

## STRUCTURAL DESIGN CALCULATIONS

OF

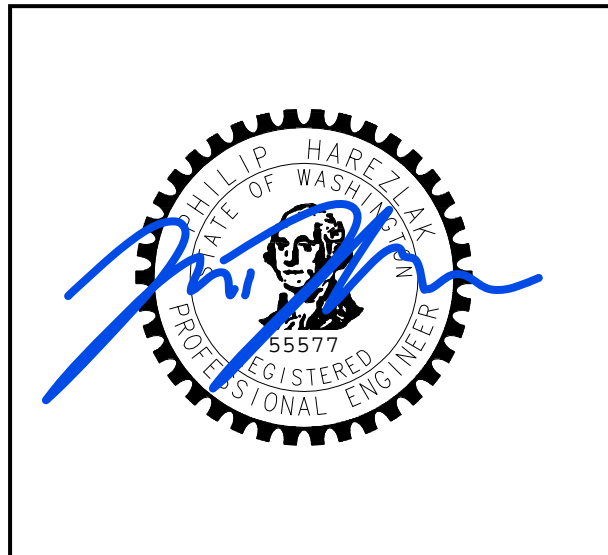
XIAO RESIDENCE

4433 86th Ave SE

Mercer Island, WA 98040

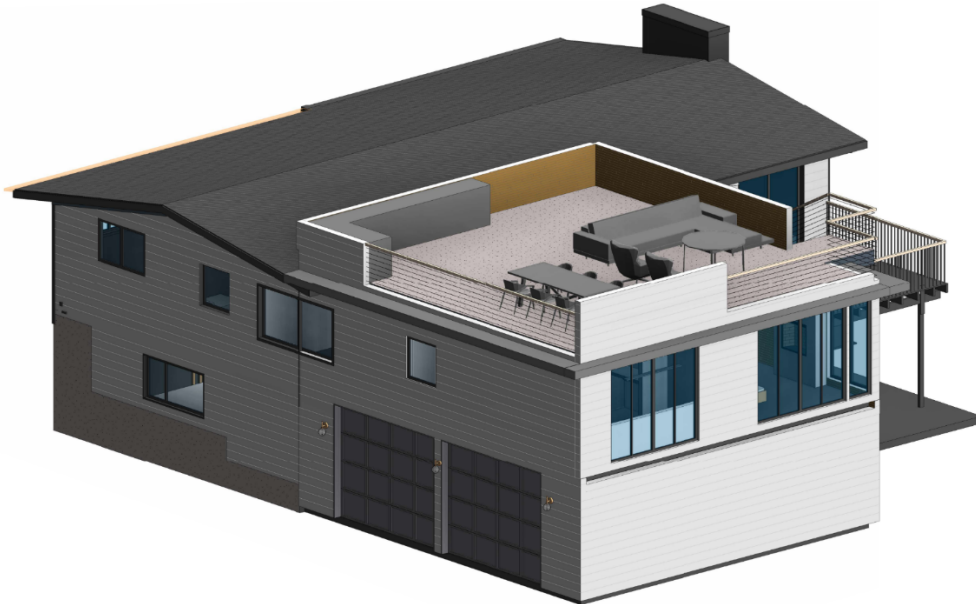
Prepared For:	XIAO ZHOU
Stage:	PERMIT SET
Date:	04-01-2025
Project No.:	25-009

### HAREZLAK ENGINEERING



The calculations contained herein have been prepared exclusively for this project. Sumer Innovations analyzed and/or designed this system for the specific configurations indicated and for the site-specific loading as of this date. These calculations are only valid with a stamp and wet signature. Calculations are site specific and not for re-use.

PROJECT SCOPE OF WORK



DESIGN OF TWO STOREY RESIDENTIAL ADDITION SINGLE-FAMILY HOME. REFER BASIS OF DESIGN AND LOAD GENERATION SHEET FOR DESIGN CRITERIA AND LOADING.

## BASIS OF DESIGN

<u>PROJECT INFORMATION</u>			
PROJECT NAME	XIAO RESIDENCE	PROJECT NO.	-
CLIENT INFORMATION	XIAO ZHOU	JURISDICTION	KING COUNTY
TYPE OF STRUCTURE	WOOD STRUCTURE ON CONC.	TYPE OF BUILDING	SINGLE FAMILY

<u>DESIGN CRITERIA</u>			
DESIGN CODE	IBC	CODE EDITION	2021
CODE FOR LOADS	ASCE 7	CODE EDITION	2016

<u>GRAVITY LOADS</u>									
<u>DEAD LOADS</u>									
ROOF	25 PSF	FLOOR	15 PSF	WALL	12 PSF	PARTITION WALL	10 PSF		
<u>LIVE LOADS</u>									
ROOF, LLR	20 PSF	FLOOR, LL	40 PSF	DECK, LL	60 PSF	STAIRS	60 PSF	RAILING	50 PLF
<u>SNOW LOADS</u>									
GROUND SNOW, P <sub>G</sub>	25 PSF	C <sub>e</sub>	1.0	C <sub>t</sub>	1.0	FLAT ROOF SNOW LOAD, P <sub>F</sub>	25 PSF		

<u>LATERAL LOADS</u>							
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<u>WIND LOAD PARAMETERS</u>	
V <sub>ULTIMATE</sub>	98 MPH
V <sub>SERVICE</sub>	75.9 MPH
RISK CATEGORY	II
EXPOSURE CATAGORY	B
K <sub>zt</sub>	1
K <sub>d</sub>	1
K <sub>e</sub>	1
G	0.85

<u>SEISMIC DESIGN PARAMETERS</u>	
S <sub>s</sub>	1.428
S <sub>1</sub>	0.496
S <sub>DS</sub>	1.142
S <sub>D1</sub>	0.597
SDC	D
SSC	D-DEFAULT
I <sub>e</sub>	1
R	6.5

ALLOWABLE SOIL VALUES (ASSUMED VALUES PER IBC TABLE 1806.2)								
BEARING PRESSURE	1500 PSF	ACTIVE	35 PCF	AT-REST	60 PCF	PASSIVE	250 PCF	$\mu$ 0.35

ALLOWABLE DEFLECTION CRITERIA			
ROOF LIVE LOAD	L/360	FLOOR LIVE LOAD	L/360
ROOF TOTAL LOAD	L/240	FLOOR TOTAL LOAD	L/240
WALLS	L/240	BRICK/STONE LOAD	-

GRAVITY STRUCTURAL SYSTEMS	
ROOF	TJI RAFTER JOISTS ON WOOD STUD BEARING WALLS
FLOOR	TJI FLOOR JOISTS ON WOOD STUD BEARING WALLS
FOUNDATION	TYPICAL CONCRETE STEM WALLS WITH STRIP AND ISOLATED FOOTINGS

LATERAL STRUCTURAL SYSTEMS	
LONGITUDINAL	LIGHT FRAME (WOOD) WALLS SHEATHED WITH WOOD STRUCTURAL PANELS RATED FOR SHEAR RESISTANCE
TRANSVERSE	LIGHT FRAME (WOOD) WALLS SHEATHED WITH WOOD STRUCTURAL PANELS RATED FOR SHEAR RESISTANCE
FOUNDATION	TYPICAL CONCRETE STEM WALLS WITH STRIP AND ISOLATED FOOTINGS

**Xiao Residence**

**Address: 4433 86th Ave SE Mercer Island, WA 98040**

**Building Code: IBC2021**

**LOADS**

**Roof Deck Loads**

**Dead Loads**

Roofing material (Deck Pavers)	15.0	psf
Sheathing (5/8" plywood)	2.0	psf
TJI @ 16"	3.0	psf
Rigid insulation, per 1"	1.5	psf
5/8" Gypboard	2.8	psf
Mep/Misc	0.7	psf
<b>Roof Dead Load =</b>	<b>25.0</b>	<b>psf</b>

**Live Loads**

<b>Roof Deck Live Load =</b>	<b>60</b>	<b>psf</b>
<b>Roof Deck Snow Load =</b>	<b>25</b>	<b>psf</b>

**Floor Loads**

**Dead Loads**

Flooring Hardwood	3.0	psf
Sheathing(23/32" plywood)	2.5	psf
TJI @ 16"	3.0	psf
Rigid insulation, per 1"	1.5	psf
5/8" Gypboard	2.8	psf
MEP/Misc.	2.2	psf
<b>Floor Dead Load =</b>	<b>15.0</b>	<b>psf</b>

**Live Loads**

<b>Floor Live Load =</b>	<b>40</b>	<b>psf</b>
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**Exterior wall weight (per square foot of wall area)**

2x6 wood stud @ 16"	2.7	psf
Plywood Sheathing	1.5	psf
5/8" Gypsum Board	2.8	psf
R-21 Insulation	0.5	psf
Wood Siding	4.0	psf
Miscellaneous	0.5	psf
<b>Total</b>	<b>12.0</b>	<b>psf</b>

**Interior partition weight (per square foot of wall area)**

2x4 wood stud @ 16"	1.7	psf
Plywood Sheathing	1.5	psf
5/8" Gypsum Board	5.5	psf
Insulation	1.0	psf
Miscellaneous	0.3	psf
<b>Total</b>	<b>10.0</b>	<b>psf</b>

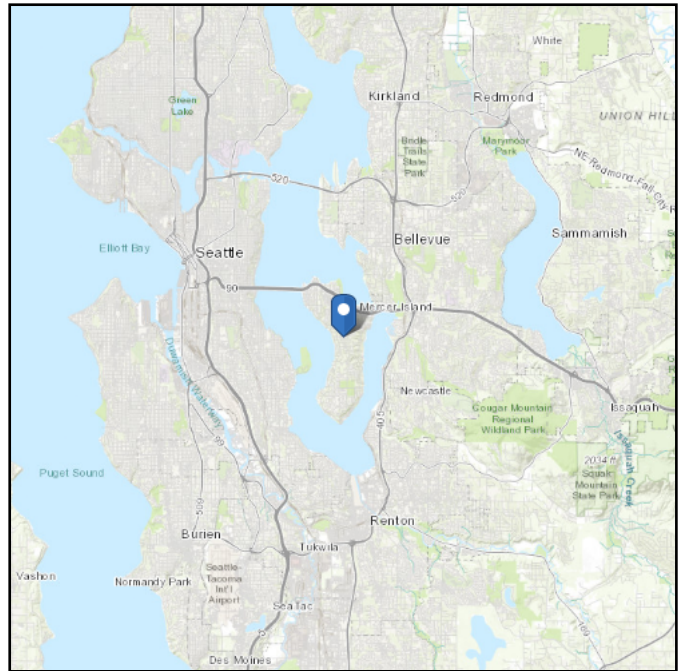
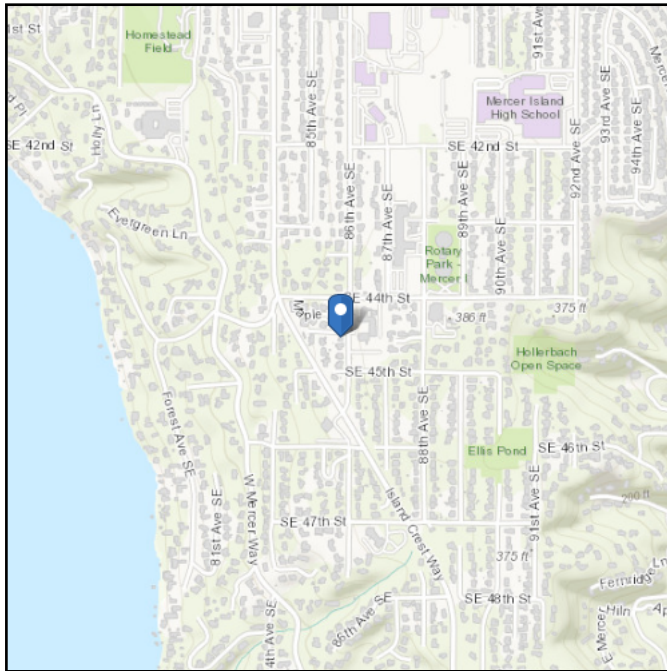


## ASCE Hazards Report

**Address:**  
4433 86th Ave SE  
Mercer Island, Washington  
98040

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

**Latitude:** 47.566342  
**Longitude:** -122.224557  
**Elevation:** 354.94395012789107 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: Fri Mar 07 2025

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.



## Seismic

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

**Results:**

$S_S$ :	1.428	$S_{D1}$ :	0.597
$S_1$ :	0.496	$T_L$ :	6
$F_a$ :	1.2	PGA :	0.611
$F_v$ :	1.804	PGA <sub>M</sub> :	0.733
$S_{MS}$ :	1.713	$F_{PGA}$ :	1.2
$S_{M1}$ :	0.895	$I_e$ :	1
$S_{DS}$ :	1.142	$C_v$ :	1.386

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

**Data Accessed:** Fri Mar 07 2025

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

## Code Search

**Code:** ASCE 7 - 16

### **Occupancy:**

Occupancy Group = R Residential

### **Risk Category & Importance Factors:**

Risk Category = II

Wind factor = 1.00

Snow factor = 1.00

Seismic factor = 1.00

### **Type of Construction:**

Fire Rating:

Roof = 1.0 hr

Floor = 1.0 hr

### **Building Geometry:**

Roof angle ( $\theta$ ) 2.00 / 12 9.5 deg

Building length (L) 53.6 ft

Least width (B) 48.0 ft

Mean Roof Ht (h) 17.0 ft

Parapet ht above grd 20.0 ft

Minimum parapet ht 3.0 ft

**Wind Loads :**

ASCE 7- 16

Ultimate Wind Speed	98 mph
Nominal Wind Speed	75.9 mph
Risk Category	II
Exposure Category	B
Enclosure Classif.	Partially Enclosed
Internal pressure	+/-0.55
Directionality (Kd)	0.85
Kh case 1	0.701
Kh case 2	0.596
Type of roof	Gable

Topographic Factor (Kzt)

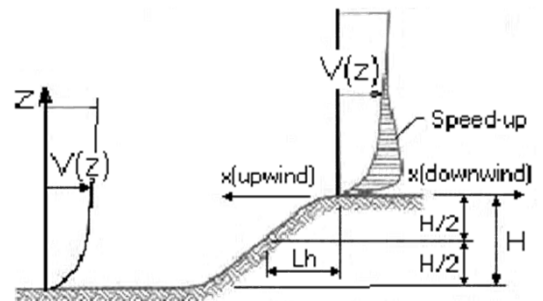
Topography	Flat
Hill Height (H)	0.0 ft
Half Hill Length (Lh)	0.0 ft
Actual H/Lh =	0.00
Use H/Lh =	0.00
Modified Lh =	0.0 ft
From top of crest: x =	0.0 ft
Bldg up/down wind?	downwind

H/Lh = 0.00	$K_1 = 0.000$
x/Lh = 0.00	$K_2 = 0.000$
z/Lh = 0.00	$K_3 = 1.000$

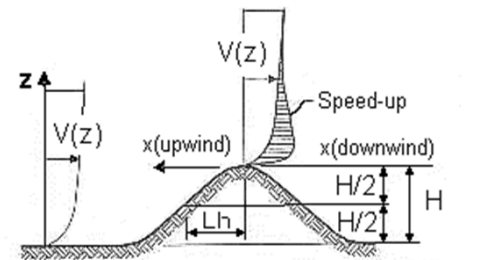
At Mean Roof Ht:

$$Kzt = (1+K_1K_2K_3)^2 = 1.00$$

H < 60ft; exp B  
∴ Kzt=1.0



**ESCARPMENT**



**2D RIDGE or 3D AXISYMMETRICAL HILL**

**Gust Effect Factor**

h =	17.0 ft
B =	48.0 ft
z (0.6h) =	30.0 ft

Flexible structure if natural frequency < 1 Hz (T > 1 second).

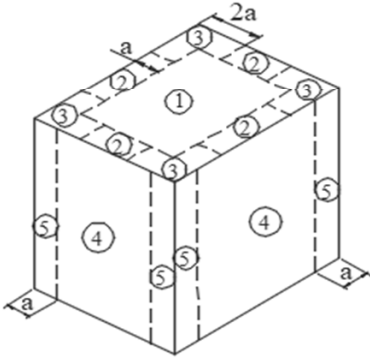
If building h/B > 4 then may be flexible and should be investigated.

h/B = 0.35 Rigid structure (low rise bldg)

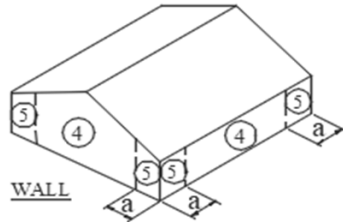
**G = 0.85** Using rigid structure default



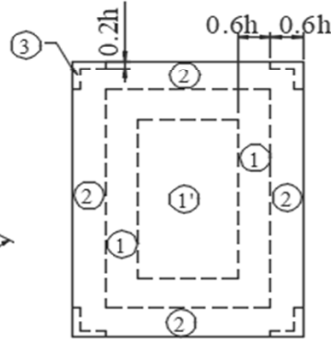
**Location of C&C Wind Pressure Zones - ASCE 7-16**



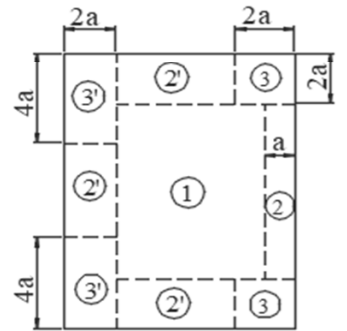
Roofs w/  $\theta \leq 10^\circ$   
and all walls  
 $h > 60'$



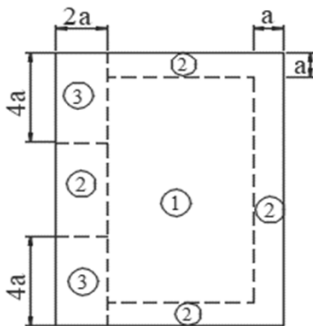
Walls  $h \leq 60'$   
& alt design  $h < 90'$



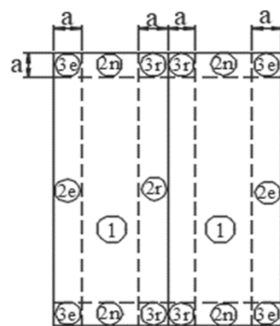
Gable, Sawtooth and  
Multispan Gable  $\theta \leq 7$  degrees &  
Monoslope  $\leq 3$  degrees  
 $h \leq 60'$  & alt design  $h < 90'$



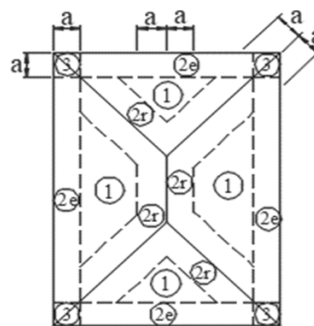
Monoslope roofs  
 $3^\circ < \theta \leq 10^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



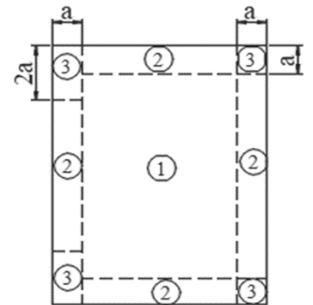
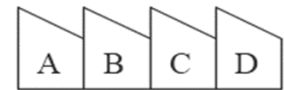
Monoslope roofs  
 $10^\circ < \theta \leq 30^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



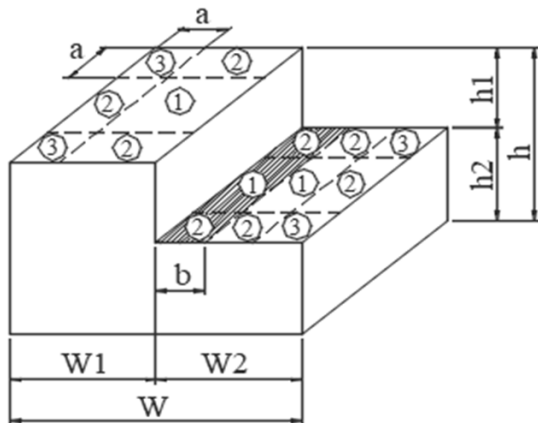
Multispan Gable &  
Gable  $7^\circ < \theta \leq 45^\circ$



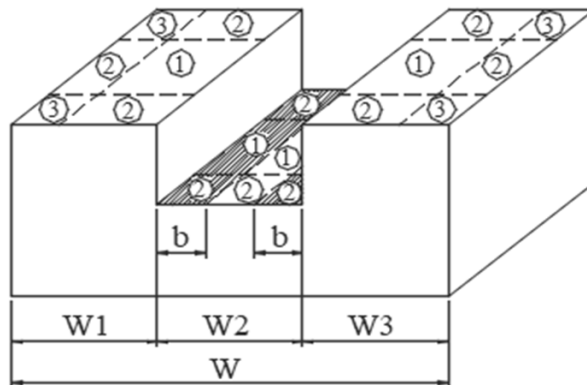
Hip  $7^\circ < \theta \leq 27^\circ$



Sawtooth  $10^\circ < \theta \leq 45^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



Stepped roofs  $\theta \leq 3^\circ$   
 $h \leq 60'$  & alt design  $h < 90'$



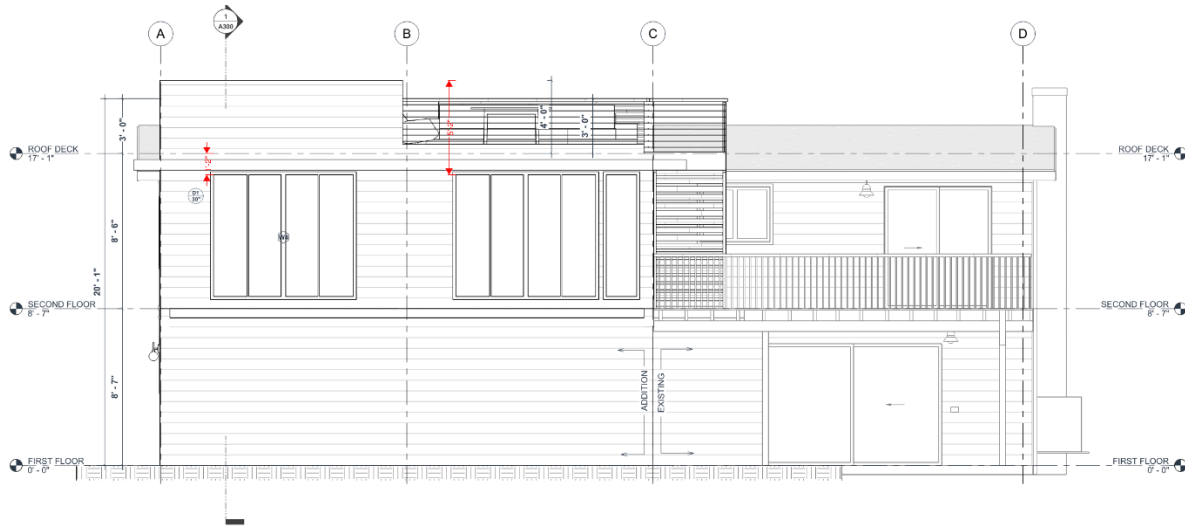
## GRAVITY CALCULATIONS

OF

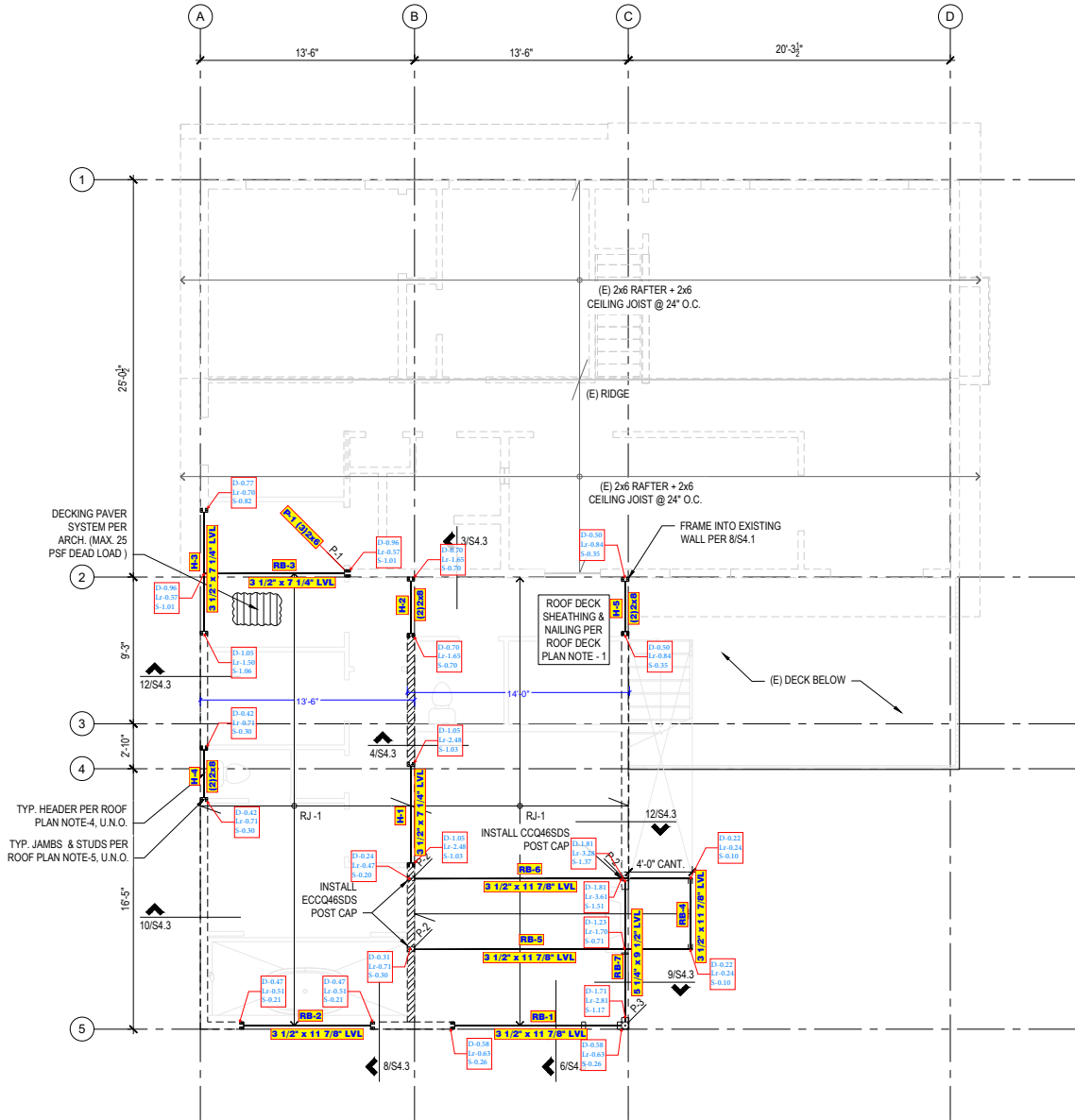
XIAO RESIDENCE

4433 86th Ave SE

Mercer Island, WA 98040



GRAVITY DESIGN FOR ROOF & MAIN FLOOR FRAMING, FOUNDATION PLAN'S STRUCTURAL MEMBERS SUCH AS JOISTS, HEADERS, BEARING STUDS, TRIMMERS AND FOOTING. REFER BASIS OF DESIGN AND LOAD GENERATION SHEET FOR DESIGN CRITERIA.



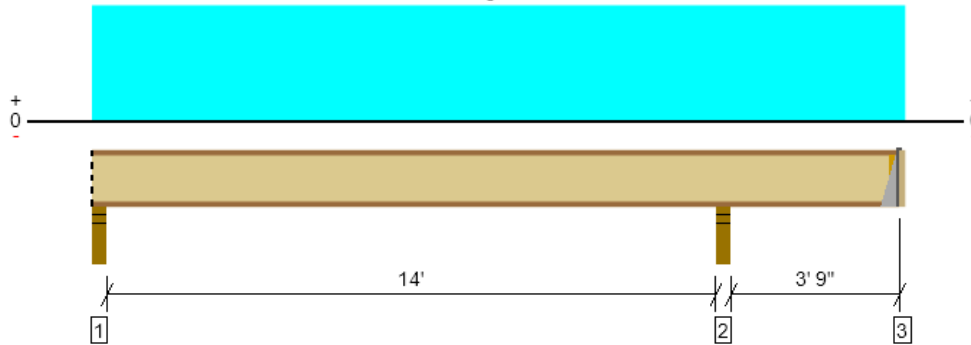
**ROOF DECK FRAMING PLAN**  
SCALE: 1/4" = 1'-0"

POST SCHEDULE	
MARK	SIZE
P-1	(3) 2x6
P-2	4x6
P-3	6x6
P-4	HSS 4x4x1/4"

Level, RR-1

**1 piece(s) 11 7/8" TJI@ 110 @ 16" OC**

Overall Length: 18' 5 1/2"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1778 @ 14' 5 1/4"	2419 (3.50")	Passed (74%)	1.25	1.0 D + 1.0 Lr (All Spans)
Shear (lbs)	862 @ 14' 3 1/2"	1950	Passed (44%)	1.25	1.0 D + 1.0 Lr (All Spans)
Moment (Ft-lbs)	-2298 @ 14' 5 1/4"	3950	Passed (58%)	1.25	1.0 D + 1.0 Lr (All Spans)
Live Load Defl. (in)	0.183 @ 6' 6 15/16"	0.711	Passed (L/932)	--	1.0 D + 1.0 Lr (Alt Spans)
Total Load Defl. (in)	0.259 @ 6' 6 15/16"	0.949	Passed (L/659)	--	1.0 D + 1.0 Lr (Alt Spans)

Member Length : 18' 4"  
 System : Roof  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2021  
 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.
- -429 lbs uplift at support located at 18' 4". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.75"	197	473	197	670	Blocking
2 - Stud wall - HF	3.50"	3.50"	3.50"	523	1255	523	1778	None
3 - Hanger on 11 7/8" LVL beam	1.50"	Hanger <sup>1</sup>	1.75" / - <sup>2</sup>	-104	-324	-135	-429	See note <sup>1</sup>

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- <sup>1</sup> See Connector grid below for additional information and/or requirements.
- <sup>2</sup> Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 2" o/c	
Bottom Edge (Lu)	3' 9" 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
3 - Top Mount Hanger	ITS1.81/11.88	2.00"	4-10dx1.5	4-10dx1.5	4-10dx1.5	Web Stiffeners

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

Vertical Load	Location	Spacing	Dead (0.90)	Roof Live (1.25)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 18' 5 1/2"	16"	25.0	60.0	25.0	ROOF DECK LOAD

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

ForteWEB Software Operator	Job Notes



## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

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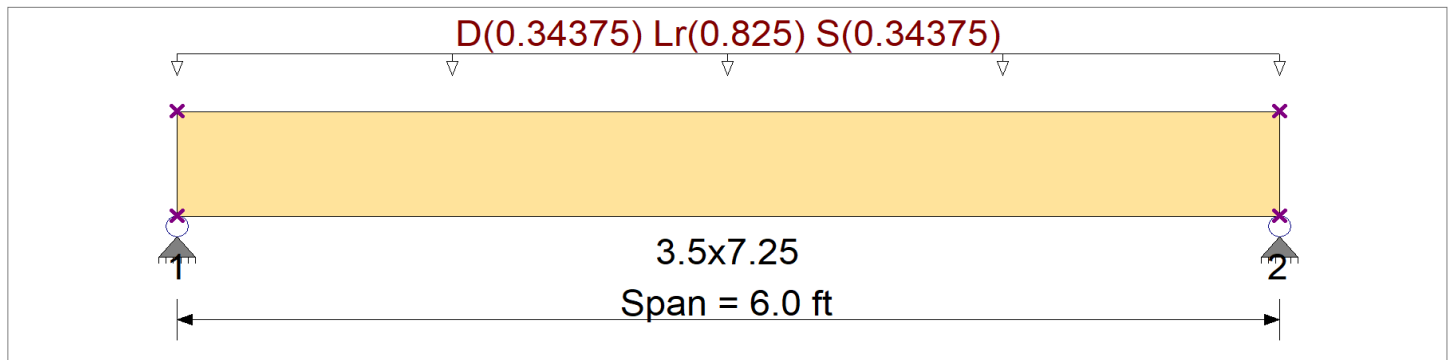
DESCRIPTION: H-1

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,000.0 psi	Eminbend - xx	1,036.83ksi
Wood Species : Boise Cascade	Fc - Perp	750.0 psi		
Wood Grade : Versa Lam 2800	Fv	285.0 psi		
	Ft	2,100.0 psi	Density	41.760pcf
Beam Bracing : Completely Unbraced				



