



TWA ENGINEERING & CONSULTING, PLLC

STRUCTURAL REVIEW REPORT


Single Family Residence at 1800 N
Harvard St. Arlington, VA 22201

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STRUCTURAL DESIGN NOTE

Project Name	Single Family Residence	Seq. No.	DN-001-R0	
		Date	02/02/2024	
Structural Engineer	TWA ENGINEERING & CONSULTING, PLLC	Project No	-	

1. DESIGN DATA

Codes & Standards

IBC 2018; IRC 2018; ASCE 7-16; ACI 318-14; AISC 360-16

Location

1800 N Harvard St. Arlington, VA 22201

Site Seismic Data

Risk Category : II

Site Class : D - Default

Importance Factor = 1.0

$S_s = 0.134$

$S_1 = 0.043$

$S_{DS} = 0.143$

Site Wind Data

Basic wind speed : 113 mph

Risk category : II

Exposure Category : B

Topographic factor, K_{zt} : 1

Snow Loads (Table 7.2-5: ASCE/SEI 7-16)

Ground Snow load = 25 lb/sq.ft

Gravity Loads

	Floor Loads	Roof Loads	Deck	Hot tub Area
Super Imposed Dead Loads	15 PSF	15 PSF	15 PSF	15 PSF
Live Loads	40 PSF	20 PSF	60 PSF	100 PSF

2. SCOPE

This design note is prepared by author to address following aspects

1. Explain basis of design adopted for the structural design
 - Structural design codes and standards
 - Basis for the calculation loadings
2. Design of Selected Critical Steel Beams
3. Design of Selected Critical Timber Beams

3. SOURCE DOCUMENTS

- ❖ ASCE standard ASCE/SEI 7-10: American Society of Civil Engineers; Minimum Design Loads for Buildings and Other Structure. (General Loads and Load combinations)
- ❖ International Building Code 2018 (IBC)
- ❖ <https://hazards.atcouncil.org/> (Ground Snow Load & Wind Load)
- ❖ National Design Specification for Wood Construction 2018 (NDS); American Wood Council
- ❖ Virginia Residential Code 2021 (VBC 2021)

4. STRUCTURAL MODELING AND ANALYSIS

4.1 Analysis of Building

The proposed building was analyzed using the finite element software SAP 2000. Member forces are obtained using this finite element model.

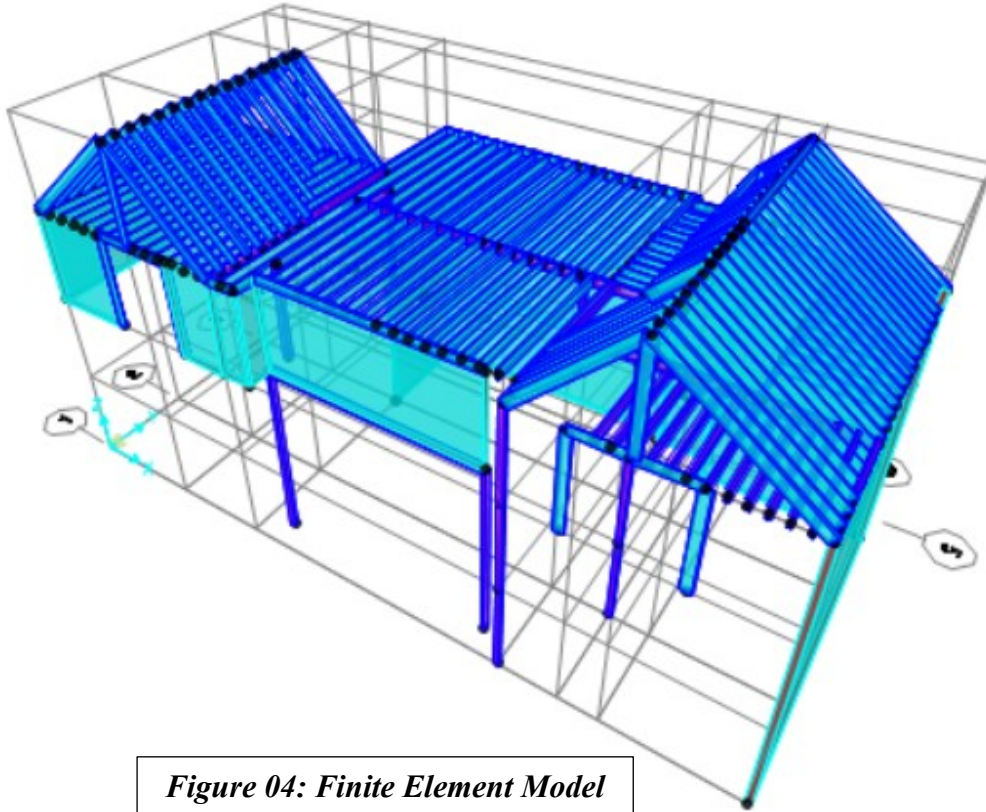
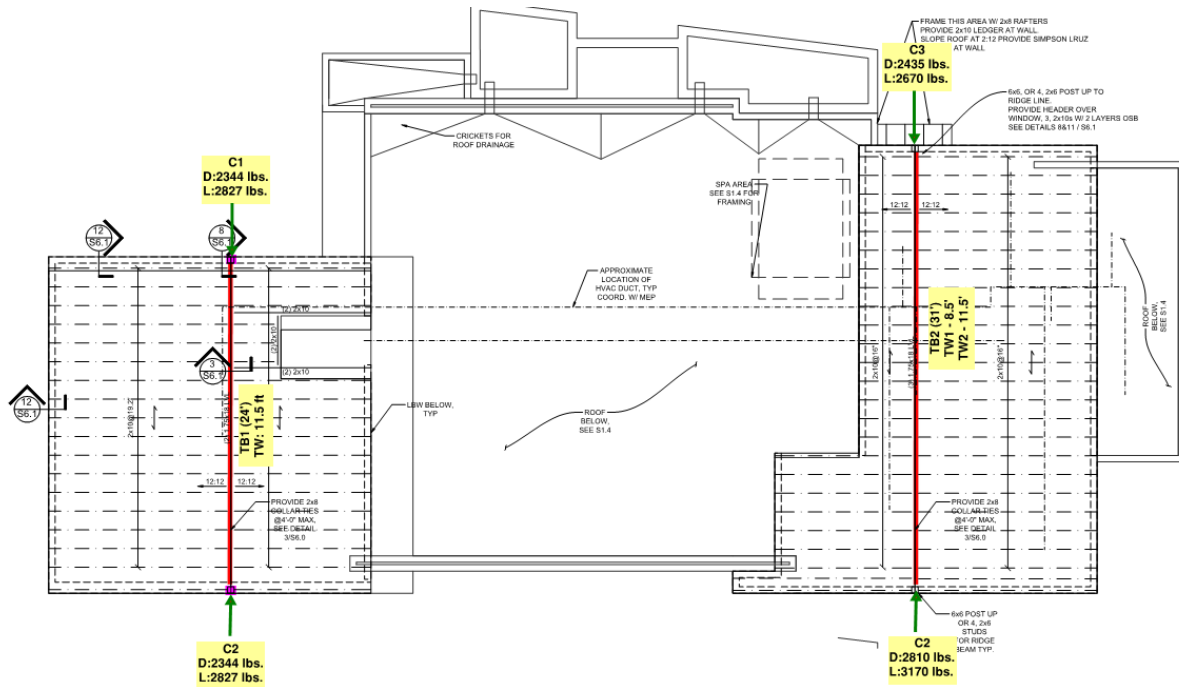


