



Structural Calculations For:

Khandelwal Shankaran

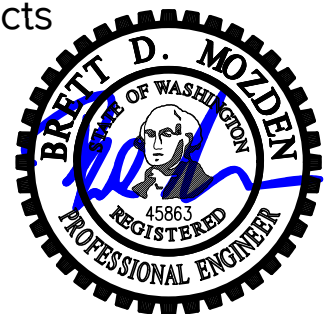
8460 SE 83rd St

Mercer Island, WA, 98040

Prepared for: Marlo Brown Architects

Job #: 11712-2022-01

Date: January 29, 2024



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Criteria Sheet

Codes

Structural IBC 2018
 Loading ASCE 7-16
 Wood: NDS 2018 / SDPWS 2015
 Steel: AISC 360-16
 Concrete: ACI 318-14
 Masonry: TMS 402/602-16

Project Location

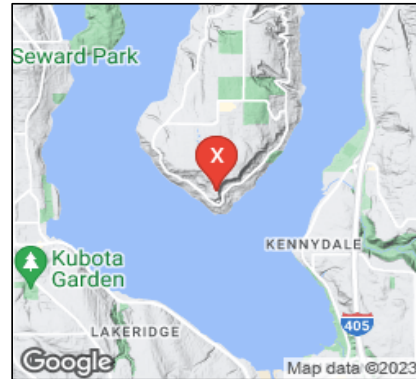
Street & Number 8460 SE 83rd St
 City: Mercer Island State: WA
 ZIP: 98040
 Latitude: 47.5281 N
 Longitude: -122.2274 W
 Ground Elevation 273 ft

Occupancy Category

Risk Category: II ASCE 7 Table 1.5-1

Seismic Load Summary:

Analysis Procedure: Equivalent Lateral Force Procedure
 Lateral System: Light-frame (wood) Walls Sheathed with Wood
 Structural Panels Rated for Shear Resistance
 R: 6.50 $C_d = 4$
 Base Shear V = 19 kips $\Omega_o = 2.5$
 $S_s = 1.466$ $S_r = 0.505$
 $S_{DS} = 0.98$ $S_{D1} = 0.86$
 $C_s = 0.150$ $I_E = 1.0$



Story Information

Stories Above Grade (Including Mezzanine Levels) 2

Horizontal and Vertical Irregularities:

Is the building a "Regular Structure"? (No horizontal or vertical irregularities) No

Wind Load Summary:

V = 110 $K_{ZT} = 1.90$
 Exposure = C

Dead Loads:

Roof		Floor	
Roofing	1 psf	Finish Floor	2 psf
1/2" Sheathing	1.8 psf	3/4" Sheathing	2.7 psf
Rafters @ 24" oc	2.5 psf	Joists @ 16" oc	2.2 psf
Misc./Mech.	1.5 psf	Misc./Mech.	2 psf
Ceiling Finish	2.8 psf	Ceiling Finish	2.8
Solar Panels	5 psf		11.7 psf
	15 psf	Use	12 psf
Use	15 psf	Add'l Seismic Weight	12 psf
Add'l Seismic Weight	6 psf	Seismic Weight	24 psf
Seismic Weight	21 psf		

Live Loads:

Roof	20 psf
Floor	40 psf
Deck	60 psf

Snow Loading Criteria:

Ground Snow, p_g	20 psf	Flat Roof Snow Load, p_f	25.0 psf	Importance Factor, I_s	1.00
Exposure Factor, C_e	1.00	Sloped Roof Snow Load, p_s	25.0 psf		
Thermal Factor, C_t	1.00	Slope Factor, C_s	0.61		

Soils:

Allowable Bearing	1500 psf	Active	55/35 pcf (Restrained/Unrestrained)
Sliding, μ	0.3	Seismic Surcharge	8H
Passive	250 pcf		

Soils Report Provided? No To be approved by the authority having jurisdiction, per 11.8.2 exception.

Site Specific Ground Motion Hazard Analysis Provided? No



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Seismic Design

ASCE 7-16 Seismic Analysis

Equivalent Lateral Force Procedure

Apply Section 12.8.1.3 (Where Applicable)? **Yes**

Seismic Force Resisting System Per Table 12.2-1	System	Bearing Wall Systems
	Type	Light-frame (wood) Walls Sheathed with Wood Structural Panels Rated for Shear Resistance

Seismic Design Cat.	D
Risk Category	II
Site Class	D
Diaphragm Flexibility	Flexible

I, II, or III, or IV per Table 1.5-1

Section 12.8.1.3

1. Regular Structure	No
2. ≤ 5 Stories above grade	Yes
3. $T \leq 0.5s$	Yes
4. $\rho = 1.0$	No
5. Not Site Class E or F	Yes
6. Risk Category I or II	Yes

If all items above are met, S_{DS} may be taken as 1.0, but not less than 0.7*(Calculated S_{DS})

S_s	1.466 g	2% in 50 yr, Latitude & Longitude lookup
S_1	0.505 g	
R	6.50	2% in 50 yr, Latitude & Longitude lookup
C_d	4.0	
Ω_o	2.5	Table 1.5-2
I_e	1.00	
h_n	20.0 ft	Table 12.8-2
C_t	0.02	
x	0.75	Table 12.8-2
T_a	0.19 sec	Eq. 12.8-7
T	0.19 sec	
T_o	0.18 sec	Eq. 12.8-7
T_s	0.88 sec	
T_L	6.00 sec	Table 11.4-1
F_a	1.00	
F_v	1.70	Table 11.4-2
S_{MS}	1.47 g	Eq. 11.4-1
S_{M1}	1.29 g	Eq. 11.4-2
S_{DS}	0.977 g	Eq. 11.4-3
S_{D1}	0.859 g	Eq. 11.4-4
C_s	0.150 Controls	Eq. 12.8-2
	0.699	Eq. 12.8-3 need not exceed, $T < T_L$
	0.010	Eq. 12.8-5 or 12.8-6 minimum
C_s , design	0.150	Section 11.4.8 Exception 2 Applied
Bldg. Weight	123.2 k	
$V = C_s W$	18.5 k	Eq. 12.8-1, Strength Level Base Shear
$V = C_{sASD} W$	13.0 k	Eq. 12.8-1 ASD Base Shear

Table 1.5-2

Table 12.8-2

Table 12.8-2

Eq. 12.8-7

Table 11.4-1

Table 11.4-2

Eq. 11.4-1

Eq. 11.4-2

Eq. 11.4-3

Eq. 11.4-4

Eq. 12.8-2

Eq. 12.8-3 need not exceed, $T < T_L$

Eq. 12.8-5 or 12.8-6 minimum

Section 11.4.8 Exception 2 Applied

Building Period Per Alternate Analysis

T (sec)	
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Per Geotech Report

F_a	
F_v	

$$T_a = C_t h_n^x \quad \text{Eq. 12.8.7}$$

$$S_{MS} = F_a S_s \quad \text{Eq. 11.4-1}$$

$$S_{M1} = F_v S_1 \quad \text{Eq. 11.4-2}$$

$$S_{DS} = \frac{2}{3} S_{MS} \quad \text{Eq. 11.4-3}$$

$$S_{D1} = \frac{2}{3} S_{M1} \quad \text{Eq. 11.4-4}$$

$$C_s = \frac{S_{DS}}{(R/I_e)} \quad \text{Eq. 12.8-2}$$

$$C_s = \frac{S_{D1}}{T(R/I_e)} \quad \text{Eq. 12.8-3}$$

$$C_s = \frac{S_{D1} T_L}{T^2(R/I_e)} \quad \text{Eq. 12.8-4}$$

$$C_s \geq 0.044 S_{DS} I_e \quad \text{Eq. 12.8-5}$$

$$C_s \geq 0.01 \quad \text{Eq. 12.8-5}$$

$$C_s \geq 0.5 \frac{S_1}{(R/I_e)} \quad \text{Eq. 12.8-6}$$

$$C_{vx} = w_x h_x^k / \sum_{i=1}^n w_i h_i^k \quad \text{Eq. 12.8-12}$$

$$F_{px} = \frac{\sum_{i=x}^n F_i}{\sum_{i=x}^n w_i} w_{px} \quad \text{Eq. 12.10-1}$$

$$F_{px} \geq 0.2 S_{DS} I_e w_{px} \quad \text{Eq. 12.10-2}$$

$$F_{px} \leq 0.4 S_{DS} I_e w_{px} \quad \text{Eq. 12.10-3}$$

Vertical Distribution ASD $\rho = 1.3$ $k = 1.000$

Level	h_x (ft)	W_x (k)	h_x^k (ft)	$W_x h_x^k$	Story Shear ASD			Diaphragm Force (ρ not included)				
					C_{vx} (%)	F_x (k)	SV (k)	$F_{px,calc}$	$F_{px,min}$	$F_{px,max}$	$F_{px,design}$	$\gamma = F_{px}/F_x$
Roof	20.0	54.7	20.0	1091	0.633	10.66	10.66	8.20	7.48	14.96	8.20	0.77
Floor	9.3	68.5	9.3	634	0.367	6.19	16.85	7.21	9.37	18.74	9.37	1.51
Σ		123.2		1725		16.85						



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Wind Design - MWFRS

ASCE 7 Chapter 27 - Directional Procedure

Design Method	ASD
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Wind Coefficients

Exposure	C	
V=	110	mph
K_d =	0.85	Table 26.6-1
K_{zt} =	0.90	Table 26.10-1
K_e =	0.99	Table 26.9-1
G=	0.85	26.9.4

Transverse Wind Pressures

L/B = 0.87 h/L = 0.36

Pressure Coefficients from Figure 27.3-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.50
Windward Roof	-0.29 / 0.19
Leeward Roof	-0.60

Location and Building Dimensions

Calculate K_{zt} ?	No	
K_{zt}	1.90	
Roof Type	Gable	
Roof Slope - Transverse Dir	22.6	degrees
Roof Slope - Long Dir	0	degrees
Ground to top of roof	22.6	ft
Bot of roof to top of roof	5.25	ft
Mean Roof Height, h	20.0	ft
Short Plan Dimension	55.5833	ft
Long Plan Dimension	64.3	ft
Parapet ?	No	
Ground to top of parapet		ft
Average Parapet Height		ft

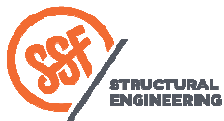
Velocity Pressure at Mean Roof Height, q_h	44.7	psf
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Wall Pressures (Unfactored):

Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lw\ walls}$	$P_{walls} \text{ (psf)}$
0-15	0.85	42.10	28.63	18.98	28.6
15-20	0.9	44.58	30.31	18.98	29.6
20-25	0.94	46.56	31.66	18.98	30.4
25-30	0.98	48.54	33.01	18.98	31.2
30-40	1.04	51.52	35.03	18.98	32.4
41-50	1.09	53.99	36.71	18.98	33.4
51-60	1.13	55.97	38.06	18.98	34.2
61-70	1.17	57.95	39.41	18.98	35.0
71-80	1.21	59.94	40.76	18.98	35.8
81-90	1.24	61.42	41.77	18.98	36.4
91-100	1.26	62.41	42.44	18.98	36.9

