb < 3565 lb
1203 lb < 5635 lb

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - SPF	5.50"	5.50"	3.23"	2430	2886	1994	2117/-2117	9427/-2117	Blocking
2 - Stud wall - SPF	5.50"	5.50"	1.50"	297	654/-258	-238	252/-252	1203/-748	Blocking

ITHU55.5/10

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 27' 5"	N/A	26.3	--	--	--	
1 - Uniform (PSF)	0 to 27' 5" (Front)	1' 4"	12.0	40.0	-	-	Default Load
2 - Point (lb)	0 (Front)	N/A	-	-	-	1865	Uplift See Page L5
3 - Point (lb)	0 (Front)	N/A	979	-	1756	-	Roof
4 - Point (lb)	0 (Front)	N/A	589	1820	-	-	Floor

670 lb × 2 = 1340 lb
1340 lb > 1203 lb
(2) 5/8 ANCHOR BOLTS

Member Notes

2117 lb - (.25 x DL=4134 lb) = 1084 lb Uplift
1084 lb Uplift < 1420 lb (2) H8 Ties

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

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

Weyerhaeuser

5/12/2020 9:39:56 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

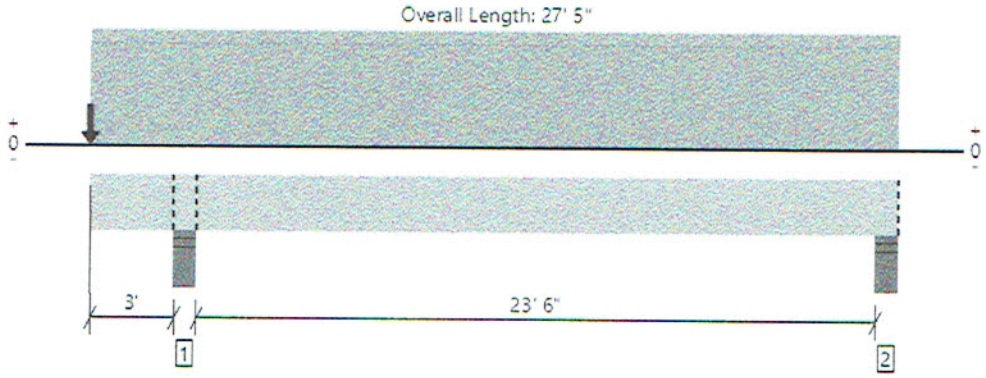
~~FAILED~~ OK

M3

Main, M3 Cantilever Floor Beams Case 2

1 piece(s) 5 1/4" x 16" 2.0E Parallam® PSL

An excessive uplift of ~~-2502 lbs at support located at 3' 2 3/4" failed this~~ OK product.



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8446 @ 3' 2 3/4"	12272 (5.50")	Passed (69%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	6462 @ 1' 8"	25984	Passed (25%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-20854 @ 3' 2 3/4"	83891	Passed (25%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.259 @ 0	0.215	Failed (2L/300)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.284 @ 0	0.323	Passed (2L/272)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 27' 5" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 27' 5" o/c based on loads applied, unless detailed otherwise.
- -356 lbs uplift at support located at 27' 1". Strapping or other restraint may be required.

SHEAR / MOMENT OK BY CALCULATION

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - SPF	5.50"	5.50"	3.79"	2007	2886	1994	5294/-5294	12181/-5294	Blocking
2 - Stud wall - SPF	5.50"	5.50"	1.50"	347	654/-258	-238	631/-631	1632/-1127	Blocking

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 27' 5"	N/A	26.3	--	--	--	
1 - Uniform (PSF)	0 to 27' 5" (Front)	1' 4"	12.0	40.0	-	-	Default Load
2 - Point (lb)	0 (Front)	N/A	-	-	-	4663	2.5 x Uplift See Page L5
3 - Point (lb)	0 (Front)	N/A	979	-	1756	-	Roof
4 - Point (lb)	0 (Front)	N/A	216	1820	-	-	Floor

Member Notes

Shear and Moment OK by calculation for over strength factor

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

ForteWEB Software Operator	Job Notes
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	

Weyerhaeuser

FORTE WEB

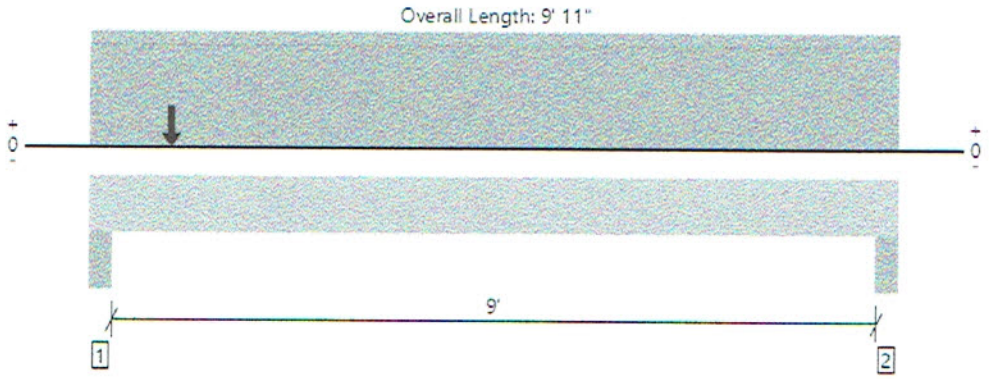
MEMBER REPORT

PASSED

M4

Main, M4 9' Header @ South

1 piece(s) 5 1/2" x 10 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	11445 @ 4"	19663 (5.50")	Passed (58%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	7024 @ 1' 4"	10203	Passed (69%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	12598 @ 4' 5 3/4"	20213	Passed (62%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.119 @ 4' 10 3/16"	0.308	Passed (L/932)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.208 @ 4' 10 1/8"	0.463	Passed (L/533)	--	1.0 D + 1.0 L (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 9' 11" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 9' 11" o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 9' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Trimmer - SPF	5.50"	5.50"	3.20"	4739	6024	2917	13680	None
2 - Trimmer - SPF	5.50"	5.50"	1.50"	2230	3029	227	5486	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 9' 11"	N/A	14.0	--	--	
1 - Uniform (PSF)	0 to 9' 11"	14'	12.0	40.0	-	Default Load
2 - Point (lb)	1'	N/A	2932	3500	3144	
3 - Uniform (PLF)	0 to 9' 11"	N/A	225.0	-	-	

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

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

5/12/2020 9:52:25 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

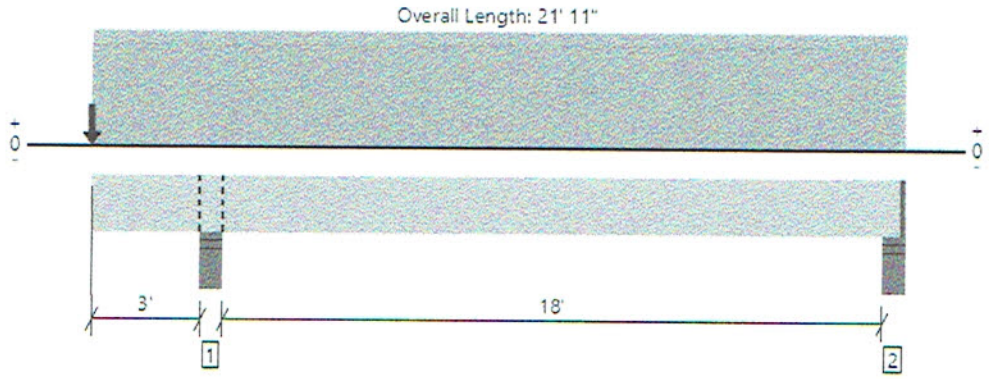
MEMBER REPORT

PASSED

M5

Main, M5 West Cantilever Floor Beam

1 piece(s) 7" x 16" 2.0E Parallam® PSL



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)	10503 @ 3' 2 3/4"	16363 (5.50")	Passed (64%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	8228 @ 1' 8"	24901	Passed (33%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-26558 @ 3' 2 3/4"	80396	Passed (33%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.157 @ 0	0.200	Passed (2L/494)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.236 @ 0	0.323	Passed (2L/328)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 21' 10" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 21' 10" o/c based on loads applied, unless detailed otherwise.
- -1000 lbs uplift at support located at 21' 7". Strapping or other restraint may be required.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

SKEWED HANGER @ BACKSPAN : HHUS7.25/10

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - SPF	5.50"	5.50"	3.53"	4125	4623	3881	12629	Blocking
2 - Stud wall - SPF	5.50"	4.25"	1.50"	-97	380/-623	-581	380/-1301	1 1/4" Rim Board

0.85 × 5635 lb = 4789 lb
4789 lb > 1301 lb
2745 lb > 1301 lb

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 21' 9 3/4"	N/A	35.1	--	--	
1 - Uniform (PSF)	0 to 21' 11" (Front)	1'	12.0	40.0	-	Default Load
2 - Point (lb)	0 (Front)	N/A	3000	3500	3300	

1340 lb > 1301 lb
(2) 5/8" ANCHOR BOLTS

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

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

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ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

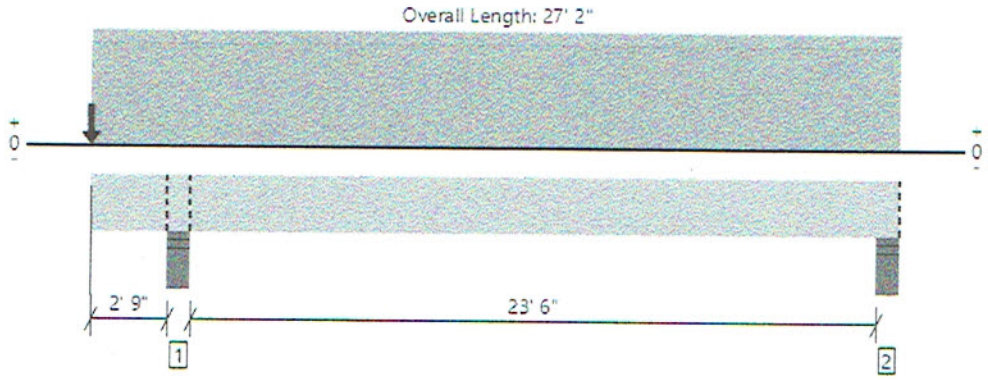
MEMBER REPORT

PASSED

M6

Main, M6 Cantilever Floor Beams Case 3

1 piece(s) 7" x 16" 2.0E Parallam® PSL



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)	11400 @ 2' 11 3/4"	16363 (5.50")	Passed (70%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	8062 @ 1' 5"	24901	Passed (32%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-24038 @ 2' 11 3/4"	80396	Passed (30%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.191 @ 0	0.200	Passed (2L/374)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.256 @ 0	0.298	Passed (2L/280)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 27' 2" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 27' 2" o/c based on loads applied, unless detailed otherwise.
- -382 lbs uplift at support located at 26' 10". Strapping or other restraint may be required.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

DOWN:
1073 lb < 3565 lb

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - SPF	5.50"	5.50"	3.83"	4089	4742	3537	2098/-2098	14466/-2098	Blocking
2 - Stud wall - SPF	5.50"	5.50"	1.50"	248	654/-447	-393	233/-233	1135/-1073	Blocking

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

UPLIFT:
1135 lb < 5635 lb

HHUS7.25/10

1340 lb > 1135 lb
(2) 5/8" ANCHORS

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 27' 2"	N/A	35.1	--	--	--	
1 - Uniform (PSF)	0 to 27' 2" (Front)	1' 4"	12.0	40.0	-	-	Default Load
2 - Point (lb)	0 (Front)	N/A	-	-	-	1865	Uplift See Page L5
3 - Point (lb)	0 (Front)	N/A	1800	-	3144	-	Roof
4 - Point (lb)	0 (Front)	N/A	1150	3500	-	-	Floor

Member Notes

2117 lb - (.25 x DL=4134 lb) = 1084 lb Uplift
1084 lb Uplift < 1420 lb (2) H8 Ties

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

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Weyerhaeuser

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ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

MEMBER REPORT

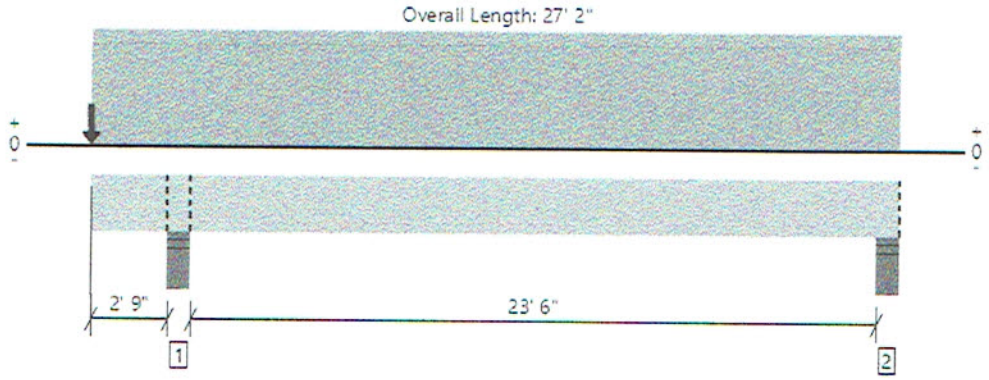
FAILED OK

M7

Main, M7 Cantilever Floor Beams Case 4

1 piece(s) 7" x 16" 2.0E Parallam® PSL

An excessive uplift of -1230 lbs at support located at 2' 11 3/4" failed this product. OK



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)	13032 @ 2' 11 3/4"	16363 (5.50")	Passed (80%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	8044 @ 1' 5"	24901	Passed (32%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-23984 @ 2' 11 3/4"	80396	Passed (30%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.238 @ 0	0.200	~~Failed (2L/300)~~	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.302 @ 0	0.298	Passed (2L/236)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/240).

