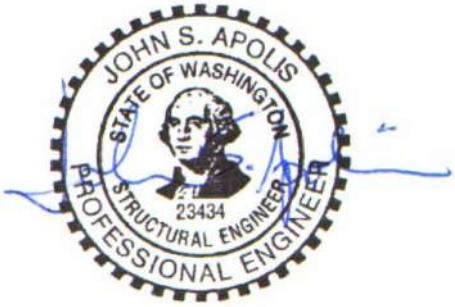
Structural Calculations Cover Sheet

Project Number:	**2022.136**	**Date:**	**October 13, 2022**
Project Name:	**Li Residence**	**Architect:**	**Shawn Sullivan**

Structural Design For: Structural design for a new residence built using some elements of an existing foundation.

Construction Type: Conventional wood framing with conventional concrete foundation. Some steel elements as needed.



CODES

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

LOADS

Dead Loads	As required
Roof snow Load	25 psf
Floor Load	40 psf, 60 psf (decks)
Wind	110 mph, Exposure B, Per ASCE 7-16 Section 28, Kzt = 1.60
Seismic	Per ASCE 7-16 Section 12

Peak Ground Accelerations (PGA) based on USGS Hazards Program (by address).
PGA 1 sec = .499 PGA .2 sec = 1.436 %V = .147 * DL

Material Design Values

Soils (assumed)	Minimum 1,500 psf allowed bearing (subject to field verification)		
Concrete	f'c=2,500 psi; 5-1/2 sack mix, or alternate mix pre-approved by bldg. dept.		
Reinforcing	Grade 60; Fy=60,000 psi minimum		
Sawn Lumber	Joists, Rafters:		HF #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	2.2E 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)		
Timberstrand Bms	1.7E LSL, Fb=2,600 psi, Fv=400 psi, E=1.7*10^6 psi (minimum)		
Structural Steel	ASTM A36, Fy=36 ksi Plates, ASTM A500, Fy=46 ksi Tubes		
Anchor Bolts	ASTM A325 hold down bolts, F1554 Anchor Bolts, A307 other bolts		

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Structural Engineering Consulting and Design

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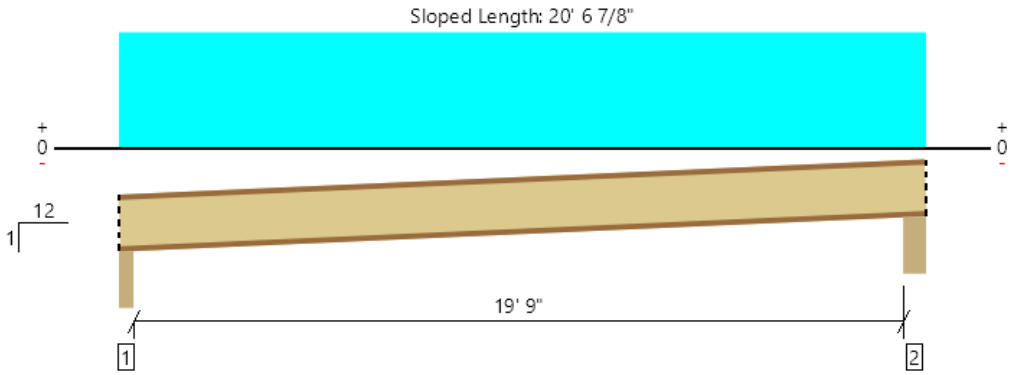
MEMBER REPORT

PASSED

Roof, R1: North Roof Joist
1 piece(s) 11 7/8" TJI® 210 @ 24" OC



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

Member Length : 20' 7 13/16"

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	828 @ 20' 1 1/2"	1679 (3.50")	Passed (49%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	791 @ 3 1/2"	1903	Passed (42%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3972 @ 10' 2"	4364	Passed (91%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.610 @ 10' 2"	0.999	Passed (L/393)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.978 @ 10' 2"	1.332	Passed (L/245)	--	1.0 D + 1.0 S (All Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - SPF	3.50"	3.50"	1.75"	306	508	814	Blocking
2 - Beveled Plate - SPF	5.50"	5.50"	1.75"	311	517	828	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 6" o/c	
Bottom Edge (Lu)	20' 7" o/c	

•TJI joists are only analyzed using Maximum Allowable bracing solutions.
•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 20' 6"	24"	15.0	25.0	Default Load

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

ForteWEB Software Operator	Job Notes
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

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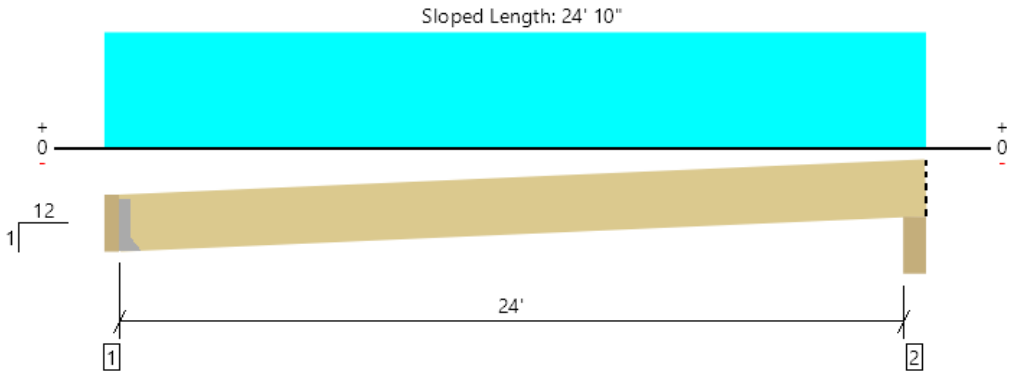
MEMBER REPORT

PASSED

Roof, R2: North East Rim

1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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

Member Length : 24' 7 1/2"

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	556 @ 3 1/2"	1969 (1.50")	Passed (28%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	511 @ 1' 3 5/16"	4541	Passed (11%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3356 @ 12' 4 1/4"	10263	Passed (33%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.403 @ 12' 4 1/4"	1.210	Passed (L/721)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.744 @ 12' 4 1/4"	1.614	Passed (L/391)	--	1.0 D + 1.0 S (All Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Hanger on 11 7/8" SPF beam	3.50"	Hanger[1]	1.50"	259	309	568	See note [1]
2 - Beveled Plate - SPF	5.50"	5.50"	1.50"	262	310	572	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.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	14' 2" o/c	
Bottom Edge (Lu)	24' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LSSR1.81Z	1.88"	N/A	14-10dx2.5	12-10dx1.5	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 24' 9"	N/A	6.1	--	
1 - Uniform (PSF)	0 to 24' 9"	1'	15.0	25.0	Default Load

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ForteWEB Software Operator	Job Notes
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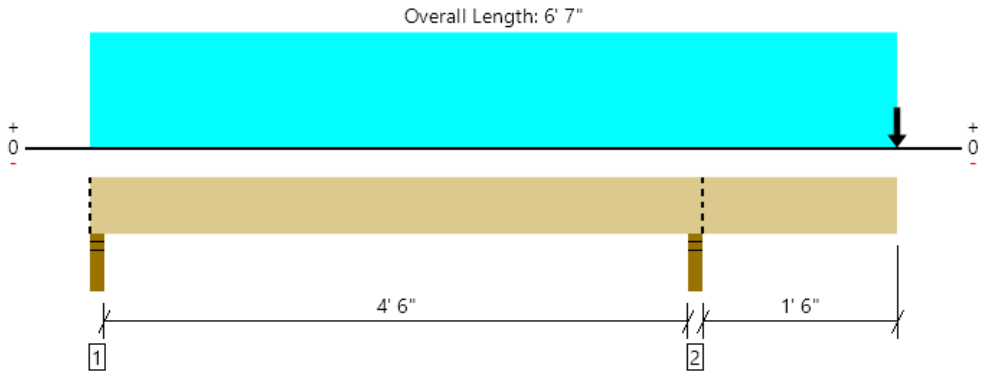
MEMBER REPORT

PASSED

Roof, R3: East Rim Cantilever

1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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)	2344 @ 4' 11 1/4"	2603 (3.50")	Passed (90%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	757 @ 3' 9 5/8"	4541	Passed (17%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-1431 @ 4' 11 1/4"	10263	Passed (14%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.011 @ 6' 7"	0.200	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.019 @ 6' 7"	0.219	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (0.2") and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - SPF	3.50"	3.50"	1.50"	231	489	720	Blocking
2 - Stud wall - SPF	3.50"	3.50"	3.15"	957	1387	2344	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)	6' 7" o/c	
Bottom Edge (Lu)	6' 7" 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 6' 7"	N/A	6.1	--	
1 - Uniform (PSF)	0 to 6' 7" (Front)	9'	15.0	25.0	Default Load
2 - Point (lb)	6' 7" (Front)	N/A	259	309	

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MEMBER REPORT

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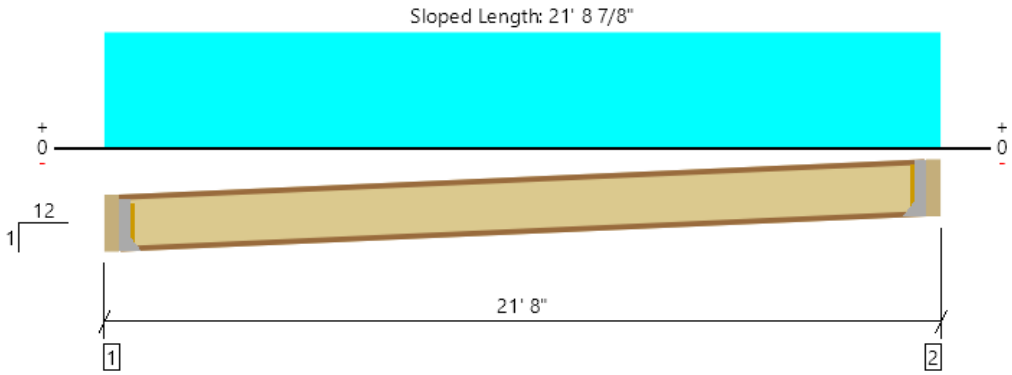
Roof, R4: South Roof Eave Joist
1 piece(s) 11 7/8" TJI® 210 @ 24" OC



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

Member Length : 21' 2 7/8"

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	844 @ 3 1/2"	1156 (1.75")	Passed (73%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	844 @ 3 1/2"	1903	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4451 @ 10' 10"	4364	Passed (102%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.760 @ 10' 10"	1.058	Passed (L/334)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	1.218 @ 10' 10"	1.410	Passed (L/208)	--	1.0 D + 1.0 S (All Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Hanger on 11 7/8" SPF beam	3.50"	Hanger[1]	1.75" / - [2]	326	542	868	See note [1]
2 - Hanger on 11 7/8" SPF beam	3.50"	Hanger[1]	1.75" / - [2]	326	542	868	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 3" o/c	
Bottom Edge (Lu)	21' 2" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LSSR2.1Z	1.88"	N/A	14-10dx2.5	12-10dx1.5	Web Stiffeners
2 - Face Mount Hanger	LSSR2.1Z	1.88"	N/A	14-10dx2.5	12-10dx1.5	Web Stiffeners

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 21' 8"	24"	15.0	25.0	Default Load

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ForteWEB Software Operator	Job Notes
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MEMBER REPORT

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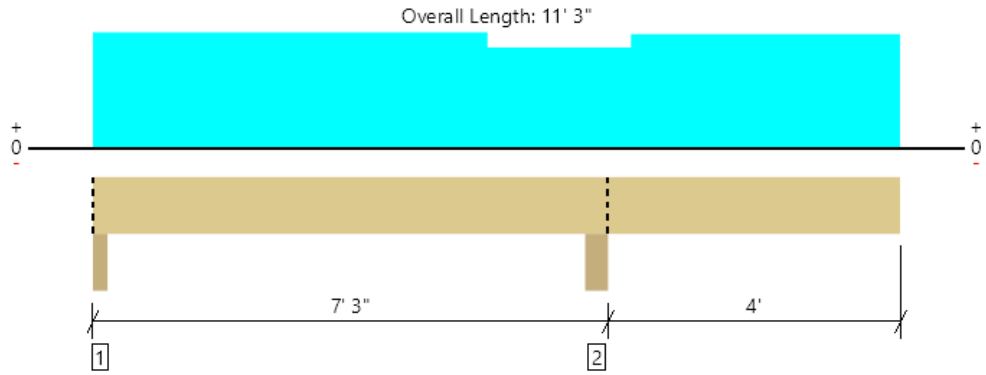
Roof, R5: East Cantilever Flush Beam @ Valley

1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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)	6021 @ 7' 1/4"	7219 (5.50")	Passed (83%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2419 @ 5' 9 5/8"	4541	Passed (53%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-6126 @ 7' 1/4"	10263	Passed (60%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.168 @ 11' 3"	0.423	Passed (2L/602)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.246 @ 11' 3"	0.564	Passed (2L/412)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - DF	3.50"	3.50"	1.50"	606	1263	1869	Blocking
2 - Column - DF	5.50"	5.50"	4.59"	2292	3729	6021	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)	11' 3" o/c	
Bottom Edge (Lu)	6' 8" 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 11' 3"	N/A	6.1	--	
1 - Uniform (PSF)	0 to 5' 6" (Front)	17' 3"	15.0	25.0	Default Load
2 - Uniform (PSF)	5' 6" to 7' 6" (Front)	15'	15.0	25.0	Default Load
3 - Uniform (PSF)	7' 6" to 11' 3" (Front)	17'	15.0	25.0	Default Load

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MEMBER REPORT

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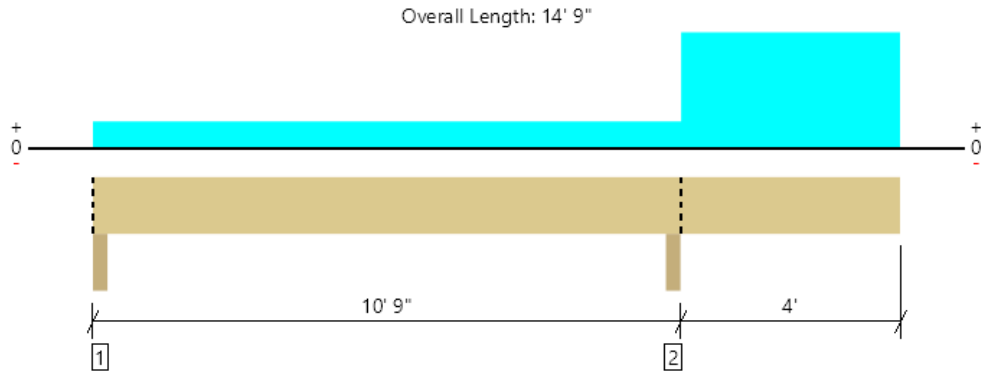
Roof, R6: South East Cantilever Flush Beam @ Rim
1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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)	2720 @ 10' 7 1/4"	4594 (3.50")	Passed (59%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1343 @ 11' 8 7/8"	4541	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-3830 @ 10' 7 1/4"	10263	Passed (37%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.148 @ 14' 9"	0.415	Passed (2L/674)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.223 @ 14' 9"	0.553	Passed (2L/446)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - DF	3.50"	3.50"	1.50"	94	223/-58	317	Blocking
2 - Column - DF	3.50"	3.50"	2.07"	1059	1661	2720	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)	14' 9" o/c	
Bottom Edge (Lu)	12' 2" 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 14' 9"	N/A	6.1	--	
1 - Uniform (PSF)	0 to 10' 9" (Front)	2' 6"	15.0	25.0	Default Load
2 - Uniform (PSF)	10' 9" to 14' 9" (Front)	11'	15.0	25.0	Default Load

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

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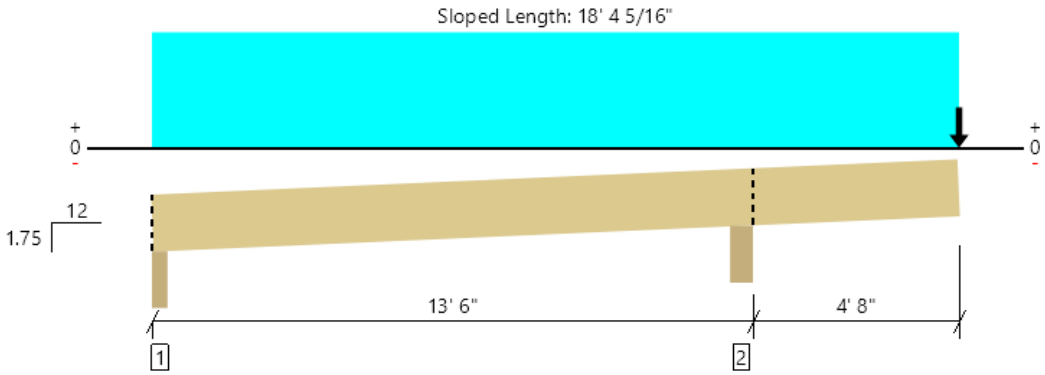
MEMBER REPORT

PASSED

Roof, R7: South East Flush Beam @ Rim Cantilever Support
1 piece(s) 5 1/4" x 11 7/8" 2.2E Parallam® PSL



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

Member Length : 18' 6 1/16"

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.75/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4973 @ 13' 3 1/4"	12402 (5.50")	Passed (40%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3089 @ 14' 5 3/4"	13861	Passed (22%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-14515 @ 13' 3 1/4"	34332	Passed (42%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.281 @ 18' 2"	0.495	Passed (2L/422)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.451 @ 18' 2"	0.660	Passed (2L/264)	--	1.0 D + 1.0 S (Alt Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -605 lbs uplift at support located at 2 1/4". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - SPF	3.75"	3.75"	1.50"	-106	3/-499	-605	Blocking
2 - Beveled Plate - SPF	5.50"	5.50"	2.21"	2073	2900	4973	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)	18' 4" o/c	
Bottom Edge (Lu)	18' 4" 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 18' 2"	N/A	19.5	--	
1 - Uniform (PSF)	0 to 18' 2"	2'	15.0	25.0	Default Load
2 - Point (lb)	18' 2"	N/A	1059	1661	