Roof Pressures (Unfactored)

Windward		Leeward	Horiz Proj (psf)
Max	Min		
7.1	-11.1	-22.8	17.93



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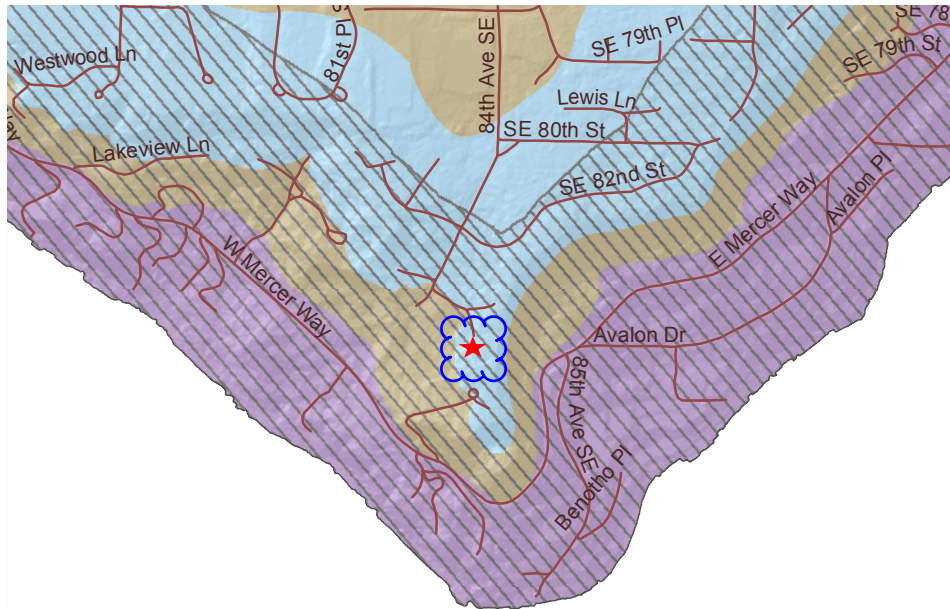
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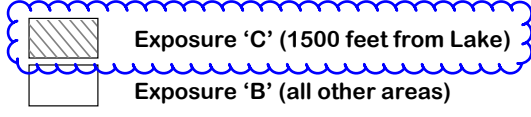
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Kzt = 1.9



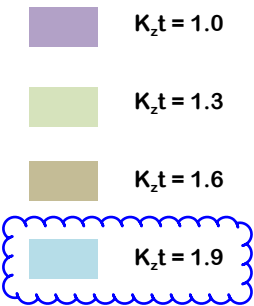
WIND EXPOSURE CATEGORIES:

Wind Exposure Category



WIND SPEED-UP (TOPOGRAPHIC EFFECT) - K_{z,t} Factor :

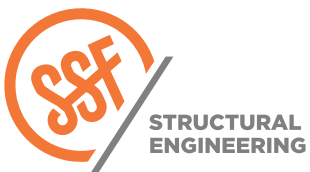
K_{z,t} Factor



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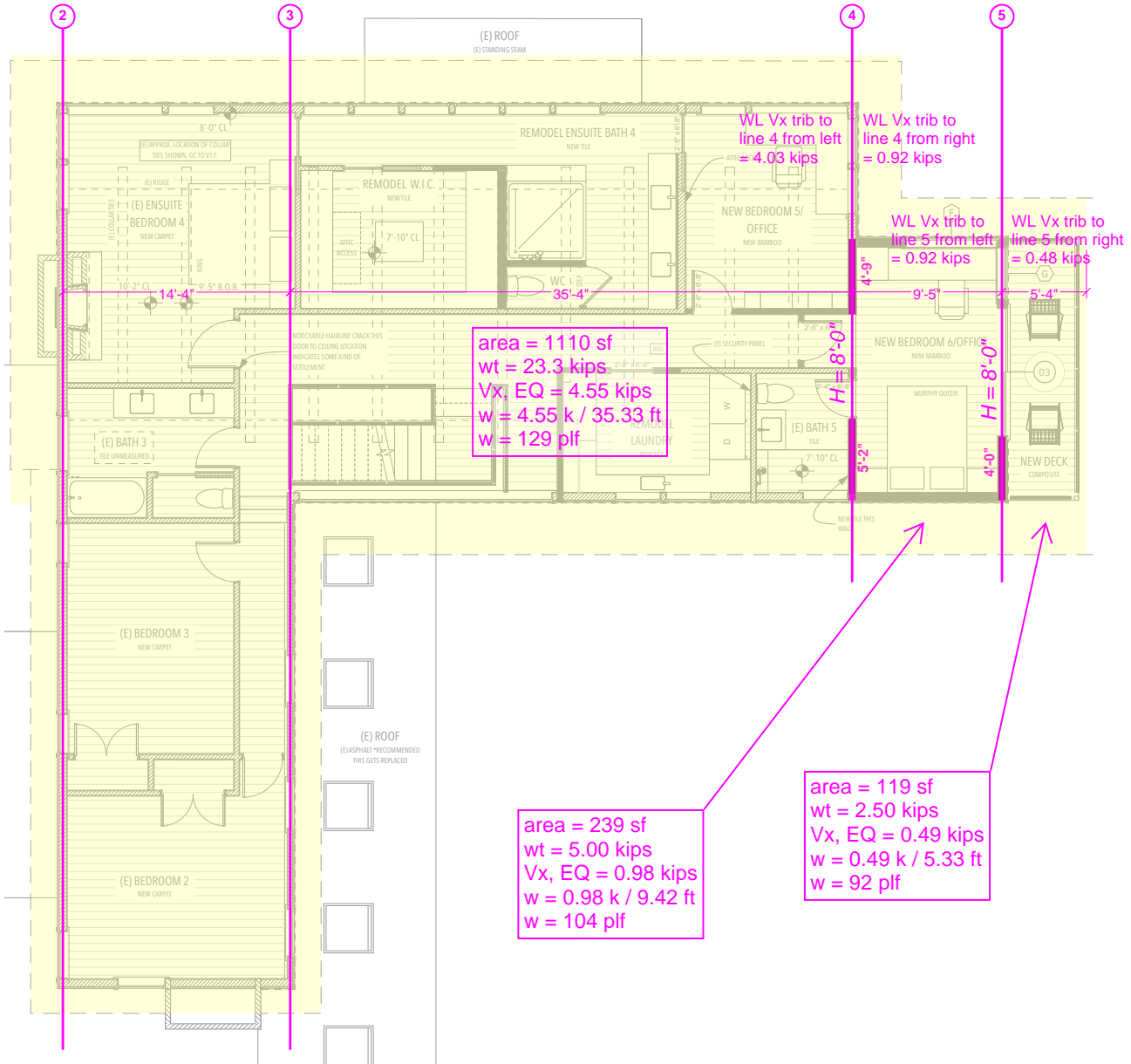
SHEET

Lateral Design - N/S Direction

ROOF

WIND --- $V_x = 13.42$ kips
 $w = \text{varies}$

EQ --- $V_x = 10.66$ kips
 $w = \text{varies}$

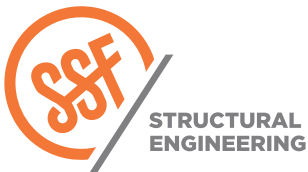


NO CHANGES TO
 LINE 2 OR 3

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Lateral Design - N/S Direction

ROOF

WIND --- $V_x = 13.42$ kips
 $w = \text{varies}$

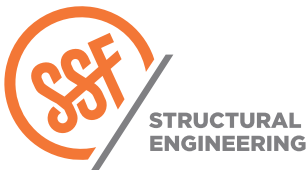
EQ --- $V_x = 10.66$ kips
 $w = \text{varies}$

	<i>Line 4</i>	<i>Line 5</i>
V (k) W/EQ	4.95 / 2.78	1.40 / 0.98
V cum (k) W/EQ	4.95 / 2.78	1.40 / 0.98
L (ft) W/EQ	9.92 / 9.92	4.00 / 4.00
V (plf) W/EQ	499 / 281	350 / 245
SW type	W3	W4
OT (k)	4.00	2.80
0.6DL (k)	0.14	0.13
OT cum (k)	3.86	2.67
HD	CMSTC16	CMSTC16

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Lateral Design - N/S Direction

ROOF (DIAPHRAGM DESIGN)

WIND --- $V_x = 13.42$ kips
 $V_{px} = 13.42$ kips

EQ --- $V_x = 10.66$ kips
 $V_{px} = 10.66 * 0.77 * 1.25$
 $V_{px} = 10.26$ kips

DIAPHRAGM CAPACITY

unblocked -- 253 plf W/ 180 plf EQ

		<i>Line 4</i>	<i>Line 5</i>
	V (k) W/EQ	4.95 / 2.68	1.40 / 0.95
INCLUDES → STRUT LENGTH+ WALL LENGTH	Attach. L (ft)	varies	15.50
	V (plf) W/EQ	see below	91 / 62
	Unblocked OK?	see below	YES

DIAPHRAGM DESIGN - LINE 4 (wind governs)

load from the left = 4.03 kips
 $4.03 \text{ k} / 23.92 \text{ ft} = 169 \text{ plf}$ so OK with unblocked diaphragm

load from the right = 0.92 kips
 $0.92 \text{ k} / 15.50 \text{ ft} = 60 \text{ plf}$ so OK with unblocked diaphragm

load over wall = $169 + 60 = 229 \text{ plf}$ so OK w/ panel edge nailing of SW below

load wall takes = 0.93 kips W/ 0.67 kips EQ
 left for strut = 0.47 kips W/ 0.28 kips EQ

strut design --
 $W = 0.47$ kips
 $EQ = 0.28 * (2.5 / 1.25) = 0.56$ kips
 strut use = top plate

DRAG STRUT - LINE 5

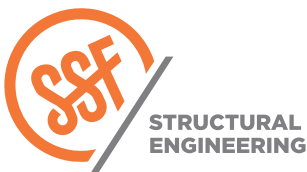
load wall takes = 0.93 kips W/ 0.67 kips EQ
 left for strut = 0.47 kips W/ 0.28 kips EQ

strut design --
 $W = 0.47$ kips
 $EQ = 0.28 * (2.5 / 1.25) = 0.56$ kips
 strut use = top plate

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Lateral Design - N/S Direction

