



May 1, 2023

**STRUCTURAL CALCULATIONS**  
(Permit Submittal)

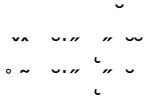
**MOBLEY RESIDENCE**  
7244 N Mercer Way  
Mercer Island, WA 98040

Quantum Job Number: 22050.01

*Prepared for:*  
PONTING FITZGERALD ARCHITECTS  
5 Islington Street  
Ponsonby  
Auckland  
New Zealand

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





---

7244 N Mercer Way  
Mercer Island, WA 98040

Quantum Job Number: 22050.01

## INDEX

DESIGN CRITERIA .....	A - 1
ROOF FRAMING DESIGN.....	B - 1
MAIN LEVEL FRAMING DESIGN.....	C - 1
EXISTING FOUNDATION.....	D - 1
LATERAL DESIGN .....	E - 1



**QUANTUM** | CONSULTING ENGINEERS

**MOBLEY RESIDENCE**

7244 N Mercer Way  
Mercer Island, WA 98040

Quantum Job Number: 22050.01

# **DESIGN CRITERIA**

# Structural Design Criteria

**Building Code:** 2018 International Building Code

**Building Department:** City of Mercer Island

## Seismic Criteria

$S_s$ : 1.38  $I_e$ : 1.00  
 $S_1$ : 0.48 Seismic Soil Site Class: D  
 $S_{ds}$ : 1.11 Seismic Design Category: D  
 $S_{d1}$ : 0.58  
R: 6.50 Light-Framed Wood Walls Sheathed With Wood Structural Panels

## Wind Criteria

Wind Speed: 110 MPH  
Risk Category: II  
Wind Exposure: C  
Kzt: 1.0

## Geotechnical Criteria

Allowable Bearing Pressure: 1500 PSF  
Minimum Footing Width: Continuous: 18" min., Isolated: 24" min.  
Frost Depth: 12" min.  
Active Soil Pressure (Restrained/Unrestrained): 50 PCF / 35 PCF  
Seismic Surcharge Pressure (Restrained/Unrestrained): 8H PSF / 6H PSF  
Passive Soil Pressure: 350 PCF  
Coefficient of Friction: 0.35

## Materials Criteria

### Concrete (28 Day Strength):

Foundation/Slab on Grade:  $F'_c$ = 2,500 PSI  
Basement Walls:  $F'_c$ = 3,000 PSI

### Reinforcing Steel:

Grade 60 (#5 bar and larger):  $F_y$ = 60,000 PSI  
Grade 40 (#4 bar):  $F_y$ = 40,000 PSI

### Structural Steel:

Wide-Flange Sections: A-992:  $F_y$ = 50,000 PSI  
Miscellaneous Sections: A-36:  $F_y$ = 36,000 PSI  
Tube Sections: A-500:  $F_y$ = 46,000 PSI  
Pipe Sections: A-53:  $F_y$ = 35,000 PSI  
Welding:  $F_y$ = 70,000 PSI

### Wood Framing:

2x, 3x & 4x Framing Members: DF#2  
6x Framing Members: DF#1  
Glulam Beams: 24F-V4 (V8 @ Cont. and Cant. Members)  
Parallam Beams: 2.0 E PSL  
LSL Members - Beams & Headers: 1.55 E LSL  
LSL Members - Studs & Columns: 1.3 E LSL  
LVL Members - Beams & Headers: 1.9 E LVL  
Wood Sheathing: APA RATED

# Residential Building Loads

<b>Snow Load</b>	Roof	25 psf
<b>Live Load</b>	Residential	40 psf
	Residential exterior decks / balconies	60 psf

## Assembly Loads

Roof Loads - Typical		Comments
Standard Roofing	4.0 psf	
1/2" Ply. Sheathing	1.5 psf	
Joists @ 24" o.c.	2.1 psf	
Insulation	1.0 psf	
5/8" GWB	2.8 psf	
Lights, ducts	0.5 psf	
PV Allowance	5.0 psf	
Miscellaneous	1.1 psf	
<b>Total:</b>	<b>18.0 psf</b>	SL=25 PSF

Roof Loads - Ballasted		Comments
Ballast	25.0 psf	
Roofing	4.0 psf	
1/2" Ply Sheathing	1.5 psf	
Joists @ 24" o.c.	2.1 psf	
Insulation	1.0 psf	
5/8" GWB	2.8 psf	
Lights, ducts	0.5 psf	
Miscellaneous	1.1 psf	
<b>Total:</b>	<b>38.0 psf</b>	SL=25 PSF

Typical Floor Loads		Comments
Flooring	4.0 psf	
3/4" Ply. Sheathing	2.3 psf	
Floor Joists @ 16" o.c.	2.5 psf	
5/8" GWB	2.8 psf	
Lights, ducts	1.0 psf	
Miscellaneous	2.4 psf	
<b>Total:</b>	<b>15.0 psf</b>	LL=40 PSF

Exterior Wood Stud Wall	
Siding	2.3 psf
1/2" Plywood	1.5 psf
2x6 studs @ 16" o.c.	1.7 psf
Insulation	0.5 psf
1/2" GWB	2.2 psf
Mech./Elec.	0.5 psf
Misc.	1.3 psf
<b>Total:</b>	<b>10.0 psf</b>

Interior Wall Framing	
5/8" GWB	2.8 psf
2x4 @ 16" o.c.	0.9 psf
5/8" GWB	2.8 psf
Mech./Elec.	0.5 psf
Misc.	1.0 psf
<b>Total:</b>	<b>8.0 psf</b>

## Deflection Criteria

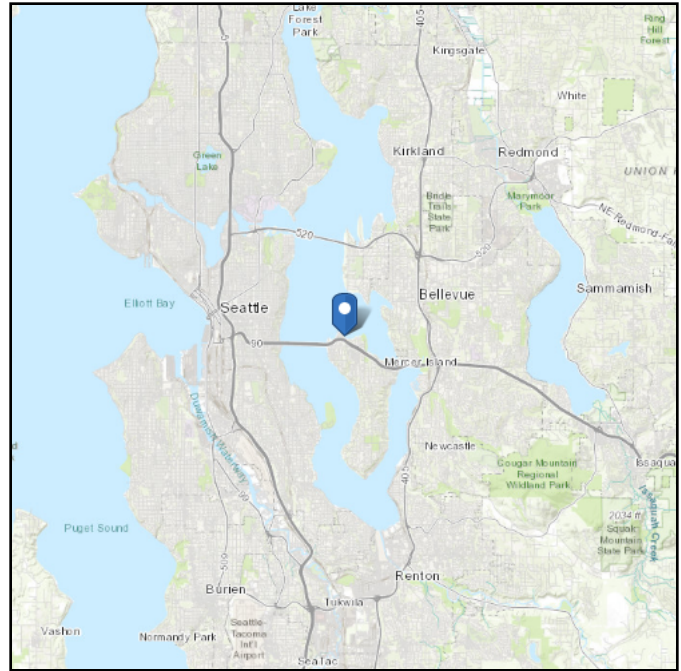
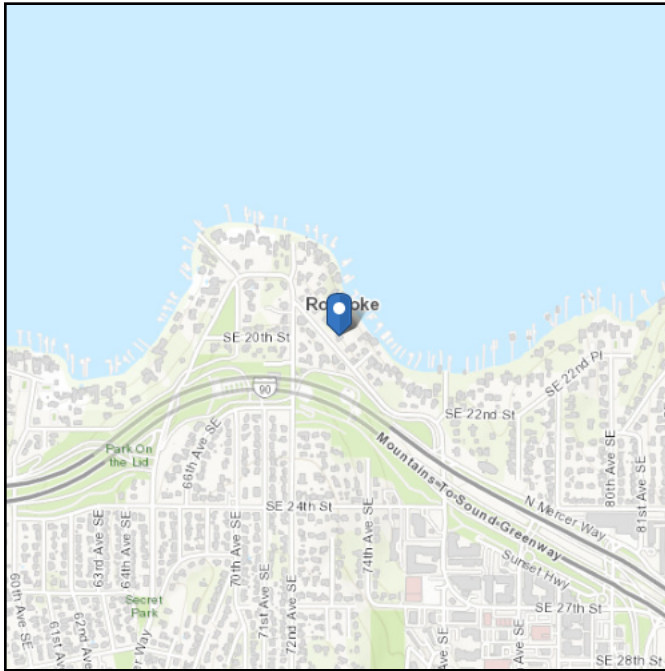
Roof	Walls	Floor
Live Load: <b>L/240</b>	<b>L/120</b> *flexible finishes	Live Load: <b>L/360</b>
Total Load: <b>L/180</b>	<b>L/240</b> *brittle finish	Total Load: <b>L/240</b>
	<b>L/240</b> *supporting glass	

# ASCE 7 Hazards Report

**Address:**  
7244 N Mercer Way  
Mercer Island, Washington  
98040

**Standard:** ASCE/SEI 7-16  
**Risk Category:** II  
**Soil Class:** D - Default (see Section 11.4.3)

**Latitude:** 47.593234  
**Longitude:** -122.241451  
**Elevation:** 75.41718686873048 ft (NAVD 88)



## Wind

### Results:

Wind Speed	98 Vmph
10-year MRI	67 Vmph
25-year MRI	74 Vmph
50-year MRI	78 Vmph
100-year MRI	83 Vmph

Data Source: ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2

Date Accessed: Tue Apr 25 2023

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

**Site Soil Class:** D - Default (see Section 11.4.3)

**Results:**

$S_s$ :	1.383	$S_{D1}$ :	N/A
$S_1$ :	0.482	$T_L$ :	6
$F_a$ :	1.2	PGA :	0.591
$F_v$ :	N/A	PGA <sub>M</sub> :	0.71
$S_{MS}$ :	1.659	$F_{PGA}$ :	1.2
$S_{M1}$ :	N/A	$I_e$ :	1
$S_{DS}$ :	1.106	$C_v$ :	1.377

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

**Data Accessed:** Tue Apr 25 2023

**Date Source:** [USGS Seismic Design Maps](#)

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

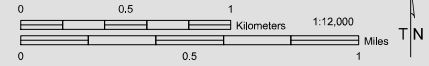
ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

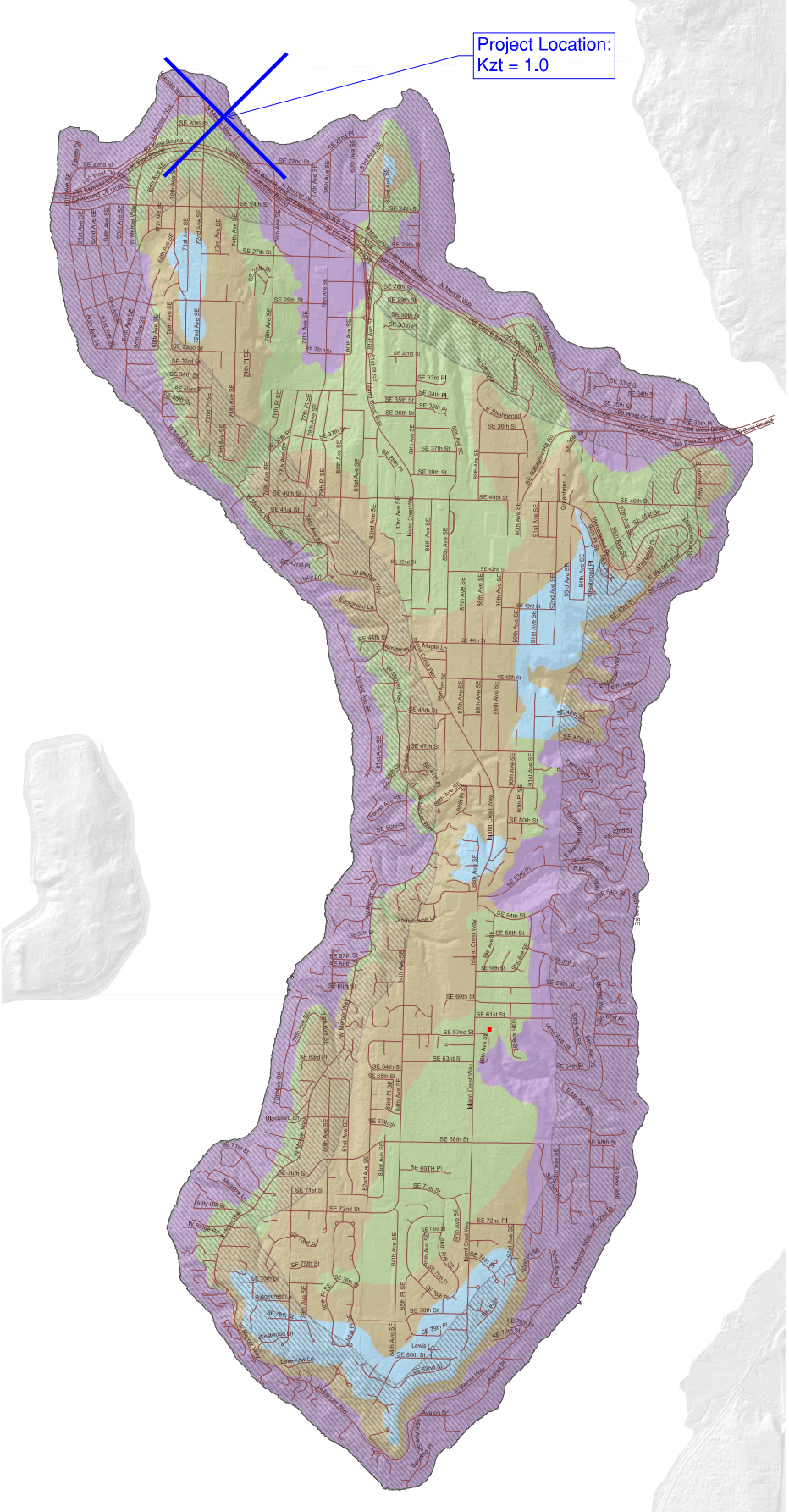


# Mercer Island Wind Exposure and Wind Speed-Up (Topographic Effect)

by Development Services Group (DSG), City of Mercer Island  
April 2009



Project Location:  
Kzt = 1.0



## WIND EXPOSURE CATEGORIES & WIND SPEED-UP FACTORS (ICC Section 1609 & ASCE 7-05 Chapter 6)

It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the Kzt factor to be utilized for each specific project. The Kzt factors and wind exposure categories indicated on this map are the minimum values accepted by the City of Mercer Island without requiring the design professional to submit additional calculations and supporting topographic documentation (to verify the values utilized in their wind load determination).

Please note – The Kzt values indicated on this map are approximations based upon periodic calculations of representative samplings around Mercer Island. These values are intended for City of Mercer Island's plan review purposes only.

### WIND EXPOSURE CATEGORIES:

Wind Exposure Category		Exposure 'C' (1500 feet from Lake)
		Exposure 'B' (all other areas)

### WIND SPEED-UP (TOPOGRAPHIC EFFECT) - K<sub>z,t</sub> Factor :

K <sub>z,t</sub> Factor		K <sub>z,t</sub> = 1.0
		K <sub>z,t</sub> = 1.3
		K <sub>z,t</sub> = 1.6
		K <sub>z,t</sub> = 1.9

### GENERAL NOTES FOR WIND EXPOSURE AND WIND SPEED-UP MAP

This map is the Wind Exposure Category and Wind Speed-up (Topographic Effects) Map for the City of Mercer Island. This map shows the minimum wind exposure category and the minimum wind speed-up, "K<sub>z,t</sub>" factor, which will be accepted without site specific documentation and calculation.

Other wind speed phenomena may occur on Mercer Island that is not specifically identified on this map. It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the appropriate design wind speed and exposure category for their specific project and location.

This map is for the sole use of the staff of the City of Mercer Island's Development Services Group (DSG) for the purposes of permit application evaluation. This map provides DSG staff a general assessment of Wind Exposure Category and Wind Speed-up (Topographic Effects). All areas have not been specifically evaluated and there may be locations that are not correctly represented on this map. It is the responsibility of individual property owners and map users to evaluate risk associated with their proposed development. No site-specific assessment of risk is implied or otherwise indicated by the City of Mercer Island with this map.

Information about data used for the map, references, and data limitation are all described the associated "Read Me" document. The digital version of this map is accompanied by a meta data file containing pertinent information about map construction. This data map is available on the City of Mercer Island website.

The City of Mercer Island is using guidance provided within ICC Section 1609 & ASCE 7-05 Chapter 6 regarding definitions used when creating this map.

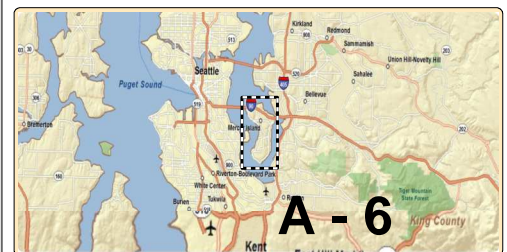
### DEFINITIONS:

**K<sub>z,t</sub> factor:** The topographic effect of wind speed-up at isolated hills, ridges, and escarpments constituting abrupt changes in the general topography, located in any exposure category, that meet all of the conditions noted in ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, Section 6.5.7.

**Exposure B:** The wind exposure category that applies where the site in question is located a minimum of 1500 feet from the shoreline and the mean roof height is less than or equal to 30 feet per IBC 2006 section 1608.4.3.

**Exposure C:** The wind exposure category that applies where the site in question is located within 1500 feet from the shoreline per IBC 2006 section 1608.4.3.

**Wind Speed:** Minimum 85 mph 3-second gust per IRC Figure R301.2(4)





**QUANTUM** | CONSULTING ENGINEERS

**MOBLEY RESIDENCE**

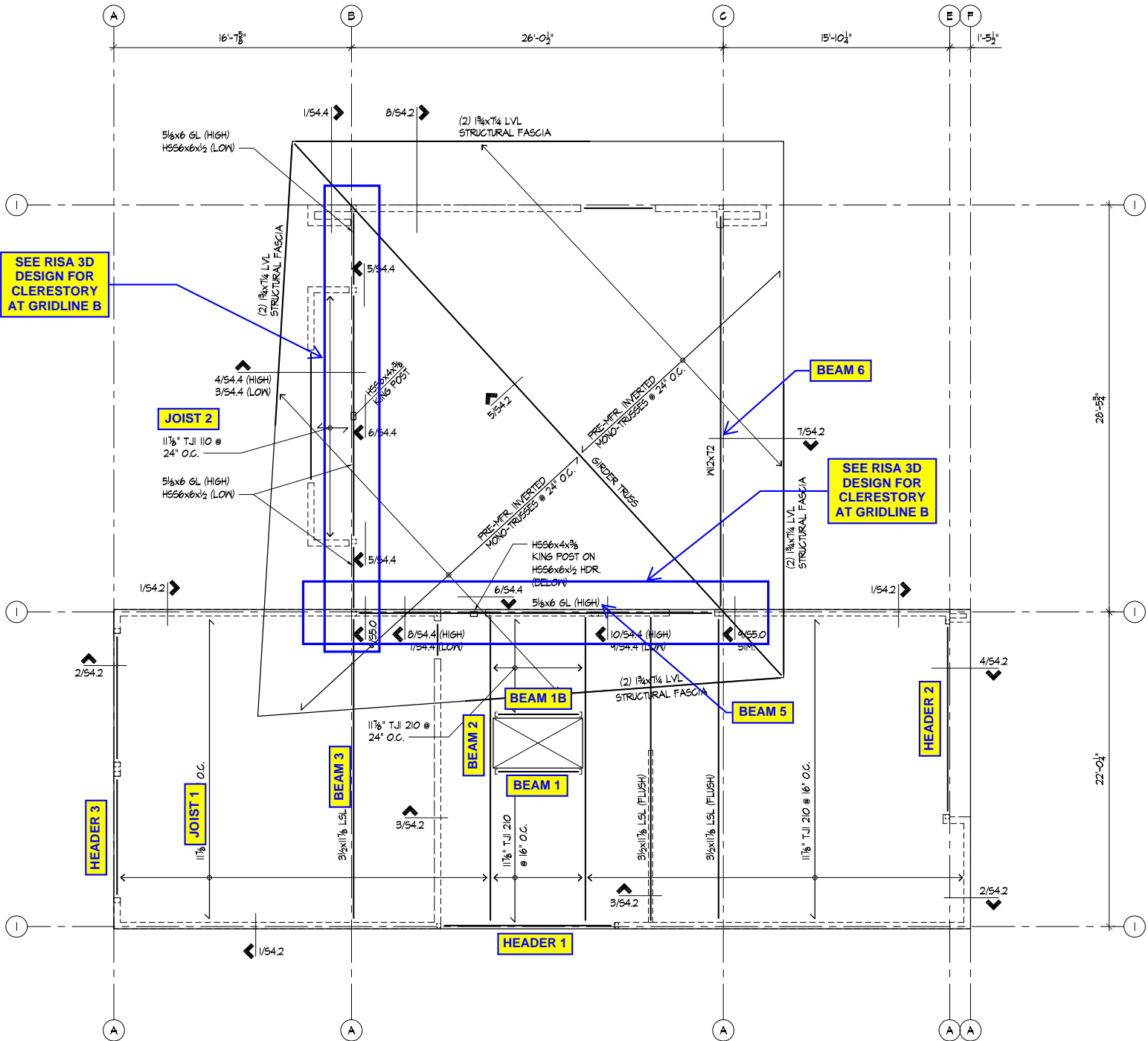
7244 N Mercer Way

Mercer Island, WA 98040

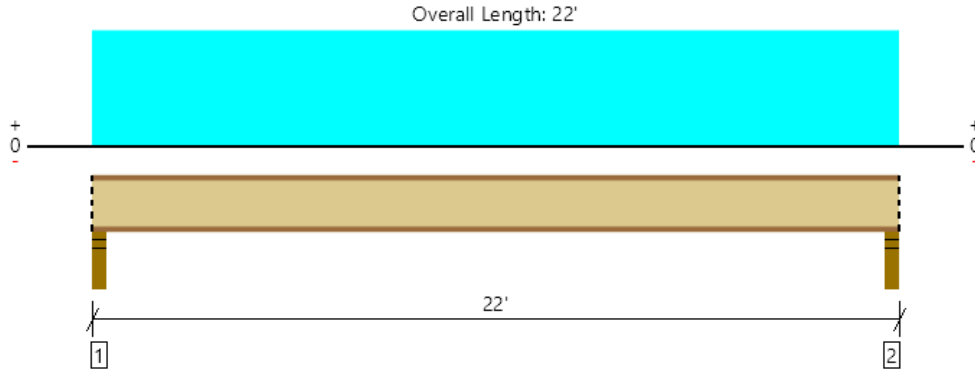
Quantum Job Number: 22050.01

# **ROOF FRAMING DESIGN**

# ROOF FRAMING DESIGN KEY PLAN



Roof Framing, Roof: Joist 1  
1 piece(s) 11 7/8" TJI® 560 @ 19.2" 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)	1109 @ 2 1/2"	1984 (3.50")	Passed (56%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1079 @ 3 1/2"	2358	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5870 @ 11'	10925	Passed (54%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.343 @ 11'	1.079	Passed (L/755)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.864 @ 11'	1.439	Passed (L/300)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
Member Type : Joist  
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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - DF	3.50"	3.50"	1.75"	669	440	1109	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.75"	669	440	1109	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' 3" o/c	
Bottom Edge (Lu)	22' 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'	19.2"	38.0	25.0	Ballasted Roof Load

**Weyerhaeuser Notes**

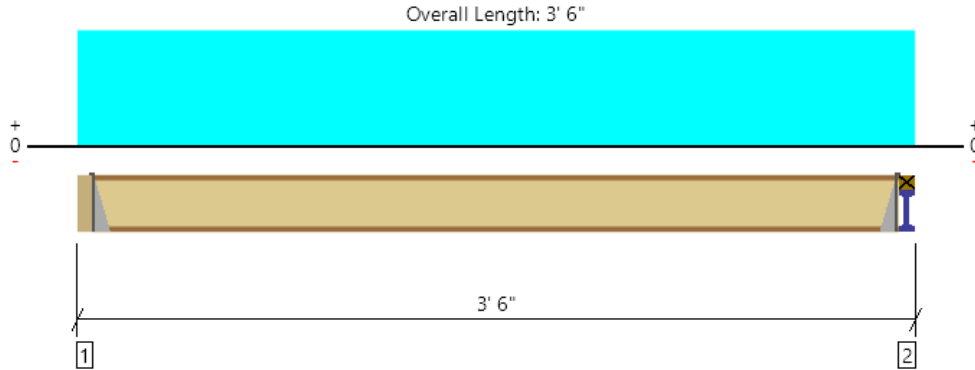
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Roof Framing, Roof: Joist 2  
1 piece(s) 11 7/8" TJI @ 110 @ 24" 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)	181 @ 3 1/2"	1047 (1.75")	Passed (17%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	181 @ 3 1/2"	1794	Passed (10%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	130 @ 1' 8 3/4"	3634	Passed (4%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.001 @ 1' 8 3/4"	0.144	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.003 @ 1' 8 3/4"	0.192	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
Member Type : Joist  
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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Hanger on 11 7/8" DF Ledger	3.50"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	131	86	218	See note <sup>1</sup>
2 - Hanger on Single 2X DF plate	4.00"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	135	89	223	See note <sup>1</sup>

- 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.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	2' 11" o/c	
Bottom Edge (Lu)	2' 11" 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 - Top Mount Hanger	ITS1.81/11.88	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip		
2 - Top Mount Hanger	ITS1.81/11.88	2.00"	4-10dx1.5	2-10dx1.5	2-Strong-Grip		

- 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 3' 6"	24"	38.0	25.0	Ballasted Roof

**Weyerhaeuser Notes**

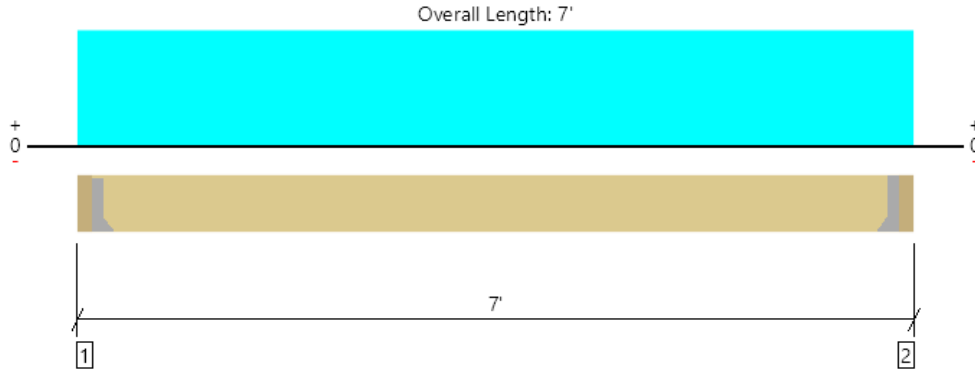
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Roof Framing, Roof: Beam 1  
1 piece(s) 3 1/2" 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)	1558 @ 3' 1/2"	4725 (1.50")	Passed (33%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1077 @ 1' 3 3/8"	9878	Passed (11%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2499 @ 3' 6"	18346	Passed (14%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.013 @ 3' 6"	0.321	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.033 @ 3' 6"	0.428	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
Member Type : Flush 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Hanger on 11 7/8" LSL beam	3.50"	Hanger <sup>1</sup>	1.50"	1039	656	1695	See note <sup>1</sup>
2 - Hanger on 11 7/8" LSL beam	3.50"	Hanger <sup>1</sup>	1.50"	1039	656	1695	See note <sup>1</sup>

- 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)	6' 5" o/c	
Bottom Edge (Lu)	6' 5" 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	LUS410	2.00"	N/A	8-10d	6-10d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-10d	6-10d	

- 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 6' 8 1/2"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 7' (Front)	7' 6"	38.0	25.0	Ballasted Roof