### Applied Loads

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

Beam self weight calculated and added to loading  
 Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 13.750 ft, (Roof Deck Load)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.568</b> 1	Maximum Shear Stress Ratio	=	<b>0.470</b> : 1
Section used for this span		<b>3.5x7.25</b>	Section used for this span		<b>3.5x7.25</b>
fb: Actual	=	2,071.33psi	fv: Actual	=	167.47 psi
F'b	=	3,643.67psi	F'v	=	356.25 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	3.000ft	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	0.109 in	Ratio = <b>661</b> >=360	Span: 1 : Lr Only		n/a
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360			n/a
Max Downward Total Deflection	0.155 in	Ratio = <b>463</b> >=240	Span: 1 : +D+Lr		n/a
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240			n/a

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.1552	3.022		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	3.528	3.528
Max Upward from Load Combinations	3.528	3.528
Max Upward from Load Cases	2.475	2.475
D Only	1.053	1.053
+D+Lr	3.528	3.528
+D+0.70S	1.775	1.775
+D+0.750Lr	2.910	2.910

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

(c) ENERCALC, LLC 1982-2025

DESCRIPTION: H-2

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021

Load Combination Set : ASCE 7-16

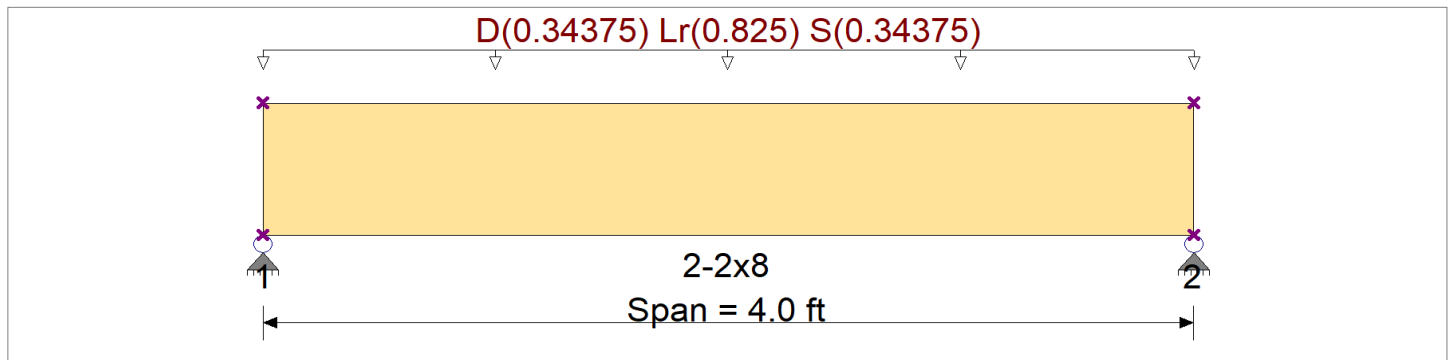
### Material Properties

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

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

Beam Bracing : Completely Unbraced

Fb +	850.0 psi	E : Modulus of Elasticity	
Fb -	850.0 psi	Ebend- xx	1,300.0ksi
Fc - Prll	1,300.0 psi	Eminbend - xx	470.0ksi
Fc - Perp	405.0 psi		
Fv	150.0 psi		
Ft	525.0 psi	Density	26.840pcf



### Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 13.750 ft, (Roof Deck Load)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.849</b> 1	Maximum Shear Stress Ratio	=	<b>0.605</b> : 1
Section used for this span		<b>2-2x8</b>	Section used for this span		<b>2-2x8</b>
fb: Actual	=	1,071.00psi	fv: Actual	=	113.35 psi
F'b	=	1,261.33psi	F'v	=	187.50 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	2.000ft	Location of maximum on span	=	3.401 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.039 in	Ratio = <b>1243</b> >=360	Span: 1 : Lr Only		n/a
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360			n/a
Max Downward Total Deflection	0.055 in	Ratio = <b>874</b> >=240	Span: 1 : +D+Lr		n/a
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240			n/a

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.0549	2.015		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.346	2.346
Max Upward from Load Combinations	2.346	2.346
Max Upward from Load Cases	1.650	1.650
D Only	0.696	0.696
+D+Lr	2.346	2.346
+D+S	1.383	1.383
+D+0.750Lr	1.933	1.933

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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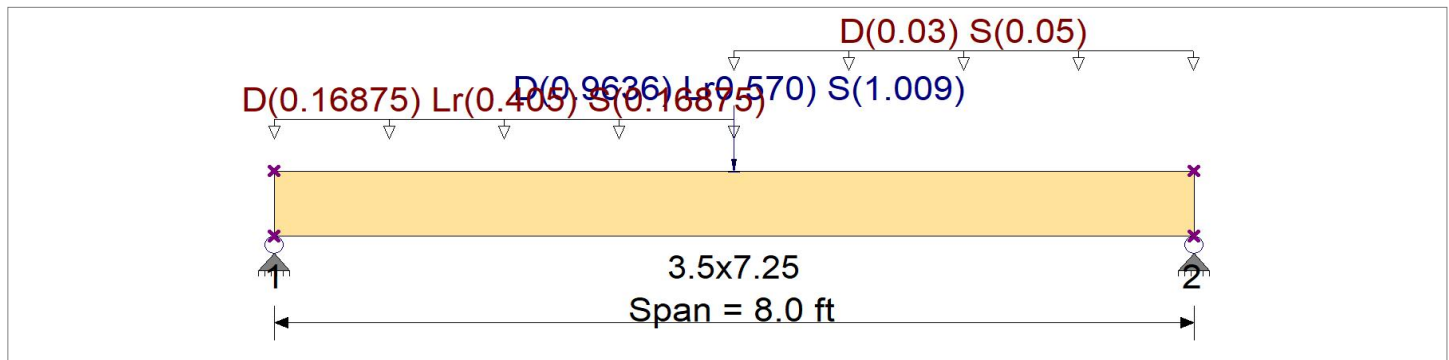
DESCRIPTION: H-3

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,000.0 psi	Eminbend - xx	1,036.83ksi
Wood Species : Boise Cascade	Fc - Perp	750.0 psi		
Wood Grade : Versa Lam 2800	Fv	285.0 psi		
	Ft	2,100.0 psi	Density	41.760pcf
Beam Bracing : Completely Unbraced				



### Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Extent = 0.0 --> 4.0 ft, Tributary Width = 6.750 ft, (Roof Deck Load)

Uniform Load : D = 0.0150, S = 0.0250 ksf, Extent = 4.0 --> 8.0 ft, Tributary Width = 2.0 ft, ((E) Roof Load)

Linked Load(s)

Beam RB-3, Support 1: D = 0.9636, Lr = 0.570, S = 1.009 k @ 4 ft from left end of beam

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.599</b> : 1	Maximum Shear Stress Ratio	=	<b>0.366</b> : 1
Section used for this span		<b>3.5x7.25</b>	Section used for this span		<b>3.5x7.25</b>
fb: Actual	=	2,168.60psi	fv: Actual	=	130.53 psi
F'b	=	3,621.33psi	F'v	=	356.25 psi
Load Combination			Load Combination		
Location of maximum on span	=	4.000ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.132 in	Ratio = <b>724</b> >=360	Span: 1 : Lr Only		
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection	0.257 in	Ratio = <b>373</b> >=240	Span: 1 : +D+Lr		
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.2573	3.883		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.547	1.460
Max Upward from Load Combinations	2.547	1.460
Max Upward from Load Cases	1.500	0.823

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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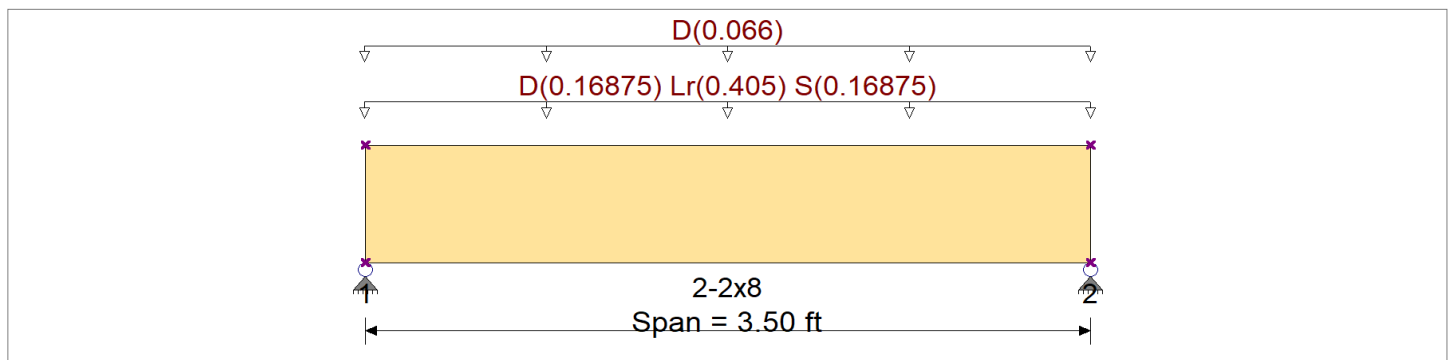
DESCRIPTION: H-4

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	850.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
	Fc - Prll	1,300.0 psi	Eminbend - xx	470.0ksi
Wood Species : Hem-Fir	Fc - Perp	405.0 psi		
Wood Grade : No.2	Fv	150.0 psi		
	Ft	525.0 psi	Density	26.840pcf
Beam Bracing : Completely Unbraced				



### Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 6.750 ft, (Roof Deck Load)

Uniform Load : D = 0.0120 ksf, Tributary Width = 5.50 ft, (Parapet/Guardrail Load)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.356</b> 1	Maximum Shear Stress Ratio	=	<b>0.272</b> : 1
Section used for this span		<b>2-2x8</b>	Section used for this span		<b>2-2x8</b>
fb: Actual	=	450.13psi	fv: Actual	=	51.04 psi
F'b	=	1,263.31psi	F'v	=	187.50 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	1.750ft	Location of maximum on span	=	2.900 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.011 in	Ratio = <b>3781</b> >=360	Span: 1 : Lr Only		
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection	0.018 in	Ratio = <b>2379</b> >=240	Span: 1 : +D+Lr		
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.0177	1.763		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.127	1.127
Max Upward from Load Combinations	1.127	1.127
Max Upward from Load Cases	0.709	0.709
D Only	0.418	0.418
+D+Lr	1.127	1.127
+D+S	0.713	0.713

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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DESCRIPTION: H-5

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-16

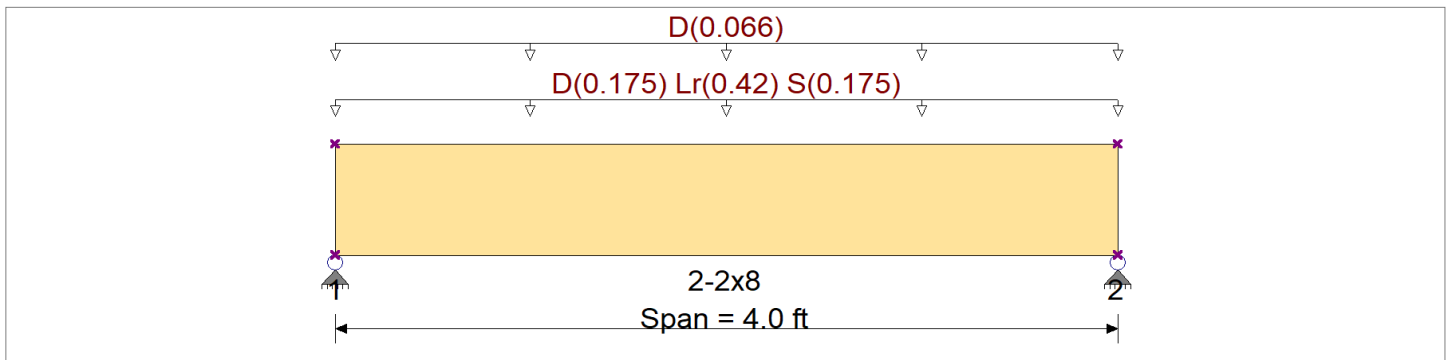
### Material Properties

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

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

Beam Bracing : Completely Unbraced

Fb +	850.0 psi	E : Modulus of Elasticity	
Fb -	850.0 psi	Ebend- xx	1,300.0ksi
Fc - Prll	1,300.0 psi	Eminbend - xx	470.0ksi
Fc - Perp	405.0 psi		
Fv	150.0 psi		
Ft	525.0 psi	Density	26.840pcf



### Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 7.0 ft, (Roof Deck Load)

Uniform Load : D = 0.0120 ksf, Tributary Width = 5.50 ft, (Parapet/Guardrail Load)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.481</b> : 1	Maximum Shear Stress Ratio	=	<b>0.343</b> : 1
Section used for this span		<b>2-2x8</b>	Section used for this span		<b>2-2x8</b>
fb: Actual	=	607.33psi	fv: Actual	=	64.28 psi
F'b	=	1,261.33psi	F'v	=	187.50 psi
Load Combination			Load Combination		
Location of maximum on span	=	2.000ft	Location of maximum on span	=	3.401 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.020 in	Ratio = <b>2443</b> >=360	Span: 1 : Lr Only		
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection	0.031 in	Ratio = <b>1542</b> >=240	Span: 1 : +D+Lr		
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.0311	2.015		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.330	1.330
Max Upward from Load Combinations	1.330	1.330
Max Upward from Load Cases	0.840	0.840
D Only	0.490	0.490
+D+Lr	1.330	1.330
+D+S	0.840	0.840

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

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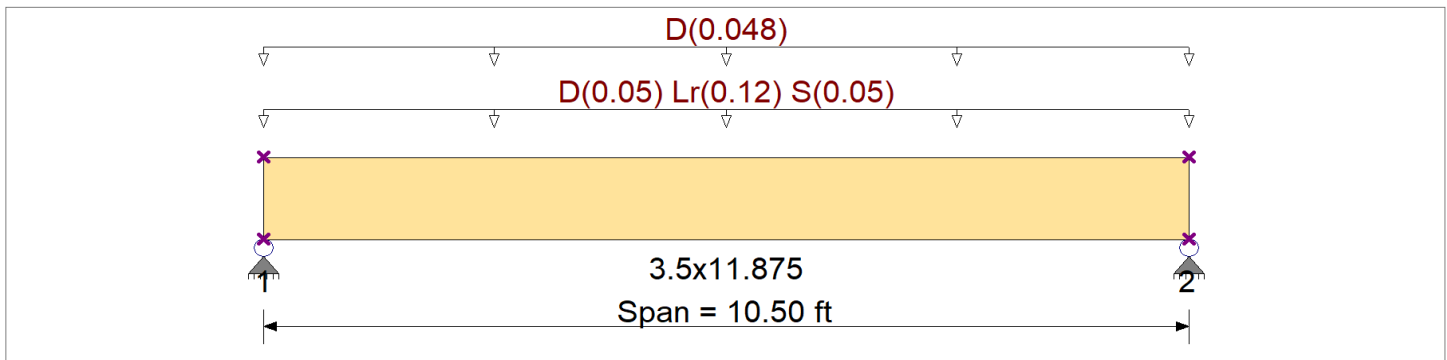
DESCRIPTION: RB-1

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,000.0 psi	Eminbend - xx	1,036.83ksi
Wood Species : Boise Cascade	Fc - Perp	750.0 psi		
Wood Grade : Versa Lam 2800	Fv	285.0 psi		
	Ft	2,100.0 psi	Density	41.760pcf
Beam Bracing : Completely Unbraced				



### Applied Loads

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

Beam self weight calculated and added to loading  
 Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 2.0 ft, (Roof Deck Load)  
 Uniform Load : D = 0.0120 ksf, Tributary Width = 4.0 ft, (Paraper wall/Guardrail Load)

### DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.142	1	Maximum Shear Stress Ratio	=	0.100	: 1
Section used for this span		3.5x11.875		Section used for this span		3.5x11.875	
fb: Actual	=	462.12psi		fv: Actual	=	35.62 psi	
F'b	=	3,249.33psi		F'v	=	356.25 psi	
Load Combination				Load Combination			
Location of maximum on span	=	5.250ft	+D+Lr	Location of maximum on span	=	0.000 ft	+D+Lr
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.034 in	Ratio = 3733 >=360	Span: 1 : Lr Only			
Max Upward Transient Deflection		0 in	Ratio = 0 <360	n/a			
Max Downward Total Deflection		0.065 in	Ratio = 1947 >=240	Span: 1 : +D+Lr			
Max Upward Total Deflection		0 in	Ratio = 0 <240	n/a			

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.0647	5.288		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.208	1.208
Max Upward from Load Combinations	1.208	1.208
Max Upward from Load Cases	0.630	0.630
D Only	0.578	0.578
+D+Lr	1.208	1.208
+D+0.70S	0.762	0.762

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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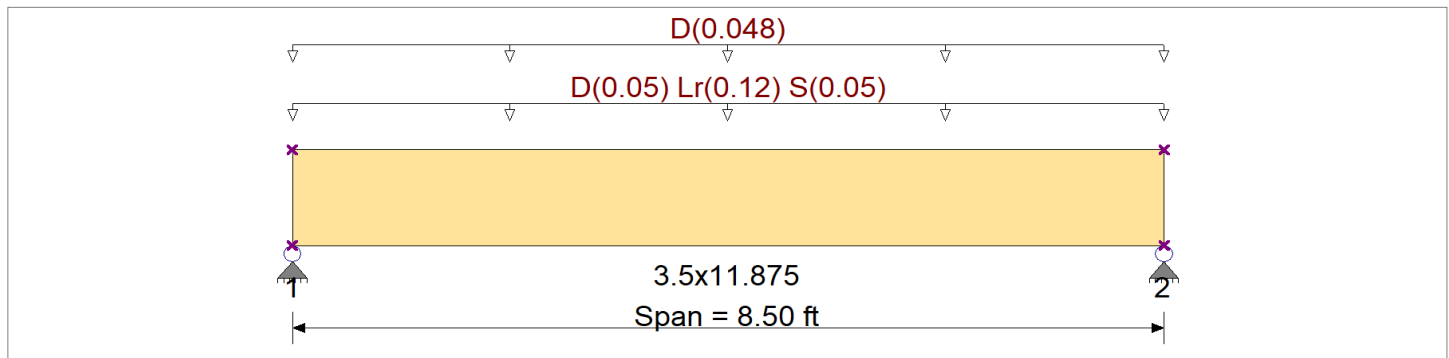
**DESCRIPTION:** RB-2

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,000.0 psi	Eminbend - xx	1,036.83ksi
Wood Species : Boise Cascade	Fc - Perp	750.0 psi		
Wood Grade : Versa Lam 2800	Fv	285.0 psi		
	Ft	2,100.0 psi	Density	41.760pcf
Beam Bracing : Completely Unbraced				



### Applied Loads

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

Beam self weight calculated and added to loading  
 Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 2.0 ft, (Roof Deck Load)  
 Uniform Load : D = 0.0120 ksf, Tributary Width = 4.0 ft, (Paraper wall/Guardrail Load)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.091</b> : 1	Maximum Shear Stress Ratio	=	<b>0.077</b> : 1
Section used for this span		<b>3.5x11.875</b>	Section used for this span		<b>3.5x11.875</b>
fb: Actual	=	302.84psi	fv: Actual	=	27.29 psi
F'b	=	3,321.95psi	F'v	=	356.25 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	4.250ft	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		0.014 in Ratio = <b>7037</b> >=360	Span: 1 : Lr Only		
Max Upward Transient Deflection		0 in Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection		0.028 in Ratio = <b>3670</b> >=240	Span: 1 : +D+Lr		
Max Upward Total Deflection		0 in Ratio = <b>0</b> <240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.0278	4.281		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.978	0.978
Max Upward from Load Combinations	0.978	0.978
Max Upward from Load Cases	0.510	0.510
D Only	0.468	0.468
+D+Lr	0.978	0.978
+D+0.70S	0.616	0.616

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

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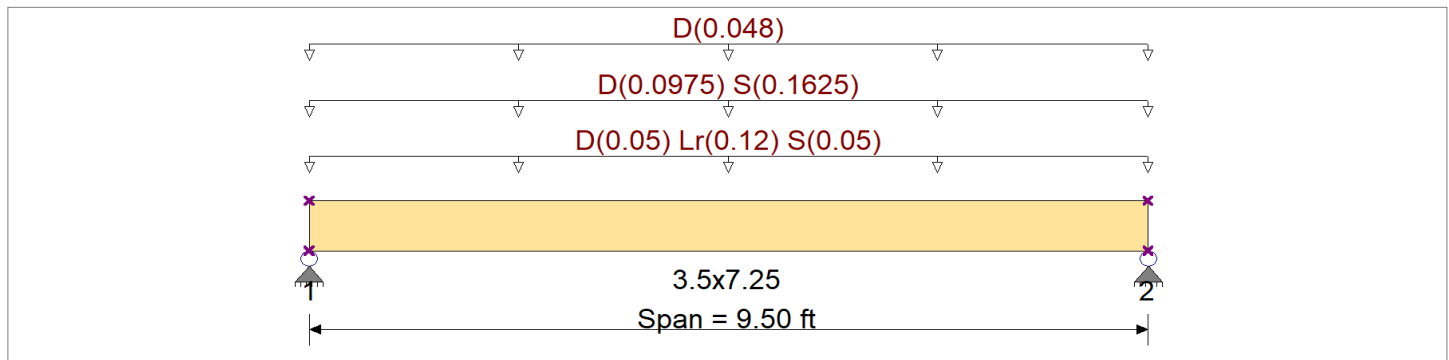
DESCRIPTION: RB-3

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx
	Fc - Prll	3,000.0 psi	Eminbend - xx
	Fc - Perp	750.0 psi	
Wood Species : Boise Cascade	Fv	285.0 psi	
Wood Grade : Versa Lam 2800	Ft	2,100.0 psi	Density
			41.760pcf
Beam Bracing : Completely Unbraced			



### Applied Loads

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

Beam self weight calculated and added to loading  
 Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 2.0 ft, (Roof Deck Load)  
 Uniform Load : D = 0.0150, S = 0.0250 ksf, Tributary Width = 6.50 ft, ((E) Roof Load)  
 Uniform Load : D = 0.0120 ksf, Tributary Width = 4.0 ft, (Parapet/Guardrail Load)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.467</b> : 1	Maximum Shear Stress Ratio	=	<b>0.264</b> : 1
Section used for this span		<b>3.5x7.25</b>	Section used for this span		<b>3.5x7.25</b>
fb: Actual	=	1,552.41 psi	fv: Actual	=	86.48 psi
F'b	=	3,323.01 psi	F'v	=	327.75 psi
Load Combination		+D+0.70S	Load Combination		+D+0.70S
Location of maximum on span	=	4.750ft	Location of maximum on span	=	8.911 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.176 in Ratio = <b>646</b> >=360	Span: 1 : S Only		
Max Upward Transient Deflection		0 in Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection		0.292 in Ratio = <b>390</b> >=240	Span: 1 : +D+0.70S		
Max Upward Total Deflection		0 in Ratio = <b>0</b> <240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+0.70S	0.2916	4.785		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.670	1.670
Max Upward from Load Combinations	1.670	1.670
Max Upward from Load Cases	1.009	1.009
D Only	0.964	0.964
+D+Lr	1.534	1.534

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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**DESCRIPTION:** RB-4

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	<i>E : Modulus of Elasticity</i>
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx 2,000.0ksi
	Fc - Prll	3,000.0 psi	Eminbend - xx 1,036.83ksi
Wood Species : Boise Cascade	Fc - Perp	750.0 psi	
Wood Grade : Versa Lam 2800	Fv	285.0 psi	
	Ft	2,100.0 psi	Density 41.760pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			



### Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 2.0 ft, (Roof Deck Load)

Uniform Load : D = 0.0120 ksf, Tributary Width = 4.0 ft, (Guardrail Load)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.019</b> 1	Maximum Shear Stress Ratio	=	<b>0.024</b> : 1
Section used for this span		<b>3.5x11.875</b>	Section used for this span		<b>3.5x11.875</b>
fb: Actual	=	67.07 psi	fv: Actual	=	8.48 psi
F'b	=	3,503.91 psi	F'v	=	356.25 psi
Load Combination		+D+Lr	Load Combination		+D+Lr
Location of maximum on span	=	2.000ft	Location of maximum on span	=	3.022 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0 in Ratio = 0 <360	n/a		
Max Upward Transient Deflection		0 in Ratio = 0 <360	n/a		
Max Downward Total Deflection		0.001 in Ratio = 35222 >=240	Span: 1 : +D+Lr		
Max Upward Total Deflection		0 in Ratio = 0 <240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.0014	2.015		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.460	0.460
Max Upward from Load Combinations	0.460	0.460
Max Upward from Load Cases	0.240	0.240
D Only	0.220	0.220
+D+Lr	0.460	0.460
+D+0.70S	0.290	0.290

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

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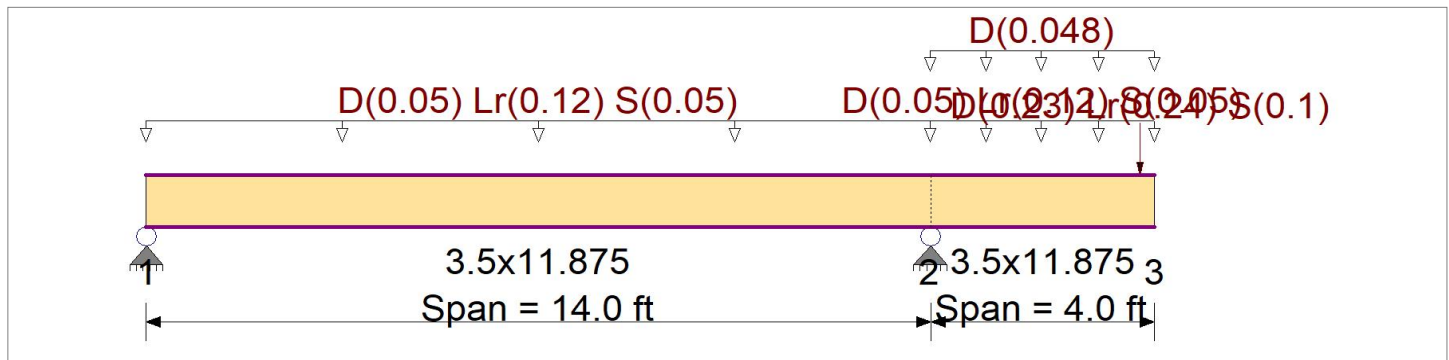
**DESCRIPTION:** RB-5

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx
	Fc - Prll	3,000.0 psi	Eminbend - xx
Wood Species : Boise Cascade	Fc - Perp	750.0 psi	
Wood Grade : Versa Lam 2800	Fv	285.0 psi	
	Ft	2,100.0 psi	Density
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			41.760pcf



### Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 2.0 ft, (Roof Deck Load)

Load for Span Number 2

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 2.0 ft, (Roof Deck Load)

Uniform Load : D = 0.0120 ksf, Tributary Width = 4.0 ft, (Guardrail Load)

Point Load : D = 0.230, Lr = 0.240, S = 0.10 k @ 3.750 ft, (RB-4)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.150</b> : 1	Maximum Shear Stress Ratio	=	<b>0.138</b> : 1
Section used for this span		<b>3.5x11.875</b>	Section used for this span		<b>3.5x11.875</b>
fb: Actual	=	525.16psi	fv: Actual	=	49.09 psi
F'b	=	3,503.91psi	F'v	=	356.25 psi
Load Combination			Load Combination		
Location of maximum on span	=	14.000ft	Location of maximum on span	=	13.061 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection		0.067 in	Ratio =	<b>2509</b> >=360	Span: 1 : Lr Only
Max Upward Transient Deflection		-0.021 in	Ratio =	<b>4638</b> >=360	Span: 2 : Lr Only
Max Downward Total Deflection		0.085 in	Ratio =	<b>1971</b> >=240	Span: 1 : +D+Lr
Max Upward Total Deflection		-0.005 in	Ratio =	<b>19922</b> >=240	Span: 2 : +D+Lr

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.0852	6.257		0.0000	0.000
2	D Only	0.0214	4.000	Lr Only	-0.0199	3.777

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	1.017	2.922	

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

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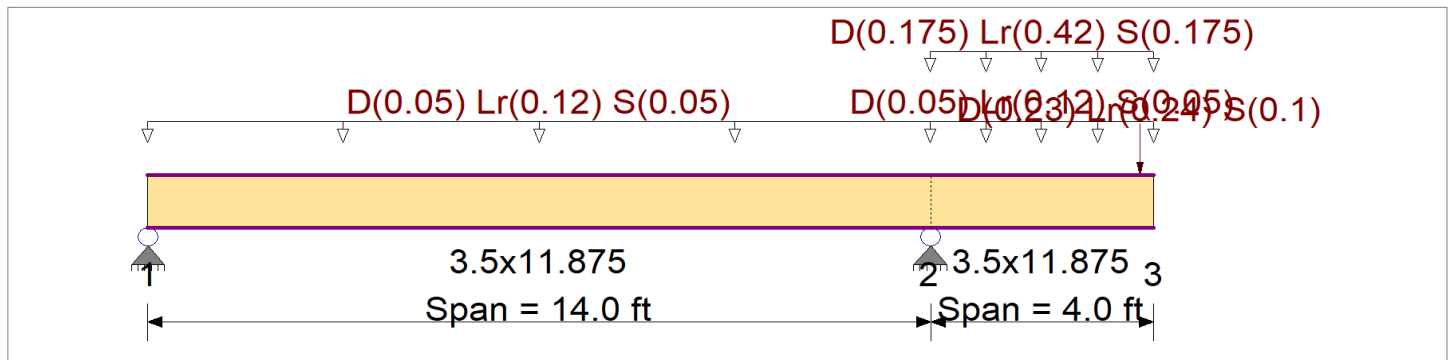
DESCRIPTION: RB-6

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx	2,000.0 ksi
	Fc - Prll	3,000.0 psi	Eminbend - xx	1,036.83 ksi
Wood Species : Boise Cascade	Fc - Perp	750.0 psi		
Wood Grade : Versa Lam 2800	Fv	285.0 psi		
	Ft	2,100.0 psi	Density	41.760 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



### Applied Loads

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

Beam self weight calculated and added to loading  
 Load for Span Number 1  
 Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 2.0 ft, (Roof Deck Load)  
 Load for Span Number 2  
 Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 2.0 ft, (Roof Deck Load)  
 Point Load : D = 0.230, Lr = 0.240, S = 0.10 k @ 3.750 ft, (RB-4)  
 Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 7.0 ft, (Stair Load)

### DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.332	1	Maximum Shear Stress Ratio	=	0.285	1
Section used for this span		3.5x11.875		Section used for this span		3.5x11.875	
fb: Actual	=	1,163.00 psi		fv: Actual	=	101.52 psi	
F'b	=	3,503.91 psi		F'v	=	356.25 psi	
Load Combination				Load Combination			
Location of maximum on span	=	14.000 ft	+D+Lr	Location of maximum on span	=	14.000 ft	+D+Lr
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.114 in	Ratio = 842 >=360	Span: 2 : Lr Only			
Max Upward Transient Deflection		-0.024 in	Ratio = 7084 >=360	Span: 1 : Lr Only			
Max Downward Total Deflection		0.176 in	Ratio = 546 >=240	Span: 2 : +D+Lr			
Max Upward Total Deflection		-0.037 in	Ratio = 4539 >=240	Span: 1 : +D+Lr			

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.0073	2.894	+D+Lr	-0.0370	11.028
2	+D+Lr	0.1758	4.000		0.0000	11.028

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Max Upward from all Load Conditions	0.704	5.423	