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Weyerhaeuser

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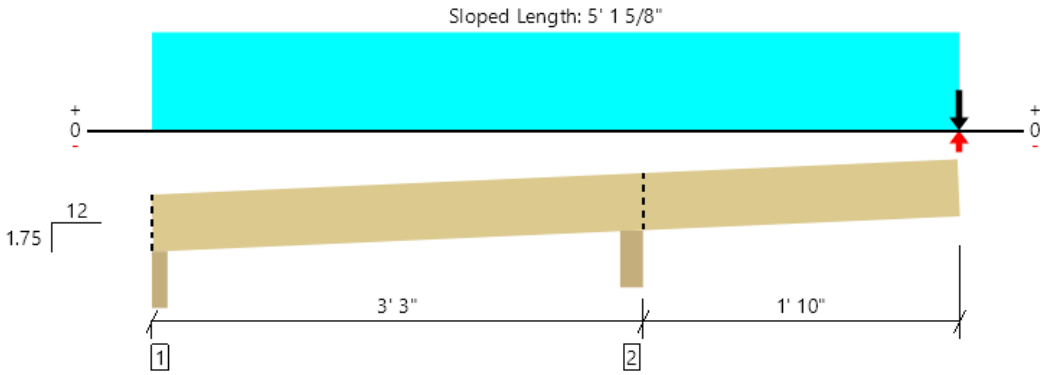
MEMBER REPORT

PASSED

Roof, R8: South East Flush Beam @ Rim Backspan Support
1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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

Member Length : 5' 3 3/8"

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.75/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	813 @ 3' 1/4"	4134 (5.50")	Passed (20%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	333 @ 4' 2 3/4"	4541	Passed (7%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-718 @ 3' 1/4"	10263	Passed (7%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.008 @ 5' 1"	0.208	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.012 @ 5' 1"	0.278	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - SPF	3.75"	3.75"	1.50"	-37	1/-118	-155	Blocking
2 - Beveled Plate - SPF	5.50"	5.50"	1.50"	317	497	813	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)	5' 2" o/c	
Bottom Edge (Lu)	5' 2" 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 5' 1"	N/A	6.1	--	
1 - Uniform (PSF)	0 to 5' 1"	2'	15.0	25.0	Default Load
2 - Point (lb)	5' 1"	N/A	94	223	
3 - Point (lb)	5' 1"	N/A	-	-58	

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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

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	R9

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam R7 South Support

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

Geometry and loads:

Height	11 ft	w(d)	0 plf	M(d)	
Axial Load	4973 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	11 ft	Le(b)	0.5 ft		

Material Properties:

Fb1	875 psi	Fb(d)'	1006.3 psi
Fb2	875 psi	Fb(b)'	1006.3 psi
Fc	1350 psi	Fc'	708.67 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

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

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.90
Section Modulus (b):	27.7 in^3	Rb(b)	1.04
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided			Required		
FcE(d)	828 psi	>	fc	164 psi	OK
FcE(b)	400611 psi	>	fc	164 psi	OK
FbE	29000 psi	>	fb(d)	0 psi	OK
FbE	29000 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

NDS 2018 EQ 3.9-3	0.05	<	1.0	**OK**

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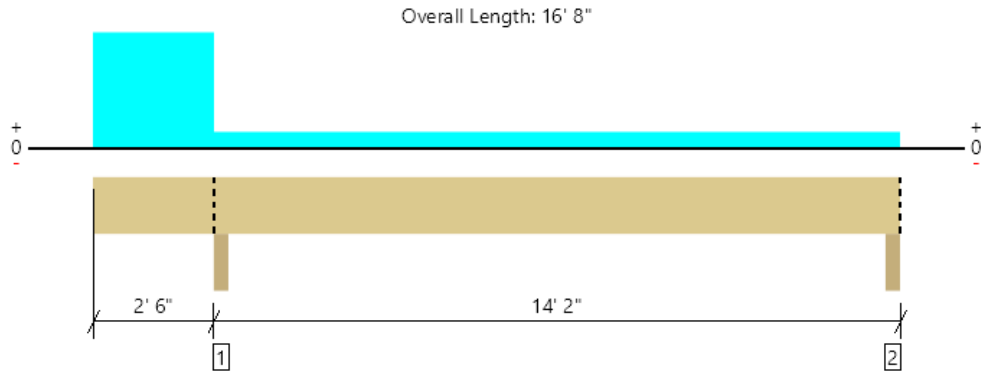
MEMBER REPORT

PASSED

Roof, R10: South West Flush Beam @ Rim

1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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)	1695 @ 2' 7 3/4"	2603 (3.50")	Passed (65%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	674 @ 1' 6 1/8"	4541	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-1557 @ 2' 7 3/4"	10263	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.033 @ 0	0.265	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.037 @ 0	0.353	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beam - SPF	3.50"	3.50"	2.28"	673	1022	1695	Blocking
2 - Beam - SPF	3.50"	3.50"	1.50"	159	231	391	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)	16' 8" o/c	
Bottom Edge (Lu)	16' 8" 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 16' 8"	N/A	6.1	--	
1 - Uniform (PSF)	2' 6" to 16' 8" (Front)	1' 6"	15.0	25.0	Default Load
2 - Uniform (PSF)	0 to 2' 6" (Front)	11'	15.0	25.0	Default Load

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

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

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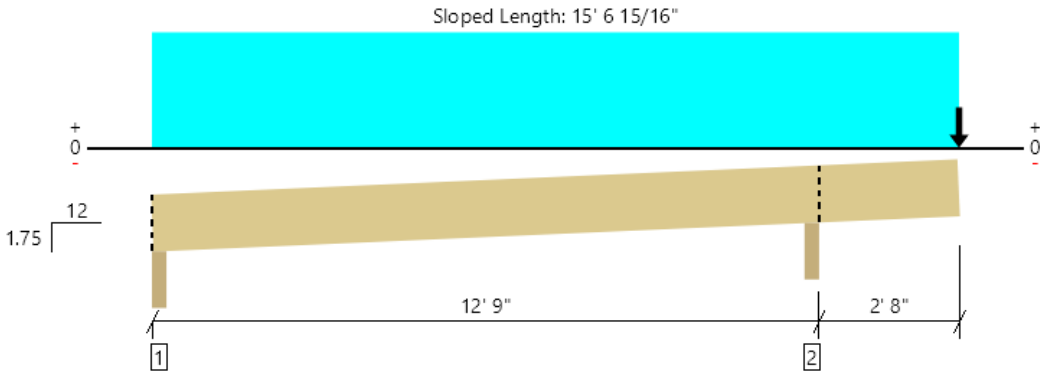
MEMBER REPORT

PASSED

Roof, R11: South West Flush Beam @ Rim Cantilever
1 piece(s) 3 1/2" x 11 7/8" 2.2E Parallam® PSL



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

Member Length : 15' 8 11/16"

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2952 @ 12' 7 1/4"	5261 (3.50")	Passed (56%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1853 @ 13' 8 3/4"	9241	Passed (20%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-5137 @ 12' 7 1/4"	22888	Passed (22%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.070 @ 15' 5"	0.284	Passed (2L/968)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.108 @ 15' 5"	0.379	Passed (2L/632)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.75/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - SPF	3.50"	3.50"	1.50"	111	196/-87	307	Blocking
2 - Beveled Plate - SPF	3.50"	3.50"	1.96"	1231	1721	2952	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)	15' 7" o/c	
Bottom Edge (Lu)	15' 7" 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 15' 5"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 15' 5"	2'	15.0	25.0	Default Load
2 - Point (lb)	15' 5"	N/A	673	1022	

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Weyerhaeuser

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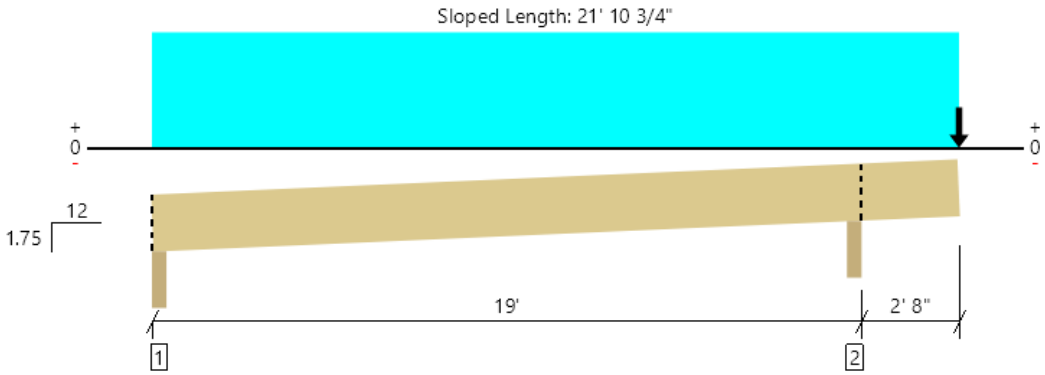
MEMBER REPORT

PASSED

Roof, R12: South West Flush Beam @ Rim Backspan

1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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

Member Length : 22' 1/2"

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.75/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1518 @ 18' 10 1/4"	2631 (3.50")	Passed (58%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	787 @ 17' 8 3/4"	4541	Passed (17%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3283 @ 8' 10 9/16"	10263	Passed (32%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.266 @ 9' 4 1/8"	0.944	Passed (L/853)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.437 @ 9' 3 1/4"	1.259	Passed (L/518)	--	1.0 D + 1.0 S (Alt Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - SPF	3.50"	3.50"	1.50"	315	453	768	Blocking
2 - Beveled Plate - SPF	3.50"	3.50"	2.02"	634	884	1518	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)	14' 6" 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' 8"	N/A	6.1	--	
1 - Uniform (PSF)	0 to 21' 8"	2'	15.0	25.0	Default Load
2 - Point (lb)	21' 8"	N/A	159	231	

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Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	R13

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: South West Window Header

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

Geometry and Loads:

Span:	13.25 ft	Tributary Width:	10.5 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1043 lbs	DL Reaction 2:	1043 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	1739 lbs	SL Reaction 2:	1739 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**2783 lbs**	Total Reaction 2:	**2783 lbs**	

Material Properties:

E	2.2 msi	E'	2.2 msi
Fb	2900 psi	Fb'	3433 psi
Fv	290 psi	Fv'	334 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.914 msi	Emin'	0.914 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240
For LL only: Allowed deflection criteria, span/			360
Max. allowed total defl:	0.66 in	Max LL defl:	0.44 in
Total defl. * I:	132.4 in^4	Required I:	199.84 in^4
LL defl. * I:	82.75 in^4	Required I:	187.35 in^4
Actual deflections:	TOTAL: 0.57 in		0.36 in

Force analysis:

Max. moment:	9217 ft-lb	Max Shear:	2783 lbs

Selected Member:	(1) PSL	**3.5**	**x**	**9.25**

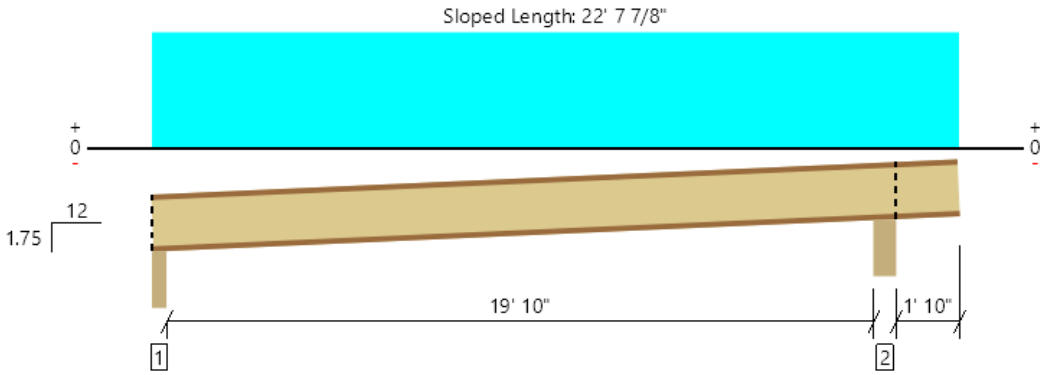
Member properties:	**Provided:**		**Required:**
Moment of inertia:	230.84 in^4		199.84 in^4
Section Modulus:	49.91 in^3		32.22 in^3
Section Area:	32.38 in^2		12.51 in^2
Bearing Area:			4.45 in^2
Minimum bearing dimensions:	3.5 in	x	1.27 in

FORTEWEB

MEMBER REPORT

PASSED

Roof, R14: South Cantilevered Roof Joists
1 piece(s) 11 7/8" TJI® 210 @ 24" OC



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

Member Length : 22' 9 9/16"

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	820 @ 2 1/2"	1679 (3.50")	Passed (49%)	1.15	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	796 @ 3 1/2"	1903	Passed (42%)	1.15	1.0 D + 1.0 S (Alt Spans)
Moment (Ft-lbs)	4016 @ 10' 2 1/2"	4364	Passed (92%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.639 @ 10' 3 3/16"	1.018	Passed (L/382)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	1.022 @ 10' 3 1/16"	1.357	Passed (L/239)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.75/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Upward deflection on right cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - SPF	3.50"	3.50"	1.75"	308	511	820	Blocking
2 - Beveled Plate - SPF	5.50"	5.50"	3.50"	371	612	983	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 6" o/c	
Bottom Edge (Lu)	8' 8" o/c	

•TJI joists are only analyzed using Maximum Allowable bracing solutions.
•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 22' 5"	24"	15.0	25.0	Default Load

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

ForteWEB Software Operator	Job Notes
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	R15

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: West Rim Above Entry

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

Geometry and Loads:

Span:	14 ft	Tributary Width:	1 ft	P Location:	12.25 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	165 lbs
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	275 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	249 lbs	DL Reaction 2:	126 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	416 lbs	SL Reaction 2:	209 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**665 lbs**	Total Reaction 2:	**335 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2600 psi	Fb'	2994 psi
Fv	285 psi	Fv'	328 psi
Fc perp	750 psi	Fc perp'	750 psi
Emin	1.016 msi	Emin'	1.016 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240
For LL only: Allowed deflection criteria, span/			360
Max. allowed total defl:	0.7 in	Max LL defl:	0.47 in
Total defl. * I:	25.46 in^4	Required I:	36.37 in^4
LL defl. * I:	15.91 in^4	Required I:	34.09 in^4
Actual deflections:	TOTAL: 0.1 in		0.07 in

Force analysis:

Max. moment:	1403 ft-lb	Max Shear:	665 lbs

Selected Member:	(1) LVL	**1.75**	**x**	**11.875**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	244.21 in^4		36.37 in^4
Section Modulus:	41.13 in^3		5.62 in^3
Section Area:	20.78 in^2		3.04 in^2
Bearing Area:			0.89 in^2
Minimum bearing dimensions:	1.75 in	x	0.51 in

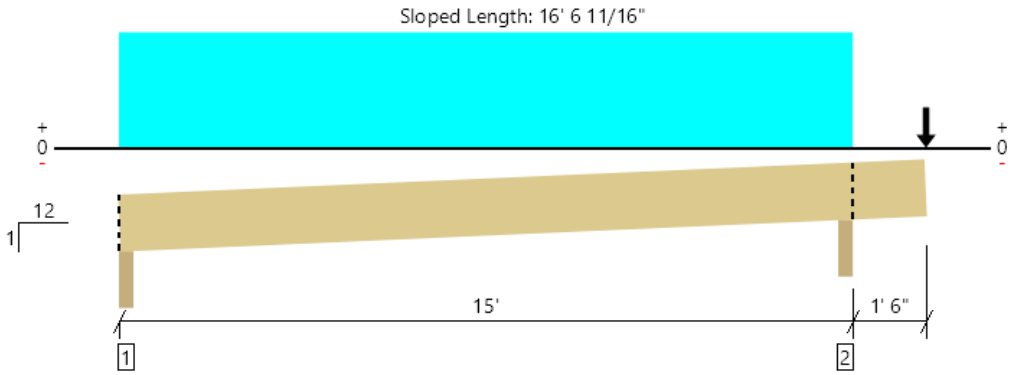
FORTEWEB

MEMBER REPORT

PASSED

Roof, R16: West Rim Joist

1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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

Member Length : 16' 7 11/16"

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	728 @ 14' 10 1/4"	2612 (3.50")	Passed (28%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	338 @ 15' 11 13/16"	4541	Passed (7%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1058 @ 6' 11 1/4"	10263	Passed (10%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.049 @ 7' 3 15/16"	0.737	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.088 @ 7' 3 7/16"	0.983	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Beveled Plate - SPF	3.50"	3.50"	1.50"	144	176	320	Blocking
2 - Beveled Plate - SPF	3.50"	3.50"	1.50"	308	420	728	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)	16' 7" o/c	
Bottom Edge (Lu)	16' 7" 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 16' 6"	N/A	6.1	--	
1 - Uniform (PSF)	0 to 15'	1'	15.0	25.0	Default Load
2 - Point (lb)	16' 6"	N/A	126	209	

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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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

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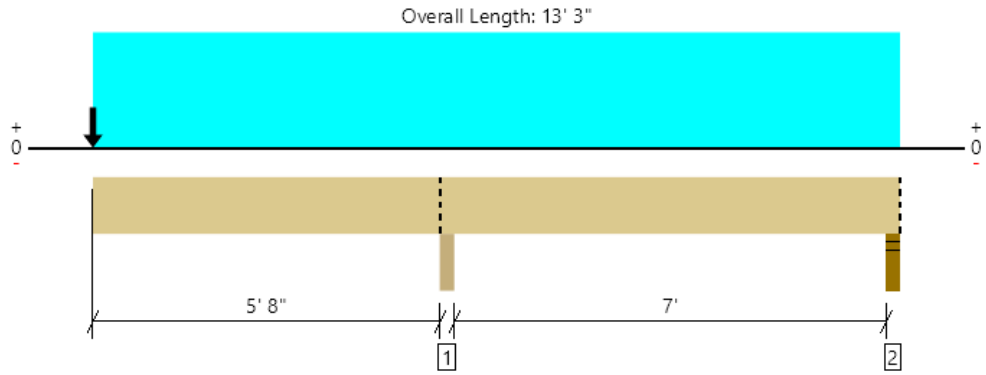
MEMBER REPORT