**Weyerhaeuser Notes**

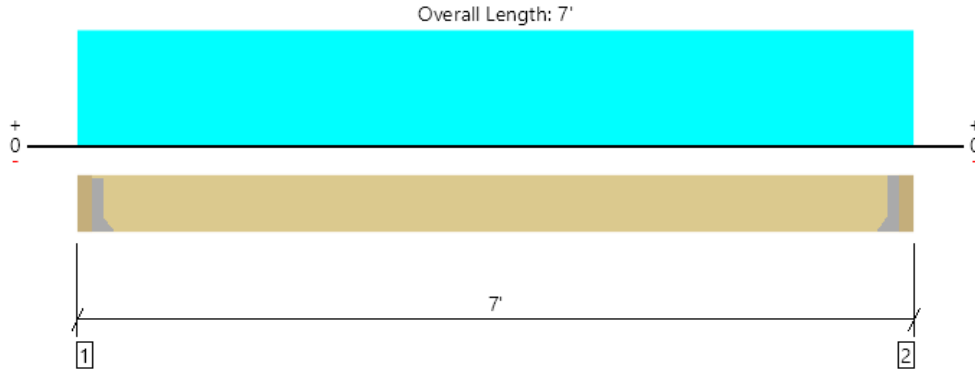
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Roof Framing, Roof: Beam 1B  
1 piece(s) 3 1/2" 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)	1187 @ 3 1/2"	4725 (1.50")	Passed (25%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	821 @ 1' 3 3/8"	9878	Passed (8%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1904 @ 3' 6"	18346	Passed (10%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.010 @ 3' 6"	0.321	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.025 @ 3' 6"	0.428	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
Member Type : Flush 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Hanger on 11 7/8" LSL beam	3.50"	Hanger <sup>1</sup>	1.50"	795	496	1291	See note <sup>1</sup>
2 - Hanger on 11 7/8" LSL beam	3.50"	Hanger <sup>1</sup>	1.50"	795	496	1291	See note <sup>1</sup>

- 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)	6' 5" o/c	
Bottom Edge (Lu)	6' 5" 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	LUS410	2.00"	N/A	8-10dx1.5	6-10d		
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-10dx1.5	6-10d		

- 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 6' 8 1/2"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 7' (Front)	5' 8"	38.0	25.0	Ballasted Roof

**Weyerhaeuser Notes**

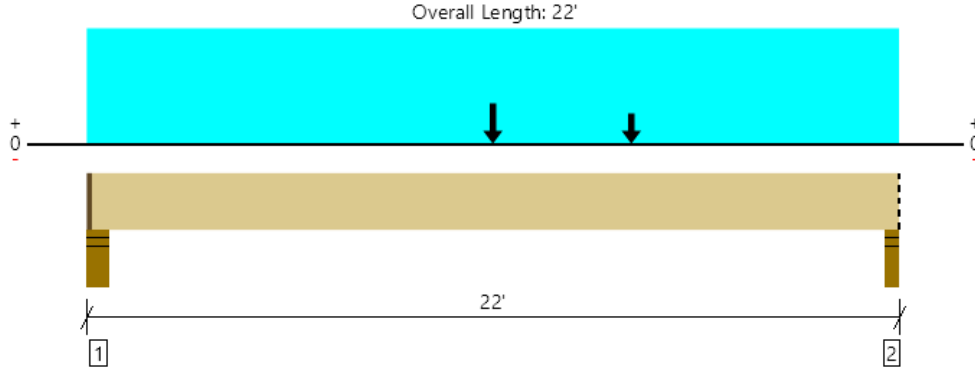
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Roof Framing, Roof: Beam 2  
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.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3066 @ 21' 10"	11484 (3.50")	Passed (27%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2906 @ 20' 8 5/8"	13861	Passed (21%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	20839 @ 11'	34332	Passed (61%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.376 @ 11' 3 11/16"	1.075	Passed (L/686)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	1.025 @ 11' 3 9/16"	1.433	Passed (L/252)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
Member Type : Flush 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - DF	5.50"	4.25"	1.50"	1701	956	2657	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	3.50"	1.50"	1953	1113	3066	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)	21' 11" 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)	1 1/4" to 22'	N/A	19.5	--	
1 - Uniform (PSF)	0 to 22' (Front)	1' 8"	38.0	25.0	Ballasted Roof
2 - Point (lb)	11' (Front)	N/A	1039	656	Beam 1
3 - Point (lb)	14' 9" (Front)	N/A	795	496	Beam 1B

**Weyerhaeuser Notes**

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

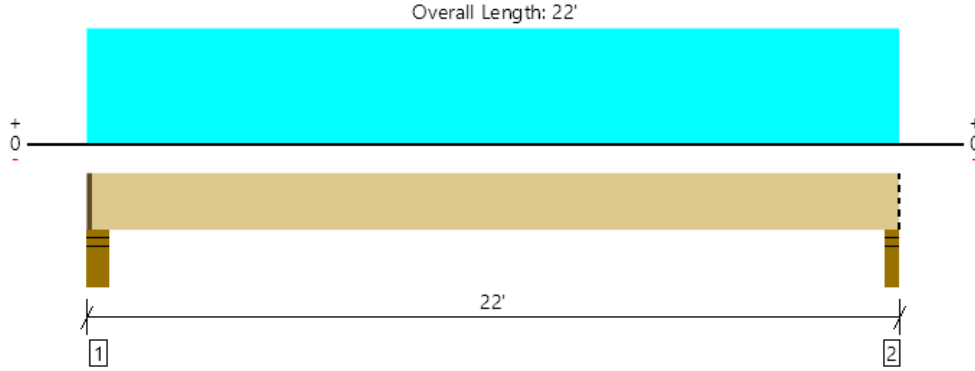
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	





Roof Framing, Roof: Beam 3  
 1 piece(s) 3 1/2" x 11 7/8" 1.5E 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)	1288 @ 21' 10"	7656 (3.50")	Passed (17%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1137 @ 1' 5 3/8"	9878	Passed (12%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6818 @ 11' 1"	18346	Passed (37%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.273 @ 11' 1"	1.075	Passed (L/944)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.774 @ 11' 1"	1.433	Passed (L/333)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
 Member Type : Flush 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Stud wall - DF	5.50"	4.25"	1.50"	845	462	1306	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	3.50"	1.50"	833	455	1288	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)	21' 11" 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)	1 1/4" to 22'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 22' (Front)	1' 8"	38.0	25.0	Ballasted Roof

**Weyerhaeuser Notes**

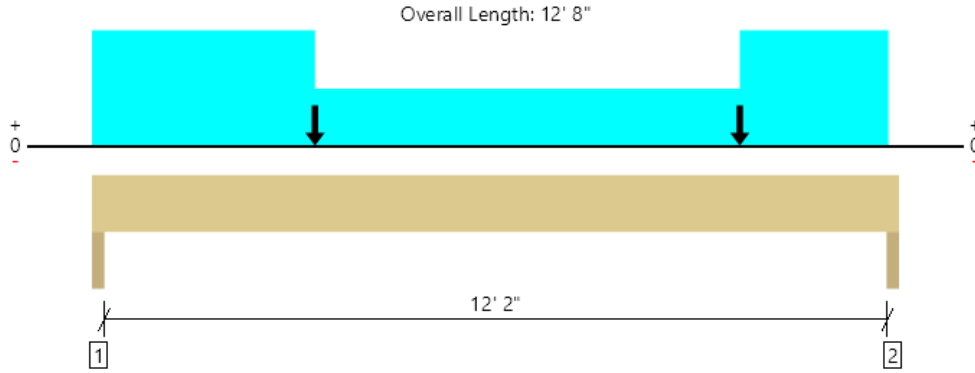
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Roof Framing, Roof: Header 1  
 1 piece(s) 3 1/2" x 11 7/8" 1.5E 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)	5989 @ 12' 6 1/2"	8138 (3.00")	Passed (74%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	5200 @ 11' 5 1/8"	9878	Passed (53%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	16087 @ 5' 6"	18346	Passed (88%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.254 @ 6' 3 3/8"	0.621	Passed (L/588)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.680 @ 6' 3 3/8"	0.828	Passed (L/219)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
 Member Type : Flush 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Factored	
1 - Trimmer - DF	3.00"	3.00"	2.15"	3643	2193	5836	None
2 - Trimmer - DF	3.00"	3.00"	2.21"	3751	2238	5989	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 8" o/c	
Bottom Edge (Lu)	12' 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 12' 8"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 3' 6" (Front)	11'	38.0	25.0	Ballasted Roof
2 - Uniform (PSF)	3' 6" to 10' 2" (Front)	5' 5"	38.0	25.0	Ballasted Roof
3 - Uniform (PSF)	10' 2" to 12' 6" (Front)	11'	38.0	25.0	Ballasted Roof
4 - Point (lb)	3' 6" (Front)	N/A	1701	956	Beam 2
5 - Point (lb)	10' 2" (Front)	N/A	1701	956	Beam 2

**Weyerhaeuser Notes**

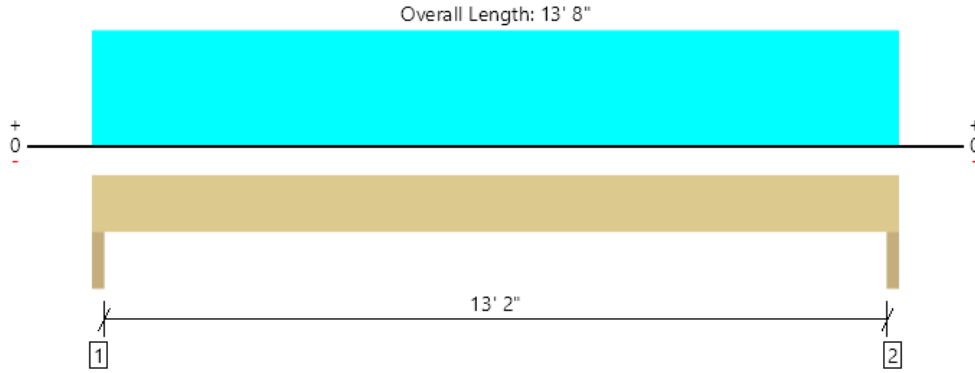
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Roof Framing, Roof: Header 2  
2 piece(s) 2 x 10 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)	909 @ 1' 1/2"	5625 (3.00")	Passed (16%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	773 @ 1' 1/4"	3830	Passed (20%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2993 @ 6' 10"	4059	Passed (74%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.115 @ 6' 10"	0.671	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.306 @ 6' 10"	0.894	Passed (L/526)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
Member Type : Flush 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	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.50"	567	342	909	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	567	342	909	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	12' 9" o/c	
Bottom Edge (Lu)	13' 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 13' 8"	N/A	7.0	--	
1 - Uniform (PSF)	0 to 13' 8" (Front)	2'	38.0	25.0	Ballasted Roof

**Weyerhaeuser Notes**

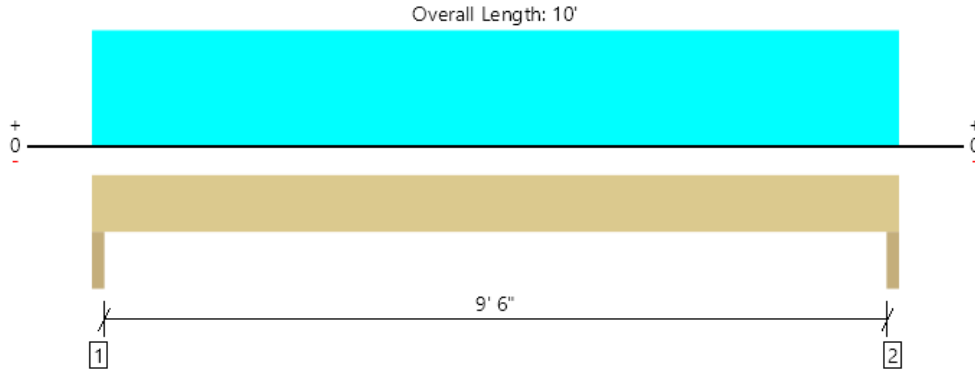
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Roof Framing, Roof: Header 3  
1 piece(s) 6 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)	682 @ 1 1/2"	10313 (3.00")	Passed (7%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	563 @ 10 1/2"	5376	Passed (10%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1621 @ 5'	3706	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.040 @ 5'	0.488	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.110 @ 5'	0.650	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof  
Member Type : Flush 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	Factored	
1 - Trimmer - DF	3.00"	3.00"	1.50"	432	250	682	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	432	250	682	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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 10'	N/A	10.4	--	
1 - Uniform (PSF)	0 to 10' (Front)	2'	38.0	25.0	Ballasted Roof

**Weyerhaeuser Notes**

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Title Block Line 1  
 You can change this area  
 using the "Settings" menu item  
 and then using the "Printing &  
 Title Block" selection.  
 Title Block Line 6

Project Title:  
 Engineer:  
 Project Descr:

Project ID:

Printed: 27 APR 2023, 11:51AM

## Steel Beam

File = M:\Gallagher Construction\22050.01 Mobley Residence\Calc\Calculations.ec6  
 ENERCALC, INC. 1983-2017, Build:10.17.7.24, Ver:10.17.7.24

Lic. # : KW-06016450

Licensee : QUANTUM CONSULTING ENGINEERS

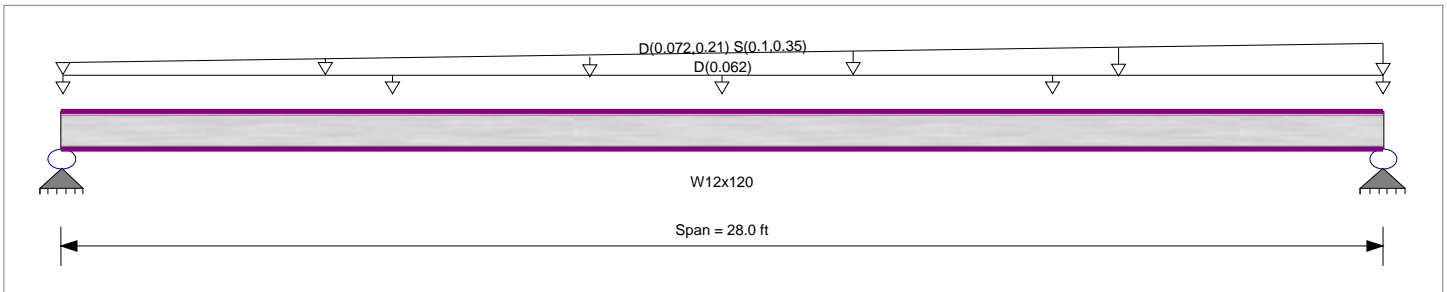
Description : Mobley Residence Roof Framing: Beam 6 (Case 1, La Cantina Door Fully Closed)

### CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, ASCE 7-16  
 Load Combination Set : IBC 20185

### Material Properties

Analysis Method : Allowable Strength Design  
 Beam Bracing : Beam is Fully Braced against lateral-torsional buckling  
 Bending Axis : Major Axis Bending  
 Fy : Steel Yield : 50.0 ksi  
 E : Modulus : 29,000.0 ksi



### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight calculated and added to loading  
 Uniform Load : D = 0.0620 k/ft, Tributary Width = 1.0 ft, (La Cantina Door)  
 Varying Uniform Load : D(S,E) = 0.0720->0.210, S(S,E) = 0.10->0.350 k/ft, Extent = 0.0 --> 28.0 ft, Trib Width = 1.0 ft, (Roof Framing)

### DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	<b>0.116</b> : 1	Maximum Shear Stress Ratio =	<b>0.046</b> : 1
Section used for this span	<b>W12x120</b>	Section used for this span	<b>W12x120</b>
Ma : Applied	53.890 k-ft	Va : Applied	8.577 k
Mn / Omega : Allowable	464.072 k-ft	Vn/Omega : Allowable	186.020 k
Load Combination	+D+S+H	Load Combination	+D+S+H
Location of maximum on span	14.800ft	Location of maximum on span	28.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
<b>Maximum Deflection</b>			
Max Downward Transient Deflection	0.101 in	Ratio =	3,334 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.245 in	Ratio =	1369 >=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		Summary of Moment Values					Summary of Shear Values				
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H	Dsgn. L = 28.00 ft	1	0.068	0.026	31.69		31.69	775.00	464.07	1.00	1.00	4.84	279.03	186.02
+D+L+H	Dsgn. L = 28.00 ft	1	0.068	0.026	31.69		31.69	775.00	464.07	1.00	1.00	4.84	279.03	186.02
+D+Lr+H	Dsgn. L = 28.00 ft	1	0.068	0.026	31.69		31.69	775.00	464.07	1.00	1.00	4.84	279.03	186.02
+D+S+H	Dsgn. L = 28.00 ft	1	0.116	0.046	53.89		53.89	775.00	464.07	1.00	1.00	8.58	279.03	186.02
+D+0.750Lr+0.750L+H	Dsgn. L = 28.00 ft	1	0.068	0.026	31.69		31.69	775.00	464.07	1.00	1.00	4.84	279.03	186.02
+D+0.750L+0.750S+H	Dsgn. L = 28.00 ft	1	0.104	0.041	48.34		48.34	775.00	464.07	1.00	1.00	7.64	279.03	186.02
+D+0.60W+H	Dsgn. L = 28.00 ft	1	0.068	0.026	31.69		31.69	775.00	464.07	1.00	1.00	4.84	279.03	186.02
+D+0.70E+H	Dsgn. L = 28.00 ft	1	0.068	0.026	31.69		31.69	775.00	464.07	1.00	1.00	4.84	279.03	186.02
+D+0.750Lr+0.750L+0.450W+H	Dsgn. L = 28.00 ft	1	0.068	0.026	31.69		31.69	775.00	464.07	1.00	1.00	4.84	279.03	186.02
+D+0.750L+0.750S+0.450W+H	Dsgn. L = 28.00 ft	1	0.104	0.041	48.34		48.34	775.00	464.07	1.00	1.00	7.64	279.03	186.02
+D+0.750L+0.750S+0.5250E+H	Dsgn. L = 28.00 ft	1	0.104	0.041	48.34		48.34	775.00	464.07	1.00	1.00	7.64	279.03	186.02
+0.60D+0.60W+0.60H	Dsgn. L = 28.00 ft	1	0.041	0.016	19.02		19.02	775.00	464.07	1.00	1.00	4.84	279.03	186.02

Title Block Line 1  
 You can change this area  
 using the "Settings" menu item  
 and then using the "Printing &  
 Title Block" selection.  
 Title Block Line 6

Project Title:  
 Engineer:  
 Project Descr:

Project ID:

Printed: 27 APR 2023, 11:51AM

**Steel Beam**

File = M:\Gallagher Construction\22050.01 Mobley Residence\Calc\Calculations.ec6  
 ENERCALC, INC. 1983-2017, Build:10.17.7.24, Ver:10.17.7.24

Lic. # : KW-06016450

Licensee : QUANTUM CONSULTING ENGINEERS

Description : Mobley Residence Roof Framing: Beam 6 (Case 1, La Cantina Door Fully Closed)

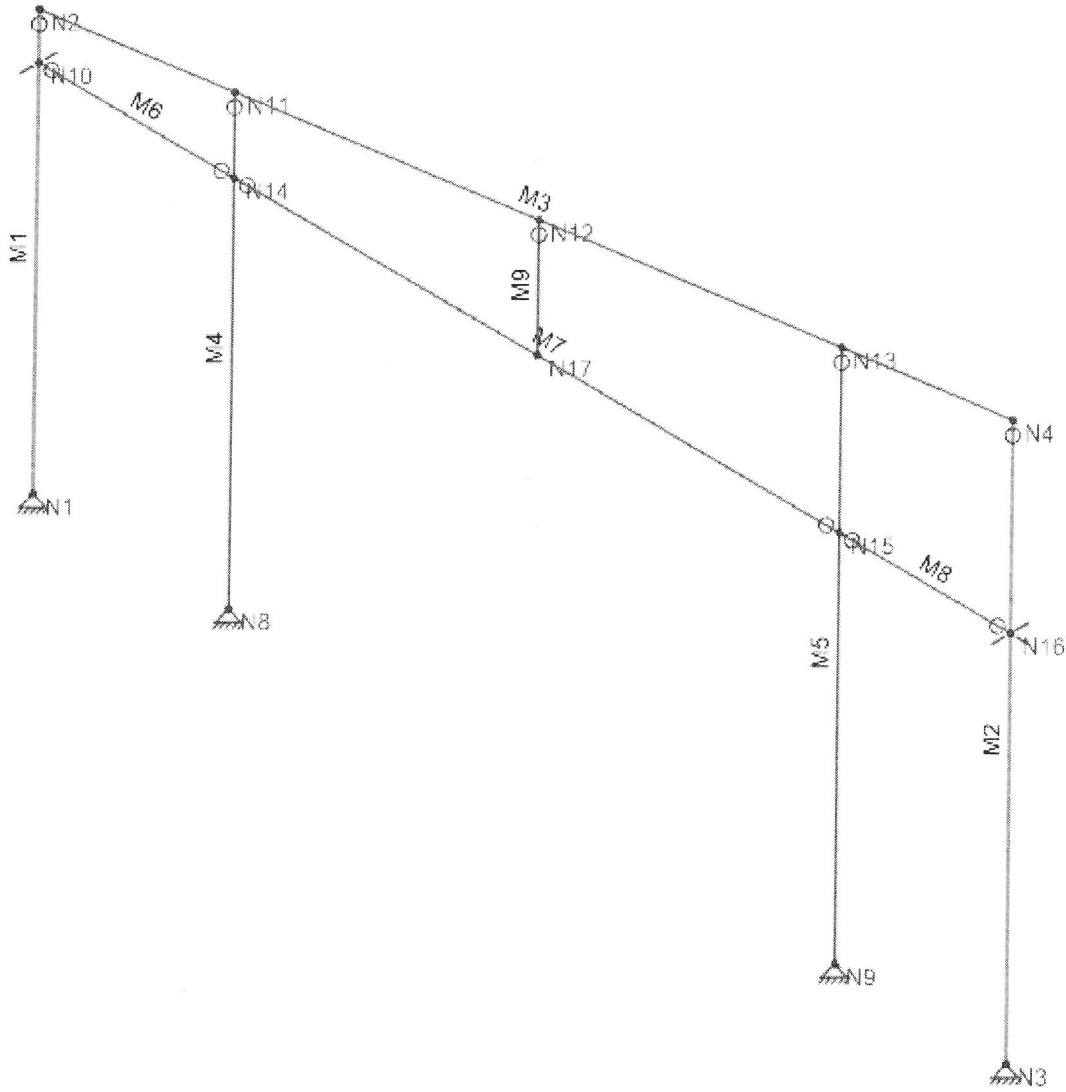
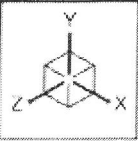
Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+0.60D+0.70E+0.60H	Dsgn. L = 28.00 ft	1	0.041	0.016	19.02		19.02	775.00	464.07	1.00	1.00	2.91	279.03	186.02

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S+H	1	0.2454	14.240		0.0000	0.000

**Vertical Reactions**

Load Combination	Support 1	Support 2
Overall MAXimum	6.767	8.577
Overall MINimum	2.520	2.906
+D+H	4.200	4.844
+D+L+H	4.200	4.844
+D+Lr+H	4.200	4.844
+D+S+H	6.767	8.577
+D+0.750Lr+0.750L+H	4.200	4.844
+D+0.750L+0.750S+H	6.125	7.644
+D+0.60W+H	4.200	4.844
+D+0.70E+H	4.200	4.844
+D+0.750Lr+0.750L+0.450W+H	4.200	4.844
+D+0.750L+0.750S+0.450W+H	6.125	7.644
+D+0.750L+0.750S+0.5250E+H	6.125	7.644
+0.60D+0.60W+0.60H	2.520	2.906
+0.60D+0.70E+0.60H	2.520	2.906
D Only	4.200	4.844
Lr Only		
L Only		
S Only	2.567	3.733
W Only		
E Only		
H Only		

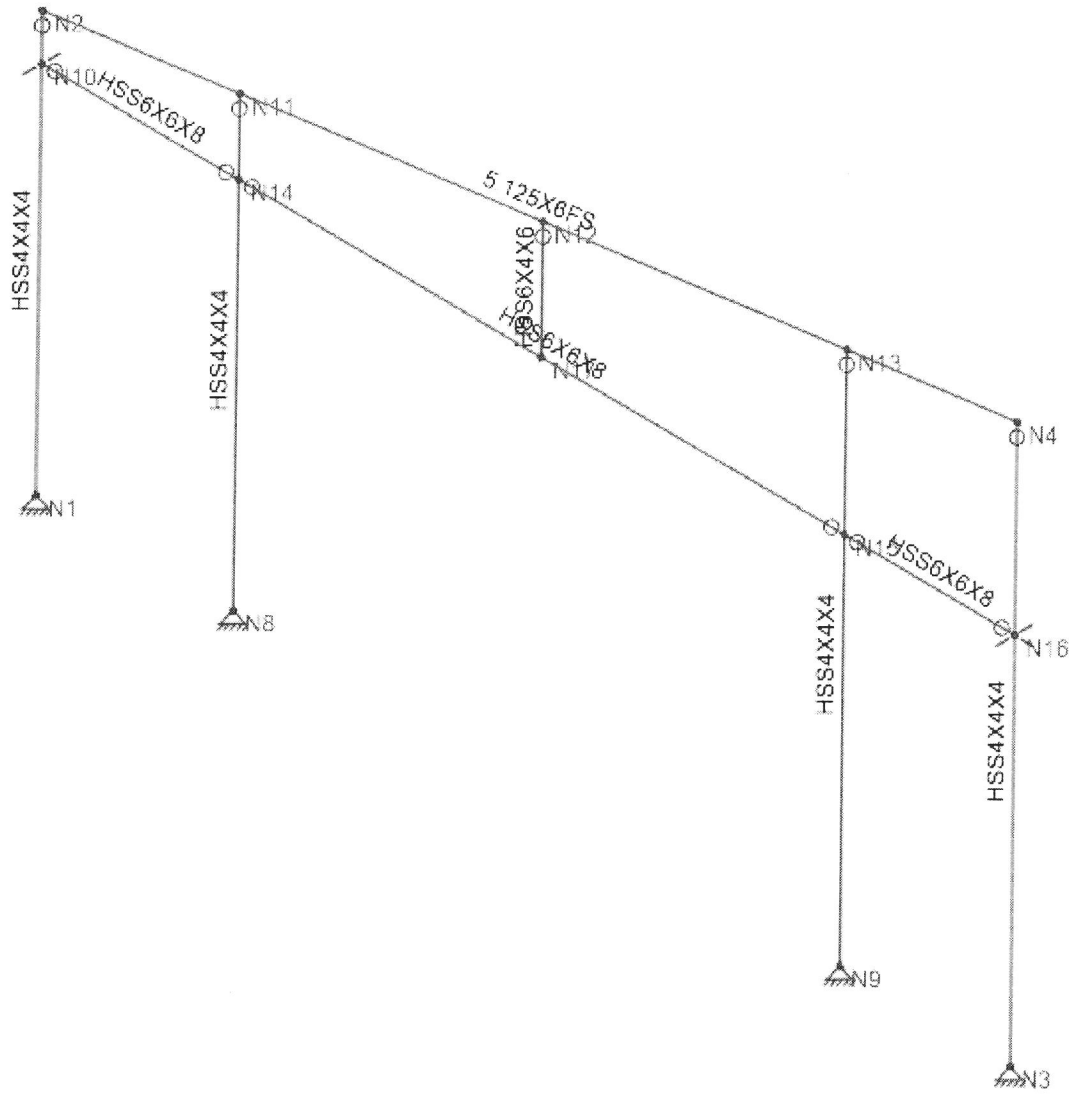
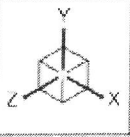