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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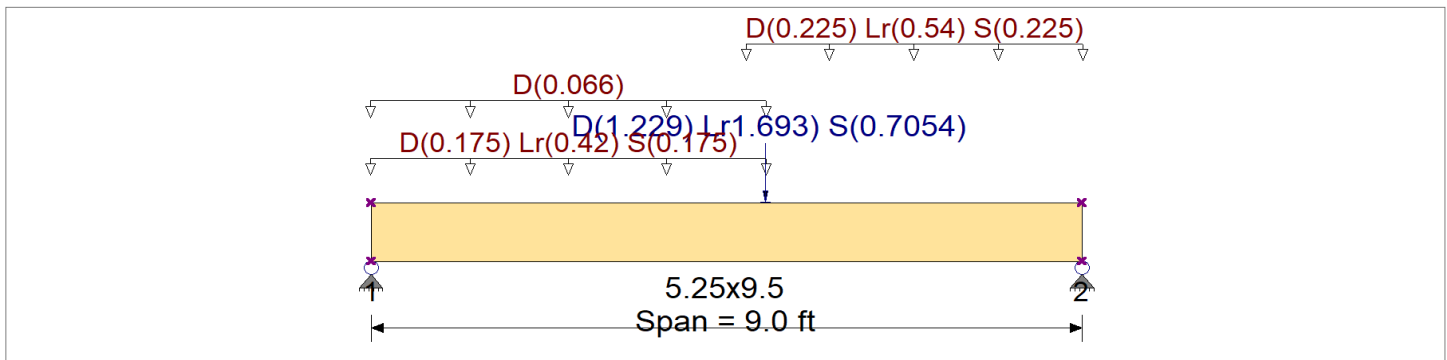
**DESCRIPTION:** RB-7

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx
	Fc - Prll	3,000.0 psi	Eminbend - xx
Wood Species : Boise Cascade	Fc - Perp	750.0 psi	
Wood Grade : Versa Lam 2800	Fv	285.0 psi	
	Ft	2,100.0 psi	Density
Beam Bracing : Completely Unbraced			41.760pcf



### Applied Loads

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

Beam self weight calculated and added to loading

Load for Span Number 1

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Extent = 0.0 --> 5.0 ft, Tributary Width = 7.0 ft, (Roof Deck Load)

Uniform Load : D = 0.0120 ksf, Extent = 0.0 --> 5.0 ft, Tributary Width = 5.50 ft, (Parapet/Guardrail Load)

Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Extent = 4.750 --> 9.0 ft, Tributary Width = 9.0 ft, (Roof Deck Load)

Linked Load(s)

Beam RB-5, Support 2: D = 1.229, Lr = 1.693, S = 0.7054 k @ 5 ft from left end of beam

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.605</b> : 1	Maximum Shear Stress Ratio	=	<b>0.378</b> : 1
Section used for this span		<b>5.25x9.5</b>	Section used for this span		<b>5.25x9.5</b>
fb: Actual	=	2,145.29psi	fv: Actual	=	134.60 psi
F'b	=	3,547.42psi	F'v	=	356.25 psi
Load Combination			Load Combination		
Location of maximum on span	=	4.993ft	Location of maximum on span	=	8.212 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.156 in	Ratio = <b>691</b> >=360	Span: 1 : Lr Only		
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection	0.250 in	Ratio = <b>432</b> >=240	Span: 1 : +D+Lr		
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240	n/a		

### Overall Maximum Deflections

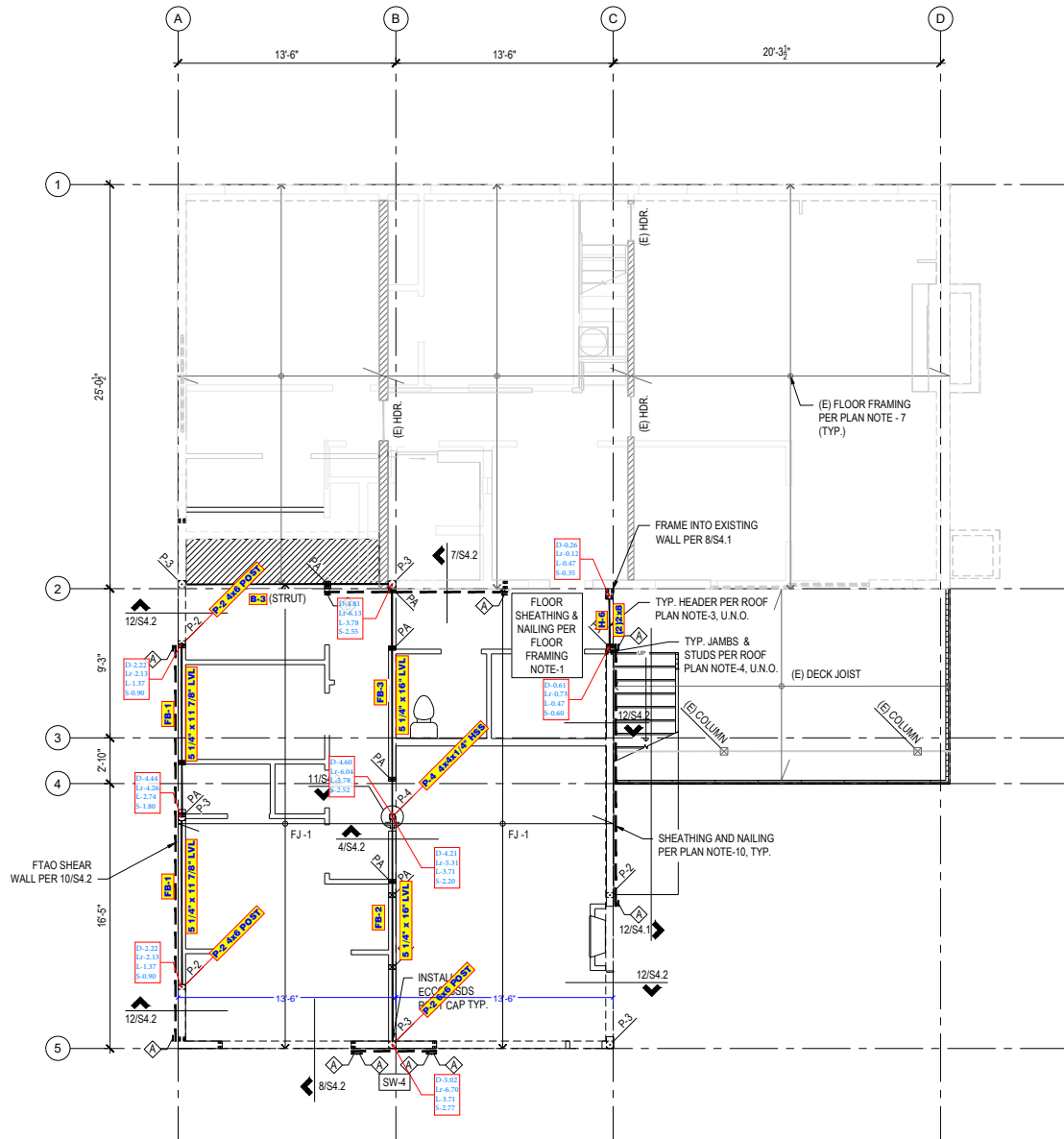
Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+Lr	0.2499	4.599		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.518	5.090
Max Upward from Load Combinations	4.518	5.090

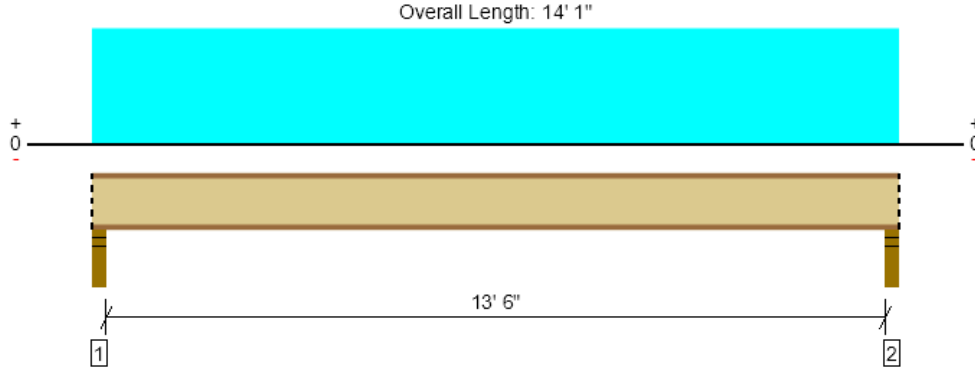


⊕ SECOND FLOOR FRAMING PLAN  
SCALE: 1/4" = 1'-0"

POST SCHEDULE	
MARK	SIZE
P-1	(3) 2x6
P-2	4x6
P-3	6x6
P-4	HSS 4x4x1/4"

Level, FJ-1

**1 piece(s) 9 1/2" TJI® 110 @ 16" OC**



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	516 @ 2 1/2"	1375 (3.50")	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	495 @ 3 1/2"	1220	Passed (41%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1712 @ 7' 1/2"	2500	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.236 @ 7' 1/2"	0.342	Passed (L/695)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.324 @ 7' 1/2"	0.683	Passed (L/506)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	42	40	Passed	--	--

Member Length : 14' 1"  
 System : Floor  
 Member Type : Joist  
 Building Use : Residential  
 Building Code : IBC 2021  
 Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	3.50"	1.75"	141	376	516	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.75"	141	376	516	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)	3' 9" o/c	
Bottom Edge (Lu)	14' 1" 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)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 14' 1"	16"	15.0	40.0	FLOOR LOAD

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

ForteWEB Software Operator	Job Notes



## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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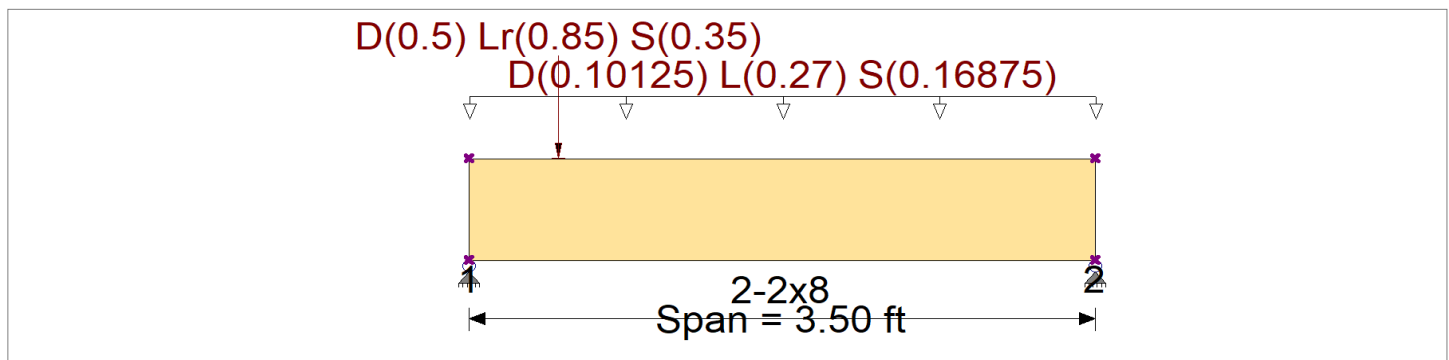
DESCRIPTION: H-6

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	850.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	850.0 psi	Ebend- xx	1,300.0ksi
	Fc - Prll	1,300.0 psi	Eminbend - xx	470.0ksi
Wood Species : Hem-Fir	Fc - Perp	405.0 psi		
Wood Grade : No.2	Fv	150.0 psi		
	Ft	525.0 psi	Density	26.840pcf
Beam Bracing : Completely Unbraced				



### Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.0150, L = 0.040, S = 0.0250 ksf, Tributary Width = 6.750 ft, (Floor Load)

Point Load : D = 0.50, Lr = 0.850, S = 0.350 k @ 0.50 ft, (H-5(L))

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.341</b> : 1	Maximum Shear Stress Ratio	=	<b>0.243</b> : 1
Section used for this span		<b>2-2x8</b>	Section used for this span		<b>2-2x8</b>
fb: Actual	=	396.97 psi	fv: Actual	=	41.95 psi
F'b	=	1,163.24 psi	F'v	=	172.50 psi
Load Combination		+D+0.750L+0.750S	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	1.495ft	Location of maximum on span	=	2.900 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
<b>Maximum Deflection</b>					
Max Downward Transient Deflection	0.007 in	Ratio = <b>5672</b> >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection	0.016 in	Ratio = <b>2637</b> >=240	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+0.750L+0.750S	0.0159	1.699		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.514	0.869
Max Upward from Load Combinations	1.514	0.869
Max Upward from Load Cases	0.729	0.473
D Only	0.613	0.256
+D+L	1.085	0.728
+D+Lr	1.341	0.377

## Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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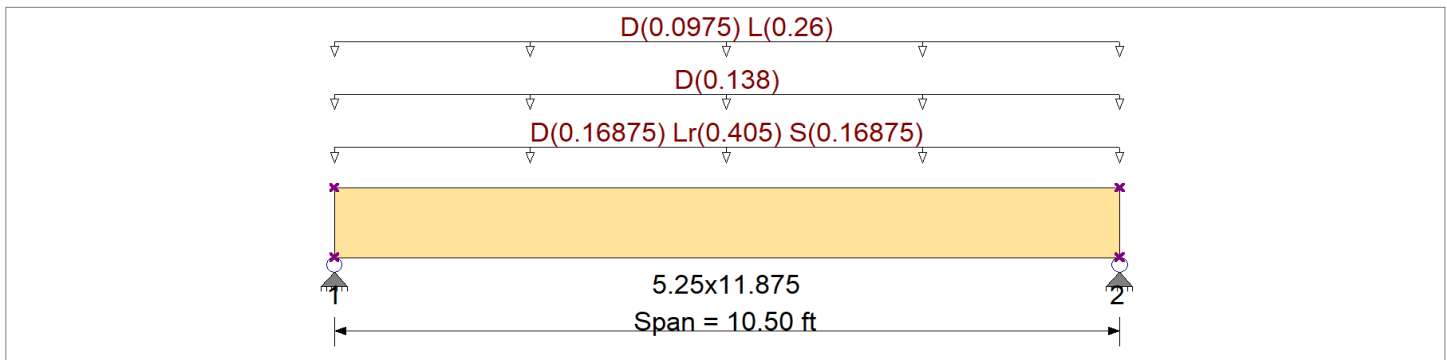
DESCRIPTION: FB-1

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx
	Fc - Prll	3,000.0 psi	Eminbend - xx
Wood Species : Boise Cascade	Fc - Perp	750.0 psi	
Wood Grade : Versa Lam 2800	Fv	285.0 psi	
	Ft	2,100.0 psi	Density
Beam Bracing : Completely Unbraced			41.760pcf



### Applied Loads

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

Beam self weight calculated and added to loading  
 Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Tributary Width = 6.750 ft, (Roof Deck Load)  
 Uniform Load : D = 0.0120 ksf, Tributary Width = 11.50 ft, (Parapet/Guardrail Load)  
 Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 6.50 ft, (Floor Load)

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.359</b>	1	Maximum Shear Stress Ratio	=	<b>0.267</b>	: 1
Section used for this span		<b>5.25x11.875</b>		Section used for this span		<b>5.25x11.875</b>	
fb: Actual	=	1,234.50psi		fv: Actual	=	95.12 psi	
F'b	=	3,435.05psi		F'v	=	356.25 psi	
Load Combination		+D+0.750Lr+0.750L		Load Combination		+D+0.750Lr+0.750L	
Location of maximum on span	=	5.250ft		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		0.076 in	Ratio = <b>1657</b>	>=360	Span: 1 : Lr Only		
Max Upward Transient Deflection		0 in	Ratio = <b>0</b>	<360	n/a		
Max Downward Total Deflection		0.173 in	Ratio = <b>728</b>	>=240	Span: 1 : +D+0.750Lr+0.750L		
Max Upward Total Deflection		0 in	Ratio = <b>0</b>	<240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+0.750Lr+0.750L	0.1729	5.288		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	4.836	4.836
Max Upward from Load Combinations	4.836	4.836
Max Upward from Load Cases	2.217	2.217
D Only	2.217	2.217
+D+L	3.582	3.582

**Wood Beam**

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

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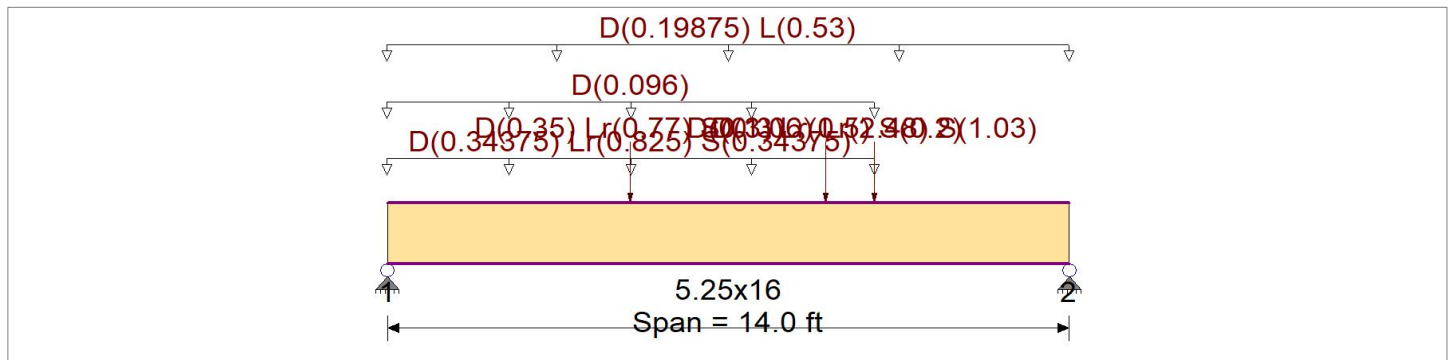
**DESCRIPTION: FB-2**

**CODE REFERENCES**

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-22 / IBC 2024 (L<=100psf)

**Material Properties**

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-22 / IBC 2024 (L<=100psf)	Fb -	2,800.0 psi	Ebend- xx	2,000.0ksi
	Fc - Prll	3,000.0 psi	Eminbend - xx	1,036.83ksi
Wood Species : Boise Cascade	Fc - Perp	750.0 psi		
Wood Grade : Versa Lam 2800	Fv	285.0 psi		
	Ft	2,100.0 psi	Density	41.760pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



**Applied Loads**

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

Beam self weight calculated and added to loading  
 Load for Span Number 1

- Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Extent = 0.0 --> 10.0 ft, Tributary Width = 13.750 ft, (Roof Deck Load)
- Uniform Load : D = 0.0120 ksf, Extent = 0.0 --> 10.0 ft, Tributary Width = 8.0 ft, (Wall Load)
- Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 13.250 ft, (Floor Load)
- Point Load : D = 0.350, Lr = 0.770, S = 0.30 k @ 5.0 ft, (RB-5(L))
- Point Load : D = 0.30, Lr = 0.50, S = 0.20 k @ 9.0 ft, (RB-6(L))
- Point Load : D = 1.060, Lr = 2.480, S = 1.030 k @ 10.0 ft, (H-1(L))

**DESIGN SUMMARY**

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.739</b> 1	Maximum Shear Stress Ratio	=	<b>0.531</b> : 1
Section used for this span		<b>5.25x16</b>	Section used for this span		<b>5.25x16</b>
fb: Actual	=	2,504.78psi	fv: Actual	=	189.10 psi
F'b	=	3,389.89psi	F'v	=	356.25 psi
Load Combination		+D+0.750Lr+0.750L	Load Combination		+D+0.750Lr+0.750L
Location of maximum on span	=	7.102ft	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	0.247 in	Ratio = <b>680</b> >=360	Span: 1 : Lr Only		
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection	0.461 in	Ratio = <b>364</b> >=240	Span: 1 : +D+0.750Lr+0.750L		
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240	n/a		

**Overall Maximum Deflections**

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+0.750Lr+0.750L	0.4611	7.051		0.0000	0.000

**Vertical Reactions**

Support notation : Far left is #1 Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	12.821	10.976

### Wood Beam

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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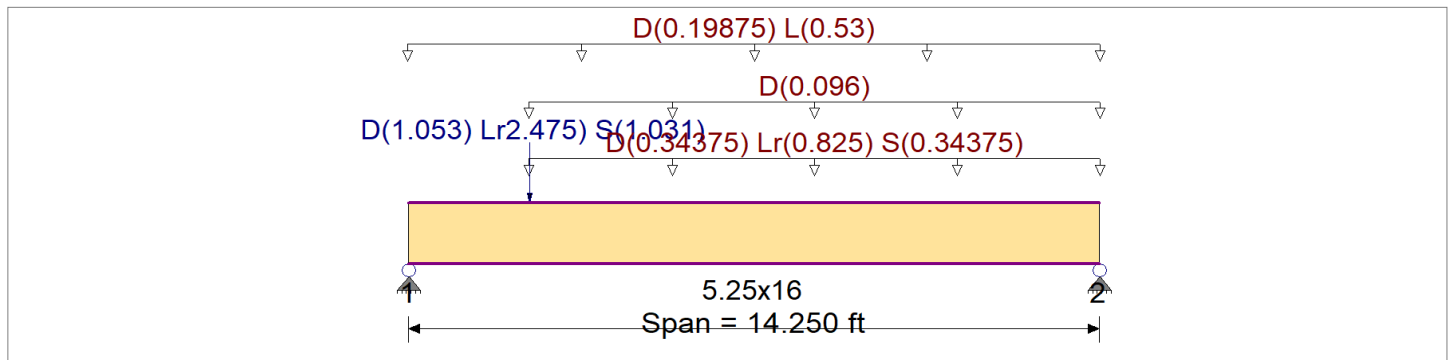
DESCRIPTION: FB-3

### CODE REFERENCES

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combination Set : ASCE 7-16

### Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,800.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-16	Fb -	2,800.0 psi	Ebend- xx
	Fc - Prll	3,000.0 psi	Eminbend - xx
Wood Species : Boise Cascade	Fc - Perp	750.0 psi	
Wood Grade : Versa Lam 2800	Fv	285.0 psi	
	Ft	2,100.0 psi	Density
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			41.760pcf



### Applied Loads

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

Beam self weight calculated and added to loading  
 Load for Span Number 1

- Uniform Load : D = 0.0250, Lr = 0.060, S = 0.0250 ksf, Extent = 2.50 --> 14.250 ft, Tributary Width = 13.750 ft, (Roof Deck Load)
- Uniform Load : D = 0.0120 ksf, Extent = 2.50 --> 14.250 ft, Tributary Width = 8.0 ft, (Wall Load)
- Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 13.250 ft, (Floor Load)

Linked Load(s)

Beam H-1, Support 2: D = 1.053, Lr = 2.475, S = 1.031 k @ 2.5 ft from left end of beam

### DESIGN SUMMARY

**Design OK**

Maximum Bending Stress Ratio	=	<b>0.705</b> : 1	Maximum Shear Stress Ratio	=	<b>0.558</b> : 1
Section used for this span		<b>5.25x16</b>	Section used for this span		<b>5.25x16</b>
fb: Actual	=	2,390.71 psi	fv: Actual	=	198.96 psi
F'b	=	3,389.89psi	F'v	=	356.25 psi
Load Combination		+D+0.750Lr+0.750L	Load Combination		+D+0.750Lr+0.750L
Location of maximum on span	=	6.969ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.236 in	Ratio = <b>725</b> >=360	Span: 1 : Lr Only		
Max Upward Transient Deflection	0 in	Ratio = <b>0</b> <360	n/a		
Max Downward Total Deflection	0.460 in	Ratio = <b>371</b> >=240	Span: 1 : +D+0.750Lr+0.750L		
Max Upward Total Deflection	0 in	Ratio = <b>0</b> <240	n/a		

### Overall Maximum Deflections

Span	Load Combination	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
1	+D+0.750Lr+0.750L	0.4602	7.125		0.0000	0.000

### Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	11.949	12.242
Max Upward from Load Combinations	11.949	12.242

Project:	Xiao Residence	By:	SN	Project #:	
		Date:	2025/04/01		
Subject:	Trimmer Studs	Chk By:		Page:	
		Date:			

Assume trimmer studs resist 100% of header reaction and king studs resist 100% of wind and load from above. Trimmer studs are braced in x-x direction. With an applied accidental eccentricity of 1.2", 2x6 studs are controlled by compression perpendicular to grain for heights up to 8.5' for HF #2 and 10' for DF#2

Level	Member	D	L	S	W or E	Load Combinations					Max Applied Load	Framing		# of Studs	Allowable	Ratio
						D+L	D+S	D+(W or E)	D+3/4S+3/4L+3/4(W or E)	0.6+U		Beam Width	Wood Species			
ROOF	H-1	1060 #	2480 #	1030 #	0 #	3540 #	2090 #	1060 #	3693 #	636 #	3693 #	6x	HF	(2)	4878 #	0.76
	H-2	700 #	1650 #	700 #	0 #	2350 #	1400 #	700 #	2463 #	420 #	2463 #	6x	HF	(2)	4878 #	0.50
	H-3	1060 #	1500 #	1070 #	0 #	2560 #	2130 #	1060 #	2988 #	636 #	2988 #	6x	HF	(2)	4878 #	0.61
	H-5	500 #	850 #	350 #	0 #	1350 #	850 #	500 #	1400 #	300 #	1400 #	6x	HF	(1)	2439 #	0.57

Capacity With DF Bottom Plate = 0.73\*625 = 456 psi

Capacity With HF Bottom Plate = 0.73\*405 = 296 psi

### ROOF LEVEL KING STUDS

\*\*DESIGN FOR WORST CASE RB-2 8 FT OPENING

Ht =	8.00 ft	K =	1.0	x-x Braced
Wall Location:	End Zone	Size:	1.50 in	x 5.50 in 2x6
F <sub>b</sub> /C <sub>d</sub> =	F <sub>b</sub> (900 psi)	C <sub>f</sub> (1.30)	C <sub>r</sub> (1.35)	= 1580 psi
F <sub>c</sub> */C <sub>d</sub> =	F <sub>c</sub> (1350 psi)	C <sub>f</sub> (1.10)		= 1485 psi
		E' =	1600000 psi	E'Min = 580000 psi (DF #2)
DL =	38 plf	x	2.00 ft	= 75 #
SL =	38 plf	x	2.00 ft	= 75 #
LL =	90 plf	x	2.00 ft	= 180 #
Load from Above	P <sub>D</sub> = 0 #			
	P <sub>S</sub> = 0 #			
	P <sub>L</sub> = 0 #			
		Trib Width =	5.79 ft	10.25/2+1.33/2
		Trib Area =	46.32 sqft	
		w =	-22.7 PSF	
		w =	-131.6 plf	

	C <sub>d</sub>	Moment*	Axial	f <sub>b</sub>	f <sub>c</sub>	F' <sub>b</sub>	F <sub>b</sub> E	F <sub>c</sub> *	C <sub>p</sub>	F' <sub>c</sub>	F <sub>c</sub> E	Interaction
DL+LL	1.0	306.0 k-ft	255 #	40 psi	31 psi	1580 psi	2966 psi	1485 psi	0.71	1053 psi	1565 psi	0.03
DL+SL	1.15	180.0 k-ft	150 #	24 psi	18 psi	1816 psi	2966 psi	1708 psi	0.66	1127 psi	1565 psi	0.01
DL+3/4(LL+SL)	1.15	319.5 k-ft	266 #	42 psi	32 psi	1816 psi	2966 psi	1708 psi	0.66	1127 psi	1565 psi	0.02
DL+3/4(LL+SL+W)	1.6	9797.6 k-ft	266 #	1296 psi	32 psi	2527 psi	2966 psi	2376 psi	0.54	1272 psi	1565 psi	0.52
DL+W	1.6	12727.5 k-ft	75 #	1683 psi	9 psi	2527 psi	2966 psi	2376 psi	0.54	1272 psi	1565 psi	0.67

\*Use accidental eccentricity of 1.2" in strong axis

Interaction Less Than 1.0 Therefore OK

Deflection =	0.36 in	l/d =	263	Allowable L/d =	180	OK
Compression perpendicular to grain:	F' <sub>c</sub> -perp = 405 psi	Capacity =	3341 #	Stress Ratio =	0.08	OK

## Wood Column

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

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DESCRIPTION: P-1

### Code References

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combinations Used : IBC 2021

### General Information

Analysis Method	Allowable Stress Design	Wood Section Name	<b>3-2x6</b>
End Fixities	Top & Bottom Pinned	Wood Grading/Manuf.	Graded Lumber
Overall Column Height	8 ft	Wood Member Type	Sawn
<i>( Used for non-slender calculations )</i>			
Wood Species	Douglas Fir-Larch	Exact Width	<b>4.50</b> in
Wood Grade	No.1	Exact Depth	<b>5.50</b> in
Fb +	1,200.0 psi	Area	24.750 in <sup>2</sup>
Fb -	1,200.0 psi	Ix	62.391 in <sup>4</sup>
Fc - Prll	1,000.0 psi	Iy	<b>41.766</b> in <sup>4</sup>
Fc - Perp	625.0 psi		
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
	Basic	1,600.0	1,600.0
	Minimum	580.0	580.0
Fv	170.0 psi		
Ft	825.0 psi		
Density	31.210 pcf		

Allow Stress Modification Factors	
Cf or Cv for Bending	1.30
Cf or Cv for Compression	1.10
Cf or Cv for Tension	1.30
Cm : Wet Use Factor	1.0
Ct : Temperature Fact	1.0
Cfu : Flat Use Factor	1.0
Kf : Built-up columns	1.0
Use Cr : Repetitive ?	No

Column Buckling Condition:  
 ABOUT X-X Axis: Lux = 8 ft, Kx = 1.0  
 ABOUT Y-Y Axis: Luy = 8 ft, Ky = 1.0

### Applied Loads

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

Column self weight included : 42.914 lbs \* Dead Load Factor

AXIAL LOADS . . .

RB-3(R): Axial Load at 8.0 ft, D = 0.960, Lr = 0.570, S = 1.010 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

**PASS** Max. Axial+Bending Stress Ratio = **0.1033 : 1**

Load Combination	+D+S
Governing NDS Formula	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	2.013 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	787.64 psi

**Maximum SERVICE Lateral Load Reactions . .**

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

**Maximum SERVICE Load Lateral Deflections . . .**

Along Y-Y	0.0 in	at	0.0 ft	above base
for load combination : n/a				
Along X-X	0.0 in	at	0.0 ft	above base
for load combination : n/a				

**PASS** Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.60D
Location of max.above base	8.0 ft
Applied Design Shear	0.0 psi
Allowable Shear	272.0 psi

**Other Factors used to calculate allowable stresses . . .**  
Bending   Compression   Tension

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		k-ft		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		
D Only						1.003						
+D+Lr						1.573						
+D+S						2.013						
+D+0.750Lr						1.430						
+D+0.750S						1.760						
+0.60D						0.602						
Lr Only						0.570						
S Only						1.010						

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000ft

**Wood Column**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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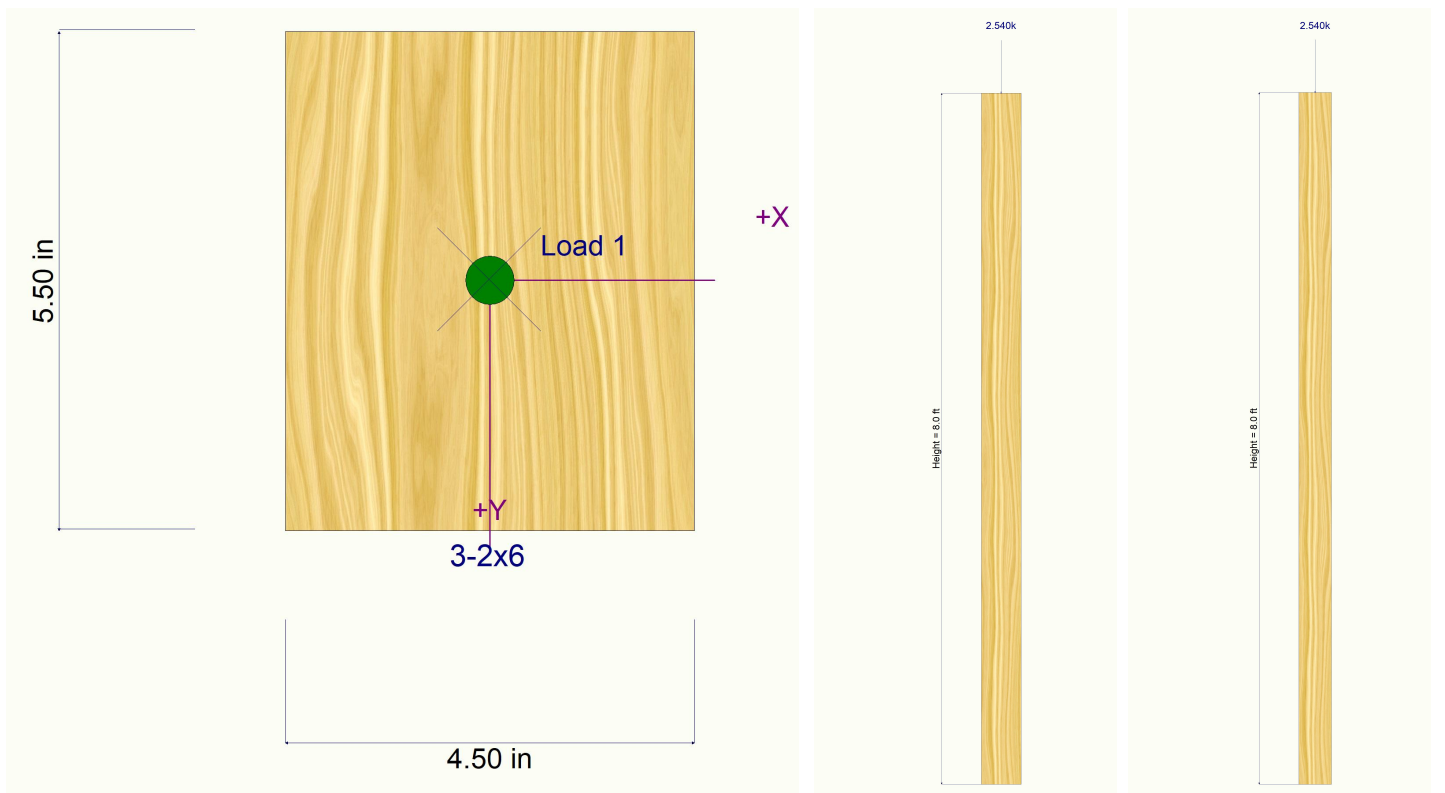
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**DESCRIPTION: P-1**

**Maximum Deflections for Load Combinations**

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
+D+Lr	0.0000 in	0.000ft	0.000 in	0.000ft
+D+S	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750Lr	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750S	0.0000 in	0.000ft	0.000 in	0.000ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000ft
Lr Only	0.0000 in	0.000ft	0.000 in	0.000ft
S Only	0.0000 in	0.000ft	0.000 in	0.000ft

**Sketches**



## Wood Column

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

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DESCRIPTION: P-2

### Code References

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combinations Used : IBC 2021

### General Information

Analysis Method	Allowable Stress Design	Wood Section Name	<b>4x6</b>
End Fixities	Top & Bottom Pinned	Wood Grading/Manuf.	Graded Lumber
Overall Column Height	8 ft	Wood Member Type	Sawn
<i>( Used for non-slender calculations )</i>			
Wood Species	Douglas Fir-Larch	Exact Width	<b>3.50</b> in
Wood Grade	No.1	Exact Depth	<b>5.50</b> in
Fb +	1,200.0 psi	Area	19.250 in <sup>2</sup>
Fb -	1,200.0 psi	Ix	48.526 in <sup>4</sup>
Fc - Prll	1,000.0 psi	Iy	<b>19.651</b> in <sup>4</sup>
Fc - Perp	625.0 psi		
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
	Basic	1,600.0	1,600.0
	Minimum	580.0	580.0
Fv	170.0 psi		
Ft	825.0 psi		
Density	31.210 pcf		
			Allow Stress Modification Factors
			Cf or Cv for Bending
			Cf or Cv for Compression
			Cf or Cv for Tension
			Cm : Wet Use Factor
			Ct : Temperature Fact
			Cfu : Flat Use Factor
			Kf : Built-up columns
			Use Cr : Repetitive ?
			No
			Column Buckling Condition:
			ABOUT X-X Axis: Lux = 8 ft, Kx = 1.0
			ABOUT Y-Y Axis: Luy = 8 ft, Ky = 1.0

### Applied Loads

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

Column self weight included : 33.377 lbs \* Dead Load Factor

AXIAL LOADS . . .