FLOOR

WIND --- $V_x = 21.57$ kips
 $w = \text{varies}$

EQ --- $V_x = 6.22$ kips
 $w = \text{varies}$

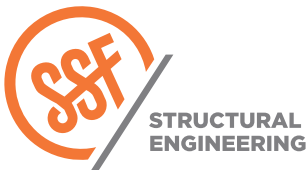
	<i>Line 4</i>	<i>Line 5</i>
V (k) W/EQ	5.37 / 1.33	1.37 / 0.26
V cum (k) W/EQ	10.32 / 4.11	2.77 / 1.24
L (ft) W/EQ	9.92 / 9.92	7.17 / 7.17
V (plf) W/EQ	1041 / 415	387 / 173
SW type	W2-10	W4
OT (k)	8.59	3.19
0.6DL (k)	0.28	0.24
OT cum (k)	12.17	2.95
HD	HDU14	HDU4

↑
 this is where HD stacks,
 where doesn't, OT cum =
 8.31 k and HD = HDU11

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Lateral Design - N/S Direction

FLOOR (DIAPHRAGM DESIGN)

WIND --- $V_x = 21.57$ kips
 $V_{px} = 21.57$ kips

EQ --- $V_x = 6.19$ kips
 $V_{px} = 6.19 * 1.51 * 1.25$
 $V_{px} = 11.69$ kips

DIAPHRAGM CAPACITY

unblocked -- 253 plf W/ 180 plf EQ blocked (4" spacing) -- 505 plf W/ 360 plf EQ

		<i>Line 4</i>	<i>Line 5</i>
	V (k) W/EQ	5.37 / 2.51	2.77 / 2.15
INCLUDES →	Attach. L (ft)	varies	7.17
STRUT	V (plf) W/EQ	see below	387 / 300
LENGTH+	Unblocked OK?	see below	USE 4" BLKG
WALL			
LENGTH			

DIAPHRAGM DESIGN - LINE 4 (wind governs)

load from the left = 4.00 kips
 $4.00 \text{ k} / 23.83 \text{ ft} = 168 \text{ plf}$ so OK with unblocked diaphragm

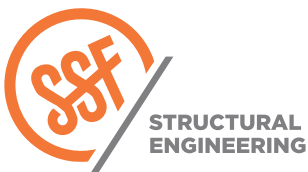
load from the right = 1.37 kips
 $1.37 \text{ k} / 15.50 \text{ ft} = 89 \text{ plf}$ so OK with unblocked diaphragm

load over wall = $168 + 89 = 257 \text{ plf}$ so OK w/ panel edge nailing of SW below

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Lateral Design - E/W Direction

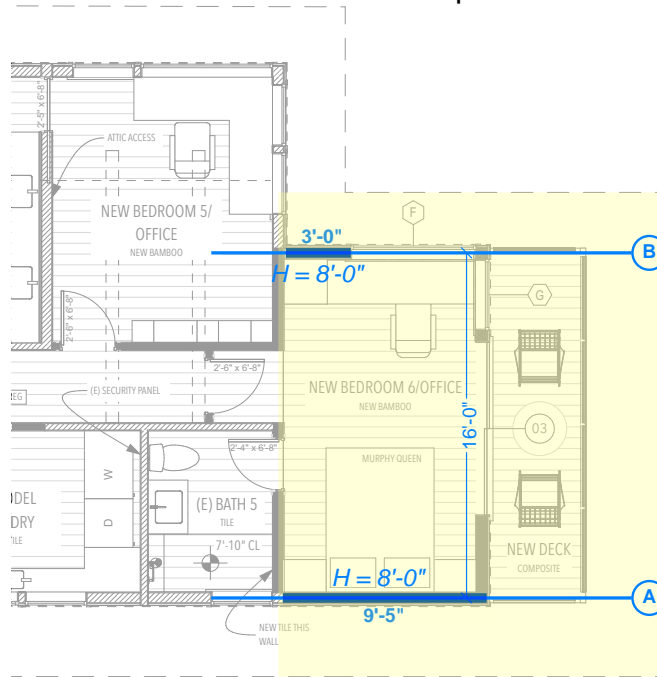
ROOF

AT THE ROOF, THE ADDITION IS FULLY SELF SUPPORTED Laterally

WIND --- $V_x, \text{add'l} = 1.58 \text{ kips}$
 $w = 1.58 \text{ k} / 16.00 \text{ ft}$
 $w = 158 \text{ plf}$

EQ --- $V_x, \text{tot} = 10.66 \text{ kips}$
 $V_x, \text{add'l} = 1.32 \text{ kips}$
 $w = 1.32 \text{ k} / 16.00 \text{ ft}$
 $w = 83 \text{ plf}$

NOTE: THIS IS USING JUST THE WINDWARD PRESSURE SINCE NOT THE LEEWARD FACE

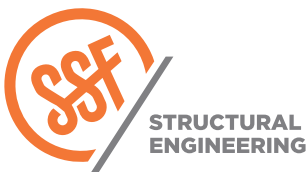


	Line A	Line B
V (k) W/EQ	0.79 / 0.66	0.79 / 0.66
V cum (k) W/EQ	0.79 / 0.66	0.79 / 0.66
L (ft) W/EQ	9.42 / 9.42	3.00 / 2.25
V (plf) W/EQ	84 / 70	264 / 294
SW type	W6	W4
OT (k)	0.67	2.11
0.6DL (k)	-	0.16
OT cum (k)	-	1.95
HD	-	CS14

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Lateral Design - E/W Direction

ROOF (DIAPHRAGM DESIGN)

WIND --- $V_x = 1.58$ kips
 $V_{px} = 1.58$ kips

EQ --- $V_x = 10.66$ kips
 $V_{px} = 10.66 * 0.77 * 1.25$
 $V_{px} = 10.26$ kips

DIAPHRAGM CAPACITY

unblocked -- 253 plf W/ 180 plf EQ

		<i>Line A</i>	<i>Line B</i>
	V (k) W/EQ	0.79 / 0.64	0.79 / 0.64
INCLUDES STRUT LENGTH+ WALL LENGTH	→ Attach. L (ft)	9.42	9.42
	V (plf) W/EQ	84 / 68	84 / 68
	Unblocked OK?	YES	YES

DIAPHRAGM DESIGN - LINE B

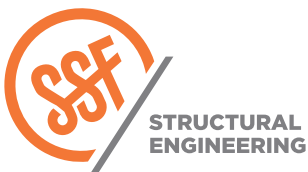
load wall takes = 0.76 kips W/ 0.54 kips EQ
left for strut = 0.03 kips W/ 0.10 kips EQ

strut design --
 $W = 0.03$ kips
 $EQ = 0.10 * (2.5/1.25) = 0.20$ kips
strut use = top plate

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LAN

DESIGN

12

SHEET

Lateral Design - E/W Direction

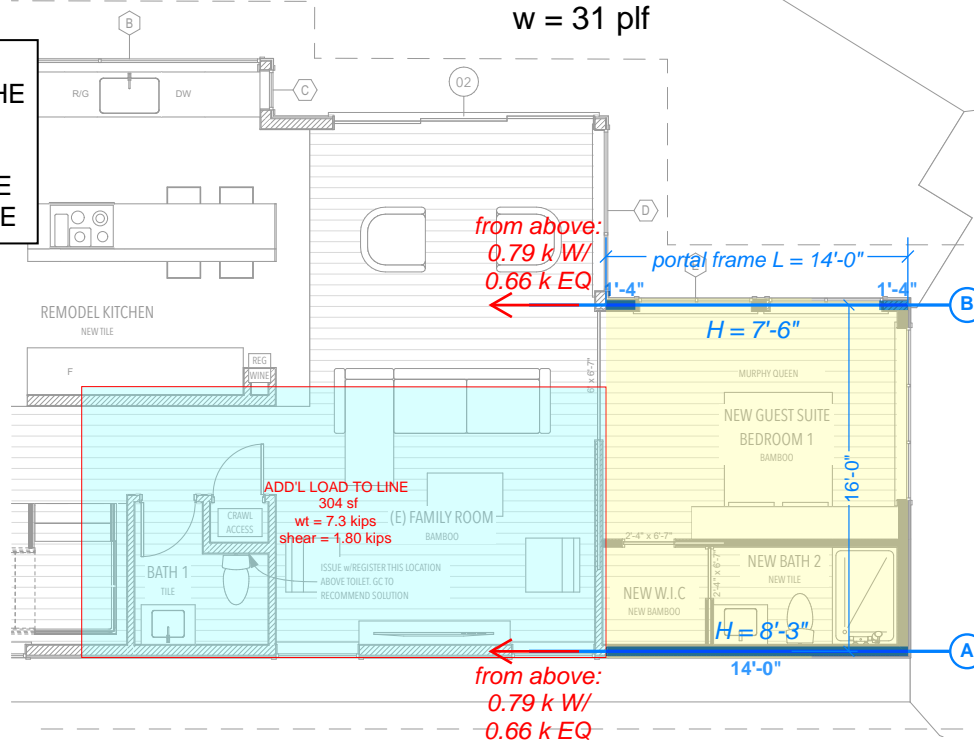
FLOOR

AT THE FLOOR, THE ADDITION IS FULLY SELF SUPPORTED Laterally

WIND --- $V_x, \text{add'l} = 2.66 \text{ kips}$
 $w = 2.66 \text{ k} / 16.00 \text{ ft}$
 $w = 166 \text{ plf}$

EQ --- $V_x, \text{tot} = 6.19 \text{ kips}$
 $V_x, \text{add'l} = 0.50 \text{ kips}$
 $w = 0.50 \text{ k} / 16.00 \text{ ft}$
 $w = 31 \text{ plf}$

NOTE: THIS IS USING JUST THE WINDWARD PRESSURE SINCE NOT THE LEEWARD FACE



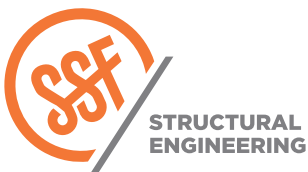
	Line A	Line B
V (k) W/EQ	1.33 / 2.04	1.33 / 0.26
V cum (k) W/EQ	2.12 / 2.70	2.12 / 0.92
L (ft) W/EQ	14.00 / 14.00	portal frame
V (plf) W/EQ	152 / 193	-
SW type	W6	W3
OT (k)	1.59	1.14
0.6DL (k)	0.61	0.08
OT cum (k)	-	3.09
HD	-	MSTCM60

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DESIGN

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SHEET

Lateral Design - E/W Direction

FLOOR (DIAPHRAGM DESIGN)

WIND --- $V_x = 21.57$ kips
 $V_{px} = 21.57$ kips

EQ --- $V_x = 6.19$ kips
 $V_{px} = 6.19 * 1.51 * 1.25$
 $V_{px} = 11.69$ kips

DIAPHRAGM CAPACITY

unblocked -- 253 plf W/ 180 plf EQ

		<i>Line A</i>	<i>Line B</i>
	V (k) W/EQ	1.33 / 3.85	1.33 / 0.49
INCLUDES STRUT LENGTH+ WALL LENGTH	→ Attach. L (ft)	14.00	14.00
	V (plf) W/EQ	see below	95 / 35
	Unblocked OK?	see below	YES