SHEAR / MOMENT OK BY CALCULATION

- Top Edge Bracing (Lu): Top compression edge must be braced at 27' 2" o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 27' 2" o/c based on loads applied, unless detailed otherwise.
- -685 lbs uplift at support located at 26' 10". Strapping or other restraint may be required.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - SPF	5.50"	5.50"	4.38"	4069	4742	3537	5245/-5245	17593/-5245	Blocking
2 - Stud wall - SPF	5.50"	5.50"	1.50"	250	654/-447	-393	582/-582	1486/-1422	Blocking

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 27' 2"	N/A	35.1	--	--	--	
1 - Uniform (PSF)	0 to 27' 2" (Front)	1' 4"	12.0	40.0	-	-	Default Load
2 - Point (lb)	0 (Front)	N/A	-	-	-	4663	2.5 x Uplift See Page L5
3 - Point (lb)	0 (Front)	N/A	1782	-	3144	-	Roof
4 - Point (lb)	0 (Front)	N/A	1150	3500	-	-	Floor

Member Notes

Shear and Moment OK by calculation for over strength factor

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

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Weyerhaeuser

5/12/2020 10:00:14 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

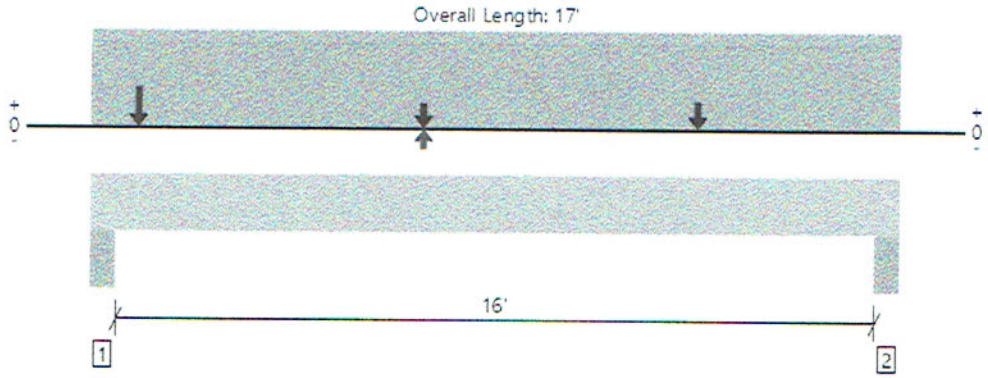
MEMBER REPORT

PASSED

M8

Main, M8 16' Garage Door Header Case 1

1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	19741 @ 4 1/2"	21450 (6.00")	Passed (92%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	10674 @ 2'	17490	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	47640 @ 7' 4 5/16"	58109	Passed (82%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.312 @ 8' 4 1/8"	0.542	Passed (L/625)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.475 @ 8' 4 1/2"	0.813	Passed (L/411)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 0.98 that was calculated using length L = 16' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Trimmer - SPF	6.00"	6.00"	5.52"	7012	11222	4850	1286/-1286	24370/-1286	None
2 - Trimmer - SPF	6.00"	6.00"	3.14"	3727	7412	2005	831/-831	13975/-831	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 17'	N/A	24.1	--	--	--	
1 - Uniform (PSF)	0 to 17'	15'	12.0	40.0	-	-	Default Load
2 - Point (lb)	1'	N/A	4134	4794	3570	2117	
3 - Point (lb)	7'	N/A	1568	1820	1792	-2117	
4 - Point (lb)	12' 9"	N/A	1568	1820	1493	2117	

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ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

FORTE WEB

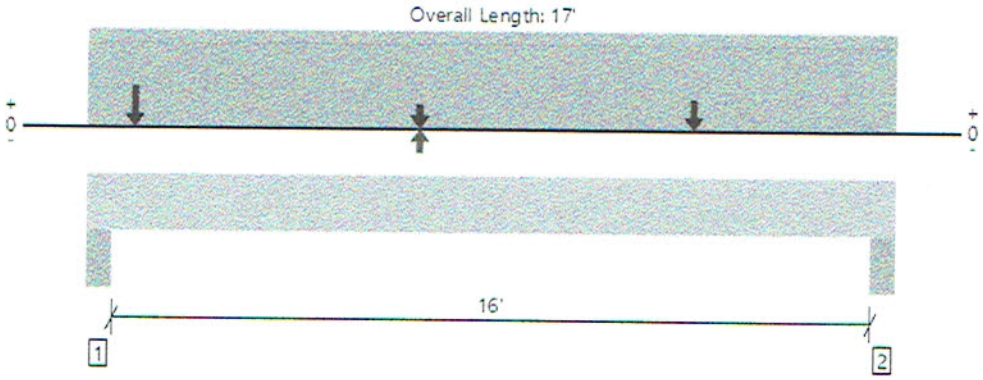
MEMBER REPORT

PASSED

M4

Main, M9 16' Garage Door Header Case 2

1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	20755 @ 4 1/2"	21450 (6.00")	Passed (97%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	10674 @ 2'	17490	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	47640 @ 7' 4 5/16"	58109	Passed (82%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.322 @ 8' 2 7/16"	0.542	Passed (L/606)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.485 @ 8' 3 3/8"	0.813	Passed (L/402)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 0.98 that was calculated using length L = 16' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Trimmer - SPF	6.00"	6.00"	5.81"	7012	11222	4850	3217/-3217	26301/-3217	None
2 - Trimmer - SPF	6.00"	6.00"	3.32"	3727	7412	2005	2076/-2076	15220/-2076	None

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 17'	N/A	24.1	--	--	--	
1 - Uniform (PSF)	0 to 17'	15'	12.0	40.0	-	-	Default Load
2 - Point (lb)	1'	N/A	4134	4794	3570	5293	2.5x UPLIFT
3 - Point (lb)	7'	N/A	1568	1820	1792	-5293	2.5x UPLIFT
4 - Point (lb)	12' 9"	N/A	1568	1820	1493	5293	2.5x UPLIFT

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5/12/2020 10:02:56 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	10-Dec-19
Architect:		Page number:	**M10**

Post Design (Combined Axial and Moment Loading)

2015 Seattle Building Code (SBC) **2015 NDS**

Beam Description: Garage Door Posts

Enter '1' for **wind load**: 1
Enter '1' for **repetitive member**:
Enter '1' for **wet use**:

Geometry and loads:

Height	7 ft	w(d)	141.0 plf
P	24000 lbs	w(b)	0 plf
Le(d)	7 ft	Le(b)	7 ft

Material Properties:

Fb1	1000 psi	Fb(d)'	1150 psi
Fb2	1000 psi	Fb(b)'	1150 psi
Fc	1500 psi	Fc'	1321 psi
E	1.7 x10^6psi	E'	1.7 x10^6psi
Emin	0.62 x10^6psi	Emin'	0.62 x10^6psi

Selected Member: DF#1 — 5.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	3.91
Section Modulus (b):	27.7 in^3	Rb(b)	3.91
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided		Required	
FcE(d)	2185 psi	>	fc	793 psi
FcE(b)	2185 psi	>	fc	793 psi
FbE	48714 psi	>	fb(d)	374 psi
FbE	48714 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3 0.87 < 1.0

FORTE WEB

MEMBER REPORT

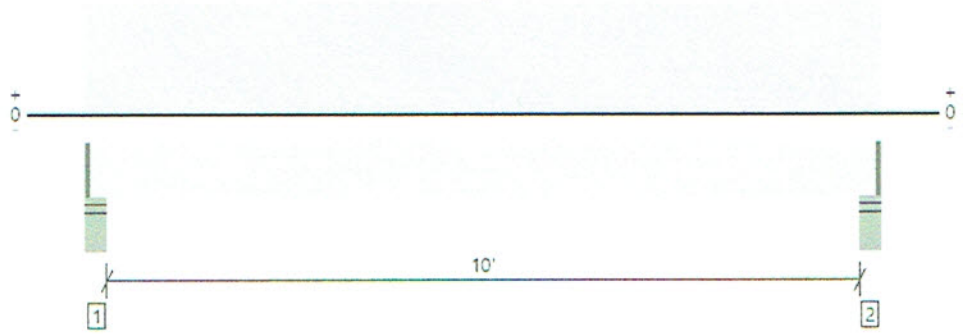
PASSED

M11

Main, M11 Flush Stair Beam

2 piece(s) 1 3/4" x 16" 2.0E Microllam® LVL

Overall Length: 10' 11"



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)	3985 @ 4"	6322 (4.25")	Passed (63%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2729 @ 1' 9 1/2"	10640	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	9775 @ 5' 5 1/2"	31114	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.073 @ 5' 5 1/2"	0.256	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.097 @ 5' 5 1/2"	0.512	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
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 10' 9" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 10' 9" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	5.50"	4.25"	2.68"	1004	3057	4061	1 1/4" Rim Board
2 - Stud wall - SPF	5.50"	4.25"	2.68"	1004	3057	4061	1 1/4" Rim Board

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 10' 9 3/4"	N/A	16.3	--	
1 - Uniform (PSF)	0 to 10' 11" (Front)	14'	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
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/12/2019 9:44:19 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	12-Dec-19
Architect:		Page number:	**M12**

Post Design (Combined Axial and Moment Loading)

2015 Seattle Building Code (SBC) **2015 NDS**

Beam Description: Interior Post

Enter '1' for **wind load**:
Enter '1' for **repetitive member**:
Enter '1' for **wet use**:

Geometry and loads:

Height	8 ft	w(d)	plf
P	25000 lbs	w(b)	0 plf
Le(d)	8 ft	Le(b)	8 ft

Material Properties:

Fb1	850 psi	Fb(d)'	850 psi
Fb2	850 psi	Fb(b)'	850 psi
Fc	1300 psi	Fc'	887 psi
E	1.3 x10^6psi	E'	1.3 x10^6psi
Emin	0.47 x10^6psi	Emin'	0.47 x10^6psi

Selected Member: HF#2 — 5.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.18
Section Modulus (b):	27.7 in^3	Rb(b)	4.18
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided		Required	
FcE(d)	1268 psi	>	fc	826 psi
FcE(b)	1268 psi	>	fc	826 psi
FbE	32313 psi	>	fb(d)	0 psi
FbE	32313 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3 0.87 < 1.0

FORTE WEB

MEMBER REPORT

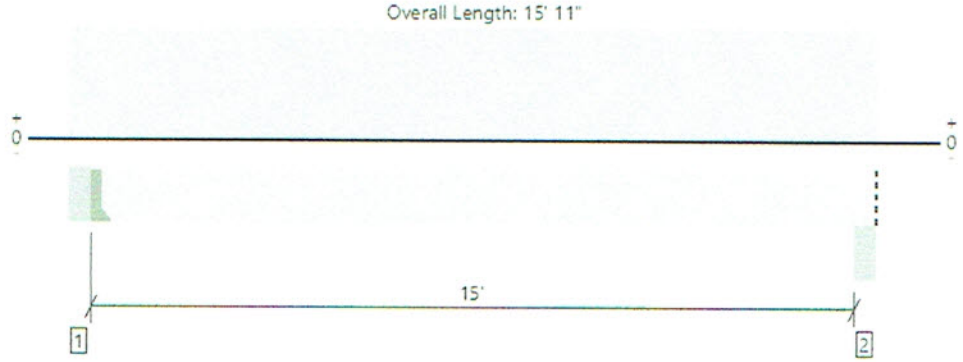
PASSED

M13

Main, M13 Deck Joists

1 piece(s) 2 x 12 Hem-Fir No. 2 @ 12" OC

Overall Length: 15' 11"



