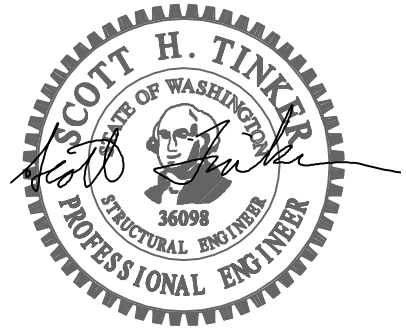




December 18, 2023



**STRUCTURAL CALCULATIONS**  
(Permit Supplement)

**HONG AND KAO RESIDENCE**

5425 W. Mercer Way  
Mercer Island, WA 98040

Quantum Job Number: 23127.01

*Prepared for:*  
CHESMORE BUCK ARCHITECTURE  
27 100th Avenue NE, Suite 100  
Bellevue, WA 98004

*Prepared by:*  
QUANTUM CONSULTING ENGINEERS  
1511 Third Avenue, Suite 323  
Seattle, WA 98101  
TEL 206.957.3900

Upper Floor			
Member Name	Results	Current Solution	Comments
Rev 2 UJ1 - Solarium Floor Joist, 11'-9"	Passed	1 piece(s) 11 7/8" TJI® 110 @ 16" OC	Right cantilever exceeds the maximum braced cantilever length of 4'.
Rev 2 UB1 - Garage Door Header, 9'-6"	Passed	1 piece(s) 5 1/8" x 10 1/2" 24F-V4 DF Glulam	
Rev 2 UB3 - Flush Beam at Shower, 11'-9"	Passed	1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL	
Main Floor			
Member Name	Results	Current Solution	Comments
Rev 2 P1 - Garage Header Post	Passed	1 piece(s) 6 x 6 DF No.1	

ForteWEB Software Operator	Job Notes
Maxwell Skotheim Quantum Consulting Engineers (206) 957-3906 MSkotheim@quantumce.com	

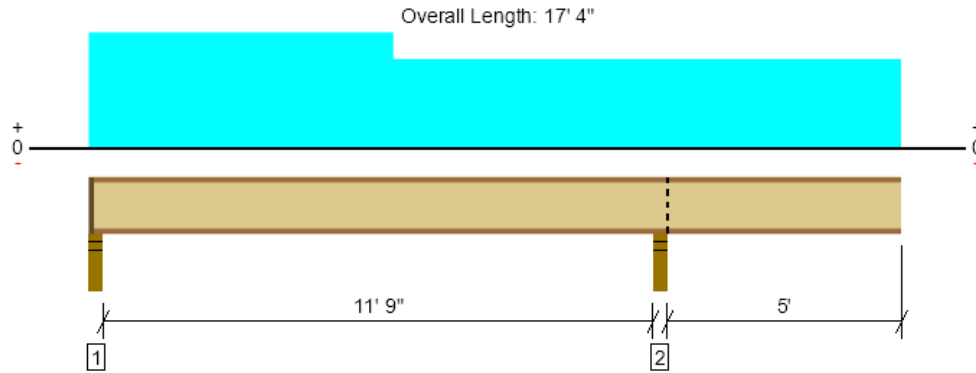


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File Name: 23127 Hong and Kao Residence - Main House

Upper Floor, Rev 2 UJ1 - Solarium Floor Joist, 11'-9"  
 1 piece(s) 11 7/8" TJI @ 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	529 @ 2 1/2"	1041 (2.25")	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	509 @ 3 1/2"	1560	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-1112 @ 12' 2 1/4"	2726	Passed (41%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.075 @ 5' 9 7/16"	0.299	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.110 @ 5' 8 11/16"	0.599	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	56	45	Passed	--	--

System : Floor  
 Member Type : Joist  
 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).
- Moment capacity over cantilever support 2 has been reduced by 25% to lessen the effects of buckling.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Stud wall - HF	3.50"	2.25"	1.75"	153	388	32/-17	541	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	3.50"	3.50"	514	132	424	938	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)	5' 2" o/c	
Bottom Edge (Lu)	5' 5" o/c	

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

Vertical Loads	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 6' 6"	16"	22.0	60.0	-	Roof Deck
2 - Uniform (PSF)	6' 6" to 17' 4"	16"	33.0	-	30.0	Roof w/ Gravel

#### Weyerhaeuser Notes

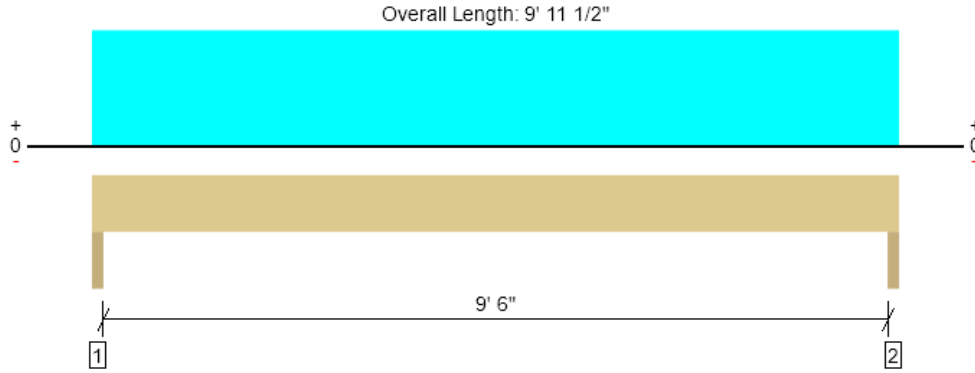
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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Maxwell Skotheim Quantum Consulting Engineers (206) 957-3906 MSkotheim@quantumce.com	