FB-1(R): Axial Load at 8.0 ft, D = 2.220, Lr = 2.130, L = 1.370, S = 0.90 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

**PASS** Max. Axial+Bending Stress Ratio = **0.4545 : 1**  
 Load Combination +D+0.750Lr+0.750L  
 Governing NDS Formula Comp Only, fc/Fc'  
 Location of max.above base 0.0 ft  
 At maximum location values are .  
 Applied Axial 4.878 k  
 Applied Mx 0.0 k-ft  
 Applied My 0.0 k-ft  
 Fc : Allowable 557.63 psi

**Maximum SERVICE Lateral Load Reactions . .**  
 Top along Y-Y 0.0 k Bottom along Y-Y 0.0 k  
 Top along X-X 0.0 k Bottom along X-X 0.0 k

**Maximum SERVICE Load Lateral Deflections . . .**  
 Along Y-Y 0.0 in at 0.0 ft above base  
 for load combination : n/a  
 Along X-X 0.0 in at 0.0 ft above base  
 for load combination : n/a

**PASS** Maximum Shear Stress Ratio = **0.0 : 1**  
 Load Combination +0.60D  
 Location of max.above base 8.0 ft  
 Applied Design Shear 0.0 psi  
 Allowable Shear 272.0 psi

**Other Factors used to calculate allowable stresses . . .**  
Bending Compression Tension

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only					2.253				
+D+L					3.623				
+D+Lr					4.383				
+D+S					3.153				
+D+0.750Lr+0.750L					4.878				
+D+0.750L+0.750S					3.956				
+0.60D+0.750L					2.380				
+0.60D					1.352				
Lr Only					2.130				
L Only					1.370				
S Only					0.900				

**Wood Column**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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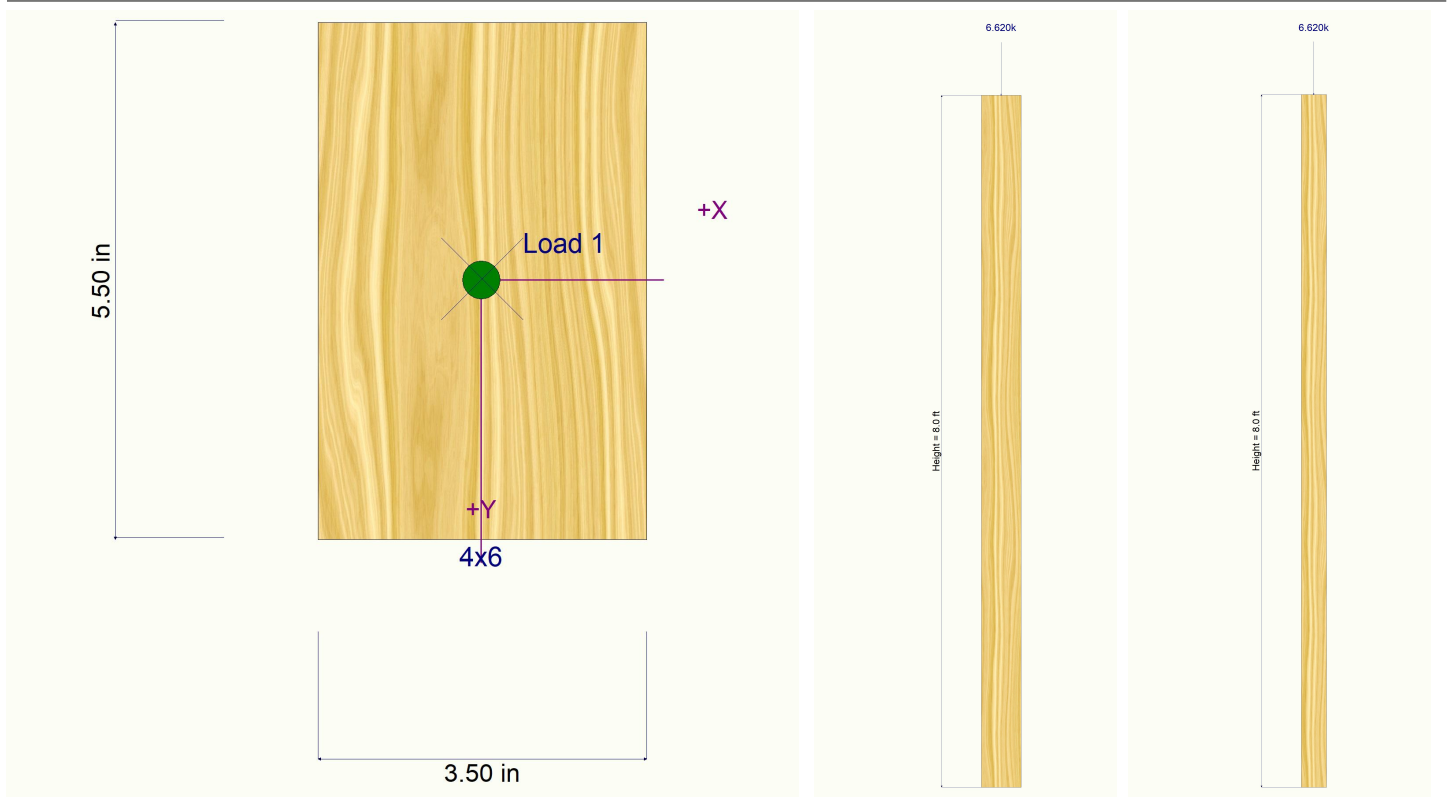
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**DESCRIPTION:** P-2

**Maximum Deflections for Load Combinations**

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000ft
+D+L	0.0000 in	0.000ft	0.000 in	0.000ft
+D+Lr	0.0000 in	0.000ft	0.000 in	0.000ft
+D+S	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750Lr+0.750L	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750L+0.750S	0.0000 in	0.000ft	0.000 in	0.000ft
+0.60D+0.750L	0.0000 in	0.000ft	0.000 in	0.000ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000ft
Lr Only	0.0000 in	0.000ft	0.000 in	0.000ft
L Only	0.0000 in	0.000ft	0.000 in	0.000ft
S Only	0.0000 in	0.000ft	0.000 in	0.000ft

**Sketches**



## Wood Column

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

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DESCRIPTION: P-3

### Code References

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combinations Used : IBC 2021

### General Information

Analysis Method	Allowable Stress Design	Wood Section Name	<b>6x6</b>
End Fixities	Top & Bottom Pinned	Wood Grading/Manuf.	Graded Lumber
Overall Column Height	10 ft	Wood Member Type	Sawn
<i>( Used for non-slender calculations )</i>			
Wood Species	Douglas Fir-Larch	Exact Width	<b>5.50</b> in
Wood Grade	No.1	Exact Depth	<b>5.50</b> in
Fb +	1,200.0 psi	Area	30.250 in <sup>2</sup>
Fb -	1,200.0 psi	Ix	76.255 in <sup>4</sup>
Fc - Prll	1,000.0 psi	Iy	76.255 in <sup>4</sup>
Fc - Perp	625.0 psi		
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
	Basic	1,600.0	1,600.0
	Minimum	580.0	580.0
			1,600.0 ksi
			Column Buckling Condition:
			ABOUT X-X Axis: Lux = 10 ft, Kx = 1.0
			ABOUT Y-Y Axis: Luy = 10 ft, Ky = 1.0

### Applied Loads

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

Column self weight included : 65.563 lbs \* Dead Load Factor

AXIAL LOADS . . .

FB-2(L): Axial Load at 10.0 ft, D = 5.020, Lr = 6.70, L = 3.710, S = 2.770 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

**PASS** Max. Axial+Bending Stress Ratio = **0.5588 : 1**  
 Load Combination +D+0.750Lr+0.750L  
 Governing NDS Formula Comp Only, fc/Fc'  
 Location of max.above base 0.0 ft  
 At maximum location values are .  
 Applied Axial 12.893 k  
 Applied Mx 0.0 k-ft  
 Applied My 0.0 k-ft  
 Fc : Allowable 762.74 psi

**Maximum SERVICE Lateral Load Reactions . .**  
 Top along Y-Y 0.0 k Bottom along Y-Y 0.0 k  
 Top along X-X 0.0 k Bottom along X-X 0.0 k

**Maximum SERVICE Load Lateral Deflections . . .**  
 Along Y-Y 0.0 in at 0.0 ft above base  
 for load combination : n/a  
 Along X-X 0.0 in at 0.0 ft above base  
 for load combination : n/a

**Other Factors used to calculate allowable stresses . . .**  
Bending Compression Tension

**PASS** Maximum Shear Stress Ratio = **0.0 : 1**  
 Load Combination +0.60D  
 Location of max.above base 10.0 ft  
 Applied Design Shear 0.0 psi  
 Allowable Shear 272.0 psi

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						5.086				
+D+L						8.796				
+D+Lr						11.786				
+D+S						7.856				
+D+0.750Lr+0.750L						12.893				
+D+0.750L+0.750S						9.946				
+0.60D+0.750L						5.834				
+0.60D						3.051				
Lr Only						6.700				
L Only						3.710				
S Only						2.770				

**Wood Column**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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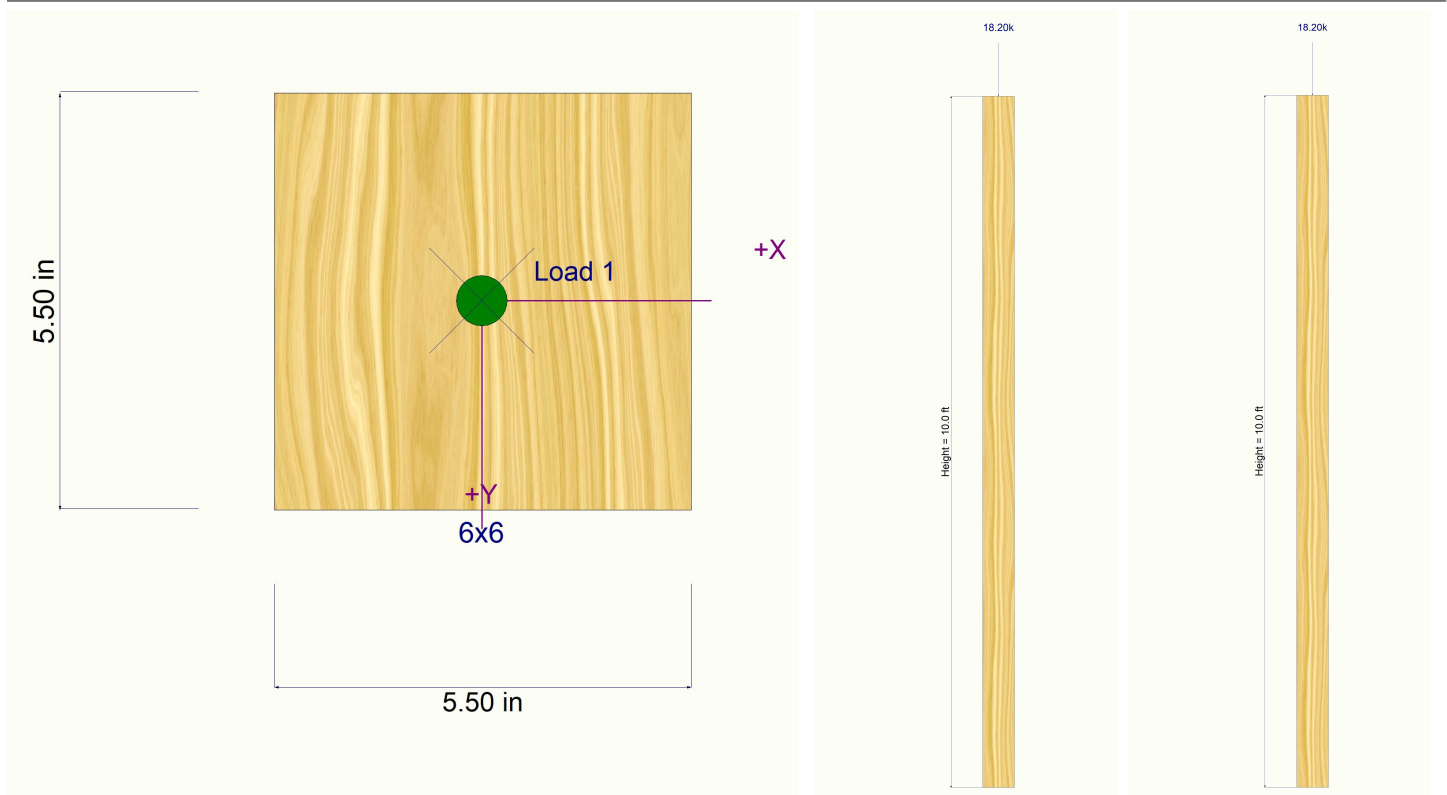
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**DESCRIPTION: P-3**

**Maximum Deflections for Load Combinations**

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000ft
+D+L	0.0000 in	0.000ft	0.000 in	0.000ft
+D+Lr	0.0000 in	0.000ft	0.000 in	0.000ft
+D+S	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750Lr+0.750L	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750L+0.750S	0.0000 in	0.000ft	0.000 in	0.000ft
+0.60D+0.750L	0.0000 in	0.000ft	0.000 in	0.000ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000ft
Lr Only	0.0000 in	0.000ft	0.000 in	0.000ft
L Only	0.0000 in	0.000ft	0.000 in	0.000ft
S Only	0.0000 in	0.000ft	0.000 in	0.000ft

**Sketches**



## Steel Column

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

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DESCRIPTION: P-4

### Code References

Calculations per AISC 360-16, IBC 2021  
 Load Combinations Used : IBC 2021

### General Information

Steel Section Name : <b>HSS4x4x1/4</b>	Overall Column Height	8.0 ft
Analysis Method : Allowable Strength	Top & Bottom Fixity	Top & Bottom Pinned
Steel Stress Grade	Brace condition :	
Fy : Steel Yield 46.0 ksi	Unbraced Length for buckling ABOUT X-X Axis = 8.0 ft, K = 1.0	
E : Elastic Bending Modulus 29,000.0 ksi	Unbraced Length for buckling ABOUT Y-Y Axis = 8.0 ft, K = 1.0	

### Applied Loads

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

Column self weight included : 97.680 lbs \* Dead Load Factor

AXIAL LOADS . . .

FB-2(R): Axial Load at 8.0 ft, D = 4.210, LR = 5.310, L = 3.710, S = 2.20 k

FB-3(L): Axial Load at 8.0 ft, D = 4.60, LR = 6.040, L = 3.780, S = 2.520 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

**PASS** Max. Axial+Bending Stress Ratio = **0.3246** : 1  
 Load Combination +D+0.750Lr+0.750L  
 Location of max.above base 0.0 ft  
 At maximum location values are . . .

Pa : Axial	23.038 k
Pn / Omega : Allowable	70.980 k
Ma-x : Applied	0.0 k-ft
Mn-x / Omega : Allowable	10.765 k-ft
Ma-y : Applied	0.0 k-ft
Mn-y / Omega : Allowable	10.765 k-ft

**Maximum Load Reactions . .**

Top along X-X	0.0 k
Bottom along X-X	0.0 k
Top along Y-Y	0.0 k
Bottom along Y-Y	0.0 k

**Maximum Load Deflections . . .**

Along Y-Y	0.0 in at	0.0ft above base
for load combination :		
Along X-X	0.0 in at	0.0ft above base
for load combination :		

**PASS** Maximum Shear Stress Ratio = **0.0** : 1  
 Load Combination 0.0  
 Location of max.above base 0.0 ft  
 At maximum location values are . . .

Va : Applied	0.0 k
Vn / Omega : Allowable	0.0 k

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction	X-X Axis Reaction		Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top

### Extreme Reactions

Item	Extreme Value	Axial Reaction	X-X Axis Reaction		Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
		@ Base	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top	@ Base	@ Top

### Maximum Deflections for Load Combinations

Load Combination	Max. Deflection in X dir	Distance	Max. Deflection in Y dir	Distance
------------------	--------------------------	----------	--------------------------	----------

Steel Section Properties : **HSS4x4x1/4**

Steel Section Properties : **HSS4x4x1/4**

**Steel Column**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

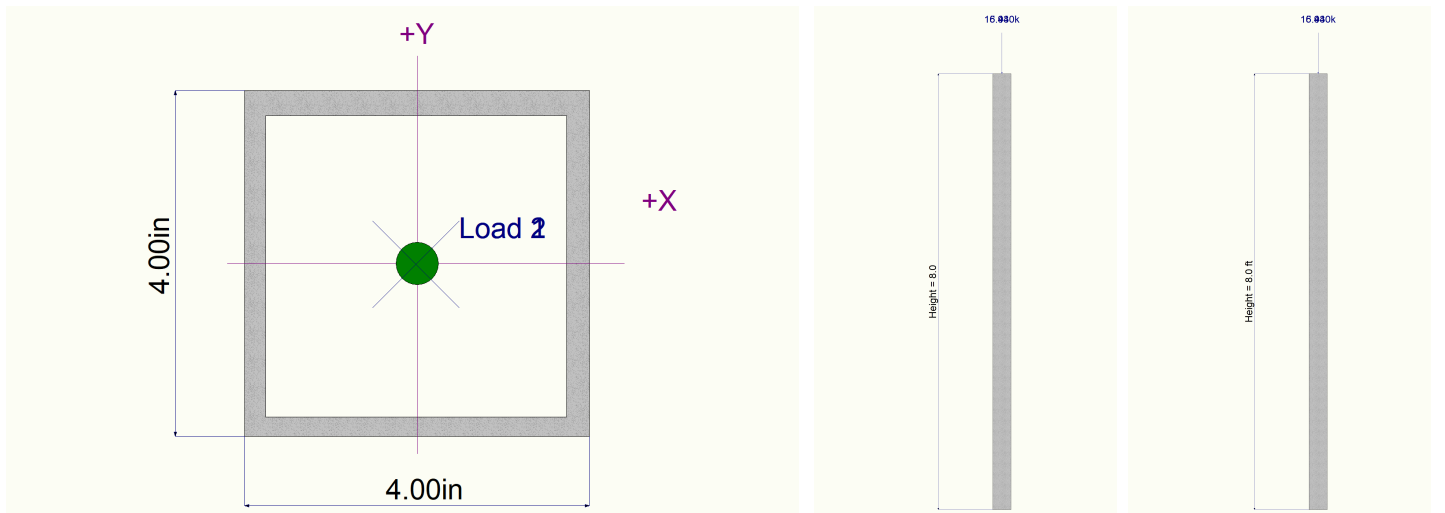
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**DESCRIPTION: P-4**

Depth	=	4.000 in	I <sub>xx</sub>	=	7.80 in <sup>4</sup>	J	=	12.800 in <sup>4</sup>
Design Thick	=	0.233 in	S <sub>xx</sub>	=	3.90 in <sup>3</sup>			
Width	=	4.000 in	R <sub>xx</sub>	=	1.520 in			
Wall Thick	=	0.250 in	Z <sub>x</sub>	=	4.690 in <sup>3</sup>			
Area	=	3.370 in <sup>2</sup>	I <sub>yy</sub>	=	7.800 in <sup>4</sup>	C	=	6.560 in <sup>3</sup>
Weight	=	12.210 plf	S <sub>yy</sub>	=	3.900 in <sup>3</sup>			
			R <sub>yy</sub>	=	1.520 in			
Ycg	=	0.000 in						

**Sketches**



## Wood Column

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

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**DESCRIPTION:** Exterior 2x6 Wall Stud

### Code References

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combinations Used : IBC 2021

### General Information

Analysis Method	Allowable Stress Design			Wood Section Name	<b>2x6</b>
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber
Overall Column Height	8.5 ft			Wood Member Type	Sawn
<i>( Used for non-slender calculations )</i>					
Wood Species	Hem-Fir			Exact Width	<b>1.50</b> in
Wood Grade	No.2			Exact Depth	<b>5.50</b> in
Fb +	850 psi	Fv	150 psi	Area	8.250 in <sup>2</sup>
Fb -	850 psi	Ft	525 psi	Ix	20.797 in <sup>4</sup>
Fc - Prll	1300 psi	Density	26.84 pcf	Iy	<b>1.547</b> in <sup>4</sup>
Fc - Perp	405 psi			Allow Stress Modification Factors	
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	Cf or Cv for Bending 1.30	
	Basic	1300	1300	1300 ksi	Cf or Cv for Compression 1.10
	Minimum	470	470		Cf or Cv for Tension 1.30
					Cm : Wet Use Factor 1.0
					Ct : Temperature Fact 1.0
					Cfu : Flat Use Factor 1.0
					Kf : Built-up columns 1.0
					Use Cr : Repetitive ? No
				Column Buckling Condition:	
				ABOUT X-X Axis: Lux = 8.5 ft, Kx = 1.0	
				Fully braced against buckling ABOUT Y-Y Axis	

### Applied Loads

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

Column self weight included : 13.071 lbs \* Dead Load Factor

AXIAL LOADS . . .

Roof Load + Floor Load: Axial Load at 8.50 ft, D = 0.4320, Lr = 0.60, L = 0.3460, S = 0.2330 k

BENDING LOADS . . .

Wind Load: Lat. Uniform Load creating Mx-x, W = 0.01410 k/ft

### DESIGN SUMMARY

#### Bending & Shear Check Results

**PASS** Max. Axial+Bending Stress Ratio = **0.1513 : 1**

Load Combination	+D+0.750Lr+0.750L
Governing NDS Formula	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	1.155 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	924.93 psi

#### Maximum SERVICE Lateral Load Reactions . .

Top along Y-Y	0.05993 k	Bottom along Y-Y	0.05993 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

#### Maximum SERVICE Load Lateral Deflections . . .

Along Y-Y	0.06192 in	at	4.279 ft	above base
for load combination : W Only				
Along X-X	0.0 in	at	0.0 ft	above base
for load combination : n/a				

#### Other Factors used to calculate allowable stresses . . .

Bending    Compression    Tension

**PASS** Maximum Shear Stress Ratio = **0.02724 : 1**

Load Combination	+D+0.60W
Location of max.above base	0.0 ft
Applied Design Shear	9.806 psi
Allowable Shear	240.0 psi

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only					0.445				
+D+L					0.791				
+D+Lr					1.045				
+D+S					0.678				
+D+0.750Lr+0.750L					1.155				
+D+0.750L+0.750S					0.879				
+D+0.60W			0.036	0.036	0.445				
+D+0.750L+0.750S+0.450W			0.027	0.027	0.879				
+0.60D+0.750L+0.450W			0.027	0.027	0.527				

**Wood Column**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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**DESCRIPTION:** Exterior 2x6 Wall Stud

**Maximum Reactions**

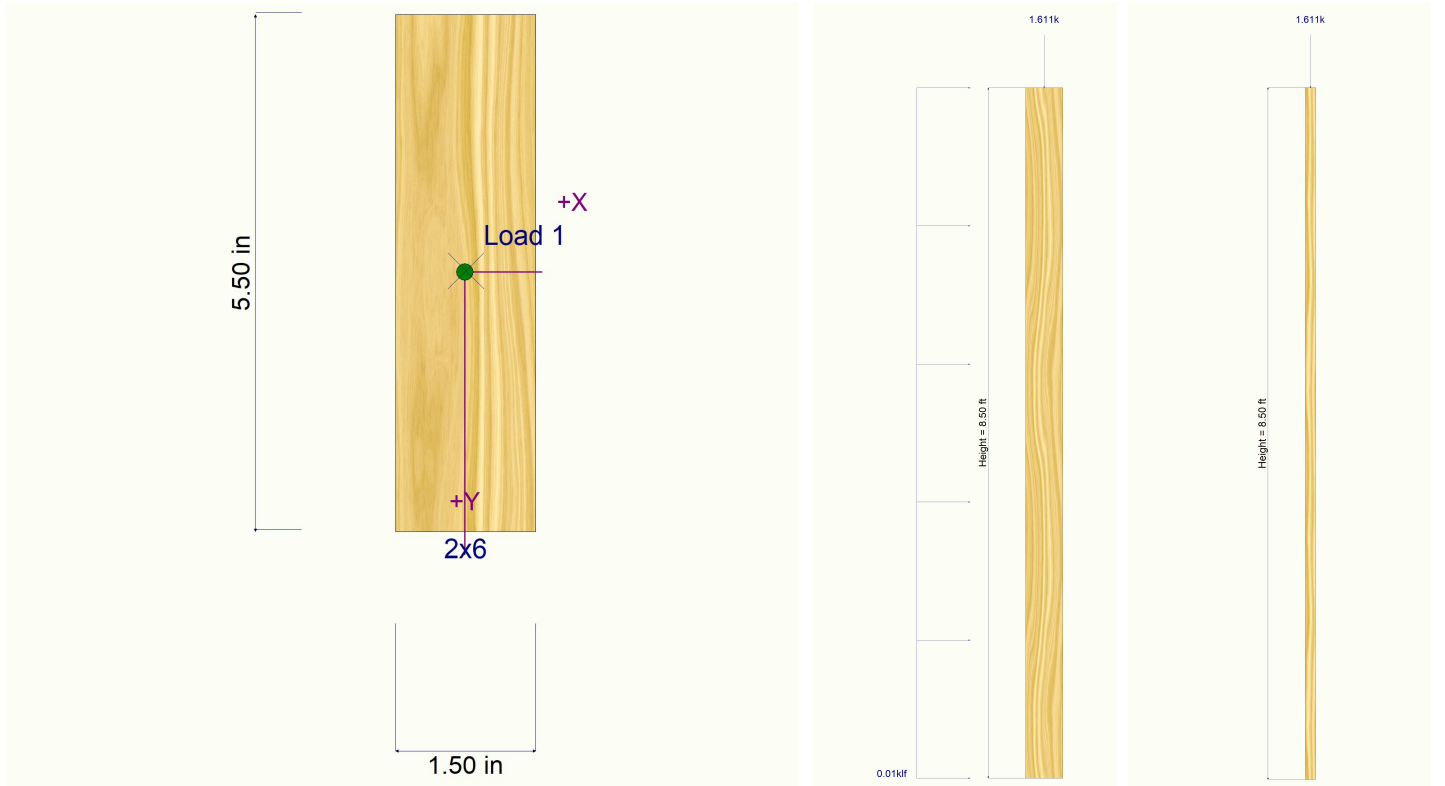
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		k-ft Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+0.60D						0.267				
Lr Only						0.600				
L Only						0.346				
S Only						0.233				
W Only				0.060	0.060					

**Maximum Deflections for Load Combinations**

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000ft
+D+L	0.000 in	0.000ft	0.000 in	0.000ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000ft
+D+S	0.000 in	0.000ft	0.000 in	0.000ft
+D+0.750Lr+0.750L	0.000 in	0.000ft	0.000 in	0.000ft
+D+0.750L+0.750S	0.000 in	0.000ft	0.000 in	0.000ft
+D+0.60W	0.000 in	0.000ft	0.037 in	4.279ft
+D+0.450W	0.000 in	0.000ft	0.028 in	4.279ft
+D+0.750L+0.750S+0.450W	0.000 in	0.000ft	0.028 in	4.279ft
+0.60D+0.750L+0.450W	0.000 in	0.000ft	0.028 in	4.279ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000ft
L Only	0.000 in	0.000ft	0.000 in	0.000ft
S Only	0.000 in	0.000ft	0.000 in	0.000ft
W Only	0.000 in	0.000ft	0.062 in	4.279ft

**Sketches**



## Wood Column

Project File: 250401-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

(c) ENERCALC, LLC 1982-2025

**DESCRIPTION:** Interior 2x6 Wall Stud

### Code References

Calculations per NDS 2018, IBC 2021, SDPWS 2021  
 Load Combinations Used : IBC 2021

### General Information

Analysis Method	Allowable Stress Design	Wood Section Name	<b>2x6</b>
End Fixities	Top & Bottom Pinned	Wood Grading/Manuf.	Graded Lumber
Overall Column Height	8.5 ft	Wood Member Type	Sawn
<i>( Used for non-slender calculations )</i>			
Wood Species	Hem-Fir	Exact Width	<b>1.50</b> in
Wood Grade	No.2	Exact Depth	<b>5.50</b> in
Fb +	850 psi	Area	8.250 in <sup>2</sup>
Fb -	850 psi	Ix	20.797 in <sup>4</sup>
Fc - Prll	1300 psi	Iy	<b>1.547</b> in <sup>4</sup>
Fc - Perp	405 psi		
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
	Basic	1300	1300
	Minimum	470	470
			1300 ksi
			Column Buckling Condition:
			ABOUT X-X Axis: Lux = 8.5 ft, Kx = 1.0
			Fully braced against buckling ABOUT Y-Y Axis

### Applied Loads

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

Column self weight included : 13.071 lbs \* Dead Load Factor

AXIAL LOADS . . .