PASSED

Roof, R17: Cantilever Flush Beam Above Entry
1 piece(s) 3 1/2" x 11 7/8" 2.2E 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)	5230 @ 5' 9 3/4"	7656 (3.50")	Passed (68%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2285 @ 4' 8 1/8"	9241	Passed (25%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-9857 @ 5' 9 3/4"	22888	Passed (43%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.222 @ 0	0.581	Passed (2L/630)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.366 @ 0	0.775	Passed (2L/380)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -470 lbs uplift at support located at 13' 1". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - DF	3.50"	3.50"	2.39"	2120	3110	5230	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	-50	360/-420	311/-470	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)	13' 3" o/c	
Bottom Edge (Lu)	13' 3" 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 13' 3"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 13' 3" (Front)	8'	15.0	25.0	Default Load
2 - Point (lb)	0 (Front)	N/A	308	420	

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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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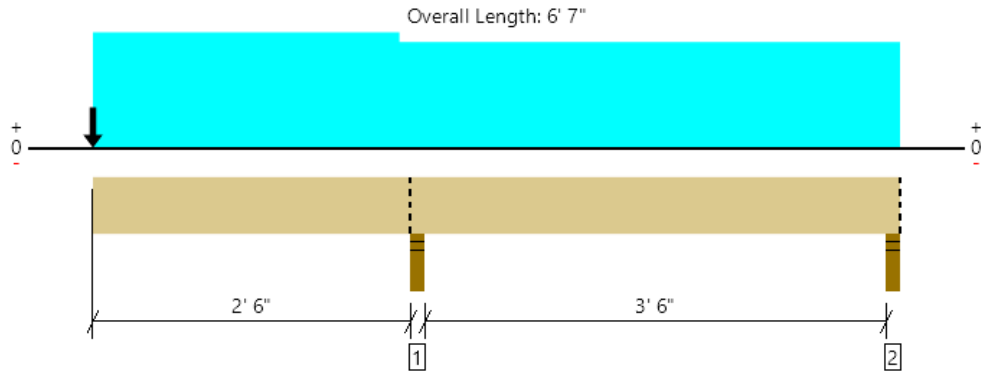
Weyerhaeuser

FORTEWEB

MEMBER REPORT

PASSED

Roof, R18: West Cantilever Flush Beam @ Valley
1 piece(s) 3 1/2" x 11 7/8" 2.2E 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)	4431 @ 2' 7 3/4"	5206 (3.50")	Passed (85%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1431 @ 1' 6 1/8"	9241	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-3422 @ 2' 7 3/4"	22888	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.020 @ 0	0.265	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.033 @ 0	0.353	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - SPF	3.50"	3.50"	2.98"	1748	2683	4431	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	169	575/-119	745	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)	6' 7" o/c	
Bottom Edge (Lu)	6' 7" 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 6' 7"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 2' 6" (Front)	18'	15.0	25.0	Default Load
2 - Point (lb)	0 (Front)	N/A	146	178	
3 - Uniform (PSF)	2' 6" to 6' 7" (Front)	16' 6"	15.0	25.0	Default Load

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

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Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	R19

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam R17 West Support

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

Geometry and loads:

Height	11 ft	w(d)	0 plf	M(d)	
Axial Load	5120 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	0.5 ft	Le(b)	0.5 ft		

Material Properties:

Fb1	900 psi	Fb(d)'	1035 psi
Fb2	900 psi	Fb(b)'	1035 psi
Fc	1350 psi	Fc'	1549.5 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

Selected Member: DF #2 3.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	17.6 in^3	Rb(d)	0.83
Section Modulus (b):	11.2 in^3	Rb(b)	1.64
Section Area:	19.3 in^2	c	0.8

Member stresses:	Provided			Required	
FcE(d)	400611 psi	>	fc	266 psi	OK
FcE(b)	162231 psi	>	fc	266 psi	OK
FbE	258364 psi	>	fb(d)	0 psi	OK
FbE	258364 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

NDS 2018 EQ 3.9-3 0.03 < 1.0 **OK**

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	R20

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Typical Roof Level Header

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

Geometry and Loads:

Span:	5.25 ft	Tributary Width:	2 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	79 lbs	DL Reaction 2:	79 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	131 lbs	SL Reaction 2:	131 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**210 lbs**	Total Reaction 2:	**210 lbs**	

Material Properties:

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

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.26 in	Max LL defl:	0.18 in
Total defl. * I:	1.05 in^4	Required I:	4.01 in^4
LL defl. * I:	0.66 in^4	Required I:	3.76 in^4
Actual deflections:	TOTAL: 0.01 in		0.01 in

Force analysis:

Max. moment:	276 ft-lb	Max Shear:	210 lbs

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

Member properties:	**Provided:**		**Required:**
Moment of inertia:	95.27 in^4		4.01 in^4
Section Modulus:	26.28 in^3		2.82 in^3
Section Area:	21.75 in^2		1.83 in^2
Bearing Area:			0.52 in^2
Minimum bearing dimensions:	3. in	x	0.17 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	R21

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Interior Header North Roof

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

Geometry and Loads:

Span:	3.5 ft	Tributary Width:	19 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	499 lbs	DL Reaction 2:	499 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	831 lbs	SL Reaction 2:	831 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**1330 lbs**	Total Reaction 2:	**1330 lbs**	

Material Properties:

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

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.18 in	Max LL defl:	0.12 in
Total defl. * I:	1.97 in^4	Required I:	11.28 in^4
LL defl. * I:	1.23 in^4	Required I:	10.57 in^4
Actual deflections:	TOTAL: 0.02 in		0.01 in

Force analysis:

Max. moment:	1164 ft-lb	Max Shear:	1330 lbs

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

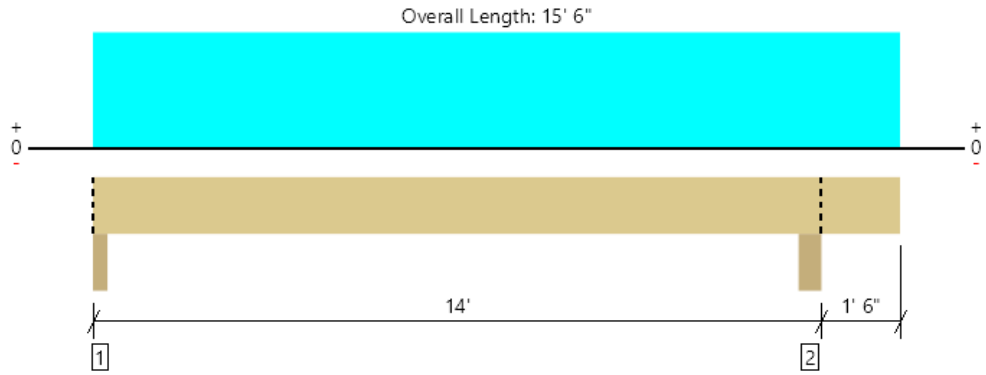
Member properties:	**Provided:**		**Required:**
Moment of inertia:	95.27 in^4		11.28 in^4
Section Modulus:	26.28 in^3		11.91 in^3
Section Area:	21.75 in^2		11.57 in^2
Bearing Area:			3.28 in^2
Minimum bearing dimensions:	3. in	x	1.09 in

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U1: North East Flush Beam
1 piece(s) 3 1/2" x 16" 2.2E 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)	3646 @ 2"	7656 (3.50")	Passed (48%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	2833 @ 12' 2 1/2"	12451	Passed (23%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	11949 @ 6' 10 5/8"	40198	Passed (30%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.083 @ 6' 11 3/8"	0.340	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.174 @ 6' 11 1/4"	0.680	Passed (L/941)	--	1.0 D + 1.0 S (Alt Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - DF	3.50"	3.50"	1.67"	1917	372/-6	1728	3646	Blocking
2 - Column - DF	5.50"	5.50"	2.09"	2415	461	2160	4575	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)	15' 6" o/c	
Bottom Edge (Lu)	15' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 15' 6"	N/A	17.5	--	--	
1 - Uniform (PSF)	0 to 15' 6" (Front)	1' 4"	12.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 15' 6" (Top)	12'	8.0	-	-	Wall
3 - Uniform (PSF)	0 to 15' 6" (Top)	10'	15.0	-	25.0	Roof

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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

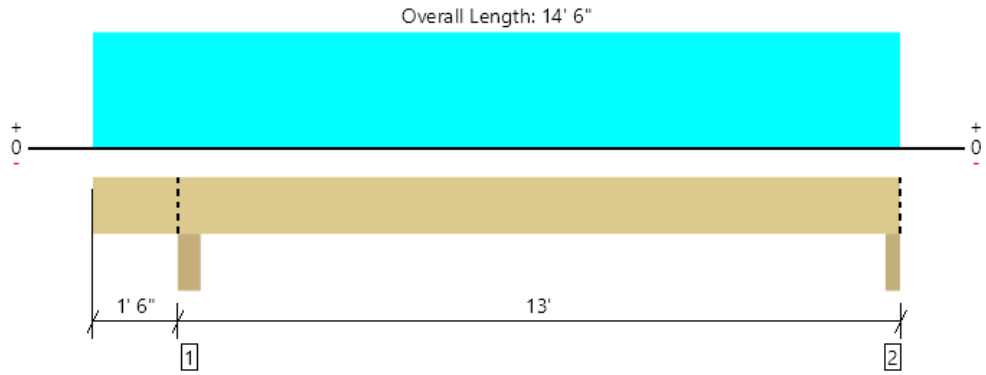
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U2: North West Flush Beam

1 piece(s) 3 1/2" x 16" 2.2E 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)	3377 @ 14' 4"	7656 (3.50")	Passed (44%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	2572 @ 3' 3 1/2"	12451	Passed (21%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	10215 @ 8' 1 7/16"	40198	Passed (25%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.062 @ 8' 5/8"	0.315	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.130 @ 8' 3/4"	0.630	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - DF	5.50"	5.50"	1.97"	2278	435	2037	4315	Blocking
2 - Column - DF	3.50"	3.50"	1.54"	1775	345/-6	1602	3377	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)	14' 6" o/c	
Bottom Edge (Lu)	14' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 14' 6"	N/A	17.5	--	--	
1 - Uniform (PSF)	0 to 14' 6" (Front)	1' 4"	12.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 14' 6" (Top)	12'	8.0	-	-	Wall
3 - Uniform (PSF)	0 to 14' 6" (Top)	10'	15.0	-	25.0	Roof

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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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U3

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: East Entrance Joist

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

Geometry and Loads:

Span:	5.5 ft	Tributary Width:	2 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	83 lbs	DL Reaction 2:	83 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	138 lbs	SL Reaction 2:	138 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**220 lbs**	Total Reaction 2:	**220 lbs**	

Material Properties:

E	1.3 msi	E'	1.3 msi
Fb	850 psi	Fb'	1461 psi
Fv	150 psi	Fv'	173 psi
Fc perp	405 psi	Fc perp'	405 psi
Emin	0.47 msi	Emin'	0.47 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.28 in	Max LL defl:	0.18 in
Total defl. * I:	1.27 in^4	Required I:	4.61 in^4
LL defl. * I:	0.79 in^4	Required I:	4.32 in^4
Actual deflections:	TOTAL: 0.06 in		0.04 in

Force analysis:

Max. moment:	303 ft-lb	Max Shear:	220 lbs

Selected Member:	(1) HF #2	**1.5**	**x**	**5.5**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	20.8 in^4		4.61 in^4
Section Modulus:	7.56 in^3		2.48 in^3
Section Area:	8.25 in^2		1.91 in^2
Bearing Area:			0.54 in^2
Minimum bearing dimensions:	1.5 in	x	0.36 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U4

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: East Entrance Rim

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

Geometry and Loads:

Span:	13 ft	Tributary Width:	2.75 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	268 lbs	DL Reaction 2:	268 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	447 lbs	SL Reaction 2:	447 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**715 lbs**	Total Reaction 2:	**715 lbs**	

Material Properties:

E	1.6 msi	E'	1.6 msi
Fb	900 psi	Fb'	1547 psi
Fv	180 psi	Fv'	207 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.58 msi	Emin'	0.58 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240
For LL only: Allowed deflection criteria, span/			360
Max. allowed total defl:	0.65 in	Max LL defl:	0.43 in
Total defl. * I:	44.18 in^4	Required I:	67.97 in^4
LL defl. * I:	27.61 in^4	Required I:	63.72 in^4
Actual deflections:	TOTAL: 0.4 in		0.25 in

Force analysis:

Max. moment:	2324 ft-lb	Max Shear:	715 lbs

Selected Member:	(1) DF #2	**3.5**	**x**	**7.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	111.15 in^4		67.97 in^4
Section Modulus:	30.66 in^3		18.02 in^3
Section Area:	25.38 in^2		5.18 in^2
Bearing Area:			1.14 in^2
Minimum bearing dimensions:	3.5 in	x	0.33 in

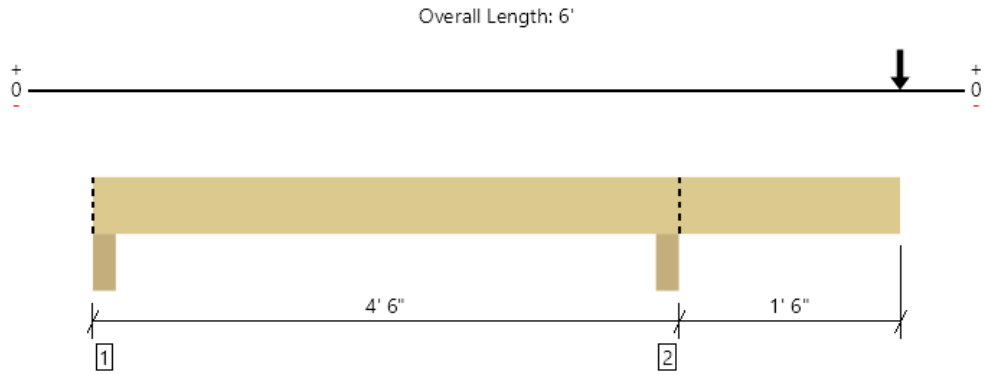
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U5: East Entry North Cantilever Flush Beam

1 piece(s) 4 x 8 DF 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)	1054 @ 4' 3 1/4"	7796 (5.50")	Passed (14%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	720 @ 5' 1 1/4"	3502	Passed (21%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-1244 @ 4' 3 1/4"	3438	Passed (36%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.025 @ 6'	0.200	Passed (2L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.039 @ 6'	0.200	Passed (2L/999+)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (0.2").
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -301 lbs uplift at support located at 4". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - HF	5.50"	5.50"	1.50"	-105	-196	-301	Blocking
2 - Beam - HF	5.50"	5.50"	1.50"	410	643	1054	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)	6' o/c	
Bottom Edge (Lu)	6' 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 6'	N/A	6.4	--	
1 - Point (lb)	6' (Front)	N/A	267	447	Default Load

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

ForteWEB Software Operator	Job Notes
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

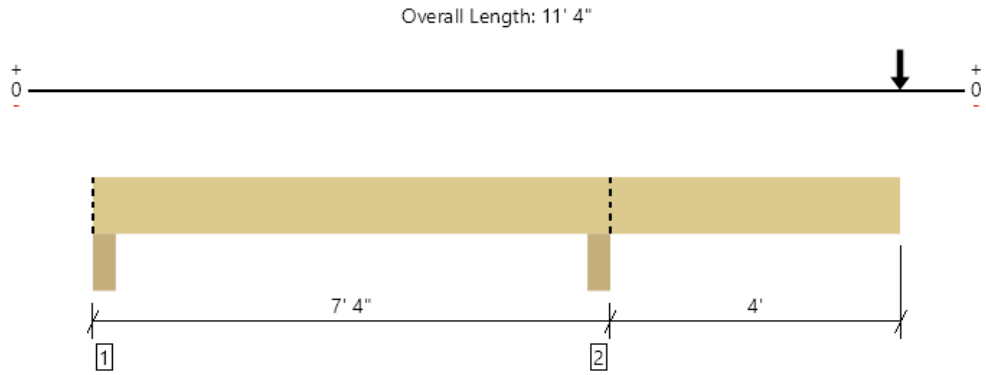
FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U6: East Entry South Cantilever Flush Beam

1 piece(s) 4 x 8 DF 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)	1219 @ 7' 1 1/4"	12031 (5.50")	Passed (10%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	737 @ 7' 11 1/4"	3502	Passed (21%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-3081 @ 7' 1 1/4"	3438	Passed (90%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.285 @ 11' 4"	0.423	Passed (2L/356)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.460 @ 11' 4"	0.564	Passed (2L/220)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -431 lbs uplift at support located at 4". Strapping or other restraint may be required.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Column - DF	5.50"	5.50"	1.50"	-152	-279	-431	Blocking
2 - Column - DF	5.50"	5.50"	1.50"	493	726	1219	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)	11' 4" o/c	
Bottom Edge (Lu)	11' 4" 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 11' 4"	N/A	6.4	--	
1 - Point (lb)	11' 4" (Front)	N/A	268	447	

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ForteWEB Software Operator	Job Notes
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Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U7

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U1/U2 Support

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

Geometry and loads:

Height	9.5 ft	w(d)	0 plf	M(d)	
Axial Load	7007 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	0.5 ft	Le(b)	9.5 ft		

Material Properties:

Fb1	900 psi	Fb(d)'	1035 psi
Fb2	900 psi	Fb(b)'	1035 psi
Fc	1350 psi	Fc'	418.5 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

