

**STRUCTURAL
CALCULATIONS**

Christofferson Residence
4340 90th Ave SE
Mercer Island, WA 98040

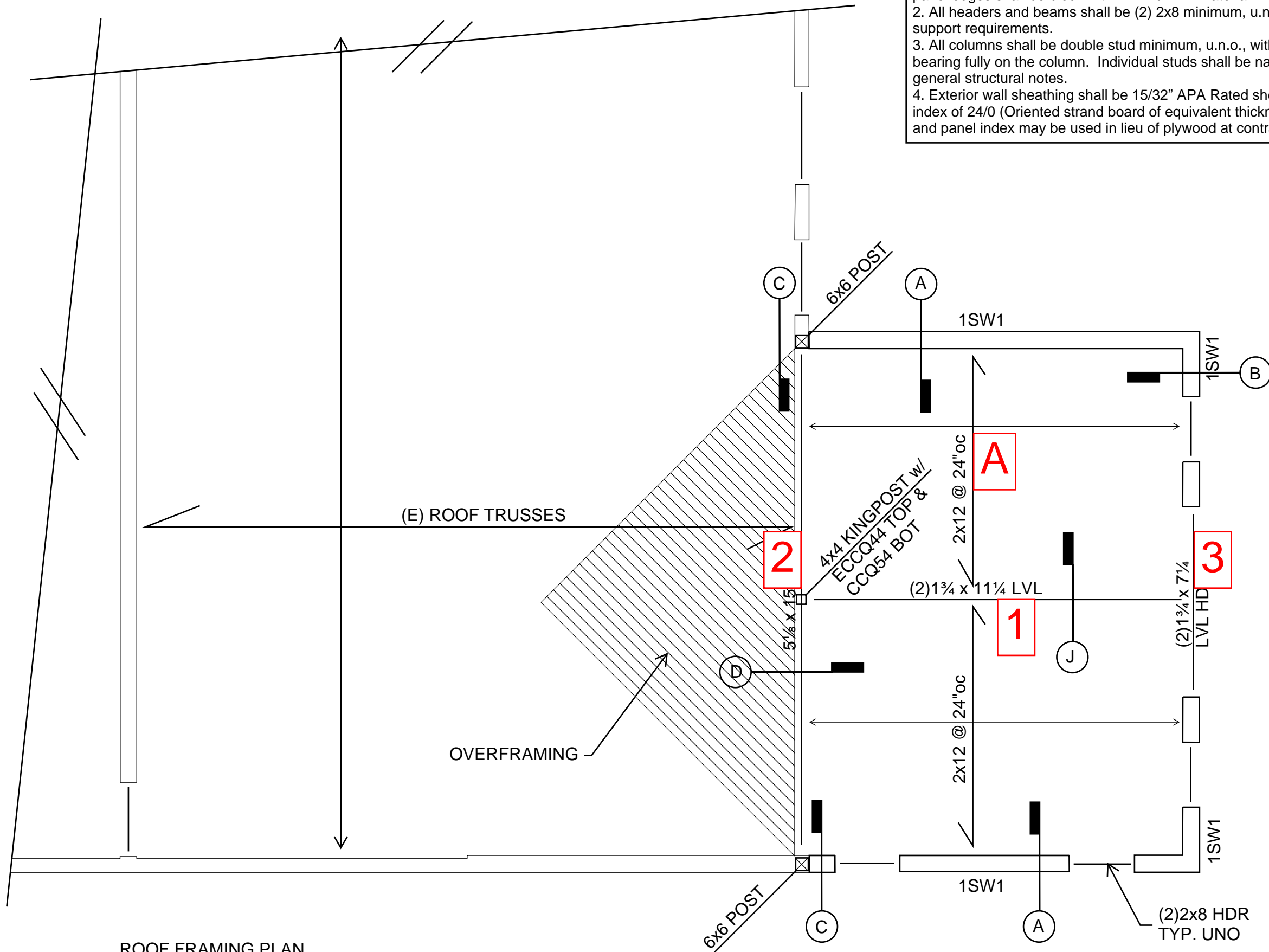
Beth Christofferson
4340 90th Ave SE
Mercer Island, WA 98040

March 19, 2024



Roof Framing Plan Notes

1. Roof sheathing shall be 15/32" APA Rated sheathing with a panel index of 24/0. Nail to framing with 8d common nails at 6" oc at panel edges and 12" oc in field unless noted otherwise on plans. Where noted on the plans all panel edges shall be block with minimum 2x material.
2. All headers and beams shall be (2) 2x8 minimum, u.n.o. Refer to note 3 for support requirements.
3. All columns shall be double stud minimum, u.n.o., with the beam or header bearing fully on the column. Individual studs shall be nailed together per the general structural notes.
4. Exterior wall sheathing shall be 15/32" APA Rated sheathing with a panel index of 24/0 (Oriented strand board of equivalent thickness, exposure rating, and panel index may be used in lieu of plywood at contractors option).