DIAPHRAGM DESIGN - LINE A

load transferred through diaphragm = 1.33 k W / 0.49 k EQ
 same as line B so OK as unblocked

load transferred through strut = $1.80 * 2.5 / 1.3 = 3.46$ kips EQ
 strut use = CMSTC16 on top plate

DIAPHRAGM DESIGN - LINE B

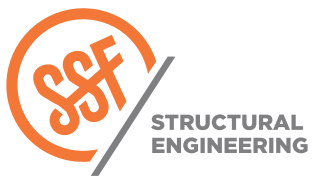
load wall takes = 0.62 kips W/ 0.45 kips EQ
 left for strut = 0.71 kips W/ 0.04 kips EQ

strut design --
 $W = 0.71$ kips
 $EQ = 0.04 * (2.5 / 1.25) = 0.08$ kips
 strut use = top plate

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 SHEET

Lateral Design - Holdowns

HOLDOWN = HDU4

OT load = 3860 lbs, ASD
6434 lbs, LRFD

shear check:

$$\Phi V_c = 0.75 * 2 * \sqrt{(2500 \text{ psi}) * (8") * (12")} = 7200 \text{ lbs} > 6434 \text{ lbs}$$

bearing check:

$$2500 \text{ psi} * (4") * (4") = 40000 \text{ lbs} > 6434 \text{ lbs}$$

so for HDU4, use 12" embed for core detail

HOLDOWN = HDU11

OT load = 8310 lbs, ASD
13850 lbs, LRFD

shear check:

$$\Phi V_c = 0.75 * 2 * \sqrt{(2500 \text{ psi}) * (8") * (36")} = 1440 \text{ lbs} > 13850 \text{ lbs}$$

bearing check:

$$2500 \text{ psi} * (4") * (4") = 40000 \text{ lbs} > 13850 \text{ lbs}$$

so for HDU11, use 24" embed for core detail

HOLDOWN = HDU14

OT load = 12170 lbs, ASD
20284 lbs, LRFD

shear check:

$$\Phi V_c = 0.75 * 2 * \sqrt{(2500 \text{ psi}) * (8") * (36")} = 21600 \text{ lbs} > 20284 \text{ lbs}$$

bearing check:

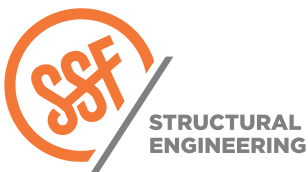
$$2500 \text{ psi} * (4") * (4") = 40000 \text{ lbs} > 20284 \text{ lbs}$$

so for HDU14, use 36" embed for core detail

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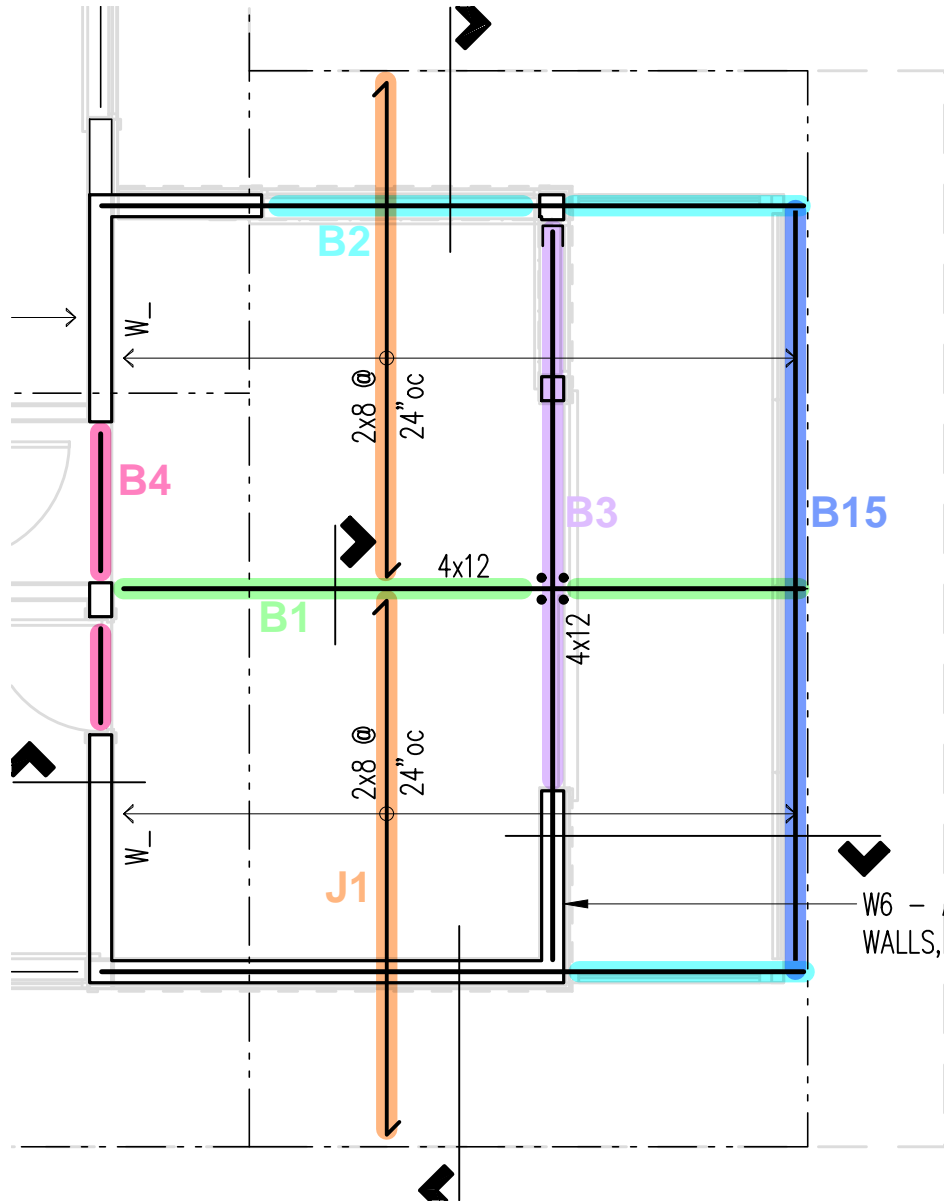
LAN

DESIGN

15

SHEET

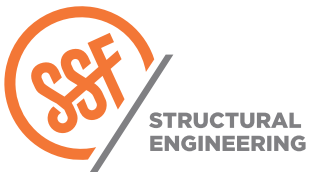
Gravity Design - Roof Key Plan



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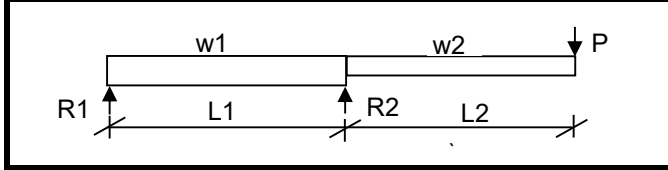
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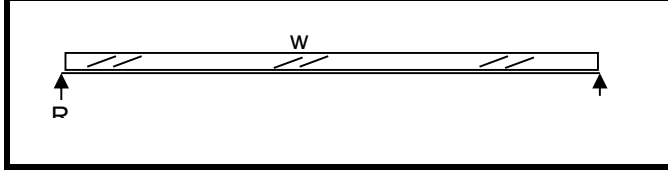
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12/12/2023
 DATE 11712-2023-01
 PROJ. # LAN
 DESIGN 16
 SHEET

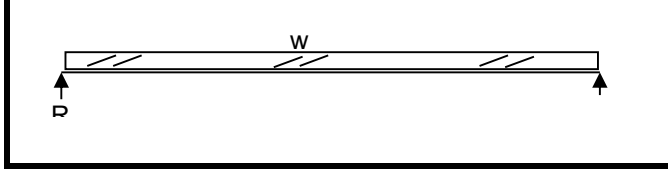
Beam		J1	DF-L	2	x 8
w1=	30	plf		R1=	50 lbs
w2=	80	plf		R2=	490 lbs
L1=	8.00	ft		M+=	41 lb-ft
L2=	3.75	ft		M-=	563 lb-ft
X=	4.00	ft		Fb=	514 psi
P=	-	lbs		Fv=	35 psi
b=	1.50	in		Δ_{span} =	(0.015) in
d=	7.25	in		I_{span} /	(6,514)
E=	1,600	ksi		Δ_{cant} =	0.12 in
Cv=	1.00			I_{cant} /	763



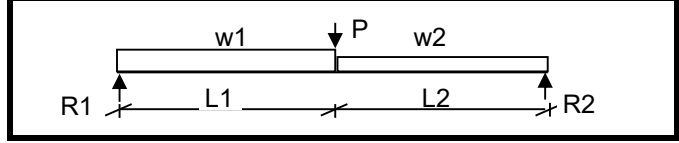
Beam		B1	HF	4	x 10
w=	320	plf		R=	1,520 lbs
L=	9.50	ft		M=	3,610 ft-lbs
b=	3.50	in		Fb=	868 psi
d=	9.25	in		Fv=	59 psi
E=	1300	ksi		Δ =	0.20 in
Cv=	1.00	≤ 1.0		I /	583



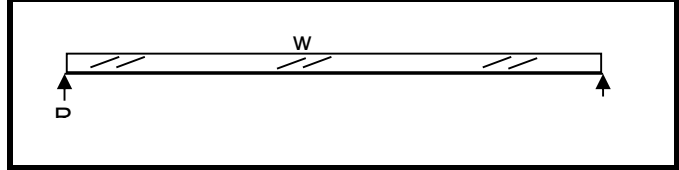
Beam		B2	HF	3	x 8
w=	345	plf		R=	1,079 lbs
L=	6.25	ft		M=	1,685 ft-lbs
b=	3.00	in		Fb=	770 psi
d=	7.25	in		Fv=	60 psi
E=	1300	ksi		Δ =	0.10 in
Cv=	1.00	≤ 1.0		I /	784



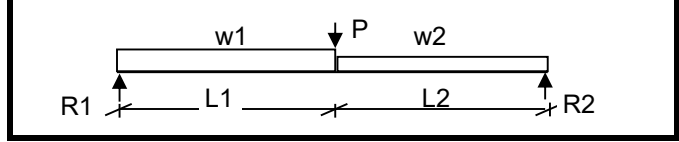
Beam		B3	LSL	3	1/2 x 11	7/8
w1=	80	plf		R1=	1,516 lbs	
w2=	80	plf		R2=	1,564 lbs	
L1=	4.33	ft		M=	5,820 lb-ft	
L2=	4.17	ft		Fb=	849 psi	
X=	4.3	ft		Fv=	54 psi	
P=	2,400	lbs		Δ =	0.08 in	
b=	3.50	in		I /	1,237	
d=	11.88	in		Cv=	1.00	
E=	1,550	ksi				