Selected Member: DF #2 — 3.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	17.6 in^3	Rb(d)	0.83
Section Modulus (b):	11.2 in^3	Rb(b)	7.15
Section Area:	19.3 in^2	c	0.8

Member stresses:	Provided			Required	
FcE(d)	400611 psi	>	fc	364 psi	OK
FcE(b)	449 psi	>	fc	364 psi	OK
FbE	13598 psi	>	fb(d)	0 psi	OK
FbE	13598 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

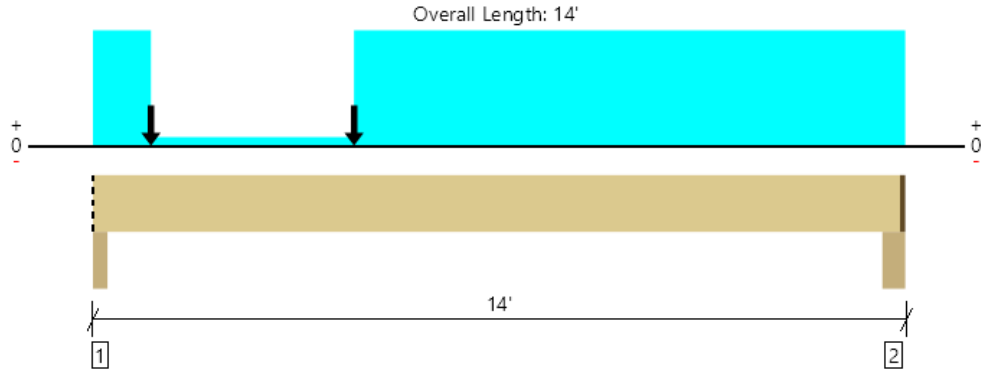
NDS 2018 EQ 3.9-3	0.76	<	1.0	**OK**

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U8: Central East Flush Beam
1 piece(s) 3 1/2" x 16" 2.2E 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)	5815 @ 2"	7656 (3.50")	Passed (76%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4569 @ 12' 2 1/2"	12451	Passed (37%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	19539 @ 6' 11 3/4"	40198	Passed (49%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.154 @ 6' 11 3/8"	0.338	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.278 @ 6' 11 1/2"	0.675	Passed (L/584)	--	1.0 D + 1.0 S (All Spans)

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

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - DF	3.50"	3.50"	2.66"	2530	369	3285	5815	Blocking
2 - Column - DF	5.50"	4.25"	2.76"	2767	378	3364	6132	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	13' 11" o/c	
Bottom Edge (Lu)	13' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 13' 10 3/4"	N/A	17.5	--	--	
1 - Uniform (PSF)	0 to 14' (Front)	1' 4"	12.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 1' (Top)	10'	8.0	-	-	Wall
3 - Uniform (PSF)	0 to 1' (Top)	19'	15.0	-	25.0	Roof
4 - Point (lb)	1' (Front)	N/A	499	-	831	
5 - Point (lb)	4' 6" (Front)	N/A	499	-	831	
6 - Uniform (PSF)	4' 6" to 14' (Top)	10'	8.0	-	-	Wall
7 - Uniform (PSF)	4' 6" to 14' (Top)	19'	15.0	-	25.0	Roof

Weyerhaeuser Notes

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ForteWEB Software Operator	Job Notes
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

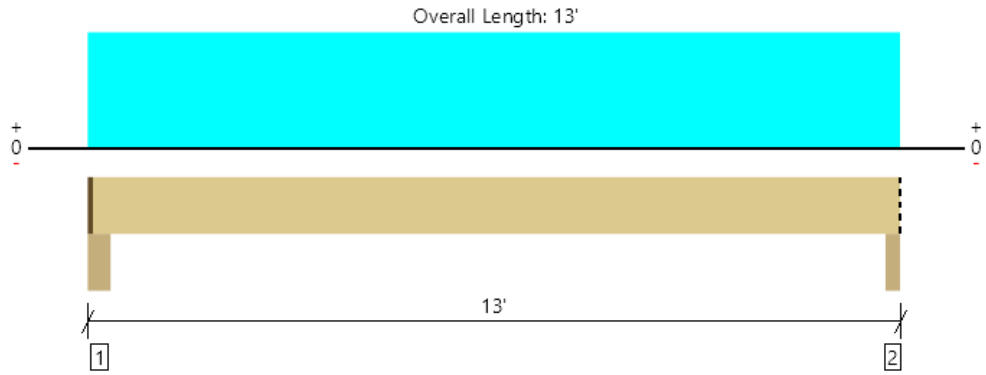
Weyerhaeuser

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U9: Central West Flush Beam
1 piece(s) 3 1/2" x 16" 2.2E 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)	5605 @ 12' 10"	7656 (3.50")	Passed (73%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4186 @ 1' 9 1/2"	12451	Passed (34%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	17061 @ 6' 7"	40198	Passed (42%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.117 @ 6' 7"	0.313	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.214 @ 6' 7"	0.625	Passed (L/699)	--	1.0 D + 1.0 S (All Spans)

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

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - DF	5.50"	4.25"	2.59"	2622	351	3127	5749	1 1/4" Rim Board
2 - Column - DF	3.50"	3.50"	2.56"	2557	342	3048	5605	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)	12' 11" o/c	
Bottom Edge (Lu)	12' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 13'	N/A	17.5	--	--	
1 - Uniform (PSF)	0 to 13' (Front)	1' 4"	12.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 13' (Top)	10'	8.0	-	-	Wall
3 - Uniform (PSF)	0 to 13' (Top)	19'	15.0	-	25.0	Roof

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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U10

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U8/U9 Support

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

Geometry and loads:

Height	9.5 ft	w(d)	0 plf	M(d)	
Axial Load	11647 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	9.5 ft	Le(b)	9.5 ft		

Material Properties:

Fb1	875 psi	Fb(d)'	1006.3 psi
Fb2	875 psi	Fb(b)'	1006.3 psi
Fc	1350 psi	Fc'	879.69 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

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

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.55
Section Modulus (b):	27.7 in^3	Rb(b)	4.55
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided			Required		
FcE(d)	1110 psi	>	fc	385 psi	OK
FcE(b)	1110 psi	>	fc	385 psi	OK
FbE	33579 psi	>	fb(d)	0 psi	OK
FbE	33579 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

NDS 2018 EQ 3.9-3	0.19	<	1.0	**OK**

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U11

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: West Entrance Door Header Below Beam U9

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

Geometry and Loads:

Span:	5.5 ft	Tributary Width:	13.5 ft	P Location:	1 ft
Add'l uniform DL:	110 lbs/ft	DL unit load:	12 psf	Concentrated DL:	2622 lbs
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	342 lbs
Add'l uniform SL:	50 lbs/ft	SL unit load:		Concentrated SL:	3048 lbs
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	2893 lbs	DL Reaction 2:	1225 lbs	Note: Design automatically uses
LL Reaction 1:	1765 lbs	LL Reaction 2:	1547 lbs	ASD load combinations
SL Reaction 1:	2631 lbs	SL Reaction 2:	692 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**6190 lbs**	Total Reaction 2:	**2904 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2600 psi	Fb'	3098 psi
Fv	285 psi	Fv'	328 psi
Fc perp	750 psi	Fc perp'	750 psi
Emin	1.016 msi	Emin'	1.016 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/		240	
For LL only: Allowed deflection criteria, span/		360	
Max. allowed total defl:	0.28 in	Max LL defl:	0.18 in
Total defl. * I:	18.46 in^4	Required I:	67.12 in^4
LL defl. * I:	11.48 in^4	Required I:	62.61 in^4
Actual deflections:	TOTAL: 0.08 in		0.05 in

Force analysis:

Max. moment:	5784 ft-lb	Max Shear:	6190 lbs

Selected Member:	(2) LVL	**1.75**	**x**	**9.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	230.84 in^4		67.12 in^4
Section Modulus:	49.91 in^3		22.41 in^3
Section Area:	32.38 in^2		28.33 in^2
Bearing Area:			8.25 in^2
Minimum bearing dimensions:	3.5 in	x	2.36 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U12

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Header @ West Entrance Floor Opening

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

Geometry and Loads:

Span:	10 ft	Tributary Width:	8.75 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	12 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	525 lbs	DL Reaction 2:	525 lbs	Note: Design automatically uses
LL Reaction 1:	1750 lbs	LL Reaction 2:	1750 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:	**2275 lbs**	Total Reaction 2:	**2275 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2600 psi	Fb'	2875 psi
Fv	285 psi	Fv'	328 psi
Fc perp	750 psi	Fc perp'	750 psi
Emin	1.016 msi	Emin'	1.016 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240	
For LL only: Allowed deflection criteria, span/			480	
Max. allowed total defl:	0.5 in		Max LL defl:	0.25 in
Total defl. * I:	51.19 in^4		Required I:	102.38 in^4
LL defl. * I:	39.38 in^4		Required I:	157.5 in^4
Actual deflections:	TOTAL:	0.04 in		0.03 in

Force analysis:

Max. moment:	5688 ft-lb	Max Shear:	2275 lbs

Selected Member:	(2) LVL	**1.75**	**x**	**16**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	1194.67 in^4		157.5 in^4
Section Modulus:	149.33 in^3		23.74 in^3
Section Area:	56. in^2		10.41 in^2
Bearing Area:			3.03 in^2
Minimum bearing dimensions:	3.5 in	x	0.87 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U13

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Stair Landing Flush Beam

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

Geometry and Loads:

Span:	7.5 ft	Tributary Width:	4.5 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	12 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:	203 lbs	DL Reaction 2:	203 lbs	Note: Design automatically uses
LL Reaction 1:	1013 lbs	LL Reaction 2:	1013 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:	**1215 lbs**	Total Reaction 2:	**1215 lbs**	

Material Properties:

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

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 480

Max. allowed total defl:	0.38 in	Max LL defl:	0.19 in
Total defl. * I:	17.74 in^4	Required I:	47.31 in^4
LL defl. * I:	14.79 in^4	Required I:	78.86 in^4
Actual deflections:	TOTAL: 0.19 in		0.16 in

Force analysis:

Max. moment:	2278 ft-lb	Max Shear:	1215 lbs

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

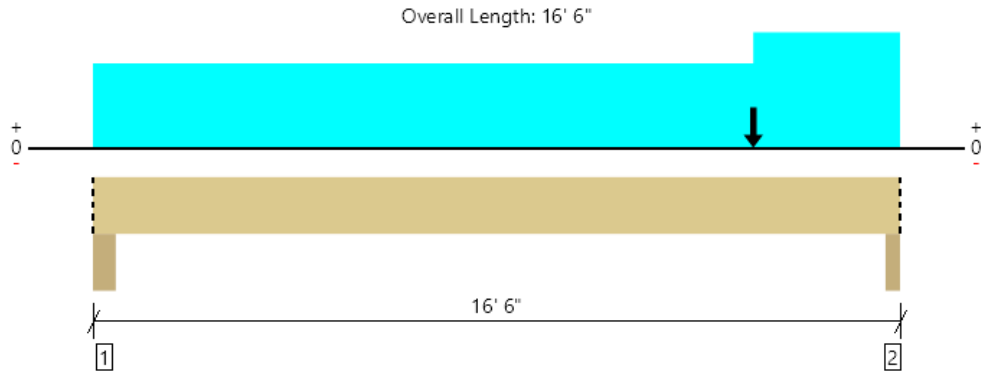
Member properties:	**Provided:**		**Required:**
Moment of inertia:	95.27 in^4		78.86 in^4
Section Modulus:	26.28 in^3		23.31 in^3
Section Area:	21.75 in^2		10.57 in^2
Bearing Area:			3. in^2
Minimum bearing dimensions:	3. in	x	1. in

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U14: Stair Opening West Flush Beam
1 piece(s) 5 1/4" x 16" 2.2E 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)	8409 @ 16' 4"	11484 (3.50")	Passed (73%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	6625 @ 14' 10 1/2"	16240	Passed (41%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	28280 @ 8' 8 1/4"	52432	Passed (54%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.277 @ 8' 5 1/4"	0.400	Passed (L/694)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.369 @ 8' 5 1/8"	0.800	Passed (L/520)	--	1.0 D + 1.0 L (All Spans)

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

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - DF	5.50"	5.50"	2.15"	1800	5240	7040	Blocking
2 - Beam - DF	3.50"	3.50"	2.56"	2016	6393	8409	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)	16' 6" o/c	
Bottom Edge (Lu)	16' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 16' 6"	N/A	26.3	--	
1 - Uniform (PSF)	0 to 16' 6" (Front)	10'	12.0	60.0	Deck to the West
2 - Uniform (PSF)	0 to 16' 6" (Front)	8'	8.0	-	Wall
3 - Uniform (PSF)	13' 6" to 16' 6" (Front)	4'	12.0	60.0	Landing
4 - Point (lb)	13' 6" (Front)	N/A	203	1013	

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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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U15

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U14 North Support

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

Geometry and loads:

Height	11 ft	w(d)	0 plf	M(d)	
Axial Load	7040 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	11 ft	Le(b)	0.5 ft		

Material Properties:

Fb1	875 psi	Fb(d)'	1006.3 psi
Fb2	875 psi	Fb(b)'	1006.3 psi
Fc	1350 psi	Fc'	708.67 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

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

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	4.90
Section Modulus (b):	27.7 in^3	Rb(b)	1.04
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided			Required		
FcE(d)	828 psi	>	fc	233 psi	OK
FcE(b)	400611 psi	>	fc	233 psi	OK
FbE	29000 psi	>	fb(d)	0 psi	OK
FbE	29000 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

NDS 2018 EQ 3.9-3	0.11	<	1.0	**OK**

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U16

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U14 South Support

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

Geometry and loads:

Height	11 ft	w(d)	0 plf	M(d)	
Axial Load	8409 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	0.5 ft	Le(b)	11 ft		

Material Properties:

Fb1	2400 psi	Fb(d)'	2760 psi
Fb2	2400 psi	Fb(b)'	2760 psi
Fc	2500 psi	Fc'	507.07 psi
E	1.8 msi	E'	1.8 msi
Emin	0.915 msi	Emin'	0.915 msi

Selected Member: PSL 3.5 (b) x 5.25 (d)

Member properties:		**Variables:**	
Section Modulus (d):	16.1 in^3	Rb(d)	0.87
Section Modulus (b):	10.7 in^3	Rb(b)	7.52
Section Area:	18.4 in^2	c	0.8

Member stresses:	Provided			Required	
FcE(d)	575850 psi	>	fc	458 psi	OK
FcE(b)	529 psi	>	fc	458 psi	OK
FbE	19409 psi	>	fb(d)	0 psi	OK
FbE	19409 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

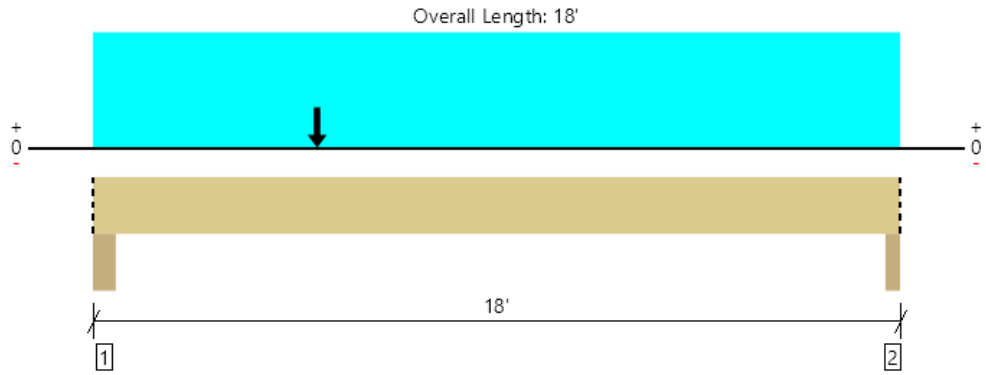
NDS 2018 EQ 3.9-3	0.81	<	1.0	**OK**

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U17: Roof Deck South East Flush Beam
1 piece(s) 5 1/4" x 16" 2.2E 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)	9383 @ 17' 10"	11484 (3.50")	Passed (82%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	8844 @ 1' 9 1/2"	16240	Passed (54%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	43171 @ 8' 5 5/8"	52432	Passed (82%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.408 @ 9' 1"	0.438	Passed (L/515)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.661 @ 8' 11 1/2"	0.875	Passed (L/318)	--	1.0 D + 1.0 L (All Spans)

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

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - DF	5.50"	5.50"	3.33"	4250	6358	2537	10921	Blocking
2 - Column - DF	3.50"	3.50"	2.86"	3141	6242	923	9383	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)	18' o/c	
Bottom Edge (Lu)	18' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 18'	N/A	26.3	--	--	
1 - Uniform (PSF)	0 to 18' (Front)	5' 6"	12.0	40.0	-	Floor
2 - Uniform (PSF)	0 to 18' (Front)	12'	8.0	-	-	Wall
3 - Point (lb)	5' (Front)	N/A	1231	-	1721	R11, south reaction
4 - Point (lb)	5' (Front)	N/A	1043	-	1739	R13, west reaction
5 - Uniform (PSF)	0 to 18' (Front)	8'	12.0	60.0	-	Roof Deck

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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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U18

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U17 North Support

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

Geometry and loads:

Height	9.5 ft	w(d)	0 plf	M(d)	
Axial Load	9383 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	0.5 ft	Le(b)	9.5 ft		

Material Properties:

Fb1	2400 psi	Fb(d)'	2760 psi
Fb2	2400 psi	Fb(b)'	2760 psi
Fc	2500 psi	Fc'	668.46 psi
E	1.8 msi	E'	1.8 msi
Emin	0.915 msi	Emin'	0.915 msi

Selected Member: PSL 3.5 (b) x 5.25 (d)

Member properties:		**Variables:**	
Section Modulus (d):	16.1 in^3	Rb(d)	0.87
Section Modulus (b):	10.7 in^3	Rb(b)	6.99
Section Area:	18.4 in^2	c	0.8