Envelope Only Solution

Quantum  
FRU  
22050.01

Clerestory Framing at Gridline B

SK-1  
Apr 27, 2023  
Clerestory at Grid B.r3d



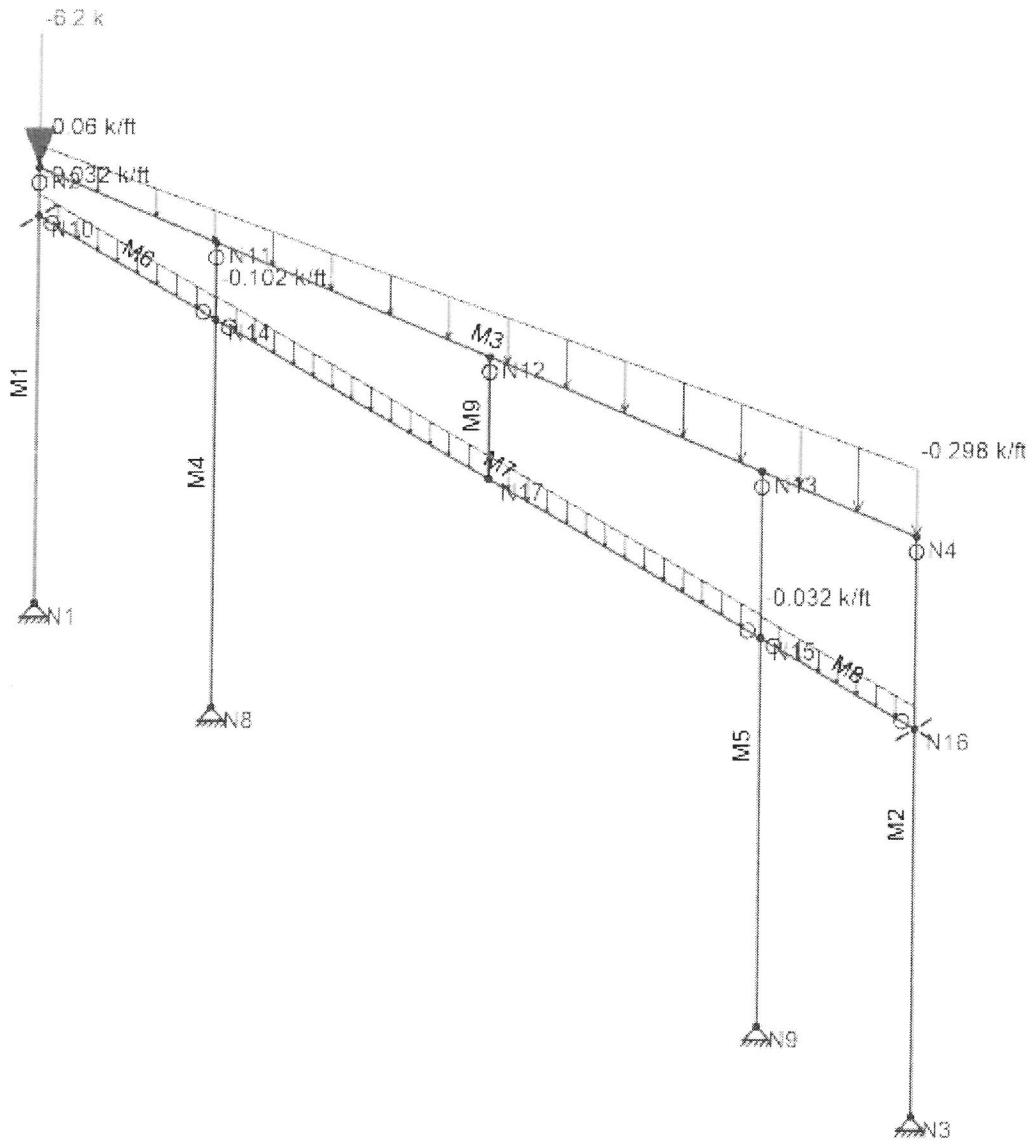
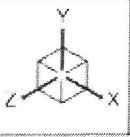
Envelope Only Solution

Quantum
FRU
22050.01

Clerestory Framing at Gridline B

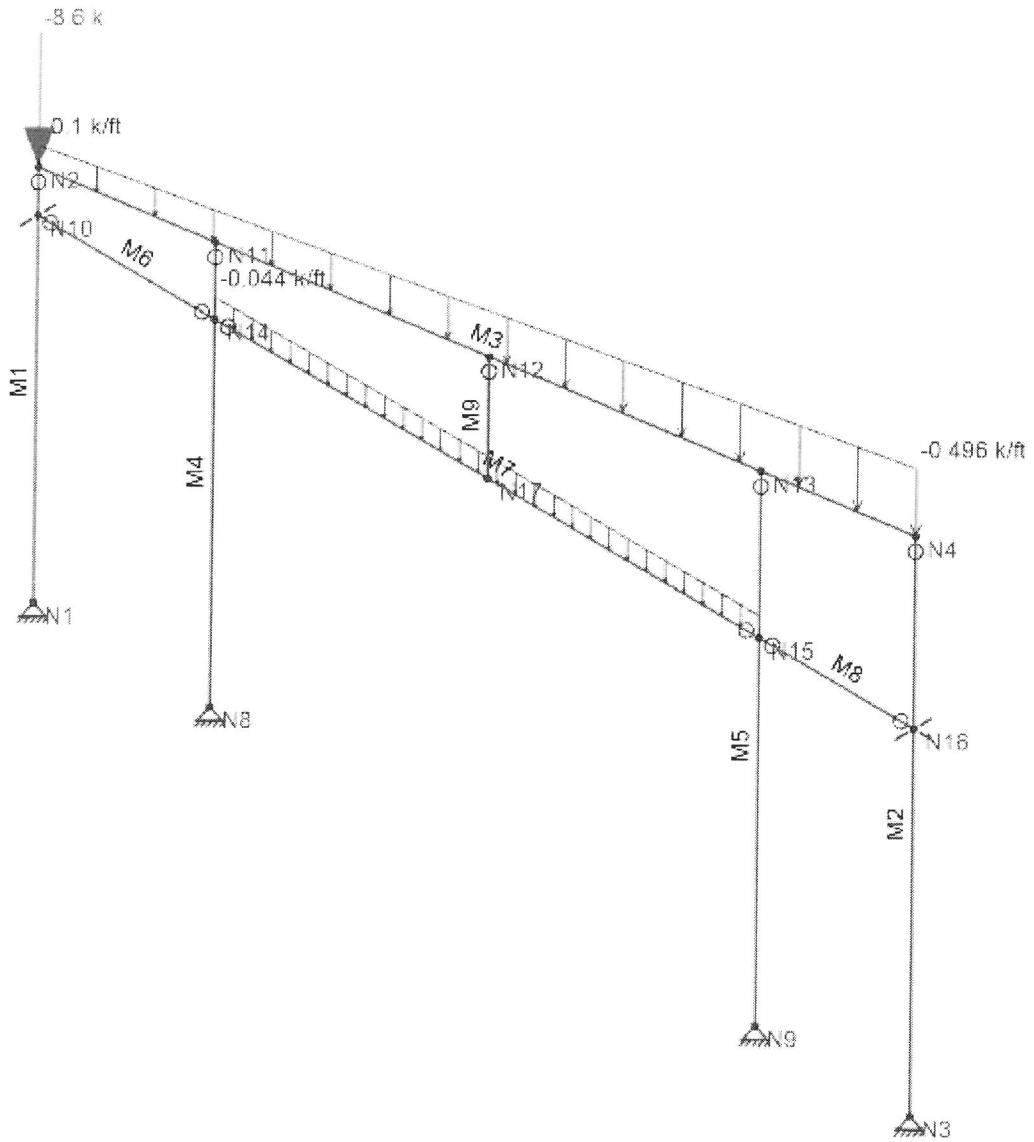
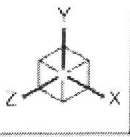
SK-2
Apr 27, 2023
Clerestory at Grid B.r3d





Loads: BLC 2, Dead Load  
Envelope Only Solution

Quantum	Clerestorey Framing at Gridline B	SK-3
FRU		Apr 27, 2023
22050.01		Clerestorey at Grid B.r3d

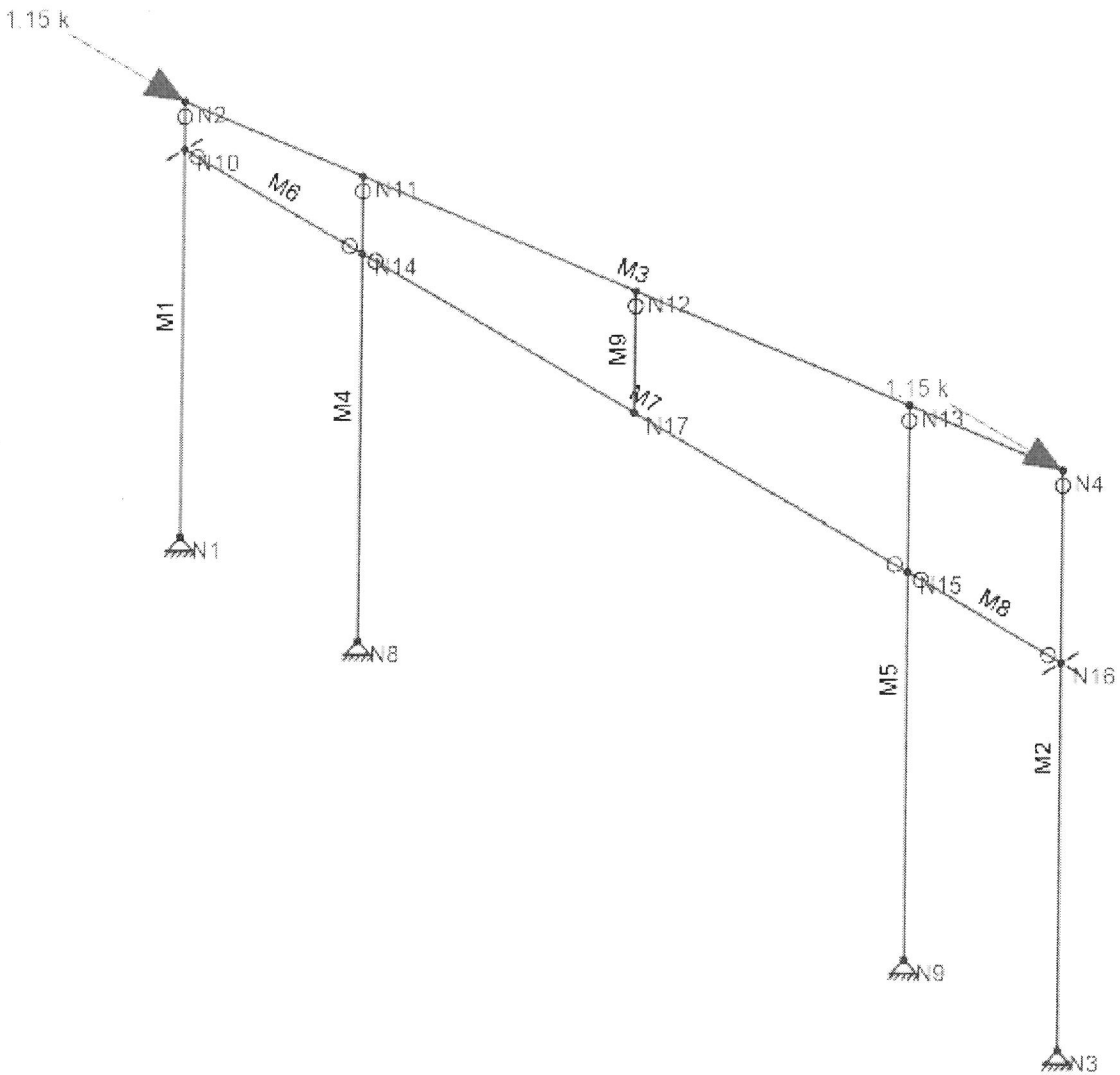
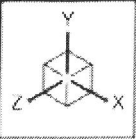


Loads: BLC 3, Snow Load  
Envelope Only Solution

Quantum  
FRU  
22050.01

Clerestory Framing at Gridline B

SK-4  
Apr 27, 2023  
Clerestory at Grid B.r3d



Loads: BLC 4, Wind Load X  
Envelope Only Solution

Quantum

FRU

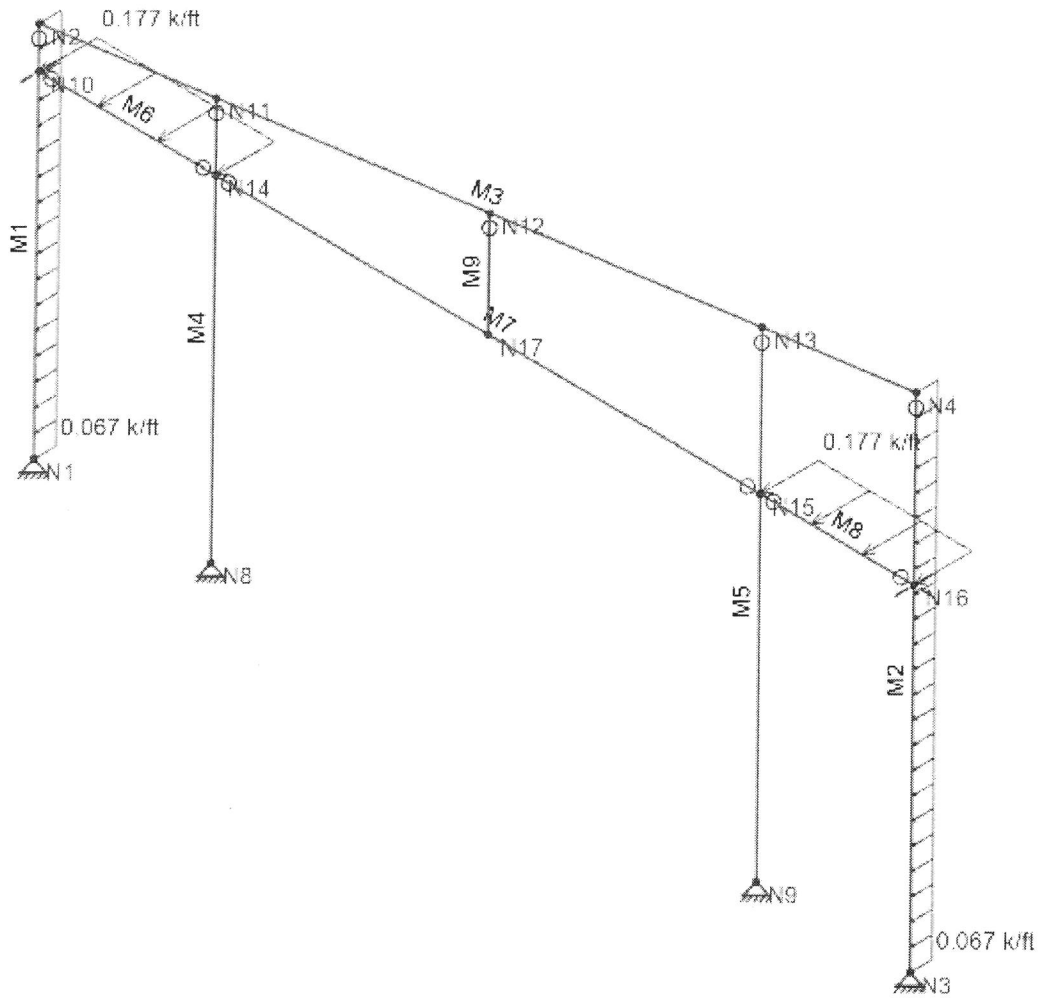
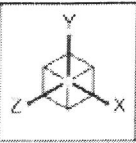
22050.01

Clerestory Framing at Gridline B

SK-5

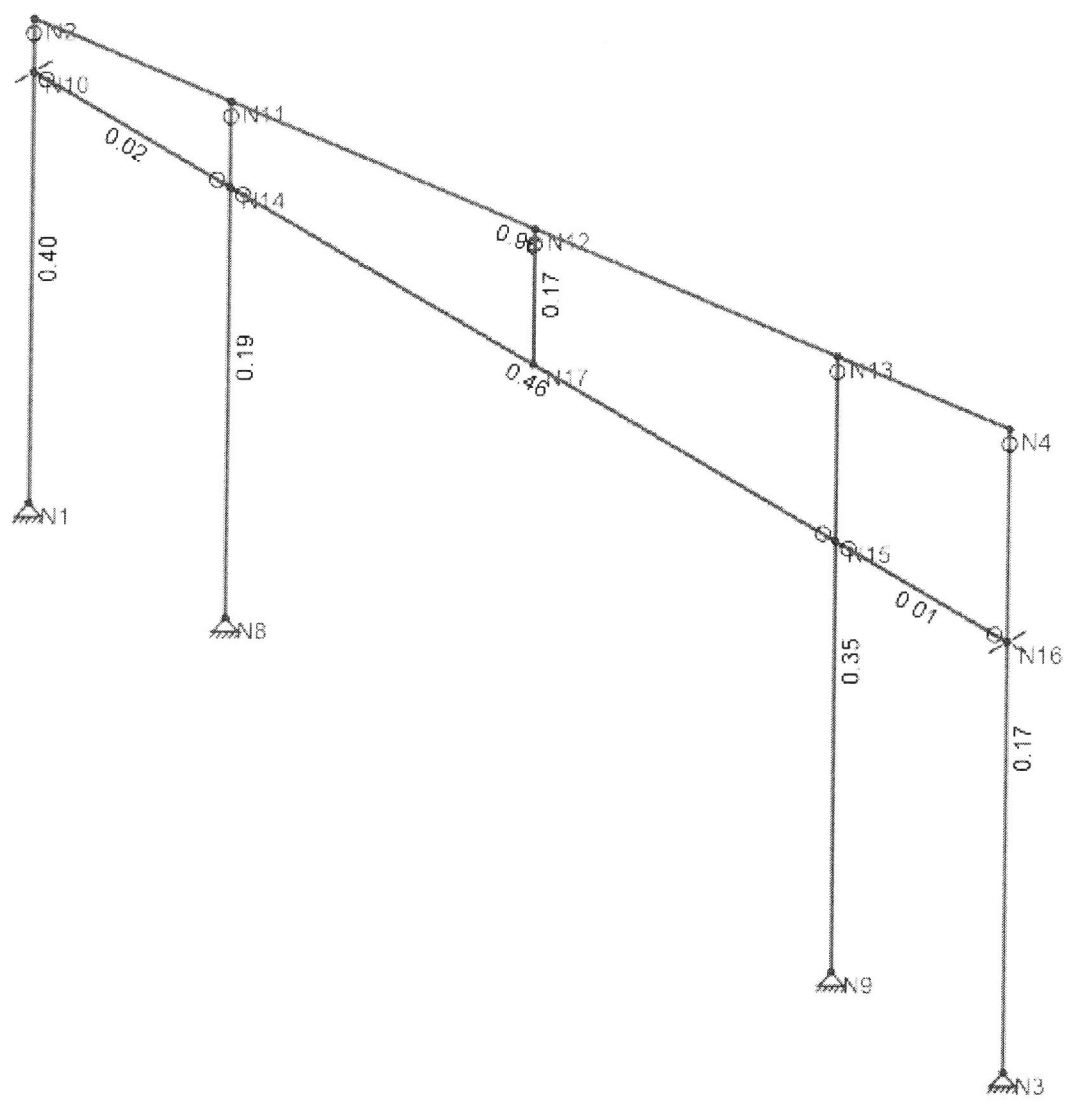
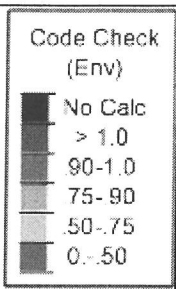
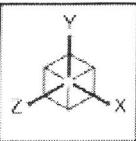
Apr 27, 2023

Clerestory at Grid B.r3d



Loads: BLC 5, Wind Load Z  
Envelope Only Solution

Quantum	Clerestory Framing at Gridline B	SK-6
FRU		Apr 27, 2023
22050.01		Clerestory at Grid B.r3d



Member Code Checks Displayed (Enveloped)  
Envelope Only Solution

Quantum
FRU
22050.01

Clerestory Framing at Gridline B

SK-7
Apr 27, 2023
Clerestory at Grid B.r3d

**Node Coordinates**

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	0	0	
2	N2	0	12.08	0	
3	N3	28.41	0	0	
4	N4	28.41	16.08	0	
5	N11	5.75	12.889574	0	
6	N12	14.58	14.132798	0	
7	N13	23.41	15.376023	0	
8	N8	5.75	0	0	
9	N9	23.41	0	0	
10	N10	0	10.75	0	
11	N14	5.75	10.75	0	
12	N15	23.41	10.75	0	
13	N16	28.41	10.75	0	
14	N17	14.58	10.75	0	

**Node Boundary Conditions**

	Node Label	X [k/in]	Y [k/in]	Z [k/in]
1	N1	Reaction	Reaction	Reaction
2	N8	Reaction	Reaction	Reaction
3	N9	Reaction	Reaction	Reaction
4	N3	Reaction	Reaction	Reaction
5	N16	Reaction		Reaction
6	N10			Reaction

**Hot Rolled Steel Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	I <sub>yy</sub> [in <sup>4</sup> ]	I <sub>zz</sub> [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	Clerestory Beam 4	HSS6X6X8	Beam	Tube	A500 Gr.B RECT	Typical	9.74	48.3	48.3	81.1
2	Column 1	HSS4X4X4	Column	Tube	A500 Gr.B RECT	Typical	3.37	7.8	7.8	12.8
3	Column 2	HSS6X4X6	Column	Tube	A500 Gr.B RECT	Typical	6.18	14.9	28.3	32.8

**Cold Formed Steel Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	I <sub>yy</sub> [in <sup>4</sup> ]	I <sub>zz</sub> [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	CF1	8CU1.25X057	Beam	CU	A653 SS Gr33	Typical	0.581	0.057	4.41	0.00063

**Wood Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	I <sub>yy</sub> [in <sup>4</sup> ]	I <sub>zz</sub> [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	Roof Beam 3	5.125X6FS	Beam	Glulam Western	24F-1.8E DF Balanced	Typical	30.75	67.306	92.25	130.774

**Concrete Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	I <sub>yy</sub> [in <sup>4</sup> ]	I <sub>zz</sub> [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	CONC1	CRECT12X8	Beam	Rectangular	Conc3000NW	Typical	96	512	1152	1187.84

**Aluminum Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	I <sub>yy</sub> [in <sup>4</sup> ]	I <sub>zz</sub> [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	AL1	AAI3X1.64	Beam	None	3003-H14	Typical	1.39	0.522	2.24	0.019



Company : Quantum  
 Designer : FRU  
 Job Number : 22050.01  
 Model Name : Clerestory Framing at Gridline B

4/27/2023  
 8:47:51 AM  
 Checked By : \_\_\_\_\_

**Stainless Steel Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	Iyy [in <sup>4</sup> ]	Izz [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	SS1	W10X33 SS	Beam	None	A276 S316	Typical	9.71	36.6	171	0.583

**General Section Sets**

	Label	Shape	Type	Material	Area [in <sup>2</sup> ]	Iyy [in <sup>4</sup> ]	Izz [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	GEN1	RE4X4	Beam	gen Conc3NW	16	21.333	21.333	31.573
2	RIGID		None	RIGID	1e+6	1e+6	1e+6	1e+6

**Member Primary Data**

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N2	Column 1	Column	Tube	A500 Gr.B RECT	Typical
2	M2	N3	N4	Column 1	Column	Tube	A500 Gr.B RECT	Typical
3	M3	N2	N4	Roof Beam 3	Beam	Glulam Western	24F-1.8E DF Balanced	Typical
4	M4	N8	N11	Column 1	Column	Tube	A500 Gr.B RECT	Typical
5	M5	N9	N13	Column 1	Column	Tube	A500 Gr.B RECT	Typical
6	M6	N10	N14	Clerestory Beam 4	Beam	Tube	A500 Gr.B RECT	Typical
7	M7	N14	N15	Clerestory Beam 4	Beam	Tube	A500 Gr.B RECT	Typical
8	M8	N15	N16	Clerestory Beam 4	Beam	Tube	A500 Gr.B RECT	Typical
9	M9	N17	N12	Column 2	Column	Tube	A500 Gr.B RECT	Typical

**Member Advanced Data**

	Label	I Release	J Release	Physical	Deflection Ratio Options	Seismic DR
1	M1		BenPIN	Yes	** NA **	None
2	M2		BenPIN	Yes	** NA **	None
3	M3			Yes	Default	None
4	M4		BenPIN	Yes	** NA **	None
5	M5		BenPIN	Yes	** NA **	None
6	M6	BenPIN	BenPIN	Yes	Default	None
7	M7	BenPIN	BenPIN	Yes	Default	None
8	M8	BenPIN	BenPIN	Yes	Default	None
9	M9		BenPIN	Yes	** NA **	None

**Member Point Loads (BLC 2 : Dead Load)**

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	-6.2	%100

**Member Point Loads (BLC 3 : Snow Load)**

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	-8.6	%100

**Member Point Loads (BLC 4 : Wind Load X)**

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	X	1.15	%100
2	M2	X	1.15	%100



**Member Distributed Loads (BLC 2 : Dead Load)**

Member	Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M3	Y	-0.06	-0.298	0	%100
2	M6	Y	-0.032	-0.032	0	%100
3	M7	Y	-0.032	-0.032	0	%100
4	M8	Y	-0.032	-0.032	0	%100
5	M7	Y	-0.07	-0.07	0	%100

**Member Distributed Loads (BLC 3 : Snow Load)**

Member	Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M3	Y	-0.1	-0.496	0	%100
2	M7	Y	-0.044	-0.044	0	%100

**Member Distributed Loads (BLC 5 : Wind Load Z)**

Member	Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Z	0.067	0.067	0	%100
2	M2	Z	0.067	0.067	0	%100
3	M8	Z	0.177	0.177	0	%100
4	M6	Z	0.177	0.177	0	%100

**Basic Load Cases**

	BLC Description	Category	Y Gravity	Point	Distributed
1	Self Weight	DL	-1		
2	Dead Load	DL		1	5
3	Snow Load	SL		1	2
4	Wind Load X	WLX		2	
5	Wind Load Z	WLZ			4

**Load Combinations**

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1										
2	Deflection 2	Yes	Y	LL	1										
3	Deflection 3	Yes	Y	DL	1	LL	1								
4	IBC 16-8	Yes	Y	DL	1										
5	IBC 16-10 (b)	Yes	Y	DL	1	SL	1	SLN	1						
6	IBC 16-12 (a) (a)	Yes	Y	DL	1	WLX	0.6								
7	IBC 16-12 (a) (b)	Yes	Y	DL	1	WLZ	0.6								
8	IBC 16-13 (b) (a)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
9	IBC 16-13 (b) (b)	Yes	Y	DL	1	WLZ	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
10	IBC 16-15 (a)	Yes	Y	DL	0.6	WLX	0.6								
11	IBC 16-15 (b)	Yes	Y	DL	0.6	WLZ	0.6								

**Load Combination Design**

	Description	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
1	Deflection 1		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Deflection 2		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Deflection 3		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	IBC 16-8	0.9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	IBC 16-10 (b)	1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	IBC 16-12 (a) (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes





**Load Combination Design (Continued)**

	Description	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
7	IBC 16-12 (a) (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	IBC 16-13 (b) (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	IBC 16-13 (b) (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	IBC 16-15 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	IBC 16-15 (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Envelope Node Reactions**

Node Label		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC	
1	N1	max	0.041	10	14.985	5	0	10	0	11	0	11	0	11
2		min	-0.091	5	0	2	-0.11	11	0	1	0	1	0	1
3	N8	max	0.023	10	7.067	5	0	10	0	11	0	11	0	11
4		min	-0.056	5	0	2	-0.073	11	0	1	0	1	0	1
5	N9	max	0.01	10	10.415	5	0	10	0	11	0	11	0	11
6		min	-0.022	5	0	2	-0.071	11	0	1	0	1	0	1
7	N3	max	0.008	10	0.94	5	0	10	0	11	0	11	0	11
8		min	-0.02	5	0	2	-0.073	11	0	1	0	1	0	1
9	N16	max	0.189	5	0	11	0	10	0	11	0	11	0	11
10		min	-1.461	10	0	1	-1.067	7	0	1	0	1	0	1
11	N10	max	0	11	0	11	0	10	0	11	0	11	0	11
12		min	0	1	0	1	-0.915	7	0	1	0	1	0	1
13	Totals:	max	0	5	33.407	5	0	10						
14		min	-1.38	10	0	2	-2.274	7						