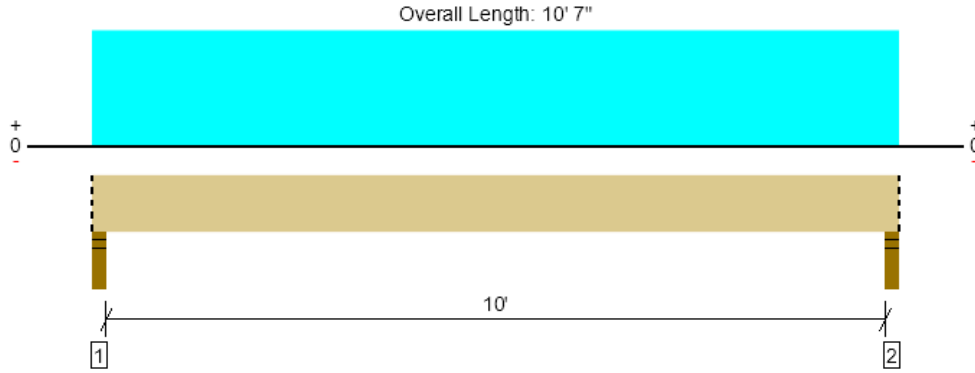
ROOF FRAMING PLAN

1/4" = 1'-0"

CHRISTOFFERSON RESIDENCE

4340 90th AVE SE
MERCER ISLAND, WA 98040

Roof Framing, Joist A
1 piece(s) 2 x 12 HF No.2 @ 24" OC



Drawing is Conceptual. 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)	476 @ 2 1/2"	2126 (3.50")	Passed (22%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	366 @ 1' 2 3/4"	1941	Passed (19%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1163 @ 5' 3 1/2"	2964	Passed (39%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.052 @ 5' 3 1/2"	0.339	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.094 @ 5' 3 1/2"	0.508	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

Member Length : 10' 7"
System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.50"	212	265	476	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	212	265	476	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)	10' 7" o/c	
Bottom Edge (Lu)	10' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 10' 7"	24"	20.0	25.0	Default Load

Weyerhaeuser Notes

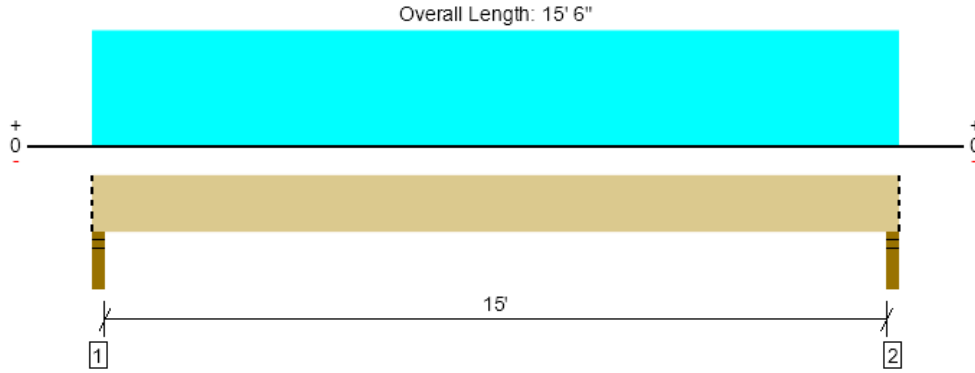
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Steven Nickolas Carter Quinn Norlin (206) 264-7784 ssn@cqn-se.com	



Roof Framing, Beam 1
2 piece(s) 1 3/4" x 11 1/4" 2.0E Microllam® LVL



Drawing is Conceptual. 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)	3112 @ 1 1/2"	4253 (3.00")	Passed (73%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2635 @ 1' 2 1/4"	8603	Passed (31%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	11671 @ 7' 9"	18558	Passed (63%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.378 @ 7' 9"	0.508	Passed (L/484)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.622 @ 7' 9"	0.762	Passed (L/294)	--	1.0 D + 1.0 S (All Spans)