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)	543 @ 5 1/2"	911 (1.50")	Passed (60%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	476 @ 1' 4 3/4"	1688	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2048 @ 8'	2577	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.302 @ 8'	0.377	Passed (L/599)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.362 @ 8'	0.754	Passed (L/499)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	--	--	--

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' 11" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 15' 6" o/c unless detailed otherwise.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

576# < 1135#

LUS210

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 11 1/4" SPF beam	5.50"	Hanger[1]	1.50"	96	480	576	See note [1]
2 - Beam - SPF	5.50"	5.50"	1.50"	95	475	570	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.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 15' 11"	12"	12.0	60.0	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
Brett Johnson CSES (253) 579-2158 Brett.ajohnson@yahoo.com	2019.089 4270

12/16/2019 7:16:24 PM UTC
ForteWEB v2.1, Engine: V7.3.2.309, Data: V7.2.0.2
File Name: 4270 Ardekani

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270**	Date:	19-Dec-19
Architect:		Page number:	**M14**

BEAM DESIGN (Uniform Load, Simple Span)

2015 INT. Building Code (IBC) **2015 NDS**

Beam Description: Deck beam

Enter '1' for incised PT lumber:	1	Enter '1' for **snow load**:	
		Enter '1' for **repetitive member**:	
		Enter '1' for **wet use**:	
Enter '1' for **fully supported:**	1	Enter '1' for **reduced live load:**	

Geometry and Loads:

Span:	21 ft	Tributary Width:	8 ft
DL unit load:	12 psf	LL unit load:	60 psf
Add'l unif. DL:	0 lb/ft	Add'l unif. LL:	0 lb/ft
Kll * At:	336 ft^2	Reduced LL:	60 psf
DL uniform load:	96 lb/ft	Max DL reaction:	1,008 lbs
LL uniform load:	480 lb/ft	Max LL reaction:	5,040 lbs
Total load:	576 lb/ft	Max Total reaction:	6,048 lbs

Material Properties:

E	1.8 x 10^6 psi	E'	1.8 x 10^6 psi
Fb	2400 psi	Fb'	1831 psi
Fv	265 psi	Fv'	212 psi
Fc perp	650 psi	Fc perp'	520 psi

(Allowable design values include modification factors per NDS 2012)

Deflection analysis:

For total load:		Allowed deflection criteria, span/	**360**		
For LL only:		Allowed deflection criteria, span/	**480**		
Max. allowed total defl:	0.700	in	Max LL defl:	0.525	in
Total defl. * I:	1400.3		Required I:	2,000	in^4
LL defl. * I:	1166.9		Required I:	2,223	in^4
Actual deflections:	TOTAL:	0.524 inches	LL:	0.437	inches

HUCQ612-SDS

Force analysis:

		Max Shear:	6048 lbs
Max. moment:	31752 ft-lb	Shear @ d =	5184 lbs < 5185 lb

Selected Member:	**GLB**	**5.500**	**x**	**18**

Member properties:	**Provided:**		**Required:**	
Moment of inertia:	2,673.0	in^4	2,222.6	in^4
Section Modulus:	297.0	in^3	208.1	in^3
Section Area:	99.0	in^2	36.7	in^2
Bearing Area:			11.6	in^2
Minimum bearing dimensions:	5.5	x	2.1	inches

FORTE WEB

MEMBER REPORT

FAILED OK

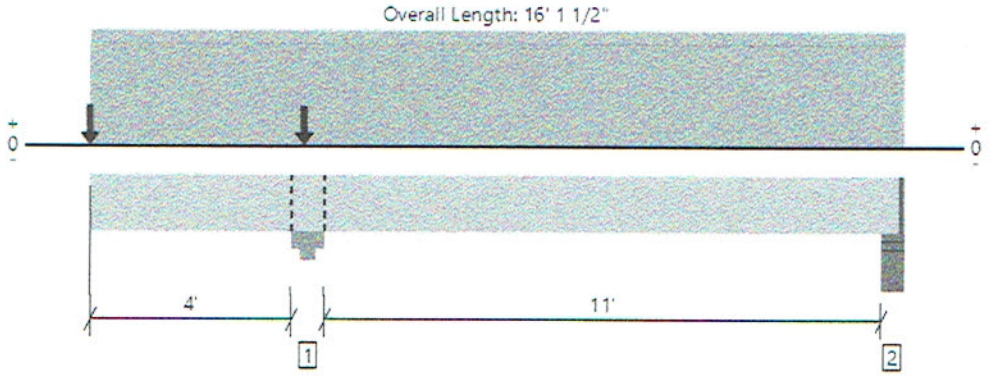
M15

Main, M15 Cantilever Deck Beams

1 piece(s) 5 1/2" x 18" 24F-V4 DF Glulam

OK

An excessive uplift of -2101 lbs at support located at 15' 9 1/2" failed this product.



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	20884 @ 4' 4"	28600 (8.00")	Passed (73%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	8736 @ 2' 6"	17490	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	10860 @ 10' 10 1/8"	59400	Passed (18%)	1.00	1.0 D + 1.0 L (Alt Spans)
Neg Moment (Ft-lbs)	-36574 @ 4' 4"	44921	Passed (81%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.230 @ 0	0.289	Passed (2L/452)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.279 @ 0	0.433	Passed (2L/374)	--	1.0 D + 1.0 L (Alt Spans)

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

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).

OK BY CALCULATION

- Top Edge Bracing (Lu): Top compression edge must be braced at 16' o/c based on loads applied, unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 16' o/c based on loads applied, unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 9' 10 11/16".
- Critical negative moment adjusted by a volume factor of 0.98 that was calculated using length L = 15' 9 1/2".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Column Cap - steel	8.00"	8.00"	5.84"	6103	14781	4200	25084	Blocking
2 - Stud wall - SPF	5.50"	4.25"	1.97"	320	4365/-2421	-	4685/-2421	1 1/4" Rim Board

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 16' 1/4"	N/A	24.1	--	--	
1 - Uniform (PSF)	0 to 16' 1 1/2" (Front)	12'	12.0	60.0	-	Default Load
2 - Point (lb)	0 (Front)	N/A	1476	5040	-	
3 - Point (lb)	4' 3" (Front)	N/A	2240	-	4200	

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

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

5/12/2020 10:03:51 PM UTC
ForteWEB v2.4, Engine: V8.0.1.5, Data: V7.3.2.0
File Name: 4270 Ardekani

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	19-Dec-19
Architect:		Page number:	**M16**

Post Design (Combined Axial and Moment Loading)

2015 INT. Building Code (IBC) **2015 NDS**

Beam Description: Deck posts

Enter '1' for **wind load**: 1

Enter '1' for **repetitive member**:

Enter '1' for **wet use**:

Geometry and loads:

Height	8 ft	w(d)	10.0 plf
P	25500 lbs < 30250 16 PB66	w(b)	0 plf
Le(d)	8 ft	Le(b)	8 ft

Material Properties:

Fb1	850 psi	Fb(d)'	977.5 psi
Fb2	850 psi	Fb(b)'	977.5 psi
Fc	1300 psi	Fc'	944 psi
E	1.3 x10^6psi	E'	1.3 x10^6psi
Emin	0.47 x10^6psi	Emin'	0.47 x10^6psi

Selected Member: HF#2 — 5.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.18
Section Modulus (b):	27.7 in^3	Rb(b)	4.18
Section Area:	30.3 in^2	c	0.8

Member stresses: Provided			Required	
FcE(d)	1268 psi	>	fc	843 psi
FcE(b)	1268 psi	>	fc	843 psi
FbE	32313 psi	>	fb(d)	35 psi
FbE	32313 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3 0.90 < 1.0

John S. Apolis, P.E.		**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270**		Date:	19-Dec-19
Architect:			Page number:	**M17**

BEAM DESIGN (Uniform Load, Simple Span)

2015 INT. Building Code (IBC) **2015 NDS**

Beam Description: Deck Header Below

Enter '1' for incised PT lumber:		Enter '1' for **snow load**:	
		Enter '1' for **repetitive member**:	
		Enter '1' for **wet use**:	
Enter '1' for **fully supported:**	1	Enter '1' for **reduced live load:**	

Geometry and Loads:

Span:	16 ft	Tributary Width:	8 ft
DL unit load:	12 psf	LL unit load:	60 psf
Add'l unif. DL:	24 lb/ft	Add'l unif. LL:	40 lb/ft
Kll * At:	256 ft^2	Reduced LL:	60 psf
DL uniform load:	120 lb/ft	Max DL reaction:	960 lbs
LL uniform load:	520 lb/ft	Max LL reaction:	4,160 lbs
Total load:	640 lb/ft	Max Total reaction:	5,120 lbs

Material Properties:

E	1.8 x 10^6 psi	E'	1.8 x 10^6 psi
Fb	2400 psi	Fb'	2400 psi
Fv	265 psi	Fv'	265 psi
Fc perp	650 psi	Fc perp'	650 psi

(Allowable design values include modification factors per NDS 2012)

Deflection analysis:

For total load:		Allowed deflection criteria, span/	**360**		
For LL only:		Allowed deflection criteria, span/	**480**		
Max. allowed total defl:	0.533	in	Max LL defl:	0.400	in
Total defl. * I:	524.3		Required I:	983	in^4
LL defl. * I:	426.0		*Required I:*	1,065	in^4
Actual deflections:	TOTAL:	0.465 inches	LL:	0.378	inches

Force analysis:

		Max Shear:	5120 lbs
Max. moment:	20480 ft-lb	Shear @ d =	4400 lbs

Selected Member: GLB 5.500 x 13.5

Member properties:	**Provided:**		**Required:**
Moment of inertia:	1,127.7 in^4		1,065.0 in^4
Section Modulus:	167.1 in^3		102.4 in^3
Section Area:	74.3 in^2		24.9 in^2
Bearing Area:			7.9 in^2
Minimum bearing dimensions:	5.5	x	1.4 inches

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	19-Dec-19
Architect:		Page number:	**M18**

Post Design (Combined Axial and Moment Loading)

2015 INT Building Code (IBC) **2015 NDS**

Beam Description: Deck Header Posts

Enter '1' for **wind load**: 1
Enter '1' for **repetitive member**:
Enter '1' for **wet use**:

Geometry and loads:

Height	8 ft	w(d)	100.0 plf
P	15000 lbs	w(b)	0 plf
Le(d)	8 ft	Le(b)	8 ft

Material Properties:

Fb1	850 psi	Fb(d)'	977.5 psi
Fb2	850 psi	Fb(b)'	977.5 psi
Fc	1300 psi	Fc'	944 psi
E	1.3 x10^6psi	E'	1.3 x10^6psi
Emin	0.47 x10^6psi	Emin'	0.47 x10^6psi

Selected Member: HF#2 — 5.5 (b) x 5.5 (d)

Member properties:

		Variables:	
Section Modulus (d):	27.7 in^3	Rb(d)	4.18
Section Modulus (b):	27.7 in^3	Rb(b)	4.18
Section Area:	30.3 in^2	c	0.8

Member stresses: Provided			Required	
FcE(d)	1268 psi	>	fc	496 psi
FcE(b)	1268 psi	>	fc	496 psi
FbE	32313 psi	>	fb(d)	346 psi
FbE	32313 psi	>	fb(b)	0 psi

Bending and Axial Compression Check:

NDS 2010 EQ 3.9-3 0.86 < 1.0

John S. Apolis, P.E. CSES, Inc. Job number: 2019.089

Project: 4270 Date: 22-Apr-21

Architect: Page number: M 19

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: NEW DECK BEAM

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

Geometry and Loads:

Span:	14.5 ft	Tributary Width:	7.25 ft	P Location:	14.5 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	60 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	788 lbs	DL Reaction 2:	788 lbs	Note: Design automatically uses
LL Reaction 1:	3154 lbs	LL Reaction 2:	3154 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**3942 lbs**	Total Reaction 2:	**3942 lbs**	

Material Properties:

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

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.73 in	Max LL defl:	0.36 in
Total defl. * I:	300.46 in^4	Required I:	414.42 in^4
LL defl. * I:	240.37 in^4	Required I:	663.08 in^4
Actual deflections:	TOTAL: 0.38 in		0.3 in

Force analysis:

Max. moment:	14290 ft-lb	Max Shear:	3942 lbs

Selected Member: (1) GLB 5.5 x 12

Member properties:	**Provided:**		**Required:**
Moment of inertia:	792. in^4		663.08 in^4
Section Modulus:	132. in^3		71.45 in^3
Section Area:	66. in^2		22.31 in^2
Bearing Area:			6.06 in^2
Minimum bearing dimensions:	5.5 in	x	1.1 in

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

Project: 4270

Architect:

Job number: **2019.089**

Date: 22-Apr-21

Page number: M20

BEAM DESIGN (Uniform Load+Concentrated Load)

2018 International Building Code (IBC) **2018 NDS**

Beam Description: NEW DECK JOISTS

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

Geometry and Loads:

Span:	6 ft	Tributary Width:	1.33 ft	P Location:	0 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	60 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	60 lbs	DL Reaction 2:	60 lbs	Note: Design automatically uses
LL Reaction 1:	239 lbs	LL Reaction 2:	239 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**299 lbs**	Total Reaction 2:	**299 lbs**	

Material Properties:

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

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.3 in		Max LL defl:	0.15 in
Total defl. * I:	2.24 in^4		Required I:	7.46 in^4
LL defl. * I:	1.79 in^4		Required I:	11.93 in^4
Actual deflections:	TOTAL:	0.05 in		0.04 in

Force analysis:

Max. moment:	449 ft-lb	Max Shear:	299 lbs

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

Member properties:	**Provided:**		**Required:**
Moment of inertia:	47.63 in^4		11.93 in^4
Section Modulus:	13.14 in^3		4.59 in^3
Section Area:	10.88 in^2		2.99 in^2
Bearing Area:			0.74 in^2
Minimum bearing dimensions:	1.5 in	x	0.49 in

F1

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 4270
Title F2 :
Dsgnr:
Description....