**Envelope Node Displacements**

Node Label		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC	
1	N1	max	0	5	0	2	0	11	4.365e-5	11	0	10	6.068e-4	10
2		min	0	10	0	5	0	1	-1.796e-4	9	-1.21e-2	7	-1.374e-3	5
3	N2	max	0.024	10	0	2	0.03	7	2.027e-4	9	0	10	2.732e-3	5
4		min	-0.051	5	-0.028	5	0	1	-3.48e-4	11	-1.21e-2	7	0	2
5	N3	max	0	5	0	2	0	11	0	10	8.752e-3	7	1.263e-4	10
6		min	0	10	0	5	0	1	-6.659e-4	9	0	1	-2.986e-4	5
7	N4	max	0.024	10	0	2	0.334	7	0	10	8.752e-3	7	0	2
8		min	-0.058	5	-0.002	5	0	1	-3.148e-3	7	0	1	-1.11e-3	5
9	N11	max	0.023	10	0	2	0.744	7	0	10	0	10	0	2
10		min	-0.054	5	-0.013	5	0	1	-1.034e-3	11	-6.997e-3	7	-6.491e-3	5
11	N12	max	0.084	8	0	2	0.949	7	0	10	0	10	0	2
12		min	0	2	-0.858	5	0	1	-1.926e-3	11	-3.881e-4	9	-1.18e-3	5
13	N13	max	0.024	10	0	2	0.811	7	0	10	5.02e-3	7	6.935e-3	5
14		min	-0.055	5	-0.022	5	0	1	-2.633e-3	11	0	1	0	2
15	N8	max	0	5	0	2	0	11	6.794e-3	7	0	10	3.368e-4	10
16		min	0	10	0	5	0	1	0	1	-6.997e-3	7	-8.525e-4	5
17	N9	max	0	5	0	2	0	11	7.539e-3	7	5.02e-3	7	1.458e-4	10
18		min	0	10	0	5	0	1	0	1	0	1	-3.403e-4	5
19	N10	max	0.001	10	0	2	0	7	1.74e-3	7	0	10	2.781e-3	5
20		min	-0.001	5	-0.025	5	0	1	0	1	-1.21e-2	7	-1.253e-3	10
21	N14	max	0.001	10	0	2	0.692	7	2.501e-3	7	0	10	1.728e-3	5
22		min	-0.001	5	-0.012	5	0	1	0	1	-6.997e-3	7	-7.069e-4	10
23	N15	max	0	10	0	2	0.77	7	2.819e-3	7	5.02e-3	7	6.851e-4	5
24		min	0	5	-0.017	5	0	1	0	1	0	1	-3.021e-4	10
25	N16	max	0	10	0	2	0	7	2.935e-3	7	8.752e-3	7	6.005e-4	5
26		min	0	5	-0.001	5	0	1	0	1	0	1	-2.54e-4	10
27	N17	max	0.001	10	0	2	0.788	7	3.436e-3	7	0	10	0	2
28		min	0	5	-0.857	5	0	1	0	1	-3.881e-4	9	-8.954e-4	8



**Envelope AISC 15TH (360-16): ASD Member Steel Code Checks**

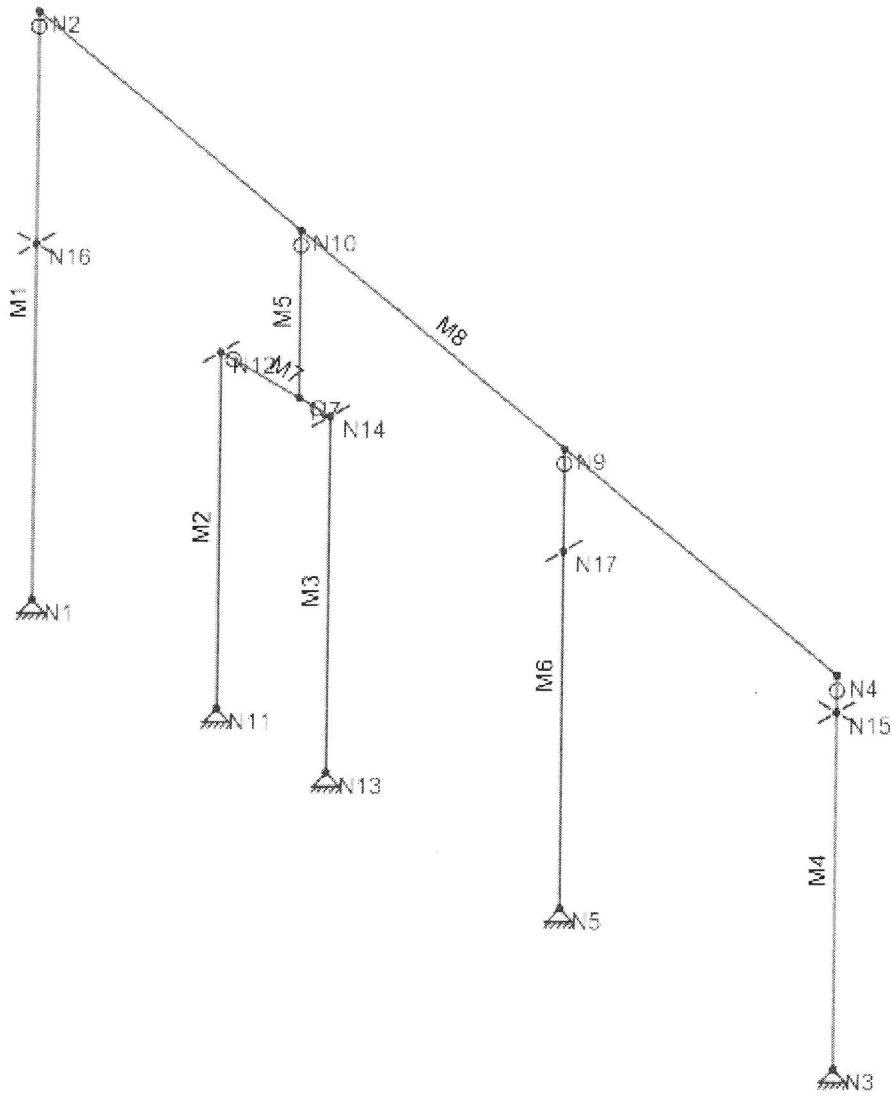
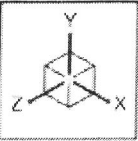
Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn	
1	M1	HSS4X4X4	0.403	10.696	9	0.029	12.08	y	5	50.401	92.826	10.765	10.765	1.534	H1-1a
2	M2	HSS4X4X4	0.17	10.888	7	0.017	10.888	z	7	31.488	92.826	10.765	10.765	1.405	H1-1b
3	M4	HSS4X4X4	0.188	10.741	9	0.015	12.89	z	7	46.313	92.826	10.765	10.765	1.471	H1-1b
4	M5	HSS4X4X4	0.353	10.731	9	0.014	15.376	z	7	34.437	92.826	10.765	10.765	1.399	H1-1a
5	M6	HSS6X6X8	0.017	2.875	7	0.025	5.75	z	7	251.508	268.287	45.449	45.449	1.136	H1-1b
6	M7	HSS6X6X8	0.461	8.83	5	0.05	17.66	y	9	145.89	268.287	45.449	45.449	1.28	H1-1b
7	M8	HSS6X6X8	0.012	2.5	7	0.007	5	z	7	255.501	268.287	45.449	45.449	1.136	H1-1b
8	M9	HSS6X4X6	0.175	0	8	0.024	3.383	y	8	162.578	170.228	20.521	27.315	1.667	H1-1b

**Envelope AWC NDS-18: ASD Member Wood Code Checks**

Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Fc' [ksi]	Ft' [ksi]	Fb1' [ksi]	Fb2' [ksi]	Fv' [ksi]	RB	CL	CP	Eqn	
1	M3	5.125X6FS	0.962	23.61	5	0.581	23.61	y	5	1.647	1.265	2.758	1.667	0.305	2.341	0.999	0.895	3.9-1

**Material Take-Off**

	Material	Size	Pieces	Length[ft]	Weight[K]
1	Hot Rolled Steel				
2	A500 Gr.B RECT	HSS4X4X4	4	56.4	0.696
3	A500 Gr.B RECT	HSS6X6X8	3	28.4	1.013
4	A500 Gr.B RECT	HSS6X4X6	1	3.4	0.077
5	Total HR Steel		8	88.2	1.785
6					
7	Wood				
8	24F-1.8E DF Balanced	5.125X6FS	1	28.7	0.214
9	Total Wood		1	28.7	0.214

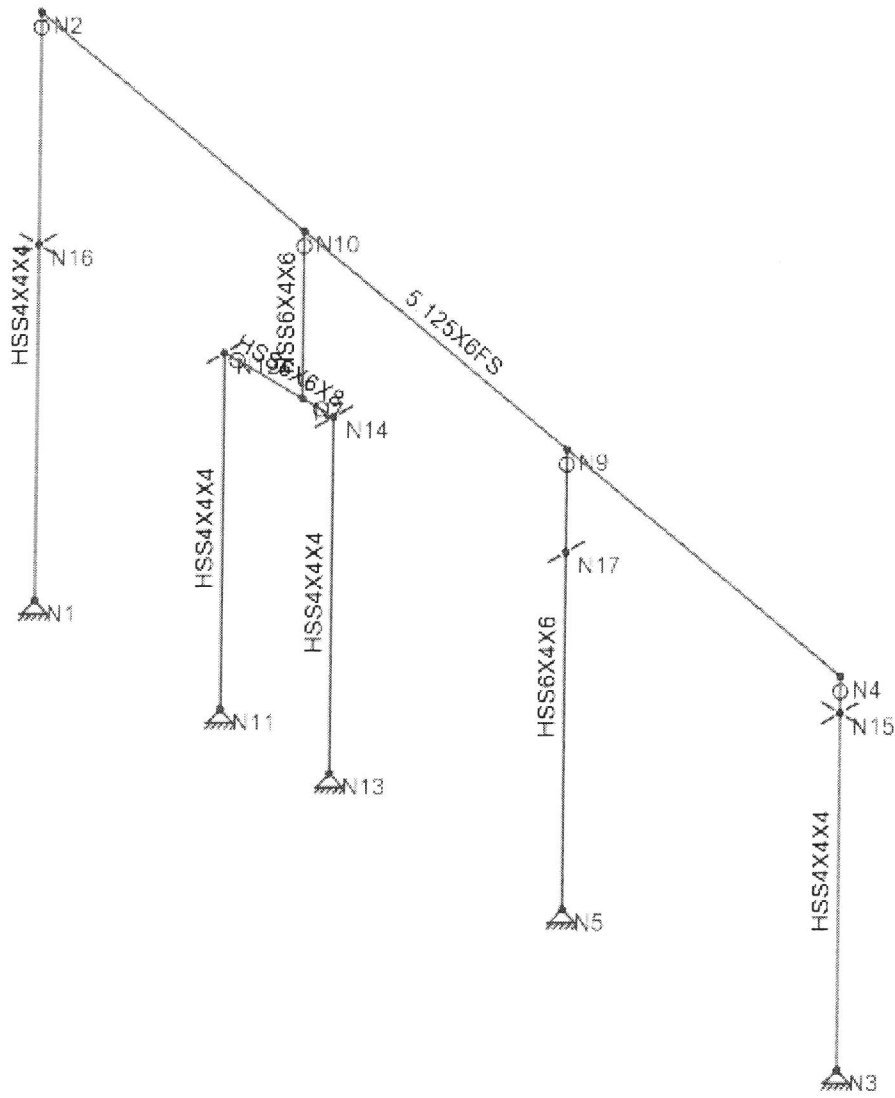
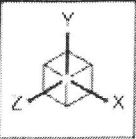


Envelope Only Solution

Quantum  
FRU

Mobley - Clerestory at Grid 2

SK-8  
Apr 27, 2023  
Clerestory at Grid 2.r3d

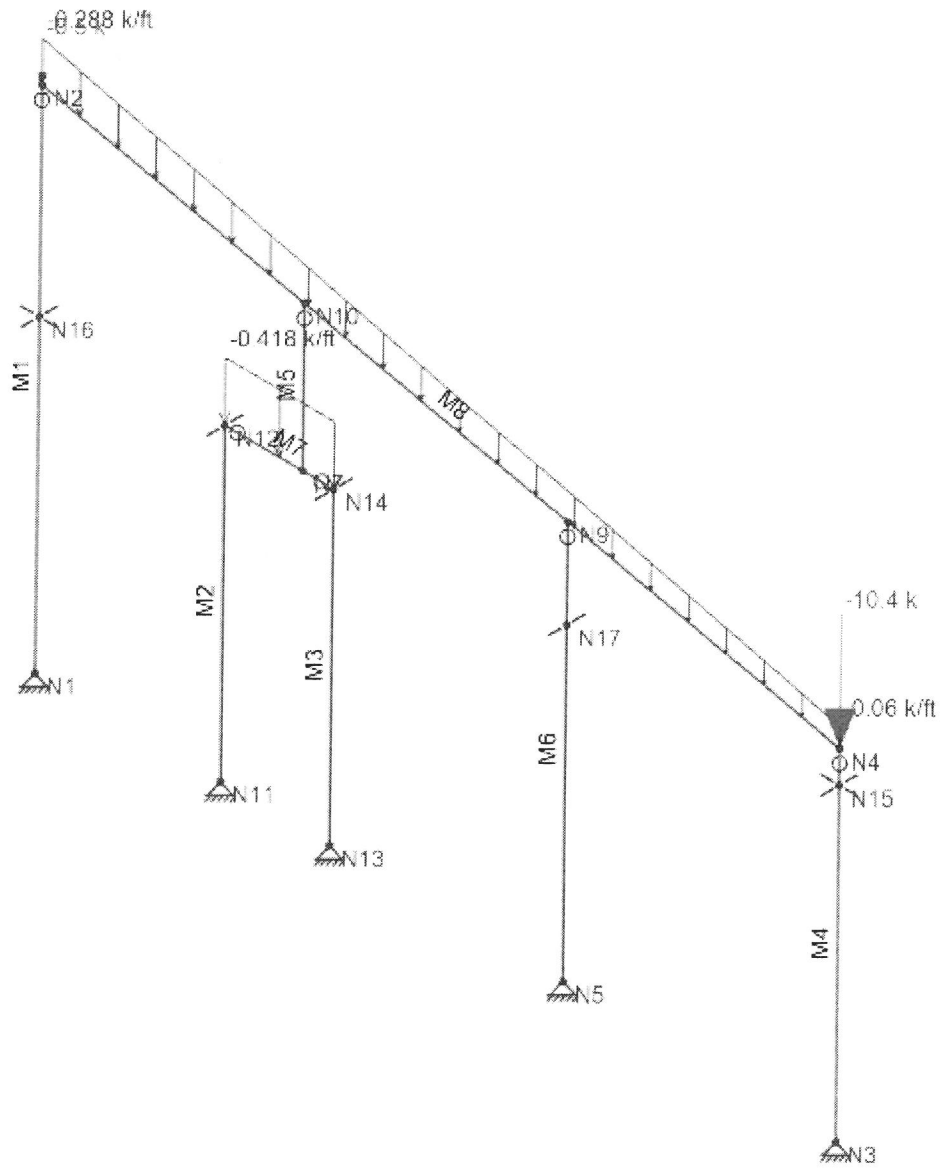
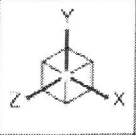


Envelope Only Solution

Quantum
FRU

Mobley - Clerestory at Grid 2

SK-9
Apr 27, 2023
Clerestory at Grid 2.r3d

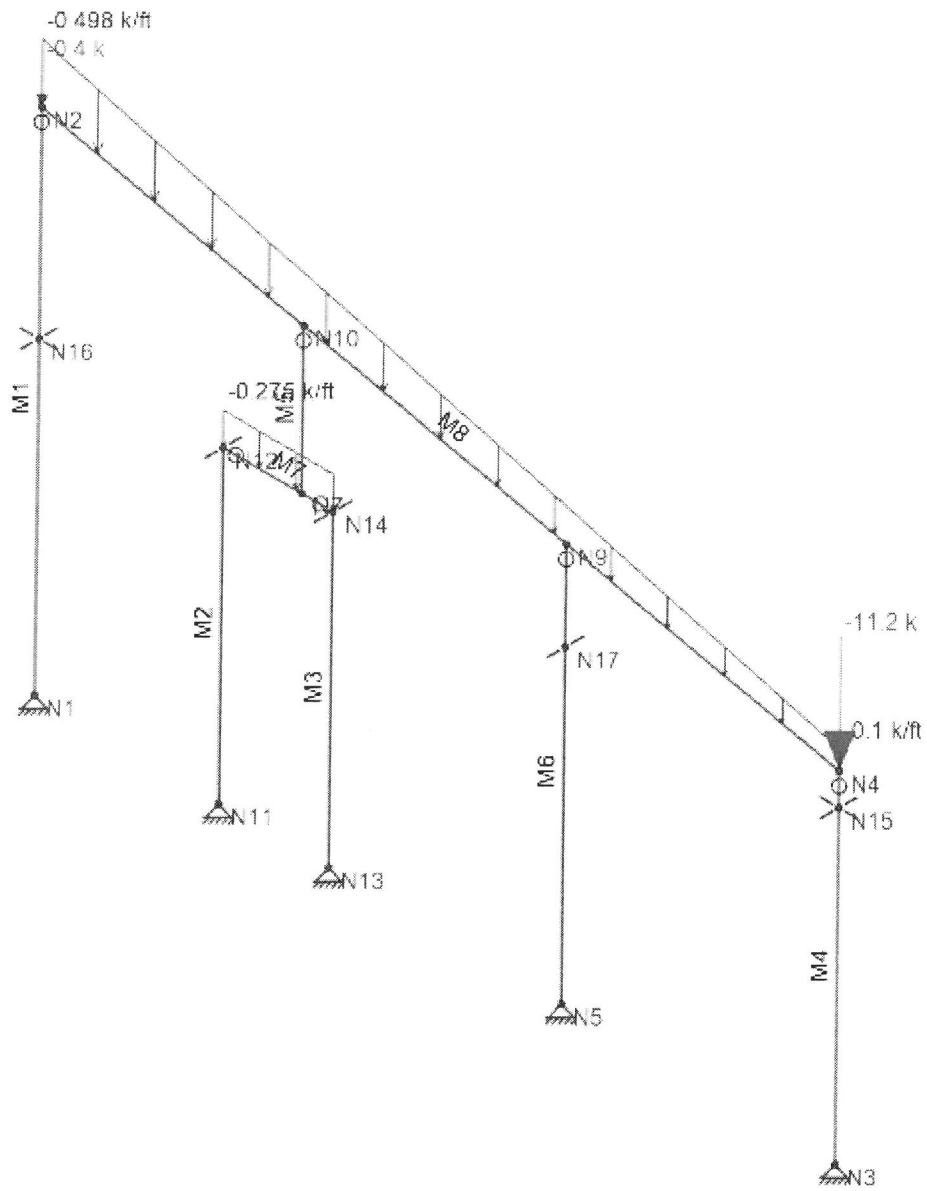
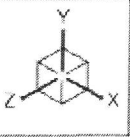


Loads: BLC 2, Dead Load  
Envelope Only Solution

Quantum
FRU

Mobley - Clerestory at Grid 2

SK-10
Apr 27, 2023
Clerestory at Grid 2.r3d

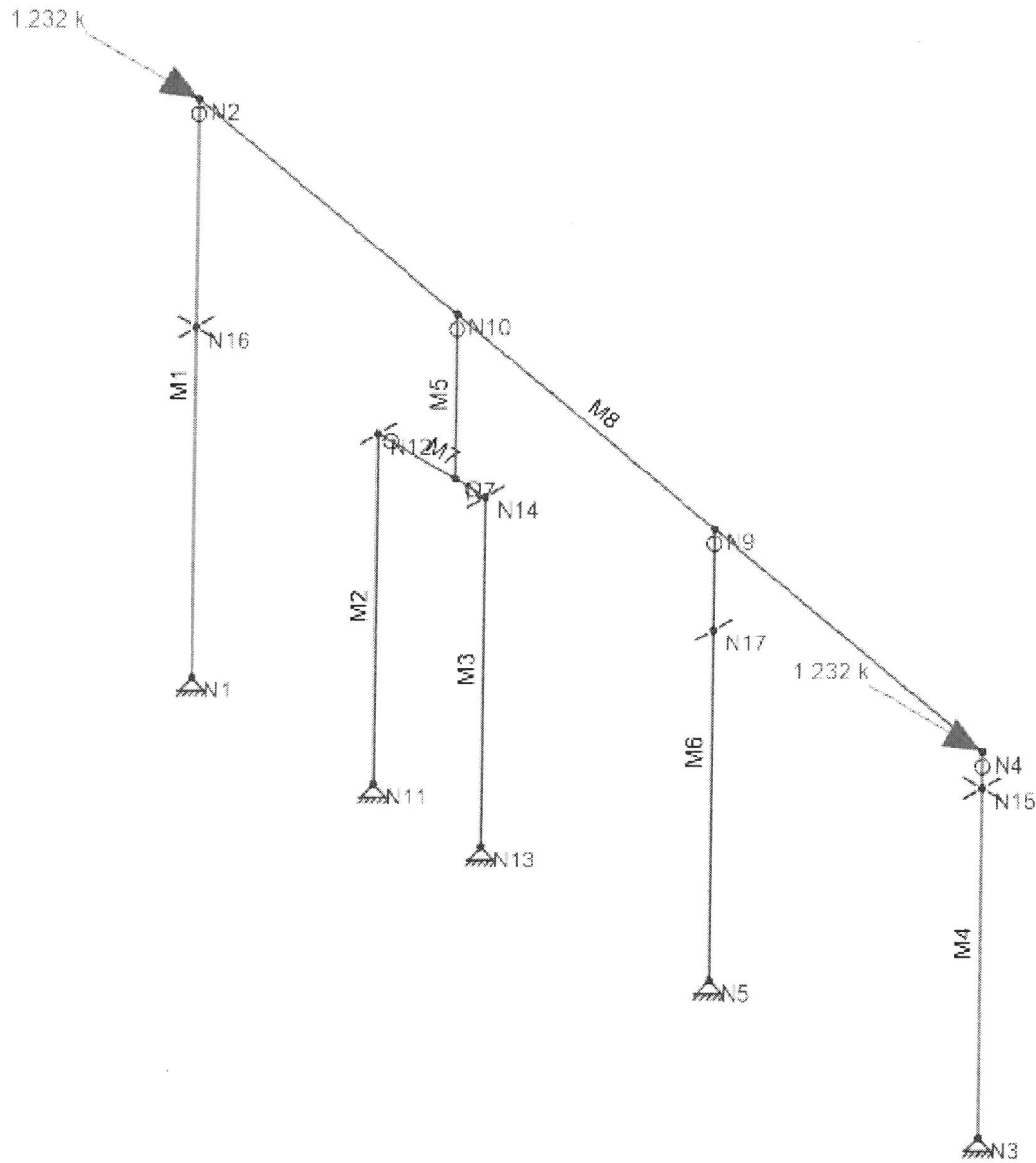
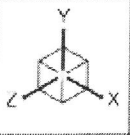


Loads: BLC 3, Snow Load  
Envelope Only Solution

Quantum
FRU

Mobley - Clerestory at Grid 2

SK-11
Apr 27, 2023
Clerestory at Grid 2.r3d

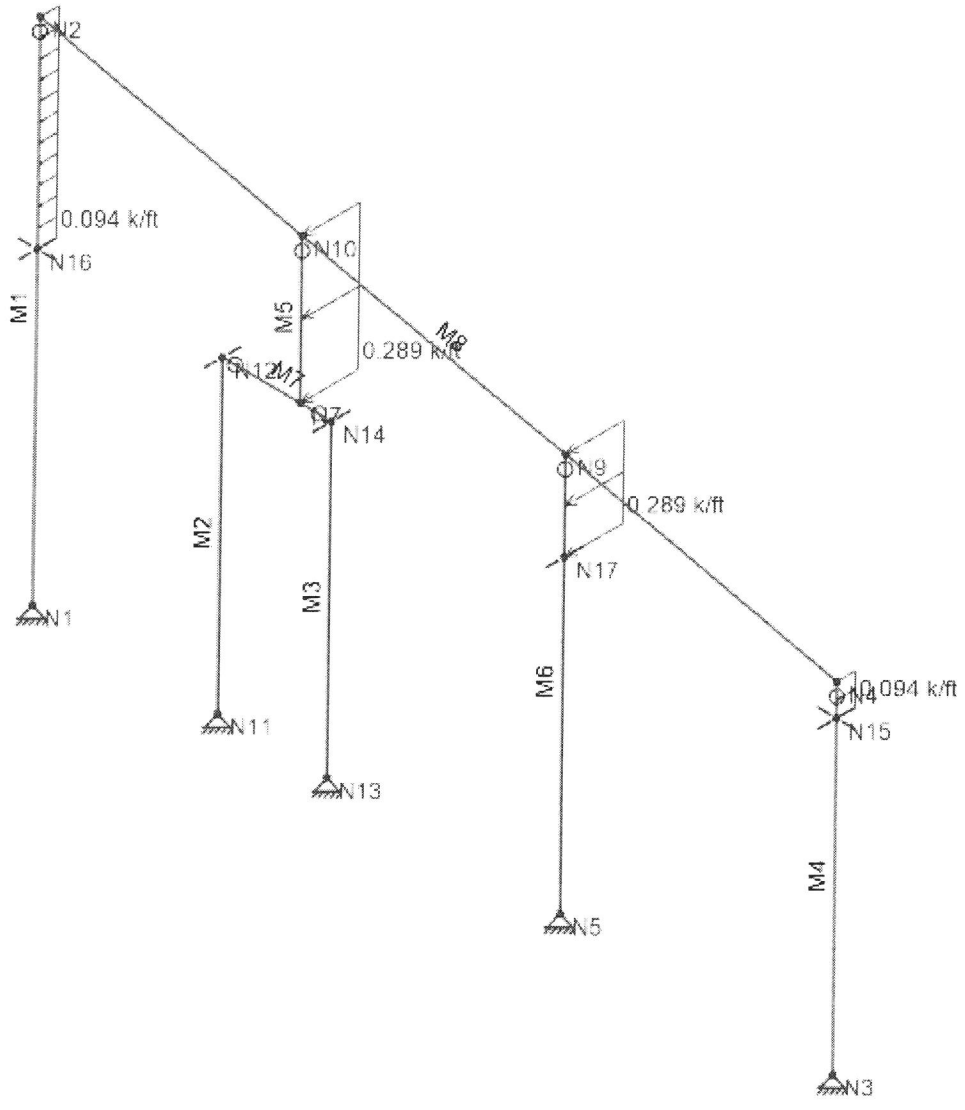
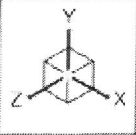