Roof Load: Axial Load at 8.50 ft, D = 0.4570, Lr = 1.097, S = 0.4570 k

### DESIGN SUMMARY

#### Bending & Shear Check Results

**PASS** Max. Axial+Bending Stress Ratio = **0.2054 : 1**

Load Combination	+D+Lr
Governing NDS Formula	Comp Only, fc/Fc'
Location of max.above base	0.0 ft
At maximum location values are .	
Applied Axial	1.567 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	924.93 psi

**Maximum SERVICE Lateral Load Reactions . .**

Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

**Maximum SERVICE Load Lateral Deflections . . .**

Along Y-Y	0.0 in	at	0.0 ft	above base
for load combination : n/a				
Along X-X	0.0 in	at	0.0 ft	above base
for load combination : n/a				

**Other Factors used to calculate allowable stresses . . .**  
Bending   Compression   Tension

**PASS** Maximum Shear Stress Ratio = **0.0 : 1**

Load Combination	+0.60D
Location of max.above base	8.50 ft
Applied Design Shear	0.0 psi
Allowable Shear	240.0 psi

### Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						0.470				
+D+Lr						1.567				
+D+S						0.927				
+D+0.750Lr						1.293				
+D+0.750S						0.813				
+0.60D						0.282				
Lr Only						1.097				
S Only						0.457				

### Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 in	0.000ft	0.000 in	0.000ft

**Wood Column**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

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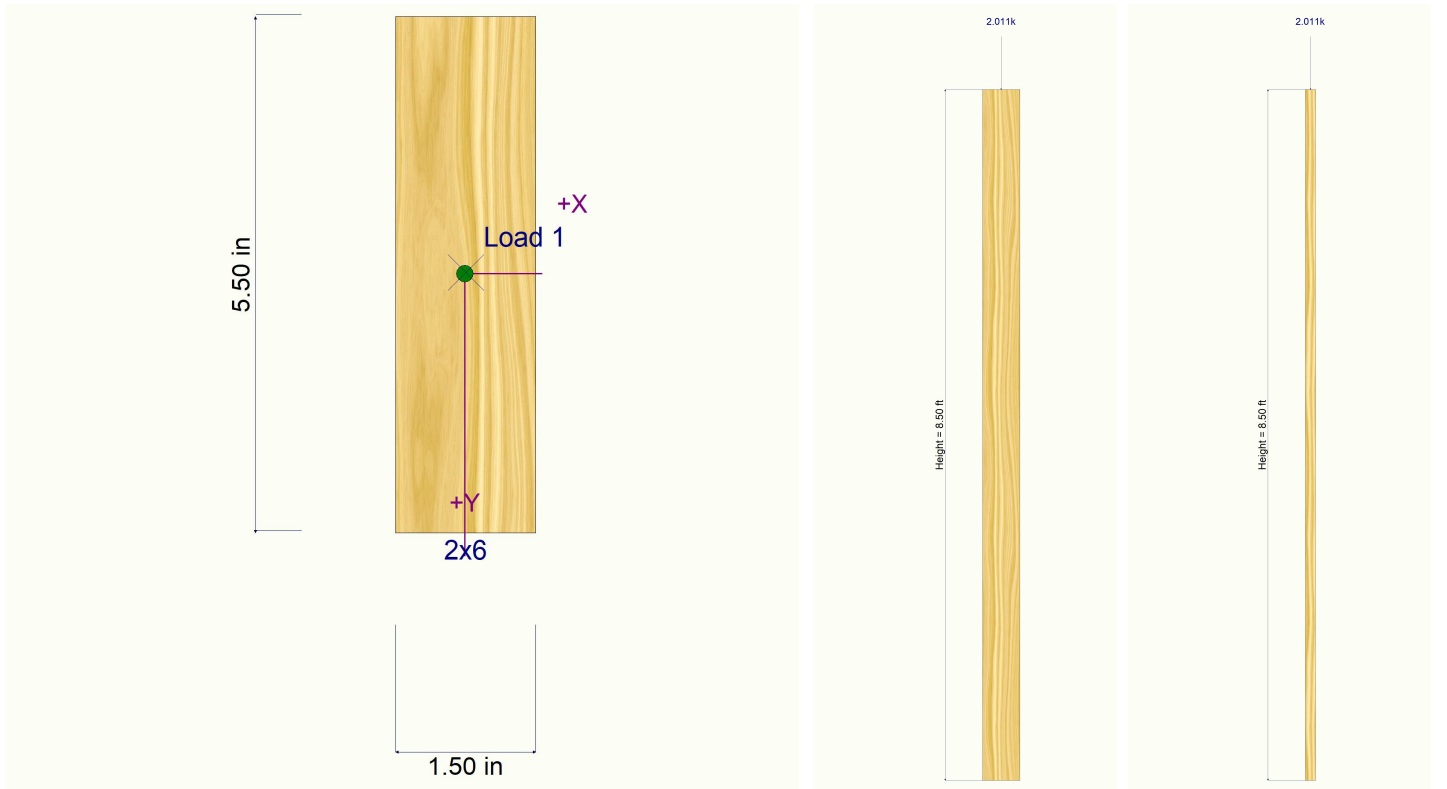
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**DESCRIPTION:** Interior 2x6 Wall Stud

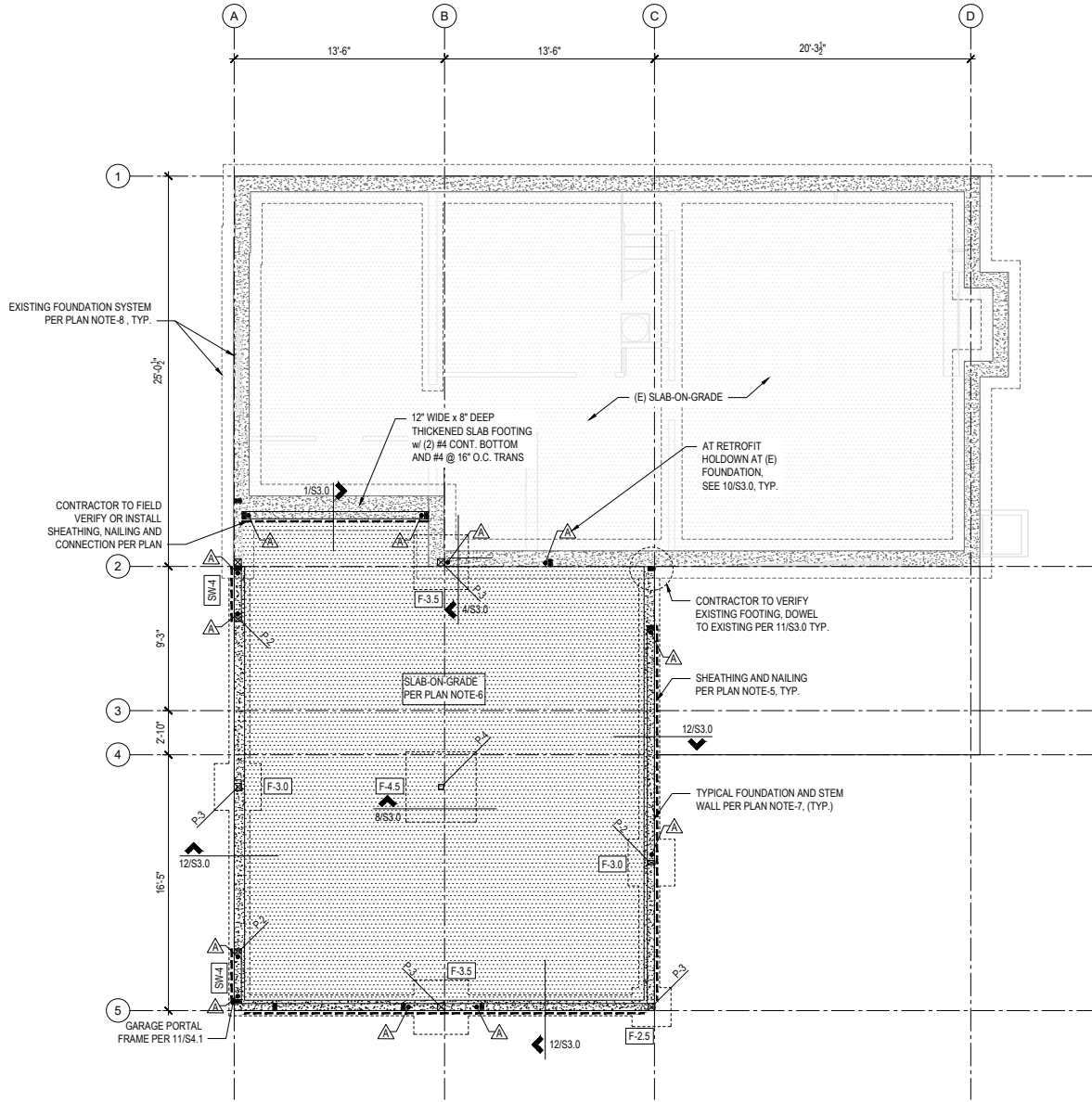
**Maximum Deflections for Load Combinations**

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
+D+Lr	0.0000 in	0.000ft	0.000 in	0.000ft
+D+S	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750Lr	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750S	0.0000 in	0.000ft	0.000 in	0.000ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000ft
Lr Only	0.0000 in	0.000ft	0.000 in	0.000ft
S Only	0.0000 in	0.000ft	0.000 in	0.000ft

**Sketches**



FOUNDATION DESIGN



**FOUNDATION PLAN**  
SCALE: 1/4" = 1'-0"

FOOTING SCHEDULE	
MARK	SIZE
F-2.5	30" SQ. x 10" DEEP FOOTING w/ (3) #4 E.W. BOTTOM, TYP.
F-3.0	36" SQ. x 10" DEEP FOOTING w/ (4) #4 E.W. BOTTOM, TYP.
F-3.5	42" SQ. x 10" DEEP FOOTING w/ (4) #4 E.W. BOTTOM, TYP.
F-4.5	54" SQ. x 12" DEEP FOOTING w/ (6) #4 E.W. BOTTOM, TYP.

## Wall Footing

Project File: 250319-Xiao Residence.ec6

LIC#: KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

(c) ENERCALC, LLC 1982-2025

### DESCRIPTION: WALL FOOTING

### Code References

Calculations per ACI 318-19, IBC 2021  
 Load Combinations Used : IBC 2021

### General Information

#### Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	150.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

#### Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Sliding Safety Factor	=	1.50 : 1
AutoCalc Footing Weight as DL :	=	Yes

#### Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Increases based on footing Depth

Reference Depth below Surface	=	ft
Allow. Pressure Increase per foot of depth when base footing is below	=	ksf

#### Increases based on footing Width

Allow. Pressure Increase per foot of width when footing is wider than	=	ksf
---	---	-----

#### Adjusted Allowable Bearing Pressure

= 1.50 ksf

### Dimensions

Footing Width	=	1.330 ft
Wall Thickness	=	8.0 in
Wall center offset from center of footing	=	0 in

### Reinforcing

Footing Thickness	=	8.0 in	Bars along X-X Axis	=	
Rebar Centerline to Edge of Concrete... at Bottom of footing =	=	3.0 in	Bar spacing	=	12.00
			Reinforcing Bar Size	=	# 4



### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	0.5130	0.420	0.260	0.1750		k
OB : Overburden	=						ksf
V-x	=						k
M-zz	=						k-ft
Vx applied	=						in above top of footing

## Wall Footing

Project File: 250319-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

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### DESCRIPTION: WALL FOOTING

#### DESIGN SUMMARY

**Design OK**

Factor of Safety	Item	Applied	Capacity	Governing Load Combination	
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift

Utilization Ratio	Item	Applied	Capacity	Governing Load Combination	
PASS	0.5794	Soil Bearing	0.8692 ksf	1.50 ksf	+D+0.750Lr+0.750L
PASS	0.01521	Z Flexure (+X)	0.06522 k-ft	4.288 k-ft	+1.20D+1.60Lr+0.50L
PASS	0.005607	Z Flexure (-X)	0.02404 k-ft	4.288 k-ft	+0.90D
PASS	N/A	1-way Shear (+X)	N/A psi	44.814 psi	N/A
PASS	N/A	1-way Shear (-X)	N/A psi	44.814 psi	N/A

#### Detailed Results

##### Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress		Actual / Allowable Ratio
			-X	+X	
D Only	1.50 ksf	0.0 in	0.4857 ksf	0.4857 ksf	0.324
+D+L	1.50 ksf	0.0 in	0.6812 ksf	0.6812 ksf	0.454
+D+Lr	1.50 ksf	0.0 in	0.8015 ksf	0.8015 ksf	0.534
+D+S	1.50 ksf	0.0 in	0.6173 ksf	0.6173 ksf	0.412
+D+0.750Lr+0.750L	1.50 ksf	0.0 in	0.8692 ksf	0.8692 ksf	0.579
+D+0.750L+0.750S	1.50 ksf	0.0 in	0.7310 ksf	0.7310 ksf	0.487
+0.60D+0.750L	1.50 ksf	0.0 in	0.4380 ksf	0.4380 ksf	0.292
+0.60D	1.50 ksf	0.0 in	0.2914 ksf	0.2914 ksf	0.194

##### One Way Shear

Units : k

Load Combination...	vu @ -X	vu @ +X	vu:Max	Φ vn	vu / Φ vn	Status
+1.40D	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+1.20D+0.50Lr+1.60L	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+1.20D+1.60L+0.50S	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+1.20D+1.60Lr+0.50L	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+1.20D+1.60Lr	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+1.20D+0.50Lr+1.60S	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+1.20D+1.60S	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+1.20D+0.50Lr+0.50L	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+1.20D+0.50L+0.50S	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+0.90D+0.50L+0.20S	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK
+0.90D	0.0 psi	0.0 psi	0.0 psi	44.8 psi	0.000	OK

## General Footing

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.03.24

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**DESCRIPTION:** F-2.5 (RB-1\_R & RB-7\_L)

### Code References

Calculations per ACI 318-19, IBC 2021  
 Load Combinations Used : IBC 2021

### General Information

#### Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	2,850.0 ksi
Concrete Density	=	150.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

#### Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Sliding Safety Factor	=	1.50 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

#### Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Increases based on footing depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

#### Increases based on footing plan dimension

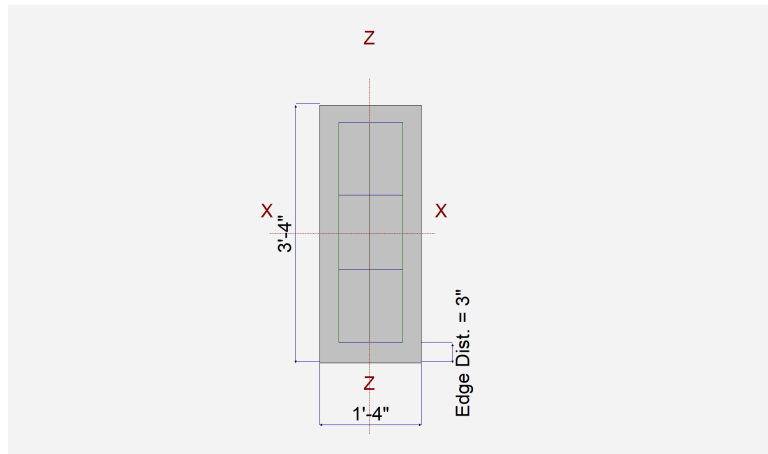
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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### Dimensions

Width parallel to X-X Axis	=	1.333 ft
Length parallel to Z-Z Axis	=	3.333 ft
Footing Thickness	=	8.0 in

#### Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



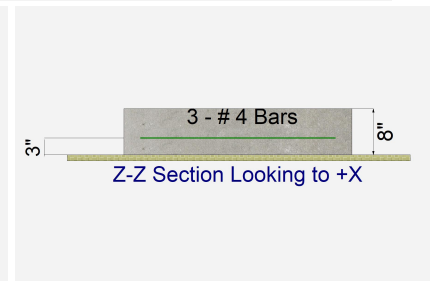
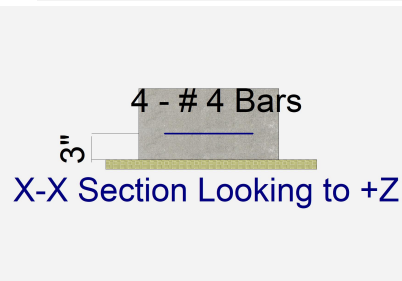
### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 4

Bars parallel to Z-Z Axis	=	
Number of Bars	=	3.0
Reinforcing Bar Size	=	# 4

#### Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation		Bars along X-X Axis
# Bars required within zone	=	57.1 %
# Bars required on each side of zone	=	42.9 %



### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	2.30	3.440		1.430		k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k

**General Footing**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.03.24

HAREZLAK ENGINEERING

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**DESCRIPTION:** F-2.5 (RB-1\_R & RB-7\_L)

**DESIGN SUMMARY**

**Design OK**

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9280	Soil Bearing	1.392 ksf	1.50 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.08108	Z Flexure (+X)	0.4131 k-ft/ft	5.096 k-ft/ft	+1.20D+1.60Lr
PASS	0.08108	Z Flexure (-X)	0.4131 k-ft/ft	5.096 k-ft/ft	+1.20D+1.60Lr
PASS	0.2852	X Flexure (+Z)	2.583 k-ft/ft	9.055 k-ft/ft	+1.20D+1.60Lr
PASS	0.2852	X Flexure (-Z)	2.583 k-ft/ft	9.055 k-ft/ft	+1.20D+1.60Lr
PASS	0.1649	1-way Shear (+X)	7.852 psi	47.624 psi	+1.20D+1.60Lr
PASS	0.1649	1-way Shear (-X)	7.852 psi	47.624 psi	+1.20D+1.60Lr
PASS	0.6510	1-way Shear (+Z)	38.231 psi	58.728 psi	+1.20D+1.60Lr
PASS	0.6510	1-way Shear (-Z)	38.231 psi	58.728 psi	+1.20D+1.60Lr
PASS	0.5298	2-way Punching	79.467 psi	150.0 psi	+1.20D+1.60Lr

**Detailed Results**

**Soil Bearing**

Rotation Axis & Load Combination...	Gross Allowable	Xecc		Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
		Zecc (in)		Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	1.50	n/a	0.0	0.6177	0.6177	n/a	n/a	0.412
X-X, +D+Lr	1.50	n/a	0.0	1.392	1.392	n/a	n/a	0.928
X-X, +D+S	1.50	n/a	0.0	0.9395	0.9395	n/a	n/a	0.626
X-X, +D+0.750Lr	1.50	n/a	0.0	1.198	1.198	n/a	n/a	0.799
X-X, +D+0.750S	1.50	n/a	0.0	0.8591	0.8591	n/a	n/a	0.573
X-X, +0.60D	1.50	n/a	0.0	0.3706	0.3706	n/a	n/a	0.247
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.6177	0.6177	0.412
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.392	1.392	0.928
Z-Z, +D+S	1.50	0.0	n/a	n/a	n/a	0.9395	0.9395	0.626
Z-Z, +D+0.750Lr	1.50	0.0	n/a	n/a	n/a	1.198	1.198	0.799
Z-Z, +D+0.750S	1.50	0.0	n/a	n/a	n/a	0.8591	0.8591	0.573
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.3706	0.3706	0.247

**Overturing Stability**

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturing				

All units k

**Sliding Stability**

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

**Footing Flexure**

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	1.006	+Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.40D	1.006	-Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.20D+0.50Lr	1.40	+Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.20D+0.50Lr	1.40	-Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.20D+0.50S	1.086	+Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.20D+0.50S	1.086	-Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.20D+1.60Lr	2.583	+Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.20D+1.60Lr	2.583	-Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.20D+1.60S	1.578	+Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +1.20D+1.60S	1.578	-Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +0.90D+0.20S	0.7364	+Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +0.90D+0.20S	0.7364	-Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK
X-X, +0.90D	0.6470	+Z	Bottom	0.1728	ACI 7.6.1.1	0.4501	9.055	OK

## General Footing

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

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**DESCRIPTION:** F-3.0 (RB-6\_R & RB-7\_R)

### Code References

Calculations per ACI 318-19, IBC 2021  
 Load Combinations Used : IBC 2021

### General Information

#### Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	2,850.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

#### Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

#### Increases based on footing depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

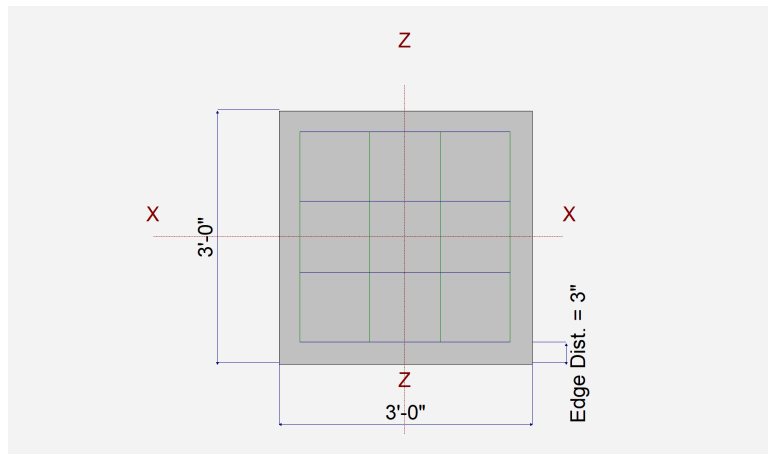
#### Increases based on footing plan dimension

Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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### Dimensions

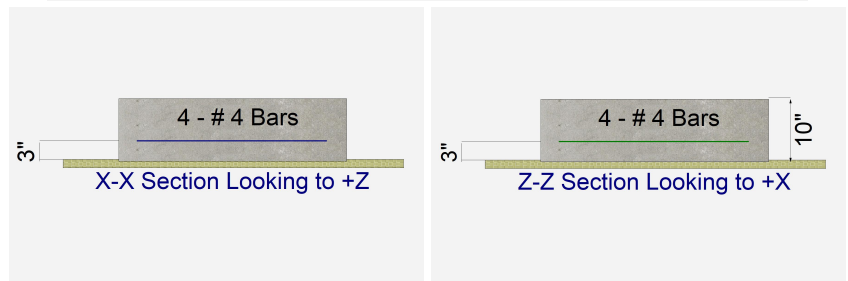
Width parallel to X-X Axis	=	3.0 ft
Length parallel to Z-Z Axis	=	3.0 ft
Footing Thickness	=	10.0 in

Pedestal dimensions...		
px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



### Reinforcing

Bars parallel to X-X Axis		
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis		
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 4
<b>Bandwidth Distribution Check (ACI 15.4.4.2)</b>		
Direction Requiring Closer Separation		n/a
# Bars required within zone		n/a
# Bars required on each side of zone		n/a



### Applied Loads

	D	Lr	L	S	W	E	H	
P : Column Load	=	3.620	6.90		2.880			k
OB : Overburden	=							ksf
M-xx	=							k-ft
M-zz	=							k-ft
V-x	=							k
V-z	=							k

**General Footing**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

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**DESCRIPTION: F-3.0 (RB-6\_R & RB-7\_R)**

**DESIGN SUMMARY**

**Design OK**

Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS 0.860	Soil Bearing	1.290 ksf	1.50 ksf	+D+Lr about Z-Z axis
PASS n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS 0.2397	Z Flexure (+X)	1.923 k-ft/ft	8.024 k-ft/ft	+1.20D+1.60Lr
PASS 0.2397	Z Flexure (-X)	1.923 k-ft/ft	8.024 k-ft/ft	+1.20D+1.60Lr
PASS 0.2397	X Flexure (+Z)	1.923 k-ft/ft	8.024 k-ft/ft	+1.20D+1.60Lr
PASS 0.2397	X Flexure (-Z)	1.923 k-ft/ft	8.024 k-ft/ft	+1.20D+1.60Lr
PASS 0.4292	1-way Shear (+X)	18.925 psi	44.091 psi	+1.20D+1.60Lr
PASS 0.4292	1-way Shear (-X)	18.925 psi	44.091 psi	+1.20D+1.60Lr
PASS 0.4292	1-way Shear (+Z)	18.925 psi	44.091 psi	+1.20D+1.60Lr
PASS 0.4292	1-way Shear (-Z)	18.925 psi	44.091 psi	+1.20D+1.60Lr
PASS 0.5023	2-way Punching	75.350 psi	150.0 psi	+1.20D+1.60Lr

**Detailed Results**

**Soil Bearing**

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	1.50	n/a	0.0	0.5231	0.5231	n/a	n/a	0.349
X-X, +D+Lr	1.50	n/a	0.0	1.290	1.290	n/a	n/a	0.860
X-X, +D+S	1.50	n/a	0.0	0.8431	0.8431	n/a	n/a	0.562
X-X, +D+0.750Lr	1.50	n/a	0.0	1.098	1.098	n/a	n/a	0.732
X-X, +D+0.750S	1.50	n/a	0.0	0.7631	0.7631	n/a	n/a	0.509
X-X, +0.60D	1.50	n/a	0.0	0.3138	0.3138	n/a	n/a	0.209
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.5231	0.5231	0.349
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.290	1.290	0.860
Z-Z, +D+S	1.50	0.0	n/a	n/a	n/a	0.8431	0.8431	0.562
Z-Z, +D+0.750Lr	1.50	0.0	n/a	n/a	n/a	1.098	1.098	0.732
Z-Z, +D+0.750S	1.50	0.0	n/a	n/a	n/a	0.7631	0.7631	0.509
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.3138	0.3138	0.209

**One Way Shear X**

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	6.23 psi	6.23 psi	6.23 psi	44.09 psi	0.14	OK
+1.20D+0.50Lr	9.59 psi	9.59 psi	9.59 psi	44.09 psi	0.22	OK
+1.20D+0.50S	7.12 psi	7.12 psi	7.12 psi	44.09 psi	0.16	OK
+1.20D+1.60Lr	18.93 psi	18.93 psi	18.93 psi	44.09 psi	0.43	OK
+1.20D+1.60S	11.01 psi	11.01 psi	11.01 psi	44.09 psi	0.25	OK
+0.90D+0.20S	4.72 psi	4.72 psi	4.72 psi	44.09 psi	0.11	OK
+0.90D	4.01 psi	4.01 psi	4.01 psi	44.09 psi	0.09	OK

**One Way Shear Z**

Load Combination...	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	6.23 psi	6.23 psi	6.23 psi	44.09 psi	0.14	OK
+1.20D+0.50Lr	9.59 psi	9.59 psi	9.59 psi	44.09 psi	0.22	OK
+1.20D+0.50S	7.12 psi	7.12 psi	7.12 psi	44.09 psi	0.16	OK
+1.20D+1.60Lr	18.93 psi	18.93 psi	18.93 psi	44.09 psi	0.43	OK
+1.20D+1.60S	11.01 psi	11.01 psi	11.01 psi	44.09 psi	0.25	OK
+0.90D+0.20S	4.72 psi	4.72 psi	4.72 psi	44.09 psi	0.11	OK
+0.90D	4.01 psi	4.01 psi	4.01 psi	44.09 psi	0.09	OK

**Two-Way "Punching" Shear**

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	24.82 psi	150.00psi	0.1655	OK
+1.20D+0.50Lr	38.18 psi	150.00psi	0.2545	OK
+1.20D+0.50S	28.33 psi	150.00psi	0.1889	OK
+1.20D+1.60Lr	75.35 psi	150.00psi	0.5023	OK
+1.20D+1.60S	43.85 psi	150.00psi	0.2923	OK

## General Footing

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

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**DESCRIPTION:** F-3.5 (FB-2\_L)

### Code References

Calculations per ACI 318-19, IBC 2021  
 Load Combinations Used : IBC 2021

### General Information

#### Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	2,850.0 ksi
Concrete Density	=	150.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

#### Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Sliding Safety Factor	=	1.50 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

#### Increases based on footing depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

#### Increases based on footing plan dimension

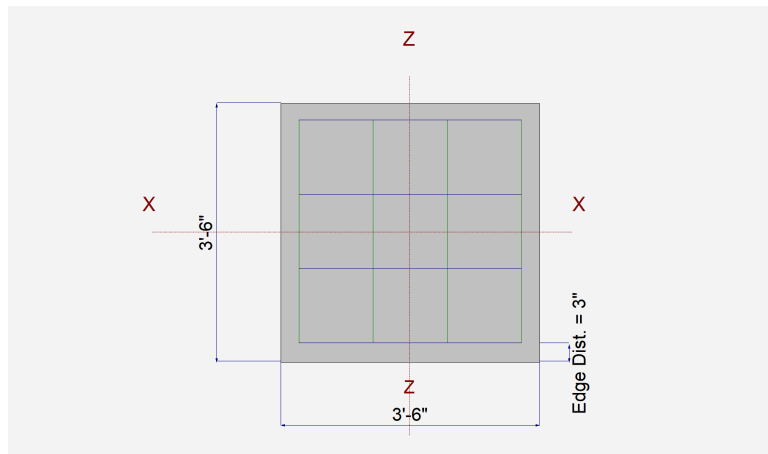
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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### Dimensions

Width parallel to X-X Axis	=	3.50 ft
Length parallel to Z-Z Axis	=	3.50 ft
Footing Thickness	=	10.0 in

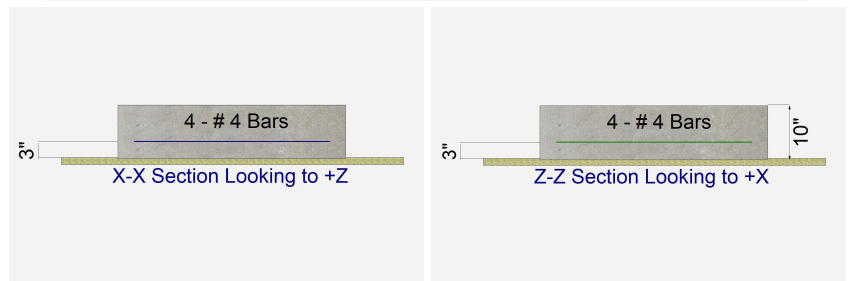
#### Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in
Footing Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



### Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	4
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis	=	
Number of Bars	=	4
Reinforcing Bar Size	=	# 4
<b>Bandwidth Distribution Check (ACI 15.4.4.2)</b>		
Direction Requiring Closer Separation		n/a
# Bars required within zone		n/a
# Bars required on each side of zone		n/a



### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	5.020	6.70	3.710	2.770		k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k

**General Footing**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

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**DESCRIPTION: F-3.5 (FB-2\_L)**

**DESIGN SUMMARY**

**Design OK**

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7813	Soil Bearing	1.172 ksf	1.50 ksf	+D+0.750Lr+0.750L about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.3358	Z Flexure (+X)	2.325 k-ft/ft	6.923 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3358	Z Flexure (-X)	2.325 k-ft/ft	6.923 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3358	X Flexure (+Z)	2.325 k-ft/ft	6.923 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3358	X Flexure (-Z)	2.325 k-ft/ft	6.923 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.4984	1-way Shear (+X)	20.876 psi	41.883 psi	+1.20D+1.60Lr+0.50L
PASS	0.4984	1-way Shear (-X)	20.876 psi	41.883 psi	+1.20D+1.60Lr+0.50L
PASS	0.4984	1-way Shear (+Z)	20.876 psi	41.883 psi	+1.20D+1.60Lr+0.50L
PASS	0.4984	1-way Shear (-Z)	20.876 psi	41.883 psi	+1.20D+1.60Lr+0.50L
PASS	0.6164	2-way Punching	92.464 psi	150.0 psi	+1.20D+1.60Lr+0.50L

**Detailed Results**

**Soil Bearing**

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	1.50	n/a	0.0	0.5348	0.5348	n/a	n/a	0.357
X-X, +D+L	1.50	n/a	0.0	0.8377	0.8377	n/a	n/a	0.559
X-X, +D+Lr	1.50	n/a	0.0	1.082	1.082	n/a	n/a	0.721
X-X, +D+S	1.50	n/a	0.0	0.7609	0.7609	n/a	n/a	0.507
X-X, +D+0.750Lr+0.750L	1.50	n/a	0.0	1.172	1.172	n/a	n/a	0.781
X-X, +D+0.750L+0.750S	1.50	n/a	0.0	0.9315	0.9315	n/a	n/a	0.621
X-X, +0.60D+0.750L	1.50	n/a	0.0	0.5480	0.5480	n/a	n/a	0.365
X-X, +0.60D	1.50	n/a	0.0	0.3209	0.3209	n/a	n/a	0.214
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.5348	0.5348	0.357
Z-Z, +D+L	1.50	0.0	n/a	n/a	n/a	0.8377	0.8377	0.559
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.082	1.082	0.721
Z-Z, +D+S	1.50	0.0	n/a	n/a	n/a	0.7609	0.7609	0.507
Z-Z, +D+0.750Lr+0.750L	1.50	0.0	n/a	n/a	n/a	1.172	1.172	0.781
Z-Z, +D+0.750L+0.750S	1.50	0.0	n/a	n/a	n/a	0.9315	0.9315	0.621
Z-Z, +0.60D+0.750L	1.50	0.0	n/a	n/a	n/a	0.5480	0.5480	0.365
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.3209	0.3209	0.214