Date: 20 FEB 2020

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

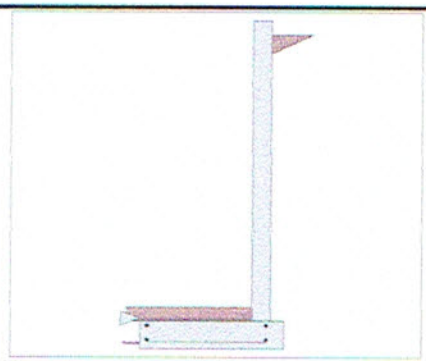
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	100.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

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

Axial Load Applied to Stem

Axial Dead Load	=	480.0 lbs
Axial Live Load	=	640.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	88.000
Total Seismic Force	=	968.000

Design Summary

Wall Stability Ratios

Overturning	=	1.29 Ratio < 1.5!
Slab Resists All Sliding !		
Total Bearing Load	=	5,389 lbs
...resultant ecc.	=	11.09 in
Soil Pressure @ Toe	=	1,696 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,374 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	37.1 psi OK
Footing Shear @ Heel	=	22.6 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	3,702.6 lbs

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

Load Factors

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

Stem Construction

Bottom

			Stem OK
Design Height Above Ftg	ft =		0.00
Wall Material Above "Ht"	=		Concrete
Design Method	=		LRFD
Thickness	=		8.00
Rebar Size	=		# 5
Rebar Spacing	=		5.00
Rebar Placed at	=		Edge
Design Data			
fb/FB + fa/Fa	=		0.997
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =		4,880.0
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =		17,733.3
Moment.....Allowable	=		17,776.5
Shear.....Actual			
Service Level	psi =		
Strength Level	psi =		65.7
Shear.....Allowable	psi =		75.0
Anet (Masonry)	in2 =		
Rebar Depth 'd'	in =		6.19
Masonry Data			
f'm	psi =		
Fs	psi =		
Solid Grouting	=		
Modular Ratio 'n'	=		
Wall Weight	psf =		100.0
Short Term Factor	=		
Equiv. Solid Thick.	=		
Masonry Block Type	=	Medium Weight	
Masonry Design Method	=	ASD	
Concrete Data			
f'c	psi =		2,500.0
Fy	psi =		60,000.0

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.6715 in2/ft	
(4/3) * As :	0.8953 in2/ft	Min Stem T&S Reinf Area 2.016 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.6715 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.744 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8382 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	4.00 ft
Heel Width	=	1.17
Total Footing Width	=	5.17
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,374	0 psf
Mu' : Upward	=	166,873	0 ft-#
Mu' : Downward	=	39,840	1,146 ft-#
Mu: Design	=	5,828	1,146 ft-#
Actual 1-Way Shear	=	37.09	22.59 psi
Allow 1-Way Shear	=	75.00	40.00 psi

Toe Reinforcing = *# 5 @ 4.50 in*
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 7.05 in, #5@ 10.93 in, #6@ 15.52 in, #7@ 21.17 in, #8@ 27.87 in, #9@ 35
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area 1.34 *in2*
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		3,025.0	3.67	11,091.7	Soil Over HL (ab. water tbl)	625.4	4.92	3,075.1
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		4.92	3,075.1
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=	1,120.0	4.33	2,080.0
Added Lateral Load	=				* Axial Live Load on Stem	=	640.0	4.33	2,773.3
Load @ Stem Above Soil	=				Soil Over Toe	=	250.0	2.00	500.0
Seismic Earth Load	=	677.6	5.50	3,726.8	Surcharge Over Toe	=	400.0	2.00	800.0
	=				Stem Weight(s)	=	1,050.0	4.33	4,550.0
Total	=	3,702.6	O.T.M. =	14,818.5	Earth @ Stem Transitions	=			
					Footing Weight	=	775.1	2.58	2,002.3
					Key Weight	=			
					Vert. Component	=	1,168.9	5.17	6,039.7
					Total	=	4,740.4 lbs	R.M.=	19,047.1

Resisting/Overturning Ratio = 1.29
Vertical Loads used for Soil Pressure = 5,389.4 lbs

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

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.096	in

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

Use menu item Settings > Printing & Title Block
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Project Name/Number : 4270
Title F2 :
Dsgnr:
Description....

Date: 19 DEC 2019

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

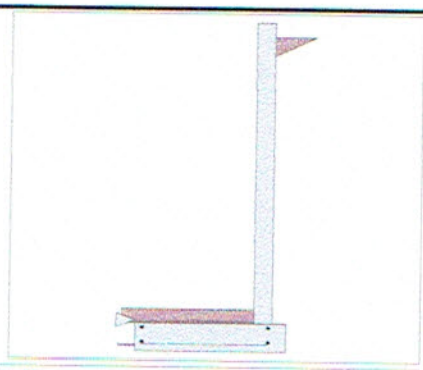
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	50.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	100.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

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

Axial Load Applied to Stem

Axial Dead Load	=	200.0 lbs
Axial Live Load	=	400.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	88.000
Total Seismic Force	=	968.000

Design Summary

Wall Stability Ratios

Overturning	=	1.19 Ratio < 1.5!
Slab Resists All Sliding !		
Total Bearing Load	=	4,972 lbs
...resultant ecc.	=	17.06 in
Soil Pressure @ Toe	=	1,970 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,759 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	36.6 psi OK
Footing Shear @ Heel	=	22.9 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	3,922.6 lbs

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

Load Factors

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

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	4.50
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	0.996
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	5,200.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	19,333.3
Moment.....Allowable	=	19,388.8
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	70.0
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.19
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

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

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.7321 in2/ft	
(4/3) * As :	0.9761 in2/ft	Min Stem T&S Reinf Area 2.016 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.7321 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.8267 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8382 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	4.25 ft
Heel Width	=	1.17
Total Footing Width	=	5.42
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,759	0 psf
Mu' : Upward	=	189,342	0 ft-#
Mu' : Downward	=	44,976	1,156 ft-#
Mu: Design	=	5,130	1,156 ft-#
Actual 1-Way Shear	=	36.57	22.92 psi
Allow 1-Way Shear	=	75.00	40.00 psi

Toe Reinforcing = # 5 @ 4.50 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 7.05 in, #5@ 10.93 in, #6@ 15.52 in, #7@ 21.17 in, #8@ 27.87 in, #9@ 35
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area 1.40 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

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

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		3,025.0	3.67	11,091.7	Soil Over HL (ab. water tbl)	625.4	5.17	3,231.4
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		5.17	3,231.4
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=	220.0	5.50	1,210.0	Surcharge Over Heel	= 25.0	5.17	129.3
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	= 600.0	4.58	916.7
Added Lateral Load	=				* Axial Live Load on Stem	= 400.0	4.58	1,833.3
Load @ Stem Above Soil	=				Soil Over Toe	= 265.6	2.13	564.5
Seismic Earth Load	=	677.6	5.50	3,726.8	Surcharge Over Toe	= 425.0	2.13	903.1
	=				Stem Weight(s)	= 1,050.0	4.58	4,812.5
Total	=	3,922.6	O.T.M. =	16,028.5	Earth @ Stem Transitions	=		
					Footing Weight	= 812.6	2.71	2,200.8
					Key Weight	=		
					Vert. Component	= 1,168.9	5.42	6,331.9
					Total =	4,572.5 lbs	R.M.=	19,090.1

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

Resisting/Overturning Ratio = 1.19 > 1.1
Vertical Loads used for Soil Pressure = 4,972.5 lbs

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.106	in

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

Use menu item Settings > Printing & Title Block
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for your program.

Project Name/Number : 4270
Title F2 :
Dsgnr:
Description....

Date: 19 DEC 2019

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

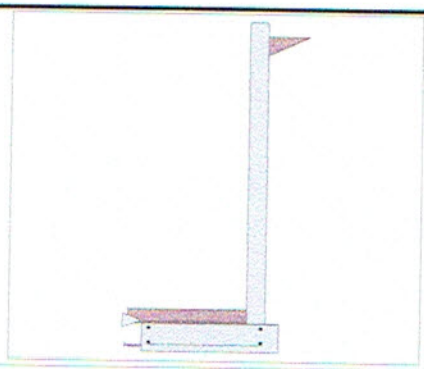
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	100.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

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

Axial Load Applied to Stem

Axial Dead Load	=	600.0 lbs
Axial Live Load	=	1,000.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	88.000
Total Seismic Force	=	968.000

Design Summary

Wall Stability Ratios

Overturning	=	1.24 Ratio < 1.5!
Slab Resists All Sliding !		
Total Bearing Load	=	5,791 lbs
...resultant ecc.	=	9.71 in
Soil Pressure @ Toe	=	1,868 psf OK
Soil Pressure @ Heel	=	12 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,615 psf
ACI Factored @ Heel	=	17 psf
Footing Shear @ Toe	=	40.9 psi OK
Footing Shear @ Heel	=	22.6 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	3,702.6 lbs

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

Load Factors

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

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	5.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	0.997
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	4,880.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	17,733.3
Moment.....Allowable	=	17,776.5
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	65.7
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.19
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Cantilevered Retaining Wall

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

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.6715 in2/ft	
(4/3) * As :	0.8953 in2/ft	Min Stem T&S Reinf Area 2.016 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.6715 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.744 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8382 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	3.75 ft
Heel Width	=	1.17
Total Footing Width	=	4.92
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,615	17 psf
Mu' : Upward	=	164,935	0 ft-#
Mu' : Downward	=	35,016	1,146 ft-#
Mu: Design	=	6,336	1,146 ft-#
Actual 1-Way Shear	=	40.90	22.59 psi
Allow 1-Way Shear	=	75.00	40.00 psi

Toe Reinforcing = *# 5 @ 5.00 in*
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 7.05 in, #5@ 10.93 in, #6@ 15.52 in, #7@ 21.17 in, #8@ 27.87 in, #9@ 35
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area 1.27 *in2*
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Cantilevered Retaining Wall

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

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		3,025.0	3.67	11,091.7	Soil Over HL (ab. water tbl)	625.4	4.67	2,918.7
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		4.67	2,918.7
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=	1,600.0	4.08	2,450.0
Added Lateral Load	=				* Axial Live Load on Stem	=	1,000.0	4.08	4,083.3
Load @ Stem Above Soil	=				Soil Over Toe	=	234.4	1.88	439.5
Seismic Earth Load	=	677.6	5.50	3,726.8	Surcharge Over Toe	=	375.0	1.88	703.1
	=				Stem Weight(s)	=	1,050.0	4.08	4,287.5
Total	=	3,702.6	O.T.M. =	14,818.5	Earth @ Stem Transitions	=			
					Footing Weight	=	737.6	2.46	1,813.3
					Key Weight	=			
					Vert. Component	=	1,168.9	4.92	5,747.4
					Total =		4,791.2 lbs	R.M.=	18,359.5

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

Resisting/Overturning Ratio = **1.24** > 1.1
Vertical Loads used for Soil Pressure = 5,791.2 lbs

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.111	in

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

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 4270
Title F3 :
Dsgnr:
Description....