Beam		B4	HF	3	x 8
w=	80	plf		R=	150 lbs
L=	3.75	ft		M=	141 ft-lbs
b=	3.00	in		Fb=	64 psi
d=	7.25	in		Fv=	7 psi
E=	1300	ksi		Δ =	0.00 in
Cv=	1.00	≤ 1.0		I /	15657



Beam		B15	DF-L	4	x 10
w1=	10	plf		R1=	520 lbs
w2=	10	plf		R2=	520 lbs
L1=	8.00	ft		M=	3,840 lb-ft
L2=	8.00	ft		Fb=	923 psi
X=	8.0	ft		Fv=	24 psi
P=	880	lbs		Δ =	0.39 in
b=	3.50	in		I /	491
d=	9.25	in		Cv=	1.00
E=	1,600	ksi			



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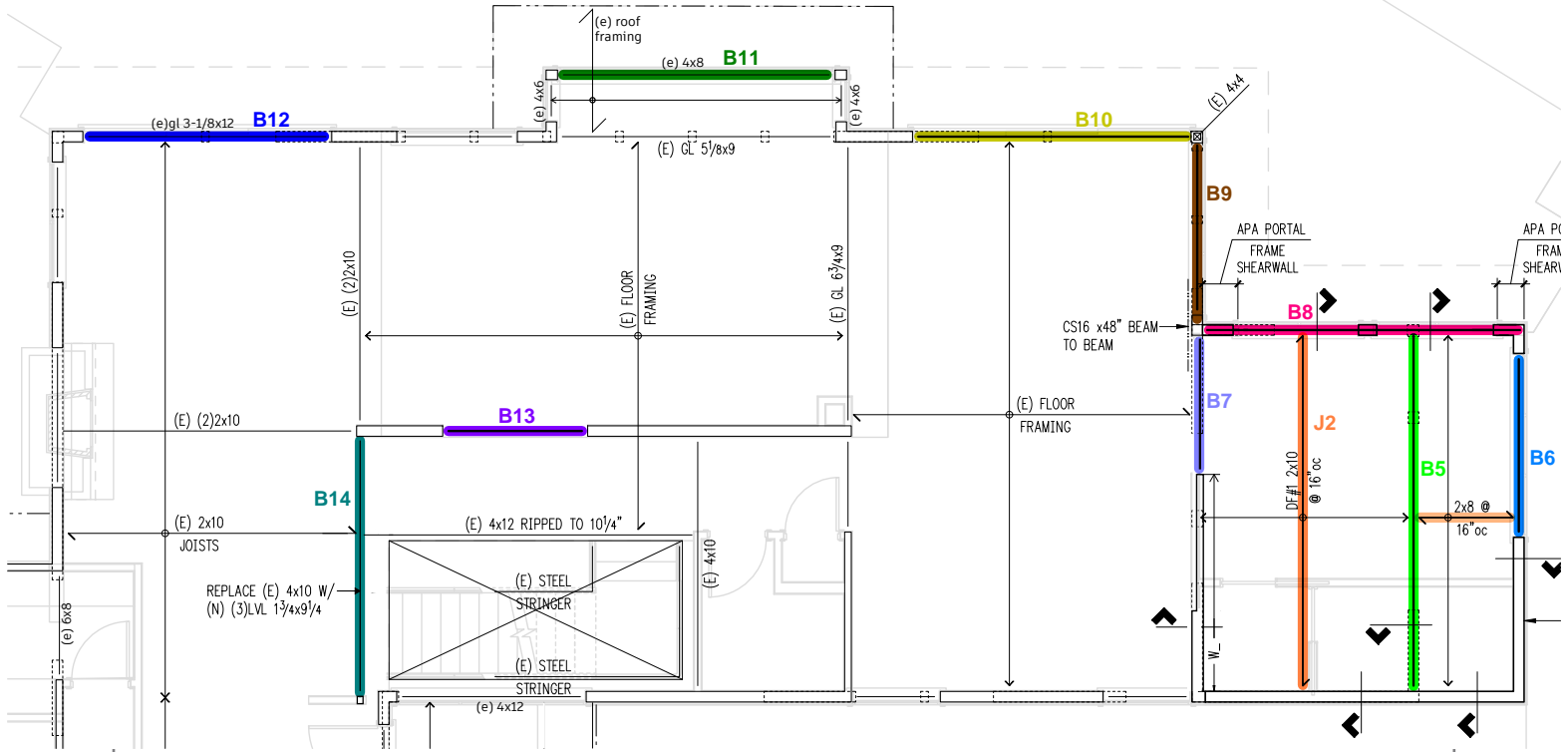
Project #: 11712-2023-
04

Design: LAN

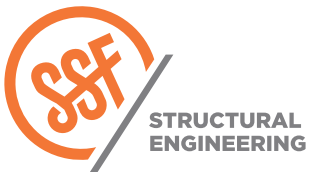
Sheet: 17

Gravity Design - 2nd Floor Key Plan

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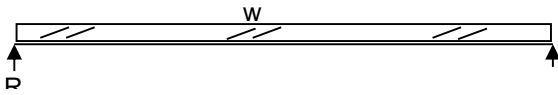
LAN

DESIGN

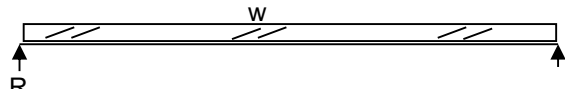
18

SHEET

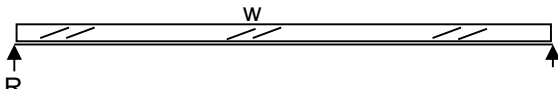
Beam		J2	DF-L	2	x 10
w=	52	plf	R=	416	lbs
L=	16.00	ft	M=	1,664	ft-lbs
b=	1.50	in	Fb=	933	psi
d=	9.25	in	Fv=	41	psi
E=	1600	ksi	Δ =	0.48	in
Cv=	1.00	≤ 1.0	I/	396	



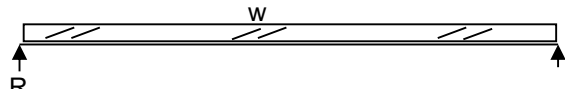
Beam		B11	DF-L	4	x 10
w=	240	plf	R=	1,523	lbs
L=	12.67	ft	M=	4,822	ft-lbs
b=	3.50	in	Fb=	1,159	psi
d=	9.25	in	Fv=	62	psi
E=	1600	ksi	Δ =	0.38	in
Cv=	1.00	≤ 1.0	I/	403	



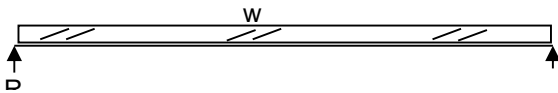
Beam		B6	DF-L	3	x 8
w=	165	plf	R=	701	lbs
L=	8.50	ft	M=	1,490	ft-lbs
b=	3.00	in	Fb=	680	psi
d=	7.25	in	Fv=	41	psi
E=	1600	ksi	Δ =	0.13	in
Cv=	1.00	≤ 1.0	I/	802	



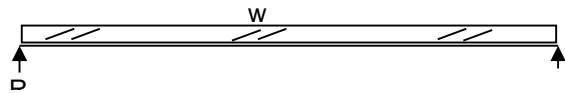
Beam		B13	DF-L	3	x 10
w=	455	plf	R=	1,536	lbs
L=	6.75	ft	M=	2,591	ft-lbs
b=	3.00	in	Fb=	727	psi
d=	9.25	in	Fv=	64	psi
E=	1600	ksi	Δ =	0.07	in
Cv=	1.00	≤ 1.0	I/	1207	



Beam		B9	LSL	3 1/2	x 9 1/4
w=	595	plf	R=	2,529	lbs
L=	8.50	ft	M=	5,374	ft-lbs
b=	3.50	in	Fb=	1,292	psi
d=	9.25	in	Fv=	96	psi
E=	1550	ksi	Δ =	0.20	in
Cv=	1.00	≤ 1.0	I/	522	



Beam		J3	DF-L	2	x 6
w=	96	plf	R=	220	lbs
L=	4.58	ft	M=	252	ft-lbs
b=	1.50	in	Fb=	400	psi
d=	5.50	in	Fv=	32	psi
E=	1600	ksi	Δ =	0.03	in
Cv=	1.00	≤ 1.0	I/	1920	



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Project #: 11712-2023-04

Design: LAN

Sheet: 19

Beam Analysis

Beam:		B5 gravity					
Load	Dead	0.75*Live	Roof Live	Seismic	Factored	Location	
Distributed (k/ft)	w ₁	0.159	0.156		0.315	0.00	
	w ₂	-0.126	-0.038		-0.164	3.58	
	w ₃				0.000		
	w ₄				0.000		
	w ₅				0.000		
	w ₆				0.000		
	w ₇				0.000		
	w ₈				0.000		
	w ₉				0.000		
	w ₁₀				0.000		
Trapezoidal (k/ft/ft)	t ₁				0.000		
	t ₂				0.000		
	t ₃				0.000		
	t ₄				0.000		
	t ₅				0.000		
	t ₆				0.000		
Point (k)	P ₁	0.57	0.71		1.283	3.58	
	P ₂	0.65	0.81		1.460	12.17	
	P ₃				0.000		
	P ₄				0.000		
	P ₅				0.000		
	P ₆				0.000		
	P ₇				0.000		
	P ₈				0.000		
	P ₉				0.000		
	P ₁₀				0.000		

Support Locations and Reactions	
# of Supports	2
Total Beam Length	16.00
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	3.078 0.00
R ₂	2.676 16.00
R ₃	0.000 16.00
R ₄	0.000 16.00
R ₅	0.000 16.00
R ₆	0.000 16.00
R ₇	0.000 16.00
R ₈	0.000 16.00
R ₉	0.000 16.00
R ₁₀	0.000 16.00

Demand Output	
Location, ft	10.00
Shear, k	-0.31
Moment, k-ft M =	10.16
Deflection, in D =	-0.47
Δ/Span	L/409

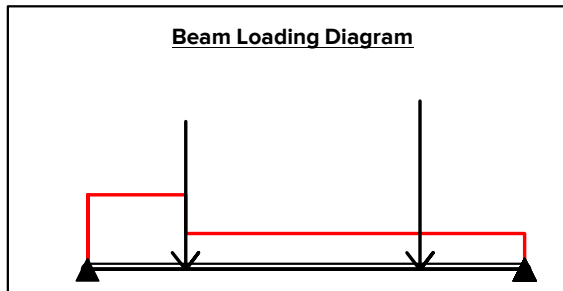
Load Factors	
Dead	1.00
Live	1.00
Roof Live	1.00
Seismic	1.00

Stresses @ Input Location	
f _v (psi)	-7
f _b (psi)	1222

Max/Min Stresses	
f _{v_MAX} (psi)	71
f _{v_MIN} (psi)	-62
f _{b_MAX} (psi)	1262
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	2200
b (in)	7
d (in)	9.25
I (in ⁴)	461.68
S (in ³)	99.823
A (in ²)	64.75
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{Tl} (in)	@ x =	L/	Δ _{Ll} (in)	@ x =	L/
Span 1	3.08	-2.68	0	10.5	-0.505 (+)	8	L/380	-0.321 (+)	8	L/598

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SHEET 20

Beam Analysis

Beam: B5 W							
Load	Dead	Live	Roof Live	Seismic	Factored	Location	
Distributed (k/ft)	w ₁	0.159	0.207			0.315	0.00
	w ₂	-0.126	-0.050			-0.164	3.58
	w ₃					0.000	
	w ₄					0.000	
	w ₅					0.000	
	w ₆					0.000	
	w ₇					0.000	
	w ₈					0.000	
	w ₉					0.000	
	w ₁₀					0.000	
Trapezoidal (k/ft/ft)	t ₁					0.000	
	t ₂					0.000	
	t ₃					0.000	
	t ₄					0.000	
	t ₅					0.000	
	t ₆					0.000	
Point (k)	P ₁	0.57	0.95		5.385	5.321	3.58
	P ₂	0.65	1.08			1.460	12.17
	P ₃					0.000	
	P ₄					0.000	
	P ₅					0.000	
	P ₆					0.000	
	P ₇					0.000	
	P ₈					0.000	
	P ₉					0.000	
	P ₁₀					0.000	

Support Locations and Reactions	
# of Supports	2
Total Beam Length	16.00
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	6.212 0.00
R ₂	3.580 16.00
R ₃	0.000 16.00
R ₄	0.000 16.00
R ₅	0.000 16.00
R ₆	0.000 16.00
R ₇	0.000 16.00
R ₈	0.000 16.00
R ₉	0.000 16.00
R ₁₀	0.000 16.00

Demand Output	
Location, ft	10.00
Shear, k	-1.21
Moment, k-ft M =	15.59
Deflection, in D =	-0.79
Δ/Span	L/244

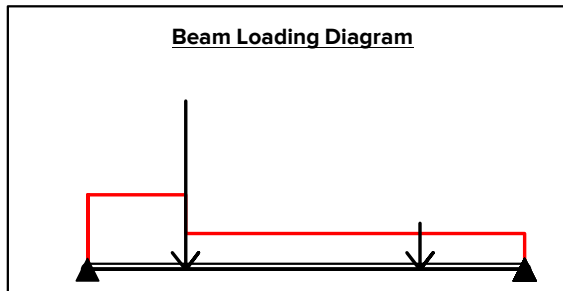
Load Factors	
Dead	1.00
Live	0.75
Roof Live	0.75
Seismic	0.75

Stresses @ Input Location	
f _v (psi)	-28
f _b (psi)	1874

Max/Min Stresses	
f _{v_MAX} (psi)	144
f _{v_MIN} (psi)	-83
f _{b_MAX} (psi)	2428
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	2200
b (in)	7
d (in)	9.25
I (in ⁴)	461.68
S (in ³)	99.823
A (in ²)	64.75
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{TL} (in)	@ x =	L/	Δ _{LL} (in)	@ x =	L/
Span 1	6.21	-3.58	0	20.2	-1.11 (+)	7.6	L/173	-0.428 (+)	8	L/449

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SHEET 21

Beam Analysis

Beam:		B7 gravity					
Load	Dead	Live	Roof Live	Seismic	Factored	Location	
Distributed (k/ft)	w ₁	0.099	0.330		0.429	0.00	
	w ₂	0.162	0.050		0.212	2.17	
	w ₃				0.000		
	w ₄				0.000		
	w ₅				0.000		
	w ₆				0.000		
	w ₇				0.000		
	w ₈				0.000		
	w ₉				0.000		
	w ₁₀				0.000		
Trapezoidal (k/ft/ft)	t ₁				0.000		
	t ₂				0.000		
	t ₃				0.000		
	t ₄				0.000		
	t ₅				0.000		
	t ₆				0.000		
Point (k)	P ₁	0.056	0.094		0.150	2.17	
	P ₂				0.000		
	P ₃				0.000		
	P ₄				0.000		
	P ₅				0.000		
	P ₆				0.000		
	P ₇				0.000		
	P ₈				0.000		
	P ₉				0.000		
	P ₁₀				0.000		

Support Locations and Reactions	
# of Supports	2
Total Beam Length	6.50
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	1.800 0.00
R ₂	2.057 6.50
R ₃	0.000 6.50
R ₄	0.000 6.50
R ₅	0.000 6.50
R ₆	0.000 6.50
R ₇	0.000 6.50
R ₈	0.000 6.50
R ₉	0.000 6.50
R ₁₀	0.000 6.50

Demand Output	
Location, ft	3.00
Shear, k	0.19
Moment, k-ft M =	3.27
Deflection, in D =	-0.07
Δ/Span	L/1130

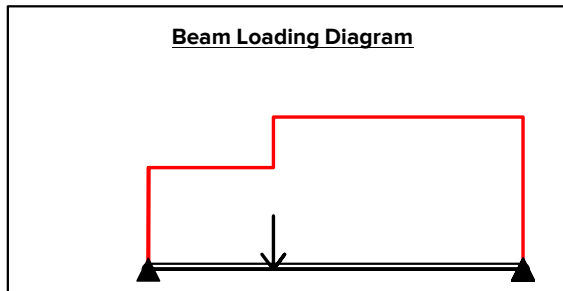
Load Factors	
Dead	1.00
Live	1.00
Roof Live	1.00
Seismic	1.00

Stresses @ Input Location	
f _v (psi)	9
f _b (psi)	787

Max/Min Stresses	
f _{v_MAX} (psi)	83
f _{v_MIN} (psi)	-95
f _{b_MAX} (psi)	793
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	1550
b (in)	3.5
d (in)	9.25
I (in ⁴)	230.84
S (in ³)	49.911
A (in ²)	32.375
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{Tl} (in)	@ x =	L/	Δ _{Ll} (in)	@ x =	L/
Span 1	1.8	-2.06	-	3.3	-0.07 (+)	3.3	L/114	-0.043 (+)	3.3	L/184

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SHEET 22

Beam Analysis

Beam: B7 W		Load	Dead	Live	Roof Live	Wind	Factored	Location
Distributed (k/ft)	W ₁		0.099	0.330			0.347	0.00
	W ₂		0.162	0.050			0.200	2.17
	W ₃						0.000	
	W ₄						0.000	
	W ₅						0.000	
	W ₆						0.000	
	W ₇						0.000	
	W ₈						0.000	
	W ₉						0.000	
	W ₁₀						0.000	
Trapezoidal (k/ft/ft)	t ₁						0.000	
	t ₂						0.000	
	t ₃						0.000	
	t ₄						0.000	
	t ₅						0.000	
	t ₆						0.000	
Point (k)	P ₁		0.056	0.094		7.692	5.896	2.17
	P ₂						0.000	
	P ₃						0.000	
	P ₄						0.000	
	P ₅						0.000	
	P ₆						0.000	
	P ₇						0.000	
	P ₈						0.000	
	P ₉						0.000	
	P ₁₀						0.000	

Support Locations and Reactions	
# of Supports	2
Total Beam Length	6.50
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	5.345 0.00
R ₂	3.668 6.50
R ₃	0.000 6.50
R ₄	0.000 6.50
R ₅	0.000 6.50
R ₆	0.000 6.50
R ₇	0.000 6.50
R ₈	0.000 6.50
R ₉	0.000 6.50
R ₁₀	0.000 6.50

Demand Output	
Location, ft	3.00
Shear, k	-1.76
Moment, k-ft M =	9.49
Deflection, in D =	-0.20
Δ/Span	L/399

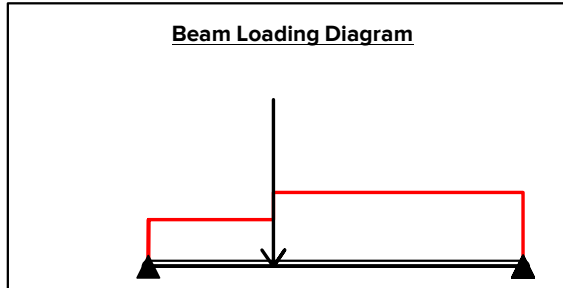
Load Factors	
Dead	1.00
Live	0.75
Roof Live	0.75
Wind	0.75

Stresses @ Input Location	
f _v (psi)	-81
f _b (psi)	2282

Max/Min Stresses	
f _{v_MAX} (psi)	247
f _{v_MIN} (psi)	-170
f _{b_MAX} (psi)	2597
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	1550
b (in)	3.5
d (in)	9.25
I (in ⁴)	230.84
S (in ³)	49.911
A (in ²)	32.375
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{Tl} (in)	@ x =	L/	Δ _{Ll} (in)	@ x =	L/
Span 1	5.34	-3.67	0	10.8	-0.252 (+)	3	L/310	-0.043 (+)	3.3	L/1814

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SHEET 23

Beam Analysis

Beam:		B8 left gravity					
Load	Dead	Live	Roof Live	Seismic	Factored	Location	
Distributed (k/ft)	w ₁	0.192	0.320		0.512	0.000	
	w ₂	-0.096			-0.096	3.417	
	w ₃				0.000		
	w ₄				0.000		
	w ₅				0.000		
	w ₆				0.000		
	w ₇				0.000		
	w ₈				0.000		
	w ₉				0.000		
	w ₁₀				0.000		
Trapezoidal (k/ft/ft)	t ₁				0.000		
	t ₂				0.000		
	t ₃				0.000		
	t ₄				0.000		
	t ₅				0.000		
	t ₆				0.000		
Point (k)	P ₁				0.000		
	P ₂				0.000		
	P ₃				0.000		
	P ₄				0.000		
	P ₅				0.000		
	P ₆				0.000		
	P ₇				0.000		
	P ₈				0.000		
	P ₉				0.000		
	P ₁₀				0.000		

Support Locations and Reactions	
# of Supports	2
Total Beam Length	7.50
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	1.813 0.00
R ₂	1.635 7.50
R ₃	0.000 7.50
R ₄	0.000 7.50
R ₅	0.000 7.50
R ₆	0.000 7.50
R ₇	0.000 7.50
R ₈	0.000 7.50
R ₉	0.000 7.50
R ₁₀	0.000 7.50

Demand Output	
Location, ft	3.00
Shear, k	0.28
Moment, k-ft M =	3.14
Deflection, in D =	-0.05
Δ/Span	L/1861

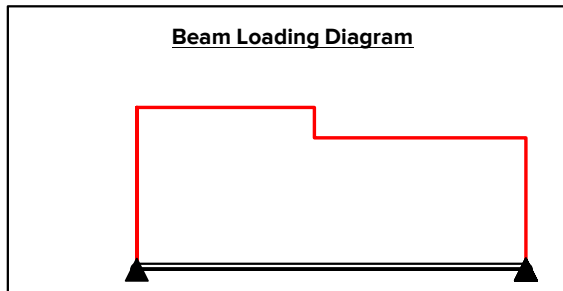
Load Factors	
Dead	1.00
Live	1.00
Roof Live	0.00
Seismic	1.00

Stresses @ Input Location	
f _v (psi)	11
f _b (psi)	510

Max/Min Stresses	
f _{v_MAX} (psi)	69
f _{v_MIN} (psi)	-62
f _{b_MAX} (psi)	522
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	1550
b (in)	3.5
d (in)	11.25
I (in ⁴)	415.28
S (in ³)	73.828
A (in ²)	39.375
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section **NONE**



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{Tl} (in)	@ x =	L/	Δ _{Ll} (in)	@ x =	L/
Span 1	1.81	-1.63	-	3.21	-0.051 (+)	3.7	L/1765	-0.035 (+)	3.8	L/2571

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SHEET 24

Beam Analysis

Beam: B8 left W							
Load	Dead	Live	Roof Live	Seismic	Factored	Location	
Distributed (k/ft)	w ₁	0.192	0.320		0.432	0.00	
	w ₂	-0.096			-0.096	3.417	
	w ₃				0.000		
	w ₄				0.000		
	w ₅				0.000		
	w ₆				0.000		
	w ₇				0.000		
	w ₈				0.000		
	w ₉				0.000		
	w ₁₀				0.000		
Trapezoidal (k/ft/ft)	t ₁				0.000		
	t ₂				0.000		
	t ₃				0.000		
	t ₄				0.000		
	t ₅				0.000		
	t ₆				0.000		
Point (k)	P ₁			4.058	3.043	3.42	
	P ₂				0.000		
	P ₃				0.000		
	P ₄				0.000		
	P ₅				0.000		
	P ₆				0.000		
	P ₇				0.000		
	P ₈				0.000		
	P ₉				0.000		
	P ₁₀				0.000		

Support Locations and Reactions	
# of Supports	2
Total Beam Length	7.50
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	3.170 0.00
R ₂	2.721 7.50
R ₃	0.000 7.50
R ₄	0.000 7.50
R ₅	0.000 7.50
R ₆	0.000 7.50
R ₇	0.000 7.50
R ₈	0.000 7.50
R ₉	0.000 7.50
R ₁₀	0.000 7.50

Demand Output	
Location, ft	3.00
Shear, k	1.87
Moment, k-ft M =	7.57
Deflection, in D =	-0.11
Δ/Span	L/834

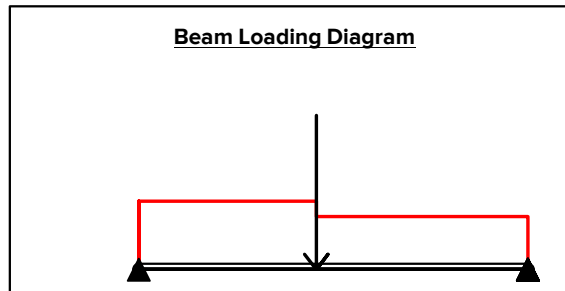
Load Factors	
Dead	1.00
Live	0.75
Roof Live	0.75
Seismic	0.75

Stresses @ Input Location	
f _v (psi)	71
f _b (psi)	1230

Max/Min Stresses	
f _{v_MAX} (psi)	121
f _{v_MIN} (psi)	-104
f _{b_MAX} (psi)	1351
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	1550
b (in)	3.5
d (in)	11.25
I (in ⁴)	415.28
S (in ³)	73.828
A (in ²)	39.375
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{Tl} (in)	@ x =	L/	Δ _{Ll} (in)	@ x =	L/
Span 1	3.17	-2.72	-	8.31	-0.145 (+)	3.7	L/621	-0.035 (+)	3.8	L/2571

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SHEET 25

Beam Analysis

Beam: B8 right gravity							
Load	Dead	Live	Roof Live	Seismic	Factored	Location	
Distributed (k/ft)	w ₁	0.096	0.320		0.416	0.00	
	w ₂	-0.088	-0.280		-0.368	2.00	
	w ₃				0.000		
	w ₄				0.000		
	w ₅				0.000		
	w ₆				0.000		
	w ₇				0.000		
	w ₈				0.000		
	w ₉				0.000		
	w ₁₀				0.000		
Trapezoidal (k/ft/ft)	t ₁				0.000		
	t ₂				0.000		
	t ₃				0.000		
	t ₄				0.000		
	t ₅				0.000		
	t ₆				0.000		
Point (k)	P ₁	2.066	3.664		5.730	2.00	
	P ₂				0.000		
	P ₃				0.000		
	P ₄				0.000		
	P ₅				0.000		
	P ₆				0.000		
	P ₇				0.000		
	P ₈				0.000		
	P ₉				0.000		
	P ₁₀				0.000		

Support Locations and Reactions	
# of Supports	2
Total Beam Length	6.58
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	4.771 0.00
R ₂	2.011 6.58
R ₃	0.000 6.58
R ₄	0.000 6.58
R ₅	0.000 6.58
R ₆	0.000 6.58
R ₇	0.000 6.58
R ₈	0.000 6.58
R ₉	0.000 6.58
R ₁₀	0.000 6.58

Demand Output	
Location, ft	3.00
Shear, k	-1.84
Moment, k-ft M =	6.90
Deflection, in D =	-0.08
Δ/Span	L/961

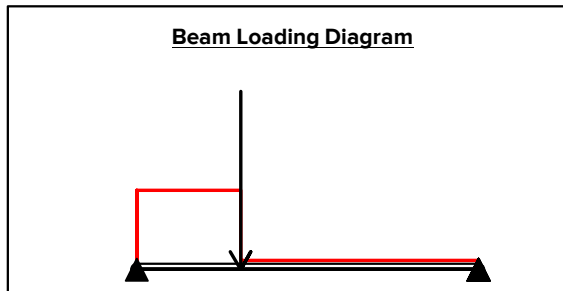
Load Factors	
Dead	1.00
Live	1.00
Roof Live	1.00
Seismic	1.00

Stresses @ Input Location	
f _v (psi)	-70
f _b (psi)	1121

Max/Min Stresses	
f _{v_MAX} (psi)	182
f _{v_MIN} (psi)	-77
f _{b_MAX} (psi)	1416
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	1550
b (in)	3.5
d (in)	11.25
I (in ⁴)	415.28
S (in ³)	73.828
A (in ²)	39.375
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{Tl} (in)	@ x =	L/	Δ _{Ll} (in)	@ x =	L/
Span 1	4.77	-2.01	-	8.71	-0.082 (+)	3	L/963	-0.054 (+)	3	L/1463

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SHEET 26

Beam Analysis

Beam: B8 right W							
Load	Dead	Live	Roof Live	Seismic	Factored	Location	
Distributed (k/ft)	w ₁	0.096	0.320		0.336	0.00	
	w ₂	-0.088	-0.280		-0.298	2.00	
	w ₃				0.000		
	w ₄				0.000		
	w ₅				0.000		
	w ₆				0.000		
	w ₇				0.000		
	w ₈				0.000		
	w ₉				0.000		
	w ₁₀				0.000		
Trapezoidal (k/ft/ft)	t ₁				0.000		
	t ₂				0.000		
	t ₃				0.000		
	t ₄				0.000		
	t ₅				0.000		
	t ₆				0.000		
Point (k)	P ₁	2.066	3.664	1.21	5.722	2.00	
	P ₂				0.000		
	P ₃				0.000		
	P ₄				0.000		
	P ₅				0.000		
	P ₆				0.000		
	P ₇				0.000		
	P ₈				0.000		
	P ₉				0.000		
	P ₁₀				0.000		

Support Locations and Reactions		
# of Supports		2
Total Beam Length		6.58
Left End Condition		Pinned
Right End Condition		Pinned
R ₁	4.614	0.00
R ₂	1.954	6.58
R ₃	0.000	6.58
R ₄	0.000	6.58
R ₅	0.000	6.58
R ₆	0.000	6.58
R ₇	0.000	6.58
R ₈	0.000	6.58
R ₉	0.000	6.58
R ₁₀	0.000	6.58

Demand Output	
Location, ft	3.00
Shear, k	-1.82
Moment, k-ft M =	6.76
Deflection, in D =	-0.08
Δ/Span	L/982

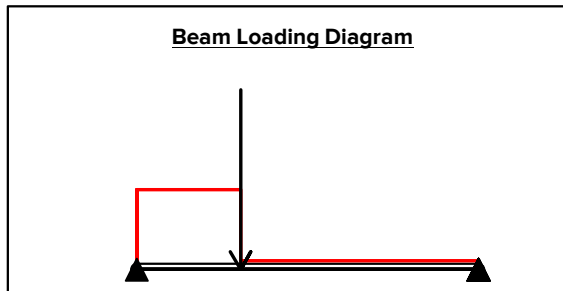
Load Factors	
Dead	1.00
Live	0.75
Roof Live	0.75
Seismic	0.75

Stresses @ Input Location	
f _v (psi)	-69
f _b (psi)	1098

Max/Min Stresses	
f _{v_MAX} (psi)	176
f _{v_MIN} (psi)	-74
f _{b_MAX} (psi)	1390
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	1550
b (in)	3.5
d (in)	11.25
I (in ⁴)	415.28
S (in ³)	73.828
A (in ²)	39.375
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{Tl} (in)	@ x =	L/	Δ _{Ll} (in)	@ x =	L/
Span 1	4.61	-1.95	0	8.55	-0.098 (+)	3	L/806	-0.054 (+)	3	L/1463

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SHEET 27

Beam Analysis

Beam: B10		Load	Dead	Live	Roof Live	Seismic	Factored	Location
Distributed (k/ft)	W ₁		0.414	0.495			0.909	0.00
	W ₂		-0.336	-0.300			-0.636	2.75
	W ₃						0.000	
	W ₄						0.000	
	W ₅						0.000	
	W ₆						0.000	
	W ₇						0.000	
	W ₈						0.000	
	W ₉						0.000	
	W ₁₀						0.000	
Trapezoidal (k/ft/ft)	t ₁						0.000	
	t ₂						0.000	
	t ₃						0.000	
	t ₄						0.000	
	t ₅						0.000	
	t ₆						0.000	
Point (k)	P ₁		0.536	0.670			1.207	2.75
	P ₂		1.609	2.011			3.620	6.00
	P ₃						0.000	
	P ₄						0.000	
	P ₅						0.000	
	P ₆						0.000	
	P ₇						0.000	
	P ₈						0.000	
	P ₉						0.000	
	P ₁₀						0.000	