**One Way Shear X**

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	7.89 psi	7.89 psi	7.89 psi	41.88 psi	0.19	OK
+1.20D+0.50Lr+1.60L	17.19 psi	17.19 psi	17.19 psi	41.88 psi	0.41	OK
+1.20D+1.60L+0.50S	14.98 psi	14.98 psi	14.98 psi	41.88 psi	0.36	OK
+1.20D+1.60Lr+0.50L	20.88 psi	20.88 psi	20.88 psi	41.88 psi	0.50	OK
+1.20D+1.60Lr	18.79 psi	18.79 psi	18.79 psi	41.88 psi	0.45	OK
+1.20D+0.50L+1.60S	13.82 psi	13.82 psi	13.82 psi	41.88 psi	0.33	OK
+1.20D+1.60S	11.74 psi	11.74 psi	11.74 psi	41.88 psi	0.28	OK
+1.20D+0.50Lr+0.50L	12.60 psi	12.60 psi	12.60 psi	41.88 psi	0.30	OK
+1.20D+0.50L+0.50S	10.40 psi	10.40 psi	10.40 psi	41.88 psi	0.25	OK
+0.90D+0.50L+0.20S	7.78 psi	7.78 psi	7.78 psi	41.88 psi	0.19	OK
+0.90D	5.07 psi	5.07 psi	5.07 psi	41.88 psi	0.12	OK

**One Way Shear Z**

Load Combination...	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	7.89 psi	7.89 psi	7.89 psi	41.88 psi	0.19	OK
+1.20D+0.50Lr+1.60L	17.19 psi	17.19 psi	17.19 psi	41.88 psi	0.41	OK
+1.20D+1.60L+0.50S	14.98 psi	14.98 psi	14.98 psi	41.88 psi	0.36	OK
+1.20D+1.60Lr+0.50L	20.88 psi	20.88 psi	20.88 psi	41.88 psi	0.50	OK
+1.20D+1.60Lr	18.79 psi	18.79 psi	18.79 psi	41.88 psi	0.45	OK
+1.20D+0.50L+1.60S	13.82 psi	13.82 psi	13.82 psi	41.88 psi	0.33	OK

## General Footing

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

(c) ENERCALC, LLC 1982-2025

**DESCRIPTION:** F-4.5

### Code References

Calculations per ACI 318-19, IBC 2021  
 Load Combinations Used : IBC 2021

### General Information

#### Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	2,850.0 ksi
Concrete Density	=	150.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

#### Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

#### Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Sliding Safety Factor	=	1.50 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

#### Increases based on footing depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth when footing base is below	=	ksf ft

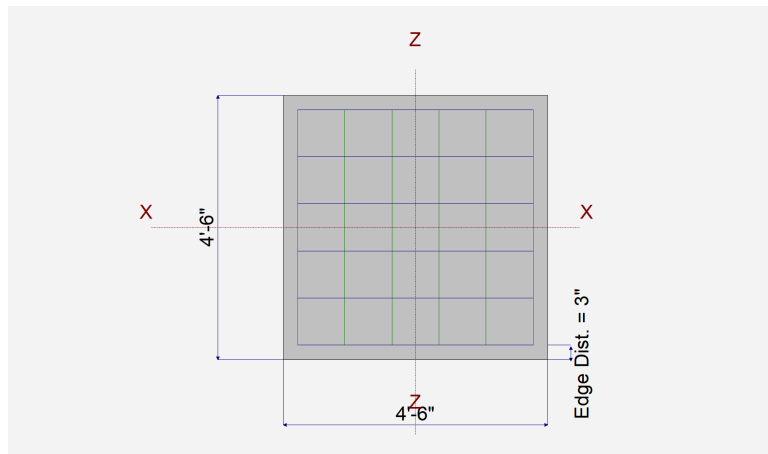
#### Increases based on footing plan dimension

Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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### Dimensions

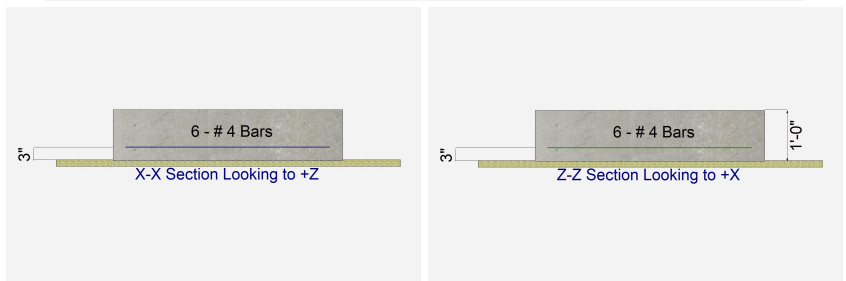
Width parallel to X-X Axis	=	4.50 ft
Length parallel to Z-Z Axis	=	4.50 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...		
px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



### Reinforcing

Bars parallel to X-X Axis		
Number of Bars	=	6
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis		
Number of Bars	=	6.0
Reinforcing Bar Size	=	# 4
Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		n/a
# Bars required within zone		n/a
# Bars required on each side of zone		n/a



### Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	8.810	11.350	7.490	4.720		k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k

**General Footing**

Project File: 250401-Xiao Residence.ec6

LIC# : KW-06017599, Build:20.25.02.26

HAREZLAK ENGINEERING

(c) ENERCALC, LLC 1982-2025

**DESCRIPTION: F-4.5**

**DESIGN SUMMARY**

**Design OK**

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8553	Soil Bearing	1.283 ksf	1.50 ksf	+D+0.750Lr+0.750L about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.3895	Z Flexure (+X)	4.060 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3895	Z Flexure (-X)	4.060 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3895	X Flexure (+Z)	4.060 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.3895	X Flexure (-Z)	4.060 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr+0.50L
PASS	0.5439	1-way Shear (+X)	22.052 psi	40.548 psi	+1.20D+1.60Lr+0.50L
PASS	0.5439	1-way Shear (-X)	22.052 psi	40.548 psi	+1.20D+1.60Lr+0.50L
PASS	0.5439	1-way Shear (+Z)	22.052 psi	40.548 psi	+1.20D+1.60Lr+0.50L
PASS	0.5439	1-way Shear (-Z)	22.052 psi	40.548 psi	+1.20D+1.60Lr+0.50L
PASS	0.6511	2-way Punching	97.672 psi	150.0 psi	+1.20D+1.60Lr+0.50L

**Detailed Results**

**Soil Bearing**

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	1.50	n/a	0.0	0.5851	0.5851	n/a	n/a	0.390
X-X, +D+L	1.50	n/a	0.0	0.9549	0.9549	n/a	n/a	0.637
X-X, +D+Lr	1.50	n/a	0.0	1.146	1.146	n/a	n/a	0.764
X-X, +D+S	1.50	n/a	0.0	0.8181	0.8181	n/a	n/a	0.545
X-X, +D+0.750Lr+0.750L	1.50	n/a	0.0	1.283	1.283	n/a	n/a	0.855
X-X, +D+0.750L+0.750S	1.50	n/a	0.0	1.037	1.037	n/a	n/a	0.691
X-X, +0.60D+0.750L	1.50	n/a	0.0	0.6284	0.6284	n/a	n/a	0.419
X-X, +0.60D	1.50	n/a	0.0	0.3510	0.3510	n/a	n/a	0.234
Z-Z, D Only	1.50	0.0	n/a	n/a	n/a	0.5851	0.5851	0.390
Z-Z, +D+L	1.50	0.0	n/a	n/a	n/a	0.9549	0.9549	0.637
Z-Z, +D+Lr	1.50	0.0	n/a	n/a	n/a	1.146	1.146	0.764
Z-Z, +D+S	1.50	0.0	n/a	n/a	n/a	0.8181	0.8181	0.545
Z-Z, +D+0.750Lr+0.750L	1.50	0.0	n/a	n/a	n/a	1.283	1.283	0.855
Z-Z, +D+0.750L+0.750S	1.50	0.0	n/a	n/a	n/a	1.037	1.037	0.691
Z-Z, +0.60D+0.750L	1.50	0.0	n/a	n/a	n/a	0.6284	0.6284	0.419
Z-Z, +0.60D	1.50	0.0	n/a	n/a	n/a	0.3510	0.3510	0.234

**One Way Shear X**

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	8.38 psi	8.38 psi	8.38 psi	40.55 psi	0.21	OK
+1.20D+0.50Lr+1.60L	19.17 psi	19.17 psi	19.17 psi	40.55 psi	0.47	OK
+1.20D+1.60L+0.50S	16.92 psi	16.92 psi	16.92 psi	40.55 psi	0.42	OK
+1.20D+1.60Lr+0.50L	22.05 psi	22.05 psi	22.05 psi	40.55 psi	0.54	OK
+1.20D+1.60Lr	19.51 psi	19.51 psi	19.51 psi	40.55 psi	0.48	OK
+1.20D+0.50L+1.60S	14.85 psi	14.85 psi	14.85 psi	40.55 psi	0.37	OK
+1.20D+1.60S	12.31 psi	12.31 psi	12.31 psi	40.55 psi	0.30	OK
+1.20D+0.50Lr+0.50L	13.58 psi	13.58 psi	13.58 psi	40.55 psi	0.33	OK
+1.20D+0.50L+0.50S	11.32 psi	11.32 psi	11.32 psi	40.55 psi	0.28	OK
+0.90D+0.50L+0.20S	8.57 psi	8.57 psi	8.57 psi	40.55 psi	0.21	OK
+0.90D	5.38 psi	5.38 psi	5.38 psi	40.55 psi	0.13	OK

**One Way Shear Z**

Load Combination...	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	8.38 psi	8.38 psi	8.38 psi	40.55 psi	0.21	OK
+1.20D+0.50Lr+1.60L	19.17 psi	19.17 psi	19.17 psi	40.55 psi	0.47	OK
+1.20D+1.60L+0.50S	16.92 psi	16.92 psi	16.92 psi	40.55 psi	0.42	OK
+1.20D+1.60Lr+0.50L	22.05 psi	22.05 psi	22.05 psi	40.55 psi	0.54	OK
+1.20D+1.60Lr	19.51 psi	19.51 psi	19.51 psi	40.55 psi	0.48	OK
+1.20D+0.50L+1.60S	14.85 psi	14.85 psi	14.85 psi	40.55 psi	0.37	OK

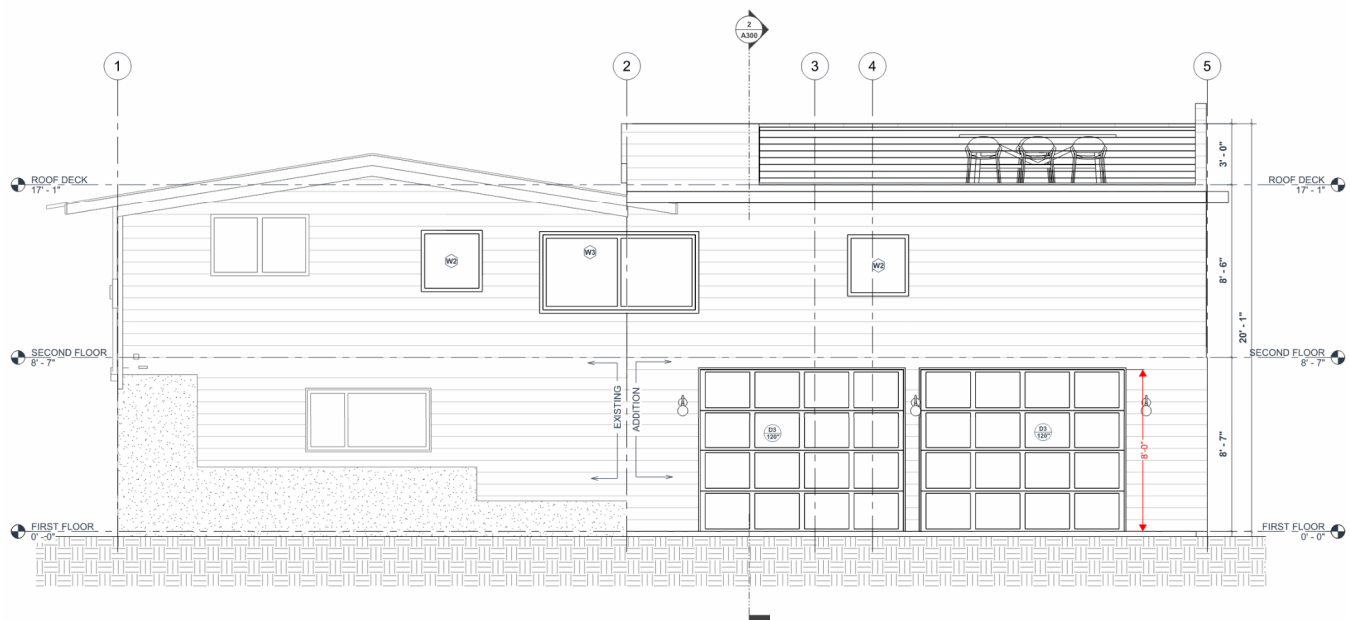
LATERAL CALCULATIONS

OF

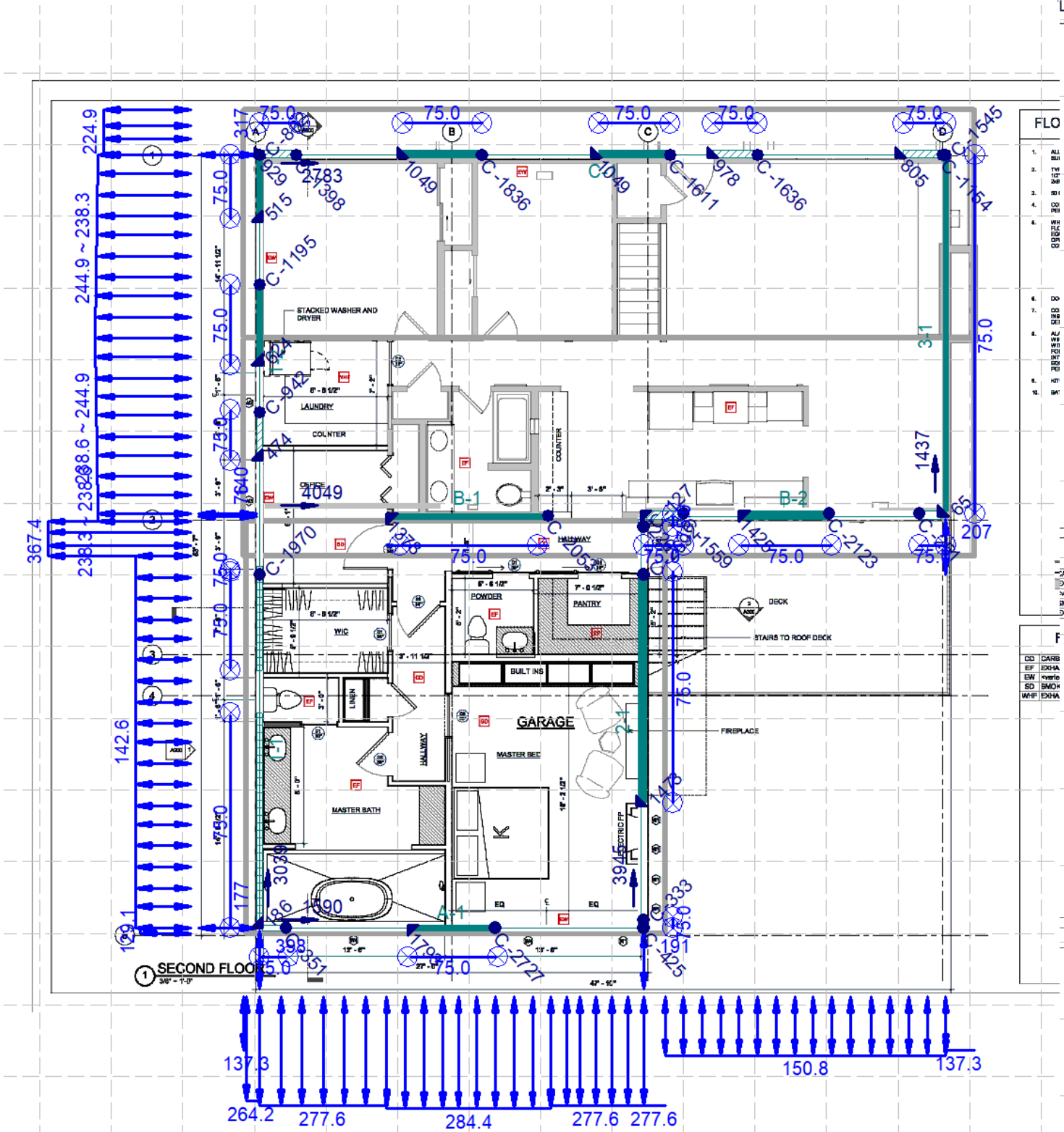
XIAO RESIDENCE

4433 86th Ave SE

Mercer Island, WA 98040



LATERAL DESIGN FOR SINGLE STOREY RESIDENTIAL HOUSE ACCOMPLISHED VIA PLYWOOD SHEATHED DIAPHRAGMS AND SHEAR WALLS. REFER BASIS OF DESIGN AND LOAD GENERATION SHEET FOR DESIGN CRITERIA AND WOOD WORKS OUTPUT FOR DESIGN.



FLO

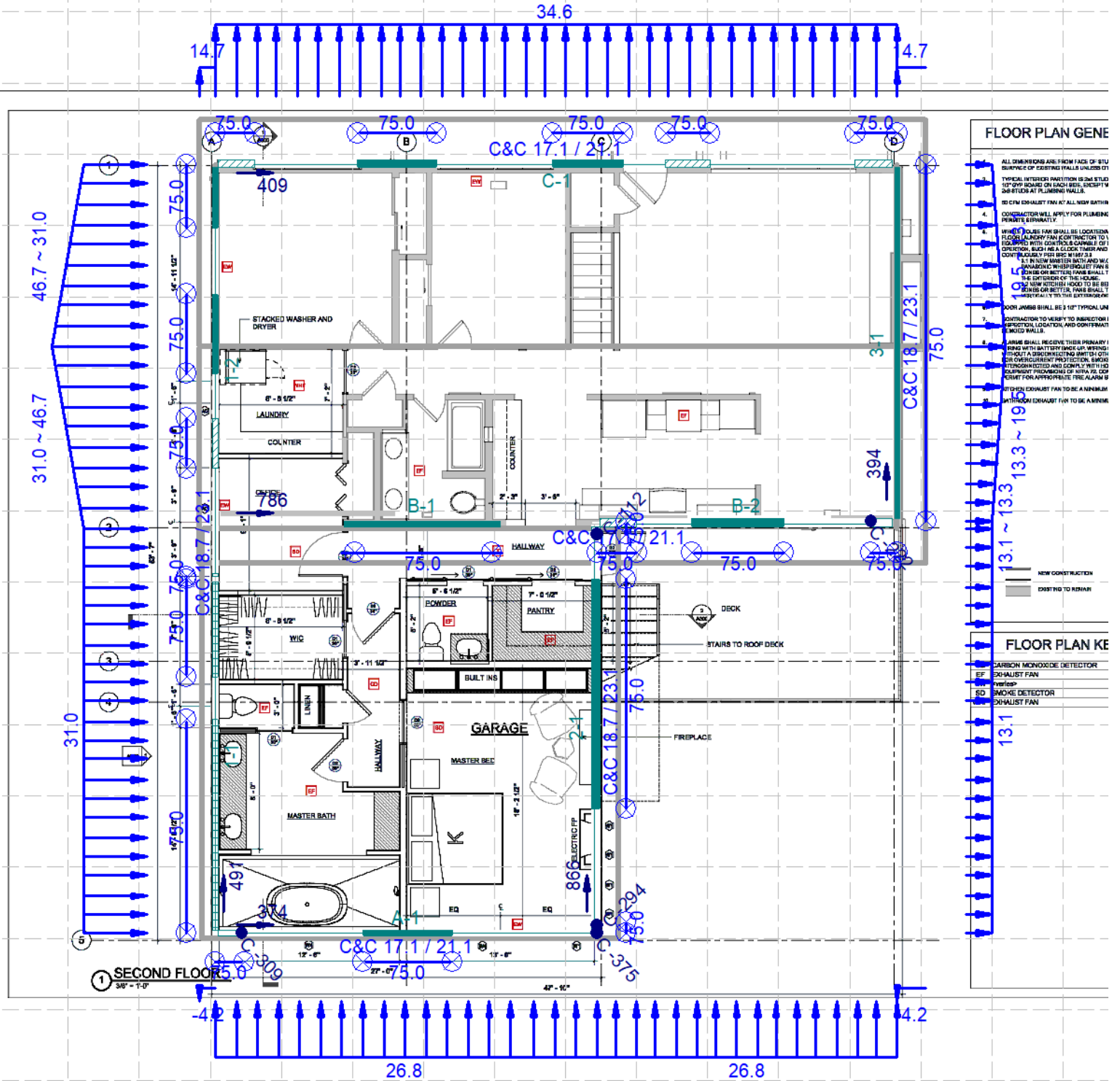
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F

- CD DOOR
- EF EXHA
- EW WINDOW
- SD SMOKE
- WF EXHA



WIND FORCES LEVEL 2



**FLOOR PLAN GENERAL NOTES**

ALL DIMENSIONS ARE FROM FACE OF STUDY SURFACE OF EXISTING WALLS UNLESS NOTED.

TYPICAL INTERIOR PARTITION IS 2x4 STUD 1/2" DRY BOARD ON EACH SIDE, EXCEPT WHERE NOTED AT PLUMBING WALLS.

IF C/FM EXHAUST FAN AT ALL NEW BATHS CONTRACTOR WILL APPLY FOR PLUMBING PERMITS SEPARATELY.

WHILE HOUSE FAN SHALL BE LOCATED EXTERIORLY, EXHAUST FAN CONTRACTOR TO EQUIP WITH CONTROLS CAPABLE OF COLLECTION, SUCH AS A CLOCK TIMER AND CONTROLS TO FEED SPEC. M/MET 2.1. 1.5" IN DIAMETER BATH AND W.C. EXHAUST VENT PERMITS SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

THE NEW KITCHEN HOOD TO BE 18" WIDE OR BETTER, FANS SHALL BE CONNECTED TO THE EXTERIOR.

DOOR JAMB SHALL BE 3/4" TYPICAL UNLESS NOTED OTHERWISE.

CONTRACTOR TO VERIFY TO ARCHITECTOR APPROVAL LOCATION, AND CONFIRMATION OF WALLS.

ALARMS SHALL RECEIVE THEIR PRIMARY POWER FROM BATTERY BACK-UP WIRING. BATTERY SHALL BE PROTECTED FROM OVERCHARGE AND OVERHEATING. BATTERY SHALL BE PROTECTED FROM SHORT CIRCUIT. EQUIPMENT PROTECTION OF 150A 75°C COP SHALL BE PROVIDED FOR THE ALARMS.

ATTENTION EXHAUST FAN TO BE A MINIMUM 18" DIAMETER EXHAUST FAN TO BE A MINIMUM 18" DIAMETER.

**FLOOR PLAN KEY**

- NEW CONSTRUCTION
- EXISTING TO REMAIN
- CARBON MONOXIDE DETECTOR
- EXHAUST FAN
- W/ESP
- SD SMOKE DETECTOR
- EXHAUST FAN



WoodWorks® Shearwalls 13.1.2

xiao residence2.wswu

Mar. 31, 2025 14:54:54

Project Information

DESIGN SETTINGS

<b>Design Code</b> IBC 2021/AWC SDPWS 2021		<b>Wind Standard</b> ASCE 7-16 Directional (All heights)		<b>Seismic Standard</b> ASCE 7-16	
<b>Load Combinations</b>			<b>Building Code Capacity Modification</b>		
<b>For Design and MWFRS Deflection</b>		<b>For Deflection (Wind:Serviceability)</b>		<b>Wind</b>	<b>Seismic</b>
0.7 Seismic + 0.6 Dead		1.0 Seismic + 0.9 Dead		1.00	1.00
0.6 Basic wind + 0.6 Dead		1.0 MRI wind + 1.0 Dead			
<b>Service Conditions and Load Duration</b>			<b>Max Shearwall Offset [ft]</b>		
<b>Duration Factor</b>	<b>Temperature Range</b>	<b>Moisture Content</b>		<b>Plan (within story)</b>	<b>Elevation (between stories)</b>
1.60	T<=100F	<b>Fabrication</b>	<b>Service</b>	10.00	0.83
		19% (<=19%)	10% (<=19%)		
<b>Maximum Height-to-width Ratio</b>					
<b>Wood panels</b>		<b>Fiberboard</b>	<b>Lumber</b>		<b>Gypsum</b>
<b>Blocked</b>	<b>Unblocked</b>		<b>Wind</b>	<b>Seismic</b>	<b>Blocked</b> <b>Unblocked</b>
3.5	2.0	-	-	-	-   -
<b>Ignore shear resistance contribution of...</b>				<b>Forces based on...</b>	
<b>Wall segments</b>		<b>Seismic</b>		<b>Hold-downs</b>	Applied loads
Side with invalid aspect ratio		Any gypsum, lumber, fiberboard		<b>Drag struts</b>	Applied loads
<b>Shearwall relative rigidity:</b> Wall capacity					
<b>Non-identical materials and construction on the shearline:</b> Not allowed					
<b>Deflection Equation:</b> 3-term from SDPWS 4.3-1					
<b>Drift limit for wind design:</b> 1 / 350 story height					
<b>FTAO strap:</b> Continuous at top of highest opening and bottom of lowest					
<b>Dead load in chord force for overturning design</b>					
<b>Tension end</b>		<b>Compression end</b>		<b>When completely counteracts overturning</b>	
Wall length / 2		Wall length / 2		Wall length / 2	

SITE INFORMATION

<b>Wind</b> ASCE 7-16 Directional (All heights)			<b>Seismic</b> ASCE 7-16 12.8 Equivalent Lateral Force Procedure		
<b>Design Wind Speed</b>	98 mph		<b>Risk Category</b>	Category II - All others	
<b>Serviceability Wind Speed</b>	83 mph		<b>Structure Type</b>	Regular	
<b>Exposure</b>	Exposure B		<b>Building System</b>	Bearing Wall	
<b>Enclosure</b>	Enclosed		<b>Design Category</b>	D	
<b>Min Wind Loads: Walls</b>	16 psf		<b>Site Class</b>	D	
<b>Roofs</b>	8 psf		<b>Spectral Response Acceleration</b>		
<b>Topographic Information [ft]</b>			<b>S1:</b> 0.496g	<b>Ss:</b> 1.428g	
<b>Shape</b>	<b>Height</b>	<b>Length</b>	<b>Fundamental Period</b>	<b>E-W</b>	<b>N-S</b>
-	-	-	<b>T Used</b>	0.169s	0.169s
<b>Site Location:</b> -			<b>Approximate Ta</b>	0.169s	0.169s
Elev: 0ft			<b>Maximum T</b>	0.237s	0.237s
Rigid building - Static analysis			<b>Response Factor R</b>	6.50	6.50
<b>Case 2</b>	<b>E-W loads</b>	<b>N-S loads</b>	<b>Fa:</b> 1.00	<b>Fv:</b> 1.80	
<b>Eccentricity (%)</b>	15	15			
<b>Loaded at</b>	75%				

**SHEATHING MATERIALS by WALL GROUP**

Grp	Surf	Material	Ratng	Sheathing				Gvtv lbs/in	Size	Fasteners					Apply Notes
				Thick in	GU in	Ply	Or			Type	RS	Eg in	Fd in	Bk	
1	Ext	Struct I OSB	32/16	15/32	-	-	Horz	83500	10d	Common	N	6	12	Y	1,7
2	Ext	Struct I OSB	32/16	15/32	-	-	Horz	83500	10d	Common	N	4	12	Y	1,2,7

**Legend:**

- Grp – Wall Design Group number, used to reference wall in other tables (created by program)
- Surf – Exterior or interior surface when applied to exterior wall
- Ratng – Span rating, see SDPWS Table C4.2.3C
- Thick – Nominal panel thickness
- GU - Gypsum underlay thickness
- Ply – Number of plies (or layers) in construction of plywood sheets
- Or – Orientation of longer dimension of sheathing panels or lumber planks. Dbl. = Double diagonal.
- Gvtv – Shear stiffness in lb/in. of depth from SDPWS Tables C4.2.3A-B
- Type – Fastener type from SDPWS Tables 4.3A-D:  
 Common: common wire nail; Box: galvanized box nail; Casing: casing nail; Roof: galvanized roofing nail; Cooler: cooler nail; WBoard: wallboard nail;  
 Screw: drywall screw; Gauge: nail measured by gauge; Galv: galvanized gauge nail; GWB: Gypsum wallboard blued nail
- Size - From Tables 4.3A-D and Table A1; shown in Wall Input fastener dropdown  
 Common nails: 6d = 0.113 x 2", 8d = 0.131 x 2.5", 10d = 0.148 x 3", 12d = 0.148 x 3.5"  
 Box or casing nails: 6d = 0.099 x 2", 8d = 0.113 x 2.5", 10d = 0.128 x 3", 12d = 0.126 x 3.5"  
 Gauge, roofing and GWB nails: 13 ga = 0.92" x 1-1/8"; 11 ga = 0.120" x 1-1/8" (GWB nail for gypsum lath & plaster), 1-1/4" (gyp. L&P), 1-1/2" (wire lath & plaster, 1/2" fiberboard, 1/2" GWB), 1-3/4" (GSB, 5/8" GWB, 25/32" fiberboard, 2-ply GWB base), 2-3/8" (2-ply GWB face)  
 Cooler or wallboard nail: 5d = .086" x 1-5/8"; 6d = .092" x 1-7/8"; 8d = .113" x 2-3/8"; 6/8d = 6d base ply, 8d face ply for 2-ply GWB.  
 Drywall screws: No. 6, 1-1/4" long.
- RS – Ring-shank nails (non-shearwalls only), with increased withdrawal capacity as per NDS 12.2.3.2.
- Eg – Panel edge fastener spacing. For lumber sheathing, no. of nails per board at shear wall boundary. For 2-ply GWB, spacing of all nails in face ply.
- Fd – Field spacing interior to panels. For lumber sheathing, no. of nails per board at interior studs. For 2-ply GWB, spacing of all nails in face ply.
- Bk – Sheathing is nailed to blocking at all panel edges; Y(es) or N(o)
- Apply Notes – Notes below table legend which apply to sheathing side

- Notes:
1. Capacity has been reduced for framing specific gravity according to SDPWS Table 4.3A Note 3. A factor of 0.93 is applied for Hem.-Fir framing and 0.92 for S.-P.-F. For other materials with specific gravity G less than 0.5, it is G + 0.5.
  2. Framing at adjoining panel edges must be 3" nominal or wider with staggered nailing according to SDPWS 4.3.7.1 (5)
  7. Capacity has been reduced by a factor of 0.92 because of the use of hold-downs on walls with 10d nailing, as per Table 4.3A Note 10.

**FRAMING MATERIALS and STANDARD WALL by WALL GROUP**

Wall Grp	Species	Grade	b in	d in	Spcg in	SG	E psi <sup>6</sup>	Fcp	Standard Wall
1	Hem-Fir	No.2	1.50	5.50	16	0.43	1.30	405	
2	Hem-Fir	No.2	1.50	5.50	16	0.43	1.30	405	

**Legend:**

- Wall Grp – Wall Design Group
- b – Stud breadth (thickness)
- d – Stud depth (width)
- Spcg – Maximum on-centre spacing of studs for design, actual spacing may be less.
- SG – Specific gravity
- E – Modulus of elasticity
- Standard Wall - Standard wall designed as group.
- Fcp - Compressive strength perpendicular to grain

- Notes:
- Check manufacture requirements for stud size, grade and specific gravity (G) for all shearwall hold-downs.
  - The following factors are applied to Fcp for compressive design and deformation under wall segment end studs :
  - Bearing area factor Cb from NDS 3.10.4, under window openings.

## Design Summary

### SHEARWALL DESIGN

**Wind Shear Loads, Flexible Diaphragm**

All shearwalls have sufficient design capacity.

**Components and Cladding Wind Loads, Out-of-plane Sheathing**

All shearwalls have sufficient design capacity.

**Components and Cladding Wind Loads, Nail Withdrawal**

All shearwalls have sufficient design capacity.

**Seismic Loads, Flexible Diaphragm**

All shearwalls have sufficient design capacity.

### HOLD-DOWN DESIGN

**Wind Loads, Flexible Diaphragm**

All hold-downs have sufficient design capacity.

**Seismic Loads, Flexible Diaphragm**

All hold-downs have sufficient design capacity.

### COMPRESSION FORCE DESIGN

**Wind Loads, Flexible Diaphragm**

Bottom plate has sufficient perpendicular-to-grain compressive capacity under all wall end studs.

**Seismic Loads, Flexible Diaphragm**

Bottom plate has sufficient perpendicular-to-grain compressive capacity under all wall end studs.

*This Design Summary does not include failures that occur due to excessive story drift from ASCE 7 CC.2.2 (wind) or 12.12 (seismic).*

*Refer to Story Drift table in this report to verify this design criterion.*

*Refer to the Deflection table for possible issues regarding fastener slippage (SDPWS Table C4.2.3D).*

Flexible Diaphragm Wind Design  
ASCE 7 Directional (All Heights) Loads

SHEAR RESULTS

N-S Shearlines	W Gp	For Dir	ASD Shear Force [plf]			Asp-Cub		Allowable Shear [plf]				Resp. Ratio	
			v	vmax/vft	V [lbs]	Int	Ext	Int	Ext	Co	C		Cmb
<b>Line 1</b>													
<b>Level 2</b>													
Ln1, Lev2	-	Both	-	-	626	-	-	-	406	-	-	15252	-
Wall 1-1	1	Both	-	-	407	-	1.0	-	406	-	-	9923	-
Seg. 1	-	Both	19.0	15.1	280	-	1.0	-	406	-	406	5995	0.05
Open. 1	-	Both	-	27.8	83	-	-	-	406	-	406	1219	0.07
Seg. 2	-	Both	19.0	15.1	127	-	1.0	-	406	-	406	2709	0.05
Wall 1-2	1	Both	-	-	219	-	1.0	-	406	-	-	5329	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	406	-	406	-	-
Seg. 2	-	Both	15.2	-	52	-	.91	-	370	-	370	1265	0.04
Seg. 3	-	Both	16.7	-	92	-	1.0	-	406	-	406	2235	0.04
Seg. 4	-	Both	16.7	-	75	-	1.0	-	406	-	406	1829	0.04
<b>Level 1</b>													
Ln1, Lev1	-	Both	-	-	1711	-	-	-	612	-	-	15439	-
Wall 1-1	2	Both	-	-	445	-	1.0	-	612	-	-	4020	-
Seg. 1	-	Both	62.1	-	228	-	.92	-	561	-	561	2056	0.11
Seg. 2	-	Both	60.7	-	218	-	.90	-	548	-	548	1964	0.11
Wall 1-2	2	Both	67.8	-	650	-	1.0	-	612	-	612	5863	0.11
Wall 1-3	2	Both	-	-	616	-	1.0	-	612	-	-	5557	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	612	-	612	-	-
Seg. 2	-	Both	67.8	-	616	-	1.0	-	612	-	612	5557	0.11
<b>Line 2</b>													
<b>Level 2</b>													
Ln2, Lev2	-	Both	-	-	1100	-	-	-	406	-	-	6469	-
Wall 2-1	1	Both	-	-	1100	-	1.0	-	406	-	-	6469	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	406	-	406	-	-
Seg. 2	-	Both	69.1	-	1100	-	1.0	-	406	-	406	6469	0.17
Seg. 3	-	Both	0.0	-	0	-	1.0	-	406	-	406	-	-
<b>Level 1</b>													
Ln2, Lev1	-	Both	-	-	3040	-	-	-	406	-	-	9923	-
Wall 2-1	1	Both	-	-	3040	-	1.0	-	406	-	-	9923	-
Seg. 1	-	Both	124.5	-	3040	-	1.0	-	406	-	406	9923	0.31
Seg. 2	-	Both	0.0	-	0	-	1.0	-	406	-	406	-	-
<b>Line 3</b>													
<b>Level 2</b>													
Ln3, Lev2	1	Both	20.5	-	506	-	1.0	-	406	-	406	10025	0.05
<b>Level 1</b>													
Ln3, Lev1	1	Both	55.6	-	1361	-	1.0	-	406	-	406	9957	0.14
E-W Shearlines	W Gp	For Dir	ASD Shear Force [plf]			Asp-Cub		Allowable Shear [plf]				Resp. Ratio	
			v	vmax/vft	V [lbs]	Int	Ext	Int	Ext	Co	C	Cmb	V [lbs]
<b>Line A</b>													
<b>Level 2</b>													
LnA, Lev2	-	Both	-	-	509	-	-	-	406	-	-	2472	-
Wall A-1	1	Both	-	-	509	-	1.0	-	406	-	-	2472	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	406	-	406	-	-
Seg. 2	-	Both	83.7	-	509	-	1.0	-	406	-	406	2472	0.21
Seg. 3	-	Both	0.0	-	0	-	1.0	-	406	-	406	-	-
<b>Level 1</b>													
LnA, Lev1	1	Both	64.2	-	1690	-	1.0	-	406	-	406	10702	0.16
<b>Line B</b>													
<b>Level 2</b>													
LnB, Lev2	-	Both	-	-	1066	-	-	-	406	-	-	8016	-
Wall B-1	1	Both	54.1	-	608	-	1.0	-	406	-	406	4572	0.13
Wall B-2	1	Both	-	-	458	-	1.0	-	406	-	-	3444	-
Seg. 1	-	Both	40.8	-	116	-	.76	-	307	-	307	870	0.13
Seg. 2	-	Both	54.1	-	342	-	1.0	-	406	-	406	2574	0.13
Seg. 3	-	Both	0.0	-	0	-	1.0	-	406	-	406	-	-
<b>Level 1</b>													
LnB, Lev1	-	Both	-	-	3250	-	-	-	406	-	-	9483	-
Wall B-1	1	Both	139.3	-	1753	-	1.0	-	406	-	406	5114	0.34
Wall B-2	1	Both	-	-	1497	-	1.0	-	406	-	-	4369	-
Seg. 1	-	Both	139.3	-	870	-	1.0	-	406	-	406	2540	0.34
Seg. 2	-	Both	139.3	-	627	-	1.0	-	406	-	406	1829	0.34
<b>Line C</b>													
<b>Level 2</b>													
LnC, Lev2	-	Both	-	-	553	-	-	-	406	-	-	7005	-

**SHEAR RESULTS (flexible wind design, continued)**

Wall C-1	1	Both	-	-	553	-	1.0	-	406	-	-	7005	-
Seg. 1	-	Both	23.5	-	65	-	.73	-	298	-	298	820	0.08
Seg. 2	-	Both	32.1	-	174	-	1.0	-	406	-	406	2201	0.08
Seg. 3	-	Both	32.1	-	160	-	1.0	-	406	-	406	2032	0.08
Seg. 4	-	Both	26.4	-	81	-	.82	-	334	-	334	1030	0.08
Seg. 5	-	Both	25.0	-	73	-	.78	-	316	-	316	922	0.08
<b>Level 1</b>													
LnC, Lev1	1	Both	33.0	-	1556	-	1.0	-	406	-	406	19135	0.08

**Legend:**

*W Gp* - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall. "A" means that this wall is critical for all walls in the Standard Wall group.

*For Dir* - Direction of wind force along shearline.

*v* - Design shear force on segment = ASD-factored shear force per unit length of full-height sheathing (FHS)

*vmax/vft* - Perforated walls: Collector and in-plane anchorage force as per SDPWS eqn. 4.3-9 =  $V/FHS/Co$ . FHS is factored for narrow segments as per 4.3.3.4

*FTAO walls*: Shear force in piers above and below either openings or piers beside opening(s). Aspect ratio factor does not apply to these piers.

*V* - ASD factored shear force. For shearline: total shearline force. For wall: total of all segments on wall. For segment: force on segment

*Asp/Cub* - Unblocked wood structural panel factor *Cub* from SDPWS 4.3.5.3 or Aspect Ratio factor from 4.3.5.5.1, which for perforated walls is sum  $b_i / FHS$  from 4.3.5.6 with  $b_i$  defined in 4.3.3.4. For multi-segment walls, wall row shows *Cub* and segment rows show *Asp*. For single-segment walls and perforated walls, value shown is *Asp* for blocked walls and *Cub* for unblocked walls.

*Int, Ext* - Nominal unit shear capacity of interior and exterior sheathing, factored by Table 4.3-1 Note 3 for framing specific gravity and Note 10 for presence of hold-downs. For wall segments, also include unblocked factor *Cub* and aspect ratio adjustments.

*Co* - Adjustment factor for perforated walls from SDPWS Equation 4.3-6.

*C* - Sheathing combination rule, A = Add capacities, S = Strongest side or twice weakest, G = Stiffness-based using Eqns. 4.3-3,-4.

*Cmb* - Combined interior and exterior unit shear capacity including perforated wall factor *Co*.

*V* - Total factored shear capacity of shearline, wall or segment.

*Crit Resp* - Response ratio =  $v/Cmb$  = design shear force/unit shear capacity. "S" indicates that the seismic design criterion was critical in selecting wall.

**Notes:**

Refer to Elevation View diagrams for individual level for uplift anchorage force *t* for perforated walls given by SDPWS 4.3.6.4.2.1.

Hold-Down and Compression Design (flexible wind design)

Level	Line-Wall	Posit'n	Location [ft]		Load Case	Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
			X	Y		Shear	Dead	Uplift	Cmb'd			
<b>Level 1</b>												
<b>Line 1</b>												
	1-1	L End	0.33	0.46	Min	660	278		382	HDU2-SDS	2215	0.17
	1-1	L End	0.33	0.46	Min	660	161		821	Compression	6682	0.12
	1-1	L Op 1	0.33	3.88	Min	535	1629		2164	Compression	6682	0.32
	1-1	R Op 1	0.33	25.04	Min	398	1956		2353	Compression	6682	0.35
	1-1	R End	0.33	28.38	Min	522	86		436	HDU2-SDS	2215	0.20
	1-1	R End	0.33	28.38	Min	522			522	Compression	6682	0.08
	1-2	L End	0.33	28.63	Min	557	294		263	HDU2-SDS	2215	0.12
	1-2	L End	0.33	28.63	Min	557	302		858	Compression	6682	0.13
		V Elem	0.33	32.54	Min	137	394		531	Compression		
		V Elem	0.33	35.71	Min	137	137		0	Refer to upper level		
		V Elem	0.33	35.71	Min	137	116		253	Compression		
	1-2	R End	0.33	37.96	Min	420	420		0	Not required	2215	0.00
	1-2	R End	0.33	37.96	Min	420	1053		1473	Compression	6682	0.22
		V Elem	0.33	44.29	Min	159	159		0	Refer to upper level		
		V Elem	0.33	44.29	Min	159	316		475	Compression		
		V Elem	0.33	48.96	Min	138	138		0	Refer to upper level		
		V Elem	0.33	48.96	Min	138	334		473	Compression		
	1-3	R End	0.33	53.21	Min	696	319		377	HDU2-SDS	2215	0.17
	1-3	R End	0.33	53.21	Min	696	585		1280	Compression	6682	0.19
<b>Line 2</b>												
	2-1	L End	26.67	0.46	Min	1006	621		386	HDU5-SDS	4340	0.09
	2-1	L End	26.67	0.46	Min	1006	1026		2032	Compression	6682	0.30
		V Elem	26.67	0.88	1	0	294		294	Compression		
		V Elem	26.67	8.96	Min	527	527		0	Refer to upper level		
		V Elem	26.67	8.96	Min	527	891		1417	Compression		
	2-1	L Op 1	26.67	24.63	Min	1533	1125		408	HDU5-SDS	4340	0.09
	2-1	L Op 1	26.67	24.63	Min	1533	1880		3413	Compression	7518	0.45
		V Elem	26.67	28.79	1	0	306		305	Compression		
<b>Line 3</b>												
		V Elem	47.42	28.79	Min	175	175		0	Refer to upper level		
		V Elem	47.42	28.79	Min	175	292		467	Compression		
	3-1	L End	47.42	28.96	Min	449	449		0	Not required	2215	0.00
	3-1	L End	47.42	28.96	Min	449	748		1197	Compression	6682	0.18
	3-1	R End	47.42	53.21	Min	624	624		0	Not required	2215	0.00
	3-1	R End	47.42	53.21	Min	624	1040		1664	Compression	6682	0.25
<b>Line A</b>												
	A-1	L End	0.46	0.33	Min	518	518		0	Not required	2215	0.00
	A-1	L End	0.46	0.33	Min	518	977		1495	Compression	6682	0.22
		V Elem	2.21	0.33	1	0	309		309	Compression		
		V Elem	10.71	0.33	Min	655	323		333	Refer to upper level		
		V Elem	10.71	0.33	Min	655	538		1192	Compression		
		V Elem	16.54	0.33	Min	655	362		293	Refer to upper level		
		V Elem	16.54	0.33	Min	655	603		1258	Compression		
	A-1	R End	26.54	0.33	Min	518	518		0	Not required	2215	0.00
	A-1	R End	26.54	0.33	Min	518	764		1282	Compression	6682	0.19
		V Elem	26.79	0.33	1	0	375		375	Compression		
<b>Line B</b>												
	B-1	L End	0.54	29.25	Min	1137	302		835	HDU2-SDS	2215	0.38
	B-1	L End	0.54	29.25	Min	1137	503		1640	Compression	6682	0.25
		V Elem	9.21	29.25	Min	415	253		161	Refer to upper level		
		V Elem	9.21	29.25	Min	415	422		836	Compression		
	B-1	R End	12.88	29.25	Min	1137	302		835	HDU2-SDS	2215	0.38
	B-1	R End	12.88	29.25	Min	1137	503		1640	Compression	6682	0.25
		V Elem	20.21	28.58	Min	415	253		161	Refer to upper level		
		V Elem	20.21	28.58	Min	415	422		836	Compression		
	B-2	L End	26.79	28.83	Min	1497	214		1283	HDU5-SDS	4340	0.30
	B-2	L End	26.79	28.83	Min	1497	356		1853	Compression	6682	0.28
		V Elem	29.38	28.83	Min	336	150		186	Refer to upper level		
		V Elem	29.38	28.83	Min	336	250		586	Compression		
	B-2	L Op 1	32.79	28.83	Min	1161	390		771	HDU5-SDS	4340	0.18
	B-2	L Op 1	32.79	28.83	Min	1161	650		1811	Compression	7518	0.24
		V Elem	33.46	28.83	Min	422	229		193	Refer to upper level		
		V Elem	33.46	28.83	Min	422	381		803	Compression		
		V Elem	39.54	28.83	Min	422	276		146	Refer to upper level		
		V Elem	39.54	28.83	Min	422	459		881	Compression		
	B-2	R Op 1	43.04	28.83	Min	1180	348		832	HDU5-SDS	4340	0.19
	B-2	R Op 1	43.04	28.83	Min	1180	580		1760	Compression	7518	0.23
		V Elem	45.71	28.83	1	0	222		222	Compression		
	B-2	R End	47.29	28.83	Min	1180	108		1072	HDU5-SDS	4340	0.25
	B-2	R End	47.29	28.83	Min	1180	180		1360	Compression	6682	0.20
<b>Line C</b>												

Hold-Down and Compression Design (flexible wind design, continued)

Level	Line-Wall	Posit'n	Location [ft]		Load Case	Tensile Hold-down or Compressive Stud Force [lbs]				Cap [lbs]	Crit Resp.
			X	Y		Shear	Dead	Uplift	Cmb'd		
C-1	L End		0.46	53.33	Min	460	460	0		2215	0.00
C-1	L End		0.46	53.33	Min	460	754	1214		6682	0.18
	V Elem		2.96	53.33	Min	194	194	0			
	V Elem		2.96	53.33	Min	194	372	566			
	V Elem		10.38	53.33	Min	252	252	0			
	V Elem		10.38	53.33	Min	252	392	645			
	V Elem		15.54	53.33	Min	252	252	-0			
	V Elem		15.54	53.33	Min	252	449	701			
	V Elem		23.71	53.33	Min	253	253	0			
	V Elem		23.71	53.33	Min	253	484	738			
	V Elem		28.46	53.33	Min	253	178	75			
	V Elem		28.46	53.33	Min	253	235	488			
	V Elem		31.63	53.33	Min	215	135	80			
	V Elem		31.63	53.33	Min	215	109	325			
	V Elem		34.46	53.33	Min	215	487	703			
	V Elem		44.63	53.33	Min	205	481	686			
C-1	R End		47.29	53.33	Min	471	471	0		2215	0.00
C-1	R End		47.29	53.33	Min	471	719	1189		6682	0.18
<b>Level 2</b>						<b>Tensile Hold-down or Compressive Stud Force [lbs]</b>				<b>Cap</b>	<b>Crit</b>
	<b>Line-Wall</b>	<b>Posit'n</b>	<b>Location [ft]</b>		<b>Load Case</b>	<b>Shear</b>	<b>Dead</b>	<b>Uplift</b>	<b>Cmb'd</b>	<b>Hold-down</b>	<b>Resp.</b>
	<b>Line 1</b>										
	1-1	L End	0.33	0.46	Min	126	126	0		2215	0.00
	1-1	L End	0.33	0.46	Min	126	161	287		6682	0.04
	1-1	R End	0.33	24.63	Min	126	126	0		2215	0.00
	1-1	R End	0.33	24.63	Min	126	275	402		7518	0.05
	1-2	R Op 1	0.33	32.54	Min	137	394	531		7518	0.07
	1-2	L Op 2	0.33	35.71	Min	137	137	0		2215	0.00
	1-2	L Op 2	0.33	35.71	Min	137	116	253		7518	0.03
	1-2	R Op 2	0.33	39.04	Min	159	159	0		2215	0.00
	1-2	R Op 2	0.33	39.04	Min	159	216	375		7518	0.05
	1-2	L Op 3	0.33	44.29	Min	159	159	0		2215	0.00
	1-2	L Op 3	0.33	44.29	Min	159	316	475		7518	0.06
	1-2	R Op 3	0.33	48.96	Min	138	138	0		2215	0.00
	1-2	R Op 3	0.33	48.96	Min	138	334	473		7518	0.06
	1-2	R End	0.33	53.21	Min	138	101	37		2215	0.02
	1-2	R End	0.33	53.21	Min	138	65	203		6682	0.03
	<b>Line 2</b>										
		V Elem	26.67	0.88	1	0	294	294			
	2-1	R Op 1	26.67	8.96	Min	527	527	0		4340	0.00
	2-1	R Op 1	26.67	8.96	Min	527	891	1417		7518	0.19
	2-1	L Op 2	26.67	24.63	Min	527	426	101		4340	0.02
	2-1	L Op 2	26.67	24.63	Min	527	696	1223		7518	0.16
		V Elem	26.67	27.88	1	0	113	112			
	<b>Line 3</b>										
	3-1	L End	47.42	28.79	Min	175	175	0		2215	0.00
	3-1	L End	47.42	28.79	Min	175	292	467		6682	0.07
	3-1	R End	47.42	53.21	Min	175	175	0		2215	0.00
	3-1	R End	47.42	53.21	Min	175	292	467		6682	0.07
	<b>Line A</b>										
		V Elem	2.21	0.33	1	0	309	309			
	A-1	R Op 1	10.71	0.33	Min	655	323	333		2215	0.15
	A-1	R Op 1	10.71	0.33	Min	655	538	1192		7518	0.16
	A-1	L Op 2	16.54	0.33	Min	655	362	293		2215	0.13
	A-1	L Op 2	16.54	0.33	Min	655	603	1258		7518	0.17
		V Elem	26.79	0.33	1	0	375	375			
	<b>Line B</b>										
	B-1	L End	9.21	28.58	Min	415	253	161		2215	0.07
	B-1	L End	9.21	28.58	Min	415	422	836		6682	0.13
	B-1	R End	20.21	28.58	Min	415	253	161		2215	0.07
	B-1	R End	20.21	28.58	Min	415	422	836		6682	0.13
	B-2	L End	26.79	28.67	Min	336	64	272		4340	0.06
	B-2	L End	26.79	28.67	Min	336	106	442		6682	0.07
	B-2	L Op 1	29.38	28.67	Min	336	150	186		4340	0.04
	B-2	L Op 1	29.38	28.67	Min	336	250	586		7518	0.08
	B-2	R Op 1	33.46	28.67	Min	422	229	193		4340	0.04
	B-2	R Op 1	33.46	28.67	Min	422	381	803		7518	0.11
	B-2	L Op 2	39.54	28.67	Min	422	276	146		4340	0.03
	B-2	L Op 2	39.54	28.67	Min	422	459	881		7518	0.12
		V Elem	45.71	28.67	1	0	222	222			
	<b>Line C</b>										
	C-1	L End	0.46	53.33	Min	194	62	132		2215	0.06
	C-1	L End	0.46	53.33	Min	194	55	249		6682	0.04
	C-1	L Op 1	2.96	53.33	Min	194	194	0		2215	0.00
	C-1	L Op 1	2.96	53.33	Min	194	372	566		7518	0.08

Hold-Down and Compression Design (flexible wind design, continued)

C-1	R Op 1	10.38	53.33	Min	252	252	0	Not required	2215	0.00
C-1	R Op 1	10.38	53.33	Min	252	392	645	Compression	7518	0.09
C-1	L Op 2	15.54	53.33	Min	252	252	0	Not required	2215	0.00
C-1	L Op 2	15.54	53.33	Min	252	449	701	Compression	7518	0.09
C-1	R Op 2	23.71	53.33	Min	253	253	0	Not required	2215	0.00
C-1	R Op 2	23.71	53.33	Min	253	484	738	Compression	7518	0.10
C-1	L Op 3	28.46	53.33	Min	253	178	75	HDU2-SDS	2215	0.03
C-1	L Op 3	28.46	53.33	Min	253	235	488	Compression	7518	0.06
C-1	R Op 3	31.63	53.33	Min	215	135	80	HDU2-SDS	2215	0.04
C-1	R Op 3	31.63	53.33	Min	215	109	325	Compression	7518	0.04
C-1	L Op 4	34.46	53.33	Min	215	487	703	Compression	7518	0.09
C-1	R Op 4	44.63	53.33	Min	205	481	686	Compression	7518	0.09
C-1	R End	47.29	53.33	Min	205	66	139	HDU2-SDS	2215	0.06
C-1	R End	47.29	53.33	Min	205		205	Compression	6682	0.03

Legend:

Line-Wall:

At wall or opening – Shearline and wall number

At vertical element – Shearline

Posit'n – Position of stud pack that hold-down is attached to or which is applying compression force:

V Elem – Vertical element: column or strengthened studs required where not at wall end or opening

L or R End – At left or right wall end

L or R Op n – At left or right side of opening n

t @ Op n – Uplift force t at opening n from offset opening in perforated wall above, from SDPWS 4.3.6.4.2.1

Location – Co-ordinates in Plan View

Load Case – Results are for critical load case:

ASCE 7 All Heights: Case 1 or 2 from Fig. 27.3-8

ASCE 7 Low-rise: Windward corner(s) and Case A or B from Fig. 28.3-1

ASCE 7 Minimum loads (27.1.5 / 28.3.4): "Min"

Tensile Hold-down or Compressive Stud Force – Upwards force on hold-down at one end of the wall or downward force on bottom plate under studs at the other end, for each force direction. Includes forces transferred from upper levels.

Shear – Overturning component =  $V \times h / beff$  from SDPWS Eqn. 4.3-7; V = force on segment, ASD-factored by 0.60; h = wall height, beff = wall segment length – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width). For perforated walls =  $V \times h / Co$  sum (bi) from SDPWS Eqn. 4.3-8.

Dead – Dead load resisting component, factored for ASD by 0.60 for tension and 1.0 for compression

Uplift – Uplift wind load component, factored for ASD by 0.60

Cmb'd – Sum of ASD-factored overturning, dead and uplift forces. May also include the uplift force t from perforated walls from SDPWS 4.3.6.4.2.1 when openings are staggered.

Hold-down – Device model number from hold-down database; "Compression" for bearing of end stud pack on bottom plate

Cap – Hold-downs: Allowable ASD tension load from database; Compression: allowable ASD bearing force =  $Ct CM Cb Fcp A$ ; A = cross sectional area of end studs. Refer to Framing materials table for details

Crit. Resp. – Critical Response = Combined ASD force / Allowable ASD tension load

Notes:

HDU2-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 6 1/4" x 2.5" SDS heavy-duty screws; 5/8" anchor bolt.

HDU5-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 14 1/4" x 2.5" SDS heavy-duty screws; 5/8" anchor bolt.

Refer to the Shear Line Dimensions table for wall height h, effective segment length beff and perforated wall adjusted sum of bi, to the Story Table for joist depth, and to the Shear Results table for perforated factor Co.

Most severe of wind load cases is used for overturning calculation.

Designer is responsible for design of connection from wall to floor or foundation for shear force shown in Shear Results table. Refer to SDPWS 4.3.6.4.3 for foundation anchor bolt requirements.

COLLECTOR FORCES (flexible wind design)

Level 1				Drag Strut Force [lbs]		Strap/Blocking Force [lbs]		
Line-Wall	Position on Wall or Opening	Location [ft]		Load Case	--->	<---	--->	<---
		X	Y					
<b>Line 1</b>								
1-1	Left Opening 1	0.33	4.00		109	-109		
1-1	Right Opening 1	0.33	24.92		-566	566		
1-2	Right Wall End	0.33	38.08		-123	123		
1-3	Right Opening 1	0.33	44.25		-323	323		
<b>Line 2</b>								
2-1	Left Opening 1	26.67	24.75		1639	-1639		
<b>Line B</b>								
B-1	Left Wall End	0.42	29.25		-6	6		
B-1	Right Wall End	13.00	29.25		878	-878		
B-2	Left Wall End	26.67	28.83		-65	65		
B-2	Left Opening 1	32.92	28.83		374	-374		
B-2	Right Opening 1	42.92	28.83		-316	316		
Level 2				Drag Strut Force [lbs]		Strap/Blocking Force [lbs]		
Line-Wall	Position on Wall or Opening	Location [ft]		Load Case	--->	<---	--->	<---
		X	Y					
<b>Line 1</b>								
1-1	Left Opening 1	0.33	15.08		49	-49		
1-1	Right Opening 1	0.33	18.08		97	-97		
1-1	Right Wall End	0.33	24.75		119	-119		
1-2	Right Opening 1	0.33	32.42		28	-28		
1-2	Left Opening 2	0.33	35.83		40	-40		
1-2	Right Opening 2	0.33	38.92		3	-3		
1-2	Left Opening 3	0.33	44.42		30	-30		
1-2	Right Opening 3	0.33	48.83		-22	22		
1-1	Left Opening 1	0.33	15.08				57	57
1-1	Right Opening 1	0.33	18.08				26	26
<b>Line 2</b>								
2-1	Right Opening 1	26.67	8.83		-176	176		
2-1	Left Opening 2	26.67	24.75		593	-593		
<b>Line A</b>								
A-1	Right Opening 1	10.58	0.33		-198	198		
A-1	Left Opening 2	16.67	0.33		193	-193		
<b>Line B</b>								
B-1	Left Wall End	9.08	28.58		-198	198		
B-1	Right Wall End	20.33	28.58		155	-155		
B-2	Left Wall End	26.67	28.67		12	-12		
B-2	Left Opening 1	29.50	28.67		63	-63		
B-2	Right Opening 1	33.33	28.67		-23	23		
B-2	Left Opening 2	39.67	28.67		175	-175		
<b>Line C</b>								
C-1	Left Opening 1	3.08	53.33		32	-32		
C-1	Right Opening 1	10.25	53.33		-52	52		
C-1	Left Opening 2	15.67	53.33		58	-58		
C-1	Right Opening 2	23.58	53.33		-35	35		
C-1	Left Opening 3	28.58	53.33		67	-67		
C-1	Right Opening 3	31.50	53.33		33	-33		
C-1	Left Opening 4	34.58	53.33		78	-78		
C-1	Right Opening 4	44.50	53.33		-39	39		

Legend:

Line-Wall - Shearline and wall number

Position... - Side of opening or wall end that drag strut is attached to

Location - Co-ordinates in Plan View

Load Case - Results are for critical load case:

ASCE 7 All heights Case 1 or 2

ASCE 7 Low-rise corner; Case A or B

Drag strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression.

Based on ASD-factored shearline force (vmax from 4.3.6.4.1.1 for perforated walls)

Strap/Blocking Force - For FTAO walls, force transferred from above and below opening to shearwall pier.

-> Due to shearline force in the west-to-east or south-to-north direction

<- Due to shearline force in the east-to-west or north-to-south direction

Out-of-plane Wind Design

COMPONENTS AND CLADDING by SHEARLINE

North-South Shearlines			Sheathing [psf]			Fastener Withdrawal [lbs]					Service Cond Factors	
Line	Lev	Grp	Force	Cap	Force/Cap	Force End	Force Int	Cap	Force/Cap End	Force/Cap Int	Temp	Moist
1	1	2	13.9	265.6	0.05	18.5	15.0	100.3	0.18	0.15	1.00	1.00
	2	1	13.9	265.6	0.05	18.5	15.0	100.3	0.18	0.15	1.00	1.00
2	1	1	13.9	265.6	0.05	18.5	15.0	100.3	0.18	0.15	1.00	1.00
	2	1	13.9	265.6	0.05	18.5	15.0	100.3	0.18	0.15	1.00	1.00
3	1	1	13.9	265.6	0.05	18.5	15.0	100.3	0.18	0.15	1.00	1.00
	2	1	13.9	265.6	0.05	18.5	15.0	100.3	0.18	0.15	1.00	1.00

East-West Shearlines			Sheathing [psf]			Fastener Withdrawal [lbs]					Service Cond Factors	
Line	Lev	Grp	Force	Cap	Force/Cap	Force End	Force Int	Cap	Force/Cap End	Force/Cap Int	Temp	Moist
A	1	1	12.6	265.6	0.05	16.9	13.7	100.3	0.17	0.14	1.00	1.00
	2	1	12.6	265.6	0.05	16.9	13.7	100.3	0.17	0.14	1.00	1.00
B	1	1	12.6	265.6	0.05	16.9	13.7	100.3	0.17	0.14	1.00	1.00
	2	1	12.6	265.6	0.05	16.9	13.7	100.3	0.17	0.14	1.00	1.00
C	1	1	12.6	265.6	0.05	16.9	13.7	100.3	0.17	0.14	1.00	1.00
	2	1	12.6	265.6	0.05	16.9	13.7	100.3	0.17	0.14	1.00	1.00

Legend:

Grp - Wall Design Group ( results for all design groups for rigid, flexible design listed for each wall )

Sheathing:

Force - C&C end zone exterior pressures using negative (suction) coefficient in ASCE 7 Figure 30.3-1 added to interior pressure using coefficients from Table 26.13-1

Cap - Out-of-plane capacity of exterior sheathing from SDPWS Tables 3.2.1A/B, divided by 1.6 for short-term ASD loads as per 3.2.1. Assumes continuous over 2 spans (table note 3).

Fastener Withdrawal:

Force - Force tributary to each nail in end zone and interior zone

Cap - Factored withdrawal capacity of individual nail according to NDS 12.2-3

## Flexible Diaphragm Seismic Design

## SEISMIC INFORMATION

Level	Mass [lbs]	Area [sq.ft]	Story Shear Fx [lbs]		Shear Resistance [lbs]		Diaphragm Force [lbs]			
			E-W	N-S	E-W	N-S	E-W		N-S	
							Fpx	Design	Fpx	Design
2	66986	0.0	0	0	12495	22676	8928	8928	8928	8928
1	44999	0.0	0	0	28086	25228	5997	5997	5997	5997
All	111984	-	11481	11481	-	-	-	-	-	-

## Legend:

Mass – Sum of all generated and input building masses on level =  $w_x$  in ASCE 7 Eqn. 12.8-12.

Story Shear – Total ASD-factored shear force induced at level  $x$  from Eqn. 12.8-11.

Shear Resistance – Lateral design strength of all shear-resisting elements on story, for use in weak story evaluation (4.1.8).

Diaphragm Force – used by Shearwalls only for drag strut forces, as per Exception to 12.10.2.1.

Fpx - Minimum ASD-factored force for diaphragm design from Eqns. 12.10-1, -2, and -3.

Design = The greater of the story shear and Fpx + transfer forces from discontinuous shearlines, factored by overstrength ( $\omega$ ) as per 12.10.1.1.

Omega = 2.5 as per 12.2-1.

Redundancy Factor  $\rho$  (rho):

E-W 1.00, N-S 1.00

Input by user (overriding calculated value).

Vertical Earthquake Load  $E_v$ 

$E_v = 0.2 S_d s D$ ;  $S_d s = 0.95$ ;  $E_v = 0.190 D$  unfactored; 0.133 D factored; total dead load factor:  $0.6 - 0.133 = 0.467$  tension,  $1.0 + 0.133 = 1.133$  compression.

## Weak Story (SDPWS 4.1.8)

The lateral resistance of each story is greater than or equal to that of the story above. This vertical distribution of SFRS is permitted.

SHEAR RESULTS (flexible seismic design)

N-S Shearlines	W Gp	For Dir	ASD Shear Force [plf]			Asp-Cub			Allowable Shear [plf]				Resp. Ratio	
			v	vmax/vft	V [lbs]	Int	Ext	Int	Ext	Co	C	Cmb		V [lbs]
<b>Line 1</b>														
<b>Level 2</b>														
Ln1, Lev2	-	Both	-	-	3039	-	-	-	290	-	-	-	10895	-
Wall 1-1	1	Both	-	-	1977	-	1.0	-	290	-	-	-	7088	-
Seg. 1	-	Both	92.3	73.4	1362	-	1.0	-	290	-	-	290	4282	0.32
Open. 1	-	Both	-	135.0	405	-	-	-	290	-	-	290	871	0.46
Seg. 2	-	Both	92.3	73.4	616	-	1.0	-	290	-	-	290	1935	0.32
Wall 1-2	1	Both	-	-	1062	-	1.0	-	290	-	-	-	3807	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	290	-	-	290	-	-
Seg. 2	-	Both	73.8	-	252	-	.91	-	264	-	-	264	904	0.28
Seg. 3	-	Both	81.0	-	445	-	1.0	-	290	-	-	290	1597	0.28
Seg. 4	-	Both	81.0	-	364	-	1.0	-	290	-	-	290	1306	0.28
<b>Level 1</b>														
Ln1, Lev1	-	Both	-	-	4208	-	-	-	437	-	-	-	11028	-
Wall 1-1	2^	Both	-	-	1096	-	1.0	-	437	-	-	-	2871	-
Seg. 1	-	Both	152.8	-	560	-	.92	-	401	-	-	401	1469	0.38
Seg. 2	-	Both	149.4	-	535	-	.90	-	391	-	-	391	1403	0.38
Wall 1-2	2^	Both	166.7	-	1598	-	1.0	-	437	-	-	437	4188	0.38
Wall 1-3	2^	Both	-	-	1514	-	1.0	-	437	-	-	-	3969	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	437	-	-	437	-	-
Seg. 2	-	Both	166.7	-	1514	-	1.0	-	437	-	-	437	3969	0.38
<b>Line 2</b>														
<b>Level 2</b>														
Ln2, Lev2	-	Both	-	-	3945	-	-	-	290	-	-	-	4620	-
Wall 2-1	1	Both	-	-	3945	-	1.0	-	290	-	-	-	4620	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	290	-	-	290	-	-
Seg. 2	-	Both	247.8	-	3945	-	1.0	-	290	-	-	290	4620	0.85
Seg. 3	-	Both	0.0	-	0	-	1.0	-	290	-	-	290	-	-
<b>Level 1</b>														
Ln2, Lev1	-	Both	-	-	5338	-	-	-	290	-	-	-	7088	-
Wall 2-1	1	Both	-	-	5338	-	1.0	-	290	-	-	-	7088	-
Seg. 1	-	Both	218.6	-	5338	-	1.0	-	290	-	-	290	7088	0.75
Seg. 2	-	Both	0.0	-	0	-	1.0	-	290	-	-	290	-	-
<b>Line 3</b>														
<b>Level 2</b>														
Ln3, Lev2	1	Both	58.3	-	1437	-	1.0	-	290	-	-	290	7161	0.20
<b>Level 1</b>														
Ln3, Lev1	1	Both	79.0	-	1935	-	1.0	-	290	-	-	290	7112	0.27
E-W Shearlines	W Gp	For Dir	ASD Shear Force [plf]			Asp-Cub			Allowable Shear [plf]				Resp. Ratio	
			v	vmax/vft	V [lbs]	Int	Ext	Int	Ext	Co	C	Cmb	V [lbs]	
<b>Line A</b>														
<b>Level 2</b>														
LnA, Lev2	-	Both	-	-	1590	-	-	-	290	-	-	-	1766	-
Wall A-1	1^	Both	-	-	1590	-	1.0	-	290	-	-	-	1766	-
Seg. 1	-	Both	0.0	-	0	-	1.0	-	290	-	-	290	-	-
Seg. 2	-	Both	261.3	-	1590	-	1.0	-	290	-	-	290	1766	0.90
Seg. 3	-	Both	0.0	-	0	-	1.0	-	290	-	-	290	-	-
<b>Level 1</b>														
LnA, Lev1	1	Both	86.0	-	2265	-	1.0	-	290	-	-	290	7644	0.30
<b>Line B</b>														
<b>Level 2</b>														
LnB, Lev2	-	Both	-	-	4049	-	-	-	290	-	-	-	5726	-
Wall B-1	1	Both	205.3	-	2309	-	1.0	-	290	-	-	290	3266	0.71
Wall B-2	1	Both	-	-	1740	-	1.0	-	290	-	-	-	2460	-
Seg. 1	-	Both	155.1	-	439	-	.76	-	219	-	-	219	621	0.71
Seg. 2	-	Both	205.3	-	1300	-	1.0	-	290	-	-	290	1839	0.71
Seg. 3	-	Both	0.0	-	0	-	1.0	-	290	-	-	290	-	-
<b>Level 1</b>														
LnB, Lev1	-	Both	-	-	5471	-	-	-	290	-	-	-	6774	-
Wall B-1	1	Both	234.5	-	2951	-	1.0	-	290	-	-	290	3653	0.81
Wall B-2	1	Both	-	-	2521	-	1.0	-	290	-	-	-	3121	-
Seg. 1	-	Both	234.5	-	1466	-	1.0	-	290	-	-	290	1814	0.81
Seg. 2	-	Both	234.5	-	1055	-	1.0	-	290	-	-	290	1306	0.81
<b>Line C</b>														
<b>Level 2</b>														
LnC, Lev2	-	Both	-	-	2783	-	-	-	290	-	-	-	5004	-
Wall C-1	1	Both	-	-	2783	-	1.0	-	290	-	-	-	5004	-
Seg. 1	-	Both	118.4	-	326	-	.73	-	213	-	-	213	585	0.56
Seg. 2	-	Both	161.5	-	875	-	1.0	-	290	-	-	290	1572	0.56
Seg. 3	-	Both	161.5	-	807	-	1.0	-	290	-	-	290	1451	0.56
Seg. 4	-	Both	132.7	-	409	-	.82	-	239	-	-	239	736	0.56

**SHEAR RESULTS (flexible seismic design, continued)**

Seg. 5	-	Both	125.6	-	366	-	.78	-	226	-	226	659	0.56
<b>Level 1</b>													
LnC, Lev1	1	Both	79.5	-	3744	-	1.0	-	290	-	290	13668	0.27

**Legend:**

W Gp - Wall design group defined in Sheathing and Framing Materials tables, where it shows associated Standard Wall. "A" means that this wall is critical for all walls in the Standard Wall group.

For Dir - Direction of seismic force along shearline.

v - Design shear force on segment = ASD-factored shear force per unit length of full-height sheathing (FHS)

vmax/vft - Perforated walls: Collector and in-plane anchorage force as per SDPWS eqn. 4.3-9 = V/FHS/Co. FHS is factored for narrow segments as per 4.3.3.4

FTAO walls: Shear force in piers above and below either openings or piers beside opening(s). Aspect ratio factor does not apply to these piers.

V - ASD factored shear force. For shearline: total shearline force. For wall: total of all segments on wall. For segment: force on segment

Asp/Cub - Unblocked wood structural panel factor Cub from SDPWS 4.3.5.3 or Aspect Ratio factor from 4.3.5.5.1, which for perforated walls is sum bi / FHS from 4.3.5.6 with bi defined in 4.3.3.4. For multi-segment walls, wall row shows Cub and segment rows show Asp. For single-segment walls and perforated walls, value shown is Asp for blocked walls and Cub for unblocked walls.

Int, Ext - Nominal unit shear capacity of interior and exterior sheathing, factored by Table 4.3-1 Note 3 for framing specific gravity and Note 10 for presence of hold-downs. For wall segments, also include unblocked factor Cub and aspect ratio adjustments.

Co - Adjustment factor for perforated walls from SDPWS Equation 4.3-6.

C - Sheathing combination rule, A = Add capacities, S = Strongest side or twice weakest, G = Stiffness-based using Eqns. 4.3-3,-4.

Cmb - Combined interior and exterior unit shear capacity including perforated wall factor Co.

V - Total factored shear capacity of shearline, wall or segment.

Crit Resp - Response ratio = v/Cmb = design shear force/unit shear capacity. "W" indicates that the wind design criterion was critical in selecting wall.

**Notes:**

Refer to Elevation View diagrams for individual level for uplift anchorage force t for perforated walls given by SDPWS 4.3.6.4.2,1.

Hold-Down and Compression Design (flexible seismic design)

Level	Line-Wall	Posit'n	Location [ft]		Tensile Hold-down or Compressive Stud Force [lbs]				Hold-down	Cap [lbs]	Crit Resp.
			X	Y	Shear	Dead	Ev	Cmb'd			
<b>Line 1</b>											
	1-1	L End	0.33	0.46	1926	637	142	1430	HDU2-SDS	2215	0.65
	1-1	L End	0.33	0.46	1926	1062	142	3130	Compression	6682	0.47
	1-1	L Op 1	0.33	3.88	1321	599	133	855	HDU2-SDS	2215	0.39
	1-1	L Op 1	0.33	3.88	1321	998	133	2452	Compression	6682	0.37
	1-1	R Op 1	0.33	25.04	679	2175	290	3144	Compression	6682	0.47
	1-1	R End	0.33	28.38	1285	86	19	1218	HDU2-SDS	2215	0.55
	1-1	R End	0.33	28.38	1285		19	1284	Compression	6682	0.19
	1-2	L End	0.33	28.63	1370	230	51	1191	HDU2-SDS	2215	0.54
	1-2	L End	0.33	28.63	1370	383	51	1804	Compression	6682	0.27
		V Elem	0.33	32.54	665	246	55	474	Refer to upper level		
		V Elem	0.33	32.54	665	409	55	1129	Compression		
		V Elem	0.33	35.71	665	146	32	552	Refer to upper level		
		V Elem	0.33	35.71	665	244	32	942	Compression		
	1-2	R End	0.33	37.96	707	541	120	286	HDU2-SDS	2215	0.13
	1-2	R End	0.33	37.96	707	902	120	1730	Compression	6682	0.26
		V Elem	0.33	44.29	774	223	50	600	Refer to upper level		
		V Elem	0.33	44.29	774	372	50	1195	Compression		
		V Elem	0.33	48.96	671	201	45	515	Refer to upper level		
		V Elem	0.33	48.96	671	334	45	1050	Compression		
	1-3	R End	0.33	53.21	2043	319	71	1795	HDU2-SDS	2215	0.81
	1-3	R End	0.33	53.21	2043	532	71	2646	Compression	6682	0.40
<b>Line 2</b>											
	2-1	L End	26.67	0.46	1767	616	137	1288	HDU5-SDS	4340	0.30
	2-1	L End	26.67	0.46	1767	1026	137	2930	Compression	6682	0.44
		V Elem	26.67	0.88	0	294	39	333	Compression		
		V Elem	26.67	8.96	1888	534	119	1473	Refer to upper level		
		V Elem	26.67	8.96	1888	891	119	2898	Compression		
	2-1	L Op 1	26.67	24.63	3655	1125	250	2780	HDU5-SDS	4340	0.64
	2-1	L Op 1	26.67	24.63	3655	1876	250	5781	Compression	7518	0.77
		V Elem	26.67	28.79	0	306	41	346	Compression		
<b>Line 3</b>											
		V Elem	47.42	28.79	497	555	123	65	Refer to upper level		
		V Elem	47.42	28.79	497	925	123	1545	Compression		
	3-1	L End	47.42	28.96	639	588	131	181	HDU2-SDS	2215	0.08
	3-1	L End	47.42	28.96	639	980	131	1749	Compression	6682	0.26
	3-1	R End	47.42	53.21	1135	1143	254	246	HDU2-SDS	2215	0.11
	3-1	R End	47.42	53.21	1135	1905	254	3294	Compression	6682	0.49
<b>Line A</b>											
	A-1	L End	0.46	0.33	695	719	160	136	HDU2-SDS	2215	0.06
	A-1	L End	0.46	0.33	695	1198	160	2052	Compression	6682	0.31
		V Elem	2.21	0.33	0	309	41	351	Compression		
		V Elem	10.71	0.33	2044	323	72	1793	Refer to upper level		
		V Elem	10.71	0.33	2044	538	72	2653	Compression		
		V Elem	16.54	0.33	2044	362	80	1762	Refer to upper level		
		V Elem	16.54	0.33	2044	603	80	2727	Compression		
	A-1	R End	26.54	0.33	695	635	141	201	HDU2-SDS	2215	0.09
	A-1	R End	26.54	0.33	695	1059	141	1895	Compression	6682	0.28
		V Elem	26.79	0.33	0	375	50	425	Compression		
<b>Line B</b>											
	B-1	L End	0.54	29.25	1914	302	67	1679	HDU2-SDS	2215	0.76
	B-1	L End	0.54	29.25	1914	503	67	2484	Compression	6682	0.37
		V Elem	9.21	29.25	1575	253	56	1378	Refer to upper level		
		V Elem	9.21	29.25	1575	422	56	2053	Compression		
	B-1	R End	12.88	29.25	1914	302	67	1679	HDU2-SDS	2215	0.76
	B-1	R End	12.88	29.25	1914	503	67	2484	Compression	6682	0.37
		V Elem	20.21	28.58	1575	253	56	1378	Refer to upper level		
		V Elem	20.21	28.58	1575	422	56	2053	Compression		
	B-2	L End	26.79	28.83	3230	214	47	3064	HDU5-SDS	4340	0.71
	B-2	L End	26.79	28.83	3230	356	47	3634	Compression	6682	0.54
		V Elem	29.38	28.83	1276	150	33	1159	Refer to upper level		
		V Elem	29.38	28.83	1276	250	33	1559	Compression		
	B-2	L Op 1	32.79	28.83	1954	390	87	1651	HDU5-SDS	4340	0.38
	B-2	L Op 1	32.79	28.83	1954	650	87	2691	Compression	7518	0.36
		V Elem	33.46	28.83	1603	229	51	1425	Refer to upper level		
		V Elem	33.46	28.83	1603	381	51	2035	Compression		
		V Elem	39.54	28.83	1603	276	61	1388	Refer to upper level		
		V Elem	39.54	28.83	1603	459	61	2123	Compression		
	B-2	R Op 1	43.04	28.83	1986	348	77	1716	HDU5-SDS	4340	0.40
	B-2	R Op 1	43.04	28.83	1986	580	77	2643	Compression	7518	0.35
		V Elem	45.71	28.83	0	222	30	251	Compression		
	B-2	R End	47.29	28.83	1986	108	24	1902	HDU5-SDS	4340	0.44

Hold-Down and Compression Design (flexible seismic design, continued)

B-2	R End	47.29	28.83	1986	180	24	2190	Compression	6682	0.33	
<b>Line C</b>											
C-1	L End	0.46	53.33	1616	1192	265	689	HDU2-SDS	2215	0.31	
C-1	L End	0.46	53.33	1616	1986	265	3867	Compression	6682	0.58	
	V Elem	2.96	53.33	977	223	50	803	Refer to upper level			
	V Elem	2.96	53.33	977	372	50	1398	Compression			
	V Elem	10.38	53.33	1269	283	63	1049	Refer to upper level			
	V Elem	10.38	53.33	1269	472	63	1804	Compression			
	V Elem	15.54	53.33	1269	300	67	1036	Refer to upper level			
	V Elem	15.54	53.33	1269	500	67	1836	Compression			
	V Elem	23.71	53.33	1275	291	65	1049	Refer to upper level			
	V Elem	23.71	53.33	1275	484	65	1823	Compression			
	V Elem	28.46	53.33	1275	178	40	1136	Refer to upper level			
	V Elem	28.46	53.33	1275	297	40	1611	Compression			
	V Elem	31.63	53.33	1083	135	30	978	Refer to upper level			
	V Elem	31.63	53.33	1083	225	30	1338	Compression			
	V Elem	34.46	53.33	1083	293	65	856	Refer to upper level			
	V Elem	34.46	53.33	1083	487	65	1636	Compression			
	V Elem	44.63	53.33	1030	289	64	805	Refer to upper level			
	V Elem	44.63	53.33	1030	481	64	1575	Compression			
C-1	R End	47.29	53.33	1670	1196	266	740	HDU2-SDS	2215	0.33	
C-1	R End	47.29	53.33	1670	1993	266	3928	Compression	6682	0.59	
<b>Level 2</b>				<b>Tensile Hold-down</b>							
<b>Line-Wall</b>	<b>Posit'n</b>	<b>Location [ft]</b>		<b>or Compressive Stud Force [lbs]</b>				<b>Cap</b>	<b>Crit</b>		
		<b>X</b>	<b>Y</b>	<b>Shear</b>	<b>Dead</b>	<b>Ev</b>	<b>Cmb'd</b>	<b>Hold-down</b>	<b>[lbs]</b>	<b>Resp.</b>	
<b>Line 1</b>											
1-1	L End	0.33	0.46	614	549	122	186	HDU2-SDS	2215	0.08	
1-1	L End	0.33	0.46	614	916	122	1651	Compression	6682	0.25	
1-1	R End	0.33	24.63	614	718	160	55	HDU2-SDS	2215	0.02	
1-1	R End	0.33	24.63	614	1197	160	1970	Compression	7518	0.26	
1-2	R Op 1	0.33	32.54	665	246	55	474	HDU2-SDS	2215	0.21	
1-2	R Op 1	0.33	32.54	665	409	55	1129	Compression	7518	0.15	
1-2	L Op 2	0.33	35.71	665	146	32	552	HDU2-SDS	2215	0.25	
1-2	L Op 2	0.33	35.71	665	244	32	942	Compression	7518	0.13	
1-2	R Op 2	0.33	39.04	774	193	43	624	HDU2-SDS	2215	0.28	
1-2	R Op 2	0.33	39.04	774	322	43	1138	Compression	7518	0.15	
1-2	L Op 3	0.33	44.29	774	223	50	600	HDU2-SDS	2215	0.27	
1-2	L Op 3	0.33	44.29	774	372	50	1195	Compression	7518	0.16	
1-2	R Op 3	0.33	48.96	671	201	45	515	HDU2-SDS	2215	0.23	
1-2	R Op 3	0.33	48.96	671	334	45	1050	Compression	7518	0.14	
1-2	R End	0.33	53.21	671	101	22	593	HDU2-SDS	2215	0.27	
1-2	R End	0.33	53.21	671	169	22	862	Compression	6682	0.13	
<b>Line 2</b>											
	V Elem	26.67	0.88	0	294	39	333	Compression			
2-1	R Op 1	26.67	8.96	1888	534	119	1473	HDU5-SDS	4340	0.34	
2-1	R Op 1	26.67	8.96	1888	891	119	2898	Compression	7518	0.39	
2-1	L Op 2	26.67	24.63	1888	426	95	1557	HDU5-SDS	4340	0.36	
2-1	L Op 2	26.67	24.63	1888	709	95	2692	Compression	7518	0.36	
	V Elem	26.67	27.88	0	113	15	127	Compression			
<b>Line 3</b>											
3-1	L End	47.42	28.79	497	555	123	65	HDU2-SDS	2215	0.03	
3-1	L End	47.42	28.79	497	925	123	1545	Compression	6682	0.23	
3-1	R End	47.42	53.21	497	555	123	65	HDU2-SDS	2215	0.03	
3-1	R End	47.42	53.21	497	925	123	1545	Compression	6682	0.23	
<b>Line A</b>											
	V Elem	2.21	0.33	0	309	41	351	Compression			
A-1	R Op 1	10.71	0.33	2044	323	72	1793	HDU2-SDS	2215	0.81	
A-1	R Op 1	10.71	0.33	2044	538	72	2653	Compression	7518	0.35	
A-1	L Op 2	16.54	0.33	2044	362	80	1762	HDU2-SDS	2215	0.80	
A-1	L Op 2	16.54	0.33	2044	603	80	2727	Compression	7518	0.36	
	V Elem	26.79	0.33	0	375	50	425	Compression			
<b>Line B</b>											
B-1	L End	9.21	28.58	1575	253	56	1378	HDU2-SDS	2215	0.62	
B-1	L End	9.21	28.58	1575	422	56	2053	Compression	6682	0.31	
B-1	R End	20.21	28.58	1575	253	56	1378	HDU2-SDS	2215	0.62	
B-1	R End	20.21	28.58	1575	422	56	2053	Compression	6682	0.31	
B-2	L End	26.79	28.67	1276	64	14	1226	HDU5-SDS	4340	0.28	
B-2	L End	26.79	28.67	1276	106	14	1396	Compression	6682	0.21	
B-2	L Op 1	29.38	28.67	1276	150	33	1159	HDU5-SDS	4340	0.27	
B-2	L Op 1	29.38	28.67	1276	250	33	1559	Compression	7518	0.21	
B-2	R Op 1	33.46	28.67	1603	229	51	1425	HDU5-SDS	4340	0.33	
B-2	R Op 1	33.46	28.67	1603	381	51	2035	Compression	7518	0.27	
B-2	L Op 2	39.54	28.67	1603	276	61	1388	HDU5-SDS	4340	0.32	
B-2	L Op 2	39.54	28.67	1603	459	61	2123	Compression	7518	0.28	
	V Elem	45.71	28.67	0	222	30	251	Compression			

Hold-Down and Compression Design (flexible seismic design, continued)

Line C										
C-1	L End	0.46	53.33	977	62	14	929	HDU2-SDS	2215	0.42
C-1	L End	0.46	53.33	977	103	14	1094	Compression	6682	0.16
C-1	L Op 1	2.96	53.33	977	223	50	803	HDU2-SDS	2215	0.36
C-1	L Op 1	2.96	53.33	977	372	50	1398	Compression	7518	0.19
C-1	R Op 1	10.38	53.33	1269	283	63	1049	HDU2-SDS	2215	0.47
C-1	R Op 1	10.38	53.33	1269	472	63	1804	Compression	7518	0.24
C-1	L Op 2	15.54	53.33	1269	300	67	1036	HDU2-SDS	2215	0.47
C-1	L Op 2	15.54	53.33	1269	500	67	1836	Compression	7518	0.24
C-1	R Op 2	23.71	53.33	1275	291	65	1049	HDU2-SDS	2215	0.47
C-1	R Op 2	23.71	53.33	1275	484	65	1823	Compression	7518	0.24
C-1	L Op 3	28.46	53.33	1275	178	40	1136	HDU2-SDS	2215	0.51
C-1	L Op 3	28.46	53.33	1275	297	40	1611	Compression	7518	0.21
C-1	R Op 3	31.63	53.33	1083	135	30	978	HDU2-SDS	2215	0.44
C-1	R Op 3	31.63	53.33	1083	225	30	1338	Compression	7518	0.18
C-1	L Op 4	34.46	53.33	1083	293	65	856	HDU2-SDS	2215	0.39
C-1	L Op 4	34.46	53.33	1083	487	65	1636	Compression	7518	0.22
C-1	R Op 4	44.63	53.33	1030	289	64	805	HDU2-SDS	2215	0.36
C-1	R Op 4	44.63	53.33	1030	481	64	1575	Compression	7518	0.21
C-1	R End	47.29	53.33	1030	66	15	979	HDU2-SDS	2215	0.44
C-1	R End	47.29	53.33	1030	109	15	1154	Compression	6682	0.17

Legend:

Line-Wall:

At wall or opening – Shearline and wall number

At vertical element – Shearline

Posit'n – Position of stud pack that hold-down is attached to:

V Elem – Vertical element: column or strengthened studs required where not at wall end or opening

L or R End – At left or right wall end

L or R Op n – At left or right side of opening n

t @ Op n – Uplift force t at opening n from offset opening in perforated wall above, from SDPWS 4.3.6.4.2.1

Location – Co-ordinates in Plan View

Tensile Hold-down or Compressive Stud Force – Upwards force on hold-down at one end of the wall or downward force on bottom plate under studs at the other end, for each force direction. Includes forces transferred from upper levels.

Shear – Overturning component =  $V \times h / beff$  from SDPWS Eqn. 4.3-7; V = force on segment, ASD-factored by 0.70; h = wall height, beff = wall segment length – (tension stud pack width + hold-down anchor bolt offset) – (1/2 compression stud pack width). For perforated walls =  $V \times h / Co$  sum (bi) from SDPWS Eqn. 4.3-8.

Dead – Dead load resisting component, factored for ASD by 0.60 for tension and 1.0 for compression

Ev – Vertical seismic load effect from ASCE 7 12.4.2.2 =  $-0.2 Sds \times ASD \text{ factor} \times \text{unfactored } D = 0.222 \text{ SDS} \times \text{factored } D$ . Refer to Seismic Information table for more details.

Cmb'd – Sum of ASD-factored overturning, dead and vertical seismic forces. May also include the uplift force t from perforated walls from SDPWS 4.3.6.4.2.1 when openings are staggered.

Hold-down – Device model number from hold-down database; "Compression" for bearing of end stud pack on bottom plate

Cap – Hold-downs: Allowable ASD tension load from database; Compression: Allowable ASD bearing force =  $Ct \text{ CM } Cb \text{ Fcp } A$ ; A = cross sectional area of end studs. Refer to Framing materials table for details.

Crit. Resp. – Critical Response = Combined ASD force/Allowable ASD tension load

Notes:

HDU2-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 6 1/4" x 2.5" SDS heavy-duty screws; 5/8" anchor bolt.

HDU5-SDS2.5 for studs with thickness > 0'-3" and depth > 0'-3.5" : Uses 14 1/4" x 2.5" SDS heavy-duty screws; 5/8" anchor bolt.

Combined force from ASCE 7 2.4.1 load combination 10 =  $-(0.6D - 0.7Ev + 0.7Eh)$ ; Eh (from 12.4.2.1) = - shear overturning force

Refer to the Shear Line Dimensions table for wall height h, effective segment length beff and perforated wall adjusted sum of bi, to the Story Table for joist depth, and to the Shear Results table for perforated factor Co.

Designer is responsible for design of connection from wall to floor or foundation for shear force shown in Shear Results table. Refer to SDPWS 4.3.6.4.3 for foundation anchor bolt requirements.

COLLECTOR FORCES (flexible seismic design)

Level 1 Line-Wall	Position on Wall or Opening	Location [ft]		Drag Strut Force [lbs]		Strap/Blocking Force [lbs]		
		X	Y	--->	<---	--->	<---	
<b>Level 1</b>								
<b>Line 1</b>								
	Shearline force			5330	5330			
1-1	Left Opening 1	0.33	4.00	341	-341			
1-1	Right Opening 1	0.33	24.92	-1762	1762			
1-2	Right Wall End	0.33	38.08	-385	385			
1-3	Right Opening 1	0.33	44.25	-1005	1005			
<b>Line 2</b>								
2-1	Left Opening 1	26.67	24.75	6675	6675			
				3600	-3600			
<b>Line B</b>								
	Shearline force			6837	6837			
B-1	Left Wall End	0.42	29.25	-12	12			
B-1	Right Wall End	13.00	29.25	1848	-1848			
B-2	Left Wall End	26.67	28.83	-137	137			
B-2	Left Opening 1	32.92	28.83	787	-787			
B-2	Right Opening 1	42.92	28.83	-665	665			
<b>Level 2</b>								
Level 2 Line-Wall	Position on Wall or Opening	Location [ft]		Drag Strut Force [lbs]		Strap/Blocking Force [lbs]		
		X	Y	--->	<---	--->	<---	
<b>Line 1</b>								
	Shearline force			3222	3222			
1-1	Left Opening 1	0.33	15.08	251	-251			
1-1	Right Opening 1	0.33	18.08	498	-498			
1-1	Right Wall End	0.33	24.75	612	-612			
1-2	Right Opening 1	0.33	32.42	146	-146			
1-2	Left Opening 2	0.33	35.83	205	-205			
1-2	Right Opening 2	0.33	38.92	18	-18			
1-2	Left Opening 3	0.33	44.42	156	-156			
1-2	Right Opening 3	0.33	48.83	-113	113			
1-1	Left Opening 1	0.33	15.08			279	279	
1-1	Right Opening 1	0.33	18.08			126	126	
<b>Line 2</b>								
2-1	Right Opening 1	26.67	8.83	4182	4182			
2-1	Left Opening 2	26.67	24.75	-671	671			
2-1				2255	-2255			
<b>Line A</b>								
	Shearline force			1685	1685			
A-1	Right Opening 1	10.58	0.33	-656	656			
A-1	Left Opening 2	16.67	0.33	640	-640			
<b>Line B</b>								
	Shearline force			4292	4292			
B-1	Left Wall End	9.08	28.58	-798	798			
B-1	Right Wall End	20.33	28.58	625	-625			
B-2	Left Wall End	26.67	28.67	48	-48			
B-2	Left Opening 1	29.50	28.67	255	-255			
B-2	Right Opening 1	33.33	28.67	-94	94			
B-2	Left Opening 2	39.67	28.67	707	-707			
<b>Line C</b>								
	Shearline force			2950	2950			
C-1	Left Opening 1	3.08	53.33	173	-173			
C-1	Right Opening 1	10.25	53.33	-276	276			
C-1	Left Opening 2	15.67	53.33	311	-311			
C-1	Right Opening 2	23.58	53.33	-185	185			
C-1	Left Opening 3	28.58	53.33	358	-358			
C-1	Right Opening 3	31.50	53.33	175	-175			
C-1	Left Opening 4	34.58	53.33	416	-416			
C-1	Right Opening 4	44.50	53.33	-206	206			

Legend:

Line-Wall - Shearline and wall number

Position... - Side of opening or wall end that drag strut is attached to

Location - Co-ordinates in Plan View

Drag strut Force - Axial force in transfer element at openings, gaps, or changes in design shear along shearline. + : tension; - : compression.

Based on ASD-factored shearline force shown. For SDC C-F, it is the greater of the design shearline force and the diaphragm force  $F_{px}$ , added to shearline force from story above and to forces transferred from discontinuous shearlines factored by overstrength ( $\omega$ ) as per 12.10.1.1.

Refer to Seismic Information table for diaphragm forces and  $\omega$  factor.

For SDC D-F, if horizontal torsional irregularities 2, 3, or 4 are input, or vertical irregularity 4 detected or input, 25% increase from 12.3.3.4 applied.

For perforated walls, this force is converted to  $v_{max}$  using 4.3.6.4.1.1.

Strap/Blocking Force - For FTAO walls, force transferred from above and below opening to shearwall pier.

-> Due to shearline force in the west-to-east or south-to-north direction

**STORY DRIFT (flexible seismic design)**

Level	Dir	Const defl	Max dxe	Actual Story Drift (in)					hsx ft	Allowable Story Drift		
				Line	Max dx	Center of Mass	C of M dxe	C of M dx		Delta a in	Ratio Max	Ratio C of M
1	N<->S	0.54	0.87	1	1.85	19.65	0.38	0.92	8.83	2.65	0.70	0.35
	E<->W	0.44	0.74	B	1.63	29.97	0.69	1.53			0.62	0.58
2	N<->S	0.54	0.71	1	1.19	20.38	0.35	0.78	7.50	2.25	0.53	0.35
	E<->W	0.64	0.93	C	1.81	31.21	0.94	1.79			0.80	0.80

ASCE 7 Eqn. 12.8-15:  $dx = dxc + (dxe - dxc) Cd / Ie$ 

Deflection amplification factor Cd from Table 12.2-1 = 4.0 (E-W), 4.0 (N-S)

Importance factor Ie = 1.00

**Legend:***Const defl (dxc)* – Deflection due to shrinkage, gaps, bolt hole, etc. (constant with respect to force)*Max dxe* – Largest deflection for any shearline on level in this direction; refer to Deflections table*Line* – Shearline with largest deflection on level in this direction*hsx* – Story height in ASCE Table 12.12-1 = Height of walls plus joist depth between this level and the one above.*Max dx* – Largest amplified deflection on level in this direction using ASCE 7 Eq'n 12.8-15*C of M dxe* - Deflection at the center of mass of this level; from interpolating deflections at adjacent shearlines.*C of M dx* - Amplified deflection at center of mass using Eq'n 12.8-15. Does not include differences between top and bottom diaphragm deflection.*Delta a* = Allowable story drift on this level from ASCE 7 Table 12.12-1*Ratio* - Proportion of allowable story drift experienced, on this level in this direction.