Figure 04: Finite Element Model

DESIGN SUMMARY OF BEAMS & COLUMNS – TOP ROOF LEVEL



Beam TB1 (2) 1 3/4" x 18" 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)	5129 @ 2"	5906 (2.25")	Passed (87%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4419 @ 1' 9 1/2"	11970	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	30938 @ 12' 3 1/2"	38753	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.557 @ 12' 3 1/2"	0.808	Passed (L/522)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	1.019 @ 12' 3 1/2"	1.212	Passed (L/286)	--	1.0 D + 1.0 L (All Spans)

• Deflection criteria: LL (L/360) and TL (L/240).
 • Allowed moment does not reflect the adjustment for the beam stability factor.

Recommended Size in the drawings is adequate

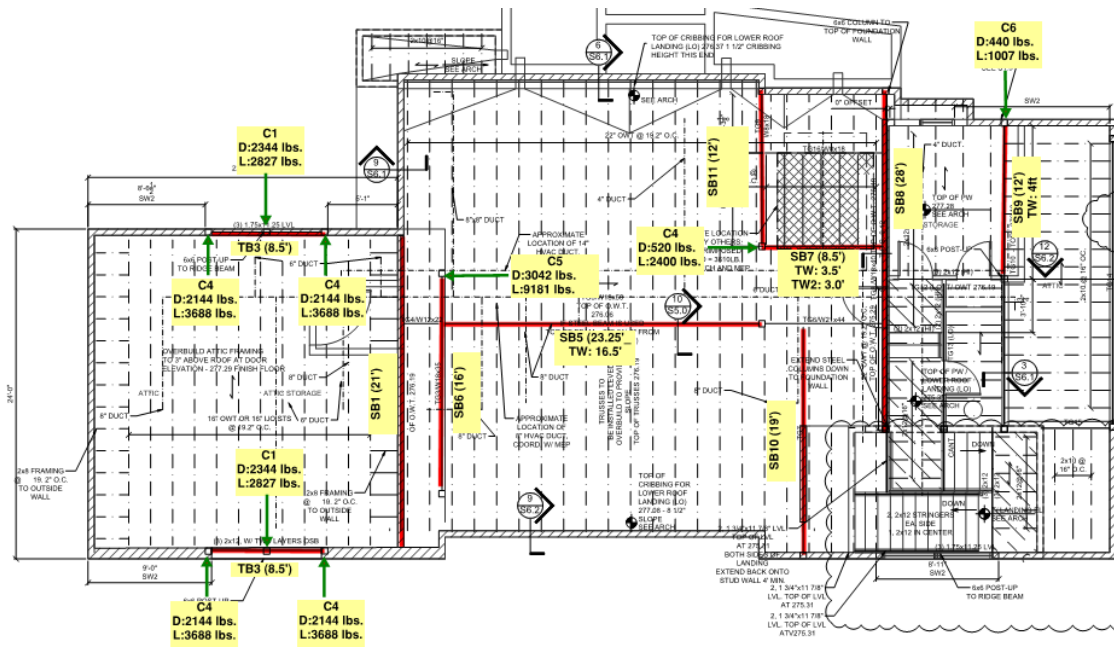
Beam TB2 (3) 1 3/4" x 18" LVL

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)	5939 @ 2"	8859 (2.25")	Passed (67%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5213 @ 1' 9 1/2"	17955	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	41988 @ 15' 4 1/16"	58130	Passed (72%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.792 @ 15' 8"	1.042	Passed (L/473)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	1.506 @ 15' 8 1/8"	1.563	Passed (L/249)	--	1.0 D + 1.0 L (All Spans)

• Deflection criteria: LL (L/360) and TL (L/240).
 • Allowed moment does not reflect the adjustment for the beam stability factor.

Recommended Size in the drawings is adequate

DESIGN SUMMARY OF BEAMS & COLUMNS – BOTTOM ROOF LEVEL



Beam TB3 (3) 1 3/4" x 11 1/4" LVL

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5763 @ 2"	8564 (2.25")	Passed (67%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5001 @ 1' 2 3/4"	11222	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	17714 @ 4' 3"	24206	Passed (73%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.126 @ 4' 3"	0.292	Passed (L/835)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.205 @ 4' 3"	0.438	Passed (L/512)	--	1.0 D + 1.0 L (All Spans)

Recommended Size in the drawings is adequate

Beam SB1 (W12x30)

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)	4525 @ 2"	26458 (2.25")	Passed (17%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4400 @ 3 1/2"	63960	Passed (7%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	22553 @ 10' 3 1/2"	45901	Passed (49%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.121 @ 10' 3 1/2"	0.405	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.241 @ 10' 3 1/2"	1.013	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Proposed Beam (W12x22) is not adequate and recommended to use W12x30

Beam SB5 (W18x50)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	15016 @ 2"	45547 (2.25")	Passed (33%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	14645 @ 3 1/2"	127800	Passed (11%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	85136 @ 11' 8"	97251	Passed (88%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.269 @ 11' 8"	0.460	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.349 @ 11' 8"	1.150	Passed (L/790)	--	1.0 D + 1.0 L (All Spans)

Proposed Beam (W18x50) can't be reduce further

Beam SB6 (W14x38)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	12247 @ 2"	36500 (2.25")	Passed (34%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	12240 @ 3' 1/2"	87420	Passed (14%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	40604 @ 3' 6"	95158	Passed (43%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.095 @ 7' 2 7/8"	0.325	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.128 @ 7' 3 7/16"	0.813	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240)

Proposed Beam (W18x35) is over designed and recommended to use W14x38

Beam SB7 (W8x18)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2930 @ 2"	23302 (2.25")	Passed (13%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2743 @ 3' 1/2"	37444	Passed (7%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6178 @ 4' 6 1/2"	34767	Passed (18%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.039 @ 4' 6 1/2"	0.175	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.047 @ 4' 6 1/2"	0.438	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Recommended Size in the drawings is adequate

Beam SB8 (W14x38)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6515 @ 2"	36500 (2.25")	Passed (18%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2027 @ 3' 1/2"	87420	Passed (2%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	24473 @ 14'	44435	Passed (55%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.175 @ 14' 2 1/2"	0.565	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.262 @ 14' 2 5/8"	1.413	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Proposed Beam (W14x38) is adequate

Beam SB9 (W8x10)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1446 @ 2"	13072 (2.25")	Passed (11%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1380 @ 3' 1/2"	26826	Passed (5%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4314 @ 6' 3 1/2"	7760	Passed (56%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.091 @ 6' 3 1/2"	0.245	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.130 @ 6' 3 1/2"	0.613	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

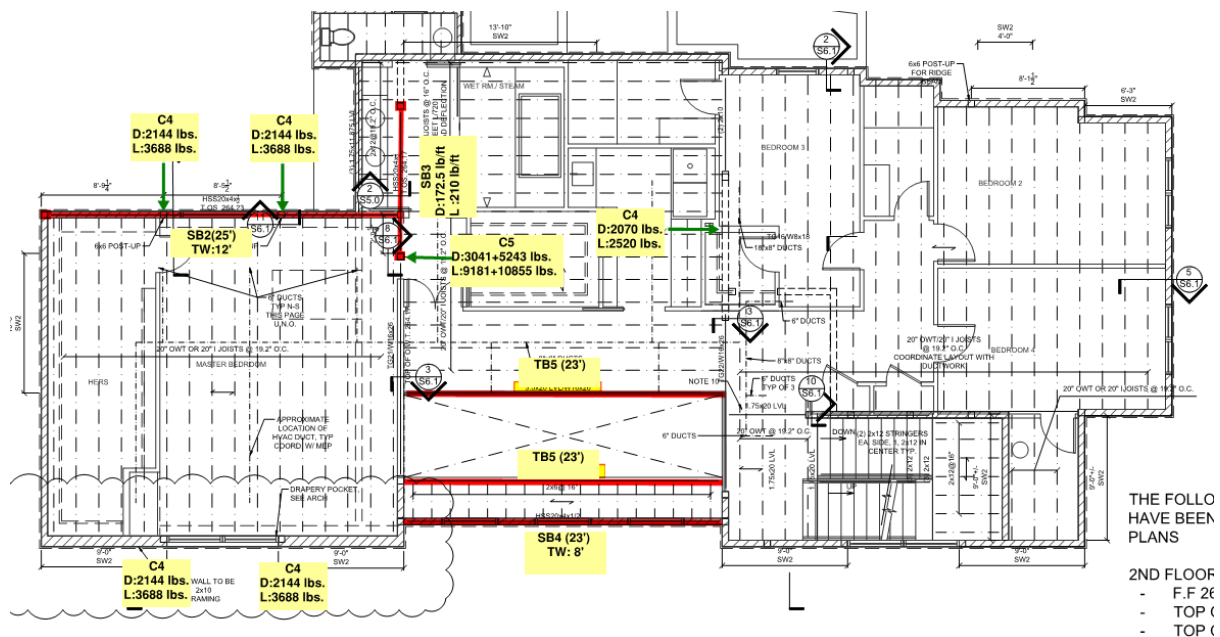
Proposed Beam (W8x10) is adequate

Beam SB10 (W8x18)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4480 @ 2"	23302 (2.25")	Passed (19%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4309 @ 3 1/2"	37444	Passed (12%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	16200 @ 7' 6 11/16"	16532	Passed (98%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.269 @ 9' 13/16"	0.385	Passed (L/858)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.547 @ 9' 1 5/16"	0.962	Passed (L/423)	--	1.0 D + 1.0 L (All Spans)

Proposed Beam (W8x18) is adequate

DESIGN SUMMARY OF BEAMS & COLUMNS – SECOND LEVEL



Beam SB2 (W14x61)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	14691 @ 25' 5"	60310 (3.50")	Passed (24%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	14491 @ 25' 3 1/2"	104250	Passed (14%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	103441 @ 12' 7 13/16"	172051	Passed (60%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.432 @ 12' 9 5/8"	0.842	Passed (L/701)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.647 @ 12' 9 5/8"	1.263	Passed (L/469)	--	1.0 D + 1.0 L (All Spans)

Its recommended to use W14x61 instead of HSS 20x4x1/2

Beam SB3 (W14x34)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	16098 @ 2"	34519 (3.50")	Passed (47%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1514 @ 3 1/2"	79800	Passed (2%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4090 @ 5' 5 5/16"	110215	Passed (4%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.006 @ 5' 5 5/16"	0.352	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.008 @ 5' 5 5/16"	0.528	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Its recommended to use W14x34 instead of HSS 20x4x1/2

Beam SB4 (W14x43)

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	12294 @ 2"	35885 (2.25")	Passed (34%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	11995 @ 3 1/2"	83570	Passed (14%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	70476 @ 11' 9 1/2"	88412	Passed (80%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.360 @ 11' 9 1/2"	0.465	Passed (L/775)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.552 @ 11' 9 1/2"	1.163	Passed (L/505)	--	1.0 D + 1.0 L (All Spans)

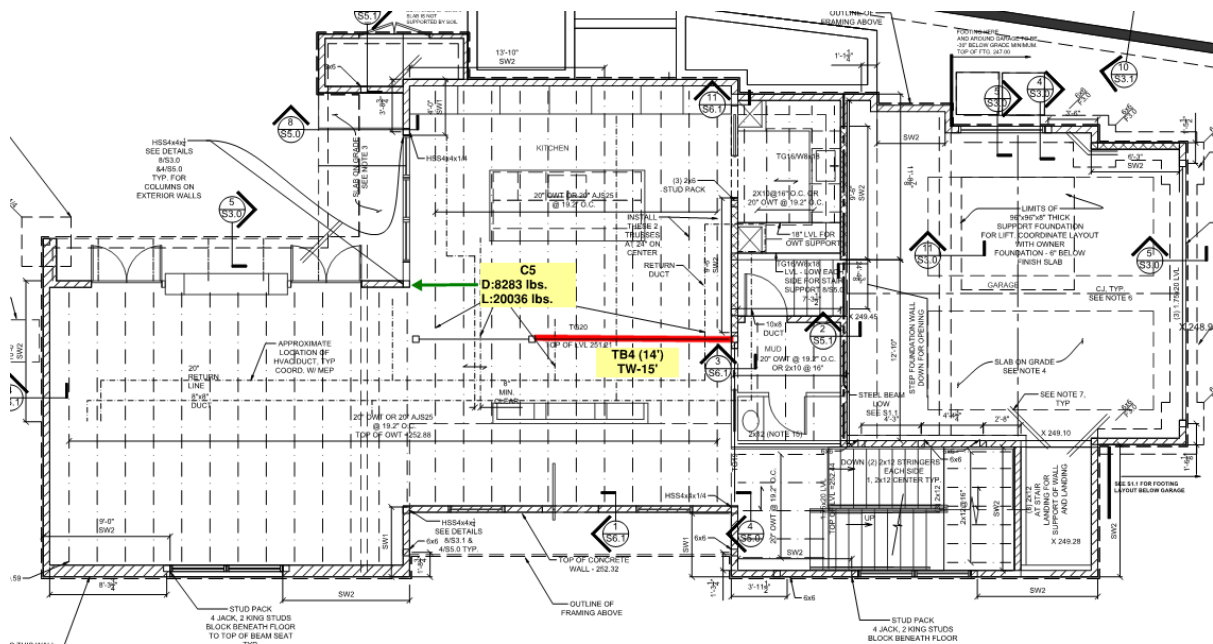
Its recommended to use W14x43 instead of HSS 20x4x1/2

Beam TB5 (2) 1 3/4" x 14 " LVL

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6060 @ 2"	8564 (2.25")	Passed (71%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5068 @ 1' 3 3/8"	11845	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	21402 @ 7' 3 1/2"	26772	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.408 @ 7' 3 1/2"	0.475	Passed (L/419)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.573 @ 7' 3 1/2"	0.712	Passed (L/298)	--	1.0 D + 1.0 L (All Spans)

Its recommended to use LVL (2) 1 3/4" x 14 instead of LVL 3.5x20

DESIGN SUMMARY OF BEAMS & COLUMNS – FIRST LEVEL



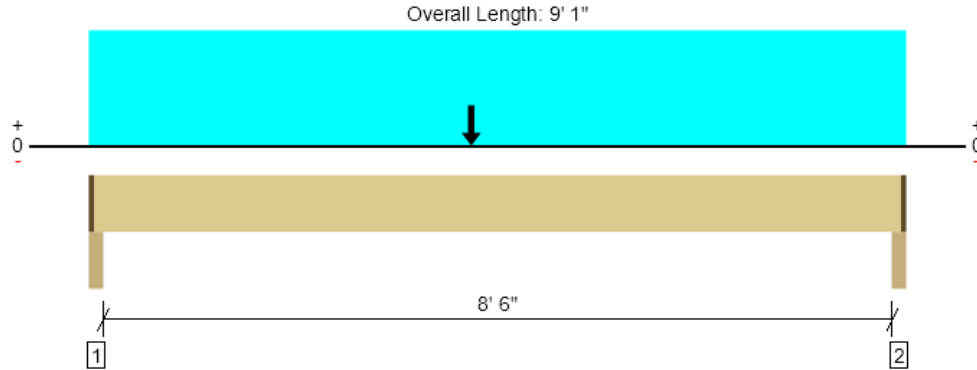
Beam TB4 (3) 1 3/4" x 11 7/8" LVL

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6060 @ 2"	8564 (2.25")	Passed (71%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5068 @ 1' 3 3/8"	11845	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	21402 @ 7' 3 1/2"	26772	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.408 @ 7' 3 1/2"	0.475	Passed (L/419)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.573 @ 7' 3 1/2"	0.712	Passed (L/298)	--	1.0 D + 1.0 L (All Spans)

Proposed beam LVL (3) 1 3/4" x 11 7/8" is adequate

ANNEX A: CALCULATIONS

Level, TB3
3 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)	5763 @ 2"	8564 (2.25")	Passed (67%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5001 @ 1' 2 3/4"	11222	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	17714 @ 4' 3"	24206	Passed (73%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.126 @ 4' 3"	0.292	Passed (L/835)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.205 @ 4' 3"	0.438	Passed (L/512)	--	1.0 D + 1.0 L (All Spans)

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

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - SPF	3.50"	2.25"	1.51"	2144	3688	5832	1 1/4" Rim Board
2 - Column - SPF	3.50"	2.25"	1.50"	1988	3499	5487	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	8' 11" o/c	
Bottom Edge (Lu)	8' 11" 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)	1 1/4" to 8' 11 3/4"	N/A	17.2	--	
1 - Uniform (PSF)	0 to 9' 1" (Front)	12'	15.0	40.0	Default Load
2 - Point (lb)	4' 3" (Front)	N/A	2344	2827	

Weyerhaeuser Notes

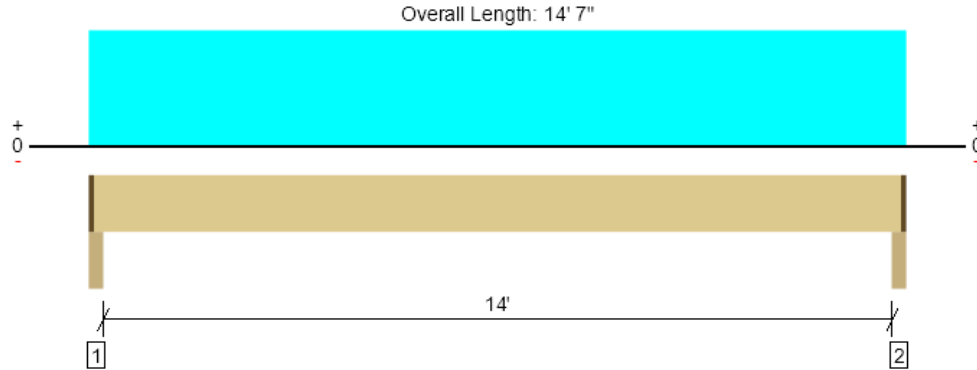
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, TB4
3 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)	6060 @ 2"	8564 (2.25")	Passed (71%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5068 @ 1' 3 3/8"	11845	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	21402 @ 7' 3 1/2"	26772	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.408 @ 7' 3 1/2"	0.475	Passed (L/419)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.573 @ 7' 3 1/2"	0.712	Passed (L/298)	--	1.0 D + 1.0 L (All Spans)

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

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - SPF	3.50"	2.25"	1.59"	1771	4375	6146	1 1/4" Rim Board
2 - Column - SPF	3.50"	2.25"	1.59"	1771	4375	6146	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	11' 7" o/c	
Bottom Edge (Lu)	14' 5" 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)	1 1/4" to 14' 5 3/4"	N/A	18.2	--	
1 - Uniform (PSF)	0 to 14' 7" (Front)	15'	15.0	40.0	Default Load

Weyerhaeuser Notes

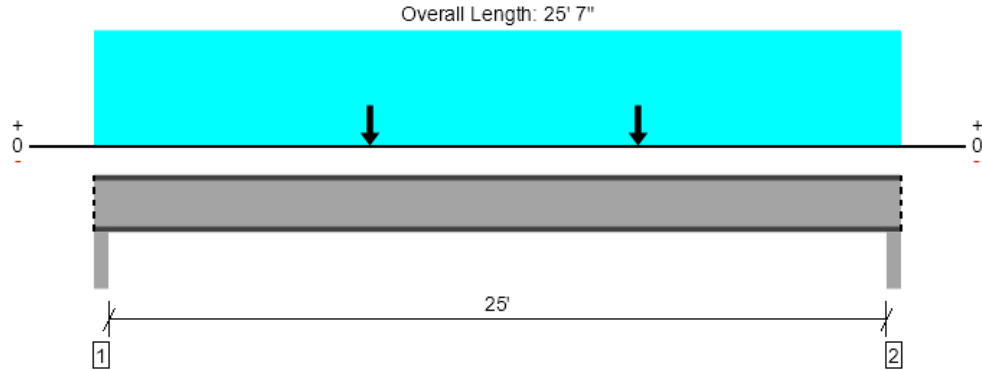
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, SB2-type changed
1 piece(s) W14X61 (A992) ASTM Steel



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)	14691 @ 25' 5"	60310 (3.50")	Passed (24%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	14491 @ 25' 3 1/2"	104250	Passed (14%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	103441 @ 12' 7 13/16"	172051	Passed (60%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.432 @ 12' 9 5/8"	0.842	Passed (L/701)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.647 @ 12' 9 5/8"	1.263	Passed (L/469)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/360) and TL (L/240).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	3.50"	3.50"	4731	9767	14498	Blocking
2 - Column - steel	3.50"	3.50"	3.50"	4802	9889	14691	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)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 25' 7"	N/A	61.0	--	
1 - Uniform (PSF)	0 to 25' 7"	12'	12.0	40.0	Default Load
2 - Point (lb)	8' 9"	N/A	2144	3688	
3 - Point (lb)	17' 3"	N/A	2144	3688	

Member Notes

(converted from: Floor Drop Beam)

Weyerhaeuser Notes

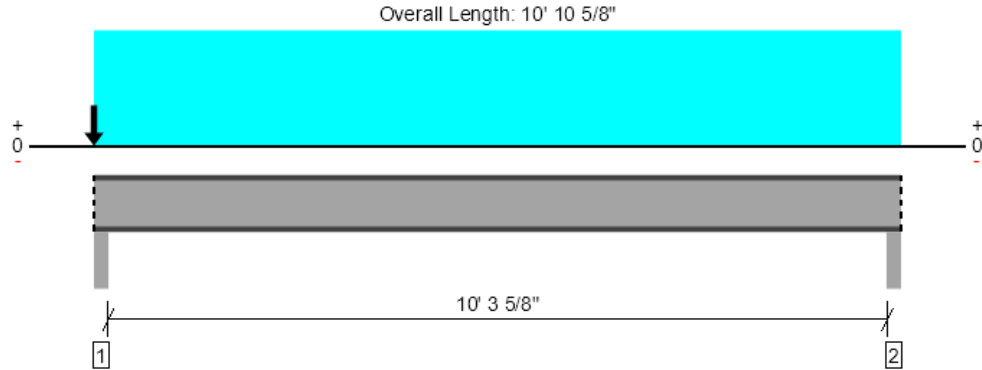
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, SB3-type changed
1 piece(s) W14X34 (A992) ASTM Steel



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)	16098 @ 2"	34519 (3.50")	Passed (47%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1514 @ 3 1/2"	79800	Passed (2%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4090 @ 5' 5 5/16"	110215	Passed (4%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.006 @ 5' 5 5/16"	0.352	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.008 @ 5' 5 5/16"	0.528	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Bearing reinforcement may be required for support located at 2".
- Bearing reinforcement may be required for point load located at 0".
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	3.50"	3.50"	5243	10855	16098	Blocking
2 - Column - steel	3.50"	3.50"	3.50"	512	1088	1600	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)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 10' 10 5/8"	N/A	34.0	--	
1 - Uniform (PSF)	0 to 10' 10 5/8"	5'	12.0	40.0	Default Load
2 - Point (lb)	0	N/A	4731	9767	Linked from: SB2-type changed, Support 1

Member Notes

(converted from: Floor Drop Beam)

Weyerhaeuser Notes

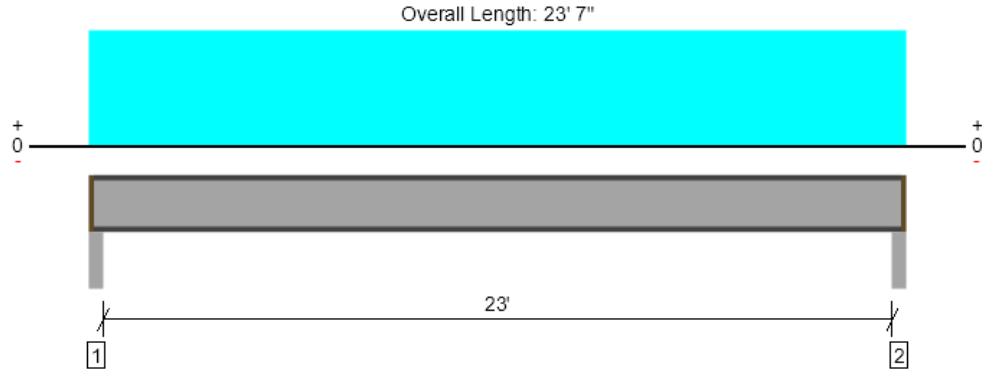
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ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, SB4
1 piece(s) W14X43 (A992) ASTM Steel



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)	12294 @ 2"	35885 (2.25")	Passed (34%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	11995 @ 3 1/2"	83570	Passed (14%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	70476 @ 11' 9 1/2"	88412	Passed (80%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.360 @ 11' 9 1/2"	0.465	Passed (L/775)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.552 @ 11' 9 1/2"	1.163	Passed (L/505)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240).
- Bearing reinforcement may be required for support located at 3/4".
- Bearing reinforcement may be required for support located at 23' 3 3/4".
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	2.25"	2.25"	4276	8018	12294	1 1/4" Rim Board
2 - Column - steel	3.50"	2.25"	2.25"	4276	8018	12294	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 23' 5 3/4"	N/A	43.0	--	
1 - Uniform (PSF)	0 to 23' 7"	8'	15.0	60.0	Default Load
2 - Uniform (PLF)	0 to 23' 7"	N/A	200.0	200.0	

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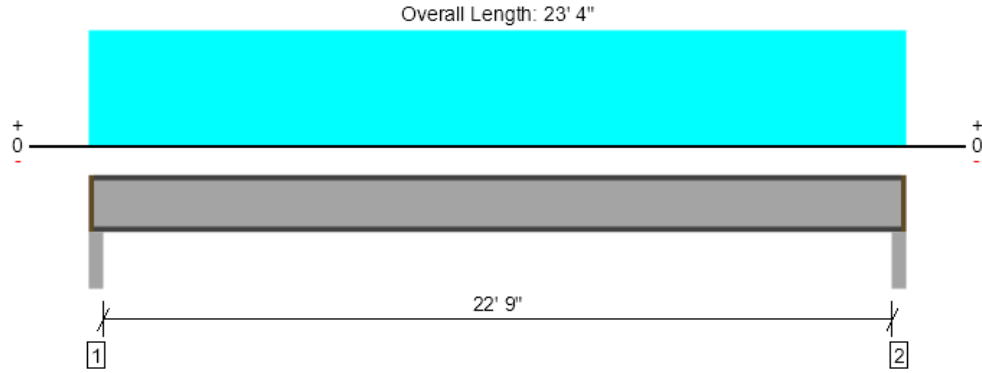
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ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, SB5
1 piece(s) W18X50 (A992) ASTM Steel



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)	15016 @ 2"	45547 (2.25")	Passed (33%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	14645 @ 3 1/2"	127800	Passed (11%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	85136 @ 11' 8"	97251	Passed (88%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.269 @ 11' 8"	0.460	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.349 @ 11' 8"	1.150	Passed (L/790)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240).
- Bearing reinforcement may be required for support located at 3/4".
- Bearing reinforcement may be required for support located at 23' 3/4".
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	2.25"	2.25"	3466	11550	15016	1 1/4" Rim Board
2 - Column - steel	3.50"	2.25"	2.25"	3466	11550	15016	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 23' 2 3/4"	N/A	50.0	--	
1 - Uniform (PSF)	0 to 23' 4"	16' 6"	15.0	60.0	Default Load

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

ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, SB6
1 piece(s) W14X38 (A992) ASTM Steel

Overall Length: 16' 7"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	12247 @ 2"	36500 (2.25")	Passed (34%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	12240 @ 3' 1/2"	87420	Passed (14%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	40604 @ 3' 6"	95158	Passed (43%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.095 @ 7' 2 7/8"	0.325	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.128 @ 7' 3 7/16"	0.813	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240).
- Bearing reinforcement may be required for support located at 3/4".
- Bearing reinforcement may be required for point load located at 3' 4 3/4".
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	2.25"	2.25"	3066	9181	12247	1 1/4" Rim Board
2 - Column - steel	3.50"	2.25"	2.25"	1022	2369	3391	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 16' 5 3/4"	N/A	38.0	--	
1 - Point (lb)	3' 6"	N/A	3466	11550	Linked from: SB5, Support 1

Weyerhaeuser Notes

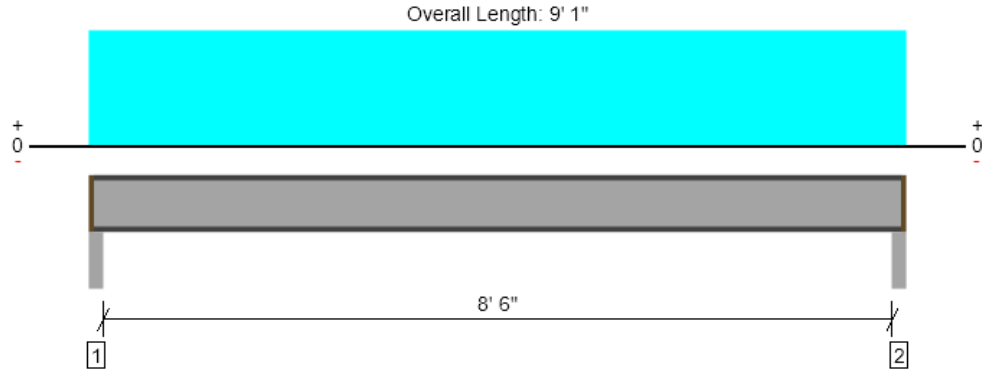
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ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, SB7
1 piece(s) W8X18 (A992) ASTM Steel



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)	2930 @ 2"	23302 (2.25")	Passed (13%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2743 @ 3 1/2"	37444	Passed (7%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6178 @ 4' 6 1/2"	34767	Passed (18%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.039 @ 4' 6 1/2"	0.175	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.047 @ 4' 6 1/2"	0.438	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	2.25"	2.25"	523	2407	2930	1 1/4" Rim Board
2 - Column - steel	3.50"	2.25"	2.25"	523	2407	2930	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 8' 11 3/4"	N/A	18.0	--	
1 - Uniform (PSF)	0 to 9' 1"	3' 6"	15.0	100.0	
2 - Uniform (PSF)	0 to 9' 1"	3'	15.0	60.0	

Weyerhaeuser Notes

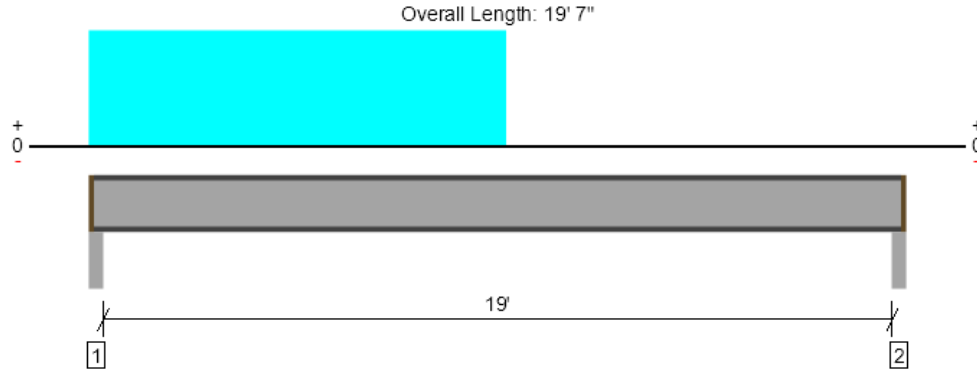
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ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, SB10
1 piece(s) W8X18 (A992) ASTM Steel



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)	4480 @ 2"	23302 (2.25")	Passed (19%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4309 @ 3 1/2"	37444	Passed (12%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	16200 @ 7' 6 11/16"	16532	Passed (98%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.269 @ 9' 13/16"	0.385	Passed (L/858)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.547 @ 9' 1 5/16"	0.962	Passed (L/423)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	2.25"	2.25"	2234	2247	4480	1 1/4" Rim Board
2 - Column - steel	3.50"	2.25"	2.25"	865	753	1619	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 19' 5 3/4"	N/A	18.0	--	
1 - Tapered (PSF)	0 to 10'	5'	15.0	20.0	
2 - Uniform (PLF)	0 to 10'	N/A	200.0	200.0	

Weyerhaeuser Notes

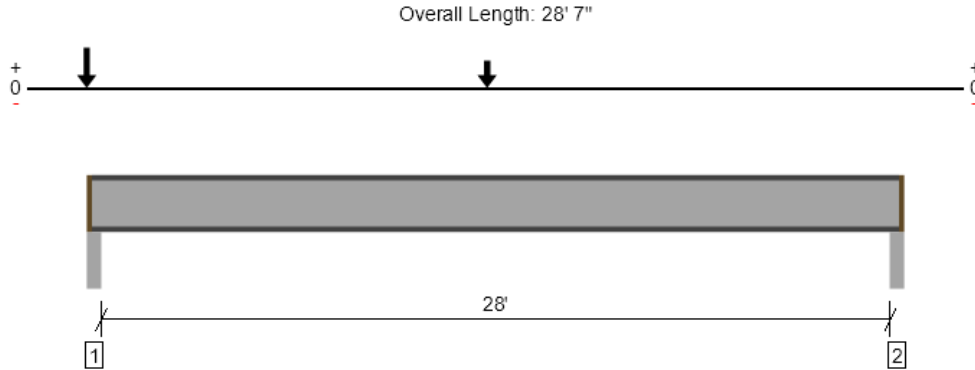
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ForteWEB Software Operator	Job Notes
Srithas Thanusan sedc (409) 332-2116 thanu17san@gmail.com	



Level, SB8
1 piece(s) W14X38 (A992) ASTM Steel



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)	6515 @ 2"	36500 (2.25")	Passed (18%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2027 @ 3 1/2"	87420	Passed (2%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	24473 @ 14'	44435	Passed (55%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.175 @ 14' 2 1/2"	0.565	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.262 @ 14' 2 5/8"	1.413	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	2.25"	2.25"	3040	3475	6515	1 1/4" Rim Board
2 - Column - steel	3.50"	2.25"	2.25"	795	1179	1974	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 28' 5 3/4"	N/A	38.0	--	
1 - Point (lb)	14'	N/A	523	2407	Linked from: SB7, Support 1
2 - Point (lb)	0	N/A	2234	2247	Linked from: SB10, Support 1

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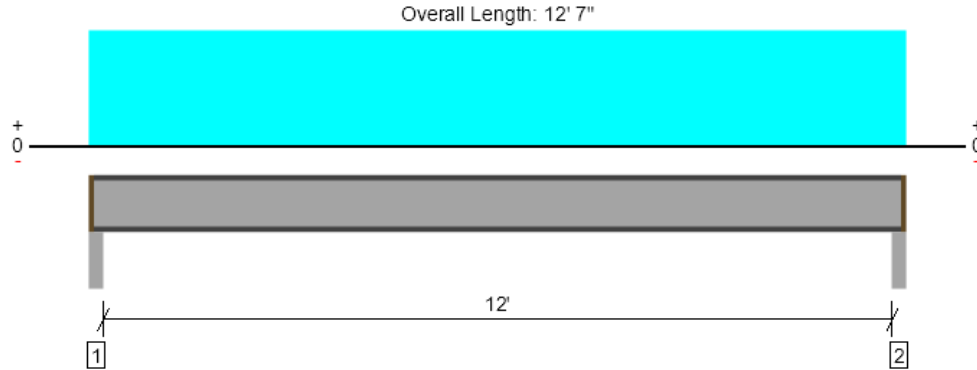
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ForteWEB Software Operator	Job Notes
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Level, SB9
1 piece(s) W8X10 (A992) ASTM Steel



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)	1446 @ 2"	13072 (2.25")	Passed (11%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1380 @ 3 1/2"	26826	Passed (5%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4314 @ 6' 3 1/2"	7760	Passed (56%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.091 @ 6' 3 1/2"	0.245	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.130 @ 6' 3 1/2"	0.613	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	2.25"	2.25"	439	1007	1446	1 1/4" Rim Board
2 - Column - steel	3.50"	2.25"	2.25"	439	1007	1446	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 12' 5 3/4"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 12' 7"	4'	15.0	40.0	

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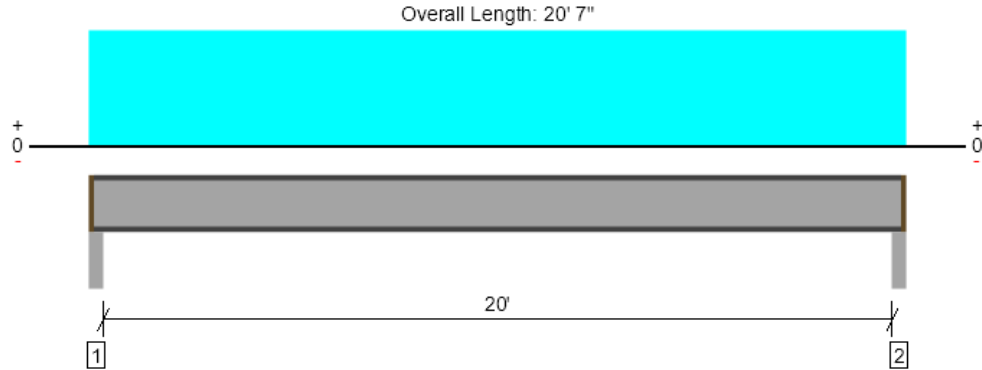
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Level, SB1
1 piece(s) W12X30 (A992) ASTM Steel



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)	4525 @ 2"	26458 (2.25")	Passed (17%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4400 @ 3 1/2"	63960	Passed (7%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	22553 @ 10' 3 1/2"	45901	Passed (49%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.121 @ 10' 3 1/2"	0.405	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.241 @ 10' 3 1/2"	1.013	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

- Deflection criteria: LL (L/600) and TL (L/240).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - steel	3.50"	2.25"	2.25"	2261	2264	4525	1 1/4" Rim Board
2 - Column - steel	3.50"	2.25"	2.25"	2261	2264	4525	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	1 1/4" to 20' 5 3/4"	N/A	30.0	--	
1 - Uniform (PSF)	0 to 20' 7"	6'	15.0	20.0	
2 - Uniform (PLF)	0 to 20' 7"	N/A	100.0	100.0	

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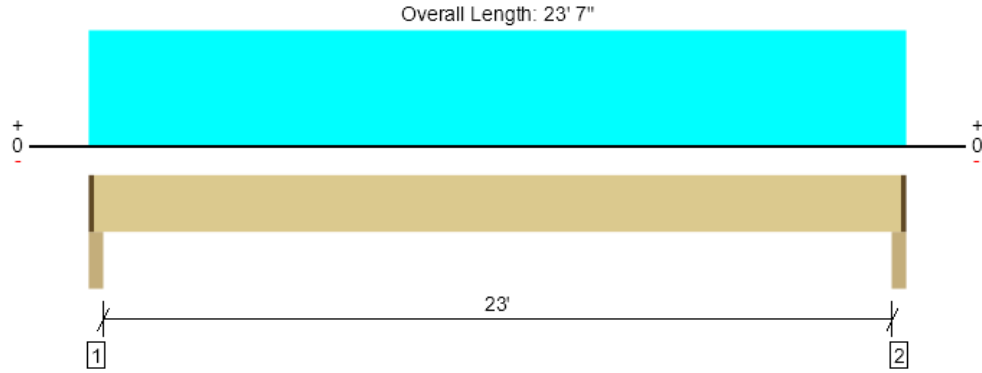
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Level, TB5
2 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL



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)	2505 @ 2"	5709 (2.25")	Passed (44%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2214 @ 1' 5 1/2"	9310	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	14480 @ 11' 9 1/2"	24258	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.427 @ 11' 9 1/2"	0.775	Passed (L/654)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.914 @ 11' 9 1/2"	1.163	Passed (L/305)	--	1.0 D + 1.0 L (All Spans)

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

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - SPF	3.50"	2.25"	1.50"	1346	1179	2525	1 1/4" Rim Board
2 - Column - SPF	3.50"	2.25"	1.50"	1346	1179	2525	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' 10" o/c	
Bottom Edge (Lu)	23' 5" 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)	1 1/4" to 23' 5 3/4"	N/A	14.3	--	
1 - Uniform (PLF)	0 to 23' 7" (Front)	N/A	100.0	100.0	Default Load

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