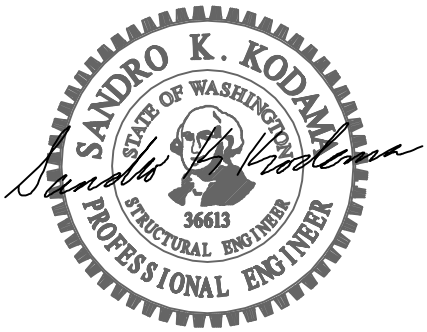
QUANTUM
CONSULTING ENGINEERS

November 1, 2021



STRUCTURAL CALCULATIONS
(Permit Supplement)

DUBEY DECK ADDITION
8140 W Mercer Way
Mercer Island, WA 98040

Quantum Job Number: 20130.02

Prepared for:
TUTMARC ASSOCIATES
3857 45th Avenue NE
Seattle, WA 98105

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

DUBEY DECK ADDITION
8140 W MERCER WAY
MERCER ISLAND, WA 98040

Quantum Job Number: 20130.02

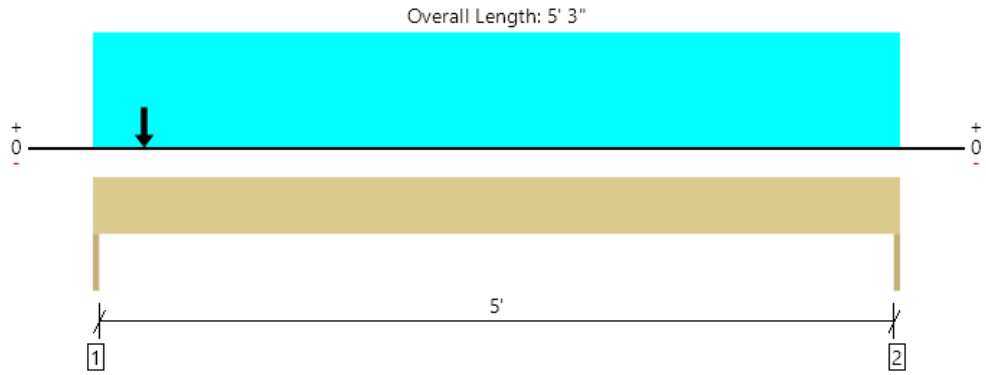
GRAVITY DESIGN

Revision 1			
Member Name	Results	Current Solution	Comments
Existing Door Header at Family Room, 5'-0"	Passed	2 piece(s) 2 x 8 HF No.2	
Existing Floor Beam at Family Room, 14'-0"	Passed	1 piece(s) 3 1/8" x 15" 24F-V4 DF Glulam	
Existing Floor Beam at Nook, 19'-6"	Passed	1 piece(s) 3 1/8" x 21" 24F-V4 DF Glulam	

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

Weyerhaeuser

Revision 1, Existing Door Header at Family Room, 5'-0"
2 piece(s) 2 x 8 HF 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)	1594 @ 0	1823 (1.50")	Passed (87%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	649 @ 8 3/4"	2501	Passed (26%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	762 @ 2' 1 3/16"	2569	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.021 @ 2' 6 7/16"	0.262	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.031 @ 2' 6 1/2"	0.350	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD
Member Pitch : 0/12

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - HF	1.50"	1.50"	1.50"	486	1108	1594	None
2 - Trimmer - HF	1.50"	1.50"	1.50"	164	320	484	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 3" o/c	
Bottom Edge (Lu)	5' 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 5' 3"	N/A	5.5	--	
1 - Point (lb)	4" (Top)	N/A	369	903	Linked from: RB3 - Grid 2, single span, Support 1
2 - Uniform (PSF)	0 to 5' 3" (Top)	4'	12.0	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
Maxwell Skotheim Quantum Consulting Engineers (206) 957-3906 MSkotheim@quantumce.com	

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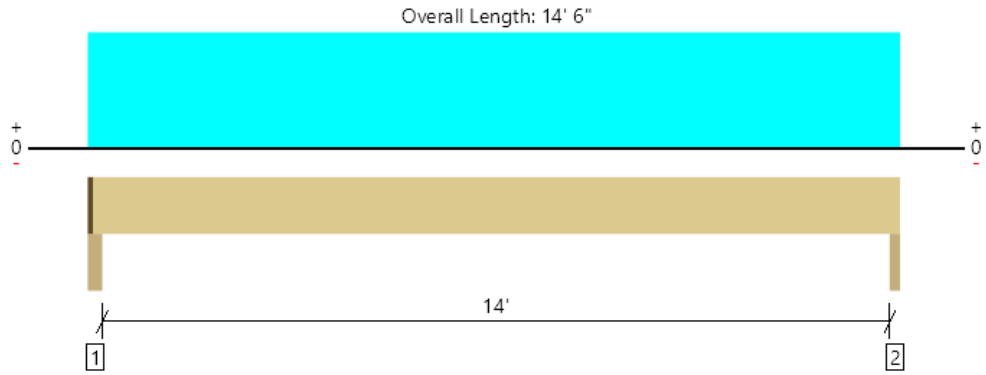
Revision 1, Existing Floor Beam at Family Room, 14'-0"

1 piece(s) 3 1/8" x 15" 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)	2359 @ 2"	2848 (2.25")	Passed (83%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1715 @ 1' 6 1/2"	8281	Passed (21%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-lbs)	7570 @ 7' 3 1/2"	23438	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.123 @ 7' 3 1/2"	0.356	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.192 @ 7' 3 1/2"	0.712	Passed (L/888)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 14' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Beam - HF	3.50"	2.25"	1.86"	861	1313	729	2903	1 1/4" Rim Board
2 - Column - HF	2.50"	2.50"	1.50"	852	1298	721	2871	None

• 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)	14' 5" 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 14' 6"	N/A	11.4	--	--	
1 - Uniform (PSF)	0 to 14' 6" (Top)	4'	15.5	-	25.0	Roof
2 - Uniform (PSF)	0 to 14' 6" (Top)	3'	15.0	60.0	-	Deck

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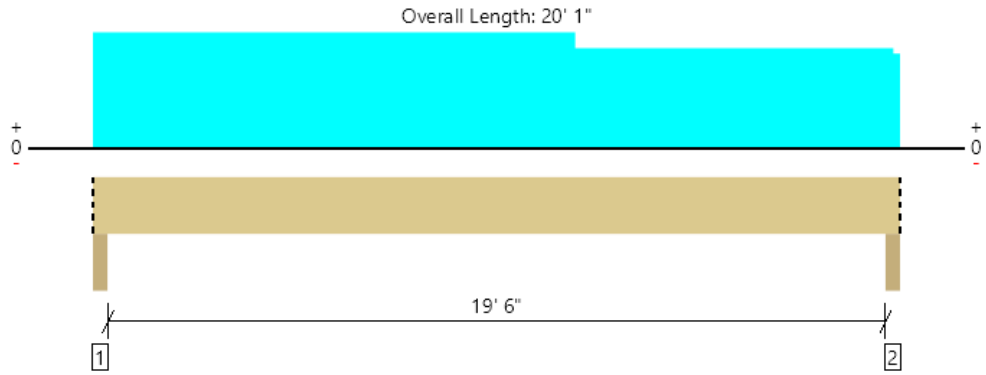
Revision 1, Existing Floor Beam at Nook, 19'-6"
1 piece(s) 3 1/8" x 21" 24F-V4 DF Glulam



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)	6684 @ 2"	7109 (3.50")	Passed (94%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	5295 @ 2' 1/2"	13333	Passed (40%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-lbs)	31736 @ 9' 9 15/16"	52809	Passed (60%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.322 @ 9' 11 7/8"	0.494	Passed (L/736)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.511 @ 9' 11 7/8"	0.988	Passed (L/463)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 19' 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	Total	
1 - Column - DF	3.50"	3.50"	3.29"	2481	3213	2391	8085	Blocking
2 - Column - DF	3.50"	3.50"	3.07"	2302	3213	2019	7534	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)	12' o/c	
Bottom Edge (Lu)	20' 1" 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 20' 1"	N/A	15.9	--	--	
1 - Uniform (PSF)	0 to 20' 1" (Top)	6'	15.5	-	25.0	House Roof
2 - Uniform (PSF)	0 to 12' (Top)	4'	12.0	-	25.0	Deck Roof
3 - Uniform (PSF)	0 to 20' 1" (Top)	8'	12.0	40.0	-	Floor
4 - Uniform (PSF)	12' to 19' 11" (Top)	1'	12.0	-	25.0	Deck Roof

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DUBEY DECK ADDITION
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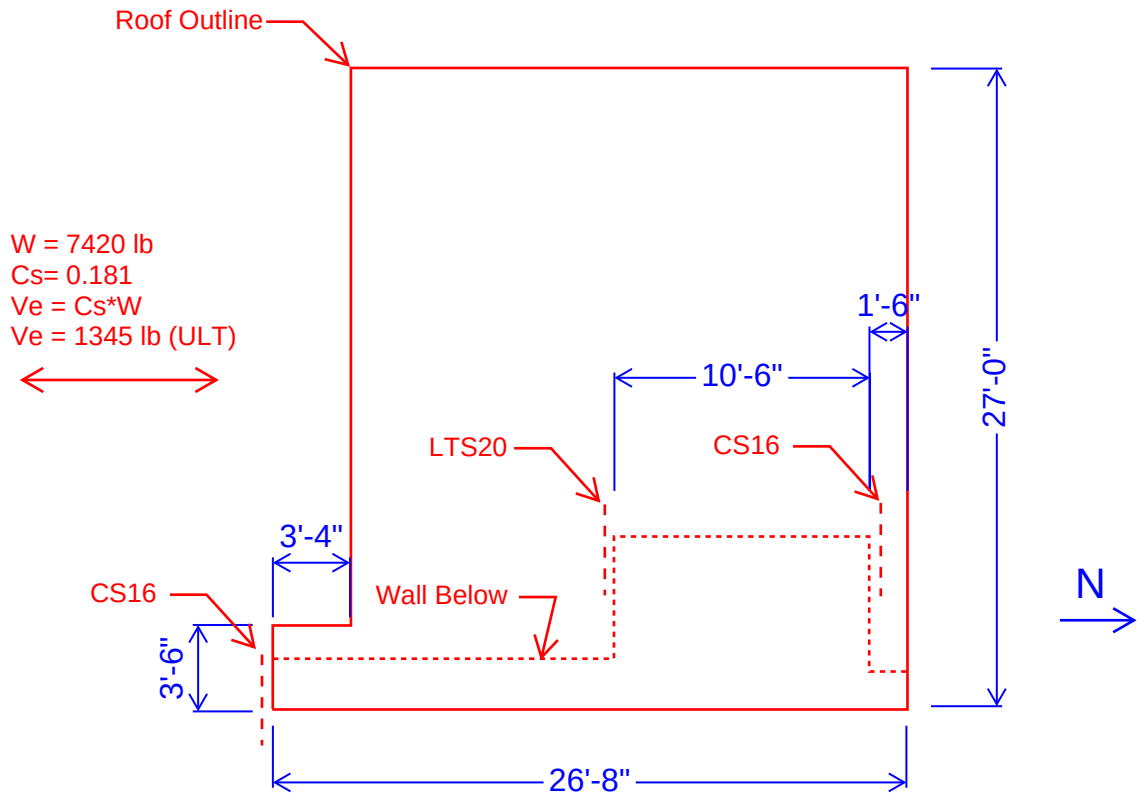
Quantum Job Number: 20130.02

LATERAL DESIGN



Diaphragm Design:

N-S Direction:
Ve = 1345 lb (ULT)
Diaphragm Length = 23.33'
v_u = 58 plf
Diaphragm Type: Unblocked, 8d nails @ 6" o.c.
phi*v_n = 353 plf

Unblocked diaphragm OK.

E-W Direction:
Ve = 1345 lb*11.75'/23.33' = 678 lb (ULT)
Diaphragm Length = 3.5'
v_u = 194 plf
Diaphragm Type: Unblocked, 8d nails @ 6" o.c.
phi*v_n = 353 plf

Unblocked diaphragm OK.

Connection Design:

Ve = 1345*0.7 =942 lb (ASD)
Moment Arm = 13.5'
Chord Width = 26.67'
T/C = 477 lb (ASD)

Strap: CS16
Allowable Tension = 1705 lb

CS16 strap OK.

Note: Prescriptively add LTS20 strap at roof midspan to existing stud wall (see plan) for additional lateral connection to existing structure.

QUANTUM
CONSULTING ENGINEERS
1511 THIRD AVENUE
SUITE 323
SEATTLE, WA 98101
TEL 206.957.3900
FAX 206.957.3901
www.quantumce.com

Dubey Deck Addition	10/28/21	20130.02
project	date	job no.
Roof Lateral Design	MKS	
	drawn by:	
Tutmarc Associates		
client	design by:	sheet no.

Wood Beam

DESCRIPTION: Wall Double Top Plate

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-16

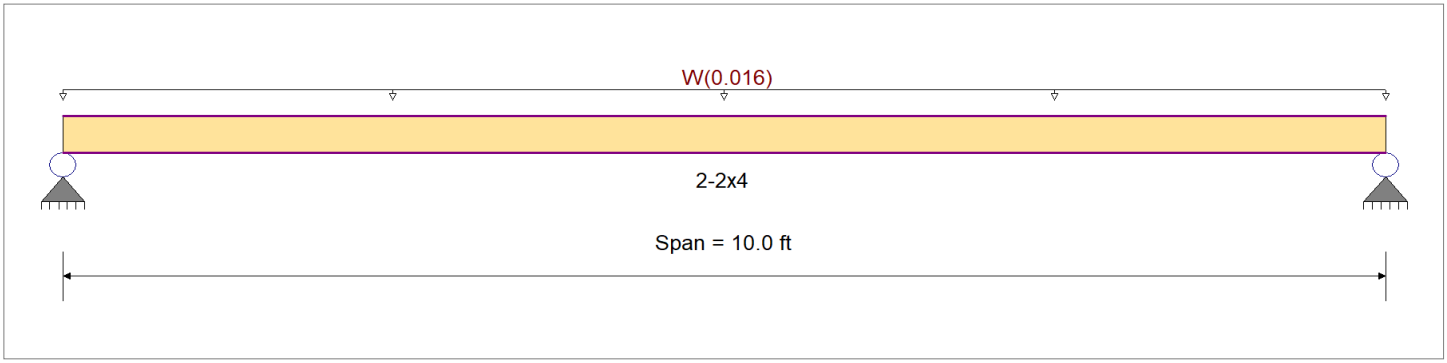
Wood Species : Hem-Fir
Wood Grade : No.2

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	850.0 psi
Fb -	850.0 psi
Fc - Prll	1,300.0 psi
Fc - Perp	405.0 psi
Fv	150.0 psi
Ft	525.0 psi

E : Modulus of Elasticity

Ebend- xx	1,300.0 ksi
Eminbend - xx	470.0 ksi
Density	26.840 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations

Uniform Load : W = 0.0160 ksf, Tributary Width = 1.0 ft, (Out of Plane Wind)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.115 : 1	Maximum Shear Stress Ratio	=	0.027 : 1
Section used for this span		2-2x4	Section used for this span		2-2x4
fb: Actual	=	235.10 psi	fv: Actual	=	6.51 psi
Fb: Allowable	=	2,040.00 psi	Fv: Allowable	=	240.00 psi
Load Combination		+0.60W	Load Combination		+0.60W
Location of maximum on span	=	5.000 ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.109 in	Ratio =	1099 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.156 in	Ratio =	769 >=180
Max Upward Total Deflection	0.000 in	Ratio =	0 <180

Maximum Forces & Stresses for Load Combinations

Load Combination / Segment Length	Span #	Max Stress Ratios M	Max Stress Ratios V	C_d	$C_{F/V}$	C_i	C_r	C_m	C_t	C_L	Moment Values M	Moment Values fb	Moment Values F'b	Shear Values V	Shear Values fv	Shear Values F'v
													0.00	0.00	0.00	0.00
Length = 10.0 ft	1			0.90	1.500	1.00	1.00	1.00	1.00	1.00			1147.50	0.00	0.00	135.00
+0.60W					1.500	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.115	0.027	1.60	1.500	1.00	1.00	1.00	1.00	1.00	0.12	235.10	2040.00	0.05	6.51	240.00
+0.450W					1.500	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 10.0 ft	1	0.086	0.020	1.60	1.500	1.00	1.00	1.00	1.00	1.00	0.09	176.33	2040.00	0.03	4.88	240.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+0.60W	1	0.1559	5.036		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.080	0.080

Wood Beam

DESCRIPTION: Wall Double Top Plate

Vertical Reactions

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Overall MINimum	0.080	0.080
+0.60W	0.048	0.048
+0.450W	0.036	0.036
W Only	0.080	0.080