Loads: BLC 4, Wind Load X  
Envelope Only Solution

Quantum
FRU

Mobley - Clerestory at Grid 2

SK-12
Apr 27, 2023
Clerestory at Grid 2.r3d



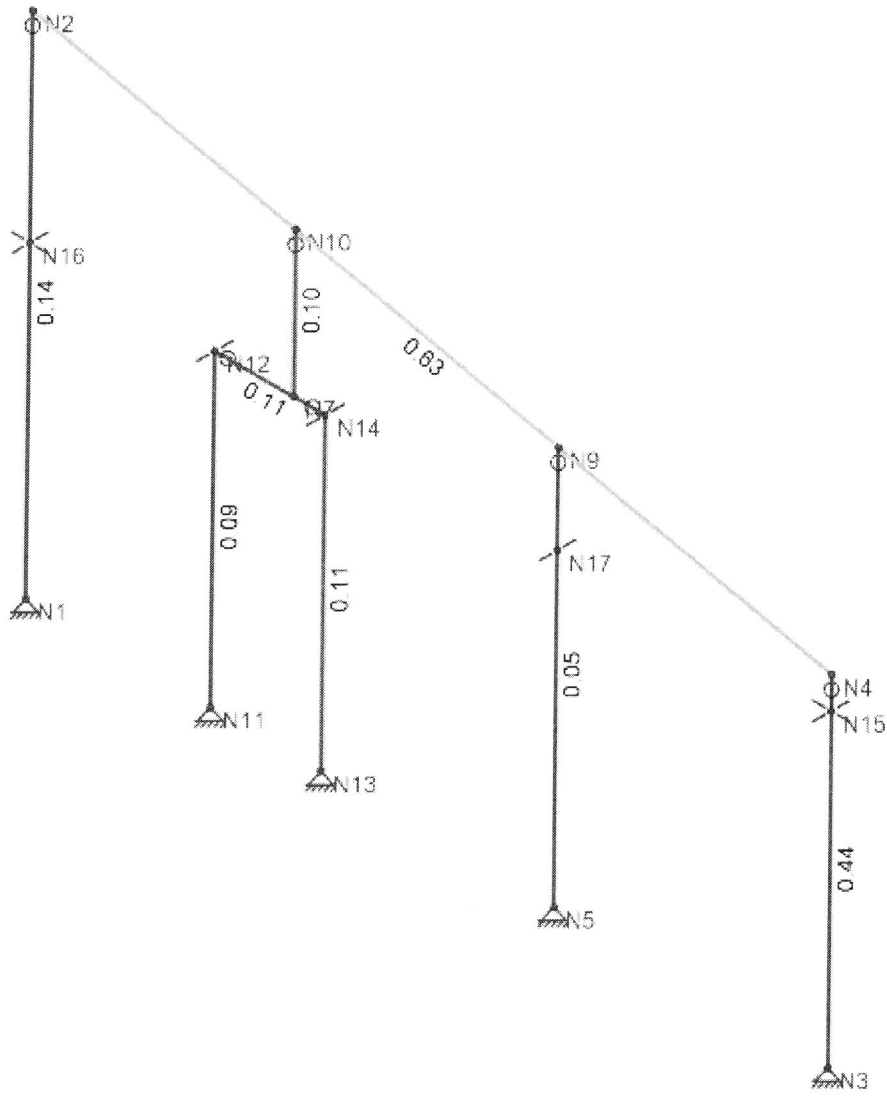
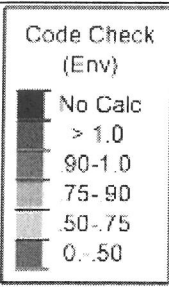
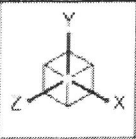
Loads: BLC 5, Wind Load Z  
Envelope Only Solution

Quantum
FRU

Mobley - Clerestory at Grid 2

SK-13
Apr 27, 2023
Clerestory at Grid 2.r3d





Member Code Checks Displayed (Enveloped)  
Envelope Only Solution

Quantum

FRU

Mobley - Clerestory at Grid 2

SK-14

Apr 27, 2023

Clerestory at Grid 2.r3d

**Node Coordinates**

	Label	X [ft]	Y [ft]	Z [ft]	Detach From Diaphragm
1	N1	0	0	0	
2	N2	0	16.08	0	
3	N3	25.59	0	0	
4	N4	25.59	10.75	0	
5	N5	16.84	0	0	
6	N7	8.42	9.75	0	
7	N9	16.84	12.572489	0	
8	N10	8.42	14.326245	0	
9	N11	5.92	0	0	
10	N12	5.92	9.75	0	
11	N13	9.42	0	0	
12	N14	9.42	9.75	0	
13	N15	25.59	9.75	0	
14	N16	0	9.75	0	
15	N17	16.84	9.75	0	

**Node Boundary Conditions**

	Node Label	X [k/in]	Y [k/in]	Z [k/in]
1	N1	Reaction	Reaction	Reaction
2	N11	Reaction	Reaction	Reaction
3	N13	Reaction	Reaction	Reaction
4	N5	Reaction	Reaction	Reaction
5	N3	Reaction	Reaction	Reaction
6	N15	Reaction		Reaction
7	N16	Reaction		Reaction
8	N12			Reaction
9	N14			Reaction
10	N17			Reaction

**Hot Rolled Steel Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	I <sub>yy</sub> [in <sup>4</sup> ]	I <sub>zz</sub> [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	Header 5	HSS6X6X8	Beam	Tube	A500 Gr.B RECT	Typical	9.74	48.3	48.3	81.1
2	Column 1	HSS4X4X4	Column	Tube	A500 Gr.B RECT	Typical	3.37	7.8	7.8	12.8
3	Column 2	HSS6X4X6	Column	Tube	A500 Gr.B RECT	Typical	6.18	14.9	28.3	32.8

**Wood Section Sets**

	Label	Shape	Type	Design List	Material	Design Rule	Area [in <sup>2</sup> ]	I <sub>yy</sub> [in <sup>4</sup> ]	I <sub>zz</sub> [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	Roof Beam 5	5.125X6FS	Beam	Glulam Western	24F-1.8E DF Balanced	Typical	30.75	67.306	92.25	130.774

**Member Primary Data**

	Label	I Node	J Node	Section/Shape	Type	Design List	Material	Design Rule
1	M1	N1	N2	Column 1	Column	Tube	A500 Gr.B RECT	Typical
2	M2	N11	N12	Column 1	Column	Tube	A500 Gr.B RECT	Typical
3	M3	N13	N14	Column 1	Column	Tube	A500 Gr.B RECT	Typical
4	M4	N3	N4	Column 1	Column	Tube	A500 Gr.B RECT	Typical
5	M5	N7	N10	Column 2	Column	Tube	A500 Gr.B RECT	Typical
6	M6	N5	N9	Column 2	Column	Tube	A500 Gr.B RECT	Typical
7	M7	N12	N14	Header 5	Beam	Tube	A500 Gr.B RECT	Typical
8	M8	N4	N2	Roof Beam 5	Beam	Glulam Western	24F-1.8E DF Balanced	Typical



**Member Advanced Data**

	Label	I Release	J Release	Physical	Deflection Ratio Options	Seismic DR
1	M1		BenPIN	Yes	** NA **	None
2	M2			Yes	** NA **	None
3	M3			Yes	** NA **	None
4	M4		BenPIN	Yes	** NA **	None
5	M5		BenPIN	Yes	** NA **	None
6	M6		BenPIN	Yes	** NA **	None
7	M7	BenPIN	BenPIN	Yes	Default	None
8	M8			Yes	Default	None

**Member Point Loads (BLC 2 : Dead Load)**

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	-0.5	%100
2	M4	Y	-10.4	%100

**Member Point Loads (BLC 3 : Snow Load)**

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	Y	-0.4	%100
2	M4	Y	-11.2	%100

**Member Point Loads (BLC 4 : Wind Load X)**

	Member Label	Direction	Magnitude [k, k-ft]	Location [(ft, %)]
1	M1	X	1.232	%100
2	M4	X	1.232	%100

**Member Distributed Loads (BLC 2 : Dead Load)**

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M8	Y	-0.06	-0.288	0	%100
2	M7	Y	-0.418	-0.418	0	%100

**Member Distributed Loads (BLC 3 : Snow Load)**

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M8	Y	-0.1	-0.498	0	%100
2	M7	Y	-0.275	-0.275	0	%100

**Member Distributed Loads (BLC 5 : Wind Load Z)**

	Member Label	Direction	Start Magnitude [k/ft, F, ksf, k-ft/ft]	End Magnitude [k/ft, F, ksf, k-ft/ft]	Start Location [(ft, %)]	End Location [(ft, %)]
1	M1	Z	0.094	0.094	9.75	%100
2	M4	Z	0.094	0.094	9.75	%100
3	M6	Z	0.289	0.289	9.75	%100
4	M5	Z	0.289	0.289	0	%100

**Basic Load Cases**

	BLC Description	Category	Y Gravity	Point	Distributed
1	Self Weight	DL	-1		
2	Dead Load	DL		2	2

**Basic Load Cases (Continued)**

	BLC Description	Category	Y Gravity	Point	Distributed
3	Snow Load	SL		2	2
4	Wind Load X	WLX		2	
5	Wind Load Z	WLZ			4

**Load Combinations**

	Description	Solve	P-Delta	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor	BLC	Factor
1	Deflection 1	Yes	Y	DL	1										
2	Deflection 2	Yes	Y	LL	1										
3	Deflection 3	Yes	Y	DL	1	LL	1								
4	IBC 16-8	Yes	Y	DL	1										
5	IBC 16-10 (b)	Yes	Y	DL	1	SL	1	SLN	1						
6	IBC 16-12 (a) (a)	Yes	Y	DL	1	WLX	0.6								
7	IBC 16-12 (a) (b)	Yes	Y	DL	1	WLZ	0.6								
8	IBC 16-13 (b) (a)	Yes	Y	DL	1	WLX	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
9	IBC 16-13 (b) (b)	Yes	Y	DL	1	WLZ	0.45	LL	0.75	LLS	0.75	SL	0.75	SLN	0.75
10	IBC 16-15 (a)	Yes	Y	DL	0.6	WLX	0.6								
11	IBC 16-15 (b)	Yes	Y	DL	0.6	WLZ	0.6								

**Load Combination Design**

	Description	CD	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
1	Deflection 1		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	Deflection 2		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	Deflection 3		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	IBC 16-8	0.9	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	IBC 16-10 (b)	1.15	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	IBC 16-12 (a) (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	IBC 16-12 (a) (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	IBC 16-13 (b) (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	IBC 16-13 (b) (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	IBC 16-15 (a)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	IBC 16-15 (b)	1.6	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

**Envelope Node Reactions**

	Node Label	X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC	
1	N1	max	0.019	6	3.664	5	0.124	7	0	11	0	11	0	11
2		min	0	2	0	2	0	1	0	1	0	1	0	1
3	N11	max	0.002	8	3.106	5	0.088	7	0	11	LOCKED	0	11	
4		min	0	2	0	2	0	1	0	1	LOCKED	0	1	
5	N13	max	0.004	8	5.649	5	0.096	7	0	11	0	11	0	11
6		min	0	2	0	2	0	1	0	1	0	1	0	1
7	N5	max	0.002	8	3.632	5	0.08	7	0	11	0	11	0	11
8		min	0	2	0	2	0	1	0	1	0	1	0	1
9	N3	max	0.157	6	22.517	5	0.001	7	0	11	0	11	0	11
10		min	0	1	0	2	0	1	0	1	0	1	0	1
11	N15	max	0.001	7	0	11	0	10	0	11	0	11	0	11
12		min	-1.612	6	0	1	-0.044	11	0	1	0	1	0	1
13	N16	max	0	2	0	11	0	10	0	11	0	11	0	11
14		min	-0.047	6	0	1	-0.481	7	0	1	0	1	0	1
15	N12	max	0	11	0	11	0	10	0	11	0	11	0	11
16		min	0	1	0	1	-0.31	7	0	1	0	1	0	1
17	N14	max	0	11	0	11	0	10	0	11	LOCKED	0	11	
18		min	0	1	0	1	-0.651	7	0	1	LOCKED	0	1	



**Envelope Node Reactions (Continued)**

Node Label	X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC	
19 N17	max	0	11	0	11	0	10	0	11	0	11	0	11
20	min	0	1	0	1	-0.6	7	0	1	0	1	0	1
21 Totals:	max	0	2	38.569	5	0	10						
22	min	-1.478	6	0	2	-1.696	7						

**Envelope Node Displacements**

Node Label	X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotation [rad]	LC	Z Rotation [rad]	LC	
1 N1	max	0	2	0	2	0	10	0	10	3.457e-5	9	2.42e-4	6
2	min	0	6	0	5	0	7	-1.552e-3	7	-1.714e-5	11	0	2
3 N2	max	0.061	6	0	2	0.356	7	7.82e-3	7	3.457e-5	9	0	2
4	min	0	2	-0.009	5	0	1	0	1	-1.714e-5	11	-1.004e-2	5
5 N3	max	0	7	0	2	0	10	0	10	0	10	1.973e-3	6
6	min	0	6	0	5	0	7	-1.866e-5	7	-1.41e-3	7	-9.999e-7	1
7 N4	max	0.054	6	0	2	0	7	7.526e-3	7	0	10	3.251e-3	5
8	min	0	1	-0.037	5	0	1	0	1	-1.41e-3	7	0	2
9 N5	max	0	2	0	2	0	10	0	10	0	10	0	2
10	min	0	8	0	5	0	7	-5.271e-4	7	-6.564e-4	7	-3.88e-4	6
11 N7	max	0.066	6	0	2	0.001	7	2.574e-3	7	3.566e-5	7	2.882e-4	5
12	min	0	2	-0.016	5	0	1	0	1	0	1	0	2
13 N9	max	0.059	6	0	2	0.044	7	7.683e-3	7	0	10	0	2
14	min	0	2	-0.004	5	0	1	0	1	-6.564e-4	7	-1.022e-3	5
15 N10	max	0.059	6	0	2	0.19	7	7.827e-3	7	3.566e-5	7	3.717e-3	5
16	min	0	2	-0.018	5	0	1	0	1	0	1	0	2
17 N11	max	0	2	0	2	0	10	0	10	0	11	0	2
18	min	0	8	0	5	0	7	-1.108e-3	7	0	1	-5.682e-4	6
19 N12	max	0.066	6	0	2	0	7	2.232e-3	7	0	11	0	2
20	min	0	2	-0.005	5	0	1	0	1	0	1	-5.682e-4	6
21 N13	max	0	2	0	2	0	10	0	10	0	11	0	2
22	min	0	8	0	5	0	7	-1.205e-3	7	0	1	-5.682e-4	6
23 N14	max	0.066	6	0	2	0	7	2.425e-3	7	0	11	0	2
24	min	0	2	-0.008	5	0	1	0	1	0	1	-5.682e-4	6
25 N15	max	0	6	0	2	0	11	3.757e-5	7	0	10	2.013e-6	7
26	min	0	1	-0.034	5	0	1	0	1	-1.41e-3	7	-3.972e-3	6
27 N16	max	0	6	0	2	0	7	3.125e-3	7	3.457e-5	9	0	2
28	min	0	2	-0.005	5	0	1	0	1	-1.714e-5	11	-4.874e-4	6
29 N17	max	0.045	6	0	2	0	7	1.064e-3	7	0	10	0	2
30	min	0	2	-0.003	5	0	1	0	1	-6.564e-4	7	-3.878e-4	6

**Envelope AISC 15TH (360-16): ASD Member Steel Code Checks**

Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Pnc/om [k]	Pnt/om [k]	Mnyy/om [k-ft]	Mnzz/om [k-ft]	Cb	Eqn
1 M1	HSS4X4X4	0.139	9.715	9	0.014	9.882	z	7	31.488	92.826	10.765	10.765	1.394	H1-1b
2 M2	HSS4X4X4	0.092	9.75	7	0.003	9.75	z	7	62.358	92.826	10.765	10.765	1	H1-1b
3 M3	HSS4X4X4	0.106	9.75	7	0.004	9.75	z	7	62.358	92.826	10.765	10.765	1	H1-1b
4 M4	HSS4X4X4	0.442	9.742	8	0.06	10.75	y	6	57.231	92.826	10.765	10.765	1.559	H1-1a
5 M5	HSS6X4X6	0.095	0	7	0.023	0	z	7	156.491	170.228	20.521	27.315	1.667	H1-1b
6 M6	HSS6X4X6	0.045	9.691	7	0.015	9.822	z	7	90.204	170.228	20.521	27.315	1.391	H1-1b
7 M7	HSS6X6X8	0.114	2.479	5	0.086	3.5	y	9	261.944	268.287	45.449	45.449	1.29	H1-1b

**Envelope AWC NDS-18: ASD Member Wood Code Checks**

Member	Shape	Code Check	Loc[ft]	LC	Shear Check	Loc[ft]	Dir	LC	Fc' [ksi]	Ft' [ksi]	Fb1' [ksi]	Fb2' [ksi]	Fv' [ksi]	RB	CL	CP	Eqn
1 M8	5.125X6FS	0.631	17.426	5	0.514	17.698	y	5	1.582	1.265	2.758	1.667	0.305	2.3410	9.9990	8.663	9-1



Company : Quantum  
Designer : FRU  
Job Number :  
Model Name : Mobley - Clerestory at Grid 2

4/27/2023  
8:56:31 AM  
Checked By : \_\_\_\_\_

**Material Take-Off**

	Material	Size	Pieces	Length[ft]	Weight[K]
1	Hot Rolled Steel				
2	A500 Gr.B RECT	HSS4X4X4	4	46.3	0.571
3	A500 Gr.B RECT	HSS6X4X6	2	17.1	0.388
4	A500 Gr.B RECT	HSS6X6X8	1	3.5	0.125
5	Total HR Steel		7	67	1.084
6					
7	Wood				
8	24F-1.8E DF Balanced	5.125X6FS	1	26.1	0.195
9	Total Wood		1	26.1	0.195



**QUANTUM** | CONSULTING ENGINEERS

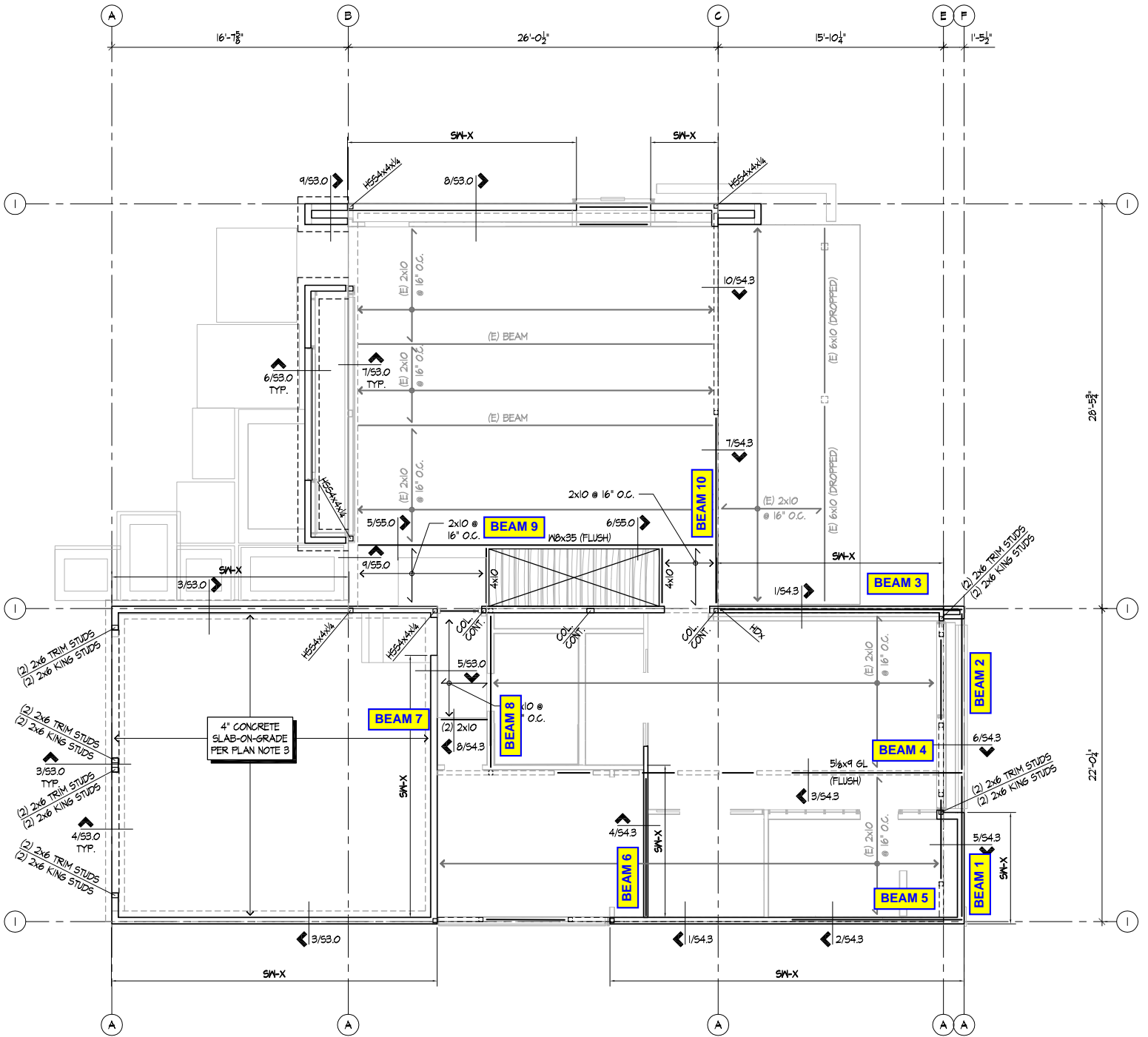
**MOBLEY RESIDENCE**

7244 N Mercer Way  
Mercer Island, WA 98040

Quantum Job Number: 22050.01

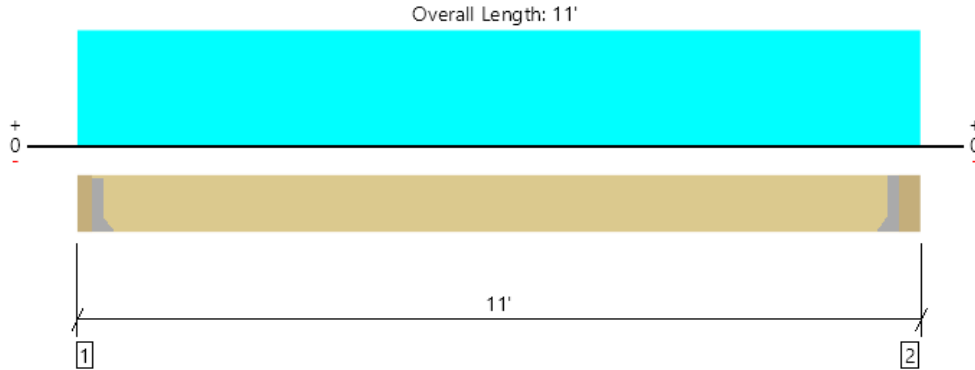
# **MAIN LEVEL FRAMING DESIGN**

# MAIN LEVEL FRAMING DESIGN KEY PLAN





Main Floor Framing, Floor: Beam 1  
 1 piece(s) 3 1/2" x 9 1/2" 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)	1562 @ 3 1/2"	4725 (1.50")	Passed (33%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1217 @ 1' 1"	6872	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3696 @ 5' 5 3/16"	10422	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.055 @ 5' 5 3/16"	0.257	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.215 @ 5' 5 3/16"	0.514	Passed (L/574)	--	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.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Hanger on 9 1/2" LSL beam	3.50"	Hanger <sup>1</sup>	1.50"	1227	290	272	1648	See note <sup>1</sup>
2 - Hanger on 9 1/2" LSL beam	5.13"	Hanger <sup>1</sup>	1.50"	1256	297	278	1688	See note <sup>1</sup>

- 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)	10' 3" o/c	
Bottom Edge (Lu)	10' 3" 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	LUS410	2.00"	N/A	8-10d	6-10d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-10d	6-10d	

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

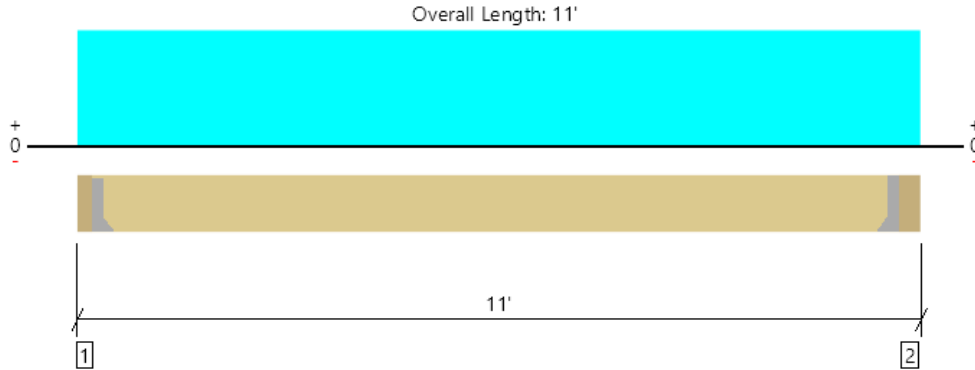
Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 10' 6 7/8"	N/A	10.4	--	--	
1 - Uniform (PSF)	0 to 11' (Front)	1' 4"	15.0	40.0	-	Floor Load
2 - Uniform (PLF)	0 to 11' (Front)	N/A	120.0	-	-	Wall Weight
3 - Uniform (PLF)	0 to 11' (Front)	N/A	76.0	-	50.0	Roof Load

**Weyerhaeuser Notes**  
 Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).  
 The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Main Floor Framing, Floor: Beam 2  
 1 piece(s) 3 1/2" x 9 1/2" 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)	430 @ 3 1/2"	4725 (1.50")	Passed (9%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	364 @ 1' 1"	6872	Passed (5%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1106 @ 5' 5 3/16"	10422	Passed (11%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.038 @ 5' 5 3/16"	0.257	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.059 @ 5' 5 3/16"	0.514	Passed (L/999+)	--	1.0 D + 1.0 L (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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 9 1/2" LSL beam	3.50"	Hanger <sup>1</sup>	1.50"	162	290	452	See note <sup>1</sup>
2 - Hanger on 9 1/2" LSL beam	5.13"	Hanger <sup>1</sup>	1.50"	165	297	462	See note <sup>1</sup>

- 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)	10' 3" o/c	
Bottom Edge (Lu)	10' 3" 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	LUS48	2.00"	N/A	6-10dx1.5	4-10d	
2 - Face Mount Hanger	LUS48	2.00"	N/A	6-10dx1.5	4-10d	

- 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)	Comments
0 - Self Weight (PLF)	3 1/2" to 10' 6 7/8"	N/A	10.4	--	
1 - Uniform (PSF)	0 to 11' (Front)	1' 4"	15.0	40.0	Floor Load

**Weyerhaeuser Notes**

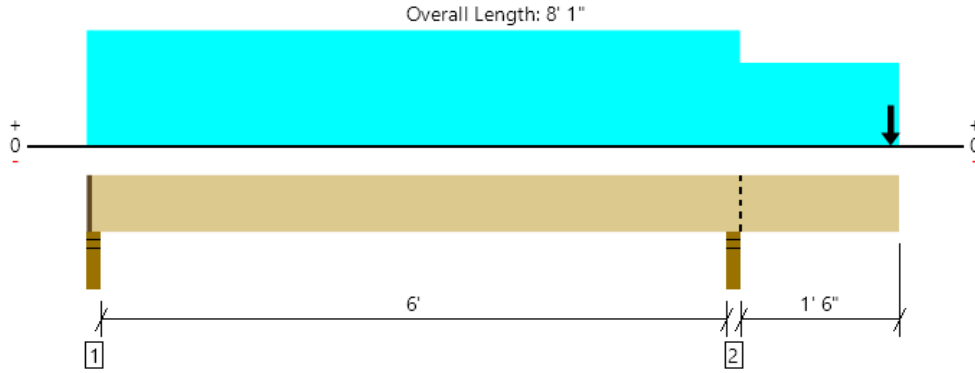
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Main Floor Framing, Floor: Beam 3  
 1 piece(s) 3 1/2" x 9 1/4" 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)	5063 @ 6' 5 1/4"	7656 (3.50")	Passed (66%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2507 @ 5' 6 1/4"	7198	Passed (35%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	4428 @ 3' 1 1/2"	14278	Passed (31%)	1.15	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Live Load Defl. (in)	0.031 @ 3' 3 3/8"	0.157	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.076 @ 3' 2 3/4"	0.314	Passed (L/990)	--	1.0 D + 0.75 L + 0.75 S (Alt 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).
- 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 - Stud wall - DF	3.50"	2.25"	1.50"	1935	759/-50	878	3163	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	3.50"	2.31"	3213	1092	1374	5063	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)	8' o/c	
Bottom Edge (Lu)	8' 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 8' 1"	N/A	10.1	--	--	
1 - Uniform (PSF)	0 to 6' 6" (Front)	5' 9"	15.0	40.0	-	Floor Load
2 - Uniform (PLF)	0 to 8' 1" (Front)	N/A	120.0	-	-	Wall Weight
3 - Uniform (PSF)	0 to 8' 1" (Front)	11'	38.0	-	25.0	Roof Load
4 - Point (lb)	8' (Front)	N/A	163	297	-	Beam 2