Member Length : 15' 6"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) 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	Snow	Factored	
1 - Stud wall - HF	3.00"	3.00"	2.20"	1222	1889	3112	Blocking
2 - Stud wall - HF	3.00"	3.00"	2.20"	1222	1889	3112	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)	15' 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 15' 6"	N/A	11.5	--	
1 - Uniform (PSF)	0 to 15' 6" (Front)	9' 9"	15.0	25.0	Default Load

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NOTCH AT EACH END:

$$F_v' = 265 \text{ psi} \times 0.72 = 190 \text{ psi}$$

PER NDS 3.4.3.2,

$$V_r' = \frac{2}{3} F_v' b \left[d - \left(\frac{d-d_n}{d_n} \right) e \right]$$

$$d = 15"$$

$$d_n = 11.25"$$

$$e = 8"$$

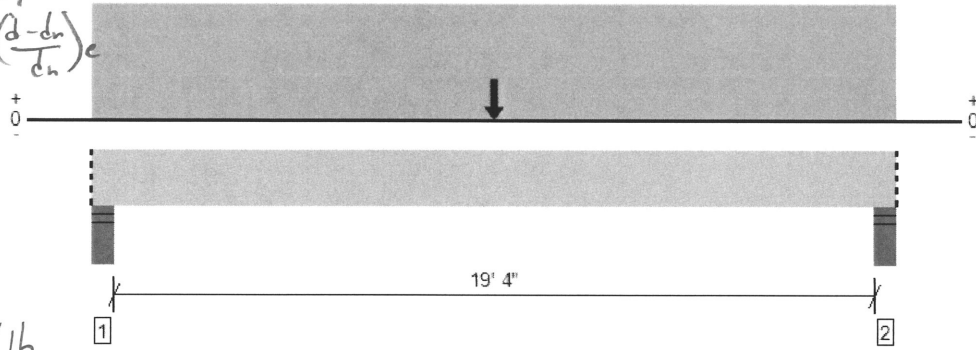
$$b = 5.125"$$

$$V_r' = 8,006.41 \text{ lbs}$$

∴ OK

Roof Framing, Beam 2
1 piece(s) 5 1/8" x 15" 24F-V4 DF Glulam

Overall Length: 20' 3"



Drawing is Conceptual. 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)	6503 @ 4"	11416 (5.50")	Passed (57%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	5669 @ 1' 8 1/2"	15618	Passed (36%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	38658 @ 10' 1 1/2"	43531	Passed (89%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.572 @ 10' 1 1/2"	0.653	Passed (L/411)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.947 @ 10' 1 1/2"	0.979	Passed (L/248)	--	1.0 D + 1.0 S (All Spans)

Member Length : 20' 3"
 System : Roof
 Member Type : Flush Beam
 Building Use : Residential
 Building Code : IBC 2018
 Design Methodology : ASD
 Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume/size factor of 0.98 that was calculated using length L = 19' 7".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - HF	5.50"	5.50"	3.13"	2585	3919	6503	Blocking
2 - Stud wall - HF	5.50"	5.50"	3.13"	2585	3919	6503	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)	20' 3" o/c	
Bottom Edge (Lu)	20' 3" o/c	

- Maximum allowable bracing intervals based on applied load.

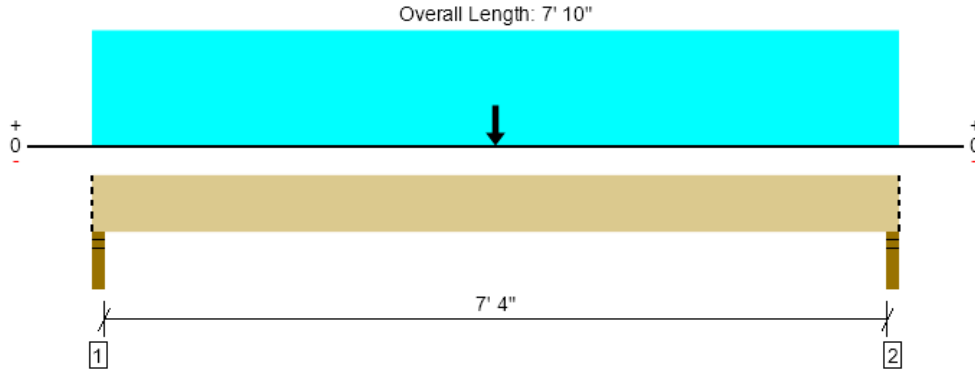
Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20' 3"	N/A	18.7	--	
1 - Uniform (PSF)	0 to 20' 3" (Front)	11' 9"	15.0	25.0	Default Load
2 - Point (lb)	10' 1 1/2" (Front)	N/A	1222	1889	Linked from: Beam 1, Support 1

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Roof Framing, Beam 3
2 piece(s) 1 3/4" x 7 1/4" 2.0E Microllam® LVL



Drawing is Conceptual. 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)	1898 @ 1 1/2"	4253 (3.00")	Passed (45%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1823 @ 10 1/4"	5544	Passed (33%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6526 @ 3' 11"	8182	Passed (80%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.168 @ 3' 11"	0.253	Passed (L/542)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.279 @ 3' 11"	0.379	Passed (L/327)	--	1.0 D + 1.0 S (All Spans)

Member Length : 7' 10"
System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) 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	Snow	Factored	
1 - Stud wall - HF	3.00"	3.00"	1.50"	757	1140	1898	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	757	1140	1898	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)	7' 10" o/c	
Bottom Edge (Lu)	7' 10" 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 7' 10"	N/A	7.4	--	
1 - Uniform (PSF)	0 to 7' 10" (Front)	2'	15.0	25.0	Default Load
2 - Point (lb)	3' 11" (Front)	N/A	1222	1889	Linked from: Beam 1, Support 1

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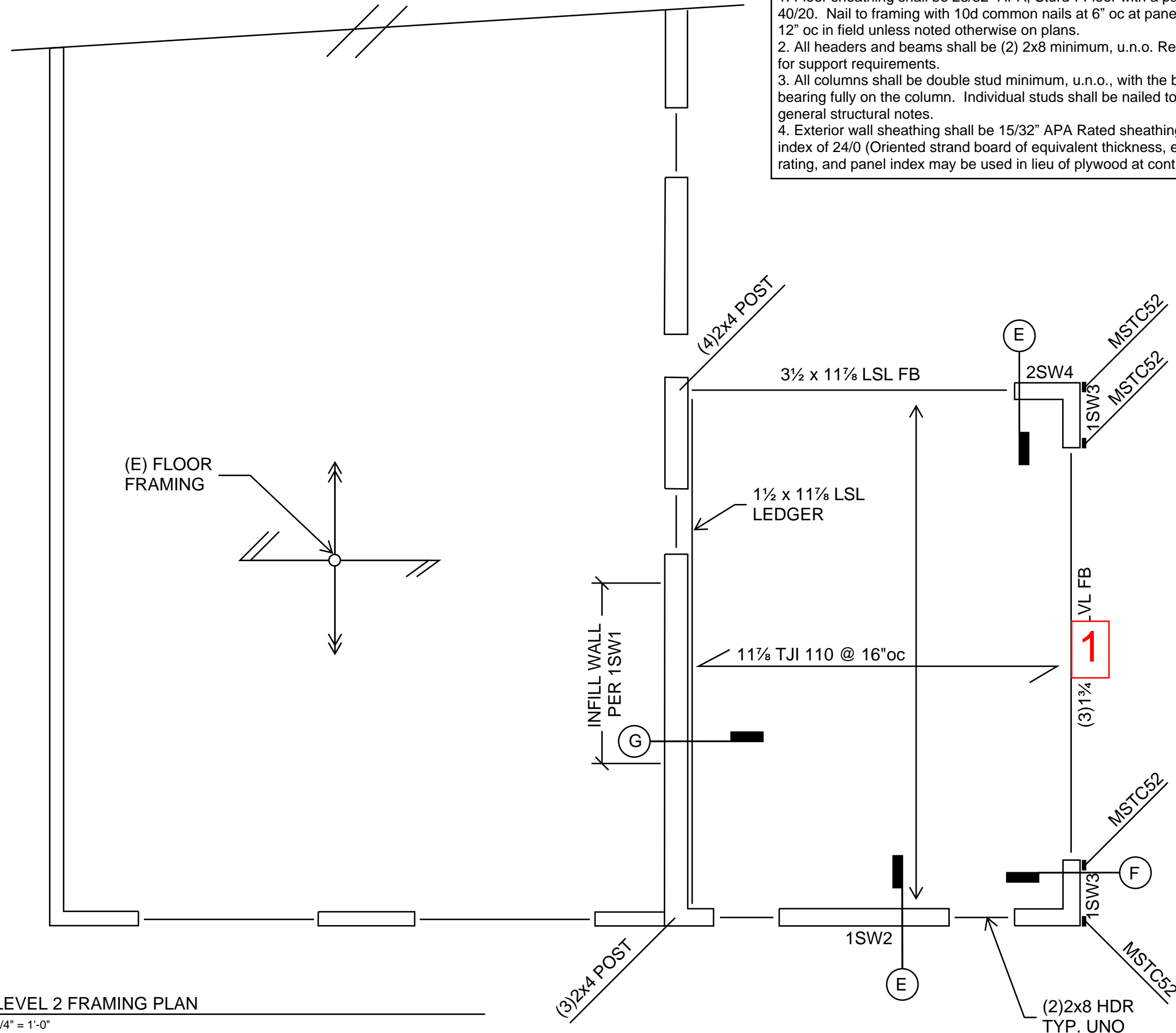
Floor Framing Plan Notes

1. Floor sheathing shall be 23/32" APA, Sturd-I-Floor with a panel index of 40/20. Nail to framing with 10d common nails at 6" oc at panel edges and 12" oc in field unless noted otherwise on plans.
2. All headers and beams shall be (2) 2x8 minimum, u.n.o. Refer to note 3 for support requirements.
3. All columns shall be double stud minimum, u.n.o., with the beam or header bearing fully on the column. Individual studs shall be nailed together per the general structural notes.
4. Exterior wall sheathing shall be 15/32" APA Rated sheathing with a panel index of 24/0 (Oriented strand board of equivalent thickness, exposure rating, and panel index may be used in lieu of plywood at contractors option).

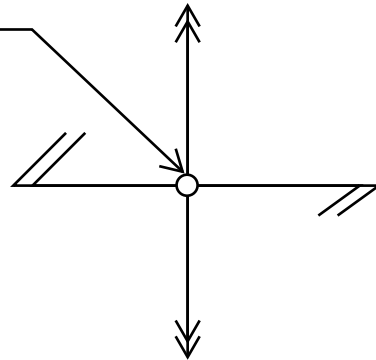
CHRISTOFFERSON RESIDENCE

4340 90th AVE SE
MERCER ISLAND, WA 98040

S2.1



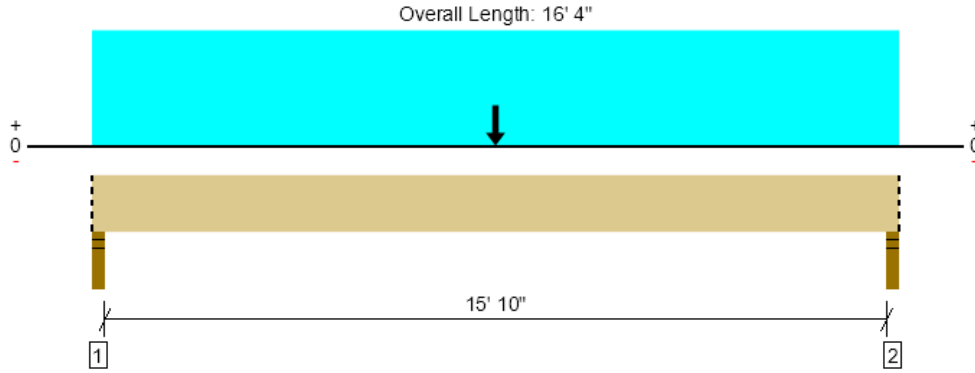
(E) FLOOR
FRAMING



LEVEL 2 FRAMING PLAN

1/4" = 1'-0"

2nd Floor Framing, Beam 1
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



Drawing is Conceptual. 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)	4235 @ 1 1/2"	6379 (3.00")	Passed (66%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	3603 @ 1' 2 7/8"	12053	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	22153 @ 8' 2"	34332	Passed (65%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.400 @ 8' 2"	0.402	Passed (L/483)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.677 @ 8' 2"	0.804	Passed (L/285)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 16' 4"
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).

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Stud wall - HF	3.00"	3.00"	1.99"	1689	2450	945	4235	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.99"	1689	2450	945	4235	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)	Continuous	
Bottom Edge (Lu)	Continuous	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 16' 4"	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 16' 4" (Front)	7' 6"	15.0	40.0	-	Default Load
2 - Point (lb)	8' 2" (Front)	N/A	1222	-	1889	Linked from: Beam 1, Support 1

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