Support Locations and Reactions	
# of Supports	2
Total Beam Length	12.50
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	6.086 0.00
R ₂	3.902 12.50
R ₃	0.000 12.50
R ₄	0.000 12.50
R ₅	0.000 12.50
R ₆	0.000 12.50
R ₇	0.000 12.50
R ₈	0.000 12.50
R ₉	0.000 12.50
R ₁₀	0.000 12.50

Demand Output	
Location, ft	10.00
Shear, k	-3.22
Moment, k-ft M =	8.90
Deflection, in D =	-0.12
Δ/Span	L/1284

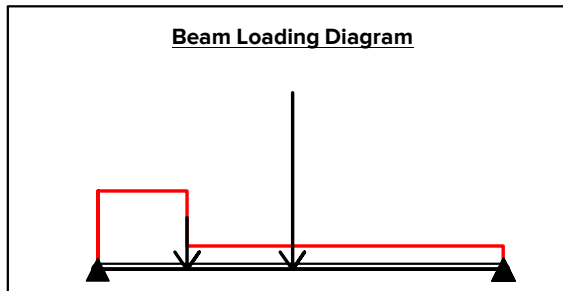
Load Factors	
Dead	1.00
Live	1.00
Roof Live	1.00
Seismic	1.00

Stresses @ Input Location	
f _v (psi)	-86
f _b (psi)	715

Max/Min Stresses	
f _{v_MAX} (psi)	163
f _{v_MIN} (psi)	-104
f _{b_MAX} (psi)	1575
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	2000
b (in)	3.5
d (in)	16
I (in ⁴)	1194.7
S (in ³)	149.33
A (in ²)	56
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{TL} (in)	@ x =	L/	Δ _{LL} (in)	@ x =	L/
Span 1	6.09	-3.9	-	19.6	-0.208 (+)	6.1	L/721	-0.124 (+)	6.1	L/1210

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PROJ. # 11712-2022-01

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SHEET 28

Beam Analysis

Beam: B12		Dead	Live	Roof Live	Seismic	Factored	Location
Distributed (k/ft)	W ₁	0.344	0.400			0.744	0.00
	W ₂	-0.336	-0.400			-0.736	2.75
	W ₃					0.000	
	W ₄					0.000	
	W ₅					0.000	
	W ₆					0.000	
	W ₇					0.000	
	W ₈					0.000	
	W ₉					0.000	
	W ₁₀					0.000	
Trapezoidal (k/ft/ft)	t ₁					0.000	
	t ₂					0.000	
	t ₃					0.000	
	t ₄					0.000	
	t ₅					0.000	
	t ₆					0.000	
Point (k)	P ₁	0.536	0.894			1.430	2.75
	P ₂	1.609	2.681			4.290	5.75
	P ₃					0.000	
	P ₄					0.000	
	P ₅					0.000	
	P ₆					0.000	
	P ₇					0.000	
	P ₈					0.000	
	P ₉					0.000	
	P ₁₀					0.000	

Support Locations and Reactions	
# of Supports	2
Total Beam Length	11.25
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	4.999 0.00
R ₂	2.835 11.25
R ₃	0.000 11.25
R ₄	0.000 11.25
R ₅	0.000 11.25
R ₆	0.000 11.25
R ₇	0.000 11.25
R ₈	0.000 11.25
R ₉	0.000 11.25
R ₁₀	0.000 11.25

Demand Output	
Location, ft	10.00
Shear, k	-2.82
Moment, k-ft M =	3.54
Deflection, in D =	-0.06
Δ/Span	L/2413

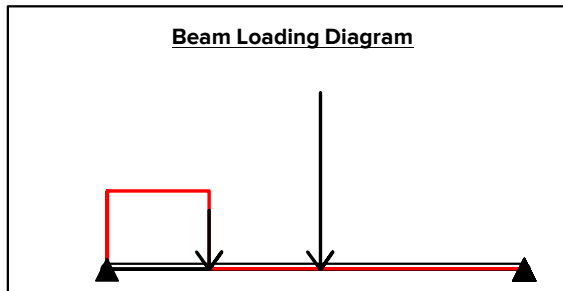
Load Factors	
Dead	1.00
Live	1.00
Roof Live	1.00
Seismic	1.00

Stresses @ Input Location	
f _v (psi)	-81
f _b (psi)	323

Max/Min Stresses	
f _{v_MAX} (psi)	143
f _{v_MIN} (psi)	-81
f _{b_MAX} (psi)	1417
f _{b_MIN} (psi)	0

Beam Properties	
E (ksi)	1800
b (in)	3.5
d (in)	15
I (in ⁴)	984.38
S (in ³)	131.25
A (in ²)	52.5
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section	NONE
--------------------	------



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{TL} (in)	@ x =	L/	Δ _{LL} (in)	@ x =	L/
Span 1	5	-2.83	-	15.5	-0.174 (+)	5.5	L/776	-0.106 (+)	5.5	L/1274

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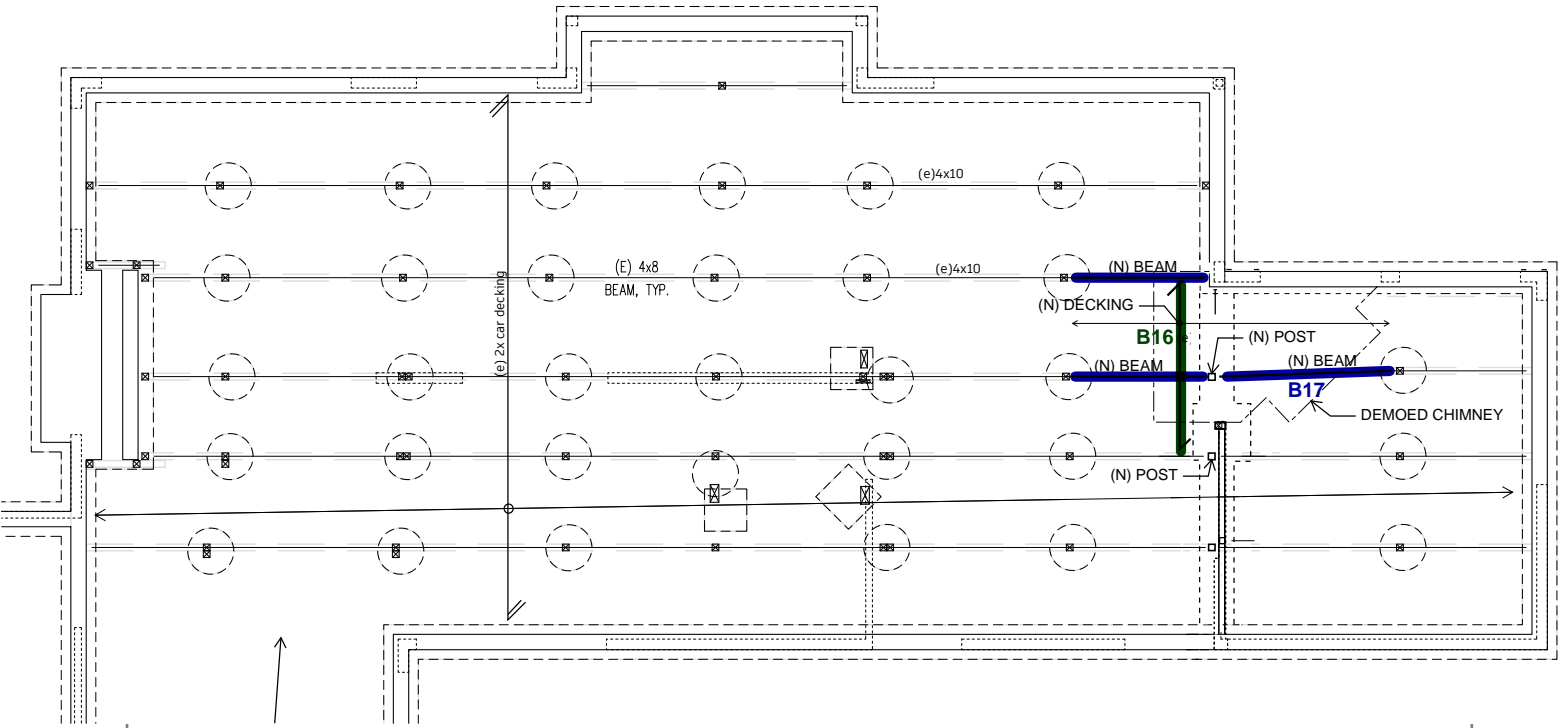


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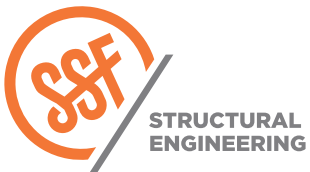
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Gravity Design - 2nd Floor Key Plan

s. WA 98121
 'A 98402
 g. WA 98926



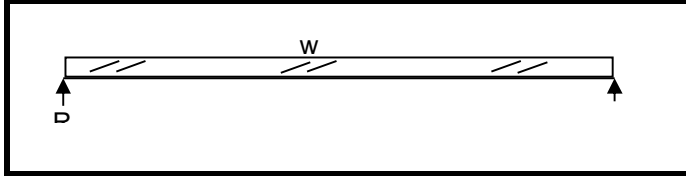
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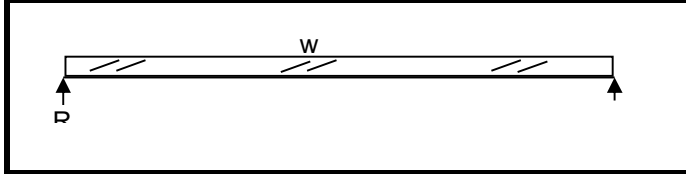
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Beam		B16	DF-L	4	x 2
w=	15	plf		R=	33 lbs
L=	4.33	ft		M=	36 ft-lbs
b=	3.50	in		Fb=	325 psi
d=	1.50	in		Fv=	9 psi
E=	1600	ksi		Δ =	0.08 in
Cv=	1.00	≤ 1.0		I/	681



Beam		B17	PSL	3 1/2	x 7 1/4
w=	204	plf		R=	832 lbs
L=	8.17	ft		M=	1,698 ft-lbs
b=	3.50	in		Fb=	665 psi
d=	7.25	in		Fv=	42 psi
E=	1600	ksi		Δ =	0.11 in
Cv=	1.00	≤ 1.0		I/	855



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 www.swensonsayfaget.com

Office: 206.443.6212
 Fax: 206.443.4870

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