**Weyerhaeuser Notes**

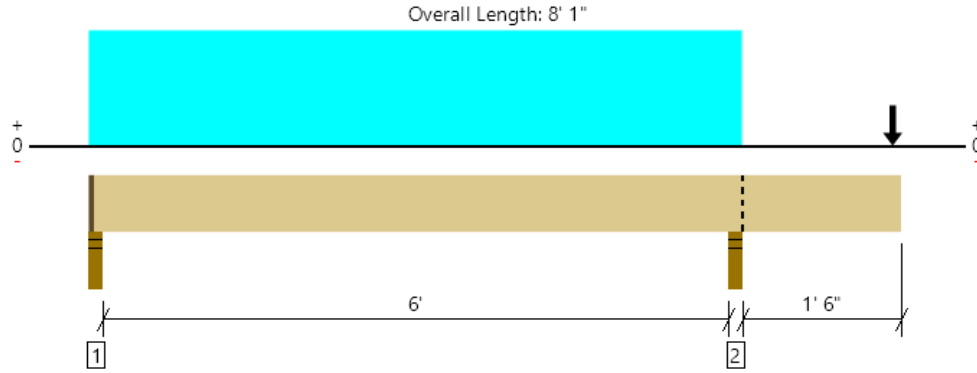
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Main Floor Framing, Floor: Beam 4  
1 piece(s) 5 1/4" x 9 1/4" 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)	4119 @ 6' 5 1/4"	11484 (3.50")	Passed (36%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1807 @ 5' 6 1/4"	9389	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-2705 @ 6' 5 1/4"	18623	Passed (15%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.025 @ 3' 3 5/8"	0.157	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.028 @ 8' 1"	0.200	Passed (2L/999+)	--	1.0 D + 0.75 L + 0.75 S (Alt 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).
- Overhang deflection criteria: LL (2L/480) and TL (0.2").
- 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 - Stud wall - DF	3.50"	2.25"	1.50"	236	1453/-28	-69	1689	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	3.50"	1.50"	2368	1751	347	4119	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)	8' o/c	
Bottom Edge (Lu)	8' 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 8' 1"	N/A	15.2	--	--	
1 - Uniform (PSF)	0 to 6' 6" (Front)	11'	15.0	40.0	-	Floor Load
2 - Point (lb)	8' (Front)	N/A	1421	297	278	Beam 1 and 2

**Weyerhaeuser Notes**

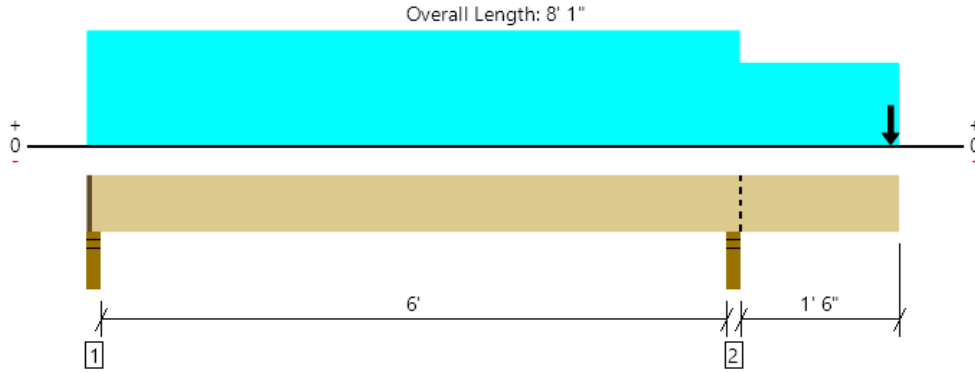
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Main Floor Framing, Floor: Beam 5  
1 piece(s) 3 1/2" x 9 1/4" 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)	6689 @ 6' 5 1/4"	7656 (3.50")	Passed (87%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2831 @ 5' 6 1/4"	7198	Passed (39%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-3658 @ 6' 5 1/4"	14278	Passed (26%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.029 @ 3' 3"	0.157	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.061 @ 3' 7/8"	0.314	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (Alt 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).
- 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 - Stud wall - DF	3.50"	2.25"	1.50"	1662	759/-50	844	2865	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	3.50"	3.06"	4578	1092	1722	6689	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)	8' o/c	
Bottom Edge (Lu)	8' 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 8' 1"	N/A	10.1	--	--	
1 - Uniform (PSF)	0 to 6' 6" (Front)	5' 9"	15.0	40.0	-	Floor Load
2 - Uniform (PLF)	0 to 8' 1" (Front)	N/A	120.0	-	-	Wall Weight
3 - Uniform (PSF)	0 to 8' 1" (Front)	11'	38.0	-	25.0	Roof Load
4 - Point (lb)	8' (Front)	N/A	1256	297	278	Beam 2

**Weyerhaeuser Notes**

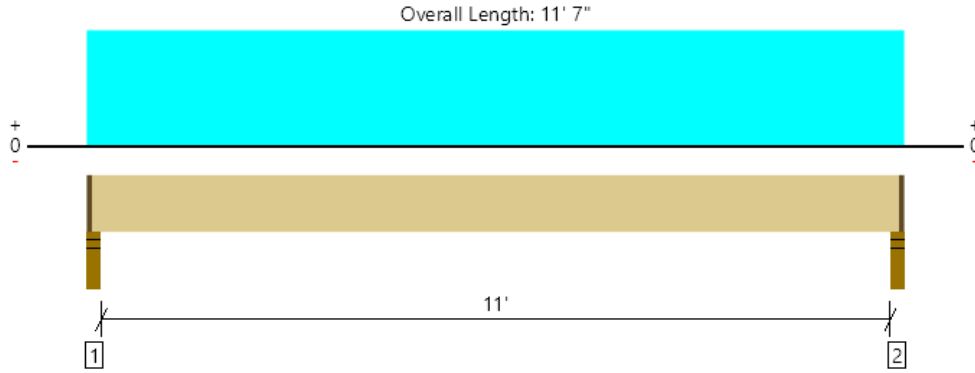
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Main Floor Framing, Floor: Beam 6  
1 piece(s) 3 1/2" x 9 1/4" 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)	475 @ 2"	4922 (2.25")	Passed (10%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	395 @ 1' 3/4"	6259	Passed (6%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1320 @ 5' 9 1/2"	12416	Passed (11%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.041 @ 5' 9 1/2"	0.281	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.063 @ 5' 9 1/2"	0.563	Passed (L/999+)	--	1.0 D + 1.0 L (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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - DF	3.50"	2.25"	1.50"	173	309	482	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	173	309	482	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' 5" o/c	
Bottom Edge (Lu)	11' 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 11' 5 3/4"	N/A	10.1	--	
1 - Uniform (PSF)	0 to 11' 7" (Front)	1' 4"	15.0	40.0	Floor Load

**Weyerhaeuser Notes**

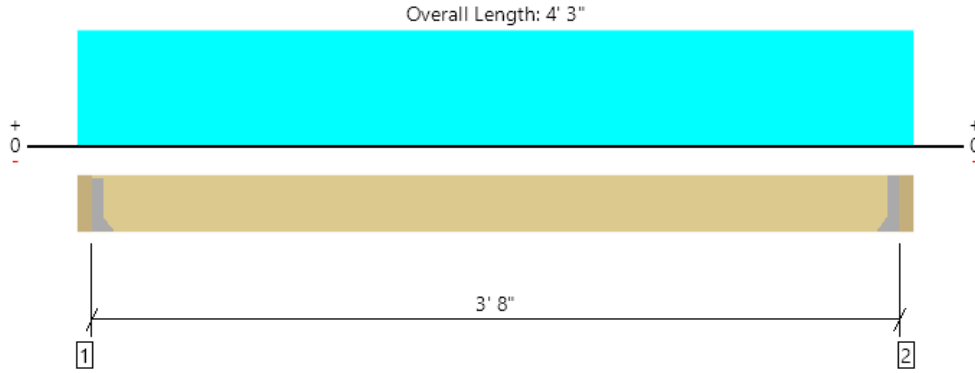
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Main Floor Framing, Floor: Beam 7  
2 piece(s) 2 x 10 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)	215 @ 3' 1/2"	2813 (1.50")	Passed (8%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	124 @ 1' 3/4"	3330	Passed (4%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	197 @ 2' 1 1/2"	3529	Passed (6%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.001 @ 2' 1 1/2"	0.092	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.002 @ 2' 1 1/2"	0.183	Passed (L/999+)	--	1.0 D + 1.0 L (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.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 9 1/4" DF Ledger	3.50"	Hanger <sup>1</sup>	1.50"	77	170	247	See note <sup>1</sup>
2 - Hanger on 9 1/4" DF beam	3.50"	Hanger <sup>1</sup>	1.50"	77	170	247	See note <sup>1</sup>

- 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)	3' 8" o/c	
Bottom Edge (Lu)	3' 8" 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	LUS28-2	2.00"	N/A	6-10dx1.5	3-10d	
2 - Face Mount Hanger	LUS28-2	2.00"	N/A	6-10dx1.5	3-10d	

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

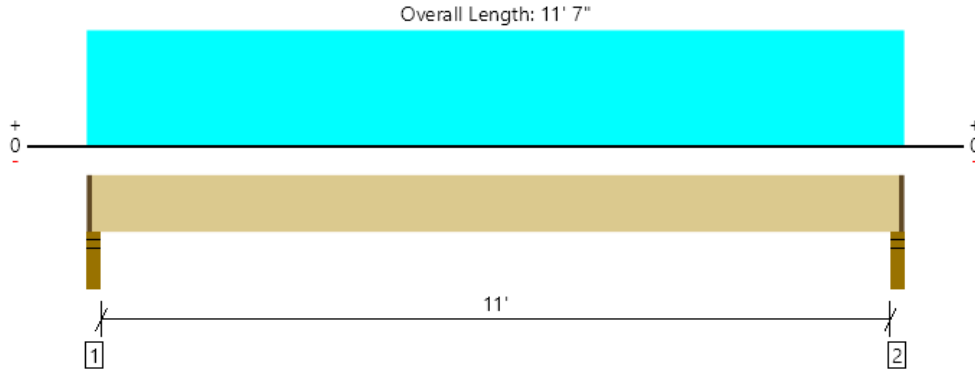
Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3' 1/2" to 3' 11 1/2"	N/A	7.0	--	
1 - Uniform (PSF)	0 to 4' 3" (Front)	2'	15.0	40.0	Floor Load

**Weyerhaeuser Notes**  
Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).  
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	



Main Floor Framing, Floor: Beam 8  
2 piece(s) 2 x 10 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)	978 @ 2"	2869 (2.25")	Passed (34%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	814 @ 1' 3/4"	3330	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2722 @ 5' 9 1/2"	3529	Passed (77%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.137 @ 5' 9 1/2"	0.281	Passed (L/988)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.196 @ 5' 9 1/2"	0.563	Passed (L/689)	--	1.0 D + 1.0 L (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.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - SPF	3.50"	2.25"	1.50"	301	695	996	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.50"	301	695	996	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' 5" o/c	
Bottom Edge (Lu)	11' 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 11' 5 3/4"	N/A	7.0	--	
1 - Uniform (PSF)	0 to 11' 7" (Front)	3'	15.0	40.0	Floor Load

**Weyerhaeuser Notes**

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to [www.weyerhaeuser.com/woodproducts/document-library](http://www.weyerhaeuser.com/woodproducts/document-library).

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

ForteWEB Software Operator	Job Notes
Frank Unocic Quantum Consulting Engineers (206) 957-3900 funocic@quantumce.com	





Title Block Line 1  
 You can change this area  
 using the "Settings" menu item  
 and then using the "Printing &  
 Title Block" selection.  
 Title Block Line 6

Project Title:  
 Engineer:  
 Project Descr:

Project ID:

Printed: 27 APR 2023, 11:53AM

## Steel Beam

File = M:\Gallagher Construction\22050.01 Mobley Residence\Calc\Calculations.ec6  
 ENERCALC, INC. 1983-2017, Build:10.17.7.24, Ver:10.17.7.24

Lic. #: KW-06016450

Licensee: QUANTUM CONSULTING ENGINEERS

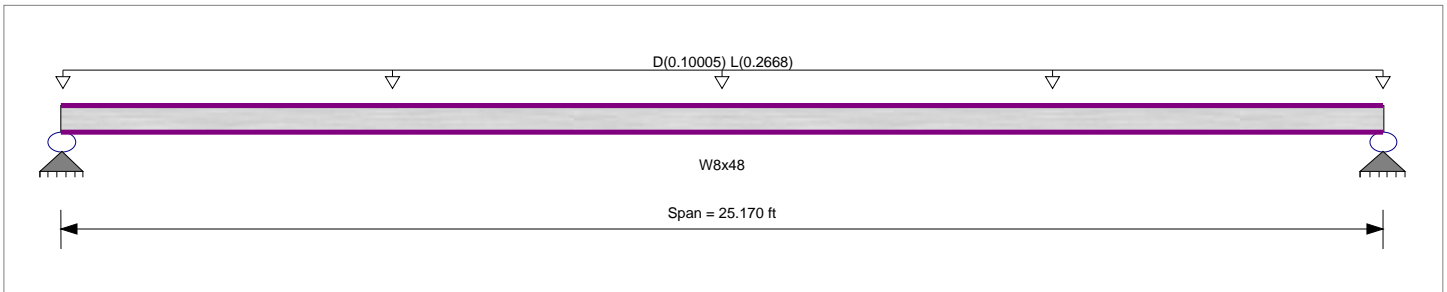
Description: Mobley Residence Main Floor Framing: Beam 9

### CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, ASCE 7-16  
 Load Combination Set: IBC 2018

### Material Properties

Analysis Method: Allowable Strength Design  
 Beam Bracing: Beam is Fully Braced against lateral-torsional buckling  
 Bending Axis: Major Axis Bending  
 Fy: Steel Yield: 50.0 ksi  
 E: Modulus: 29,000.0 ksi



### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added  
 Uniform Load: D = 0.0150, L = 0.040 ksf, Tributary Width = 6.670 ft

### DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	<b>0.238</b> : 1	Maximum Shear Stress Ratio =	<b>0.068</b> : 1
Section used for this span	<b>W8x48</b>	Section used for this span	<b>W8x48</b>
Ma: Applied	29.051 k-ft	Va: Applied	4.617 k
Mn / Omega: Allowable	122.255 k-ft	Vn/Omega: Allowable	68.0 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	12.585ft	Location of maximum on span	0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
<b>Maximum Deflection</b>			
Max Downward Transient Deflection	0.454 in	Ratio =	665 >=360
Max Upward Transient Deflection	0.000 in	Ratio =	0 <360
Max Downward Total Deflection	0.624 in	Ratio =	484 >=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		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H	Dsgn. L = 25.17 ft	1	0.065	0.019	7.92		7.92	204.17	122.26	1.00	1.00	1.26	102.00	68.00
+D+L+H	Dsgn. L = 25.17 ft	1	0.238	0.068	29.05		29.05	204.17	122.26	1.00	1.00	4.62	102.00	68.00
+D+Lr+H	Dsgn. L = 25.17 ft	1	0.065	0.019	7.92		7.92	204.17	122.26	1.00	1.00	1.26	102.00	68.00
+D+S+H	Dsgn. L = 25.17 ft	1	0.065	0.019	7.92		7.92	204.17	122.26	1.00	1.00	1.26	102.00	68.00
+D+0.750Lr+0.750L+H	Dsgn. L = 25.17 ft	1	0.194	0.056	23.77		23.77	204.17	122.26	1.00	1.00	3.78	102.00	68.00
+D+0.750L+0.750S+H	Dsgn. L = 25.17 ft	1	0.194	0.056	23.77		23.77	204.17	122.26	1.00	1.00	3.78	102.00	68.00
+D+0.60W+H	Dsgn. L = 25.17 ft	1	0.065	0.019	7.92		7.92	204.17	122.26	1.00	1.00	1.26	102.00	68.00
+D+0.70E+H	Dsgn. L = 25.17 ft	1	0.065	0.019	7.92		7.92	204.17	122.26	1.00	1.00	1.26	102.00	68.00
+D+0.750Lr+0.750L+0.450W+H	Dsgn. L = 25.17 ft	1	0.194	0.056	23.77		23.77	204.17	122.26	1.00	1.00	3.78	102.00	68.00
+D+0.750L+0.750S+0.450W+H	Dsgn. L = 25.17 ft	1	0.194	0.056	23.77		23.77	204.17	122.26	1.00	1.00	3.78	102.00	68.00
+D+0.750L+0.750S+0.5250E+H	Dsgn. L = 25.17 ft	1	0.194	0.056	23.77		23.77	204.17	122.26	1.00	1.00	3.78	102.00	68.00
+0.60D+0.60W+0.60H	Dsgn. L = 25.17 ft	1	0.039	0.011	4.75		4.75	204.17	122.26	1.00	1.00	0.76	102.00	68.00
+0.60D+0.70E+0.60H	Dsgn. L = 25.17 ft	1	0.039	0.011	4.75		4.75	204.17	122.26	1.00	1.00	0.76	102.00	68.00

Title Block Line 1  
 You can change this area  
 using the "Settings" menu item  
 and then using the "Printing &  
 Title Block" selection.  
 Title Block Line 6

Project Title:  
 Engineer:  
 Project Descr:

Project ID:

Printed: 27 APR 2023, 11:53AM

**Steel Beam**

File = M:\Gallagher Construction\22050.01 Moblely Residence\Calc\Calculations.ec6  
 ENERCALC, INC. 1983-2017, Build:10.17.7.24, Ver:10.17.7.24

Lic. # : KW-06016450

Licensee : QUANTUM CONSULTING ENGINEERS

Description : Moblely Residence Main Floor Framing: Beam 9

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values					Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx
Dsgn. L =	25.17 ft	1	0.039	0.011	4.75	4.75	204.17	122.26	1.00	1.00	0.76	102.00	68.00

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.6237	12.657		0.0000	0.000

**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.617	4.617
Overall MINimum	0.755	0.755
+D+H	1.259	1.259
+D+L+H	4.617	4.617
+D+Lr+H	1.259	1.259
+D+S+H	1.259	1.259
+D+0.750Lr+0.750L+H	3.777	3.777
+D+0.750L+0.750S+H	3.777	3.777
+D+0.60W+H	1.259	1.259
+D+0.70E+H	1.259	1.259
+D+0.750Lr+0.750L+0.450W+H	3.777	3.777
+D+0.750L+0.750S+0.450W+H	3.777	3.777
+D+0.750L+0.750S+0.5250E+H	3.777	3.777
+0.60D+0.60W+0.60H	0.755	0.755
+0.60D+0.70E+0.60H	0.755	0.755
D Only	1.259	1.259
Lr Only		
L Only	3.358	3.358
S Only		
W Only		
E Only		
H Only		

Title Block Line 1  
 You can change this area  
 using the "Settings" menu item  
 and then using the "Printing &  
 Title Block" selection.  
 Title Block Line 6

Project Title:  
 Engineer:  
 Project Descr:

Project ID:

Printed: 27 APR 2023, 12:03PM

## Steel Beam

File = M:\Gallagher Construction\22050.01 Mobley Residence\Calc\Calculations.ec6  
 ENERCALC, INC. 1983-2017, Build:10.17.7.24, Ver:10.17.7.24

Lic. # : KW-06016450

Licensee : QUANTUM CONSULTING ENGINEERS

Description : Mobley Residence Main Floor Framing: Beam 10

### CODE REFERENCES

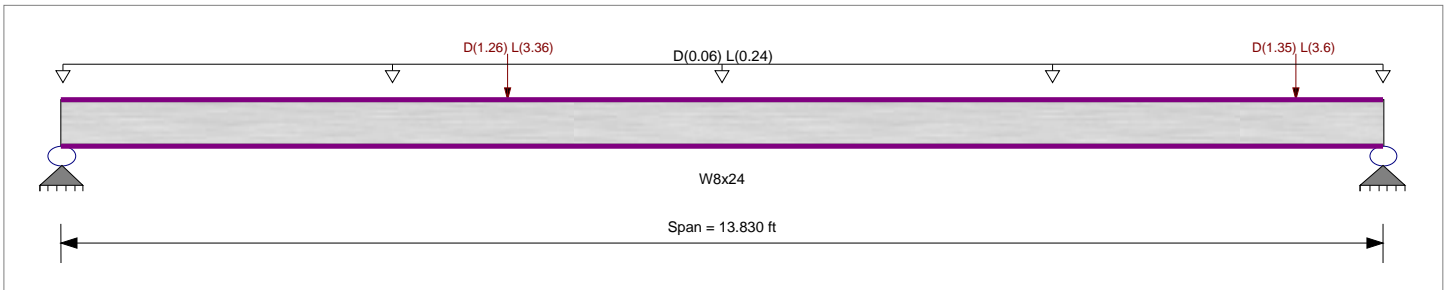
Calculations per AISC 360-16, IBC 2018, ASCE 7-160

Load Combination Set : IBC 20185

### Material Properties

Analysis Method : Allowable Strength Design  
 Beam Bracing : Beam is Fully Braced against lateral-torsional buckling  
 Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi  
 E: Modulus : 29,000.0 ksi



### Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Beam self weight NOT internally calculated and added  
 Uniform Load : D = 0.0150, L = 0.060 ksf, Tributary Width = 4.0 ft  
 Point Load : D = 1.260, L = 3.360 k @ 4.670 ft, (Beam 9)  
 Point Load : D = 1.350, L = 3.60 k @ 12.920 ft, (Existing Beam)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio =	<b>0.385</b> : 1	Maximum Shear Stress Ratio =	<b>0.213</b> : 1
Section used for this span	<b>W8x24</b>	Section used for this span	<b>W8x24</b>
Ma : Applied	22.209 k-ft	Va : Applied	8.259 k
Mn / Omega : Allowable	57.635 k-ft	Vn/Omega : Allowable	38.857 k
Load Combination	+D+L+H	Load Combination	+D+L+H
Location of maximum on span	4.702ft	Location of maximum on span	13.830 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.226 in	Ratio =	<b>733</b> >=360
Max Upward Transient Deflection	0.000 in	Ratio =	<b>0</b> <360
Max Downward Total Deflection	0.301 in	Ratio =	<b>552</b> >=180
Max Upward Total Deflection	0.000 in	Ratio =	<b>0</b> <180

### Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
+D+H														
Dsgn. L = 13.83 ft		1	0.097	0.054	5.59		5.59	96.25	57.63	1.00	1.00	2.10	58.29	38.86
+D+L+H														
Dsgn. L = 13.83 ft		1	0.385	0.213	22.21		22.21	96.25	57.63	1.00	1.00	8.26	58.29	38.86
+D+Lr+H														
Dsgn. L = 13.83 ft		1	0.097	0.054	5.59		5.59	96.25	57.63	1.00	1.00	2.10	58.29	38.86
+D+S+H														
Dsgn. L = 13.83 ft		1	0.097	0.054	5.59		5.59	96.25	57.63	1.00	1.00	2.10	58.29	38.86
+D+0.750Lr+0.750L+H														
Dsgn. L = 13.83 ft		1	0.313	0.173	18.05		18.05	96.25	57.63	1.00	1.00	6.72	58.29	38.86
+D+0.750L+0.750S+H														
Dsgn. L = 13.83 ft		1	0.313	0.173	18.05		18.05	96.25	57.63	1.00	1.00	6.72	58.29	38.86
+D+0.60W+H														
Dsgn. L = 13.83 ft		1	0.097	0.054	5.59		5.59	96.25	57.63	1.00	1.00	2.10	58.29	38.86
+D+0.70E+H														
Dsgn. L = 13.83 ft		1	0.097	0.054	5.59		5.59	96.25	57.63	1.00	1.00	2.10	58.29	38.86
+D+0.750Lr+0.750L+0.450W+H														
Dsgn. L = 13.83 ft		1	0.313	0.173	18.05		18.05	96.25	57.63	1.00	1.00	6.72	58.29	38.86
+D+0.750L+0.750S+0.450W+H														
Dsgn. L = 13.83 ft		1	0.313	0.173	18.05		18.05	96.25	57.63	1.00	1.00	6.72	58.29	38.86
+D+0.750L+0.750S+0.5250E+H														
Dsgn. L = 13.83 ft		1	0.313	0.173	18.05		18.05	96.25	57.63	1.00	1.00	6.72	58.29	38.86
+0.60D+0.60W+0.60H														

Title Block Line 1  
 You can change this area  
 using the "Settings" menu item  
 and then using the "Printing &  
 Title Block" selection.  
 Title Block Line 6

Project Title:  
 Engineer:  
 Project Descr:

Project ID:

Printed: 27 APR 2023, 12:03PM

**Steel Beam**

File = M:\Gallagher Construction\22050.01 Mobley Residence\Calc\Calculations.ec6  
 ENERCALC, INC. 1983-2017, Build:10.17.7.24, Ver:10.17.7.24

Lic. # : KW-06016450

Licensee : QUANTUM CONSULTING ENGINEERS

Description : Mobley Residence Main Floor Framing: Beam 10

Load Combination	Segment Length	Span #	Max Stress Ratios		Summary of Moment Values						Summary of Shear Values			
			M	V	Mmax +	Mmax -	Ma Max	Mnx	Mnx/Omega	Cb	Rm	Va Max	Vnx	Vnx/Omega
Dsgn. L = 13.83 ft		1	0.058	0.032	3.35		3.35	96.25	57.63	1.00	1.00	1.26	58.29	38.86
+0.60D+0.70E+0.60H														
Dsgn. L = 13.83 ft		1	0.058	0.032	3.35		3.35	96.25	57.63	1.00	1.00	1.26	58.29	38.86

**Overall Maximum Deflections**

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.3008	6.717		0.0000	0.000

**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	5.460	8.259
Overall MINimum	0.803	1.261
+D+H	1.338	2.102
+D+L+H	5.460	8.259
+D+Lr+H	1.338	2.102
+D+S+H	1.338	2.102
+D+0.750Lr+0.750L+H	4.430	6.720
+D+0.750L+0.750S+H	4.430	6.720
+D+0.60W+H	1.338	2.102
+D+0.70E+H	1.338	2.102
+D+0.750Lr+0.750L+0.450W+H	4.430	6.720
+D+0.750L+0.750S+0.450W+H	4.430	6.720
+D+0.750L+0.750S+0.5250E+H	4.430	6.720
+0.60D+0.60W+0.60H	0.803	1.261
+0.60D+0.70E+0.60H	0.803	1.261
D Only	1.338	2.102
Lr Only		
L Only	4.122	6.157
S Only		
W Only		
E Only		
H Only		



**QUANTUM** | CONSULTING ENGINEERS

**MOBLEY RESIDENCE**

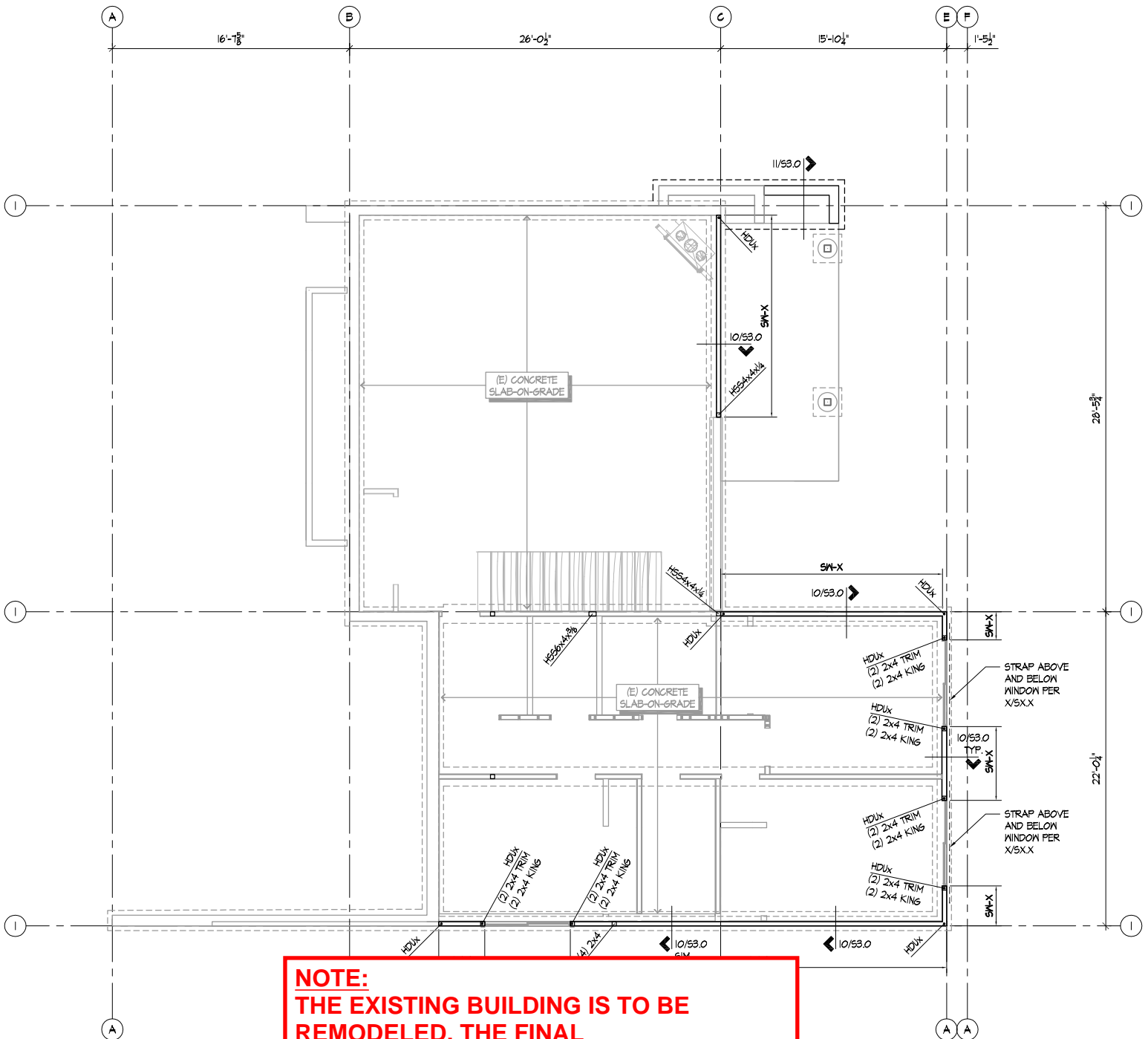
7244 N Mercer Way

Mercer Island, WA 98040

Quantum Job Number: 22050.01

# **EXISTING FOUNDATION**

# EXISTING FOUNDATION



**NOTE:**  
 THE EXISTING BUILDING IS TO BE REMODELED. THE FINAL CONFIGURATION WILL HAVE A SIMILAR FOOTPRINT AND MASS AS THE ORIGINAL STRUCTURE, SO THE EXISTING FOUNDATION IS TO BE RE-USED.