Member stresses:	Provided			Required	
FcE(d)	575850 psi	>	fc	511 psi	OK
FcE(b)	709 psi	>	fc	511 psi	OK
FbE	22474 psi	>	fb(d)	0 psi	OK
FbE	22474 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

NDS 2018 EQ 3.9-3	0.58	<	1.0	**OK**

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U19

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U17 North Support

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

Geometry and loads:

Height	9.5 ft	w(d)	0 plf	M(d)	
Axial Load	10921 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	0.5 ft	Le(b)	9.5 ft		

Material Properties:

Fb1	875 psi	Fb(d)'	1006.3 psi
Fb2	875 psi	Fb(b)'	1006.3 psi
Fc	1350 psi	Fc'	879.69 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

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

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	1.04
Section Modulus (b):	27.7 in^3	Rb(b)	4.55
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided			Required		
FcE(d)	400611 psi	>	fc	361 psi	OK
FcE(b)	1110 psi	>	fc	361 psi	OK
FbE	33579 psi	>	fb(d)	0 psi	OK
FbE	33579 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

NDS 2018 EQ 3.9-3	0.17	<	1.0	**OK**

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U20

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Stair Landing Flush Beam

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

Geometry and Loads:

Span:	11 ft	Tributary Width:	1.33 ft	P Location:	3.75 ft
Add'l uniform DL:	96 lbs/ft	DL unit load:	12 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	616 lbs	DL Reaction 2:	616 lbs	Note: Design automatically uses
LL Reaction 1:	293 lbs	LL Reaction 2:	293 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:	**908 lbs**	Total Reaction 2:	**908 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2600 psi	Fb'	3202 psi
Fv	285 psi	Fv'	328 psi
Fc perp	750 psi	Fc perp'	750 psi
Emin	1.016 msi	Emin'	1.016 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/		240	
For LL only: Allowed deflection criteria, span/		480	
Max. allowed total defl:	0.55 in	Max LL defl:	0.28 in
Total defl. * I:	27.2 in^4	Required I:	49.46 in^4
LL defl. * I:	8.76 in^4	Required I:	31.86 in^4
Actual deflections:	TOTAL: 0.24 in		0.08 in

Force analysis:

Max. moment:	2498 ft-lb	Max Shear:	908 lbs

Selected Member:	(2) LVL	**1.75**	**x**	**7.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	111.15 in^4		49.46 in^4
Section Modulus:	30.66 in^3		9.36 in^3
Section Area:	25.38 in^2		4.16 in^2
Bearing Area:			1.21 in^2
Minimum bearing dimensions:	3.5 in	x	0.35 in

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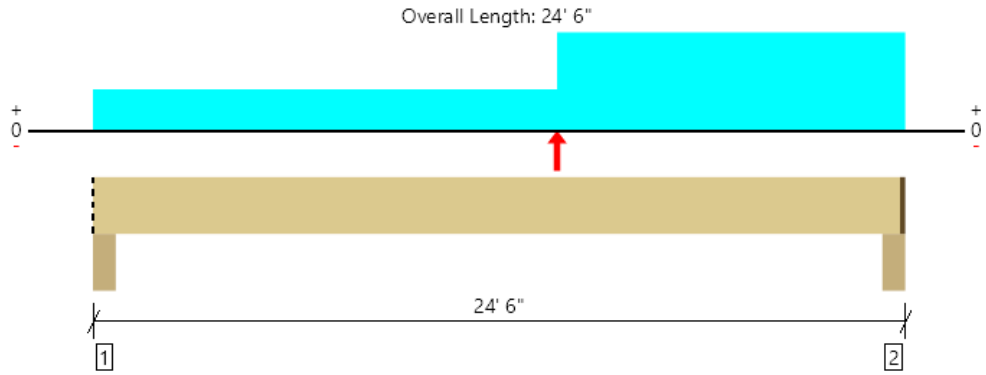
MEMBER REPORT

PASSED

Upper Floor, U21: South Flush Beam Below Wall A
2 piece(s) 1 3/4" x 11 1/4" 2.0E Microllam® LVL



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)	1750 @ 24' 2"	10784 (4.25")	Passed (16%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1522 @ 23' 1 1/4"	7481	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	8266 @ 14' 6"	16137	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.477 @ 12' 3"	0.596	Passed (L/599)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	1.032 @ 12' 7 7/16"	1.192	Passed (L/277)	--	1.0 D + 1.0 L (All Spans)

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

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - HF	5.50"	5.50"	1.50"	529	653	-50	1182	Blocking
2 - Column - HF	5.50"	4.25"	1.50"	1114	653	-68	1767	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	16' 11" o/c	
Bottom Edge (Lu)	24' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 24' 4 3/4"	N/A	11.5	--	--	
1 - Uniform (PSF)	0 to 24' 6" (Front)	1' 4"	12.0	40.0	-	Default Load
2 - Point (lb)	14' (Front)	N/A	-37	-	-118	R8 north reaction
3 - Uniform (PSF)	14' to 24' 6" (Front)	12'	8.0	-	-	

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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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

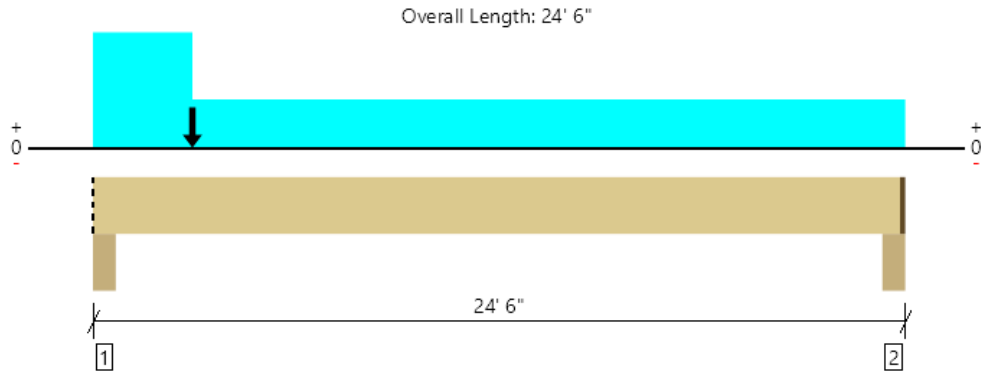
Weyerhaeuser

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U22: South Flush Beam Below Wall B
2 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL



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)	4464 @ 4"	13956 (5.50")	Passed (32%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4258 @ 1' 7 1/2"	10707	Passed (40%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	11342 @ 3'	27897	Passed (41%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.395 @ 11' 4 7/16"	0.596	Passed (L/724)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.727 @ 11' 3 15/16"	1.192	Passed (L/393)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

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

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - HF	5.50"	5.50"	1.76"	2134	653	2330	4464	Blocking
2 - Column - HF	5.50"	4.25"	1.50"	572	653	293	1282	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	15' 1" o/c	
Bottom Edge (Lu)	24' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 24' 4 3/4"	N/A	14.3	--	--	
1 - Uniform (PSF)	0 to 24' 6" (Front)	1' 4"	12.0	40.0	-	Default Load
2 - Point (lb)	3' (Front)	N/A	634	-	884	R12 south reaction
3 - Uniform (PSF)	0 to 3' (Front)	12'	8.0	-	-	
4 - Point (lb)	3' (Front)	N/A	1043	-	1739	R13 east reaction

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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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

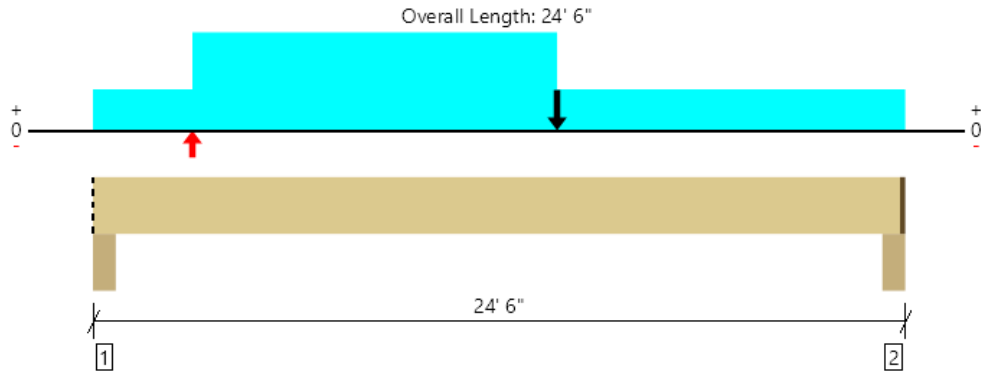
Weyerhaeuser

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U23.0: South Flush Beam Below Wall C
2 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL



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)	1965 @ 24' 2"	10784 (4.25")	Passed (18%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1718 @ 1' 7 1/2"	9310	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	11724 @ 11' 11 1/16"	24258	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.461 @ 12' 10 1/2"	0.596	Passed (L/620)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.964 @ 12' 5 5/16"	1.192	Passed (L/297)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

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

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

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Factored	
1 - Column - HF	5.50"	5.50"	1.50"	1200	653	212	675/-675	2204	Blocking
2 - Column - HF	5.50"	4.25"	1.50"	913	653	285	675/-675	1971	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	9' 11" o/c	
Bottom Edge (Lu)	24' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

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 24' 4 3/4"	N/A	14.3	--	--	--	
1 - Uniform (PSF)	0 to 24' 6" (Front)	1' 4"	12.0	40.0	-	-	Default Load
2 - Point (lb)	3' (Front)	N/A	-	-	-	-1462	SW Hold down
3 - Uniform (PSF)	3' to 14' (Front)	12'	8.0	-	-	-	
4 - Point (lb)	14' (Front)	N/A	-	-	-	1462	SW hold down
5 - Point (lb)	14' (Front)	N/A	317	-	497	-	R8 south reaction

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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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

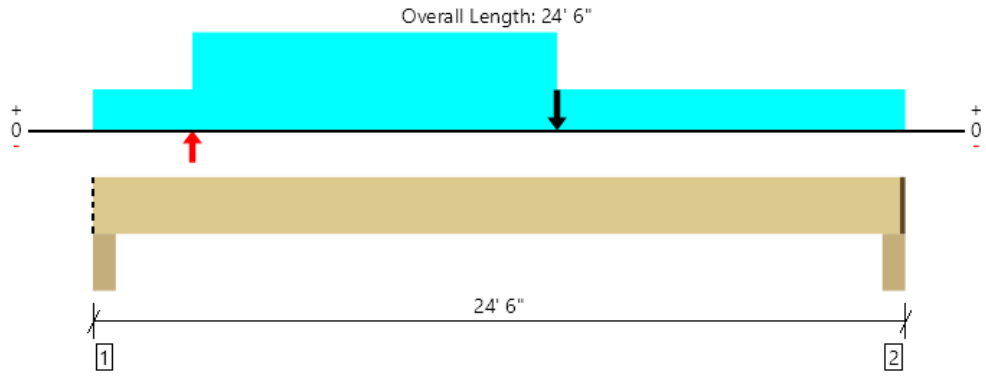
Weyerhaeuser

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U23.1: South Flush Beam Below Wall C - Seismic Overstrength
2 piece(s) 1 3/4" x 16" 2.0E Microllam® LVL



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)	2522 @ 24' 2"	10784 (4.25")	Passed (23%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1725 @ 1' 9 1/2"	10640	Passed (16%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	21729 @ 14'	49783	Passed (44%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.476 @ 13' 1 1/4"	0.596	Passed (L/601)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.821 @ 12' 8 1/4"	1.192	Passed (L/348)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -446 lbs uplift at support located at 4". Strapping or other restraint may be required.
- -618 lbs uplift at support located at 24' 2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Factored	
1 - Column - HF	5.50"	5.50"	1.50"	1225	653	212	1687/-1687	2760/-446	Blocking
2 - Column - HF	5.50"	4.25"	1.50"	938	653	285	1687/-1687	2527/-618	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 11" o/c	
Bottom Edge (Lu)	24' 5" o/c	

•Maximum allowable bracing intervals based on applied load.

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 24' 4 3/4"	N/A	16.3	--	--	--	
1 - Uniform (PSF)	0 to 24' 6" (Front)	1' 4"	12.0	40.0	-	-	Default Load
2 - Point (lb)	3' (Front)	N/A	-	-	-	-3655	SW Hold down
3 - Uniform (PSF)	3' to 14' (Front)	12'	8.0	-	-	-	
4 - Point (lb)	14' (Front)	N/A	-	-	-	3655	SW hold down
5 - Point (lb)	14' (Front)	N/A	317	-	497	-	R8 south reaction

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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
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

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John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U24

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: East Header

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

Geometry and Loads:

Span:	12.75 ft	Tributary Width:	12 ft	P Location:	3.75 ft
Add'l uniform DL:	96 lbs/ft	DL unit load:	12 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	40 psf	Concentrated LL:	
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1530 lbs	DL Reaction 2:	1530 lbs	Note: Design automatically uses
LL Reaction 1:	3060 lbs	LL Reaction 2:	3060 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:	**4590 lbs**	Total Reaction 2:	**4590 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2600 psi	Fb'	2604 psi
Fv	285 psi	Fv'	285 psi
Fc perp	750 psi	Fc perp'	750 psi
Emin	1.016 msi	Emin'	1.016 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/		240	
For LL only: Allowed deflection criteria, span/		480	
Max. allowed total defl:	0.64 in	Max LL defl:	0.32 in
Total defl. * I:	214.06 in^4	Required I:	335.77 in^4
LL defl. * I:	142.7 in^4	Required I:	447.7 in^4
Actual deflections:	TOTAL: 0.44 in		0.29 in

Force analysis:

Max. moment:	14631 ft-lb	Max Shear:	4590 lbs

Selected Member:	(2) LVL	**1.75**	**x**	**11.875**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	488.41 in^4		447.7 in^4
Section Modulus:	82.26 in^3		67.43 in^3
Section Area:	41.56 in^2		24.16 in^2
Bearing Area:			6.12 in^2
Minimum bearing dimensions:	3.5 in	x	1.75 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U25

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U24 South Support

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

Geometry and loads:

Height	9.5 ft	w(d)	0 plf	M(d)	
Axial Load	9677 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	0.5 ft	Le(b)	9.5 ft		

Material Properties:

Fb1	875 psi	Fb(d)'	1006.3 psi
Fb2	875 psi	Fb(b)'	1006.3 psi
Fc	1350 psi	Fc'	879.69 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

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

Member properties:		**Variables:**	
Section Modulus (d):	27.7 in^3	Rb(d)	1.04
Section Modulus (b):	27.7 in^3	Rb(b)	4.55
Section Area:	30.3 in^2	c	0.8

Member stresses:	Provided			Required		
FcE(d)	400611 psi	>	fc	320 psi	OK
FcE(b)	1110 psi	>	fc	320 psi	OK
FbE	33579 psi	>	fb(d)	0 psi	OK
FbE	33579 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

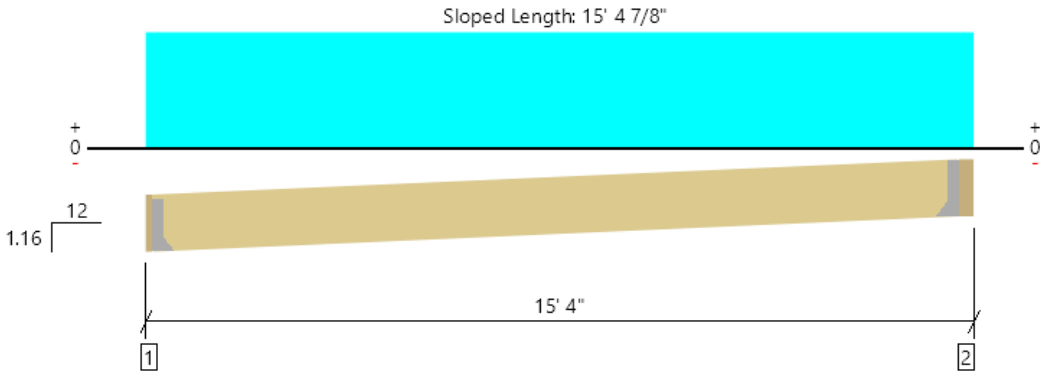
NDS 2018 EQ 3.9-3	0.13	<	1.0	**OK**

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U26: West Roof Joist
1 piece(s) 2 x 12 HF No.2 @ 24" OC



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

Member Length : 15' 15/16"

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.16/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	598 @ 1 1/2"	911 (1.50")	Passed (66%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	523 @ 1' 11/16"	1941	Passed (27%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2229 @ 7' 7"	2964	Passed (75%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.243 @ 7' 7"	0.749	Passed (L/740)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.389 @ 7' 7"	0.999	Passed (L/462)	--	1.0 D + 1.0 S (All Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Hanger on 11 1/4" DF ledgerOnMasonry	1.50"	Hanger[1]	1.50"	229	379	608	See note [1]
2 - Hanger on 11 1/4" PSL beam	3.50"	Hanger[1]	1.50"	234	388	621	See note [1]

- 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.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 8" o/c	
Bottom Edge (Lu)	15' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LRU28Z	1.94"	N/A	6-10dx1.5	5-10d	
2 - Face Mount Hanger	LRU28Z	1.94"	N/A	6-10dx1.5	5-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 15' 4"	24"	15.0	25.0	Default Load