Date: 19 DEC 2019

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

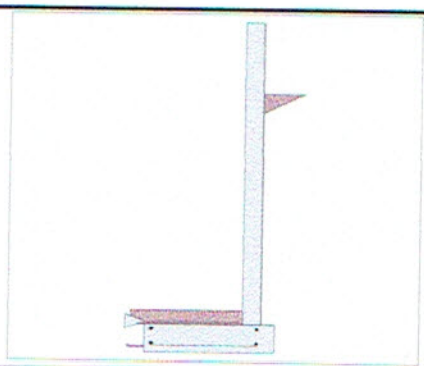
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	2.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	100.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	100.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	1.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Earth (H) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Earth Pressure Seismic Load

Method : Uniform
Multiplier Used = 8.000
(Multiplier used on soil density)

Uniform Seismic Force = 72.000
Total Seismic Force = 648.000

Design Summary

Wall Stability Ratios
Overturning = 1.31 Ratio < 1.5!
Slab Resists All Sliding !

Total Bearing Load	=	3,652 lbs
...resultant ecc.	=	15.45 in
Soil Pressure @ Toe	=	1,829 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,561 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	26.9 psi OK
Footing Shear @ Heel	=	16.9 psi OK
Allowable	=	75.0 psi

Sliding Calcs
Lateral Sliding Force = 2,838.6 lbs

Stem Construction

	Bottom
Design Height Above Ftg ft =	Stem OK 0.00
Wall Material Above "Ht" =	Concrete
Design Method =	LRFD
Thickness =	8.00
Rebar Size =	# 5
Rebar Spacing =	8.00
Rebar Placed at =	Edge
Design Data	
fb/FB + fa/Fa =	0.946
Total Force @ Section	
Service Level lbs =	
Strength Level lbs =	3,648.0
Moment....Actual	
Service Level ft-# =	
Strength Level ft-# =	11,178.7
Moment.....Allowable =	11,799.2
Shear.....Actual	
Service Level psi =	
Strength Level psi =	49.1
Shear.....Allowable psi =	75.0
Anet (Masonry) in2 =	
Rebar Depth 'd' in =	6.19
Masonry Data	
f'm psi =	
Fs psi =	
Solid Grouting =	
Modular Ratio 'n' =	
Wall Weight psf =	100.0
Short Term Factor =	
Equiv. Solid Thick. =	
Masonry Block Type =	Medium Weight
Masonry Design Method =	ASD
Concrete Data	
f'c psi =	2,500.0
Fy psi =	60,000.0

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

Load Factors

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

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.4233 in2/ft	
(4/3) * As :	0.5644 in2/ft	Min Stem T&S Reinf Area 2.016 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.4233 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.465 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8382 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	3.50 ft
Heel Width	=	1.17
Total Footing Width	=	4.67
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,561	0 psf
Mu' : Upward	=	118,300	0 ft-#
Mu' : Downward	=	30,503	819 ft-#
Mu: Design	=	2,730	819 ft-#
Actual 1-Way Shear	=	26.86	16.85 psi
Allow 1-Way Shear	=	75.00	40.00 psi

Toe Reinforcing = # 5 @ 6.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 9.05 in, #5@ 14.03 in, #6@ 19.92 in, #7@ 27.16 in, #8@ 35.77 in, #9@ 45
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area 1.21 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

Cantilevered Retaining Wall

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

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		2,025.0	3.00	6,075.0	Soil Over HL (ab. water tbl)	500.3	4.42	2,209.9
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		4.42	2,209.9
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=	360.0	4.50	1,620.0	Surcharge Over Heel	= 50.0	4.42	221.0
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	= 218.8	1.75	382.8
Seismic Earth Load	=	453.6	4.50	2,041.2	Surcharge Over Toe	= 350.0	1.75	612.5
	=				Stem Weight(s)	= 1,050.0	3.83	4,025.0
					Earth @ Stem Transitions	=		
Total	=	2,838.6	O.T.M. =	9,736.2	Footing Weight	= 700.1	2.33	1,633.6
					Key Weight	=		
					Vert. Component	= 782.5	4.67	3,651.8
					Total =	3,651.6 lbs	R.M.=	12,736.6

Resisting/Overturning Ratio = 1.31
Vertical Loads used for Soil Pressure = 3,651.6 lbs

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

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.114	in

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

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 4270
Title F5 :
Dsgnr:
Description....

Date: 23 DEC 2019

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

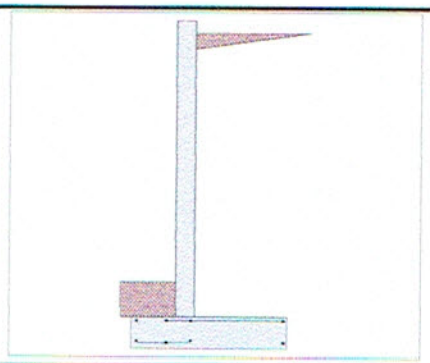
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	12.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	18.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	1.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Earth (H) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios

Overturning	=	2.62 OK
Sliding	=	1.21 Ratio < 1.5!
Total Bearing Load	=	11,305 lbs
...resultant ecc.	=	1.89 in
Soil Pressure @ Toe	=	1,554 psf OK
Soil Pressure @ Heel	=	1,185 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,176 psf
ACI Factored @ Heel	=	1,659 psf
Footing Shear @ Toe	=	10.2 psi OK
Footing Shear @ Heel	=	69.4 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	4,444.4 lbs
less 100% Passive Force	= -	1,404.9 lbs
less 100% Friction Force	= -	3,956.7 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	1,305.1 lbs NG

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

Load Factors

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

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	10.00
Rebar Size	=	# 5
Rebar Spacing	=	4.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	0.775
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	5,760.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	23,040.0
Moment.....Allowable	=	29,672.1
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	58.6
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	8.19
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	125.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

Cantilevered Retaining Wall

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

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.6507 in2/ft	
(4/3) * As :	0.8676 in2/ft	Min Stem T&S Reinf Area 3.000 in2
200bd/fy : 200(12)(8.1875)/60000 :	0.3275 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.240 in2/ft
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.6507 in2/ft	#4@ 10.00 in #4@ 20.00 in
Provided Area :	0.93 in2/ft	#5@ 15.50 in #5@ 31.00 in
Maximum Area :	1.1092 in2/ft	#6@ 22.00 in #6@ 44.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	5.00
Total Footing Width	=	7.00
Footing Thickness	=	16.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,176	1,659 psf
Mu' : Upward	=	51,041	0 ft-#
Mu' : Downward	=	11,160	29,158 ft-#
Mu: Design	=	2,905	29,158 ft-#
Actual 1-Way Shear	=	10.23	69.43 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 5 @ 4.00 *in*
Heel Reinforcing = # 5 @ 4.00 in
Key Reinforcing = # 4 @ 9.00 in
Footing Torsion, Tu = 36,616.50 ft-lbs
Footing Allow. Torsion, phi Tu = 8,640.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 6.93 in, #5@ 10.75 in, #6@ 15.27 in, #7@ 20.82 in, #8@ 27.42 in, #9@ 34
Heel: #4@ 6.93 in, #5@ 10.75 in, #6@ 15.27 in, #7@ 20.82 in, #8@ 27.42 in, #9@ 34
Key: No key defined

Min footing T&S reinf Area 2.42 *in2*
Min footing T&S reinf Area per foot 0.35 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 6.94 in	#4@ 13.89 in
#5@ 10.76 in	#5@ 21.53 in
#6@ 15.28 in	#6@ 30.56 in

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

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

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	4,444.4	4.44	19,753.1			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
=						
				Soil Over HL (ab. water tbl)	6,250.0	4.92	30,729.2
				Soil Over HL (bel. water tbl)		4.92	30,729.2
				Watre Table			
				Sloped Soil Over Heel =			
				Surcharge Over Heel =			
				Adjacent Footing Load =			
				Axial Dead Load on Stem =			
				* Axial Live Load on Stem =			
				Soil Over Toe =	375.0	1.00	375.0
				Surcharge Over Toe =			
				Stem Weight(s) =	1,562.5	2.42	3,776.0
				Earth @ Stem Transitions =			
				Footing Weight =	1,400.0	3.50	4,900.0
				Key Weight =			
				Vert. Component =	1,717.4	7.00	12,021.6
Total =	4,444.4	O.T.M. =	19,753.1	Total =	11,304.9 lbs	R.M.=	51,801.8

Resisting/Overturning Ratio = 2.62
Vertical Loads used for Soil Pressure = 11,304.9 lbs

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.077	in

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

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 4270
Title F4 :
Dsgnr:
Description....

Date: 23 DEC 2019

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

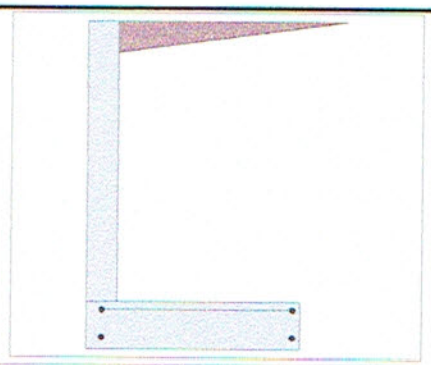
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	100.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	1.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Earth (H) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	56.000
Total Seismic Force	=	392.000

Design Summary

Wall Stability Ratios

Overturning	=	2.73 OK
Sliding	=	1.16 Ratio < 1.5!
Total Bearing Load	=	5,174 lbs
...resultant ecc.	=	6.78 in
Soil Pressure @ Toe	=	1,739 psf OK
Soil Pressure @ Heel	=	275 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,434 psf
ACI Factored @ Heel	=	386 psf
Footing Shear @ Toe	=	0.0 psi OK
Footing Shear @ Heel	=	50.2 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	1,779.4 lbs
less 100% Passive Force	= -	0.0 lbs
less 100% Friction Force	= -	2,069.5 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	599.6 lbs NG

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

Load Factors

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

Stem Construction

Bottom

Design Height Above Ftg	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	9.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.707
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	2,160.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	5,040.0
Moment.....Allowable	=	7,122.4
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	28.8
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.25

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD

Concrete Data

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

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.1888 in2/ft	
(4/3) * As :	0.2518 in2/ft	Min Stem T&S Reinf Area 1.152 in2
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.25 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.2667 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	0.00 ft
Heel Width	=	4.67
Total Footing Width	=	4.67
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,434	386 psf
Mu' : Upward	=	0	0 ft-#
Mu' : Downward	=	0	12,951 ft-#
Mu: Design	=	0	12,951 ft-#
Actual 1-Way Shear	=	0.00	50.16 psi
Allow 1-Way Shear	=	0.00	75.00 psi

Toe Reinforcing = # 4 @ 9.00 in
Heel Reinforcing = # 4 @ 9.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 36,616.50 ft-lbs
Footing Allow. Torsion, phi Tu = 8,640.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area 1.21 *in2*
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

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

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		1,225.0	2.33	2,858.3	Soil Over HL (ab. water tbl)	3,000.3	2.67	8,001.2
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		2.67	8,001.2
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=	280.0	3.50	980.0	Surcharge Over Heel	= 400.0	2.67	1,066.8
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=		
Seismic Earth Load	=	274.4	3.50	960.4	Surcharge Over Toe	=		
	=				Stem Weight(s)	= 600.0	0.33	200.0
					Earth @ Stem Transitions	=		
Total	=	1,779.4	O.T.M. =	4,798.7	Footing Weight	= 700.1	2.33	1,633.6
					Key Weight	=		
					Vert. Component	= 473.4	4.67	2,209.1
					Total =	5,173.7 lbs	R.M.=	13,110.7

Resisting/Overturning Ratio = 2.73
Vertical Loads used for Soil Pressure = 5,173.7 lbs

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

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.062	in

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

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 4270
Title F4 :
Dsgnr:
Description....

Date: 23 DEC 2019

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

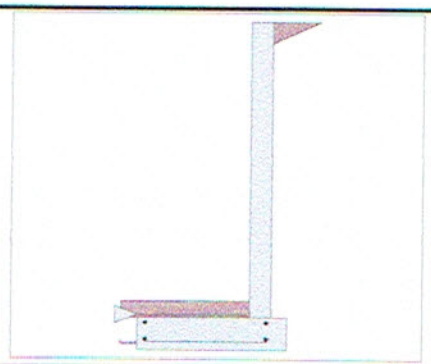
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	50.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	100.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	1.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Earth (H) (Service Level)
Wind on Exposed Stem (Service Level)	=	0.0 psf

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios

Overturning	=	1.57 OK

Slab Resists All Sliding !

Total Bearing Load	=	3,698 lbs
...resultant ecc.	=	7.18 in
Soil Pressure @ Toe	=	1,036 psf OK
Soil Pressure @ Heel	=	135 psf OK
Allowable	=	2,000 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,450 psf
ACI Factored @ Heel	=	189 psf
Footing Shear @ Toe	=	17.3 psi OK
Footing Shear @ Heel	=	19.3 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	2,500.0 lbs

Stem Construction

	Bottom
	Stem OK
Design Height Above Ftg ft =	0.00
Wall Material Above "Ht" =	Concrete
Design Method =	LRFD
Thickness =	8.00
Rebar Size =	# 4
Rebar Spacing =	6.00
Rebar Placed at =	Edge
Design Data	
fb/FB + fa/Fa =	0.934
Total Force @ Section	
Service Level lbs =	
Strength Level lbs =	3,240.0
Moment....Actual	
Service Level ft-# =	
Strength Level ft-# =	9,720.0
Moment.....Allowable =	10,400.4
Shear.....Actual	
Service Level psi =	
Strength Level psi =	43.2
Shear.....Allowable psi =	75.0
Anet (Masonry) in2 =	
Rebar Depth 'd' in =	6.25
Masonry Data	
f'm psi =	
Fs psi =	
Solid Grouting =	
Modular Ratio 'n' =	
Wall Weight psf =	100.0
Short Term Factor =	
Equiv. Solid Thick. =	
Masonry Block Type =	Medium Weight
Masonry Design Method =	ASD
Concrete Data	
f'c psi =	2,500.0
Fy psi =	60,000.0

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

Load Factors

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

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

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

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.3642 in2/ft	
(4/3) * As :	0.4856 in2/ft	Min Stem T&S Reinf Area 1.728 in2
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.3642 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.4 in2/ft	#5@ 19.38 in #5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	3.50 ft
Heel Width	=	1.17
Total Footing Width	=	4.67
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,450	189 psf
Mu' : Upward	=	83,393	0 ft-#
Mu' : Downward	=	30,503	965 ft-#
Mu: Design	=	2,477	965 ft-#
Actual 1-Way Shear	=	17.32	19.26 psi
Allow 1-Way Shear	=	75.00	40.00 psi

Toe Reinforcing = # 4 @ 6.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 36,616.50 ft-lbs
Footing Allow. Torsion, phi Tu = 8,640.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.34 in, #6@ 20.36 in, #7@ 27.77 in, #8@ 36.56 in, #9@ 46
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area 1.21 *in2*
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

This Wall in File: i:\work\cses engineering\jobs\walkey\4270.rpx

Cantilevered Retaining Wall

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

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		2,500.0	3.33	8,333.3	Soil Over HL (ab. water tbl)	562.9	4.42	2,486.1
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		4.42	2,486.1
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	218.8	1.75	382.8
	=				Surcharge Over Toe	=	350.0	1.75	612.5
					Stem Weight(s)	=	900.0	3.83	3,450.0
					Earth @ Stem Transitions	=			
					Footing Weight	=	700.1	2.33	1,633.6
					Key Weight	=			
					Vert. Component	=	966.0	4.67	4,508.4
Total	=	2,500.0	O.T.M. =	8,333.3	Total =		3,697.7 lbs	R.M.=	13,073.4

Resisting/Overturning Ratio = 1.57
Vertical Loads used for Soil Pressure = 3,697.7 lbs

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.055	in

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

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270**	Date:	19-Dec-19
Owner:		Page number:	F22

SLAB DESIGN (Uniform Load, Simple Span)

2015 INT. Building Code (IBC) **ACI 318**

Beam Description:

Material Properties:

Fy:	60000	psi		f'c:	2500 psi
Es:	29000000	psi		Ec:	2850000 psi
β1:	0.85		φv: 0.75		φm: 0.9

Geometry and Loads:

Span:	12	ft		Tributary Width:	1 ft
DL unit load:	100	psf		LL unit load:	50 psf
Add'l unif. DL:		lb/ft		Add'l unif. LL:	lb/ft
Point DL:		lbs		Point LL:	lbs
Point Location:	2	ft			
Depth:	8	in		Width:	12 in
d:	5	in			

Force analysis:

Mu:	43200	in-lbs		Vu:	1200 lbs

Reinforcement:

Center Bars	(1)	#4
As:	0.20	In^2
ρ:	0.002	

Design:

a:	0.46	in		c:	0.54 in
tensile strain:	0.025		>		0.005 **OK**
φMn:	50,565	in-lbs	>		43,200 **OK**
φVc:	4500	lbs			
φVn:	4500	lbs	>		1200 **OK**

Shear Reinforcement Required for: **-5.3 ft** from supports.

Deflections:

Ig:	512	In^4		Mcr:	48000 In-lbs
Icr:	36	In^4		Ie:	512 In^4
LL Deflection:	0.0160	in		L/	9007 **OK**
DL Deflection:	0.0320	in		λΔ:	2.00
TL Deflection:	0.0799	in		L/	1801 **OK, > L/360**

John S. Apolis, P.E. | CSES, Inc. | Job number: 2019.089

Project: 4270 | Date: 22-Apr-21

Owner: | Page number: F23

CONCRETE BEAM DESIGN (Uniform Load, Simple Span)

2018 Seattle Building Code (SBC) | ACI 318

Beam Description: Grade Beam

Material Properties:

Fy:	60000 psi		f'c:	2500 psi	
Es:	29000000 psi		Ec:	2850000 psi	
β1:	0.85	φv: 0.75		φm: 0.9	

Geometry and Loads:

Span:	14 ft		Tributary Width:	12 ft	
DL unit load:	100 psf		LL unit load:	50 psf	
Add'l unif. DL:	lb/ft		Add'l unif. LL:	lb/ft	
Point DL:	0 lbs		Point LL:	lbs	
Point Location:	0 ft				
Depth:	18 in		Width:	18 in	
d:	15 in				

Force analysis:

Mu:	705600 in-lbs		Vu:	16800 lbs	

Reinforcement:

Top Rebar:	*(4)*	*#5*	Bottom Rebar:	(4)	#5
As':	1.23	In^2	As:	1.23	In^2
ρ':	0.004		ρ:	0.004	
Ties:	(1)	#3	@ 7.5 in o.c.	OK	

Design:

a:	1.92 in		c:	2.26 in	
tensile strain:	0.017	>		0.005	**OK**
φMn:	930,237 in-lbs	>		705,600	**OK**
φVc:	20250 lbs		φVs:	9940 lbs	
φVn:	30190 lbs	>		16800	**OK**

Shear Reinforcement Required for: **2.8 ft** from supports.

Deflections:

Ig:	8748 In^4		Mcr:	364500 In-lbs	
Icr:	1894 In^4		Ie:	2839 In^4	
LL Deflection:	0.0641 in		L/	2621	**OK**
DL Deflection:	0.1282 in		λΔ:	1.68	
TL Deflection:	0.2796 in		L/	601	**OK, > L/360**

CALCULATING DEAD LOAD

SLAB : $100\ psf \times 2300\ ft^2 = 230000\ lb$

GRADE BEAMS : $(1.5' \times 1.5' \times 150\ pcf) \times 166' = 56025\ lb$

RET. WALLS : $1863\ lb/ft \times 159' = 296217\ lb$

WOOD WALLS : $(20' \times 236') \times 12\ psf = 56640\ lb$

WOOD FLOORS : $(2300\ ft^2 \times 2\ floors \times 12\ psf) = 47664\ lb$

ROOF : $(2300\ ft^2 \times 12\ psf) = 27600\ lb$

$\longrightarrow$ TOTAL $= 714146\ lb = P$

CALCULATING SLIDING FORCES

$F_s = 3703\ lb/ft \times 24' + 3923\ lb/ft \times 22' + 3703\ lb/ft \times 28'$

$= 278862\ lb$

$P \times 0.35 = 249951\ lb$ ← DEAD LOAD RESISTING SLIDING

$F_s - 249951\ lb = 28911\ lb$

CALCULATING PASSIVE FORCE

$V_p = 350\ pcf \times 2.5' \times 2.5'/2 - 350\ pcf \times 1' \times 1'/2 = 918\ plf$

$F_p = 918\ plf \times 82' = 75276\ lb > 28911\ lb$ ✓

CONSULTING STRUCTURAL ENGINEERING SERVICES
Residential and Commercial Structural Design
6311 17th Avenue NE, Seattle, WA 98115
Phone: (206)527-1288 Email: john@cses-engineering.com

Project No. 2019.089 Date 2/20/20
Project Name 4270
Comments
Revision Page F25

PILE DESIGN 4"Q PILES, CAP = 20"

GARAGE NORTH WALL → w = 2,220 plf (HOUSE) + 1,950 plf (WALL) + (100 psf + 40 psf) x 6' (SLAB)
+ 0.5' x 10.5' x 130 pcf (SOIL) = 5,692 plf (EAST WALL SIMILAR) 20"/5.7 kips = 3.5' o.c.

NORTH HOUSEWALLS → w = 5,692 plf + 1,740 plf − 2,229 plf = 5,212 plf
20"/5.2 kips/ft = 3.75' o.c.

OVERTURNING SUPPORTS − 6,509 plf 20"/6.5 kips/ft = 3' o.c.

WEST WALL - w = 5,692 plf − 2,220 plf + 440 plf = 3,912 plf 20"/3.9 k = 5' o.c.

GRADE BEAMS w = 1.5 x 1.5 x 150 pcf + 12' x 140 psf ≈ 2000 plf 10' o.c.

GARAGE OPENING w = 2,605 plf + 1.5' x 1.5 x 150 pcf + 6' x 140 psf = 3,783 #
20/3.8 = 5.25' o.c.

DETAIL [F5] B SIMILAR

w = 11,305 #-ft REF F13 20/11.3 = 1.75' PILES @ 1.75' o.c.

SE WALLS

w = 2,175 plf + 1.5' x 1.5' x 150 psf + 6' x 140 psf = 3,353 plf
20/3.3 = 6' o.c.

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Project No. 2019.089 Date 5/26/21
Project Name 4270 ARDEKANI
Comments
Revision Page F26-A

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2019.089**
Project:	**4270 Ardekani**	Date:	20-Nov-20
Architect:		Page number:	F27

Pile Supported Retaining Wall

2015 International Building Code (IBC)

Seismic Condition: Overturning Factor of Safety = 1.2, Sliding Factor of Safety = 1.1

SHORT RETAINING WALL

Design Information:

Concrete Weight:	150 pcf	Pile Capacity:	6000 lbs	Soil Weight:	130 pcf
Friction Coefficient:	0.35	Passive Pressure:	350 pcf	Ignore Soil Height:	12 in

Wall Information:

Wall Height:	4.0 ft	Wall Thickness:	6 in		
Triangular Loads:		Active Pressure:	50 pcf	Seismic Pressure:	0 pcf
Uniform Loads:		Slab surcharge:	0 psf	Seismic Pressure:	40 psf

Footing Information:

Length from face:	12 in	Thickness:	12 in		
Heel Length:	18 in	Soil Over Toe:	12 in		

Forces and Moments: (sum moments about bottom of heel corner)

Wall weight:	300 lbs/ft	Wall location:	21 in	Wall moment:	6300 lb-in
Footing Weight:	280 lbs/ft	Footing location:	30 in	Footing moment:	8400 lb-in
Axial Load:	0 lbs/ft	Load location:	0 in	Axial moment:	0 lb-in
Soil Behind Wall:	1005 lbs/ft	Load location:	9 in	Soil moment:	9045 lb-in
Uniform load:	200 lbs/ft	Uniform location:	30 in	Uniform moment:	6000 lb-in
Triangular Load:	625 lbs/ft	Triangular location:	20 in	Triangular moment:	12500 lb-in
Pile 2 Load:	1408 lbs/ft	Pile 2 Location:	30 in	Pile 2 moment:	42245 lb-in
Pile 1 Load:	177 lbs/ft	Pile 1 Location:	6 in	Pile 1 moment:	0 lb-in

Pile Specification:

Min. pile 2 spacing:	51 in	Min. pile 1 spacing:	407 in		
Pile 2 spacing:	**48 in**	Pile 1 spacing:	**72 in**		
Pile 2 moment:	45000 lb-in	Pile 1 moment:	6000 lb-in		
Design Pile 2 Loading:	5633 lbs	Design Pile 1 Loading:	1061 lbs		
Overturning Moment:	42245 lb-in	Resisting Moment:	51000 lb-in	Safety Factor:	**1.21**
Sliding Demand:	825 lbs/ft	Sliding Resistance:	1080 lbs/ft	Safety Factor:	**1.31**

Melissa Lookups: Personator Result

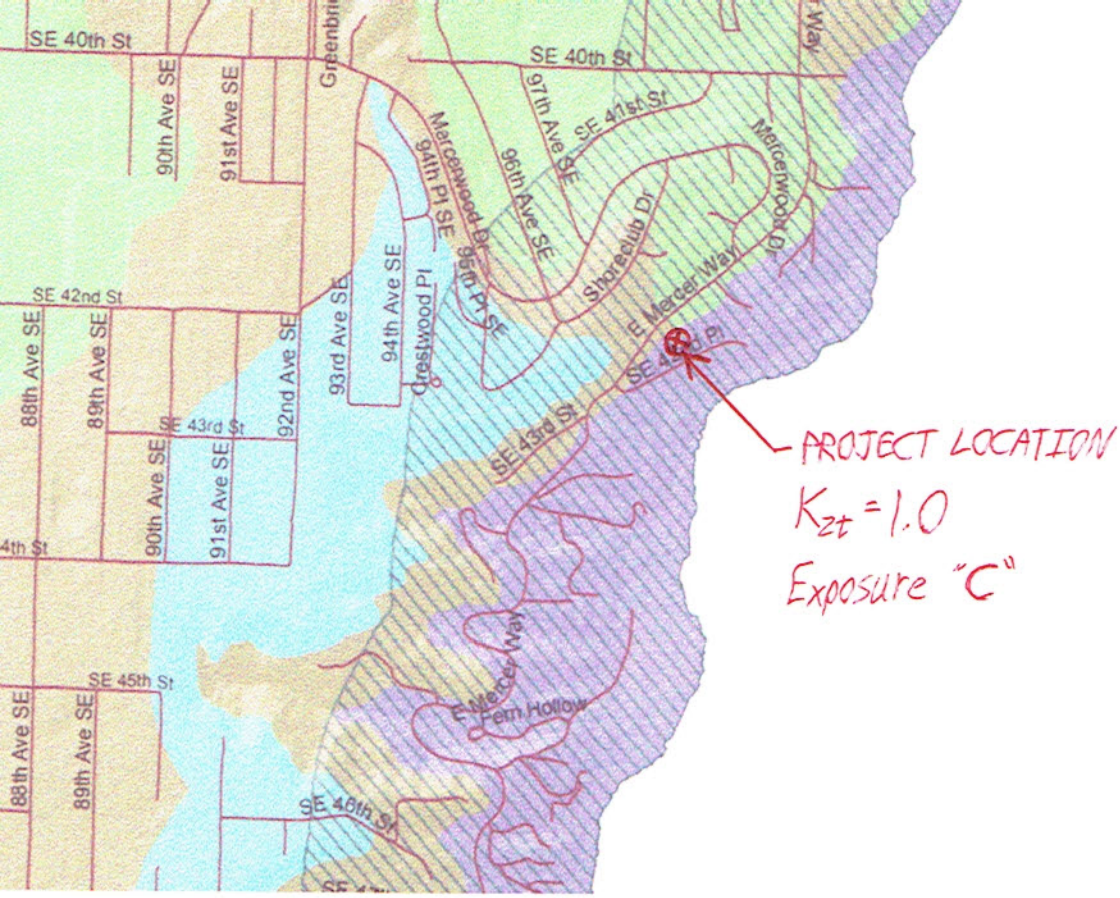
Name & Address Verified

AS01,AS16,DA00,DA10,GS05,NE05,NS02,VR01

Name at Address	Millad Llc Name & Address Match (VR01)
Address	4270 E Mercer Way Mercer IslandWA98040-3824 Address Verified (AS01)
Property Information	Owner: Millad V Llc
MAK (Melissa Address Key)	6766954241
Lat. & Long.	47.570628 -122.208266 Geocoded to Rooftop Level (GS05)
Address Type	Residential
Postal Carrier Route	C006 (DPC: 70-5)
U.S. Representative	Adam Smith (D) (09)
Census Entities	County 53033 King County Subdivision 92931 Seattle East CCD Tract 0245.00 Block 1001 City, Place or Town 5345005 Mercer Island Unified School District 04980 Mercer Island School District
State Upper District	041
State Lower District	041
Delivery Post Office	Mercer Island 3040 78Th Ave Se Mercer Island WA 98040 206-232-8834

View Google Map and Picture (3 credits) Hide Markers Download (Print) Map

Address Location


SE 40th St
90th Ave SE
91st Ave SE
Greenbrier
Mercerwood Dr
94th Pl SE
96th Ave SE
97th Ave SE
SE 41st St
Shorecliub Dr
E Mercer Way
SE 42nd St
88th Ave SE
89th Ave SE
92nd Ave SE
93rd Ave SE
94th Ave SE
Crestwood Pl
SE 43rd St
SE 45th St
Fern Hollow
SE 46th St
PROJECT LOCATION
$K_{zt} = 1.0$
Exposure "C"

OSHPD

4270 E Mercer Way, Mercer Island, WA 98040, USA

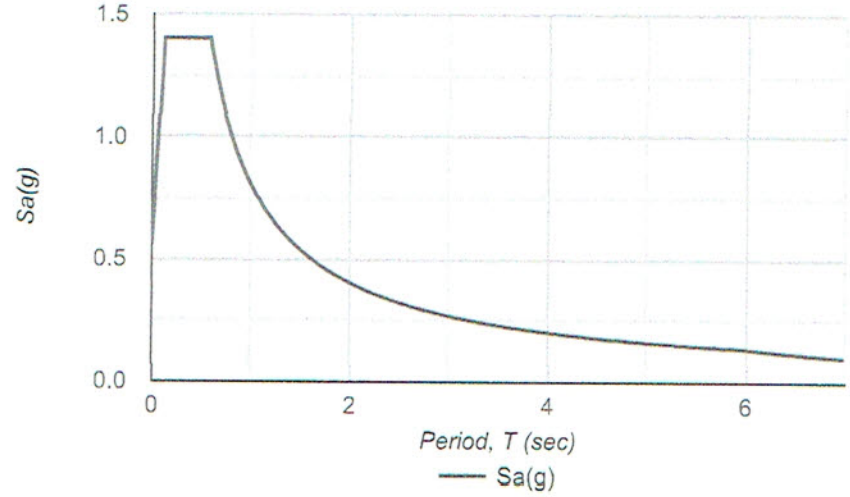
Latitude, Longitude: 47.5706712, -122.20809150000002

Date	11/20/2019, 12:06:11 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

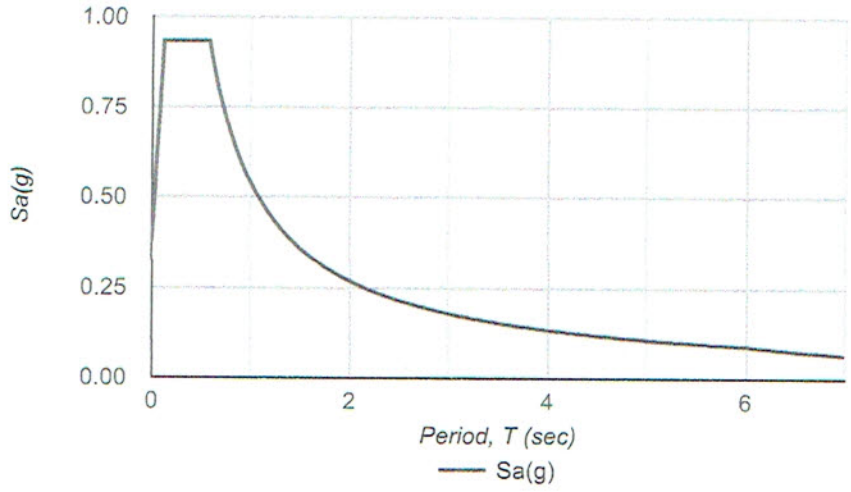
Type	Value	Description
S_S	1.401	MCE_R ground motion. (for 0.2 second period)
S_1	0.538	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.401	Site-modified spectral acceleration value
S_{M1}	0.807	Site-modified spectral acceleration value
S_{DS}	0.934	Numeric seismic design value at 0.2 second SA
S_{D1}	0.538	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.578	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.578	*Site modified peak ground acceleration*
T_L	6	Long-period transition period in seconds
SsRT	1.401	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.463	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	3.273	Factored deterministic acceleration value. (0.2 second)
S1RT	0.538	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.576	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.308	Factored deterministic acceleration value. (1.0 second)
PGAd	1.268	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.958	Mapped value of the risk coefficient at short periods
C_{R1}	0.933	Mapped value of the risk coefficient at a period of 1 s

MCER Response Spectrum



Design Response Spectrum



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John S. Apolis, P.E. CSES, Inc. Job number: **2019.089**
Project: **4270 Ardekani** Date: 20-Nov-19
Architect: Page number: **L1**

Lateral Loads Design per ASCE 7-10, Wind: Section 27 Seismic: Section 12

(Directional Procedure Part 1) 2015 Seattle Building Code (SBC)

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

Ps = lambda * Kzt * Ps(30) * 0.6 Exposure : C Roof Slope: **0.00** : 12 = 0.0 (degrees)

Least Horizontal Dimension, feet: **27** Mean Roof Ht, feet: **32**

Risk Category: II Kzt = **1.00**

Directionality Factor: Kd = 0.85 Gust-Effect Factor: G = 0.85

Enclosure Classification: Enclosed Gcpi = 0.18 -0.18

Horizontal wind pressure on walls at specified heights of structure.

Significant Heights of structure (ft)		EQ 27.3-1 Velocity Pressure (psf):	EQ 27.4-1 Design Pressures (psf):
1	10	22.4	**17.6**
2	20	23.7	**18.5**
3	30	25.8	**19.9**

Horizontal and vertical wind pressure on roof of structure.

Horizontal roof pressure: **0.0** psf

Vertical/uplift pressure: **12.0** psf

Vertical/uplift pressure on overhangs: **13.3** psf

(Equivalent Lateral Force Procedure, Section 12.8)

SEISMIC LOADS Ie 1.0 R = 6.5 ASCE 7-10, Table 12.2.1

Seismic Parameters per ASCE 7-10) Group I Site Class: **D**

PGA (.2 sec) 1.401 Fa = 1.00 ASCE 7-10 Table 11.4-1

PGA (1 sec) 0.538 Fv = 1.50 ASCE 7-10 Table 11.4-2

Seismic Design Categories per ASCE 7-10 Tables 11.6-1, 11.6-2

Based on Sds: **D** Based on Sd1: **D**

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

Ss = 1.4010 Sms = Fa * Ss = 1.40 Equation 11.4-1

S1 = 0.5380 Sm1 = Fv * S1 = 0.81 Equation 11.4-2

Equations 11.4-3, 11.4-4 Sds = 2/3 * Sms = 0.93 Sd1 = 2/3 * Sm1 = 0.54

Equation 12.14-11 Cs (or %V) = (Sds / (R/I)) = 0.144 **Building period < 0.5 s per IBC eq 12.8-7**

Base Shear = %V * W * 0.7 = 6.84 psf, uniformly distributed over floor area

(0.7 reduction factor per ASCE 7-10, Section 2.4.1, Eq 5 (seismic vertical distribution per IBC eqs 12.8-11 & 12)

Base = top of foundation	Roof or Floor DL (psf)	Wall DL (psf) dist. over floor area	Story Height Above Base (ft)	Lateral Load (psf)
Roof	16	8	30	3.57
Second floor	12	10	20	2.18
First floor	12	10	10	1.09
				0.00
Total Seismic DL:	68		Sum	6.84

SHEAR WALL DESIGN - NORTH WALL - UPPER FLOOR $L = 4.5' + 4'$

$P_W = [(5.5' \times 5') \times 19.9\ psf] = 548\ lb$

$P_E = [(52' \times 7') \times 3.57\ psf] = 1300\ lb$ ← CONTROLS

$V = 1300\ lb / 8.5' = 153\ plf < 230\ plf$ SW1

$UPLIFT = 153\ plf \times 11' = 1683\ lb < 1705\ lb$ CS16
$< 3900\ lb$ MSTC48B3

MAIN FLOOR - $L = 3' + 3'$

$P_W = [(4.5' \times 11') \times 18.5\ psf] + 548\ lb = 1464\ lb$

$P_E = [(8' \times 28') \times 2.18\ psf] + 1300\ lb = 1789\ lb$ ← CONTROLS

$V = 1789\ lb / 6' = 299\ plf$

$V^* = 299\ plf / 1.25 - 0.125 \times 10.5'/3' = 368\ plf < 550\ plf$ SW3

$UPLIFT = 1683\ lb + [(368\ plf \times 10.5') + 3864\ lb] = 5547\ lb < 5820\ lb$ HDU8
$< 6435\ lb$ SB7/8×24