**QUANTUM** | CONSULTING ENGINEERS

**MOBLEY RESIDENCE**

7244 N Mercer Way  
Mercer Island, WA 98040

Quantum Job Number: 22050.01

# **LATERAL DESIGN**

# Seismic Base Shear for the Equivalent Lateral Force Procedure

Per IBC 2018 & ASCE 7-16

Structure: **MOBLEY RESIDENCE**  
 Address: **7244 N MERCER WAY, MERCER ISLAND, WA 98040**  
 Latitude: **47.5932** Longitude: **-122.2415**

## Structure Classification

Risk Category : **II** per ASCE Table 1.5-1

Seismic Force-Resisting System: **Light-Framed Wood Walls Sheathed with Structural Panels**

R: **6 1/2** per ASCE Table 12.2-1  
 W<sub>o</sub>: **3** per ASCE Table 12.2-1  
 C<sub>d</sub>: **4** per ASCE Table 12.2-1  
 h<sub>n</sub> (ft): **20.00** height above the base to the highest level of the structure

## Site Ground Motion

Reg. Structure/5 Stories Max: **No** Per ASCE 12.8.1.3

S<sub>1</sub> (g-sec): **0.48** S<sub>s</sub> (g-sec): **1.38**

Site Class: **D** **Assumed Value** per ASCE 11.4.3

ASCE 11.4.8 Exception 2 Used

F<sub>v</sub> **1.82**

F<sub>a</sub> **1.20**

1.2 Min Value where SC D Assumed

S<sub>M1</sub> (g-sec): **0.88**

S<sub>MS</sub> (g-sec): **1.66**

per ASCE 11.4.4

S<sub>D1</sub> (g-sec): **0.58**

S<sub>DS</sub> (g-sec): **1.11**

per ASCE 11.4.5

SDC: **D** per ASCE 11.6

I<sub>E</sub>: **1.00** per ASCE Table 1.5-2

## Fundamental Period per ASCE 12.8.2

Period Method: **Approximate Fundamental Period**

Structure Type: **All Other Structural Systems**

T<sub>L</sub> (sec): **6.00** ASCE Figures 22-14 through 22-17

T<sub>s</sub>: 0.53


T<sub>a</sub> (sec): 0.19 Ct \* h<sub>nx</sub> per ASCE Eq. 12.8-7

T<sub>use</sub> (sec): **0.19** ≤ TL

## Equivalent Lateral Force Procedure Design Base Shear per ASCE 12.8

C<sub>s</sub>: 0.17 = S<sub>DS</sub> / (R/I<sub>E</sub>) per ASCE Eq. 12.8-2  
 C<sub>s-max</sub>: 0.48 = S<sub>D1</sub> / (T<sub>a</sub>\*R/I<sub>E</sub>) for T ≤ T<sub>L</sub> per ASCE Eq. 12.8-3  
 C<sub>s-max</sub>: -- = S<sub>D1</sub>\*T<sub>L</sub> / (T<sub>a</sub><sup>2</sup>\*R/I<sub>E</sub>) for T > T<sub>L</sub> per ASCE Eq. 12.8-4  
 C<sub>s-min</sub>: 0.05 per ASCE Eq. 12.8-5  
 C<sub>s-min</sub>: -- = 0.5S<sub>1</sub> / (R/I<sub>E</sub>) for S<sub>1</sub> ⇒ 0.6g per ASCE Eq. 12.8-6  
 C<sub>s-use</sub>: 0.17

**V : 0.170 W = C<sub>s-use</sub> \* W per ASCE Eq. 12.8-1**

	<b>Quantum Consulting Engineers LLC</b> 1511 Third Avenue, Suite 323 Seattle, WA 98101	Project: <b>Mobley Residence</b>	Date: <b>4/27/23</b>	Job No: <b>22050.01</b>
		Designer: <b>FRU</b>		Sheet: <b>1</b>
	Client:	Checked By:		



# Vert. Distribution of Seismic Forces for the Equiv. Lateral Force Procedure

Per IBC 2018 & ASCE 7-16

Structure: **MOBLEY RESIDENCE**

## Seismic Parameters

$I_E$ : 1.00 per ASCE Table 1.5-2  
 $S_{DS}$  (g-sec): 1.11 per ASCE 11.4.4  
 Period (Sec): 0.19 per ASCE 12.8.2.1  
 $k$ : 1.00 per ASCE 12.8.3

## Vertical Distribution of Seismic Forces per ASCE 12.8.3

$$F_x = C_{vx}V \text{ per ASCE Eq. 12.8-11}$$

$$C_{vx} = (w_x h_x^k) / (\sum w_i h_i^k) \text{ per ASCE Eq. 12.8-12}$$

Level	$h_x$ (ft)	$w_x$ (k)	% of $W_{total}$	$w_x * h_x^k$	$C_{vx}$ (%)	$F_x$ (k)	$V_x$ (k)
<b>ROOF</b>	<b>19.83</b>	<b>90.40</b>	49.2%	1792.6	68.5%	<b>21.43</b>	<b>21.43</b>
<b>MAIN</b>	<b>8.83</b>	<b>93.40</b>	50.8%	824.7	31.5%	<b>9.86</b>	<b>31.29</b>

Total WT (k): 183.80      Sum: 2617

$C_{s-use}$ : 0.170

$V$  (k): **31.29** per ASCE 12.8.1

## Vertical Distribution of Seismic Diaphragm Forces per ASCE 12.10.1.1

$$F_{px} = (SF_i / S_{w_i}) * w_{px} \text{ per ASCE Eq 12.10-1}$$

$$F_{px-max} = 0.4 * S_{DS} * I_E * w_{px} \text{ per per ASCE 12.10.1.1}$$

$$F_{px-min} = 0.2 * S_{DS} * I_E * w_{px} \text{ per per ASCE 12.10.1.1}$$

Level	$w_{px}$ (k)	$\sum W_i$ (k)	$F_x$ (k)	$\sum F_i$ (k)	$F_{px}$ (k)	Notes
ROOF	90.40	90.40	21.43	21.43	<b>21.43</b>	
MAIN	93.40	183.80	9.86	31.29	<b>20.67</b>	<b>= Fp-min</b>

Diaphragm/Story

Force Ratio

1.000

2.097

# Wind Loads Criteria

ASCE 7-16

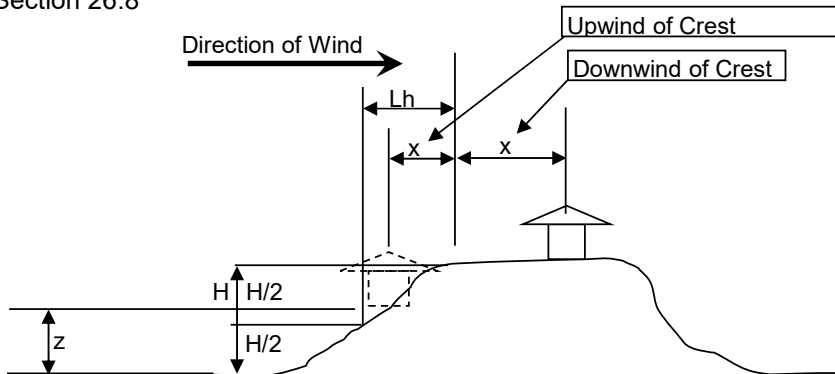
## Wind Load Criteria

Risk Category: **II** Table 1.5-1  
 Basic Wind Speed: **110** Figure 26.5.1  
 Exposure Category: **C** Section 26.7.3  
 Ground Elevation: **0 ft**  
 Wall Ht: **26.3 ft**

Roof Type: **Gable/Mansard**  
 Roof Slope: **2.0:12** 9.5 DEG  
 Mean Roof HT: **26.3 ft** UP TO 160FT  
 Parapet: **No**  
**26.3 ft** UP TO 160FT

### Wind Topographic Factor, $K_{zt}$ :

per Section 26.8




Terrain Type: **2-dimensional escarpments**  
 Direction: **Upwind of Crest**

$L_h$ : **100 ft** DIST UPWIND OF CREST TO HALF HT OF HILL OR ESCARP.  
 $H$ : **50 ft** HT. OF HILL OR ESCARP. RELATIVE TO THE UPWIND TERRAIN  
 $x$ : **10 ft** DIST. (UPWIND OR DOWNWIND) FROM THE CREST TO THE BUILDING  
 $z$ : **30 ft** HEIGHT ABOVE GROUND SURFACE AT BUILDING SITE

$K_{zt}$ : 1.41 EQUATION 26.8-1  
 $K_{zt}$ : **1.00** MANUALLY INPUT

$K_e$ : **1.000** ASCE 26.10.1

$K_d$ : **0.85** ASCE 26.6

 <b>Quantum Consulting Engineers LLC</b> 1511 Third Avenue, Suite 323 Seattle, WA 98101	Project: <b>Mobley Residence</b>	Date: <b>4/27/23</b>	Job No: <b>22050.01</b>
	Client:	Designer: <b>FRU</b>	Sheet: <b>1</b>
	Checked By:		

# Wind Loads - Main Wind Force Resisting System

ASCE 7-16 Chapter 27.3 Part 1 - Enclosed Simple Diaphragm,  $h < 160\text{ft}$

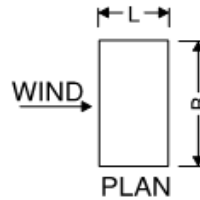
## Wind Load Criteria

Risk Category:	<b>II</b>	Table 1.5-1	$K_e$ :	<b>1</b>	Section 26.10.1
Basic Wind Speed:	<b>110 mph</b>	Figure 26.5.1	$K_d$ :	<b>0.85</b>	Section 26.6
Exposure Category:	<b>C</b>	Section 26.7.3	$G$ :	<b>0.85</b>	Section 26.11
$K_{zt}$ :	<b>1.00</b>	Section 26.8	Wall Height:	<b>26.3 ft</b>	

## Wall Pressures:

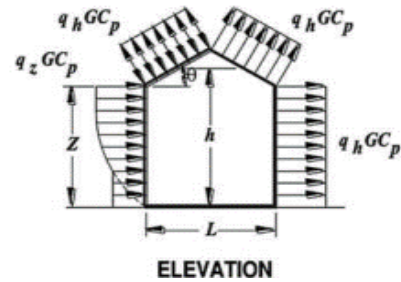
### L/B Ratio:

Short Dimension:	<b>50.5 ft</b>
Long Dimension:	<b>60.0 ft</b>
Transverse Wind L/B:	0.84
Longitudinal Wind L/B:	1.19



\*NOTE: INTERNAL BUILDING PRESSURE CANCEL EACH OTHER OUT IN ENCLOSED BUILDING

$K_h$ & $K_z$ :	0.955	At Top of Wall
$K_z$ :	0.85	0 ft to 15 ft



	<u>Transverse</u> Wind Direction	<u>Longitudinal</u> Wind Direction
Top of Wall:	<b>27.8 psf</b>	<b>27.0 psf</b>
0 ft to 15 ft Wall:	<b>25.9 psf</b>	<b>25.1 psf</b>

ASCE EQ 27.3-1  
ASCE EQ 27.3-1

\*Enveloped Leeward and Windward Pressure  
\*All Values Ultimate (multiply x0.6 for ASD)



**Quantum Consulting Engineers LLC**  
1511 Third Avenue, Suite 323  
Seattle, WA 98101

Project: Moblely Residence

Date: 4/27/23

Job No: #####

Designer: FRU

Sheet: 2

Client:

Checked By:

# Wind Loads - Main Wind Force Resisting System (Cont.)

ASCE 7-16 Chapter 27.3 Part 1 - Enclosed Simple Diaphragm,  $h < 160\text{ft}$

## Roof Pressure:

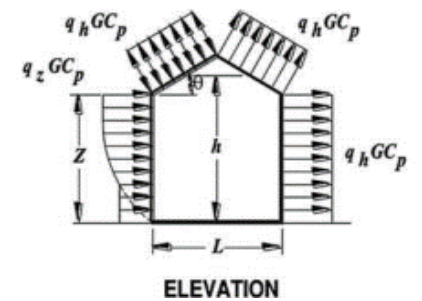
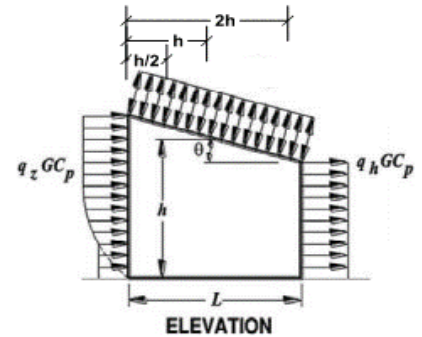
Slope: 2.0:12 = 9.5 DEGREES  
 Mean Roof HT: 26.3 ft  
 Building Dimension: **40.0 ft** Parallel to Ridge  
 Building Dimension: **60.0 ft** Normal to Ridge  
 $K_n$  &  $K_z$ : 0.955 At Mean Roof Ht

## FLAT ROOF

### Windward Pressure

	LC 1	LC 2	LC 1	LC 2
0 to $h/2$	-29.6 psf	0.7 psf	-4.9 psf	0.1 psf
$h/2$ to $h$	-20.8 psf	0.7 psf	-3.4 psf	0.1 psf
$h$ to $2h$	-18.2 psf	0.7 psf	-3.0 psf	0.1 psf
$>2h$	-16.8 psf	0.7 psf	-2.8 psf	0.1 psf

tal



\*Negative indicates pressure away from surface

\*Total horizontal shear shall not be less than that determined by neglecting roof wind forces

\*All Values Ultimate (multiply x0.6 for ASD)

## Roof Overhang (PSF)

$P_{ovh}$ : -46.7 psf -7.7 psf

## Minimum Total Projected Horizontal Pressure (PSF)

8.0 psf

ASCE 27.1.5



Quantum Consulting Engineers LLC  
 1511 Third Avenue, Suite 323  
 Seattle, WA 98101

Project: Mobley Residence

Date: 4/27/23

Job No: #####

Designer: FRU

Sheet: 3

Client:

Checked By:

# Wind Loads - Components and Cladding

ASCE 7-16 Chapter 30.3 & 30.5 - Part 1 and Part 3 Enclosed Buildings With  $h < 160$  FT

## Wind Load Criteria

Risk Category:	<b>II</b>	Table 1.5-1	$K_d$ :	<b>0.85</b>	Section 26.6
Basic Wind Speed:	<b>110 mph</b>	Figure 26.5.1	Roof Type:	<b>Gable/Mansard</b>	
Exposure Category:	<b>C</b>	Section 26.7.3	Roof Slope:	<b>2.0:12</b>	= 9.5 DEG
$K_{zt}$ :	<b>1.00</b>	Section 26.8	Mean Roof Height:	<b>26.3 ft</b>	
$K_e$ :	<b>1.00</b>	Section 26.10.1	Wall Height:	<b>26.3 ft</b>	<b>0.0 ft</b>

## Zone Dimensions

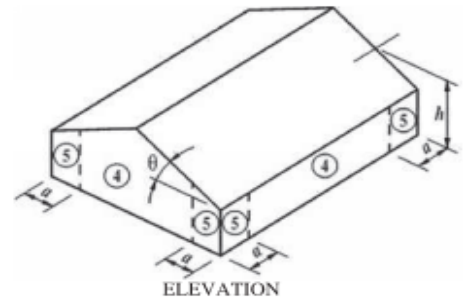
Least Horiz. BLDG Dimension: **51 ft**      a: **5.1 ft**  
 2a: **10.1 ft**

## Wall Pressures

$K_z$ :	0.850	Table 26.10-1	0-15 ft (PART 3)
$K_h$ :	0.955	Table 26.10-1	
Effective Wind Area:	Zone 4:	<b>400 ft<sup>2</sup></b>	
	Zone 5:	<b>400 ft<sup>2</sup></b>	

Load Case	At Top of Wall		0 FT TO 15 FT (>60' bldg)	
	4	5	4	5
1	<b>20.8</b>	<b>20.8</b>		
2	<b>-23.0</b>	<b>-23.4</b>		

- \*Negative indicates pressure away from surface
- \*Okay to interpolate between 15ft and top of wall (>60' bldg)
- \*All Values Ultimate (multiply x0.6 for ASD)



## Roof Pressures

$K_h$ : 0.955 Table 26.10-1  
 Overhang?: **No**

Effective Wind Area:	Zone 1:	<b>75 ft<sup>2</sup></b>	Zone 2:	<b>75 ft<sup>2</sup></b>	Zone 3:	<b>75 ft<sup>2</sup></b>
	Zone 1':	<b>75 ft<sup>2</sup></b>	Zone 2e:	<b>75 ft<sup>2</sup></b>	Zone 3e:	<b>75 ft<sup>2</sup></b>
			Zone 2n:	<b>75 ft<sup>2</sup></b>	Zone 3r:	<b>75 ft<sup>2</sup></b>
			Zone 2r:	<b>75 ft<sup>2</sup></b>	Zone 3':	<b>75 ft<sup>2</sup></b>
			Zone 2':	<b>75 ft<sup>2</sup></b>		

Load Case	Zone (PSF)	
	1	1'
1	<b>12.8</b>	-
2	<b>-23.8</b>	-

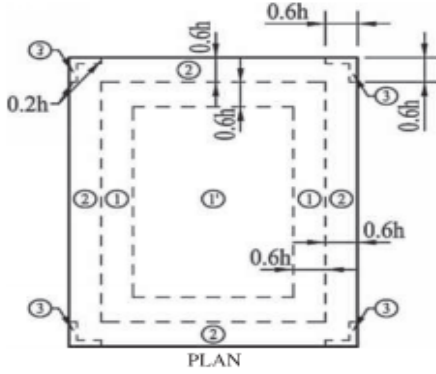
Load Case	2	2e	2n	2r	2'
	1	-	<b>12.8</b>	<b>12.8</b>	<b>12.8</b>
2	-	<b>-23.8</b>	<b>-48.5</b>	<b>-48.5</b>	-

Load Case	3	3e	3r	3'
	1	-	<b>12.8</b>	<b>12.8</b>
2	-	<b>-48.5</b>	<b>-55.4</b>	-

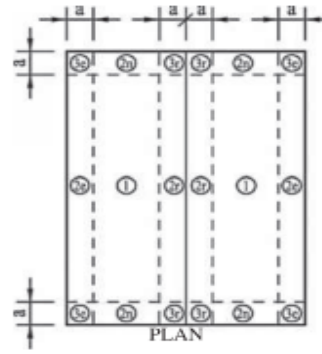
- \*Negative indicates pressure away from surface
- \*All Values Ultimate (multiply x0.6 for ASD)

# Wind Loads - Components and Cladding (Cont.)

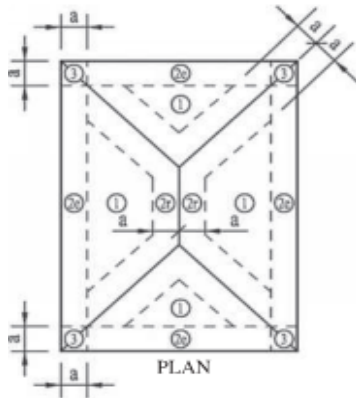
ASCE 7-16 Chapter 30 - Part 4 Enclosed Buildings With  $h < 160$  FT (Simplified)



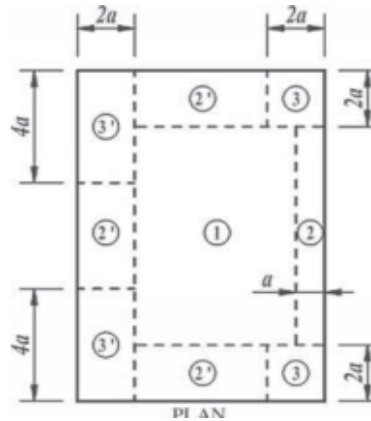
**ASCE FIG 30.3-2A**  
**FLAT/GABLE ROOF  $\theta \leq 7^\circ$**



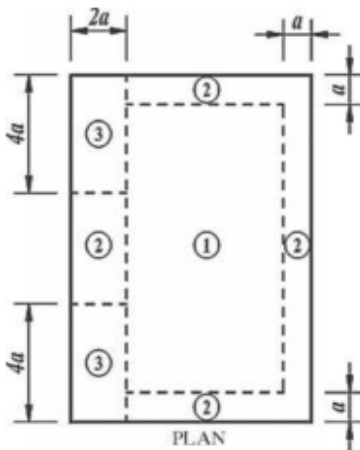
**ASCE FIG 30.3-2B to D**  
**GABLE ROOF  $7^\circ < \theta \leq 45^\circ$**



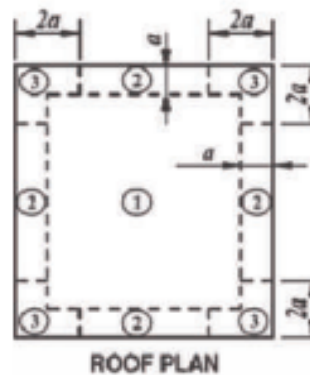
**ASCE FIG 30.3-2E to I**  
**HIP ROOF  $7^\circ < \theta \leq 45^\circ$**



**ASCE FIG 30.3-5A**  
**Monoslope ROOF  $3^\circ < \theta \leq 10^\circ$**



**ASCE FIG 30.3-5B**  
**Monoslope ROOF  $10^\circ < \theta \leq 30^\circ$**



**ASCE FIG 30.5-1**  
**ROOF  $H > 60$ ft,  $\theta \leq 7^\circ$**

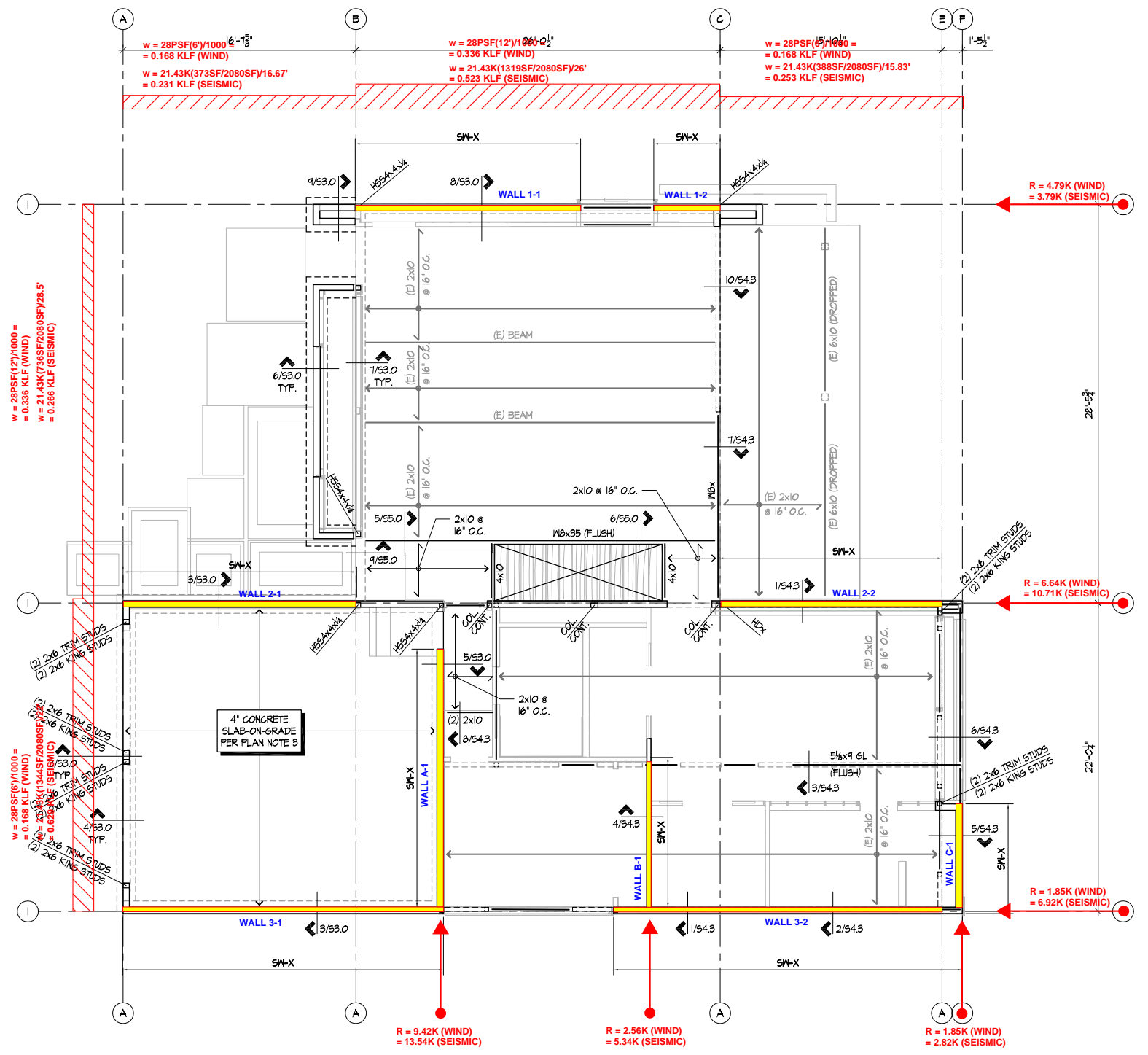


**Quantum Consulting Engineers LLC**  
 1511 Third Avenue, Suite 323  
 Seattle, WA 98101

Project: Moblely Residence      Date: 4/27/23  
 Designer: FRU  
 Client:                                      Checked By:

Job No: 22050.01  
 Sheet: 5

# ROOF DIAPHRAGM ON MAIN LEVEL SHEAR WALLS



# LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018

Structure: **MOBLEY RESIDENCE**  
 Floor Level: **ROOF DIAPRAGM ON MAIN LEVEL SHEAR WALLS (N-S)**


Sds = 1.11  
 Depth of Floor Framing & Plates (Clearspan) at Interstory (in) = 14.50

**Shear Wall Line Information**

SW Mark	L <sub>sw</sub> (ft)	Wall Pier h <sub>wp</sub> (ft)	Aspect Ratio	Wall Framing Species	Specific Gravity G	Interstory or Base?	h <sub>sw</sub> (ft)	Wall Wt. (psf)	Roof/Floor Trib. (ft)	Roof/Floor Wt. (psf)
<b>SW GRID A</b>	<b>18.33</b>	-	-	-	-	-	-	-	-	-
SW Segment A-1	18.33	9.25	0.50	DF #2	0.50	Base	9.25	8.0	2.0	38.0
<b>SW GRID B</b>	<b>10.42</b>	-	-	-	-	-	-	-	-	-
B-1	10.42	9.25	0.89	DF #2	0.50	Interstory	9.25	8.0	2.0	38.0
<b>SW GRID C</b>	<b>7.83</b>	-	-	-	-	-	-	-	-	-
C-1	7.83	9.25	1.18	DF #2	0.50	Interstory	9.25	10.0	2.0	38.0
<b>SW GRID</b>	<b>0.00</b>	-	-	-	-	-	-	-	-	-

**Shear Wall Loads and Summary**

SW Mark	EQ (lb) Wall (ULT)	Wind (lb) Wall (ULT)	Wall DL (lb)	Wall DL (lb) End 1	Wall DL (lb) End 2	Shear Wall Type	MIN. # of End Studs	Holdown
<b>SW GRID A</b>	13540	9420	-	-	-	-	-	-
SW Segment A-1	13540	9420	2750			SW-3	2	HDU4 (4565DF, 3285HF)
<b>SW GRID B</b>	5340	2560	-	-	-	-	-	-
B-1	5340	2560	1563			SW-4	2	MSTC48B3 (3975DF, 3900HF)
<b>SW GRID C</b>	2820	1850	-	-	-	-	-	-
C-1	2820	1850	1319			SW-6	2	MSTC48B3 (3975DF, 3900HF)
<b>SW GRID</b>						-	-	-

	<b>Quantum Consulting Engineers LLC</b>	Project: MOBLEY RESIDENCE	Date: 5/1/23	Job No: 22050.01
	1511 Third Avenue, Suite 323		Designer: FRU	Sheet: 1
	Seattle, WA 98101	Client:	Checked By:	



## LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018

Structure: **MOBLEY RESIDENCE**  
 Floor Level: **ROOF DIAPHRAGM ON MAIN LEVEL SHEAR WALLS (N-S)**

Shear Wall Schedule (LRFD)

$\phi_c = 0.8$

Shear Wall Type	Sheathing Grade, Sheathing Thickness, & Nail Size	Panel Edge Nail Spacing (in)	Nominal Seismic SW Capacity (plf)	LRFD Seismic SW Capacity (plf)	Nominal Wind SW Capacity (plf)	LRFD Wind SW Capacity (plf)	Sheathing Shear Stiffness, $G_a$ (lb/in)
SW-6	APA Rated, 7/16", 8d Common	6	520	416	730	584	10
SW-4	APA Rated, 7/16", 8d Common	4	760	608	1065	852	13
SW-3	APA Rated, 7/16", 8d Common	3	980	784	1370	1096	15
SW-2	APA Rated, 7/16", 8d Common	2	1280	1024	1790	1432	20
2SW-4	APA Rated, 7/16", 8d Common	4	1520	1216	2130	1704	26
2SW-3	APA Rated, 7/16", 8d Common	3	1960	1568	2740	2192	30
2SW-2	APA Rated, 7/16", 8d Common	2	2560	2048	3580	2864	40

\*\*See SDPWS Table 4.3A Note 2


Determine Shear Wall Type (LRFD)

SW Segment Mark	Seismic Shear (plf)	Aspect Ratio Reduction	Adjusted Seismic Shear (plf)	Wind Shear (plf)	Adjusted Wind Shear (plf)	Controlling Shear (plf)	Shear Wall Type	Shear Wall Capacity (plf)	Check	Controlling Shear
A-1	739	1.00	739	514	514	739	SW-3	784	OK	Seismic
B-1	512	1.00	512	246	246	512	SW-4	608	OK	Seismic
C-1	360	1.00	360	236	236	360	SW-6	416	OK	Seismic

\*NOTE: CONTROLLING SHEAR IS BASED ON THE DIFFERENCE IN SHEAR WALL CAPACITY BETWEEN WIND & EQ

Determine Shear Wall Overturning Moment Lever Arm

SW Segment Mark	Wall Length Lever Arm (ft)	Calculated Lever Arm (ft)	% Different	Override Wall Length	User Input $M_{OT}$ Lever Arm (ft)
A-1	18.33	17.85	2.71%	No	
B-1	10.42	10.21	2.04%	No	
C-1	7.83	7.62	2.73%	No	

	<b>Quantum Consulting Engineers LLC</b>	Project: MOBLEY RESIDENCE	Date: 5/1/23	Job No: 22050.01
	1511 Third Avenue, Suite 323		Designer: FRU	Sheet: 3
	Seattle, WA 98101	Client: 0	Checked By:	

## LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018


Structure: **MOBLEY RESIDENCE**  
 Floor Level: **ROOF DIAPHRAGM ON MAIN LEVEL SHEAR WALLS (N-S)**

Shear Wall End Axial Load (ASD)

SW Segment Mark	Seismic Tension (lb)	ASD Seismic Tension Above (lb)	Seismic Tension Total (lb)	Wind Tension (lb)	ASD Wind Tension Above (lb)	Wind Tension Total (lb)	End 1 Dead (lb)	End 2 Dead (lb)
A-1	4783		4783	2852		2852	1375	1375
B-1	3318		3318	1364		1364	782	782
C-1	2332		2332	1311		1311	660	660

Determine Required Holdown (ASD)

SW Segment Mark	Wind End 1 Eq. 16-15	EQ End 1 Eq. 16-16	Wind End 2 Eq. 16-15	EQ End 2 Eq. 16-16	Controlling Ten. Load (lb)	Holdown	Holdown Capacity (lb)	Status
A-1	-2027	-4172	-2027	-4172	-4172	HDU4 (4565DF, 3285HF)	-4565	OK
B-1	-895	-2971	-895	-2971	-2971	MSTC48B3 (3975DF, 3900HF)	-3975	OK
C-1	-915	-2039	-915	-2039	-2039	MSTC48B3 (3975DF, 3900HF)	-3975	OK

	<b>Quantum Consulting Engineers LLC</b>	Project: MOBLEY RESIDENCE	Date: 5/1/23	Job No: 22050.01
	1511 Third Avenue, Suite 323		Designer: FRU	Sheet: 3
	Seattle, WA 98101	Client: 0	Checked By:	

# LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018

Structure: **MOBLEY RESIDENCE**  
 Floor Level: **ROOF DIAPRAGM ON MAIN LEVEL SHEAR WALLS (E-W)**

Sds = 1.11  
 Depth of Floor Framing & Plates (Clearspan) at Interstory (in) = 14.50

**Shear Wall Line Information**

SW Mark	L <sub>sw</sub> (ft)	Wall Pier h <sub>wp</sub> (ft)	Aspect Ratio	Wall Framing Species	Specific Gravity G	Interstory or Base?	h <sub>sw</sub> (ft)	Wall Wt. (psf)	Roof/Floor Trib. (ft)	Roof/Floor Wt. (psf)
<b>SW GRID 1</b>	<b>20.75</b>	-	-	-	-	-	-	-	-	-
SW Segment 1-1	16.00	9.25	0.58	DF #2	0.50	Base	9.25	10.0	7.3	15.0
1-2	4.75	9.25	1.95	DF #2	0.50	Base	9.25	10.0	12.5	15.0
<b>SW GRID 2</b>	<b>32.50</b>	-	-	-	-	-	-	-	-	-
2-1	16.58	9.25	0.56	DF #2	0.50	Base	9.25	10.0	11.0	38.0
2-2	15.92	9.25	0.58	DF #2	0.50	Interstory	9.25	10.0	11.0	38.0
<b>SW GRID 3</b>	<b>46.25</b>	-	-	-	-	-	-	-	-	-
3-1	22.92	9.25	0.40	DF #2	0.50	Base	9.25	10.0	11.0	38.0
3-2	23.33	9.25	0.40	DF #2	0.50	Interstory	9.25	10.0	11.0	38.0
<b>SW GRID</b>	<b>0.00</b>	-	-	-	-	-	-	-	-	-

**Shear Wall Loads and Summary**

SW Mark	EQ (lb) Wall (ULT)	Wind (lb) Wall (ULT)	Wall DL (lb)	Wall DL (lb) End 1	Wall DL (lb) End 2	Shear Wall Type	MIN. # of End Studs	Holdown
<b>SW GRID 1</b>	4790	3790	-	-	-	-	-	-
SW Segment 1-1	3693	2922	3220			SW-6	2	HDU2 (3075DF,2215HF)
1-2	1097	868	1330			SW-6	2	HDU2 (3075DF,2215HF)
<b>SW GRID 2</b>	10710	6640				-	-	-
2-1	5464	3387	8464			SW-6	2	HDU2 (3075DF,2215HF)
2-2	5246	3253	8127			SW-6	2	CS16 (1705)
<b>SW GRID 3</b>	6920	1850				-	-	-
3-1	3429	917	11701			SW-6	2	No HD
3-2	3491	933	11910			SW-6	2	No Strap
<b>SW GRID</b>						-	-	-



**Quantum Consulting Engineers LLC**  
 1511 Third Avenue, Suite 323  
 Seattle, WA 98101

Project: MOBLEY RESIDENCE  
 Client:

Date: 5/1/23  
 Designer: FRU  
 Checked By:

Job No: 22050.01  
 Sheet: 1

# LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018

Structure: **MOBLEY RESIDENCE**  
 Floor Level: **ROOF DIAPHRAGM ON MAIN LEVEL SHEAR WALLS (E-W)**

Shear Wall Schedule (LRFD)

$\phi_c = 0.8$

Shear Wall Type	Sheathing Grade, Sheathing Thickness, & Nail Size	Panel Edge Nail Spacing (in)	Nominal Seismic SW Capacity (plf)	LRFD Seismic SW Capacity (plf)	Nominal Wind SW Capacity (plf)	LRFD Wind SW Capacity (plf)	Sheathing Shear Stiffness, $G_a$ (lb/in)
SW-6	APA Rated, 7/16", 8d Common	6	520	416	730	584	10
SW-4	APA Rated, 7/16", 8d Common	4	760	608	1065	852	13
SW-3	APA Rated, 7/16", 8d Common	3	980	784	1370	1096	15
SW-2	APA Rated, 7/16", 8d Common	2	1280	1024	1790	1432	20
2SW-4	APA Rated, 7/16", 8d Common	4	1520	1216	2130	1704	26
2SW-3	APA Rated, 7/16", 8d Common	3	1960	1568	2740	2192	30
2SW-2	APA Rated, 7/16", 8d Common	2	2560	2048	3580	2864	40

\*\*See SDPWS Table 4.3A Note 2

Determine Shear Wall Type (LRFD)

SW Segment Mark	Seismic Shear (plf)	Aspect Ratio Reduction	Adjusted Seismic Shear (plf)	Wind Shear (plf)	Adjusted Wind Shear (plf)	Controlling Shear (plf)	Shear Wall Type	Shear Wall Capacity (plf)	Check	Controlling Shear
1-1	231	1.00	231	183	183	231	SW-6	416	OK	Seismic
1-2	231	1.00	231	183	183	231	SW-6	416	OK	Seismic
2-1	330	1.00	330	204	204	330	SW-6	416	OK	Seismic
2-2	330	1.00	330	204	204	330	SW-6	416	OK	Seismic
3-1	150	1.00	150	40	40	150	SW-6	416	OK	Seismic
3-2	150	1.00	150	40	40	150	SW-6	416	OK	Seismic

\*NOTE: CONTROLLING SHEAR IS BASED ON THE DIFFERENCE IN SHEAR WALL CAPACITY BETWEEN WIND & EQ

Determine Shear Wall Overturning Moment Lever Arm

SW Segment Mark	Wall Length Lever Arm (ft)	Calculated Lever Arm (ft)	% Different	Override Wall Length	User Input $M_{OT}$ Lever Arm (ft)
1-1	16.00	15.52	3.12%	No	
1-2	4.75	4.27	11.36%	No	
2-1	16.58	16.10	3.01%	No	
2-2	15.92	15.71	1.33%	No	
3-1	22.92	22.55	1.66%	No	
3-2	23.33	23.12	0.90%	No	

	Quantum Consulting Engineers LLC	Project: MOBLEY RESIDENCE	Date: 5/1/23	Job No: 22050.01
	1511 Third Avenue, Suite 323		Designer: FRU	Sheet: 3
	Seattle, WA 98101	Client: 0	Checked By:	

## LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018

Structure: **MOBLEY RESIDENCE**  
 Floor Level: **ROOF DIAPRAGM ON MAIN LEVEL SHEAR WALLS (E-W)**

Shear Wall End Axial Load (ASD)

SW Segment Mark	Seismic Tension (lb)	ASD Seismic Tension Above (lb)	Seismic Tension Total (lb)	Wind Tension (lb)	ASD Wind Tension Above (lb)	Wind Tension Total (lb)	End 1 Dead (lb)	End 2 Dead (lb)
1-1	1495		1495	1014		1014	1610	1610
1-2	1495		1495	1014		1014	665	665
2-1	2134		2134	1134		1134	4232	4232
2-2	2134		2134	1134		1134	4064	4064
3-1	969		969	222		222	5850	5850
3-2	969		969	222		222	5955	5955

Determine Required Holddown (ASD)

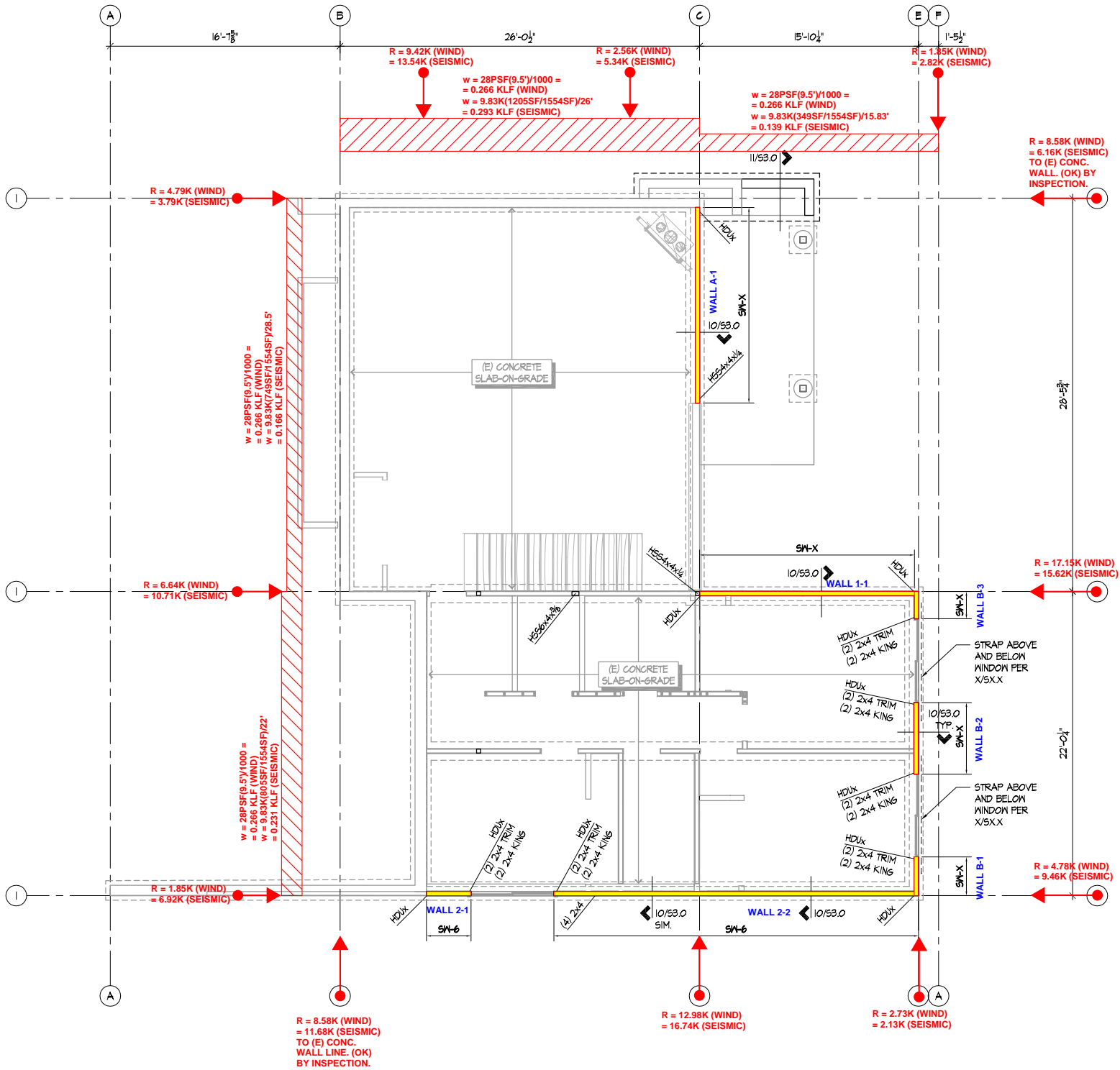
SW Segment Mark	Wind End 1 Eq. 16-15	EQ End 1 Eq. 16-16	Wind End 2 Eq. 16-15	EQ End 2 Eq. 16-16	Controlling Ten. Load (lb)	Holddown	Holddown Capacity (lb)	Status
1-1	-48	-779	-48	-779	-779	HDU2 (3075DF,2215HF)	-3075	OK
1-2	-615	-1199	-615	-1199	-1199	HDU2 (3075DF,2215HF)	-3075	OK
2-1	1405	-252	1405	-252	-252	HDU2 (3075DF,2215HF)	-3075	OK
2-2	1304	-327	1304	-327	-327	CS16 (1705)	-1705	OK
3-1	3288	1632	3288	1632	1632	No HD	0	OK
3-2	3351	1679	3351	1679	1679	No Strap	0	OK



**Quantum Consulting Engineers LLC**  
 1511 Third Avenue, Suite 323  
 Seattle, WA 98101

Project: MOBLEY RESIDENCE	Date: 5/1/23	Job No: 22050.01
Client: 0	Designer: FRU	Sheet: 3
Checked By:		

# MAIN DIAPHRAGM ON LOWER LEVEL SHEAR WALLS



# LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018

Structure: **MOBLEY RESIDENCE**  
 Floor Level: **MAIN LEVEL DIAPRAGM ON LOWER LEVEL WALLS**

Sds = 1.11  
 Depth of Floor Framing & Plates (Clearspan) at Interstory (in) = 14.50

**Shear Wall Line Information**

SW Mark	L <sub>sw</sub> (ft)	Wall Pier h <sub>wp</sub> (ft)	Aspect Ratio	Wall Framing Species	Specific Gravity G	Interstory or Base?	h <sub>sw</sub> (ft)	Wall Wt. (psf)	Roof/Floor Trib. (ft)	Roof/Floor Wt. (psf)
<b>SW GRID 1</b>	<b>15.67</b>	-	-	-	-	-	-	-	-	-
SW Segment 1-1	15.67	8.25	0.53	DF #2	0.50	Base	8.25	10.0	5.8	15.0
<b>SW GRID 2</b>	<b>29.00</b>	-	-	-	-	-	-	-	-	-
2-1	3.25	4.25	1.31	DF #2	0.50	Base	4.25	10.0	5.8	15.0
2-2	25.75	8.25	0.32	DF #2	0.50	Base	8.25	10.0	5.8	15.0
<b>SW GRID A</b>	<b>14.17</b>	-	-	-	-	-	-	-	-	-
A-1	14.17	8.25	0.58	DF #2	0.50	Base	9.25	10.0	2.0	15.0
<b>SW GRID B</b>	<b>9.92</b>	<b>5.00</b>	-	-	-	-	-	-	-	-
B-1	2.75	5.00	1.82	DF #2	0.50	Base	8.25	10.0	2.0	15.0
B-2	5.17	5.00	0.97	DF #2	0.50	Base	8.25	10.0	2.0	15.0
B-3	2.00	5.00	2.50	DF #2	0.50	Base	8.25	10.0	2.0	15.0

**Shear Wall Loads and Summary**

SW Mark	EQ (lb) Wall (ULT)	Wind (lb) Wall (ULT)	Wall DL (lb)	Wall DL (lb) End 1	Wall DL (lb) End 2	Shear Wall Type	MIN. # of End Studs	Holdown
<b>SW GRID 1</b>	15620	17150	-	-	-	-	-	-
SW Segment 1-1	15620	17150	2644			SW-2	2	HDU5 (5645DF, 4340HF)
<b>SW GRID 2</b>	9460	4780				-	-	-
2-1	1060	536	418			SW-6	2	HDU2 (3075DF,2215HF)
2-2	8400	4244	4345			SW-6	2	HDU2 (3075DF,2215HF)
<b>SW GRID A</b>	16740	12980				-	-	-
A-1	16740	12980	1736			2SW-4	3	HDU8 (3) Studs (7870DF, 6580HF)
<b>SW GRID B</b>	2130	2730				-	-	-
B-1	590	757	309			SW-6	2	HDU4 (4565DF, 3285HF)
B-2	1110	1423	582			SW-6	2	HDU4 (4565DF, 3285HF)
B-3	429	550	225			SW-6	2	HDU2 (3075DF,2215HF)



**Quantum Consulting Engineers LLC**  
 1511 Third Avenue, Suite 323  
 Seattle, WA 98101

Project: MOBLEY RESIDENCE  
 Client:

Date: 5/1/23  
 Designer: FRU  
 Checked By:

Job No: 22050.01  
 Sheet: 1

# LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018

Structure: **MOBLEY RESIDENCE**  
 Floor Level: **MAIN LEVEL DIAPHRAGM ON LOWER LEVEL WALLS**

Shear Wall Schedule (LRFD)

$\phi_c = 0.8$

Shear Wall Type	Sheathing Grade, Sheathing Thickness, & Nail Size	Panel Edge Nail Spacing (in)	Nominal Seismic SW Capacity (plf)	LRFD Seismic SW Capacity (plf)	Nominal Wind SW Capacity (plf)	LRFD Wind SW Capacity (plf)	Sheathing Shear Stiffness, $G_a$ (lb/in)
SW-6	APA Rated, 7/16", 8d Common	6	520	416	730	584	10
SW-4	APA Rated, 7/16", 8d Common	4	760	608	1065	852	13
SW-3	APA Rated, 7/16", 8d Common	3	980	784	1370	1096	15
SW-2	APA Rated, 7/16", 8d Common	2	1280	1024	1790	1432	20
2SW-4	APA Rated, 7/16", 8d Common	4	1520	1216	2130	1704	26
2SW-3	APA Rated, 7/16", 8d Common	3	1960	1568	2740	2192	30
2SW-2	APA Rated, 7/16", 8d Common	2	2560	2048	3580	2864	40

\*\*See SDPWS Table 4.3A Note 2

Determine Shear Wall Type (LRFD)

SW Segment Mark	Seismic Shear (plf)	Aspect Ratio Reduction	Adjusted Seismic Shear (plf)	Wind Shear (plf)	Adjusted Wind Shear (plf)	Controlling Shear (plf)	Shear Wall Type	Shear Wall Capacity (plf)	Check	Controlling Shear
1-1	997	1.00	997	1094	1094	997	SW-2	1024	OK	Seismic
2-1	326	1.00	326	165	165	326	SW-6	416	OK	Seismic
2-2	326	1.00	326	165	165	326	SW-6	416	OK	Seismic
A-1	1181	1.00	1181	916	916	1181	2SW-4	1216	OK	Seismic
B-1	215	1.00	215	275	275	215	SW-6	416	OK	Seismic
B-2	215	1.00	215	275	275	215	SW-6	416	OK	Seismic
B-3	215	0.94	229	275	294	229	SW-6	416	OK	Seismic

\*NOTE: CONTROLLING SHEAR IS BASED ON THE DIFFERENCE IN SHEAR WALL CAPACITY BETWEEN WIND & EQ

Determine Shear Wall Overturning Moment Lever Arm

SW Segment Mark	Wall Length Lever Arm (ft)	Calculated Lever Arm (ft)	% Different	Override Wall Length	User Input $M_{OT}$ Lever Arm (ft)
1-1	15.67	15.19	3.19%	No	
2-1	3.25	2.77	17.51%	No	
2-2	25.75	25.27	1.92%	No	
A-1	14.17	13.56	4.53%	No	
B-1	2.75	2.27	21.38%	No	
B-2	5.17	4.69	10.34%	No	
B-3	2.00	1.52	31.96%	No	

**Quantum Consulting Engineers LLC**  
 1511 Third Avenue, Suite 323  
 Seattle, WA 98101

Project: MOBLEY RESIDENCE

Date: 5/1/23

Job No: 22050.01

Designer: FRU

Sheet: 3

Client: 0

Checked By:



## LIGHT FRAMED WOOD SHEATHED PANEL SHEAR WALL DESIGN

Per IBC 2018, ASCE 7-16, SDPWS 2015 & NDS 2018

Structure: **MOBLEY RESIDENCE**

Floor Level: **MAIN LEVEL DIAPRAGM ON LOWER LEVEL WALLS**

Shear Wall End Axial Load (ASD)

SW Segment Mark	Seismic Tension (lb)	ASD Seismic Tension Above (lb)	Seismic Tension Total (lb)	Wind Tension (lb)	ASD Wind Tension Above (lb)	Wind Tension Total (lb)	End 1 Dead (lb)	End 2 Dead (lb)
1-1	5757	327	6084	5418	327	5745	1322	1322
2-1	970		970	420		420	209	209
2-2	1884		1884	816		816	2173	2173
A-1	7649		7649	5084		5084	868	868
B-1	1240	2332	3572	1362	1311	2673	155	155
B-2	1240	2332	3572	1362	1311	2673	291	291
B-3	1240		1240	1362		1362	113	113

Determine Required Holddown (ASD)

SW Segment Mark	Wind End 1 Eq. 16-15	EQ End 1 Eq. 16-16	Wind End 2 Eq. 16-15	EQ End 2 Eq. 16-16	Controlling Ten. Load (lb)	Holddown	Holddown Capacity (lb)	Status
1-1	-4951	-5496	-4951	-5496	-5496	HDU5 (5645DF, 4340HF)	-5645	OK
2-1	-295	-877	-295	-877	-877	HDU2 (3075DF, 2215HF)	-3075	OK
2-2	488	-918	488	-918	-918	HDU2 (3075DF, 2215HF)	-3075	OK
A-1	-4563	-7263	-4563	-7263	-7263	HDU8 (3) Studs (7870DF, 6580HF)	-7870	OK
B-1	-2580	-3503	-2580	-3503	-3503	HDU4 (4565DF, 3285HF)	-4565	OK
B-2	-2499	-3443	-2499	-3443	-3443	HDU4 (4565DF, 3285HF)	-4565	OK
B-3	-1295	-1190	-1295	-1190	-1295	HDU2 (3075DF, 2215HF)	-3075	OK



**Quantum Consulting Engineers LLC**  
1511 Third Avenue, Suite 323  
Seattle, WA 98101

Project: MOBLEY RESIDENCE

Date: 5/1/23

Job No: 22050.01

Designer: FRU

Sheet: 3

Client: 0

Checked By: