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SIM RESIDENCE
4226 85TH AVE SE, MERCER ISLAND, WA 98040
STRUCTURAL CALCULATIONS

PROJECT NO: 24003   DATE:04/12/24
PREPARED BY: BASRI BASRI PE, SE

Design Criteria

International Building Code (IBC) 2021
American Society of Civil Engineers (ASCE) 7-16

Project Description

The structural scope of the project includes a one-story addition at the rear of the house, utilizing conventional wood framing on a shallow concrete foundation. Another aspect involves an interior remodel, which includes the design of new structural beams and their supports. Lastly, the project encompasses a full seismic upgrade of the existing building, utilizing plywood or OSB shear walls with Simpson holdowns and tension straps, and adding new plywood/OSB sheathing above the existing roof decking.   Please see the attached calculations for your reference.

Live Load and Other Structural Criteria

Roof Snow (psf)	25
Residential Live Load (psf)	40
Balcony, Deck and Platform Live Load (psf)	60
Allowable Soil Bearing Pressure (psf)	1500 (assumed)
Soil Active Pressure (pcf)	35 (assumed)

Seismic Criteria

S_s, %g	142.1
S_1, %g	49.4
Risk Category	II
Site Class	D
Ductility Factor, R	6.5
Seismic Performance Category	D

Wind Criteria

Ultimate Wind Speed, mph	98
Building Classifications	II
Wind Exposure Category	B
Topographic Effect, Kzt	1.0

BASRI BASRI
STATE OF WASHINGTON
STRUCTURAL ENGINEER
43789
PROFESSIONAL ENGINEER

A. *IRC Table R301.2(1) Amended.* International Residential Code Table R301.2(1) is hereby amended to read as follows:

TABLE R301.2

CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

GROUND SNOW LOAD [a] (psf)	WIND DESIGN				SEISMIC DESIGN CATEGORY	SUBJECT TO DAMAGE FROM			ICE BARRIER UNDERLAYMENT REQUIRED	FLOOD HAZARD [e]	AIR FREEZING INDEX	MEAN ANNUAL TEMP
	Speed [b] (mph)	Topographic effects [c]	Special wind region	Windborne debris zone		Weathering [d]	Frost line depth	Termite				
25	98	Yes	No	No	D2	Moderate	12"	Slight to Moderate	No	NA	113	53 ºF

MANUAL J DESIGN CRITERIA

Elevation	Altitude correction factor	Coincident wet bulb	Indoor winter design dry-bulb temperature	Indoor winter design dry-bulb temperature	Outdoor winter design dry-bulb temperature	Heating temperature difference
338 feet	0.99	66 ºF	72 ºF	72 ºF	24 ºF	48 ºF
Latitude	Daily Range	Indoor summer design relative humidity	Summer design gains 50% RH	Indoor summer design dry-bulb temperature	Outdoor summer design dry-bulb temperature	Cooling temperature difference
47°34'39"	M	50%	50% RH	75 ºF	83 ºF	8 ºF

a. This is the minimum roof snow load. When using this snow load it will be left to the engineer's judgment whether to consider drift or sliding snow. However, rain on snow surcharge of 5 psf must be considered for roof slopes less than 5 degrees.

b. The basic wind speed is determined from the basic wind speed map in Figure R301.2(2). Wind exposure category shall be determined on a site-specific basis in accordance with Section R301.2.1.4.

c. Topographic effects (Wind Speed-up Kzt factor) shall be determined on a site-specific basis in accordance with Section R301.2.1.5.

d. Weathering may require a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code. The grade of masonry units shall be determined from ASTM C34, C55, C62, C73, C90, C129, C145, C216 or C652.

e. The City of Mercer Island participates in the National Flood Insurance Program (NFIP); Regular Program (No Special Flood Hazard Area). Further NFIP participation information: CID 530083, Initial FHBM Identified 06/28/74, Initial FIRM Identified 05/16/95, Current Effective Map Date (NSFHA), Reg-Emer Date 06/30/97, 53033C0654G effective 8/19/2020.

⚠ This is a beta release of the new ATC Hazards by Location website. Please contact us with feedback.

ⓘ The ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.

ΔTC Hazards by Location

Search Information

Address:	4226 85th Ave SE, Mercer Island, WA 98040, USA
Coordinates:	47.5700496, -122.225191
Elevation:	317 ft
Timestamp:	2024-04-02T19:55:57.597Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	II
Site Class:	D-default

317 ft

Map data ©2024 Google · Report a map error
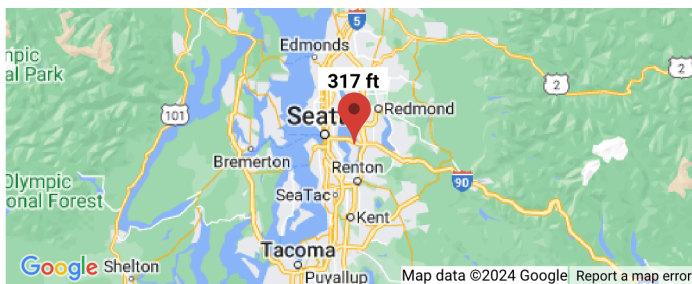
Basic Parameters

Name	Value	Description
S_S	1.421	MCE_R ground motion (period=0.2s)
S_1	0.494	MCE_R ground motion (period=1.0s)
S_{MS}	1.705	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.137	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

▼Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.902	Coefficient of risk (0.2s)
CR_1	0.897	Coefficient of risk (1.0s)
PGA	0.608	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.73	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)
SsRT	1.421	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.575	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.713	Factored deterministic acceleration value (0.2s)
S1RT	0.494	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.55	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.475	Factored deterministic acceleration value (1.0s)
PGAd	1.261	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

4/2/24, 12:56 PM   ATC Hazards by Location

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. Find out why.   Page 4 of 42

Disclaimer

Hazard loads are provided by the U.S. Geological Survey Seismic Design Web Services.

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W-E DIRECTION (CONTROLLING)
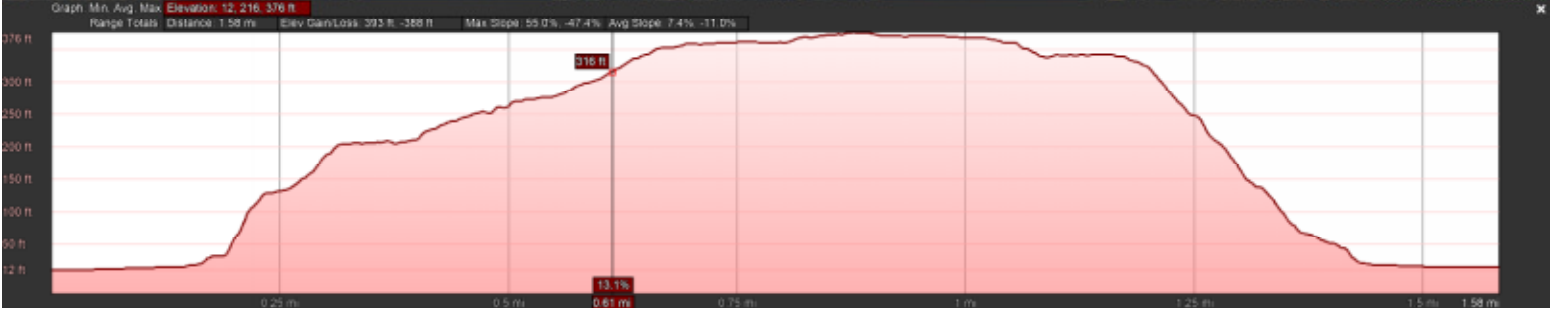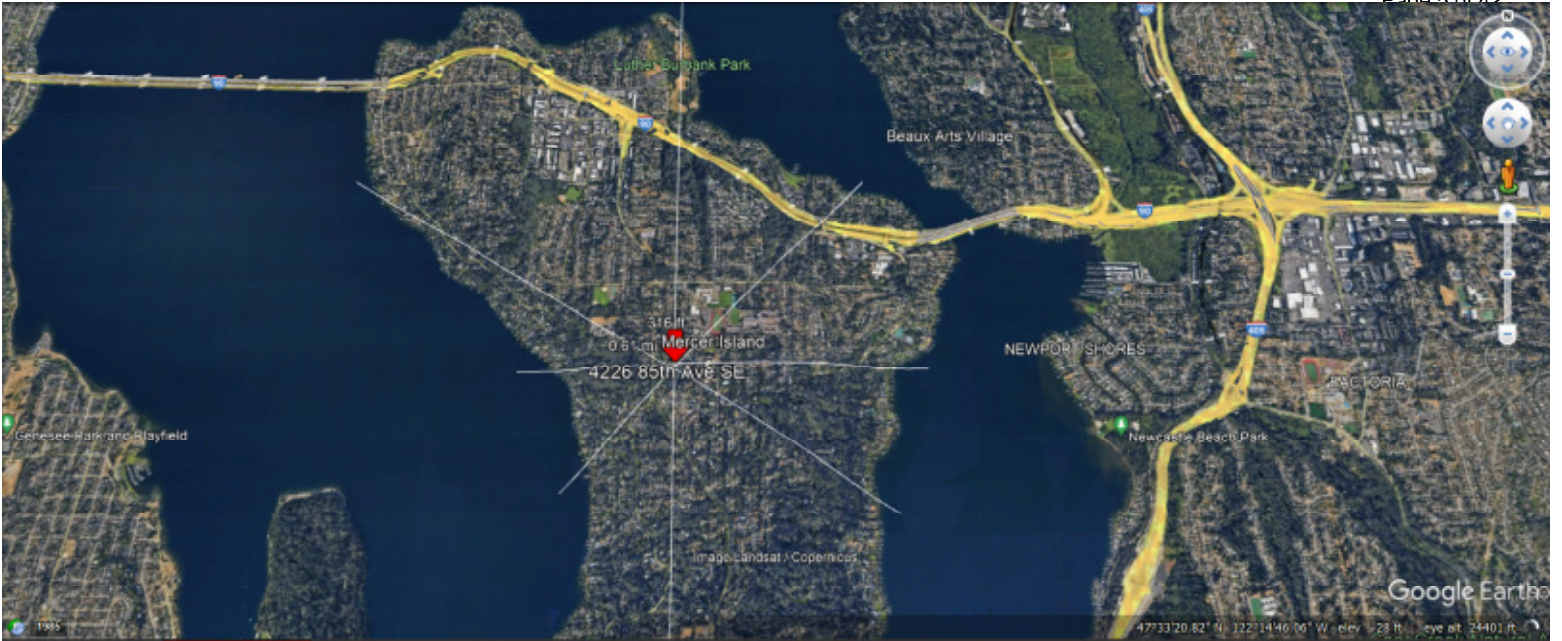
N-S DIRECTION
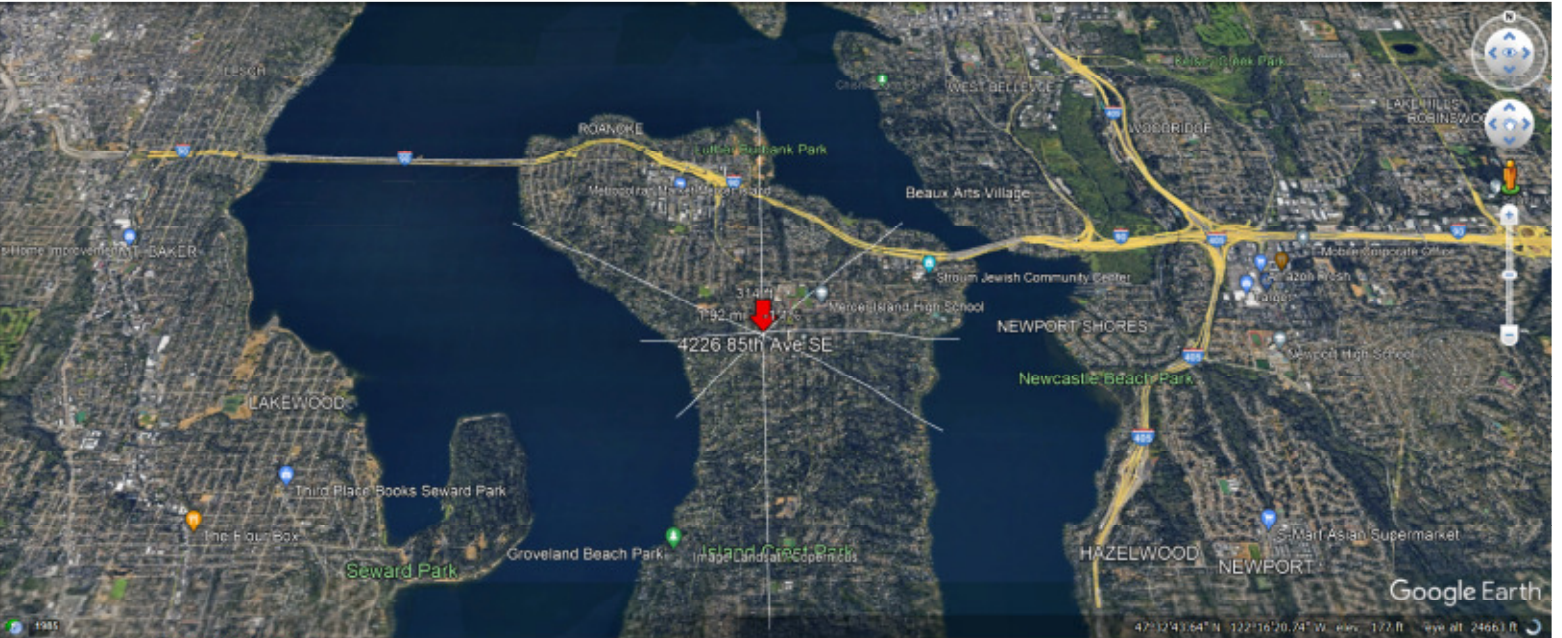
NW-SE DIRECTION
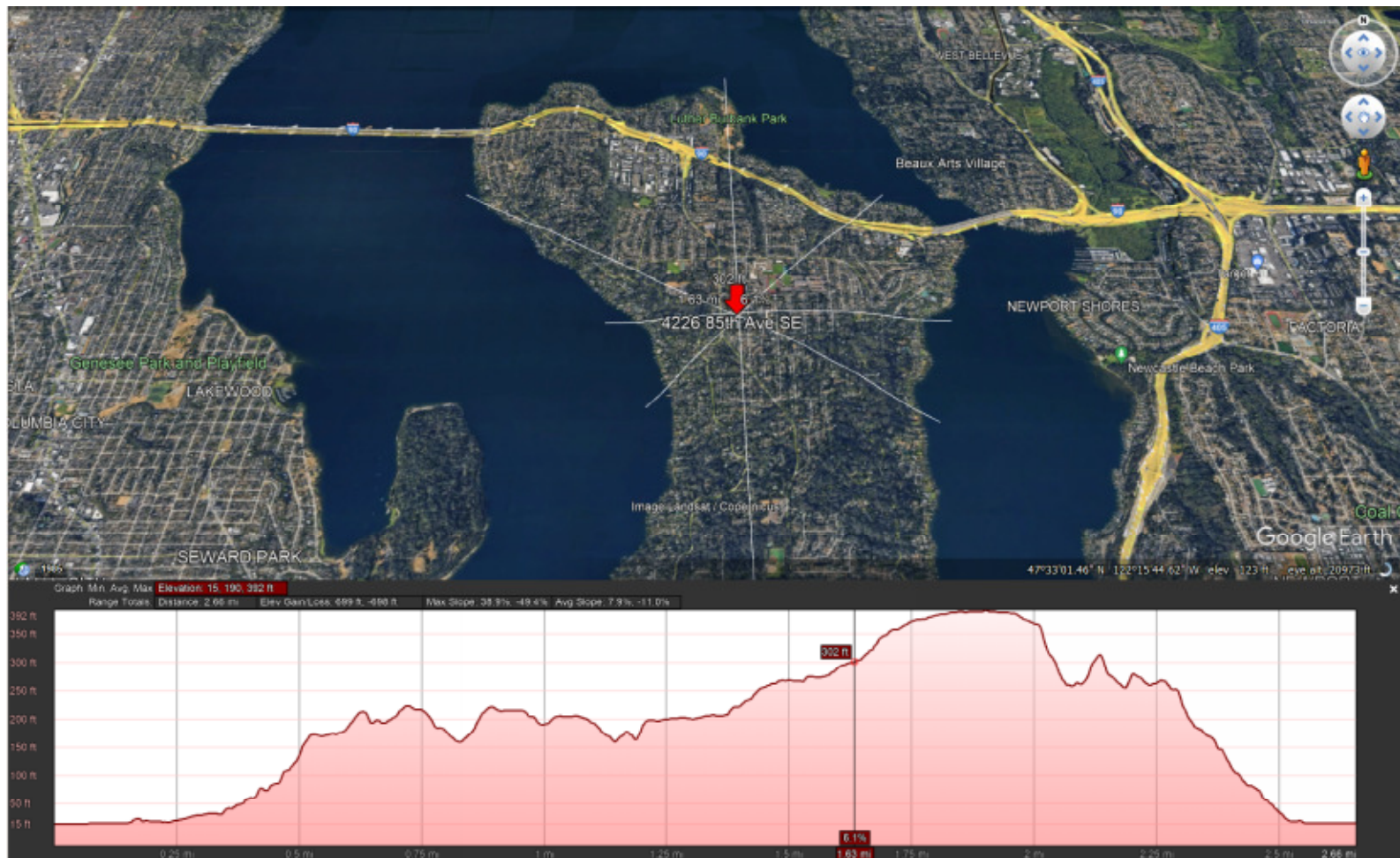
SW-NE DIRECTION

Topographic Factor, Kzt Figure 26.8-1 of ASCE7-16	JOB NO.			24003
	BY	BB	DATE	04/02/24
	CHECKED		DATE	
	PAGE		REV.	

CLIENT AND LOCATION	SIM RESIDENCE: 4226 85th Ave SE, Mercer Island, WA
UNIT	
ITEM:	

ESCARPMENT   2-D RIDGE OR 3-D AXISYMMETRICAL HILL

					kzt vs z		
Type of Topography	=	2-D Ridge			z	K3	Kzt
Exposure Category	=	B			0	1.000	1.000
H	=	376.000	ft, see notation below		10	0.978	1.000
Lh	=	1782.000	ft, see notation below		20	0.956	1.000
X	=	1346.000	ft, see notation below		30	0.935	1.000
z	=	25.000	ft, see notation below		40	0.914	1.000

Is there any topographic features of comparable height , less of 100H and 2 miles from the toe of the topography?	Yes			50	0.894	1.000
Does the topography protrude above the height of upwind terrain features with 2 miles radius in any quadrant by a factor of two or more?	No			60	0.874	1.000
Is the structure located in the upper half of the topography or near the crest?	Yes			70	0.855	1.000

H/Lh	=	0.211	>=	0.2	80	0.836	1.000
H	=	376.000ft	>=	60.000ft	90	0.817	1.000
					100	0.799	1.000

$$K_{zt} = (1 + K_1 K_2 K_3)^2$$

$K_{zt} = (1 + K_1 K_2 K_3)^2$	=	**1.000**		110	0.781	1.000
K1 determined from the table below	=	0.274		120	0.764	1.000
$K_2 = (1 - \dfrac{|x|}{\mu L_h})$	=	0.496		130	0.747	1.000
γ	=	4.000		140	0.730	1.000
μ	=	1.500		150	0.714	1.000
$K_3 = e^{-\gamma z/L_h}$	=	0.945		160	0.698	1.000

Topographic Factor, Kzt Figure 26.8-1 of ASCE7-16	JOB NO.			24003
	BY	BB	DATE	04/02/24
	CHECKED		DATE	
	PAGE		REV.	

CLIENT AND LOCATION	SIM RESIDENCE: 4226 85th Ave SE, Mercer Island, WA
UNIT	
ITEM:	

Parameters for Speed-Up Over Hills and Escarpments						
Hill Shape	K1/(H/Lh)			γ	μ	
	Exposure				Upwind of Crest	Downwind of Crest
	B	C	D			
2-dimensional ridges (or valleys with negative H in K1/(H/Lh)	1.30	1.45	1.55	3	1.5	1.5
2-dimensional escarpments	0.75	0.85	0.95	2.5	1.5	4
3-dimensional axisym. hill	0.95	1.05	1.15	4	1.5	1.5

Notes:

1. For values of H/L_h, x/L_h and z/L_h other than those shown, linear interpolation is permitted.
2. For $H/L_h > 0.5$, assume $H/L_h = 0.5$ for evaluating K_1 and substitute $2H$ for L_h for evaluating K_2 and K_3.
3. Multipliers are based on the assumption that wind approaches the hill or escarpment along the direction of maximum slope.
4. Notation:

   H: Height of hill or escarpment relative to the upwind terrain, in feet (meters).

   L_h: Distance upwind of crest to where the difference in ground elevation is half the height of hill or escarpment, in feet (meters).

   K_1: Factor to account for shape of topographic feature and maximum speed-up effect.

   K_2: Factor to account for reduction in speed-up with distance upwind or downwind of crest.

   K_3: Factor to account for reduction in speed-up with height above local terrain.

   x: Distance (upwind or downwind) from the crest to the building site, in feet (meters).

   z: Height above ground surface at building site, in feet (meters).

   μ: Horizontal attenuation factor.

   γ: Height attenuation factor.

(3)2X4

F-2

1.1

4

HDU2

SW6

S-3

5

HDU2

T5

2

UP

HDU2

T2 SW6

HDU2

(E)

2

FOR HOLDOWN ANCHOR SIZE AND EMBEDMENT, SEE
SHEARWALL SCHEDULE A/S-3

HDU2

SW6 T6

HDU2

P

(3)2X4

7
S-3

4

HDU2

A

P

3.5X3.5 LVL 1.8E
P-2

T1 SW6

(3)2X4

4
S-3

HDU2

P

3.5X3.5 LVL 1.8E
P-2

2

2
S-3

1.1

1

F-1

P

6X6 OR 4X8 P-1

1
S-3

ALL FOOTINGS SHALL BEAR ON SUITABLE SOIL SUCH
AS MIN. OF MEDIUM DENSE NATIVE SOIL OR
COMPACTED STRUCTURAL FILL (NO SOFT OR ORGANIC
MATERIALS). GEOTECHNICAL ENGINEER MAY BE
REQUIRED TO ASSESS EXISTING SOIL CONDITIONS.

CONTRACTOR TO FIELD VERIFY SIZE OF EXISTING
FOOTING AND REPORT TO ENGINEER OF RECORD
(E.O.R.); IF MISSING OR INADEQUATE CUT EXISTING
SLAB ON GRADE AND POUR NEW PER SCHEDULE

4

EXISTING STUD WALL TO BE REMOVED; CONTRACTOR
TO PROVIDE TEMPORARY SHORING AS REQ'D PRIOR TO
DEMOLITION WORKS.

3
S-3

6
S-3

1' - 2"   1' - 2"

6"   6"   1.1

1.1

ALL FOOTINGS SHALL BEAR ON SUITABLE SOIL SUCH
AS MIN. OF MEDIUM DENSE NATIVE SOIL OR
COMPACTED STRUCTURAL FILL (NO SOFT OR ORGANIC
MATERIALS). GEOTECHNICAL ENGINEER MAY BE
REQUIRED TO ASSESS EXISTING SOIL CONDITIONS.

1' - 2"   6"

1.1

1' - 2"   6"

6"   1.1

1' - 2"

1

1

2

2

Labels and annotations on the plan:

- 2
- L25
- 1
- HDU2
- SW6
- 5
- 5
- 5
- 5
- 4
- 6 PROVIDE SIMPSON HU410 HANGER W/ (18) 1/4" X 1 3/4" TITEN TURBO SCREWS FOR NEW GLB BEAM TO EXISTING CONCRETE FOUNDATION WALL ATTACHMENT
- NEW (2)2X10 MEMBERS UNDER POSTS SUPPORTING ROOF BEAMS (B-1) TYP.
- NEW 3.5X12 GLB 24F-V4 DF/DF (B1-3)
- T5 SW6
- 4X4
- S-3
- 4X4
- EXISTING 2X10 FLOOR JOISTS @ 16" O.C. (VERIFIED) TO REMAIN
- P
- S-3 5
- 4
- (3)2X4
- CMSTC16X48
- P
- B
- EXISTING 2X10 FLOOR JOISTS @ 16" O.C. (VERIFIED) TO REMAIN
- 4X6
- 4
- 4
- S-3
- NEW BEAM (B1-1) OPTION 1: 8.75X12 GLB 24F-V4 DF/DF OPTION 2: W8X21 STEEL BEAM
- CS16X48
- 6.1 PROVIDE SIMPSON HGUM HANGER W/ (5) 5/8"X5" TITEN HD SCREWS FOR NEW GLB BEAM TO EXISTING CONCRETE FOUNDATION WALL ATTACHMENT
- T2 SW6
- CS16X48
- 3.5X3.5 LVL HDU2
- 5
- 5
- (3)2X4
- (3)2X4
- (3)2X4
- S-3
- (E)
- P
- SW6
- HDU2
- HDU2
- SW6
- 5
- HDU2
- HDU2
- SW6
- T14
- L17
- L18
- TYPICAL SLAB ON GRADE: 4" CONCRETE WITH #3 AT 18" E.W. (MID-DEPTH) OVER VAPOR BARRIER, & RIGID INSULATION PER ARCHITECTURAL DRAWINGS, ON 4" COMPACTED CRUSHED ROCK, PROVIDE 1" DEEP SAWCUT JOINT AT 15' MAX SPACING E.W.
- 6 S-3
- S-3 7
- EXISTING FLOOR JOISTS (ASSUMED) TO REMAIN
- B
- HDU2
- SW4
- T13
- NEW 3.5X7.25 LVL 1.8E BEAM (B1-2)
- (3)2X6
- (3)2X6
- (3)2X6
- A
- P
- (5)2X6 HDU2
- SW6
- HDU2
- HDU2
- SW6
- P
- HDU2
- L9
- L10
- S-3 4
- EXISTING FLOOR JOISTS (ASSUMED) TO REMAIN
- P
- P
- 3.5X3.5 LVL 1.8E
- SLAB ON GRADE SHALL BE MIN. 4" THICK WITH #3 AT 18" EACH WAY (AT MID-DEPTH) ON 4" COMPACTED CRUSHED ROCK. SAWCUT JOINT (1" DEEP) AT 15 FT MAX SPACING EACH WAY SHALL BE DONE WITHIN 4 TO 12 HOURS AFTER FINISHING, DEPENDING ON WEATHER.
- 3
- HDU2
- EXISTING FLOOR JOISTS (ASSUMED) TO REMAIN
- 5 INFILL EXISTING OPENING W/ 2X4 (MIN) STUDS @ 16" O.C. AND PROVIDE 15/32" PLYWOOD OR OSB SHEATHING, REF. TO PLAN AND SHEARWALL SCHEDULE FOR NAILING
- SW6
- T9
- NEW 4X10 HEADER (H1-1)
- MSTC48B3
- T1 SW6
- HDU2
- 5
- CS16X48
- SW6
- L1
- 2 FOR HOLDOWN ANCHOR SIZE AND EMBEDMENT, SEE SHEARWALL SCHEDULE A/S-3

ROOF PLAN

INSTALL NEW SHEATHING OVER EXISTING ROOF DECKING: 1/2" APA PLYWOOD ROOF SHEATHING WITH 6d AT 4" EDGE & BLOCKING NAILING AND 6d AT 9" FIELD NAILING & 16d NAILS AT 6" O.C. ALONG SHEARWALLS AND LOAD-BEARING WALLS

EXISTING ROOF BEAMS TO REMAIN (ASSUMED TO BE GLULAM - GLUE LAMINATED BEAMS. THE CONTRACTOR IS REQUIRED TO FIELD VERIFY AND REPORT BACK TO THE ENGINEER OF RECORD)

21' - 3"

NEW 4X10 HEADER (H2-4)

NEW 4X10 HEADER (H2-4)

PROVIDE SIMPSON HUC HANGER FOR NEW HEADER TO EXISTING ROOF BEAM ATTACHMENT

EXISTING 4X12 GLB (ASSUMED) ROOF BEAM TO REMAIN AS A GIRDER FOR NEW HEADER

EXISTING ROOF BEAMS TO REMAIN (ASSUMED TO BE GLULAM - GLUE LAMINATED BEAMS. THE CONTRACTOR IS REQUIRED TO FIELD VERIFY AND REPORT BACK TO THE ENGINEER OF RECORD)

1/2" APA PLYWOOD ROOF SHEATHING WITH 8d AT 6" EDGE & BLOCKING NAILING AND 8d AT 12" FIELD NAILING

NEW 2X12 RAFTERS WITH SPLICED 2X8 DF#1 RAFTERS @ 16" O.C. (RR-1)

NEW 2X12 RAFTERS WITH SPLICED 2X8 DF#1 RAFTERS @ 16" O.C. (RR-1)

BACKSPAN

NEW 3.5X9.25 LVL 1.8E HEADER (H2-2)

NEW 4X8 DF#1 HEADER (H2-1)

NEW CANT. (3)1.75X11.25 LVL 1.8E (RB-1)

FOR COMMON OPENING FRAMING DETAIL, PLEASE REFER TO B/S-3

CANTILEVER

NEW 3.5X15 GLB 24F-V4 HEADER (UP TO 1/4" MAX TOTAL DELFECTION) (H2-3)

NEW 2X8 ROOF RAFTERS @ 24" O.C.

NEW 3.5X9.25 LVL 1.8E HEADER (H2-6)

TAPER NEW LVL BEAM TO UP TO 7 1/4" AT CANTILEVERED END

INSTALL NEW SHEATHING OVER EXISTING ROOF DECKING: 1/2" APA PLYWOOD ROOF SHEATHING WITH 6d AT 4" EDGE & BLOCKING NAILING AND 6d AT 9" FIELD NAILING & 16d NAILS AT 6" O.C. ALONG SHEARWALLS AND LOAD-BEARING WALLS

SEISMIC BASE SHEAR CALCULATIONS PER IBC 2021 (ASCE 7-16)

Response Spectral Acc. (0.2 sec) S_s = 142.10%g   = 1.421g   Figure 22-1 through 22-14

Response Spectral Acc.(1.0 sec) S_1 = 49.40%g   = 0.494g   Figure 22-1 through 22-14

Soil Site Class | D | Table 20-3-1, Default = D

Site Coefficient F_a = 1.200

Site Coefficient F_v = 1.807

Max Considered Earthquake Acc. S_{MS} = $F_a.S_s$ = 1.705   Table 11.4-1

Max Considered Earthquake Acc. S_{M1} = $F_v.S_1$ = 0.893   Table 11.4-2

@ 5% Damped Design S_{DS} = 2/3(S_{MS})   = 1.137   (11.4-1)

S_{D1} = 2/3(S_{M1})   = 0.595   (11.4-2)

     (11.4-3)

     (11.4-4)

Building Occupancy Categories | II, Standard | Table 1-1

Design Category Consideration: | Flexible Diaphragm | with dist. between seismic resisting system >40ft

Seismic Design Category for 0.1sec   D   Table 11.6-1

Seismic Design Category for 1.0sec   D   Table 11.6-2

   S1 <.75g   NA   Section 11.6

Since Ta < .8Ts (see below), SDC =   D   **Control (exception of Section 11.6 does not apply)**

Comply with Seismic Design Category D | IRC, Seismic Design Category = D2 | T-R301.2.2.1.1

12.8 Equivalent lateral force procedure

Seismic Force Resisting Systems | 13. Light-framed walls sheathed with wood structural panels rated for shear resistance or st | T-12.2-

A. BEARING WALL SYSTEMS

C_t = 0.02   x = 0.75

Building ht. H_n = 20.25   ft   Limited Building Height (ft) = 65   T-12.8-2

C_u = 1.400   for S_{D1} of 0.595g   T-12.8-1

Approx Fundamental period, T_a = $C_t(h_n)^x$ = 0.191   12.8-7   Table 12.8-1 T_L = 6.000 Sec

Calculated T shall not exceed ≤ Cu.Ta

0.8Ts =   0.8(S_{D1} /S_{DS})   = 0.419   Control (exception of Section 11.6 does not apply)   Use T = | 0.191 | sec.

Is structure Regular & ≤ 5 stories ? | Yes | 12.8.1.3

Response Spectral Acc.(0.2 sec) S_s = 1.421g   Max Ss ≤ 1.5g

F_a = 1.20

@ 5% Damped Design S_{DS} = ⅔($F_a.S_s$)   = 1.137g   (11.4-3)

Response Modification Coef. R =   6.5   Table-12.2-1

Over Strength Factor Ω_o =   2.5   foot note b

Importance factor I =   1   Table 11.5-1

Seismic Base Shear V = $C_s W$

C_s = $\dfrac{S_{DS}}{R/I}$ =0.175   (12.8-2)

or need not to exceed, C_s = $\dfrac{S_{D1}}{(R/I).T}$ = 0.480   For T≤ T_L (12.8-3)

or C_s = $\dfrac{S_{D1}.T_L}{T^2(R/I)}$ N/A   For T > T_L (12.8-4)

C_s shall not be less than =   0.01

Min C_s =   0.5S_1.I/R   N/A   For S_1 ≥ 0.6g   (12.8-5)

Use C_s = 0.175   (12.8-6)

Design base shear V = 0.175 W   **Control**

WIND FORCES CALCULATIONS PER IBC 2021 (ASCE 7-16)

Ultimate wind speed =	98 MPH
Bldg. Classification =	II
Exposure =	B
K_{zt} =	1.000
Roof Pitch =	1.50 : 12
Mean Roof Height h =	18 ft

CHAPTER 28-MWFRS (ENVELOPE PROCEDURE)

TRANSVERSE ELEV.

-12.69G
-18.26E

-8.26H
-10.74F

θ= 7.1

All forces shown in psf

= 60.25

18

-4.49D
-7.59B

10.63C
16.03A

LONGITUDINAL ELEV.

-12.69G
-18.26E

-8.06H
-10.43F

10.08C
15.18A

= 49

H =21.8

PLAN VIEW

15.18A

10.08C

60.25 ft

2a= 9.8ft

13.00 k
10.9 psf

10.33 kips
9.7psf

49 ft

10.63C

16.03A

9.8ft

All forces shown in psf

FIGURE 28.4-1, Main Wind Force System

10 % of least dimension=	4.9 ft
40 % of the eave height =	7.2 ft
4 % of least dimension or 3 ft=	3.0 ft
therefore a =	4.9 ft

Example: $p_s = \lambda K_{zt} I p_{s30}$

MWFRS

Load Direction	Roof Angle	Horizontal Loads				Vertical Loads				Overhang	
		End Zone		Interior zone		End Zone		Interior zone			
		Wall (A)	Roof (B)	Wall (C)	Roof (D)	WW (E)	LW (F)	WW (G)	LW (H)	E_{OH}	G_{OH}
Transverse	7.1	16.03	-7.59	10.63	-4.49	-18.26	-10.74	-12.69	-8.26	-25.61	-20.04
Longitudinal	All	15.18	-7.94	10.08	-4.74	-18.26	-10.43	-12.69	-8.06	-25.61	-20.04

* If roof pressure under horizontal loads is less than zero, use zero

Plus and minus signs signify pressures acting toward and away from projected surfaces, respectively.

For the design of the longitudinal MWFRS use Θ = 0°, and locate the zone E/F, G/H boundary at the mid-length of the building

b2 structural engineers
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7516 NE 153rd Place NE
Kenmore, WA 98028
(425) 296-2993

Job No.		Sheet No.	
Project No.		Sheet Title	
Checked By		Made By	
Date		Date	

WIND FORCES:

Transverse Direction

LOCATION	WIDTH	HEIGHT	INTERIOR PRESSURE	END ZONE PRESSURE	FORCE		SUBTOTAL
END ZONE WIDTH	9.8	FT					
ROOF							
T.O.Roof to Parapet	49	0.0	-4.49	-7.59	0	=	
T.O. Roof TO MID	49	6.00	10.63	16.03	3761	=	3761
5th FLOOR							
MID TO FLOOR	49		10.63	16.03	0	=	
FLOOR TO MID	49		10.63	16.03	0	=	0
4th FLOOR							
MID TO FLOOR	49		10.63	16.03	0	=	
FLOOR TO MID	49		10.63	16.03	0	=	0
3rd FLOOR							
MID TO FLOOR	49		10.63	16.03	0	=	
FLOOR TO MID	49		10.63	16.03	0	=	0
2nd FLOOR							
MID TO FLOOR	49	6.00	10.63	16.03	3761	=	
FLOOR TO MID	0	4.00	10.63	16.03	423	=	0

TOTAL FOR WALL SHEAR: 4184 **7.95 Kips**

Longitudinal Direction

LOCATION	WIDTH	HEIGHT	INTERIOR PRESSURE	END ZONE PRESSURE	FORCE		SUBTOTAL
ROOF							
T.O.Roof to Parapet	60.25	0.0		15.18	0		
T.O. Roof TO MID	60.25	6.00	10.08	15.18	4243		4243
5th FLOOR							
MID TO FLOOR	60.25	0.0	10.08	15.18	0		
FLOOR TO MID	60.25	0.0	10.08	15.18	0		0
4th FLOOR							
MID TO FLOOR	60.25	0.0	10.08	15.18	0		
FLOOR TO MID	60.25	0.0	10.08	15.18	0		0
3rd FLOOR							
MID TO FLOOR	60.25	0.00	10.08	15.18	0		
FLOOR TO MID	60.25	0.00	10.08	15.18	0		0
2nd FLOOR							
MID TO FLOOR	60.25	6.00	10.08	15.18	4243		
FLOOR TO MID	60.25	4.00	10.08	15.18	2829		0

TOTAL FOR WALL SHEAR: 7072 **11.32 Kips**

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DEAD LOAD WEIGHTS FOR SEISMIC FORCE CALCULATIONS:

Unit Roof Weight:	10 psf
Unit Floor Weight:	12 psf
Unit Exterior Wall Weight :	9 psf
Unit Interior Corridor Wall Weight:	0 psf
Unit Interior Party Wall Weight:	0 psf
Unit Interior Partition Wall Weight:	6.5 psf

LOCATION		LENGTH	HEIGHT	UNIT WT.	TOTAL WEIGHT	SUB TOTAL	
ROOF DIAPHRAGM	Roof	3082		10	= 30820		
	Ext. Wall Below	218.5	5.00	9	= 9833		psf 15
	Corridor Wall Below	0		0	= 0		
	Party Wall Below	0		0	= 0		
	Partition Wall Below	153	5.00	6.5	= 4973	45626	
FIFTH FLOOR DIAPHRAGM	Floor	1		12	= 0		
	Ext. Wall Above	0		9	= 0		psf #DIV/0!
	Corridor Wall Above	0		0	= 0		
	Party Wall Above			6.5	= 0		
	Partition Wall Above	0	5.00	6.5	= 0		
	Ext. Wall Below			9	= 0		
	Corridor Wall Below			0	= 0		
	Party Wall Below			0	= 0		
	Partition Wall Below			6.5	= 0	0	
FOURTH FLOOR DIAPHRAGM	Floor	1		12	= 0		
	Ext. Wall Above	0		9	= 0		psf #DIV/0!
	Corridor Wall Above	0		0	= 0		
	Party Wall Above			6.5	= 0		
	Partition Wall Above		6.5	= 0			
	Ext. Wall Below			9	= 0		
	Corridor Wall Below	0		0	= 0		
	Party Wall Below			0	= 0		
	Partition Wall Below			6.5	= 0	0	
THIRD FLOOR DIAPHRAGM	Floor	1		12	= 0		
	Ext. Wall Above			9	= 0		psf
	Corridor Wall Above			0	= 0		
	Party Wall Above			6.5	= 0		
	Partition Wall Above			6.5	= 0		
	Ext. Wall Below			9	= 0		
	Corridor Wall Below			0	= 0		
	Party Wall Below			0	= 0		
	Partition Wall Below			6.5	= 0	0	
SECOND FLOOR DIAPHRAGM	Floor	2356		12	= 28272		
	Ext. Wall Above	218.5	5.00	9	= 9833		psf 21
	Corridor Wall Above	0		0	= 0		
	Party Wall Above	0		0	= 0		
	Partition Wall Above	153	5.00	6.5	= 4973		
	Ext. Wall Below	80	4.00	9	= 2880		
	Corridor Wall Below	0		0	= 0		
	Party Wall Below	0		0	= 0		
	Partition Wall Below	129	4.00	6.5	= 3354	49312	

STRUCTURE WEIGHT FOR BASE SHEAR TOTAL: **94.9 Kips**

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Checked By					
Date				Date	

Vertical Seismic Distribution

Cs = 0.17 W
W = 94.9 kips
V = 16.6 kips
Rho = 1

Important: It is assumed that the R value is the same for both directions

Floor	Story Height Hi (ft)	Total Height Ht (ft)	Story Weight Wi (kips)	Wi*Ht (k-ft)		N/S Direction			E/W Direction				
						Story Force Fi (kips)	Story Shear E (kips)		Story Force Fi (kips)	Story Shear E (kips)	Mot E (kip-ft)		
Roof	10.00	18.00	45.6	821		11.2	0.0		11.2	0.0	201.89		
5th	0.00	8.00	0.0	0		0.0	0.0		0.0	0.0	0		
4th	0.00	8.00	0.0	0		0.0	0.0		0.0	0.0	0		
3rd	0.00	8.00	0.0	0		0.0	0.0		0.0	0.0	0		
2nd	8.00	8.00	49.3	394		5.4	5.4		5.4	5.4	43.1		
			94.9	1216		16.6			16.6				
						16.60	**16.60**		**16.60**	**244.99**			

Diaphragm Seismic Distribution

Floor	Story Height Hi (ft)	Total Height Ht (ft)	Story Weight Wi (kips)	Force Distribution Fx (kips)	Calculated Fpx (kips)	Max Fpx (kips)	Min Fpx (kips)	Governing Fpx (kips)	Transverse Fpx (plf)	Longitudinal Fpx (plf)
Roof	10.00	20.00	45.6	11.2	11.2	20.7	10.4	**11.2**	**219**	**178**
5th	0.00	10.00	0.0	0.0	0.0	0.0	0.0	**0.0**	**#DIV/0!**	**#DIV/0!**
4th	0.00	10.00	0.0	0.0	0.0	0.0	0.0	**0.0**	**#DIV/0!**	**#DIV/0!**
3rd	0.00	10.00	0.0	0.0	0.0	0.0	0.0	**0.0**	**#DIV/0!**	**#DIV/0!**
2nd	10.00	10.00	49.3	5.4	8.6	22.4	11.2	**11.2**	**11.2**	**11.2**
			94.9	16.6						

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Date				Date	

Lateral Forces Summary

Level	Wind (Trans.) (kips)	Wind (Long.) (kips)	Seismic (Trans.) (kips)	Seismic (Long.) (kips)
Roof	3.76	4.24	11.22	11.22
Fifth	0.00	0.00	0.00	0.00
Fourth	0.00	0.00	0.00	0.00
Third	0.00	0.00	0.00	0.00
Second	4.18	7.07	5.39	5.39
Total	7.95	11.32	16.60	16.60

Controlling:
Transverse - Seismic
Longitudinal - Seismic

Transverse Direction

11.22 k

5.39 k

0.00 k

0.00 k

0.00 k

Longitudinal Direction

11.22 k

5.39 k

0.00 k

0.00 k

0.00 k
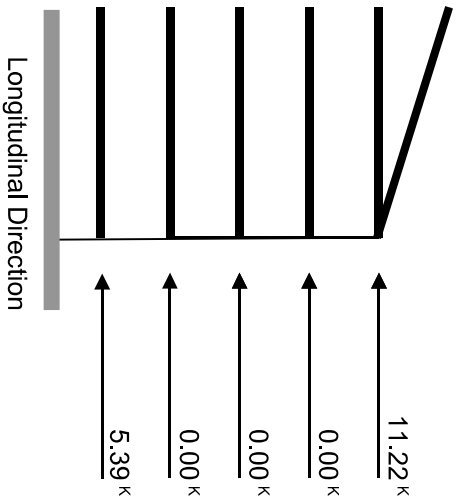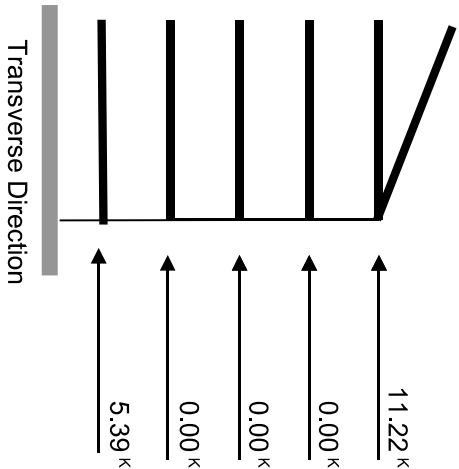
SECOND STORY
Shearwall forces -Transverse Direction

Story shear(kips) =	11.22	
Story height (ft) =	10.00	
Floor depth (ft)=	1.00	
Total Width(Ft) =	49.00	

Seismic

Accumulated shear(kips)= 11.22

SEG= SEGMENTAL SHEARWALL METHOD
PERF = PERFORATED SHEARWALL METHOD
FTM = SHEAR TRANSFER METHOD

Story	Wall	Method	Wall D (ft)	Σ Opening Width (ft)	PERF Ao (ft²)	PERF Σ Li (ft)	FTM Opening Width (ft)	FTM Opening Height (ft)	PERF/FTM Wall Width (ft)	Trib.Width (ft)	Story DL (klf)	PERF r	PERF Co	Sheathing Ratio	h/w Ratio	%Sharing	Story V(kips)	Sum V(kips)	Sum DL(klf)	Wall Shear (plf)	Sum OTM(k-ft)	RM (k-ft)	Resultant HD(kips)	FTM Bound. Shear(k)	Force at Opening(k)	Wall
2	T1	SEG	2.75			0.00	0.00			10.00	0.26	0.00	0.00	1.00	3.27	0.31	0.72	0.72	0.26	428	7.19	0.97	2.30	0.00	0.00	T1
2	T2	SEG	6.00			0.00	0.00			10.00	0.00	0.00	0.00	1.00	1.50	0.69	1.57	1.57	0.00	262	15.70	0.00	2.62	0.00	0.00	T2
2	T3	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T3
2	T4	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T4
2	T5	SEG	15.25			0.00	0.00			9.90	0.00	0.00	0.00	1.00	0.59	1.00	2.27	2.27	0.00	149	22.66	0.00	1.49	0.00	0.00	T5
2	T6	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T6
2	T7	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T7
2	T8	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T8
2	T9	SEG	9.25			0.00	0.00			17.00	0.00	0.00	0.00	1.00	0.97	1.00	3.89	3.89	0.00	421	38.91	0.00	4.21	0.00	0.00	T9
2	T10	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T10
2	T11	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T11
2	T12	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T12
2	T13	SEG	2.90			0.00	0.00			12.10	0.00	0.00	0.00	1.00	3.10	0.39	1.07	1.07	0.00	571	10.67	0.00	3.68	0.00	0.00	T13
2	T14	SEG	4.63			0.00	0.00			12.10	0.00	0.00	0.00	1.00	1.95	0.61	1.70	1.70	0.00	368	17.02	0.00	3.68	0.00	0.00	T14
2	T15	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T15
2	T16	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T16
2	T17	SEG	0.00			0.00	0.00				0.00	0.00	0.00	1.00	9000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T17
2	T18	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T18
2	T19	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T19
2	T20	SEG	0.00			0.00	0.00				0.00	0.00	0.00	1.00	9000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T20
2	T21	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T21
2	T22	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T22
2	T23	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T23
2	T24	SEG	0.00			0.00	0.00				0.00	0.00	0.00	1.00	9000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T24
2	T25	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T25
2	T26	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T26
2	T27	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T27
2	T28	SEG	0.00			0.00	0.00				0.00	0.00	0.00	1.00	9000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T28
2	T29	SEG	0.00			0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T29
2	T30	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T30
2	T31	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T31
2	T32	SEG				0.00	0.00				0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T32
Sum			-40.78				0.00			49.00				1.00	#DIV/0!	0.00	11.22	11.22	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	Sum

FIRST STORY
Shearwall forces -Transverse Direction

Seismic

Story shear(kips) = 5.39
Story height (ft) = 9.00
Floor depth (ft) = 1.00
Total Width(Ft) = 49.00

Accumulated shear(kips) = 16.60

SEG= SEGMENTAL SHEARWALL METHOD
PERF = PERFORATED SHEARWALL METHOD
FTM = SHEAR TRANSFER METHOD

Story	Wall	Method	Wall D(ft)	Σ Opening Width (ft)	PERF A_c (ft²)	PERF Σ Li (ft)	FTM Opening Width (ft)	FTM Opening Height (ft)	PERF/FTM Wall Width(ft)	Trib.Width (ft)	Story DL(klf)	PERF r	PERF Co	Sheathing Ratio	h/w Ratio	%Sharing	Story V(kips)	Sum V(kips)	Sum DL(klf)	Wall Shear (plf)	Sum OTM(k-ft)	RM (k-ft)	Resultant HD(kips)	FTM Bound. Shear(k)	Force at Opening(k)	Wall
1	T1	SEG	7.00			0.00				10.00	0.08	0.00	0.00	1.00	1.14	0.54	0.59	1.82	0.34	261	23.62	8.24	2.31	0.00	0.00	T1
1	T2	SEG	6.00			0.00				10.00	0.11	0.00	0.00	1.00	1.33	0.46	0.51	1.56	0.11	261	29.77	2.00	4.66	0.00	0.00	T2
1	T3	SEG				0.00						0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T3
1	T4	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T4
1	T5	SEG	4.75			0.00				9.90	0.21	0.00	0.00	1.00	1.68	0.56	0.61	1.87	0.21	395	39.53	2.34	3.94	0.00	0.00	T5
1	T6	SEG	3.75			0.00				9.90	0.21	0.00	0.00	1.00	2.13	0.44	0.48	1.48	0.21	421	13.32	1.46	3.94	0.00	0.00	T6
1	T7	SEG				0.00						0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T7
1	T8	SEG				0.00						0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T8
1	T9	SEG	0.00		CONCRETE SHEARWALL	0.00				17.00	0.00	0.00	0.00	1.00	1.00	1.00	1.87	5.76	0.00	23042182902	90.76	0.00	90758.32	0.00	0.00	T9
1	T10	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T10
1	T11	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T11
1	T12	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T12
1	T13	SEG	0.00		CONCRETE SHEARWALL	0.00				12.10	0.00	0.00	0.00	1.00	8000.00	1.00	1.33	4.10	0.00	1640612529	47.58	0.00	47575.38	0.00	0.00	T13
1	T14	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	17.02	0.00	#DIV/0!	0.00	0.00	T14
1	T15	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T15
1	T16	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T16
1	T17	SEG	0.00			0.00						0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T17
1	T18	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T18
1	T19	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T19
1	T20	SEG	0.00			0.00						0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T20
1	T21	SEG	0.00			0.00						0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T21
1	T22	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T22
1	T23	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T23
1	T24	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T24
1	T25	SEG	0.00			0.00						0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T25
1	T26	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T26
1	T27	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T27
1	T28	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T28
1	T29	SEG	0.00			0.00						0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00	0.00	T29
1	T30	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T30
1	T31	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T31
1	T32	SEG				0.00						0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	0.00	0.00	T32
Sum			21.50			0.00				49.00							5.39	16.60	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	Sum

SECOND STORY
Shearwall forces -Longitudinal Direction

Story height (ft) = 9.00
Floor depth (ft) = 1.00
Total Width(Ft) = 60.25
Story shear(kips) = 11.22

Seismic

Accumulated shear(kips) = 11.22

SEG= SEGMENTAL SHEARWALL METHOD
PERF = PERFORATED SHEARWALL METHOD
FTM = SHEAR TRANSFER METHOD

Story	Wall	Method	Wall D(ft)	Σ Opening Width (ft)	PERF A_h (ft²)	PERF Σ Li (ft)	FTM Opening Width (ft)	FTM Opening Height (ft)	PERF/FTM Wall Width(ft)	Trib.Width (ft)	Story DL(klf)	PERF r	PERF Co	Sheathing Ratio	h/w Ratio	%Sharing	Story V(kips)	Sum V(kips)	Sum DL(klf)	Wall Shear(plf)	Sum OTM(k-ft)	RM (k-ft)	Resultant HD(kips)	FTM Bound. Shear(k)	Force at Opening(k)	Wall
2	L1	SEG	19.9		0.00	0.00				12.00	0.08	0.00	0.00	1.00	0.40	1.00	2.23	2.23	0.08	112	20.11	15.63	0.30	0.00	0.00	L1
2	L2	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L2
2	L3	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L3
2	L4	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L4
2	L5	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L5
2	L6	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L6
2	L7	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L7
2	L8	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L8
2	L9	SEG	4.0		0.00	0.00				17.25	0.20	0.00	0.00	1.00	2.00	0.24	0.78	0.78	0.20	195	7.01	1.58	1.40	0.00	0.00	L9
2	L10	SEG	12.5		0.00	0.00				17.25	0.20	0.00	0.00	1.00	0.64	0.76	2.43	2.43	0.20	195	21.90	15.47	0.64	0.00	0.00	L10
2	L11	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L11
2	L12	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L12
2	L13	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L13
2	L14	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L14
2	L15	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L15
2	L16	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L16
2	L17	SEG	9.7		0.00	0.00				17.75	0.12	0.00	0.00	1.00	0.82	1.00	3.30	3.30	0.12	341	29.74	5.79	2.53	0.00	0.00	L17
2	L18	SEG			0.00	0.00				17.75	0.12	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L18
2	L19	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L19
2	L20	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L20
2	L21	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L21
2	L22	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L22
2	L23	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L23
2	L24	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L24
2	L25	PERF	34.0	13.36	42.35	20.64			2.25	13.25	0.08	0.80	0.93	0.61	3.56	1.00	2.47	2.47	0.08	228	22.20	45.64	-0.98	0.00	0.00	L25
2	L26	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L26
2	L27	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L27
2	L28	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L28
2	L29	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L29
2	L30	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L30
2	L31	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L31
2	L32	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L32
	Sum		36.4		0.00						60.25	0.00						11.22	11.22	0.00							Sum

FIRST STORY
Shearwall forces -Longitudinal Direction

Story height (ft) =	9.00	Seismic
Floor depth (ft) =	1.00	
Total Width(Ft) =	60.25	
Story shear(kips) =	5.39	Accumulated shear(kips) = 16.60

SEG = SEGMENTAL SHEARWALL METHOD
PERF = PERFORATED SHEARWALL METHOD
FTM = SHEAR TRANSFER METHOD

Story	Wall	Method	Wall D(ft)	Σ Opening Width (ft)	PERF A_h (ft²)	PERF ΣLi(ft)	FTM Opening Width(ft)	FTM Opening Height (ft)	PERF/FTM Wall Width(ft)	Trib.Width (ft)	Story DL(klf)	PERF r	PERF Co	Sheathing Ratio	h/w Ratio	%Sharing	Story V(kips)	Sum V(kips)	Sum DL(klf)	Wall Shear(plf)	Sum OTM(k-ft)	RM (k-ft)	Resultant HD(kips)	FTM Bound. Shear(k)	Force at Opening(k)	Wall
1	L1	SEG	0.00		0.00	0.00					0.08	0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.16	0	20.11	0.00	20105.42	0.00	0.00	L1
1	L2	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L2
1	L3	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L3
1	L4	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L4
1	L5	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L5
1	L6	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L6
1	L7	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L7
1	L8	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L8
1	L9	SEG	0.00		0.00	0.00					0.00	0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.20	0	7.01	0.00	7006.43	0.00	0.00	L9
1	L10	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.20	#DIV/0!	21.90	0.00	#DIV/0!	#DIV/0!	0.00	L10
1	L11	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L11
1	L12	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L12
1	L13	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L13
1	L14	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L14
1	L15	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L15
1	L16	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L16
1	L17	SEG	0.00		0.00	0.00					0.00	0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.12	0	29.74	0.00	29739.26	0.00	0.00	L17
1	L18	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.12	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L18
1	L19	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L19
1	L20	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L20
1	L21	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L21
1	L22	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L22
1	L23	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L23
1	L24	SEG	0.00		0.00	0.00					0.00	0.00	0.00	1.00	8000.00	1.00	0.00	0.00	0.08	0	22.20	0.00	22199.73	0.00	0.00	L24
1	L25	SEG	0.00		0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.08	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L25
1	L26	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L26
1	L27	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L27
1	L28	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L28
1	L29	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L29
1	L30	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L30
1	L31	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L31
1	L32	SEG			0.00	0.00					0.00	0.00	0.00	1.00	#DIV/0!	0.00	0.00	0.00	0.00	#DIV/0!	0.00	0.00	#DIV/0!	#DIV/0!	0.00	L32
Sum			0.0		0.00	0.00											0.00	0.00		0.00	0.00		0.00			Sum

SHEARWALL, DIAPHRAGM, STRAP AND HOLDOWN CAPACITY TABLE PER IBC 2018

PLYWOOD SHEATHED SHEARWALL

	LRFD CAPACITY (SEISMIC/WIND)	COMMENT
SW6 (15/32" PLYWOOD WITH 10d AT 6" AT EDGE, 10d AT 12" FIELD NAILING)	496 PLF/ 696 PLF	SDPWS TABLE 4.3A
SW4 (15/32" PLYWOOD WITH 10d AT 4" AT EDGE, 10d AT 12" FIELD NAILING)	736 PLF/ 1032 PLF	MULTIPLY VALUES BY TWO IF SHEATHING
SW3 (15/32" PLYWOOD WITH 10d AT 3" AT EDGE, 10d AT 12" FIELD NAILING)	960 PLF/ 1344PLF	APPLIED ON BOTH SIDES
SW2 (15/32" PLYWOOD WITH 10d AT 2" AT EDGE, 10d AT 12" FIELD NAILING)	1232 PLF/ 1724 PLF	

UNBLOCKED FLOOR DIAPHRAGM

	LRFD CAPACITY (SEISMIC/WIND)	COMMENT
15/32" PLYWOOD WITH 8d AT 6" AT EDGE, 8d AT 12" FIELD NAILING	368 PLF/ 516 PLF	SPDWS TABLE 4.2B
15/32" PLYWOOD WITH 10d AT 6" AT EDGE, 10d AT 12" FIELD NAILING	408 PLF/ 572 PLF	
19/32" PLYWOOD WITH 10d AT 6" AT EDGE, 10d AT 12" FIELD NAILING	456 PLF/ 640 PLF	

SIMPSON'S FLOOR STRAP

	LRFD CAPACITY (SEISMIC/WIND)	COMMENT
CS18	1916 LBS/ 2190 LBS	12" END LENGTH
CS16	2363 LBS/ 2700 LBS	14" END LENGTH
CS14	3487 LBS/ 3985 LBS	20" END LENGTH
CMSTC16	6236 LBS/ 7336 LBS	26" END LENGTH
CMSTC14	9086 LBS/ 10384 LBS	36" END LENGTH

SIMPSON'S HOLDOWN

	LRFD CAPACITY (SEISMIC/WIND)	COMMENT
HDU2	4305 LBS/ 4920 LBS	
HDU4	6391 LBS/ 7304 LBS	
HDU5	7903 LBS/ 9032 LBS	
HDU8	9471 LBS/ 10824 LBS	
LSTHD8/ LSTHD8RJ AT 6" STEMWALL	2730 LBS/ 3120 LBS	CRACKED CONCRETE (CORNER CONDITION)
STHD10/ STH10RJ AT 6" STEMWALL	3700 LBS/ 4224 LBS	CRACKED CONCRETE (CORNER CONDITION)
STHD14/ STHD14RJ AT 6" STEMWALL	5173 LBS/ 5912 LBS	CRACKED CONCRETE (CORNER CONDITION)
LSTHD8/ LSTHD8RJ AT 8" STEMWALL	2730 LBS/ 3120 LBS	CRACKED CONCRETE (CORNER CONDITION)
STHD10/ STH10RJ AT 8" STEMWALL	4116 LBS/ 4700 LBS	CRACKED CONCRETE (CORNER CONDITION)
STHD14/ STHD14RJ AT 8" STEMWALL	5340 LBS/ 6100 LBS	CRACKED CONCRETE (CORNER CONDITION)

SIMPSON'S ANCHOR BOLT FOR SHEARWALL HOLDOWNS

	LRFD CAPACITY (SEISMIC/WIND)	COMMENT
SSTB16 (5/8" DIAMETER, 12 5/8" MIN. EMBED., 6" STEMWALL)	3570 LBS/ 5776 LBS	2500 PSI MIN. CONCRETE (CORNER CONDITION)
SSTB20 (5/8" DIAMETER, 16 5/8" MIN. EMBED., 6" STEMWALL)	4403 LBS/ 6464 LBS	1 3/4" MIN. EDGE DISTANCE
SB 5/8"X24 (5/8" DIAMETER, 18" MIN. EMBED., 6" STEMWALL)	8022 LBS/ 10680 LBS	
SB 7/8"X24 (7/8" DIAMETER, 18" MIN. EMBED., 8" STEMWALL)	10997 LBS/ 14968 LBS	
SB 1"X30 (1" DIAMETER, 24" MIN. EMBED., 8" STEMWALL)	11640 LBS/ 15848 LBS	

Project: SIM RESIDENCE

Location: H2-1
Multi-Loaded Multi-Span Beam
Multi-Loaded Multi-Span Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 7.25 IN x 7.5 FT
#1 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 5.6%
Controlling Factor: Moment

DEFLECTIONS   Center
Live Load	0.12	IN L/737
Dead Load	0.07	in
Total Load	0.19	IN L/464

Live Load Deflection Criteria: L/360   Total Load Deflection Criteria: L/240

REACTIONS
	A	B
Live Load	1215 lb	1215 lb
Dead Load	714 lb	714 lb
Total Load	1929 lb	1929 lb
Bearing Length	0.88 in	0.88 in

BEAM DATA   Center
Span Length	7.5 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	7.5 ft
Live Load Duration Factor	1.15
Notch Depth	0.00

MATERIAL PROPERTIES
#1 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	Fb = 1000 psi	Fb' = 1495 psi
	Cd=1.15 CF=1.30	
Shear Stress:	Fv = 180 psi	Fv' = 207 psi
	Cd=1.15	
Modulus of Elasticity:	E = 1700 ksi	E' = 1700 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ = 625 psi	Fc - $\perp$' = 625 psi

Controlling Moment: 3618 ft-lb
 3.75 Ft from left support of span 2 (Center Span)
 Created by combining all dead loads and live loads on span(s) 2
Controlling Shear: 1929 lb
 At left support of span 2 (Center Span)
 Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	29.04 in3	30.66 in3
Area (Shear):	13.98 in2	25.38 in2
Moment of Inertia (deflection):	57.45 in4	111.15 in4
Moment:	3618 ft-lb	3820 ft-lb
Shear:	1929 lb	3502 lb

LOADING DIAGRAM
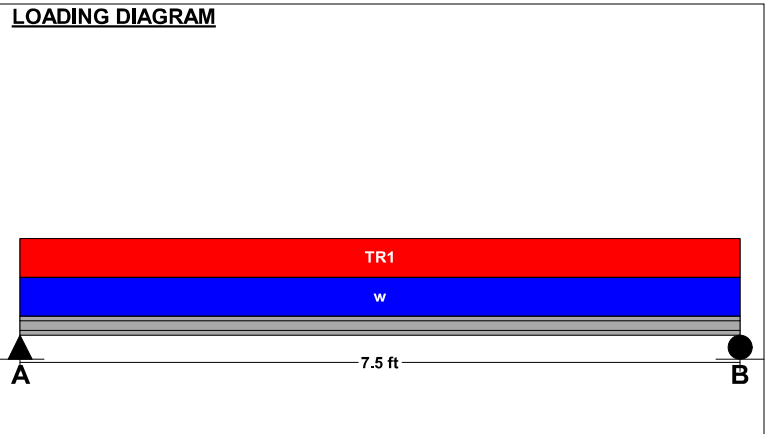
UNIFORM LOADS   Center*
Uniform Live Load	324	plf
Uniform Dead Load	155	plf
Beam Self Weight	6	plf
Total Uniform Load	485	plf

* Load obtained from Load Tracker. See Summary Report for details.

TRAPEZOIDAL LOADS - CENTER SPAN
Load Number	One
Left Live Load	0 plf
Left Dead Load	30 plf
Right Live Load	0 plf
Right Dead Load	30 plf
Load Start	0 ft
Load End	7.5 ft
Load Length	7.5 ft

Project: SIM RESIDENCE

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Location: H2-2
Uniformly Loaded Floor Beam
Uniformly Loaded Floor Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 9.25 IN x 10.3 FT
1.5E-2250F - APA EWS LVL Stress Classes
Section Adequate By: 41.2%
Controlling Factor: Moment

DEFLECTIONS   Center
Live Load   0.20   IN L/615
Dead Load   0.16   in
Total Load   0.36   IN L/340
Live Load Deflection Criteria: L/360   Total Load Deflection Criteria: L/240

REACTIONS   A   B
Live Load   885   lb   885   lb
Dead Load   886   lb   886   lb
Total Load   1771   lb   1771   lb
Bearing Length   0.67   in   0.67   in

BEAM DATA   Center
Span Length   10.3   ft
Unbraced Length-Top   0   ft
Floor Duration Factor   1.15
Notch Depth   0.00

MATERIAL PROPERTIES
1.5E-2250F - APA EWS LVL Stress Classes

	Base Values		Adjusted	
Bending Stress:	Fb =	2250 psi	Fb' =	2693 psi
	Cd=1.15 CF=1.04			
Shear Stress:	Fv =	285 psi	Fv' =	328 psi
	Cd=1.15			
Modulus of Elasticity:	E =	1500 ksi	E' =	1500 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	750 psi	Fc - ⊥' =	750 psi

Controlling Moment: 7933 ft-lb
   5.15 ft from left support
   Created by combining all dead and live loads.
Controlling Shear: -1771 lb
   At support.
   Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	35.34 in3	49.91 in3
Area (Shear):	8.1 in2	32.38 in2
Moment of Inertia (deflection):	162.72 in4	230.84 in4
Moment:	7933 ft-lb	11202 ft-lb
Shear:	-1771 lb	7074 lb

LOADING DIAGRAM
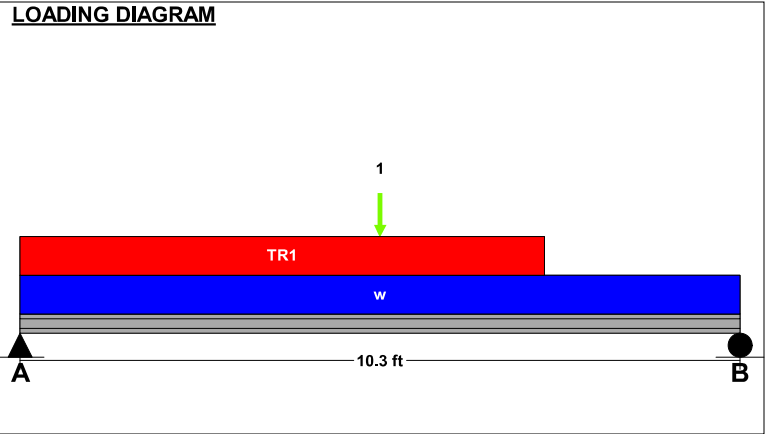
FLOOR LOADING

		Side 1	Side 2
Floor Live Load	FLL =	0 psf	0 psf
Floor Dead Load	FDL =	0 psf	0 psf
Floor Tributary Width	FTW =	0 ft	0 ft
Wall Load	WALL =	80 plf	

BEAM LOADING
Beam Total Live Load: wL =   0 plf
Beam Total Dead Load: wD =   80 plf
Beam Self Weight: BSW =   9 plf
Total Maximum Load: wT =   89 plf

POINT LOADS - CENTER SPAN
Load Number   One
Live Load   1770 lb
Dead Load   850 lb
Location   5.15 ft

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

Location: B1-1

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Combination Roof And Floor Beam
Combination Roof And Floor Beam [2018 International Building Code(2018 NDS
8.75 IN x 12.0 IN x 14.0 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 17.2%
Controlling Factor: Deflection

DEFLECTIONS   Center
Live Load	0.23	IN L/727
Dead Load	0.17	in
Total Load	0.40	IN L/422

Live Load Deflection Criteria: L/480   Total Load Deflection Criteria: L/360

REACTIONS   A   B
Live Load	4513	lb	3679	lb
Dead Load	3236	lb	2710	lb
Total Load	7749	lb	6389	lb
Bearing Length	1.36	in	1.12	in

BEAM DATA   Center
Span Length	14	ft
Unbraced Length-Top	0	ft
Roof Pitch	6	:12
Floor Duration Factor	1.00	
Roof Duration Factor	1.15	
Camber Adj. Factor	1.5	
Camber Required	0.25	
Notch Depth	0.00	

MATERIAL PROPERTIES
24F-V4 - Visually Graded Western Species

	Base Values		Adjusted
Bending Stress:	Fb = 2400 psi	*Controlled by:*	
	Fb_cmpr = 1850 psi	Fb' =	2369 psi
	Cd=1.00 Cv=0.99		
Shear Stress:	Fv = 265 psi	Fv' =	265 psi
	Cd=1.00		
Modulus of Elasticity:	E = 1800 ksi	E' =	1800 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ = 650 psi	Fc - $\perp$' =	650 psi

Controlling Moment: 26048 ft-lb
  7.0 ft from left support
  Created by combining all dead and live loads.
Controlling Shear: 7749 lb
  At support.
  Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	131.94 in3	210 in3
Area (Shear):	43.86 in2	105 in2
Moment of Inertia (deflection):	1075.35 in4	1260 in4
Moment:	26048 ft-lb	41460 ft-lb
Shear:	7749 lb	18550 lb

LOADING DIAGRAM

ROOF LOADING
		Side 1	Side 2
Roof Live Load	RLL =	0 psf	0 psf
Roof Dead Load	RDL =	0 psf	0 psf
Roof Tributary Width	RTW =	0 ft	0 ft

FLOOR LOADING
		Side 1	Side 2
Floor Live Load	FLL =	30 psf	0 psf
Floor Dead Load	FDL =	15 psf	0 psf
Floor Tributary Width	FTW =	12.1 ft	0 ft
Wall Load	WALL =	80 plf	

BEAM LOADING
Roof Uniform Live Load:	wL-roof =	0 plf
Roof Uniform Dead Load:	wD-roof =	0 plf
Floor Uniform Live Load:	wL-floor =	363 plf
Floor Uniform Dead Load:	wD-floor =	182 plf
Beam Self Weight:	BSW =	23 plf
Combined Uniform Live Load:	wL =	363 plf
Combined Uniform Dead Load:	wD =	284 plf
Combined Uniform Total Load:	wT =	647 plf

POINT LOADS - CENTER SPAN
Load Number	One	Two
Live Load	1555 lb	1555 lb
Dead Load	983 lb	983 lb
Location	2 ft	8.25 ft

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

Location: F-1
Footing
Footing [2018 International Building Code(2018 NDS)]
Footing Size: 2.5 FT x 2.5 FT x 10.00 IN
Reinforcement: #4 Bars @ 11.00 IN. O.C. E/W / (3) min.
Section Footing Design Adequate

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of

FOOTING PROPERTIES
Allowable Soil Bearing Pressure:	Qs =	1500 psf
Concrete Compressive Strength:	F'c =	2500 psi
Reinforcing Steel Yield Strength:	Fy =	40000 psi
Concrete Reinforcement Cover:	c =	3 in

FOOTING SIZE
Width:	W =	2.5 ft
Length:	L =	2.5 ft
Depth:	Depth =	10 in
Effective Depth to Top Layer of Steel:	d =	6.25 in

COLUMN AND BASEPLATE SIZE
Column Type:	Wood	
Column Width:	m = 6 in	
Column Depth:	n = 6 in	

FOOTING CALCULATIONS

Bearing Calculations:
Ultimate Bearing Pressure:	Qu =	1240 psf
Effective Allowable Soil Bearing Pressure:	Qe =	1375 psf
Required Footing Area:	Areq =	5.64 sf
Area Provided:	A =	6.25 sf

Baseplate Bearing:
Bearing Required:	Bear =	11104 lb
Allowable Bearing:	Bear-A =	99450 lb

Beam Shear Calculations (One Way Shear):
Beam Shear:	Vu1 =	3239 lb
Allowable Beam Shear:	Vc1 =	14063 lb

Punching Shear Calculations (Two Way Shear):
Critical Perimeter:	Bo =	49 in
Punching Shear:	Vu2 =	9253 lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	68906 lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	81563 lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	45938 lb
Controlling Allowable Punching Shear:	vc2 =	45938 lb

Bending Calculations:
Factored Moment:	Mu =	41640 in-lb
Nominal Moment Strength:	Mn =	128617 in-lb

Reinforcement Calculations:
Concrete Compressive Block Depth:	a =	0.37 in
Steel Required Based on Moment:	As(1) =	0.19 in2
Min. Code Req'd Reinf. Flex. Members (ACI-150.1):	As(2) =	0.54 in2
Controlling Reinforcing Steel:	As-reqd =	0.54 in2
Selected Reinforcement:	#4's @ 11.0 in. o.c. e/w (3) Min.	
Reinforcement Area Provided:	As =	0.59 in2

Development Length Calculations:
Development Length Required:	Ld =	15 in
Development Length Supplied:	Ld-sup =	12 in

Note: Plain concrete adequate for bending,
therefore adequate development length not required.

LOADING DIAGRAM
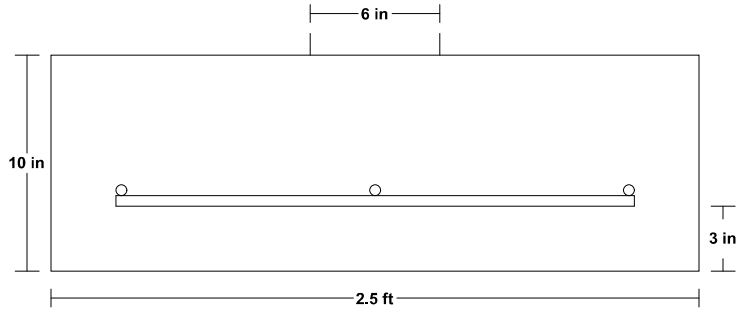
FOOTING LOADING
Live Load:	PL =	4513 lb *
Dead Load:	PD =	3236 lb *
Total Load:	PT =	7749 lb *
Ultimate Factored Load:	Pu =	11104 lb
Footing plus soil above footing weight:	Wt =	503 lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: SIM RESIDENCE

Location: P-1
Column
Column [2018 International Building Code(2018 NDS)]
5.5 IN x 5.5 IN x 9.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 53.8%

The Vitruvius Project, Inc.

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of

VERTICAL REACTIONS
Live Load:	Vert-LL-Rxn =	4513	lb
Dead Load:	Vert-DL-Rxn =	3295	lb
Total Load:	Vert-TL-Rxn =	7808	lb

COLUMN DATA
Total Column Length:	9	ft
Unbraced Length (X-Axis) Lx:	9	ft
Unbraced Length (Y-Axis) Ly:	9	ft
Column End Condition-K (e):	1	
Axial Load Duration Factor	1.00	

COLUMN PROPERTIES
#2 - Douglas-Fir-Larch

	Base Values	Adjusted	
Compressive Stress:	F_c = 700 psi	F_c' = 559 psi	
	C_d=1.00 C_p=0.80		
Bending Stress (X-X Axis):	F_{bx} = 750 psi	F_{bx}' = 750 psi	
	C_d=1.00 C_F=1.00		
Bending Stress (Y-Y Axis):	F_{by} = 750 psi	F_{by}' = 750 psi	
	C_d=1.00 C_F=1.00		
Modulus of Elasticity:	E = 1300 ksi	E' = 1300 ksi	

Column Section (X-X Axis):	d_x =	5.5	in
Column Section (Y-Y Axis):	d_y =	5.5	in
Area:	A =	30.25	in2
Section Modulus (X-X Axis):	S_x =	27.73	in3
Section Modulus (Y-Y Axis):	S_y =	27.73	in3
Slenderness Ratio:	L_{ex}/d_x =	19.64	
	L_{ey}/d_y =	19.64	

Column Calculations (Controlling Case Only):
Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	F_c =	258	psi
Allowable Compressive Stress:	F_c' =	559	psi
Eccentricity Moment (X-X Axis):	M_x-e_x =	0	ft-lb
Eccentricity Moment (Y-Y Axis):	M_y-e_y =	0	ft-lb
Moment Due to Lateral Loads (X-X Axis):	M_x =	0	ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	M_y =	0	ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	F_{bx} =	0	psi
Allowable Bending Stress (X-X Axis):	F_{bx}' =	750	psi
Bending Stress Lateral Loads Only (Y-Y Axis):	F_{by} =	0	psi
Allowable Bending Stress (Y-Y Axis):	F_{by}' =	750	psi
Combined Stress Factor:	**CSF =**	**0.46**	

LOADING DIAGRAM

B

9 ft

A
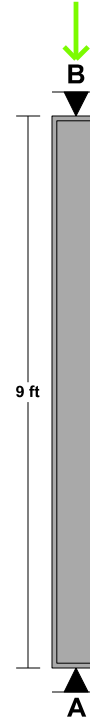
AXIAL LOADING
Live Load:	PL =	4513 lb *
Dead Load:	PD =	3236 lb *
Column Self Weight:	CSW =	59 lb
Total Axial Load:	PT =	7808 lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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Location: H2-4
Roof Beam
Roof Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 9.25 IN x 8.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 28.1%
Controlling Factor: Moment

DEFLECTIONS   Center
Live Load   0.06   IN L/1565
Dead Load   0.03   in
Total Load   0.09   IN L/1032
Live Load Deflection Criteria: L/360   Total Load Deflection Criteria: L/240

REACTIONS   A   B
Live Load   1535 lb   430 lb
Dead Load   778 lb   238 lb
Total Load   2313 lb   668 lb
Bearing Length   1.06 in   0.31 in

BEAM DATA
Span Length   8   ft
Unbraced Length-Top   0   ft
Unbraced Length-Bottom   0   ft
Roof Pitch   6   :12
Roof Duration Factor   1.15
Notch Depth   0.00

MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch
                        Base Values   Adjusted
Bending Stress: Fb =   900 psi   Fb' =   1242 psi
                      $Cd=1.15$ $CF=1.20$
Shear Stress: Fv =   180 psi   Fv' =   207 psi
                      $Cd=1.15$
Modulus of Elasticity: E =   1600 ksi   E' =   1600 ksi
Comp. $\perp$ to Grain: Fc - $\perp$ = 625 psi Fc - $\perp$' = 625 psi

Controlling Moment: 4031 ft-lb
  4.0 ft from left support
  Created by combining all dead and live loads.
Controlling Shear: 2313 lb
  At support.
  Created by combining all dead and live loads.

Comparisons with required sections: Req'd   Provided
Section Modulus: 38.95 in3   49.91 in3
Area (Shear):   16.76 in2   32.38 in2
Moment of Inertia (deflection):   53.7 in4   230.84 in4
Moment: 4031 ft-lb 5166 ft-lb
Shear: 2313 lb   4468 lb
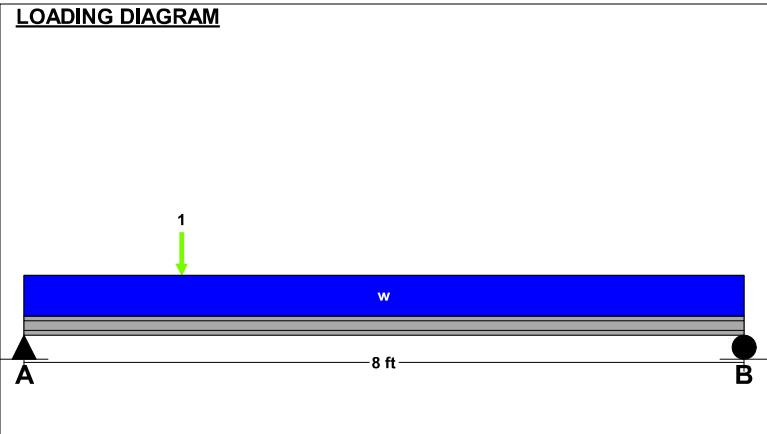
LOADING DIAGRAM

ROOF LOADING
Side One:
  Roof Live Load: LL =   0   psf
  Roof Dead Load: DL =   0   psf
  Tributary Width: TW =   0   ft
Side Two:
  Roof Live Load: LL =   0   psf
  Roof Dead Load: DL =   0   psf
  Tributary Width: TW =   0   ft

Wall Load: WALL =   0   plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS
Adjusted Beam Length: Ladj =   8   ft
Beam Self Weight: BSW =   7   plf
Beam Uniform Live Load: wL =   0   plf
Beam Uniform Dead Load: wD_adj =   7   plf
Total Uniform Load: wT =   7   plf

POINT LOADS - CENTER SPAN
Load Number   One
Live Load   1965 lb
Dead Load   960 lb
Location   1.75 ft

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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Location: J-1
Roof Beam
Roof Beam [2018 International Building Code(2018 NDS)]
(2) 1.5 IN x 9.25 IN x 12.125 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 34.8%
Controlling Factor: Shear

CAUTIONS
* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS   Center
Live Load	0.05	IN L/2885
Dead Load	0.03	in
Total Load	0.08	IN L/1730

Live Load Deflection Criteria: L/360   Total Load Deflection Criteria: L/240

REACTIONS
	A	B
Live Load	1884 lb	81 lb
Dead Load	957 lb	76 lb
Total Load	2841 lb	157 lb
Bearing Length	1.52 in	0.08 in

BEAM DATA
Span Length	12.1	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	0	ft
Roof Pitch	6	:12
Roof Duration Factor	1.15	
Notch Depth	0.00	

MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch

	Base Values	Adjusted
Bending Stress:	F_b = 900 psi	F_b' = 1139 psi
	C_d=1.15 CF=1.10	
Shear Stress:	F_v = 180 psi	F_v' = 207 psi
	C_d=1.15	
Modulus of Elasticity:	E = 1600 ksi	E' = 1600 ksi
Comp. $\perp$ to Grain:	F_c - $\perp$ = 625 psi	F_c - $\perp'$ = 625 psi

Controlling Moment: 1410 ft-lb
  6.063 ft from left support
  Created by combining all dead and live loads.

Controlling Shear: 2841 lb
  At support.
  Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	14.87 in3	42.78 in3
Area (Shear):	20.59 in2	27.75 in2
Moment of Inertia (deflection):	27.45 in4	197.86 in4
Moment:	1410 ft-lb	4059 ft-lb
Shear:	2841 lb	3830 lb

LOADING DIAGRAM
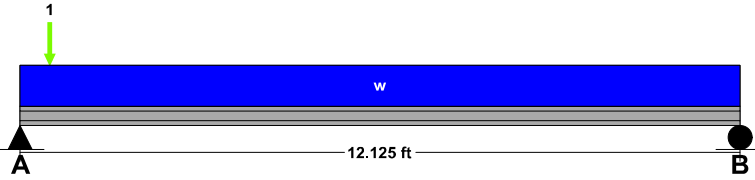
ROOF LOADING
Side One:
Roof Live Load:	LL =	0	psf
Roof Dead Load:	DL =	0	psf
Tributary Width:	TW =	0	ft

Side Two:
Roof Live Load:	LL =	0	psf
Roof Dead Load:	DL =	0	psf
Tributary Width:	TW =	0	ft

Wall Load:	WALL =	0	plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS
Adjusted Beam Length:	Ladj =	12.13	ft
Beam Self Weight:	BSW =	6	plf
Beam Uniform Live Load:	wL =	0	plf
Beam Uniform Dead Load:	wD_adj =	6	plf
Total Uniform Load:	wT =	6	plf

POINT LOADS - CENTER SPAN
Load Number	One
Live Load	1965 lb
Dead Load	960 lb
Location	0.5 ft

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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Location: B1-2
Uniformly Loaded Floor Beam
Uniformly Loaded Floor Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 7.25 IN x 7.75 FT
2.0E-2900F - APA EWS LVL Stress Classes
Section Adequate By: 1.5%
Controlling Factor: Deflection

DEFLECTIONS   Center
Live Load   0.18   IN L/526
Dead Load   0.08   in
Total Load   0.25   IN L/365
Live Load Deflection Criteria: L/480   Total Load Deflection Criteria: L/360

REACTIONS	A	B
Live Load	1876 lb	1876 lb
Dead Load	826 lb	826 lb
Total Load	2702 lb	2702 lb
Bearing Length	1.03 in	1.03 in

BEAM DATA   Center
Span Length   7.75   ft
Unbraced Length-Top   0   ft
Floor Duration Factor   1.00
Notch Depth   0.00

LOADING DIAGRAM

A ———————— 7.75 ft ———————— B

MATERIAL PROPERTIES
2.0E-2900F - APA EWS LVL Stress Classes

	Base Values		Adjusted	
Bending Stress:	Fb =	2900 psi	Fb' =	3089 psi
	Cd=1.00 CF=1.07			
Shear Stress:	Fv =	285 psi	Fv' =	285 psi
	Cd=1.00			
Modulus of Elasticity:	E =	2000 ksi	E' =	2000 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	750 psi	Fc - ⊥' =	750 psi

Controlling Moment: 5234 ft-lb
  3.875 ft from left support
  Created by combining all dead and live loads.
Controlling Shear: -2701 lb
  At support.
  Created by combining all dead and live loads.

FLOOR LOADING

		Side 1		Side 2	
Floor Live Load	FLL =	40	psf	0	psf
Floor Dead Load	FDL =	17	psf	0	psf
Floor Tributary Width	FTW =	12.1	ft	0	ft
Wall Load	WALL =		0	plf	

BEAM LOADING
Beam Total Live Load:	wL =	484	plf
Beam Total Dead Load:	wD =	206	plf
Beam Self Weight:	BSW =	7	plf
Total Maximum Load:	wT =	697	plf

Comparisons with required sections:

	Req'd	Provided
Section Modulus:	20.33 in3	30.66 in3
Area (Shear):	14.22 in2	25.38 in2
Moment of Inertia (deflection):	109.5 in4	111.15 in4
Moment:	5234 ft-lb	7892 ft-lb
Shear:	-2701 lb	4821 lb

Project: SIM RESIDENCE

Location: RB-1
Multi-Span Roof Beam
Multi-Span Roof Beam [2018 International Building Code(2018 NDS)]
(3) 1.75 IN x 7.25 IN x 16.625 FT (10.6 + 6)
1.8E-2600F - APA EWS LVL Stress Classes
Section Adequate By: 30.9%
Controlling Factor: Deflection

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CAUTIONS
* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS	Center		Right	
Live Load	-0.07	IN L/1742	0.31	IN 2L/472
Dead Load	-0.01	in	0.11	in
Total Load	-0.08	IN L/1570	0.42	IN 2L/342
Live Load Deflection Criteria: L/360		Total Load Deflection Criteria: L/240		

REACTIONS	A	B
Live Load	305 lb	1056 lb
Dead Load	108 lb	651 lb
Total Load	413 lb	1707 lb
Uplift (1.5 F.S)	**-94 lb**	**0 lb**
Bearing Length	0.11 in	0.46 in

BEAM DATA	Center	Right
Span Length	10.63 ft	6 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	10.63 ft	6 ft
Roof Pitch	0	:12
Roof Duration Factor	1.15	
Notch Depth	0.00	

MATERIAL PROPERTIES
1.8E-2600F - APA EWS LVL Stress Classes

	Base Values	Adjusted
Bending Stress:	F_b = 2600 psi	F_b' = 3150 psi
	Cd=1.15 Cl=0.99 CF=1.07	
Shear Stress:	F_v = 285 psi	F_v' = 328 psi
	Cd=1.15	
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Comp. $\perp$ to Grain:	$Fc - \perp$ = 700 psi	$Fc - \perp'$ = 700 psi

Controlling Moment: -2797 ft-lb
  10.62 Ft from left support of span 2 (Center Span)
  Created by combining all dead loads and live loads on span(s) 2, 3
Controlling Shear: 932 lb
  At left support of span 3 (Right Span)
  Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Req'd	Provided
Section Modulus:	10.65 in3	45.99 in3
Area (Shear):	4.27 in2	38.06 in2
Moment of Inertia (deflection):	127.41 in4	166.72 in4
Moment:	-2797 ft-lb	12075 ft-lb
Shear:	932 lb	8317 lb

LOADING DIAGRAM
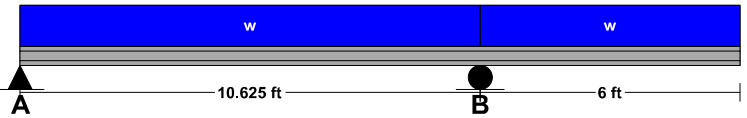
ROOF LOADING		Center		Right	
Roof Live Load	RLL =	25	psf	25	psf
Roof Dead Load	RDL =	12	psf	12	psf
Roof Tributary Width Side One	TW1 =	2.3	ft	3.9	ft
Roof Tributary Width Side Two	TW2 =	0	ft	0	ft
Wall Load	WALL =	0	plf	0	plf

BEAM LOADING	Center		Right	
Total Live Load	58	plf	98	plf
Total Dead Load (Adjusted for Roof Pitch)	28	plf	47	plf
Beam Self Weight	11	plf	11	plf
Total Load	96	plf	155	plf

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

Location: H2-6

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Roof Beam
Roof Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 9.25 IN x 11.33 FT
1.8E-2600F - APA EWS LVL Stress Classes
Section Adequate By: 70.2%
Controlling Factor: Deflection

DEFLECTIONS   Center
Live Load	0.19	IN L/719
Dead Load	0.14	in
Total Load	0.33	IN L/409

Live Load Deflection Criteria: L/360   Total Load Deflection Criteria: L/240

REACTIONS   A   B
Live Load	750 lb	750 lb
Dead Load	697 lb	697 lb
Total Load	1447 lb	1447 lb
Bearing Length	0.59 in	0.59 in

BEAM DATA
Span Length	11.3	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	0	ft
Roof Pitch	6	:12
Roof Duration Factor	1.15	
Notch Depth	0.00	

MATERIAL PROPERTIES
1.8E-2600F - APA EWS LVL Stress Classes

	Base Values		Adjusted	
Bending Stress:	Fb =	2600 psi	Fb' =	3089 psi
	$Cd=1.15$ $CF=1.03$			
Shear Stress:	Fv =	285 psi	Fv' =	328 psi
	$Cd=1.15$			
Modulus of Elasticity:	E =	1800 ksi	E' =	1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	700 psi	Fc - ⊥' =	700 psi

Controlling Moment: 7242 ft-lb
 5.665 ft from left support
 Created by combining all dead and live loads.
Controlling Shear: -1447 lb
 At support.
 Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	28.13 in3	49.91 in3
Area (Shear):	6.62 in2	32.38 in2
Moment of Inertia (deflection):	135.59 in4	230.84 in4
Moment:	7242 ft-lb	12848 ft-lb
Shear:	-1447 lb	7074 lb

LOADING DIAGRAM
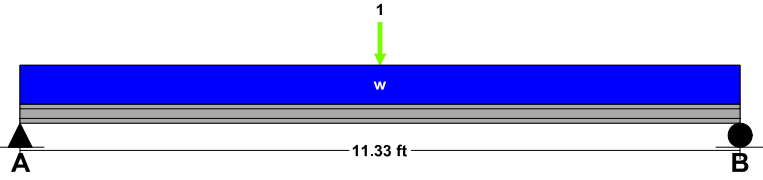
ROOF LOADING
Side One:
Roof Live Load:	LL =	0	psf
Roof Dead Load:	DL =	0	psf
Tributary Width:	TW =	0	ft

Side Two:
Roof Live Load:	LL =	0	psf
Roof Dead Load:	DL =	0	psf
Tributary Width:	TW =	0	ft

Wall Load: WALL = 50 plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS
Adjusted Beam Length:	Ladj =	11.33	ft
Beam Self Weight:	BSW =	9	plf
Beam Uniform Live Load:	wL =	0	plf
Beam Uniform Dead Load:	wD_adj =	59	plf
Total Uniform Load:	wT =	59	plf

POINT LOADS - CENTER SPAN
Load Number	One
Live Load	1500 lb
Dead Load	720 lb
Location	5.67 ft

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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Location: P-2
Column
Column [2018 International Building Code(2018 NDS)]
3.5 IN x 3.5 IN x 15 FT
1.5E-2250F - APA EWS LVL Stress Classes
Section Adequate By: 71.1%

VERTICAL REACTIONS

Live Load:	Vert-LL-Rxn =	1343	lb
Dead Load:	Vert-DL-Rxn =	1477	lb
Total Load:	Vert-TL-Rxn =	2820	lb

COLUMN DATA

Total Column Length:	15	ft
Unbraced Length (X-Axis) Lx:	8	ft
Unbraced Length (Y-Axis) Ly:	8	ft
Column End Condition-K (e):	1	
Axial Load Duration Factor	1.15	

COLUMN PROPERTIES

1.5E-2250F - APA EWS LVL Stress Classes

	Base Values	Adjusted
Compressive Stress:	F_c = 2200 psi	F_c' = 797 psi
	C_d=1.15 C_p=0.31	
Bending Stress (X-X Axis):	F_{bx} = 2250 psi	F_{bx}' = 3128 psi
	C_d=1.15 C_F=1.21	
Bending Stress (Y-Y Axis):	F_{by} = 2250 psi	F_{by}' = 3128 psi
	C_d=1.15 C_F=1.21	
Modulus of Elasticity:	E = 1500 ksi	E' = 1500 ksi

Column Section (X-X Axis):	d_x =	3.5	in
Column Section (Y-Y Axis):	d_y =	3.5	in
Area:	A =	12.25	in2
Section Modulus (X-X Axis):	S_x =	7.15	in3
Section Modulus (Y-Y Axis):	S_y =	7.15	in3
Slenderness Ratio:	L_{ex}/d_x =	27.43	
	L_{ey}/d_y =	27.43	

Column Calculations (Controlling Case Only):

Controlling Load Case: Axial Total Load Only (L + D)

Actual Compressive Stress:	F_c =	230	psi
Allowable Compressive Stress:	F_c' =	797	psi
Eccentricity Moment (X-X Axis):	$M_{x\text{-}ex}$ =	0	ft-lb
Eccentricity Moment (Y-Y Axis):	$M_{y\text{-}ey}$ =	0	ft-lb
Moment Due to Lateral Loads (X-X Axis):	M_x =	0	ft-lb
Moment Due to Lateral Loads (Y-Y Axis):	M_y =	0	ft-lb
Bending Stress Lateral Loads Only (X-X Axis):	F_{bx} =	0	psi
Allowable Bending Stress (X-X Axis):	F_{bx}' =	3128	psi
Bending Stress Lateral Loads Only (Y-Y Axis):	F_{by} =	0	psi
Allowable Bending Stress (Y-Y Axis):	F_{by}' =	3128	psi
Combined Stress Factor:	**CSF =**	**0.29**	

LOADING DIAGRAM
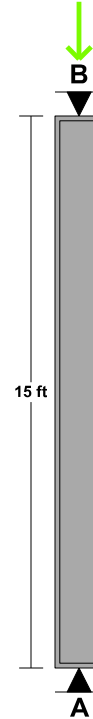
AXIAL LOADING

Live Load:	PL =	1343	lb *
Dead Load:	PD =	1423	lb *
Column Self Weight:	CSW =	54	lb
Total Axial Load:	PT =	2820	lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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of

Location: RR-2
Floor Joist
Floor Joist [2018 International Building Code(2018 NDS)]
1.5 IN x 7.25 IN x 6.5 FT (3.2 + 3.2) @ 24 O.C.
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 280.8%
Controlling Factor: Moment

DEFLECTIONS

	Left		Center	
Live Load	0.04	IN 2L/2114	0.00	IN L/9614
Dead Load	0.02	in	0.00	in
Total Load	0.05	IN 2L/1498	-0.01	IN L/7443

Live Load Deflection Criteria: L/360   Total Load Deflection Criteria: L/240

REACTIONS

	A		B	
Live Load	325	lb	81	lb
Dead Load	156	lb	0	lb
Total Load	481	lb	81	lb
Uplift (1.5 F.S)	0	**lb**	-81	**lb**
Bearing Length	0.51	in	0.09	in

SUPPORT LOADS

	A		B	
Live Load	163	plf	41	plf
Dead Load	78	plf	0	plf
Total Load	241	plf	41	plf

MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch

		Base Values		Adjusted	
Bending Stress:	Fb =	900	psi	Fb' =	1359 psi

Cd=1.15 Cl=0.95 CF=1.20 Cr=1.15

Shear Stress:	Fv =	180	psi	Fv' =	207 psi

Cd=1.15

Modulus of Elasticity:	E =	1600	ksi	E' =	1600 ksi
Comp. ⊥ to Grain:	Fc - ⊥ =	625	psi	Fc - ⊥' =	625 psi

Controlling Moment: -391 ft-lb
  Over right support of span 1 (Left Span)
  Created by combining all dead loads and live loads on span(s) 1, 2
Controlling Shear: 241 lb
  At left support of span 2 (Center Span)
  Created by combining all dead loads and live loads on span(s) 1, 2

Comparisons with required sections:	Req'd	Provided
Section Modulus:	3.45 in3	13.14 in3
Area (Shear):	1.74 in2	10.88 in2
Moment of Inertia (deflection):	8.11 in4	47.63 in4
Moment:	-391 ft-lb	1488 ft-lb
Shear:	241 lb	1501 lb

LOADING DIAGRAM
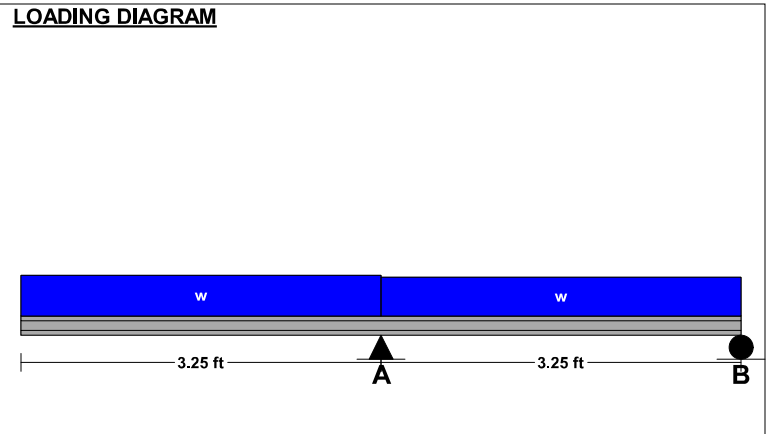
JOIST DATA

	Left	Center
Span Length	3.25 ft	3.25 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	0 ft	0 ft

Floor sheathing applied to top of joists-top of joists fully braced.
Floor Duration Factor   1.15

JOIST LOADING

Uniform Floor Loading

		Left	Center
Live Load	LL =	25 psf	25 psf
Dead Load	DL =	12 psf	12 psf
Total Load	TL =	37 psf	37 psf
TL Adj. For Joist Spacing	wT =	74 plf	74 plf

Roof Beam
Roof Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 12.0 IN x 21.5 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 6.6%
Controlling Factor: Deflection

CAUTIONS
The design dead load deflection exceeds the default maximum of 1/4" on spans (2).

DEFLECTIONS   Center
Live Load	0.86	IN	L/300
Dead Load	0.48	in	
Total Load	1.34	IN	L/192

Live Load Deflection Criteria: L/240   Total Load Deflection Criteria: L/180

REACTIONS   A   B
	A		B	
Live Load	1747	lb	1747	lb
Dead Load	982	lb	982	lb
Total Load	2729	lb	2729	lb
Bearing Length	1.20	in	1.20	in

BEAM DATA
Span Length	21.5	ft
Unbraced Length-Top	0	ft
Unbraced Length-Bottom	0	ft
Roof Pitch	4	:12
Roof Duration Factor	1.15	
Camber Adj. Factor	0	
Camber Required	0	
Notch Depth	0.00	

MATERIAL PROPERTIES
24F-V4 - Visually Graded Western Species

		Base Values		Adjusted	
Bending Stress:	Fb =	2400	psi	*Controlled by:*	
	Fb_cmpr =	1850	psi	Fb' =	2760 psi
	Cd=1.15				
Shear Stress:	Fv =	265	psi	Fv' =	305 psi
	Cd=1.15				
Modulus of Elasticity:	E =	1800	ksi	E' =	1800 ksi
Comp. $\perp$ to Grain:	Fc - $\perp$ =	650	psi	Fc - $\perp$' =	650 psi

Controlling Moment: 14666 ft-lb
  10.75 ft from left support
  Created by combining all dead and live loads.
Controlling Shear: 2729 lb
  At support.
  Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	63.77 in3	84 in3
Area (Shear):	13.43 in2	42 in2
Moment of Inertia (deflection):	472.91 in4	504 in4
Moment:	14666 ft-lb	19320 ft-lb
Shear:	2729 lb	8533 lb

LOADING DIAGRAM
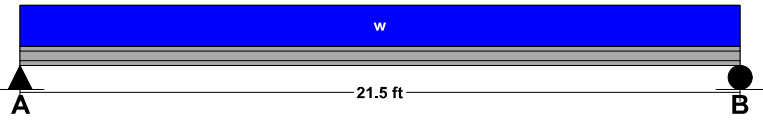
ROOF LOADING
Side One:
Roof Live Load:	LL =	25	psf
Roof Dead Load:	DL =	12	psf
Tributary Width:	TW =	6.5	ft

Side Two:
Roof Live Load:	LL =	0	psf
Roof Dead Load:	DL =	0	psf
Tributary Width:	TW =	0	ft

Wall Load:	WALL =	0	plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS
Adjusted Beam Length:	Ladj =	21.5	ft
Beam Self Weight:	BSW =	9	plf
Beam Uniform Live Load:	wL =	163	plf
Beam Uniform Dead Load:	wD_adj =	91	plf
Total Uniform Load:	wT =	254	plf

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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of

Location: H2-3
Roof Beam
Roof Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 15.0 IN x 14.58 FT (3.2 + 11.3)
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 29.1%
Controlling Factor: Deflection

DEFLECTIONS   Center
Live Load   0.08   IN L/1714
Dead Load   0.07   in
Total Load   0.15   IN L/929
Live Load Deflection Criteria: L/720   Total Load Deflection Criteria: L/720

REACTIONS   A   B
Live Load   1343   lb   1343 lb
Dead Load   1423   lb   1423 lb
Total Load   2766   lb   2766 lb
Bearing Length   1.22   in   1.22 in

BEAM DATA
Span Length   11.3   ft
Unbraced Length-Top   0   ft
Unbraced Length-Bottom   0   ft
Roof Pitch   6   :12
Roof Duration Factor   1.15
Notch Depth   0.00

MATERIAL PROPERTIES
24F-V4 - Visually Graded Western Species

	Base Values	Adjusted
Bending Stress:	Fb = 2400 psi	Controlled by:
	Fb_cmpr = 1850 psi	Fb' = 2760 psi
	Cd=1.15	
Shear Stress:	Fv = 265 psi	Fv' = 305 psi
	Cd=1.15	
Modulus of Elasticity:	E = 1800 ksi	E' = 1800 ksi
Comp. ⊥ to Grain:	Fc - ⊥ = 650 psi	Fc - ⊥' = 650 psi

Controlling Moment: 13476 ft-lb
  5.665 ft from left support
  Created by combining all dead and live loads.
Controlling Shear: 2765 lb
  At support.
  Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	58.59 in3	131.25 in3
Area (Shear):	13.61 in2	52.5 in2
Moment of Inertia (deflection):	762.54 in4	984.38 in4
Moment:	13476 ft-lb	30188 ft-lb
Shear:	2765 lb	10666 lb
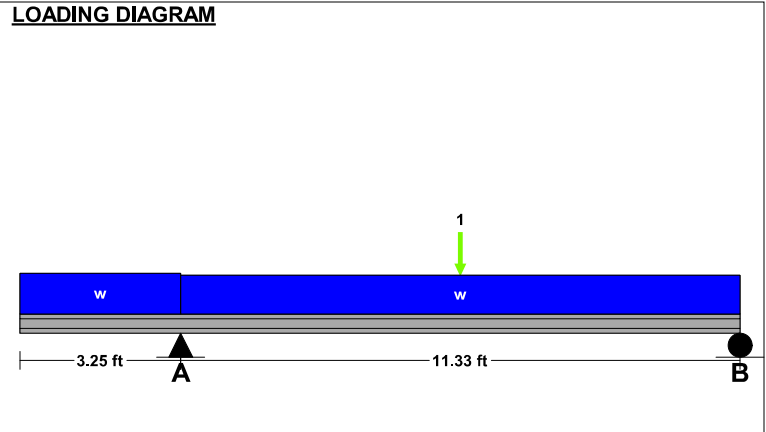
LOADING DIAGRAM

ROOF LOADING
Side One:
  Roof Live Load: LL =   0   psf
  Roof Dead Load: DL =   0   psf
  Tributary Width: TW =   0   ft
Side Two:
  Roof Live Load: LL =   0   psf
  Roof Dead Load: DL =   0   psf
  Tributary Width: TW =   0   ft

Wall Load: WALL =   125   plf

SLOPE/PITCH ADJUSTED LENGTHS AND LOADS
Adjusted Beam Length:	Ladj =	14.58	ft
Beam Self Weight:	BSW =	11	plf
Beam Uniform Live Load:	wL =	0	plf
Beam Uniform Dead Load:	wD_adj =	136	plf
Total Uniform Load:	wT =	136	plf

POINT LOADS - CENTER SPAN
Load Number   One
Live Load   2685   lb
Dead Load   1300   lb
Location   5.67   ft

Project: SIM RESIDENCE

Location: H1-1
Uniformly Loaded Floor Beam
Uniformly Loaded Floor Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 9.25 IN x 5.0 FT
#2 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 28.7%
Controlling Factor: Moment

The Vitruvius Project, Inc.

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of

DEFLECTIONS   Center
Live Load	0.03	IN L/2015
Dead Load	0.01	in
Total Load	0.04	IN L/1692

Live Load Deflection Criteria: L/480   Total Load Deflection Criteria: L/360

REACTIONS   A   B
Live Load	1958	lb	1380	lb
Dead Load	374	lb	374	lb
Total Load	2332	lb	1754	lb
Bearing Length	1.07	in	0.80	in

BEAM DATA   Center
Span Length	5	ft
Unbraced Length-Top	0	ft
Floor Duration Factor	0.90	
Notch Depth	0.00	

MATERIAL PROPERTIES
#2 - Douglas-Fir-Larch

	Base Values		Adjusted	
Bending Stress:	$F_b =$	900 psi	$F_b' =$	972 psi
	$Cd=0.90$ $CF=1.20$			
Shear Stress:	$F_v =$	180 psi	$F_v' =$	162 psi
	$Cd=0.90$			
Modulus of Elasticity:	$E =$	1600 ksi	$E' =$	1600 ksi
Comp. $\perp$ to Grain:	$Fc\text{-}\perp =$	625 psi	$Fc\text{-}\perp' =$	625 psi

Controlling Moment: 3142 ft-lb
  2.5 ft from left support
  Created by combining all dead and live loads.
Controlling Shear: 2331 lb
  At support.
  Created by combining all dead and live loads.

Comparisons with required sections:	Req'd	Provided
Section Modulus:	38.8 in3	49.91 in3
Area (Shear):	21.59 in2	32.38 in2
Moment of Inertia (deflection):	55 in4	230.84 in4
Moment:	3142 ft-lb	4043 ft-lb
Shear:	2331 lb	3497 lb

LOADING DIAGRAM
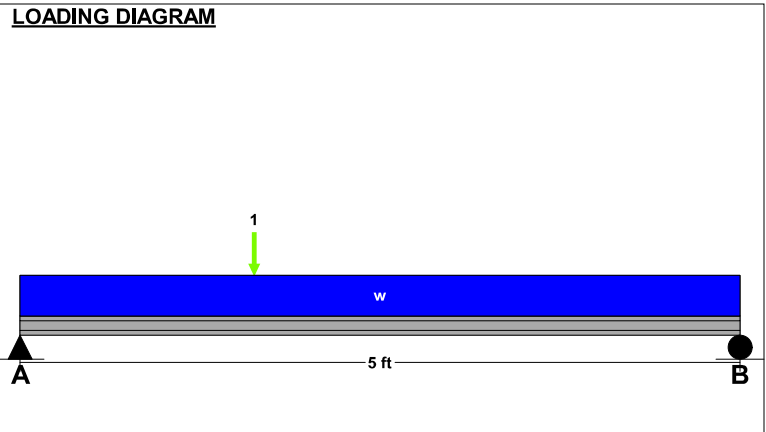
FLOOR LOADING
		Side 1	Side 2
Floor Live Load	FLL =	45 psf	30 psf
Floor Dead Load	FDL =	12 psf	15 psf
Floor Tributary Width	FTW =	2.5 ft	7.5 ft
Wall Load	WALL =	0 plf	

BEAM LOADING
Beam Total Live Load:	wL =	338 plf
Beam Total Dead Load:	wD =	143 plf
Beam Self Weight:	BSW =	7 plf
Total Maximum Load:	wT =	487 plf

POINT LOADS - CENTER SPAN
Load Number	One
Live Load	1650 lb
Dead Load	0 lb
Location	1.63 ft

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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of

Location: B1-3
Uniformly Loaded Floor Beam
Uniformly Loaded Floor Beam [2018 International Building Code(2018 NDS)]
3.5 IN x 12.0 IN x 9.75 FT
24F-V4 - Visually Graded Western Species - Dry Use
Section Adequate By: 19.5%
Controlling Factor: Moment

DEFLECTIONS   Center
Live Load   0.14   IN L/841
Dead Load   0.10   in
Total Load   0.24   IN L/483
Live Load Deflection Criteria: L/480   Total Load Deflection Criteria: L/360

REACTIONS   A   B
Live Load   2542 lb   2582 lb
Dead Load   1933 lb   1958 lb
Total Load   4475 lb   4540 lb
Bearing Length   1.97 in   2.00 in

BEAM DATA   Center
Span Length   9.75 ft
Unbraced Length-Top   0   ft
Floor Duration Factor   1.00
Camber Adj. Factor   1.5
Camber Required   0.15
Notch Depth   0.00

MATERIAL PROPERTIES
24F-V4 - Visually Graded Western Species
                          Base Values   Adjusted
Bending Stress: F_b =   2400 psi   Controlled by:
                       F_{b_cmpr} = 1850 psi F_b' =   2400 psi
                       C_d=1.00
Shear Stress: F_v =   265 psi F_v' =   265 psi
                       C_d=1.00
Modulus of Elasticity: E =   1800 ksi   E' =   1800 ksi
Comp. ⊥ to Grain: $F_{c-\perp}$ =   650 psi $F_{c-\perp}'$ = 650 psi

Controlling Moment: 14059 ft-lb
  4.875 ft from left support
  Created by combining all dead and live loads.
Controlling Shear: -4540 lb
  At support.
  Created by combining all dead and live loads.

Comparisons with required sections: Req'd   Provided
Section Modulus: 70.29 in3   84 in3
Area (Shear):   25.7 in2   42 in2
Moment of Inertia (deflection):   375.79 in4   504 in4
Moment: 14059 ft-lb 16800 ft-lb
Shear: -4540 lb   7420 lb
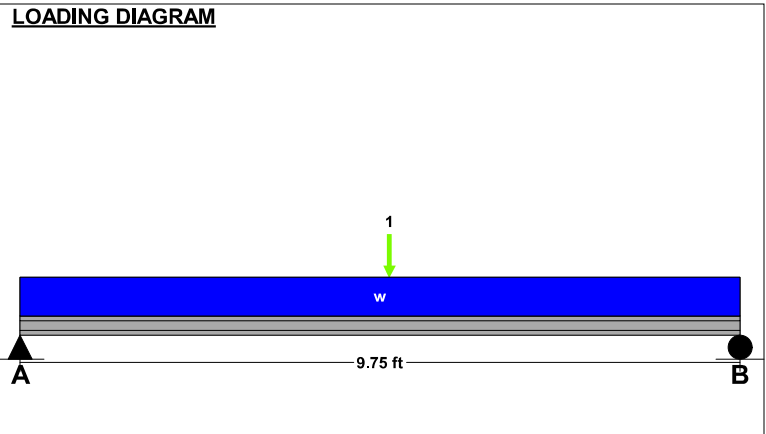
LOADING DIAGRAM

FLOOR LOADING
                                  Side 1   Side 2
Floor Live Load   FLL =   30   psf   0   psf
Floor Dead Load   FDL =   17   psf   0   psf
Floor Tributary Width FTW =   12.2 ft   0   ft

Wall Load   WALL =   80   plf

BEAM LOADING
Beam Total Live Load: w_L =   366   plf
Beam Total Dead Load: w_D =   287   plf
Beam Self Weight: BSW =   9   plf
Total Maximum Load: w_T =   663   plf

POINT LOADS - CENTER SPAN
Load Number   One
Live Load   1555 lb
Dead Load   1000 lb
Location   5 ft

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

Location: F-2
Footing
Footing [2018 International Building Code(2018 NDS)]
Footing Size: 2.0 FT x 2.0 FT x 10.00 IN
Reinforcement: #4 Bars @ 8.00 IN. O.C. E/W / (3) min.
Section Footing Design Adequate

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of

FOOTING PROPERTIES
Allowable Soil Bearing Pressure:	Qs =	1500 psf
Concrete Compressive Strength:	F'c =	2500 psi
Reinforcing Steel Yield Strength:	Fy =	40000 psi
Concrete Reinforcement Cover:	c =	3 in

FOOTING SIZE
Width:	W =	2 ft
Length:	L =	2 ft
Depth:	Depth =	10 in
Effective Depth to Top Layer of Steel:	d =	6.25 in

COLUMN AND BASEPLATE SIZE
Column Type:	Wood
Column Width:	m = 4 in
Column Depth:	n = 4 in

FOOTING CALCULATIONS

Bearing Calculations:
Ultimate Bearing Pressure:	Qu =	1135 psf
Effective Allowable Soil Bearing Pressure:	Qe =	1375 psf
Required Footing Area:	Areq =	3.3 sf
Area Provided:	A =	4.00 sf

Baseplate Bearing:
Bearing Required:	Bear =	6481 lb
Allowable Bearing:	Bear-A =	44200 lb

Beam Shear Calculations (One Way Shear):
Beam Shear:	Vu1 =	1553 lb
Allowable Beam Shear:	Vc1 =	11250 lb

Punching Shear Calculations (Two Way Shear):
Critical Perimeter:	Bo =	41 in
Punching Shear:	Vu2 =	5299 lb
Allowable Punching Shear (ACI 11-35):	vc2-a =	57656 lb
Allowable Punching Shear (ACI 11-36):	vc2-b =	77813 lb
Allowable Punching Shear (ACI 11-37):	vc2-c =	38438 lb
Controlling Allowable Punching Shear:	vc2 =	38438 lb

Bending Calculations:
Factored Moment:	Mu =	19442 in-lb
Nominal Moment Strength:	Mn =	127637 in-lb

Reinforcement Calculations:
Concrete Compressive Block Depth:	a =	0.46 in
Steel Required Based on Moment:	As(1) =	0.09 in2
Min. Code Req'd Reinf. Flex. Members (ACI-150.1):	As(2) =	0.43 in2
Controlling Reinforcing Steel:	As-reqd =	0.43 in2
Selected Reinforcement:	#4's @ 8.0 in. o.c. e/w (3) Min.	
Reinforcement Area Provided:	As =	0.59 in2

Development Length Calculations:
Development Length Required:	Ld =	15 in
Development Length Supplied:	Ld-sup =	9 in

Note: Plain concrete adequate for bending,
therefore adequate development length not required.

LOADING DIAGRAM
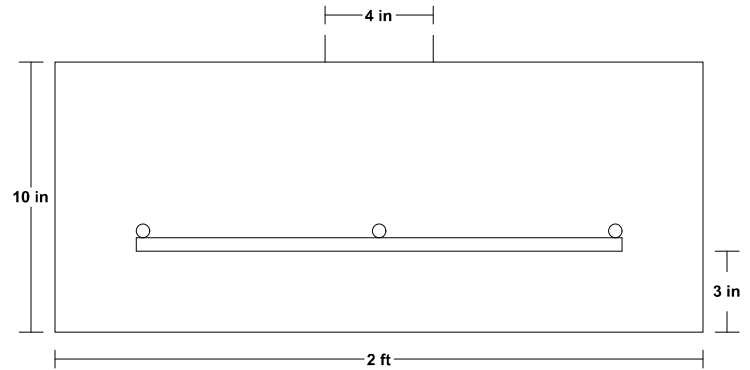
FOOTING LOADING
Live Load:	PL =	2582 lb *
Dead Load:	PD =	1958 lb *
Total Load:	PT =	4540 lb *
Ultimate Factored Load:	Pu =	6481 lb
Footing plus soil above footing weight:	Wt =	322 lb

* Load obtained from Load Tracker. See Summary Report for details.

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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Location: RR-1
Floor Joist
Floor Joist [2018 International Building Code(2018 NDS)]
1.5 IN x 7.25 IN x 16.5 FT (10.5 + 6) @ 16 O.C.
#1 - Douglas-Fir-Larch - Dry Use
Section Adequate By: 4.1%
Controlling Factor: Deflection

DEFLECTIONS

	Center		Right	
Live Load	0.11	IN L/1119	0.38	IN 2L/374
Dead Load	0.01	in	0.09	in
Total Load	0.12	IN L/1012	0.47	IN 2L/306

Live Load Deflection Criteria: L/360   Total Load Deflection Criteria: L/240

REACTIONS

	A		B	
Live Load	175	lb	432	lb
Dead Load	57	lb	207	lb
Total Load	232	lb	639	lb
Uplift (1.5 F.S)	**-19 lb**		0	**lb**
Bearing Length	0.25	in	0.68	in

SUPPORT LOADS

	A		B	
Live Load	131	plf	324	plf
Dead Load	43	plf	155	plf
Total Load	174	plf	479	plf

MATERIAL PROPERTIES
#1 - Douglas-Fir-Larch

		Base Values		Adjusted	
Bending Stress:	F_b =	1000 psi	F_b' =	930 psi	
	Cd=1.15 Cl=0.59 CF=1.20 Cr=1.15				
Shear Stress:	F_v =	180 psi	F_v' =	207 psi	
	Cd=1.15				
Modulus of Elasticity:	E =	1700 ksi	E' =	1700 ksi	
Comp. ⊥ to Grain:	F_c-⊥ =	625 psi	F_c-⊥' =	625 psi	

Controlling Moment: -888 ft-lb
  Over right support of span 2 (Center Span)
  Created by combining all dead loads and live loads on span(s) 3
Controlling Shear: -344 lb
  10.0 Ft from left support of span 2 (Center Span)
  Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Req'd	Provided
Section Modulus:	11.46 in3	13.14 in3
Area (Shear):	2.49 in2	10.88 in2
Moment of Inertia (deflection):	45.74 in4	47.63 in4
Moment:	-888 ft-lb	1018 ft-lb
Shear:	-344 lb	1501 lb

LOADING DIAGRAM
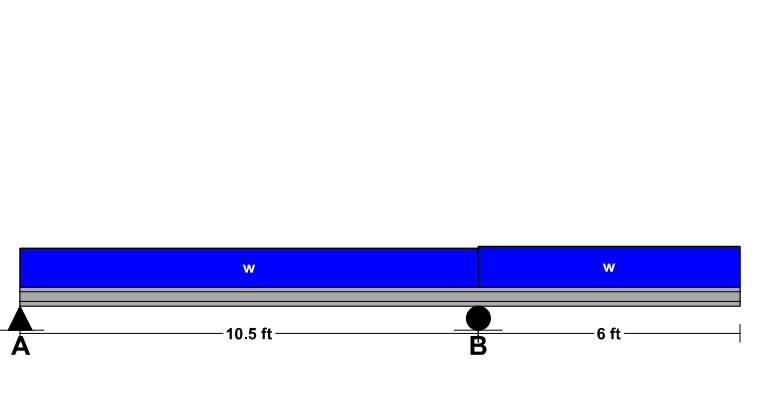
JOIST DATA

	Center	Right
Span Length	10.5 ft	6 ft
Unbraced Length-Top	0 ft	0 ft
Unbraced Length-Bottom	0 ft	0 ft

Floor sheathing applied to top of joists-top of joists fully braced.
Floor Duration Factor   1.15

JOIST LOADING

Uniform Floor Loading		Center	Right
Live Load	LL =	25 psf	25 psf
Dead Load	DL =	12 psf	12 psf
Total Load	TL =	37 psf	37 psf
TL Adj. For Joist Spacing	wT =	49.3 plf	49.3 plf

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

Location: ADDITION PERIMETER FOUNDARTION

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Footing
Footing [2018 International Building Code(2018 NDS)]
Footing Size: 14.0 IN Wide x 10.0 IN Deep Continuous Footing With 6.0 IN Thick x 12.0 IN Tall Stemwall
LongitudinalReinforcement: (2) Continuous #4 Bars
TransverseReinforcement: #4 Bars @ 9.00 IN. O.C. (unnecessary)
Section Footing Design Adequate

FOOTING PROPERTIES
Allowable Soil Bearing Pressure:	Q_s =	1500 psf
Concrete Compressive Strength:	$F'c$ =	2500 psi
Reinforcing Steel Yield Strength:	F_y =	40000 psi
Concrete Reinforcement Cover:	c =	3 in

FOOTING SIZE
Width:	W =	14 in
Depth:	Depth =	10 in
Effective Depth to Top Layer of Steel:	d =	6.25 in

STEMWALL SIZE
Stemwall Width: 6 in
Stemwall Height: 12 in
Stemwall Weight: 150 pcf

FOOTING CALCULATIONS

Bearing Calculations:
Ultimate Bearing Pressure:	Q_u =	518 psf
Effective Allowable Soil Bearing Pressure:	Q_e =	1375 psf
Width Required:	W_{req} =	0.44 ft

Beam Shear Calculations (One Way Shear):
Beam Shear:	V_{u1} =	0 lb
Allowable Beam Shear:	V_{c1} =	3281 lb

Transverse Direction:

Bending Calculations:
Factored Moment:	M_u =	481 in-lb
Nominal Moment Strength:	M_n =	0 in-lb

Reinforcement Calculations:
Concrete Compressive Block Depth:	a =	0.38 in
Steel Required Based on Moment:	$A_s(1)$ =	0.00 in2
Min. Code Req'd Reinf. Flex. Members (ACI-150.1)	$A_s(2)$ =	0.24 in2
Controlling Reinforcing Steel:	As-reqd =	0.24 in2
Selected Reinforcement:	Trans: #4's @ 9.0 in. o.c.	
Reinforcement Area Provided:	As =	0.24 in2

Development Length Calculations:
|		
Development Length Required:	L_d =	15 in
Development Length Supplied:	Ld-sup =	1 in

Note: Plain concrete adequate for bending,
therefore adequate development length not required.

Longitudinal Direction:

Reinforcement Calculations:
Min. Code Req'd Reinf. Flex. Members (ACI-150.1):	$A_s(2)$ =	0.28 in2
Controlling Reinforcing Steel:	As-reqd =	0.28 in2
Selected Reinforcement:	Longitudinal: (2) Cont. #4 Bars	
Reinforcement Area Provided:	As =	0.39 in2

LOADING DIAGRAM
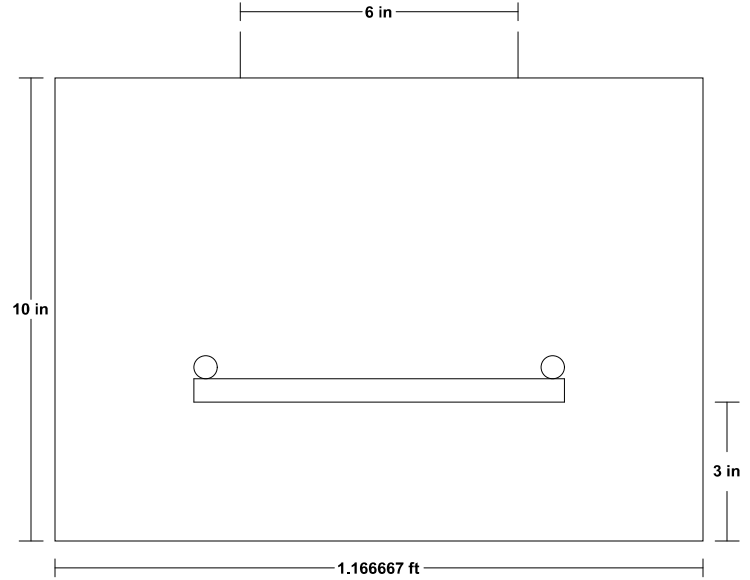
FOOTING LOADING
Live Load:	PL =	290 plf
Dead Load:	PD =	239 plf
Total Load:	PT =	604 plf
Ultimate Factored Load:	Pu =	841 plf

LOAD CALCULATOR
	Live Load	Dead Load	Tributary Width
Roof:	LL = 25 psf	DL = 12 psf	TA = 11.6 ft2
Second Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft2
First Floor:	LL = 40 psf	DL = 15 psf	TA = 0 ft2

Project: SIM RESIDENCE

The Vitruvius Project, Inc.

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Location: B1-1 STEEL
Combination Roof And Floor Beam
Combination Roof And Floor Beam [2018 International Building Code(AISC 14th
A992-50 W8x18 x 14.0 FT
Section Adequate By: 1.6%
Controlling Factor: Deflection

DEFLECTIONS   Center
Live Load	0.29	IN L/575
Dead Load	0.21	in
Total Load	0.50	IN L/335

Live Load Deflection Criteria: L/480   Total Load Deflection Criteria: L/330

REACTIONS   A   B
Live Load	4513	lb	3679	lb
Dead Load	3203	lb	2676	lb
Total Load	7716	lb	6355	lb
Bearing Length	0.63	in	0.63	in

BEAM DATA   Center
Span Length	14	ft
Unbraced Length-Top	0	ft
Roof Pitch	6	:12
Floor Duration Factor	0.00	
Roof Duration Factor	0.00	

STEEL PROPERTIES
W8x18 - A992-50

Properties:

Yield Stress:	Fy =	50	ksi
Modulus of Elasticity:	E =	29000	ksi
Depth:	d =	8.14	in
Web Thickness:	tw =	0.23	in
Flange Width:	bf =	5.25	in
Flange Thickness:	tf =	0.33	in
Distance to Web Toe of Fillet:	k =	0.63	in
Moment of Inertia About X-X Axis:	Ix =	61.9	in4
Section Modulus About X-X Axis:	Sx =	15.2	in3
Plastic Section Modulus About X-X Axis:	Zx =	17	in3

Design Properties per AISC 14th Edition Steel Manual:ACI 318-19

Flange Buckling Ratio:	FBR =	7.95	
Allowable Flange Buckling Ratio:	AFBR =	9.15	
Web Buckling Ratio:	WBR =	29.91	
Allowable Web Buckling Ratio:	AWBR =	90.55	
Controlling Unbraced Length:	Lb =	0	ft
Limiting Unbraced Length -			
for lateral-torsional buckling:	Lp =	4.34	ft
Nominal Flexural Strength w/ safety factor:	Mn =	42415	ft-lb
Controlling Equation:	F2-1		
Web height to thickness ratio:	h/tw =	29.91	
Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
Cv Factor:	Cv =	1	
Controlling Equation:	G2-2		
Nominal Shear Strength w/ safety factor:	Vn =	37444	lb

LOADING DIAGRAM

ROOF LOADING
		Side 1		Side 2	
Roof Live Load	RLL =	0	psf	0	psf
Roof Dead Load	RDL =	0	psf	0	psf
Roof Tributary Width	RTW =	0	ft	0	ft

FLOOR LOADING
		Side 1		Side 2	
Floor Live Load	FLL =	30	psf	0	psf
Floor Dead Load	FDL =	15	psf	0	psf
Floor Tributary Width	FTW =	12.1	ft	0	ft
Wall Load	WALL =			80	plf

BEAM LOADING
Roof Uniform Live Load:	wL-roof =	0	plf
Roof Uniform Dead Load:	wD-roof =	0	plf
Floor Uniform Live Load:	wL-floor =	363	plf
Floor Uniform Dead Load:	wD-floor =	182	plf
Beam Self Weight:	BSW =	18	plf
Combined Uniform Live Load:	wL =	363	plf
Combined Uniform Dead Load:	wD =	280	plf
Combined Uniform Total Load:	wT =	643	plf

POINT LOADS - CENTER SPAN
Load Number	One	Two
Live Load	1555 lb	1555 lb
Dead Load	983 lb	983 lb
Location	2 ft	8.25 ft

Controlling Moment: 25934 ft-lb
7.0 ft from left support
Created by combining all dead and live loads.

Controlling Shear: 7715 lb
At support.
Created by combining all dead and live loads.
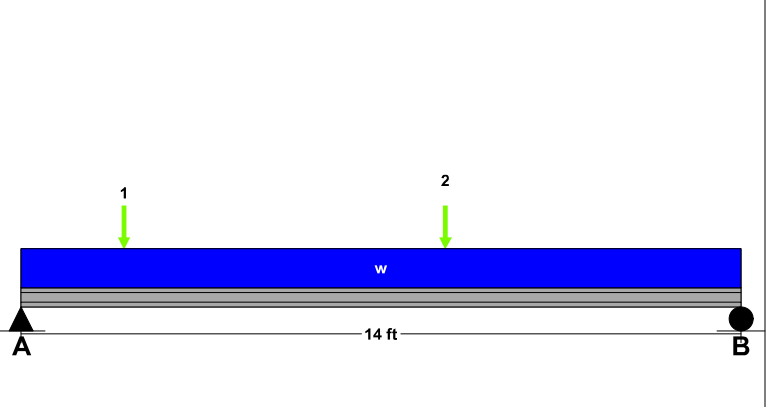
Comparisons with required sections:
	Req'd	Provided
Moment of Inertia (deflection):	60.9 in4	61.9 in4
Moment:	25934 ft-lb	42415 ft-lb
Shear:	7715 lb	37444 lb