Upper Floor, Rev 2 UB1 - Garage Door Header, 9'-6"  
 1 piece(s) 5 1/8" x 10 1/2" 24F-V4 DF Glulam



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6929 @ 1' 1/4"	9161 (2.75")	Passed (76%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	5315 @ 1' 1 1/4"	9507	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	16298 @ 4' 11 3/4"	18834	Passed (87%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.110 @ 4' 11 3/4"	0.325	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.318 @ 4' 11 3/4"	0.488	Passed (L/368)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

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

- 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 1.00 that was calculated using length L = 9' 9".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - HF	2.75"	2.75"	2.08"	4539	2290	896	6929	None
2 - Column - HF	2.75"	2.75"	2.08"	4539	2290	896	6929	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	10' o/c	
Bottom Edge (Lu)	10' 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 9' 11 1/2"	N/A	13.1	--	--	
1 - Uniform (PSF)	0 to 9' 11 1/2" (Top)	11' 6"	15.0	40.0	-	Floor
2 - Uniform (PSF)	0 to 9' 11 1/2" (Top)	6'	33.0	-	30.0	Roof w/ Gravel
3 - Uniform (PLF)	0 to 9' 11 1/2" (Top)	N/A	528.0	-	-	Wall w/ Veneer

**Weyerhaeuser Notes**

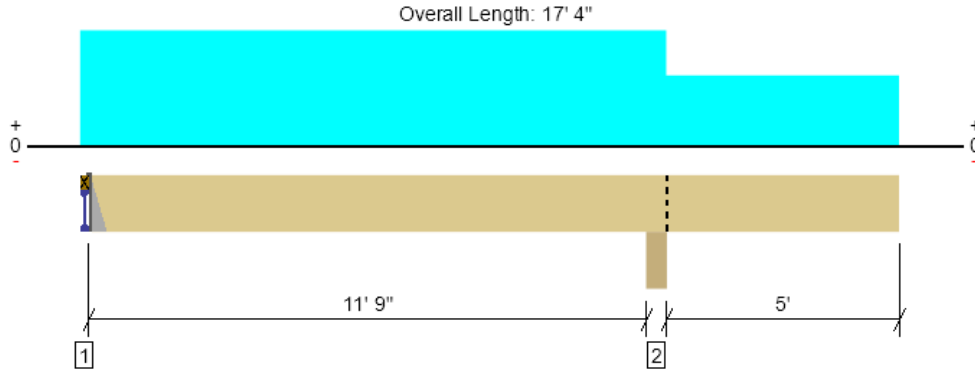
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Maxwell Skotheim Quantum Consulting Engineers (206) 957-3906 MSkotheim@quantumce.com	



Upper Floor, Rev 2 UB3 - Flush Beam at Shower, 11'-9"  
 1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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)	804 @ 2"	2363 (1.50")	Passed (34%)	--	1.0 D + 1.0 L (Alt Spans)
Shear (lbs)	746 @ 10' 11 1/8"	4295	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2243 @ 5' 9"	7977	Passed (28%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.134 @ 6' 1 3/4"	0.299	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.166 @ 6'	0.598	Passed (L/866)	--	1.0 D + 1.0 L (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 - Hanger on Single 2X HF plate	2.00"	Hanger <sup>1</sup>	1.50"	212	615	-45	827	See note <sup>1</sup>
2 - Beam - GLB	5.00"	5.00"	1.50"	582	619	245	1230	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
- <sup>1</sup> See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	16' 7" o/c	
Bottom Edge (Lu)	17' 2" 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 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	2" to 17' 4"	N/A	6.5	--	--	
1 - Uniform (PSF)	0 to 12' 4" (Front)	2' 6"	15.0	40.0	-	Floor
2 - Uniform (PSF)	12' 4" to 17' 4" (Top)	1' 4"	33.0	-	30.0	Roof w/ Gravel

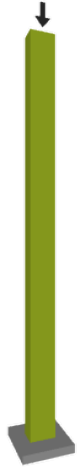
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Main Floor, Rev 2 P1 - Garage Header Post  
1 piece(s) 6 x 6 DF No.1

Post Height: 8'



Design Results	Actual	Allowed	Result	LDF	Load: Combination
Slenderness	17	50	Passed (35%)	--	--
Compression (lbs)	13658	24796	Passed (55%)	1.00	1.0 D + 1.0 L
Base Bearing (lbs)	13857	898425	Passed (2%)	--	1.0 D + 0.75 L + 0.75 S
Bending/Compression	N/A	1	Passed (N/A)	--	N/A

- Input axial load eccentricity for the design is zero
- Applicable calculations are based on NDS.

Supports	Type	Material
Base	Plate	Steel

Member Type : Free Standing Post  
Building Code : IBC 2018  
Design Methodology : ASD

Max Unbraced Length	Comments
Full Member Length	No bracing assumed.

Drawing is Conceptual

Vertical Loads	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Point (lb)	4539	2290	896	Linked from: Rev 2 UB1 - Garage Door Header, 9'-6", Support 1
2 - Point (lb)	4539	2290	896	Linked from: Rev 2 UB1 - Garage Door Header, 9'-6", Support 1

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