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

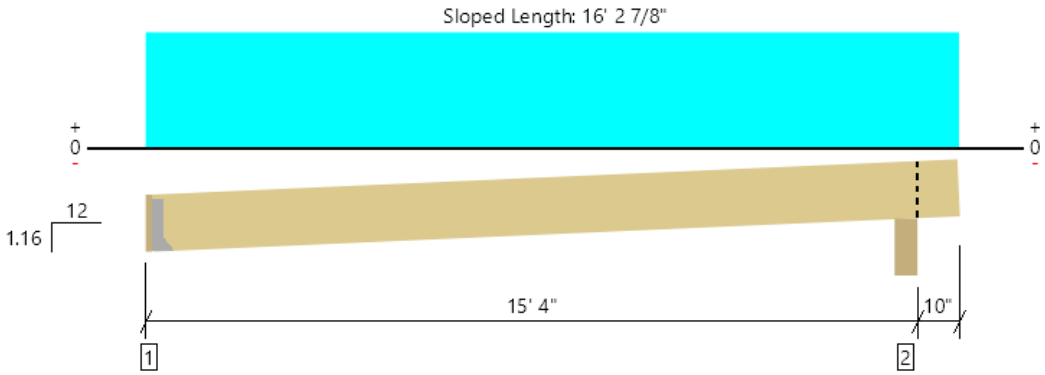
Weyerhaeuser

FORTEWEB

MEMBER REPORT

PASSED

Upper Floor, U27: West Roof Joist, Cantilevered
1 piece(s) 2 x 12 HF No.2 @ 24" OC



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

Member Length : 16' 2 1/2"

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 1.16/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	598 @ 1 1/2"	911 (1.50")	Passed (66%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	523 @ 1' 11/16"	1941	Passed (27%)	1.15	1.0 D + 1.0 S (Alt Spans)
Moment (Ft-lbs)	2232 @ 7' 7 1/16"	2964	Passed (75%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.246 @ 7' 7 5/16"	0.752	Passed (L/735)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.393 @ 7' 7 1/4"	1.003	Passed (L/460)	--	1.0 D + 1.0 S (Alt Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Hanger on 11 1/4" DF ledgerOnMasonry	1.50"	Hanger[1]	1.50"	228	380	608	See note [1]
2 - Beveled Plate - HF	5.50"	5.50"	1.50"	259	429	688	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.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 8" o/c	
Bottom Edge (Lu)	16' 1" o/c	

- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	LRU28Z	1.94"	N/A	6-10dx1.5	5-10d	

- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 16' 2"	24"	15.0	25.0	Default Load

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
William Nocka CSES (978) 503-9935 11wnocka@gmail.com	

Weyerhaeuser

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U28

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: West Patio Roof Flush Beam

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

Geometry and Loads:

Span:	21 ft	Tributary Width:	8 ft	P Location:	3.75 ft
Add'l uniform DL:		DL unit load:	15 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:		Concentrated LL:	
Add'l uniform SL:		SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1260 lbs	DL Reaction 2:	1260 lbs	Note: Design automatically uses
LL Reaction 1:	0 lbs	LL Reaction 2:	0 lbs	ASD load combinations
SL Reaction 1:	2100 lbs	SL Reaction 2:	2100 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**3360 lbs**	Total Reaction 2:	**3360 lbs**	

Material Properties:

E	2.2 msi	E'	2.2 msi
Fb	2900 psi	Fb'	3359 psi
Fv	290 psi	Fv'	334 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.914 msi	Emin'	0.914 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240
For LL only: Allowed deflection criteria, span/			360
Max. allowed total defl:	1.05 in	Max LL defl:	0.7 in
Total defl. * I:	636.48 in^4	Required I:	606.17 in^4
LL defl. * I:	397.8 in^4	Required I:	568.29 in^4
Actual deflections:	TOTAL: 1.02 in		0.64 in

Force analysis:

Max. moment:	17640 ft-lb	Max Shear:	3360 lbs

Selected Member:	(1) PSL	**5.25**	**x**	**11.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	622.92 in^4		606.17 in^4
Section Modulus:	110.74 in^3		63.02 in^3
Section Area:	59.06 in^2		15.11 in^2
Bearing Area:			5.38 in^2
Minimum bearing dimensions:	5.25 in	x	1.02 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U29

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U28 South Support

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

Geometry and loads:

Height	11 ft	w(d)	0 plf	M(d)	
Axial Load	3360 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	11 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'	355.15 psi
E	1.3 msi	E'	1.3 msi
Emin	0.47 msi	Emin'	0.47 msi

Selected Member: HF #2 — 3 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	15.1 in^3	Rb(d)	3.62
Section Modulus (b):	8.3 in^3	Rb(b)	7.66
Section Area:	16.5 in^2	c	0.8

Member stresses:	Provided			Required	
FcE(d)	671 psi	>	fc	204 psi	OK
FcE(b)	377 psi	>	fc	204 psi	OK
FbE	9614 psi	>	fb(d)	0 psi	OK
FbE	9614 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

NDS 2018 EQ 3.9-3	0.33	<	1.0	**OK**

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U30

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Grid C Header 1

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

Geometry and Loads:

Span:	4.75 ft	Tributary Width:	10 ft	P Location:	3.75 ft
Add'l uniform DL:	120 lbs/ft	DL unit load:	12 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	60 psf	Concentrated LL:	
Add'l uniform SL:	200 lbs/ft	SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	570 lbs	DL Reaction 2:	570 lbs	Note: Design automatically uses
LL Reaction 1:	1425 lbs	LL Reaction 2:	1425 lbs	ASD load combinations
SL Reaction 1:	1069 lbs	SL Reaction 2:	1069 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**2440 lbs**	Total Reaction 2:	**2440 lbs**	

Material Properties:

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

Deflection analysis:

For total load: Allowed deflection criteria, span/			240		
For LL only: Allowed deflection criteria, span/			360		
Max. allowed total defl:	0.24 in		Max LL defl:	0.16 in	
Total defl. * I:	11.37 in^4		Required I:	47.86 in^4	
LL defl. * I:	9.25 in^4		Required I:	58.43 in^4	
Actual deflections:	TOTAL:	0.06 in		0.05 in	

Force analysis:

Max. moment:	2898 ft-lb	Max Shear:	2440 lbs

Selected Member:	(2) HF #2	**1.5**	**x**	**9.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	197.86 in^4		58.43 in^4
Section Modulus:	42.78 in^3		32.34 in^3
Section Area:	27.75 in^2		21.22 in^2
Bearing Area:			6.03 in^2
Minimum bearing dimensions:	3. in	x	2.01 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U31

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Grid C Header 2

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

Geometry and Loads:

Span:	8.25 ft	Tributary Width:	10 ft	P Location:	3.75 ft
Add'l uniform DL:	120 lbs/ft	DL unit load:	12 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	60 psf	Concentrated LL:	
Add'l uniform SL:	200 lbs/ft	SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	990 lbs	DL Reaction 2:	990 lbs	Note: Design automatically uses
LL Reaction 1:	2475 lbs	LL Reaction 2:	2475 lbs	ASD load combinations
SL Reaction 1:	1856 lbs	SL Reaction 2:	1856 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**4238 lbs**	Total Reaction 2:	**4238 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2600 psi	Fb'	3098 psi
Fv	285 psi	Fv'	328 psi
Fc perp	750 psi	Fc perp'	750 psi
Emin	1.016 msi	Emin'	1.016 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240	
For LL only: Allowed deflection criteria, span/			360	
Max. allowed total defl:	0.41 in	Max LL defl:		0.28 in
Total defl. * I:	67.23 in^4	Required I:		162.98 in^4
LL defl. * I:	54.72 in^4	Required I:		198.99 in^4
Actual deflections:	TOTAL: 0.29 in			0.24 in

Force analysis:

Max. moment:	8742 ft-lb	Max Shear:	4238 lbs

Selected Member:	(2) LVL	**1.75**	**x**	**9.25**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	230.84 in^4		198.99 in^4
Section Modulus:	49.91 in^3		33.86 in^3
Section Area:	32.38 in^2		19.4 in^2
Bearing Area:			5.65 in^2
Minimum bearing dimensions:	3.5 in	x	1.61 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U32

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Grid C Header 3

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

Geometry and Loads:

Span:	15 ft	Tributary Width:	8 ft	P Location:	3.75 ft
Add'l uniform DL:	120 lbs/ft	DL unit load:	12 psf	Concentrated DL:	
Add'l uniform LL:		LL unit load:	60 psf	Concentrated LL:	
Add'l uniform SL:	200 lbs/ft	SL unit load:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	1620 lbs	DL Reaction 2:	1620 lbs	Note: Design automatically uses
LL Reaction 1:	3600 lbs	LL Reaction 2:	3600 lbs	ASD load combinations
SL Reaction 1:	3000 lbs	SL Reaction 2:	3000 lbs	
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**6570 lbs**	Total Reaction 2:	**6570 lbs**	

Material Properties:

E	2.2 msi	E'	2.2 msi
Fb	2900 psi	Fb'	3230 psi
Fv	290 psi	Fv'	334 psi
Fc perp	625 psi	Fc perp'	625 psi
Emin	0.914 msi	Emin'	0.914 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/ 240

For LL only: Allowed deflection criteria, span/ 360

Max. allowed total defl:	0.75 in	Max LL defl:	0.5 in
Total defl. * I:	567.46 in^4	Required I:	756.61 in^4
LL defl. * I:	455.63 in^4	Required I:	911.25 in^4
Actual deflections:	TOTAL: 0.47 in		0.38 in

Force analysis:

Max. moment:	24638 ft-lb	Max Shear:	6570 lbs

Selected Member: (1) PSL **3.5** **x** **16**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	1194.67 in^4		911.25 in^4
Section Modulus:	149.33 in^3		91.53 in^3
Section Area:	56. in^2		29.55 in^2
Bearing Area:			10.51 in^2
Minimum bearing dimensions:	3.5 in	x	3. in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer:	**Shawn Sullivan**	Page number:	U33

Post Design (Combined Axial and Moment Loading)

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

Post Description: Beam U32 Support

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

Geometry and loads:

Height	9 ft	w(d)	0 plf	M(d)	
Axial Load	6570 lbs	w(b)	0 plf	M(b)	0 ft-lbs
Le(d)	9 ft	Le(b)	9 ft		

Material Properties:

Fb1	900 psi	Fb(d)'	1035 psi
Fb2	900 psi	Fb(b)'	1035 psi
Fc	1350 psi	Fc'	461.64 psi
E	1.6 msi	E'	1.6 msi
Emin	0.58 msi	Emin'	0.58 msi

Selected Member: DF #2 — 3.5 (b) x 5.5 (d)

Member properties:		**Variables:**	
Section Modulus (d):	17.6 in^3	Rb(d)	3.53
Section Modulus (b):	11.2 in^3	Rb(b)	6.96
Section Area:	19.3 in^2	c	0.8

Member stresses:	Provided			Required	
FcE(d)	1236 psi	>	fc	341 psi	OK
FcE(b)	501 psi	>	fc	341 psi	OK
FbE	14354 psi	>	fb(d)	0 psi	OK
FbE	14354 psi	>	fb(b)	0 psi	OK

Bending and Axial Compression Check:

NDS 2018 EQ 3.9-3	0.55	<	1.0	**OK**

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U34

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: South East Garage Header

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

Geometry and Loads:

Span:	18 ft	Tributary Width:	2 ft	P Location:	3.75 ft
Add'l uniform DL:	80 lbs/ft	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:	25 psf	Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	990 lbs	DL Reaction 2:	990 lbs	Note: Design automatically uses
LL Reaction 1:	1080 lbs	LL Reaction 2:	1080 lbs	ASD load combinations
SL Reaction 1:	450 lbs	SL Reaction 2:	450 lbs	1
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**2138 lbs**	Total Reaction 2:	**2138 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2600 psi	Fb'	2994 psi
Fv	285 psi	Fv'	328 psi
Fc perp	750 psi	Fc perp'	750 psi
Emin	1.016 msi	Emin'	1.016 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240
For LL only: Allowed deflection criteria, span/			360
Max. allowed total defl:	0.9 in	Max LL defl:	0.6 in
Total defl. * I:	330.67 in^4	Required I:	367.42 in^4
LL defl. * I:	200.77 in^4	Required I:	334.61 in^4
Actual deflections:	TOTAL: 0.68 in		0.41 in

Force analysis:

Max. moment:	9619 ft-lb	Max Shear:	2138 lbs

Selected Member:	(2) LVL	**1.75**	**x**	**11.875**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	488.41 in^4		367.42 in^4
Section Modulus:	82.26 in^3		38.55 in^3
Section Area:	41.56 in^2		9.78 in^2
Bearing Area:			2.85 in^2
Minimum bearing dimensions:	3.5 in	x	0.81 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Designer	**Shawn Sullivan**	Page number:	U35

BEAM DESIGN (Uniform Load+Concentrated Load)

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

Beam Description: Stair Opening East Flush Beam

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

Geometry and Loads:

Span:	7 ft	Tributary Width:	8.5 ft	P Location:	3.25 ft
Add'l uniform DL:	48 lbs/ft	DL unit load:	12 psf	Concentrated DL:	202.5 lbs
Add'l uniform LL:	240 lbs/ft	LL unit load:	40 psf	Concentrated LL:	1012.5 lbs
Add'l uniform SL:		SL unit load:		Concentrated SL:	
Add'l uniform WL:		WL unit load:		Concentrated WL:	

DL Reaction 1:	633 lbs	DL Reaction 2:	619 lbs	Note: Design automatically uses
LL Reaction 1:	2572 lbs	LL Reaction 2:	2500 lbs	ASD load combinations
SL Reaction 1:	0 lbs	SL Reaction 2:	0 lbs	1
WL Reaction 1:	0 lbs	WL Reaction 2:	0 lbs	
Total Reaction 1:	**3206 lbs**	Total Reaction 2:	**3119 lbs**	

Material Properties:

E	2 msi	E'	2 msi
Fb	2600 psi	Fb'	2500 psi
Fv	285 psi	Fv'	285 psi
Fc perp	750 psi	Fc perp'	750 psi
Emin	1.016 msi	Emin'	1.016 msi

Deflection analysis:

For total load: Allowed deflection criteria, span/			240
For LL only: Allowed deflection criteria, span/			360
Max. allowed total defl:	0.35 in	Max LL defl:	0.23 in
Total defl. * I:	27.17 in^4	Required I:	77.63 in^4
LL defl. * I:	21.88 in^4	Required I:	93.75 in^4
Actual deflections:	TOTAL: 0.02 in		0.02 in

Force analysis:

Max. moment:	6564 ft-lb	Max Shear:	3206 lbs

Selected Member:	(2) LVL	**1.75**	**x**	**16**

Member properties:	**Provided:**		**Required:**
Moment of inertia:	1194.67 in^4		93.75 in^4
Section Modulus:	149.33 in^3		31.5 in^3
Section Area:	56. in^2		16.87 in^2
Bearing Area:			4.27 in^2
Minimum bearing dimensions:	3.5 in	x	1.22 in

John S. Apolis, P.E.	**CSES, Inc.**	Job number:	**2022.136**
Project:	**Li Residence**	Date:	13-Oct-22
Architect:	**Shawn Sullivan**	Page number:	U36

Steel Post Design

2018 International Building Code (IBC)

Design Information:

Gravity Load:	3360	lbs	Moment:	0	ft-lbs
Height:	12	ft	K:	1.2	
E	29000	ksi	Fy:	46	ksi

Gravity Load Design

Kl/r	155.68		4.71*SQRT(E/Fy)	118.26	
Fe	11,810	psi	Fcr	10,358	psi
Pc	15,133	lbs	>	3360	lbs

Lateral Load Design (Compact sections only)

F7-1 Mn	114080				
Mc	114080	in-lbs	>	0	in-lbs

Combined Axial/Flexural Load Design

Pr/Pc	0.22	>	0.2	H1-1a
H1-1a	0.22	<	1	OK

Column Specification:	HSS3x3x1/4

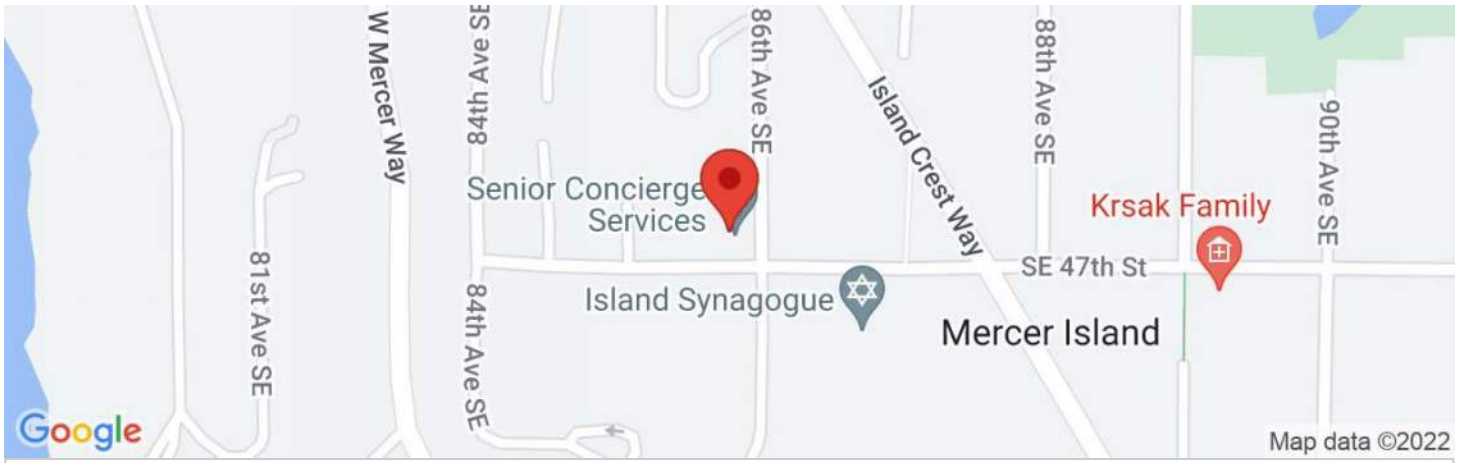
Z: 2.48

A: 2.44
S: 2.01
I: 3.02
r: 1.11

2022.136 Li Residence

4657 86th Ave SE, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.5621293, -122.2245528



Date	9/6/2022, 2:33:19 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	1.436	MCE_R ground motion. (for 0.2 second period)
S_1	0.499	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.723	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.149	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

John S. Apolis, P.E. **CSES, Inc.** Job number: **2022.136**
Project: **Li Residence** Date: 13-Oct-22
Architect: **Shawn Sullican** Page number: **L 1**

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

(Simplified Envelope Procedure Part 2) 2015 & 2018 International Building Code (IBC)

WIND LOADS **110** mph Basic Wind Speed 2018 NDS

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

Least Horizontal Dimension, feet: **64** Mean Roof Ht, feet: **25** (degrees)

lambda = 1.00 a = 6.4 ft, 2a = 12.8 ft

Iw = 1.00 KzT = **1.60**

Tabulated Ps(30): (Refer to ASCE 7-16, Figure 28.6-1)	Zone	Tabulated Wind Pressure		Calc'd Design Pressure (*lambda*KzT*0.6)	Min Design Pressure
(horizontal)	A	19.2	psf	**18.4**	**18.4**
"	B	-10.0	psf	**-9.6**	**9.6**
"	C	12.7	psf	**12.2**	**15.4**
"	D	-5.9	psf	**-5.7**	**7.7**
(vertical)	E	-23.1	psf	**-22.2**	
"	F	-13.1	psf	**-12.6**	
"	G	-16.0	psf	**-15.4**	
"	H	-10.1	psf	**-9.7**	
(uplift on overhangs)	E(oh)	-32.3	psf	**-31.0**	
"	G(oh)	-25.3	psf	**-24.3**	

(Per section 28.6.4 minimum tabulated wind pressure is 16 PSF for zonesA,C, and 8 PSF for zones B, D)

(Equivalent Lateral Force Procedure, Section 12.8)

SEISMIC LOADS Ie 1.0 R = 6.5 ASCE 7-16, Table 12.2.1

Seismic Parameters per ASCE 7-16) Group I Site Class: **D**

PGA (.2 sec) 1.4360 Fa = 1.00 ASCE 7-16 Table 11.4-1

PGA (1 sec) 0.4990 Fv = 1.60 ASCE 7-16 Table 11.4-2

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

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

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

Ss = 1.4360 Sms = Fa * Ss = 1.44 Equation 11.4-1

S1 = 0.4990 Sm1 = Fv * S1 = 0.80 Equation 11.4-2

Equations 11.4-3, 11.4-4 Sds = 2/3 * Sms = 0.96 Sd1 = 2/3 * Sm1 = 0.53

Equation 12.14-11 Cs (%V) = (Sds / (R/I)) = 0.147 **Building period < 0.5 s per IBC eq 12.8-7**

Base Shear = %V * W * 0.7 = 4.64 psf, uniformly distributed over floor area

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

Base = top of foundation	Roof DL (psf)	Wall DL (psf) dist. over floor area	Story Height Above Base (ft)	Lateral Load (psf)
Roof	**15**	**6**	**21**	**2.90**
Main Floor	**12**	**12**	**11**	**1.74**

Total Seismic DL: **45** Sum **4.64**

LATERAL DESIGN – ROOF LEVEL

NORTH SHEAR WALL – L = 27'

$P_w = 12.8' \times 6' \times 18.4\,psf + 6.5' \times 6' \times 15.4\,psf = 2,014\#$ //

$P_E = 19.25' \times 30' \times 2.90\,psf = 1,675\#$

$v = \frac{2,014\#}{27'} = 75\,plf < 100\,plf \Rightarrow$ SW0

$H = 75\,plf \times 12' = 900\# < 1,705\# \Rightarrow$ CS16

$< 2,215\# \Rightarrow$ HDU2

E-W INTERIOR SHEAR WALL – L = 17'

$P_w = (12' + 19.25') \times 5.5' \times 15.4\,psf = 2,647\#$

$P_E = [(12' + 16') \times 42' + 3.25' \times 30'] \times 2.90\,psf = 3,693\#$ //

$v = \frac{3,693\#}{17'} = 217\,plf < 230\,plf \Rightarrow$ SW1

$H = 217\,plf \times 10' = 2,170\# < (2)\,1,705\# \Rightarrow$ (2) CS16

SOUTH SHEAR WALL – L = 11'

$P_w = 12' \times 6' \times 18.4\,psf = 1,325\#$

$P_E = 12' \times 42' \times 2.90\,psf = 1,462\#$ //

$v = \frac{1,462\#}{11'} = 133\,plf < 230\,plf \Rightarrow$ SW1

$H = 133\,plf \times 12' = 1,596\# < 3,900\# \Rightarrow$ MSTC48B3

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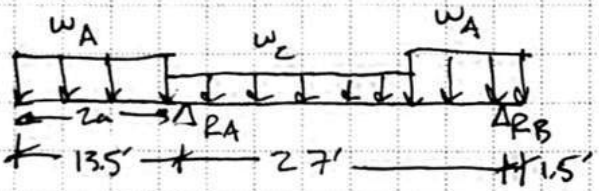
LATERAL DESIGN - ROOF LEVEL

NORTH-SOUTH LOADING DIAPHRAGM ANALYSIS:

WIND:



$w_A = 6' \times 18.4 psf = 110$ plf

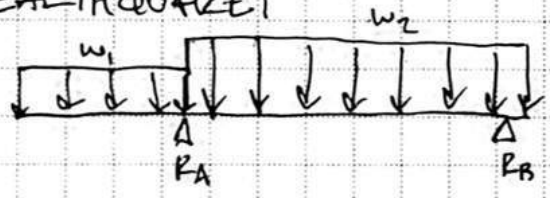
$w_C = 6' \times 15.4 psf = 92$ plf

$2a = 12.8'$

$\Sigma M, \Sigma F \Rightarrow R_{t,w} = 3,120\#$

$R_{B,w} = 1,200\#$

EARTHQUAKE:



$w_1 = 38' \times 2.90 psf = 110$ plf

$w_2 = 60' \times 2.90 psf = 174$ plf

$R_{A,EQ} = 4,200\#$ $R_{B,EQ} = 2,250\#$

EAST SHEAR WALL - L = 13.5'

$P_W = 1,200\#$ $P_E = 2,250\#$

$v = \frac{2,250\#}{13.5'} = 167$ plf < 230 plf $\Rightarrow$ SW1

$H = 167$ plf $\times 12' = 2,004\# < (2)\ 1,705\# \Rightarrow$ (2) CS16

WEST SHEAR WALL - L = 9' + 8'

$P_W = 3,120\#$ $P_E = 4,200\#$

$v = \frac{4,200\#}{17'} = 247$ plf < 350 plf $\Rightarrow$ SW2

$H = 247$ plf $\times 12' = 2,964\# < (2)\ 1,705\# \Rightarrow$ (2) CS16

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LATERAL DESIGN - UPPER FLOOR LEVEL

NORTH SHEAR WALL, EAST DIAPHRAGM - L = 27'

$P_w = 2{,}014\# + 12.8' \times 11' \times 18.4\ psf + 8.5' \times 11' \times 15.4\ psf = 6{,}045\#$

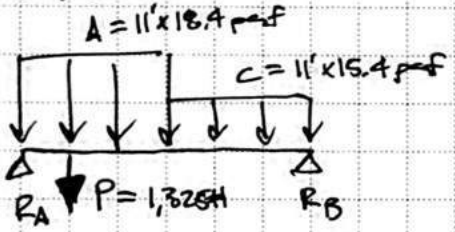
$P_E = 1{,}675\# + 20.5' \times 30' \times 1.74\ psf = 2{,}745\#$

$v = \frac{6{,}045\#}{27'} = 224\ plf < 230\ plf \Rightarrow$ SW1

$H = 224\ plf \times 5' = 1{,}220\# < 2{,}215\# \Rightarrow$ HDU2

SOUTH EAST DIAPHRAGM, EAST-WEST LOADING

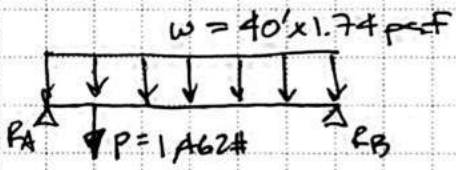
WIND:



$R_{A,w} = 3{,}440\#$

$R_{B,w} = 2{,}360\#$

EARTHQUAKE:



$R_{A,EQ} = 2{,}060\#$

$R_{B,EQ} = 1{,}080\#$

EAST-WEST INTERIOR SHEAR WALL - L = 17'

$P_w = 2{,}647\# + 2{,}360\# + 20' \times 11' \times 15.4\ psf = 8{,}395\#$

$P_E = 3{,}693\# + 20' \times 30' \times 1.74\ psf = 4{,}737\#$

$v = \frac{8{,}395\#}{17'} = 494\ plf < 550\ plf \Rightarrow$ SW3

$H = 2{,}170\# + 494\ plf \times 10' = 7{,}110\# < 7{,}870\# \Rightarrow$ HDU8 w/ 4x6 DF

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LATERAL DESIGN - UPPER FLOOR LEVEL

SOUTH SHEAR WALL - L = 10.5'

$P_w = 3,440\#$

$P_E = 2,060\# + 16' \times 20' \times 1.74 psf = 2,617\#$

$v = \frac{3,440\#}{10.5'} = 328 plf < 350 plf \Rightarrow$ SW2

$H = 328 plf \times 10' = 3,280\# < 4,340\# \Rightarrow$ HDU5

NORTH SHEAR WALL, WEST DIAPHRAGM - L = 16'

$P_w = 12.8' \times 6' \times 18.4 psf + 7.2' \times 6' \times 15.4 psf = 2,078\#$ //

$P_E = 20' \times 36' \times 1.74 psf = 1,253\#$

$v = \frac{2,078\#}{16'} = 130 plf < 230 plf \Rightarrow$ SW1

$H = 130 plf \times 12' = 1,560\# < 2,215\# \Rightarrow$ HDU2

EAST SHEAR WALL - L = 19'

$P_w = 1,200\# + 12.8' \times 11' \times 18.4 psf + 2.2' \times 11' \times 15.4 psf = 4,163\#$

$P_E = 2,250\# + 15' \times 64' \times 1.74 psf = 3,920\#$

$v = \frac{4,163\#}{19'} = 219 plf < 230 plf \Rightarrow$ SW1

$H = 219 plf \times 10' = 2,190\# < 2,215\# \Rightarrow$ HDU2

$+ 2,004\#$

$4,194\# < 4,340\# \Rightarrow$ HDU5

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LATERAL DESIGN - UPPER FLOOR LEVEL

SOUTH SHEAR WALL, DINING ROOM - L = 13'

$P_w = 12.8' \times 6' \times 18.4\,psf + 7.2' \times 6' \times 15.4\,psf = 2,078\#$

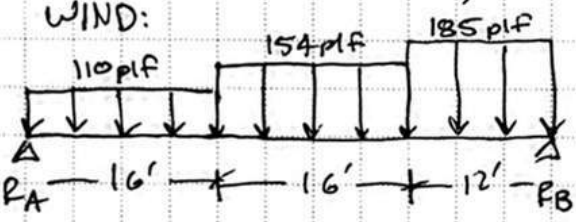
$P_E = 20' \times 16' \times 1.74\,psf = 557\#$

$v = \frac{2,078\#}{13'} = 160\,plf < 230\,plf \Rightarrow$ SW1

$H = 160\,plf \times 12' = 1,920\# < 2,215\# \Rightarrow$ HDU2

WEST DIAPHRAGM, NORTH-SOUTH LOADING

WIND:



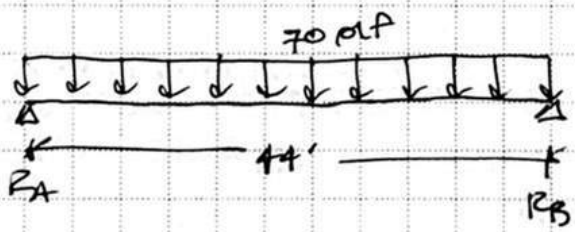
$R_{A,W} = 2,860\#$

$R_{B,W} = 3,580\#$

$V_{@16'} = 1,100\#$, $L = 40' \Rightarrow v = 28\,plf \Rightarrow$ SW0

$V_{@32'} = 1,360\#$, $L = 40' \Rightarrow v = 34\,plf \Rightarrow$ SW0

EARTHQUAKE:



$R_{A,EQ} = R_{B,EQ} = 1,540\#$

$V_{@16'} = 155\#$

$V_{@32'} = 71\#$

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LATERAL DESIGN - UPPER FLOOR LEVEL

WEST SHEAR WALL - L = 7'

$P_w = 2{,}860\#$, $P_E = 1{,}540\#$ (L6)

$v = \frac{2{,}860\#}{7'} = 409 \text{ plf} < 550 \text{ plf} \Rightarrow$ SW3

$H = 409 \text{ plf} \times 12' = 4{,}908\# < 5{,}645\# \Rightarrow$ HDU5 w/ DF post

N-S INTERIOR SHEAR WALL - L = 14'

$P_w = 3{,}120\#$ (L3) $+ 3{,}580\#$ (L6) $+ 15' \times 11' \times 15.4 \text{ psf} = 9{,}241\#$ //

$P_E = 4{,}200\#$ (L3) $+ 1{,}540\#$ (L6) $+ 64' \times 15' \times 1.74 \text{ psf} = 7{,}410\#$

$v = \frac{9{,}241\#}{14'} = 660 \text{ plf} < 710 \text{ plf} \Rightarrow$ SW3X

$H = 660 \text{ plf} \times 10' = 6{,}660\# < 6{,}970\# \Rightarrow$ HDU8 w/ 4x4 DF

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STEEL STAIR DESIGN

Stringers: HSS 4x6x1/4"

Tread Supports: HSS 4x2x1/4"

Treads: 4"x12" nominal wood treads

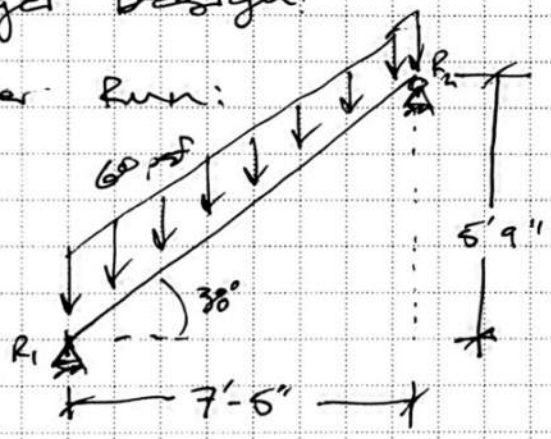
Bottom Rail: HSS 2x2x1/4"

Top Rail:

⇒ UPPER RUN CONTROLS STRINGER & CONNECTION DESIGN

Stringer Design:

Upper Run:



$$R_1 = R_2 = \frac{(60psf + 12psf)\times 7'\text{-}5''\times 3'\text{-}6'}{2} + \frac{16\,lbs/ft \times 9.38'}{2}$$

(LL: 60psf, DL: 12psf)

$R_{1,2} = 1{,}010\#$

$M_{max} = \frac{wl^2}{8}$, $w = 268$ plf, $l = 7.42'$

$M_{max} = 1{,}844$ ft-lbs

$V_{max} = 1{,}010\#$

Section Properties (HSS 6 x 4 x 1/4")

$I_x = 20.2\ in^4$	$A = 4.38\ in^2$	$J = 23.6\ in^4$
$S = 6.96\ in^3$	$b/t = 14.2$	$C = 10.1\ in^3$
$r = 2.20$ in	$h/t = 22.8$	
$Z = 8.53\ in^3$	$t = .233$	

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Revision Page S1

STEEL STAIR DESIGN

Stringer Design / Upper Run (continued):

λ_r (Table B4.1b) = 35.15 > b/t, h/t OK

λ_p (Table B4.1b) = 28.12 > b/t, h/t OK

⇒ Section is compact

⇒ Short HSS, high LTB resistance ⇒ LTB OK

$M_n = M_p = F_y Z$, $F_y = 46$ ksi

$M_n = 392{,}380$ in-lbs

$M_n = 32{,}968$ ft-lbs

$\frac{M_n}{\Omega_b} = 19.6$ kip-ft ⇒ $M_r = 1{,}844$ ft-lbs OK

$h = H - 3t = 6\text{ in} - 3(.233\text{ in}) = 5.301$ in

$\frac{h}{t} = 22.75 < 260 \Rightarrow k_v = 5$

$1.10\sqrt{\frac{k_v E}{F_y}} = 61.76 > \frac{h}{t} \Rightarrow C_v = 1.0$

$V_n = 0.6 F_y A_w$, $A_w = 2ht = 2.47\text{ in}^2$

$V_n = 68.2$ kips

$\frac{V_n}{\Omega_v} = 40.8$ kip ⇒ $V_r = 1{,}010\#$ OK

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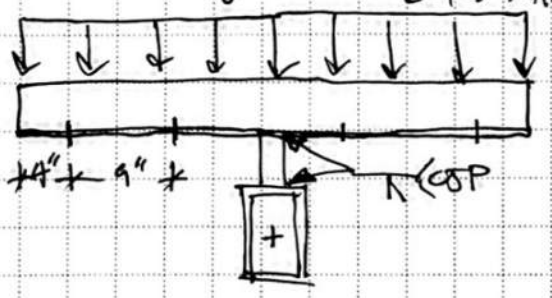
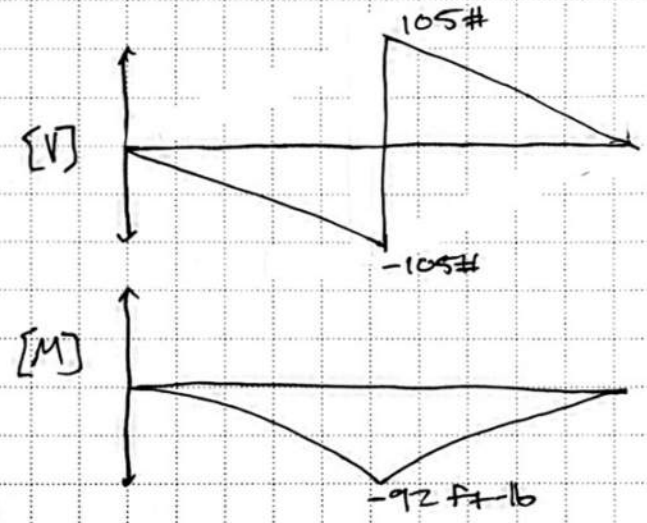
STEEL STAIR DESIGN

Tread Design:





$P_{max} = 60\,psf \times 1' \times 3.5' = 210\,\#$

$M_{max} = -92\,ft\text{-}lb$

$V_{max} = 105\,\#$

⇒ ASSUME HF#2 WOOD TREAD MIN.

$F_b = 850\,psi \times C_D \times C_{fu} = 935\,psi$
$F_v = 150\,psi$
$F_{c\perp} = 405\,psi$

$f_b = \frac{6M}{bd^2} = 34.5\,psi < 935\,psi$ OK

$f_v = \frac{V}{bd} = 2.2\,psi < 150\,psi$ OK

$f_c = \frac{210\#}{A_c} = 26.3\,psi < 405\,psi$ OK

A_c: 4"x2"

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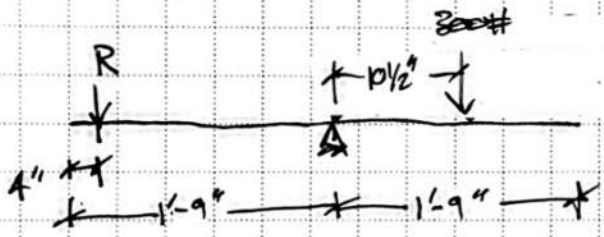
STEEL STAIR DESIGN



(WORST CASE OFFSET LOAD)

R = 185 #

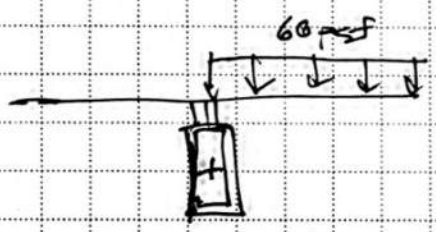
⇒ (2) LAGS EACH END

R = 93# WITHDRAWAL PER LAG

⇒ ¼" LAG w/ 2" PENETRATION

W = 2" × 179#/in = 358# > 93# OK

Stringer Torsion:



$T_{max} = \frac{60\,psf \times 1.75'^2 \times 8'}{2} = 735\,ft\text{-}lb$

$J = 23.6\ in^4 \quad \Omega_T = 1.67 \quad T_n = F_{cr} C$

$C = 10.1\ in^3$

$h/t \le 2.45\sqrt{\frac{E}{F_y}} \Rightarrow F_{cr} = 0.6F_y = 27.6\ ksi$

$T_n = 23.2\ kip\text{-}ft$

$\frac{T_n}{\Omega_T} = 13.9\ kip\cdot ft > 735\,ft\text{-}lb \Rightarrow$ OK

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STEEL STAIR DESIGN

Stringer to Landing Upper Connection:

$V_R = 1{,}010\#$

Weld Design:

$$R_n = F_{nw} A_{we} = 0.60 F_{exx} A_{we}$$

$$= 0.60 (70\ ksi) \left(\frac{3/16\ in}{\sqrt{2}}\right)$$

$$= 5.57\ kip/in$$

$$l = 2 \times 5.5in = 11\ in$$

$$R_n = 5.57\ kip/in \times 11in = 61.3\ kips$$

$$\frac{R_n}{\Omega} = 30.6\ kips >> 1{,}010\# \Rightarrow \underline{OK}$$

Base Metal Strength:

$$R_n = F_{nBM} A_{BM} = 0.6 F_u t_p l_w = 0.6 \times 60\ ksi \times 0.25" \times 2 \times 5.5"$$

$$R_n = 99\ kips$$

$$\frac{R_n}{\Omega} = 49.5\ kip >> 1{,}010\# \Rightarrow \underline{OK}$$

(4) $\frac{5}{8}$"x3" LAG SCREWS (LOWER CONNECTION SIMILAR TO UPPER)

$$Z_\perp = 440\# \times \frac{3"}{4"} = 330\#$$

$$Z_n = 1{,}320\# > 1{,}010\# \Rightarrow \underline{OK}$$

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STEEL STAIR DESIGN

Stringer to Concrete Connection:

Bearing:

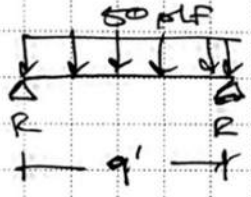
$P_{max} = 1{,}010\#$

$A = 4" \times 10.5" = 42 in^2$

$p = \frac{1{,}010\#}{42 in^2} = 24 psi$ (STEEL & CONCRETE OK)

Railing Design:

$L_{max} = 9'$



$M_{max} = 506 ft\text{-}lb$

$V_{max} = 225\#$

$R = 225\#$

2"x2" FLAT BAR RAILING

$I_x = \frac{2 \times 2^3}{12} = 1.33 in^4$ $\quad S_x = \frac{bd^2}{6} = 1.33 in^3$

$F_y = 36 ksi$ $\quad F_u = 58 ksi$ $\quad Z_x = \frac{bd^2}{4} = 2 in^3$

$\frac{L_b d}{t^2} = 54$, $\quad \frac{0.08E}{F_y} = 64.4 > 54 \Rightarrow$ yield limit state applies

$M_n = M_p = F_y Z \leq 1.6 F_y S$

$M_n = 72 kip{\cdot}in = 6000 ft\text{-}lb$

$\frac{M_n}{\Omega_b} = 3{,}593 ft\text{-}lb > M_R$ OK

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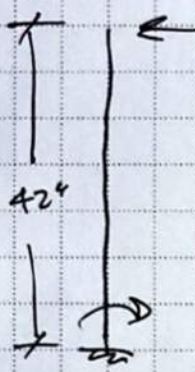
STEEL STAIR DESIGN

RAILING @ LANDINGS



$P_{max} = 50 plf \times 4.5' = 225\#$

$M = 9{,}450$ in-lbs $= 788$ ft-lbs

$R = 225\#$

Post:

$\Rightarrow$ HSS 2x2x1/8", $\frac{M_n}{\Omega_b} = 1.34$ kip-ft > 788 ft-lbs OK

Post to plate: CJP weld

Plate: 6 x 3 1/2" x 5/8" A36 Plate, $\Omega_b = 1.67$

$S = \frac{bh^2}{6} = 0.391\ in^3$, $Z = \frac{bh^2}{4} = 0.586\ in^3$

$M_n = M_p = F_y Z \leq 1.6 M_y$, $M_y = F_y S =$ in-lbs

$= 21{,}096$ in-lbs $\leq 22{,}522$ in-lbs

$M_n = 21{,}096$ in-lbs

$\frac{M_n}{\Omega_b} = 12{,}632$ in-lbs $> 9{,}450$ in-lbs OK

Bolts: (4) 5/8" LAG BOLTS, 3" THREAD DEPTH

$C_D = 1.25$, $s = ?$, $M_R = 9{,}450$ in-lbs

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Project No. 2022.136 Date 10-24-22
Project Name LI RESIDENCE
Comments
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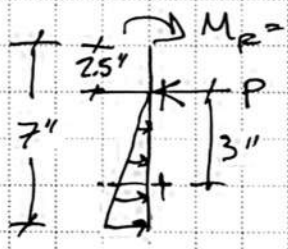
STEEL STAIR DESIGN

RAILING @ LANDINGS (CONTINUED)

BOLTS:



$P = 9{,}450 \text{ in-lbs} / 3 \text{ in} = 3{,}150\#$

(2) 5/8"ø LAGS PER ROW, $P_{allow} = 1{,}575\#$
(3" EMBED)

$P_u = 3" \times 447 \text{ lbs/in} \times C_D = 1{,}676\# > 1{,}575\#$ OK
(1.25)

$$q = \frac{3{,}150\ \#}{A} = \frac{3{,}150\ \#}{\frac{1}{2} \times 6" \times 4.5"} = 233 \text{ psi} < 625 \text{ psi}$$ OK

⇒ IDENTICAL CALCULATION FOR INVERTED LOADING, WITH ADDITIONAL BEARING CAPACITY PROVIDED BY TOP PLATE

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Company:		Date:	10/21/2022
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description: Railing Base Plate

Location:
Fastening description: Li Residence Railing Post Anchors

2. Input Data & Anchor Parameters

General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.625
Nominal Embedment depth (inch): 4.500
Effective Embedment depth, h_{ef} (inch): 3.390
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 6.83
c_{ac} (inch): 5.13
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 8.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: B tension, B shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: No
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 5.00 x 5.00 x 0.25

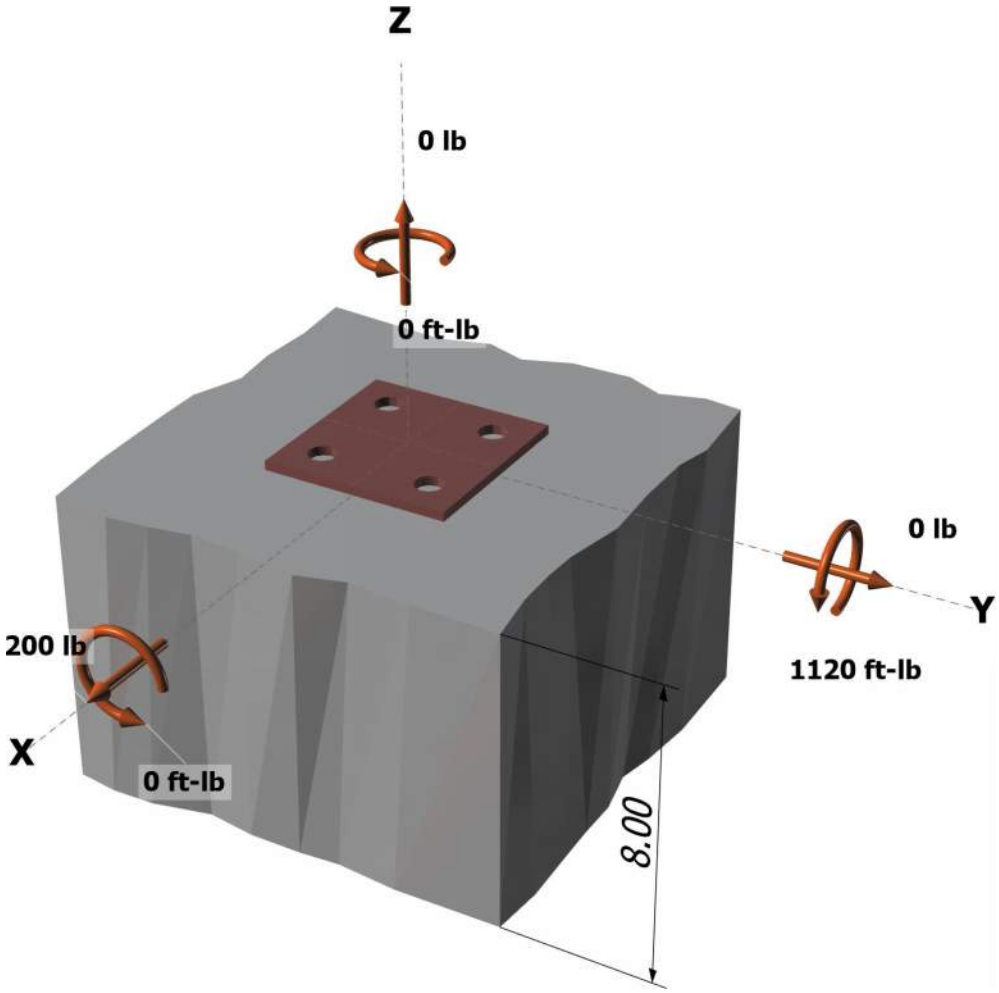
Recommended Anchor
Anchor Name: Titen HD® - 5/8"Ø Titen HD (THDB model), hnom:4.5" (114mm)
Code Report: ICC-ES ESR-2713

Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

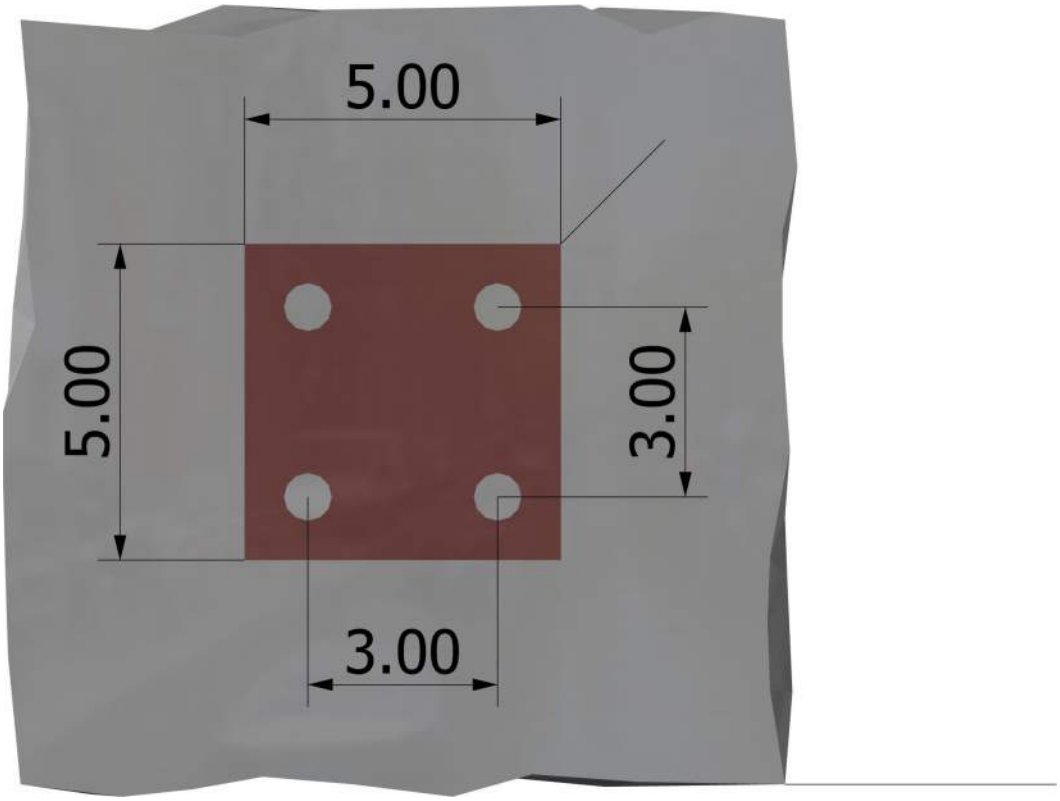
Strength level loads:

N_{ua} [lb]: 0
V_{uax} [lb]: 200
V_{uay} [lb]: 0
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 1120
M_{uz} [ft-lb]: 0

<Figure 1>



<Figure 2>

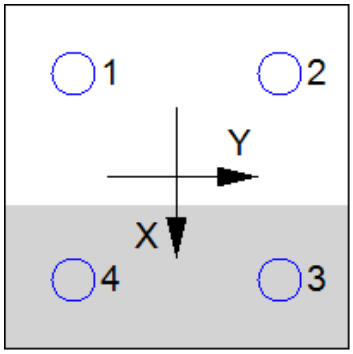


3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	2031.7	50.0	0.0	50.0
2	2031.7	50.0	0.0	50.0
3	0.0	50.0	0.0	50.0
4	0.0	50.0	0.0	50.0
Sum	4063.4	200.0	0.0	200.0

Maximum concrete compression strain (‰): 0.18
Maximum concrete compression stress (psi): 782
Resultant tension force (lb): 4063
Resultant compression force (lb): 4063
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N_{sa} (lb)	ϕ	ϕN_{sa} (lb)
30360	0.65	19734

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$N_b = k_c \lambda_a \sqrt{f'_c} h_{ef}^{1.5}$ (Eq. 17.4.2.2a)

k_c	λ_a	f'_c (psi)	h_{ef} (in)	N_b (lb)
17.0	1.00	2500	3.390	5305

$\phi N_{cbg} = \phi \, (A_{Nc} / A_{Nco}) \, \Psi_{ec,N} \, \Psi_{ed,N} \, \Psi_{c,N} \, \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.4.2.1b)

A_{Nc} (in^2)	A_{Nco} (in^2)	$c_{a,min}$ (in)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕN_{cbg} (lb)
133.94	103.43	-	1.000	1.000	1.00	1.000	5305	0.65	4466

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$\phi N_{pn} = \phi \Psi_{c,P} \lambda_a N_p (f'_c / 2{,}500)^n$ (Sec. 17.3.1, Eq. 17.4.3.1 & Code Report)

$\Psi_{c,P}$	λ_a	N_p (lb)	f'_c (psi)	n	ϕ	ϕN_{pn} (lb)
1.0	1.00	3883	2500	0.50	0.65	2524

8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
10000	1.0	0.60	6000

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

$\phi V_{cpg} = \phi k_{cp} N_{cbg} = \phi k_{cp} (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.5.3.1b)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
2.0	173.45	103.43	1.000	1.000	1.000	1.000	5305	0.70	12456

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.6.)

Tension	Factored Load, N_{ua} (lb)	Design Strength, øN_n (lb)	Ratio	Status
Steel	2032	19734	0.10	Pass
Concrete breakout	**4063**	**4466**	**0.91**	**Pass (Governs)**
Pullout	2032	2524	0.80	Pass

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	50	6000	0.01	Pass
Pryout	**200**	**12456**	**0.02**	**Pass (Governs)**

Interaction check	$N_{ua}/\phi N_n$	$V_{ua}/\phi V_n$	Combined Ratio	Permissible	Status
Sec. 17.6..1	0.91	0.00	91.0%	1.0	Pass

5/8"Ø Titen HD (THDB model), hnom:4.5" (114mm) meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of 6da per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.