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SHEAR WALL DESIGN - EAST WALL - UPPER FLOOR L = 28'

$P_W = [(5.5' \times 11') \times 19.9\ psf] = 1204\ lb$

$P_E = (11' \times 34' \times 3.57\ psf) = 1336\ lb$ ← CONTROLS

$V = 1336\ lb / 28' = 48\ plf < 230\ plf$ SW1

UPLIFT = $48\ plf \times 10.5' = 504\ lb < 1705\ lb$ CS16

MAIN FLOOR - L = 28'

$P_W = [(11' \times 18') \times 18.5\ psf] + 1204\ lb + (2518\ lb \times 14'/36') = 5847\ lb$ ← CONTROLS

$P_E = [(18' \times 70') \times 2.18\ psf] + 1336\ lb + (3006\ lb \times 14'/36') = 5252\ lb$

$V = 5847\ lb / 28' = 209\ plf < 230\ plf$ SW1

UPLIFT = $(209\ plf \times 10.5') + 504\ lb = 2699\ lb < 4340\ lb$ HDU5
$< 3410\ lb$ (2)CS16

LOWER FLOOR - L = 11'

$P_W = (5847\ lb \times 16'/28') + [(11' \times 5') \times 17.6\ psf] = 4310\ lb$ ← CONTROLS

$P_E = (5252\ lb \times 16'/28') + [(11' \times 32') \times 1.09\ psf] = 3385\ lb$

$V = 4310\ lb / 11' = 392\ plf < 550\ plf$ SW3

UPLIFT = $2699\ lb + 392\ plf \times 10' = 6617\ lb < 8030\ lb$ HDU11
$< 8030\ lb$ SB.1x30

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Revision Page L3

SHEAR WALL DESIGN - SOUTH EAST WALL - UPPER FLOOR L = 11.5'

$P_W = [11.5' \times 5.5' \times 19.9\ psf] = 1258\ lb$
$P_E = [11.5' \times 82' \times 3.57\ psf] = 3367\ lb$ ← CONTROLS

$V = 3367\ lb / 11.5' = 293\ plf < 350\ plf$ SW2
$UPLIFT = 293\ plf \times 10.5' = 3077\ lb < 3900\ lb$ MSTC48B3
$< 3410\ lb$ (2)CS16

SOUTH MID WALL - UPPER FLOOR L = 7'

$P_W = [5.5' \times 5.5' \times 19.9\ psf] = 602\ lb$
$P_E = [4' \times 67' \times 3.57\ psf] = 957\ lb$ ← CONTROLS

$V = 957\ lb / 7' = 137\ plf < 230\ plf$ SW1
$UPLIFT = 137\ plf \times 10.5' = 1436\ lb < 1705\ lb$ CS16

MAIN FLOOR - L = 8.5' + 3.5' = 12' *PERFORATED SHEAR WALL

$P_W = 602\ lb + [(19/27) \times 1258\ lb] + [13' \times 11' \times 18.5\ psf] = 4133\ lb$ ← CONTROLS
$P_E = 957\ lb + [(19/27) \times 3367\ lb] + [4' \times 82' \times 2.18\ psf] = 4042\ lb$

$V = 4133\ lb / 12' = 345\ plf < 550\ plf$ SW3
$UPLIFT = 1436\ lb + (345\ plf \times 10.5') = 5059\ lb$

$UPLIFT^* = 5059\ lb + (345\ plf \times 7.5') = 7647\ lb < 8030\ lb$ HDU11
(345 plf × 7.5' UNIFORM UPLIFT) $< 8030\ lb$ SB1×30

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Project No. 2019.089 Date 5/11/2020
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SHEAR WALL DESIGN - SOUTH WEST WALL - UPPER FLOOR $L = 5.75' + 4.25'$

$P_W = [(2' \times 5.5') \times 19.9\ psf] = 219\ lb$

$P_E = [(5' \times 42') \times 3.57\ psf] = 750\ lb$ ← CONTROLS

$V = 750\ lb / 10' = 75\ plf < 230\ plf$ SW1

UPLIFT $= 75\ plf \times 10.5' = 788\ lb < 1705\ lb$ CS16

MAIN FLOOR - $L = 5.75' + 4.25'$

$P_W = 219\ lb + [(2' \times 11') \times 18.5\ psf] = 626\ lb$

$P_E = 750\ lb + [(3' \times 42') \times 2.18\ psf] = 1025\ lb$ ← CONTROLS

$V = 1025\ lb / 10' = 102.5\ plf < 230\ plf$ SW1

UPLIFT $= 788\ lb + (102.5\ plf \times 10.5') = 1865\ lb < 3900\ lb$ MSTC48B3

DIAPHRAGM CHECK: $1025\ lb / 100\ plf = 10.25' < 16'$

PROVIDE 16' DRAG STRUT

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Project No. 2019.089 Date 11/20/19
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SHEAR WALL DESIGN - EAST MID WALL - UPPER FLOOR L = 5.5' + 4'

$P_W = [(23' \times 5.5') \times 19.9\ psf] = 2518\ lb$

$P_E = [(11' \times 34') + (13' \times 36')] \times 3.57\ psf = 3006\ lb$ ← CONTROLS

$V = 3006\ lb / 9.5' = 317\ plf < 350\ plf$ SW2

UPLIFT = $317\ plf \times 10.5' = 3323\ lb < 3410\ lb$ (2) CS16

WEST STAIR WALL - UPPER FLOOR L = 8'

$P_W = [(30' \times 5.5') \times 19.9\ psf] = 3284\ lb$

$P_E = [(12' \times 35') + (18' \times 33')] \times 3.57\ psf = 3620\ lb$ ← CONTROLS

$V = 3620\ lb / 8' = 453\ plf < 550\ plf$ SW3

UPLIFT = $453\ plf \times 10.5' = 4757\ lb < 6475\ lb$ CMST14

WEST WALL - UPPER FLOOR L = 9'

$P_W = [(18' \times 5.5') \times 19.9\ psf] = 1971\ lb$

$P_E = [(18' \times 33') \times 3.57\ psf] = 2121\ lb$ ← CONTROLS

$V = 2121\ lb / 9' = 236\ plf < 350\ plf$ SW2

UPLIFT = $236\ plf \times 10.5' = 2478\ lb < 3410\ lb$ (2) CS16

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SHEAR WALL DESIGN - EAST STAIR WALL - MAIN FLOOR L = 13'

$P_W = [(23' \times 11') \times 18.5\ psf] + [2518\ lb \times (22'/36')] = 6220\ lb$ ← CONTROLS

$P_E = [(23' \times 58') \times 2.18\ psf] + [3006\ lb \times (22'/36')] = 4746\ lb$

$V = 6220\ lb / 13' = 474\ plf < 550\ plf$ SW3

UPLIFT = $479\ plf \times 10.5' = 5030\ lb$ < 6475 lb CMST14
< 5820 lb HDU8
< 6435 lb SB 7/8 x 24

LOWER FLOOR L = 15.5' + 8'

$P_W = [23' \times 5' \times 17.6\ psf] + 6220\ lb = 8244\ lb$ ← CONTROLS

$P_E = [23' \times 32' \times 1.09\ psf] + 4746\ lb = 5549\ lb$

$V = 8244\ lb / 23.5' = 351\ plf < 550\ plf$ SW3

UPLIFT = $351\ plf \times 10.5' = 3686\ lb < 4340\ lb$ HDU5

WEST STAIR WALL - MAIN FLOOR L = 8'

$P_W = [(8' \times 11') \times 18.5\ psf] + 3284\ lb = 4912\ lb$ ← CONTROLS

$P_E = 3620\ lb + [(8' \times 35') \times 2.18\ psf] = 4231\ lb$

$V = 4912\ lb / 8' = 614\ plf < 710\ plf$ SW3X

UPLIFT = $4757\ lb + (614\ plf \times 11') = 11511\ lb < 14445\ lb$ HDU14 w/ 6 x 6 POSTS
< 17080 lb PAB8
$l_e = 10.5"$

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Project No. 2019.089 Date 12/17/19
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Revision Page L7

SHEAR WALL DESIGN - WEST STAIR WALL - LOWER FLOOR L = 10'

$P_W = [(8' \times 5') \times 17.6\ psf] + 4912\ lb = 5616\ lb$ ← CONTROLS

$P_E = 4231\ lb + [(8' \times 28') \times 1.04\ psf] = 4476\ lb$

$V = 5616\ lb / 10' = 562\ plf < 710\ plf$ SW3X

$UPLIFT = 562\ plf \times 11' = 6182\ lb < 8030\ lb$ HDU11
$< 8030\ lb$ SB1×30

WEST ELEVATOR WALL - MAIN FLOOR L = 6'

$P_W = [(18' \times 11') \times 18.5\ psf] = 3664\ lb$ ← CONTROLS

$P_E = [(18' \times 28') \times 2.18\ psf] = 1099\ lb$

$V = 3664\ lb / 6' = 611\ plf < 710\ plf$ SW3X

$UPLIFT = 611\ plf \times 11' = 6721\ lb < 9215\ lb$ CMST12

LOWER FLOOR L = 6'

$P_W = 3664\ lb + [(18' \times 5') \times 17.6\ psf] = 5248\ lb$ ← CONTROLS

$P_E = 1099\ lb + [(18' \times 28') \times 1.09\ psf] = 1649\ lb$

$V = 5248\ lb / 6' = 881\ plf < 910\ plf$ SW5

$UPLIFT = 6721\ lb + 881\ plf \times 10' = 15531\ lb < 16735\ lb$ HD19
$< 21620\ lb$ PAB9

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Project No. 2019.089 Date 12/17/19
Project Name 4270
Comments
Revision Page L8

SHEAR WALL DESIGN - WEST WALL - MAIN FLOOR L = 9'

P_W = 1971 lb + [(15' × 11') × 18.5 psf] = 5024 lb ← CONTROLS

P_E = 2121 lb + [(15' × 28') × 2.18 psf] = 3037 lb

V = 5024 lb / 9' = 559 plf < 710 plf SW3X

UPLIFT = 2478 lb + 559 plf × 11' = 8627 lb < 9260. lb HDU14
< 11405 lb PAB8 dc = 8"

NORTH WEST WALL - UPPER FLOOR L = 19'

P_W = [(14' × 5.5') × 19.9 psf] = 1533 lb

P_E = [(14' × 82') × 3.57 psf] = 4099 lb ← CONTROLS

V = 4099 lb / 19' = 216 plf < 230 plf SW1

UPLIFT = 216 plf × 11' = 2376 lb < 3410 lb (2)CS16

MAIN FLOOR L = 19'

P_W = [(14' × 11') × 18.5 psf] + 1533 lb = 4382 lb

P_E = [(14' × 82') × 2.18 psf] + 4099 lb = 6602 lb ← CONTROLS

V = 6602 lb / 19' = 348 plf < 350 plf SW2 < 500 plf (2) 1/4 × 6" SDS @ 12" O.C.

UPLIFT = 2376 lb + 348 plf × 11' = 6204 lb < 8030 lb HDU11
3828 lb < 4340 lb 8030 lb SB1×30
HDU5

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Project No. 2019.089 Date 12/17/19
Project Name 4279
Comments
Revision Page L9

POST FOOTING DESIGN

$4' \times 11' = 44\ FT^2$, $44\ FT^2 \times 2.18\ psf = 96\ lb$ SEISMIC LOAD

$6' \times 2' = 12\ FT^2$, $12\ FT^2 \times 18.5\ psf = 222\ lb$ WIND LOAD CONTROLS

MAX POINT LOAD = 3622 lb - SEE PAGE U12

MAX MOMENT = 2221b × 10 FT = 2220 lb·FT < 2795 lb MPB662

- TRY 24"×24" $e = 2220\ lb\cdot FT / 3622\ lb = 0.61$

$L/6 = 0.33$ $L/6 < e < L/2$
$L/2 = 1.00$

$$q_{MAX} = \frac{2 \times 3622\ lb}{3 \times 2' \times \left(\frac{2'}{2} - 0.61\right)} = 3096\ psf \quad X$$

- TRY 30"×30" $L/6 = 0.417$, $L/2 = 1.25$, $L/6 < e < L/2$

$$q_{MAX} = \frac{2 \times 3622\ lb}{3 \times 2.5' \times \left(\frac{2.5}{2} - 0.61\right)} = 1510\ psf < 2000\ psf \quad \checkmark$$

- USE 30"×30"×12" DEEP FOOTINGS MIN.

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