STRUCTURAL DESIGN

FOR

7545 E MERCER WAY REMODEL

Submitted to: Liang Du

Date: *6/3/2022*

F.T. Engineering & Construction Management, LLC

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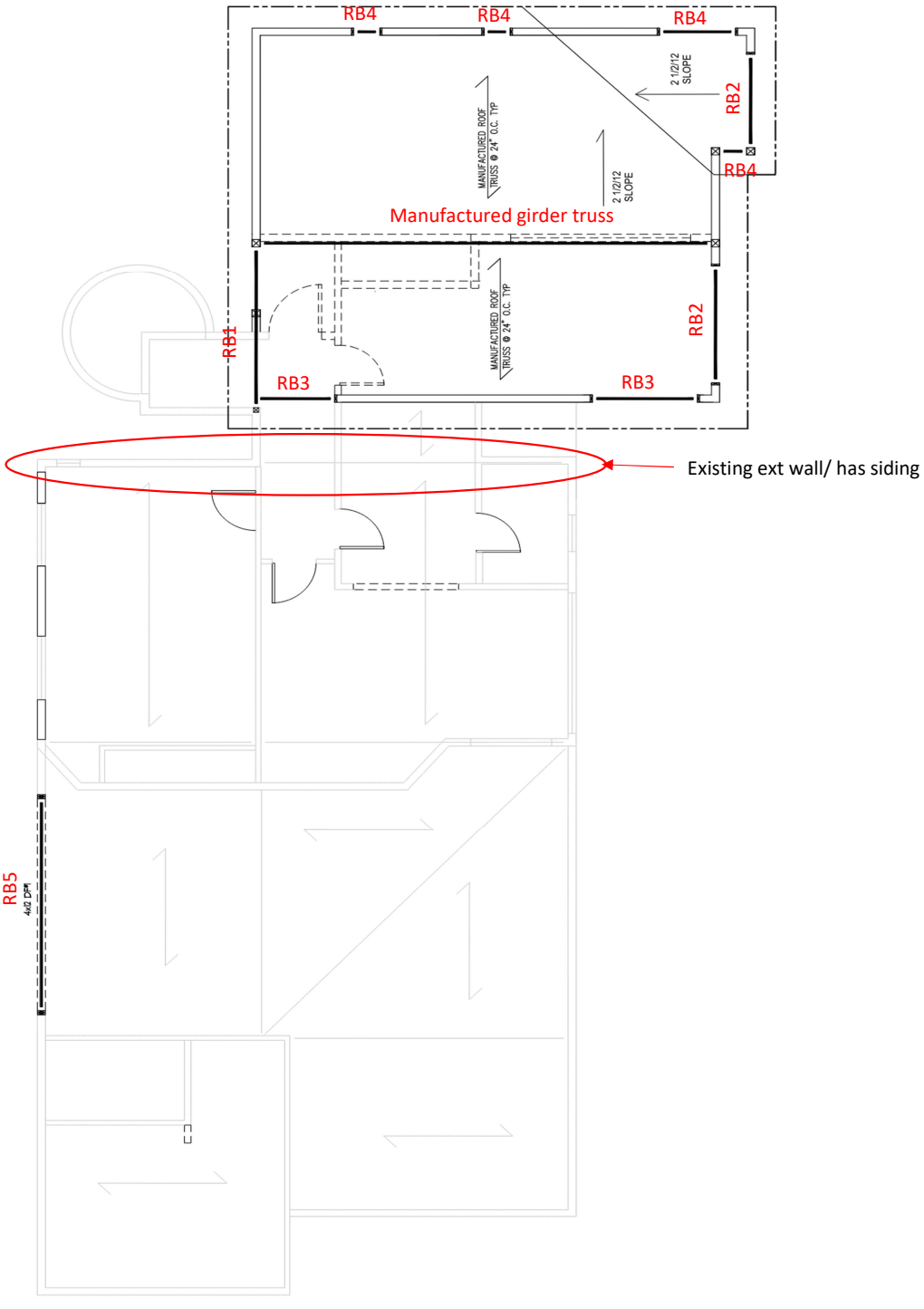
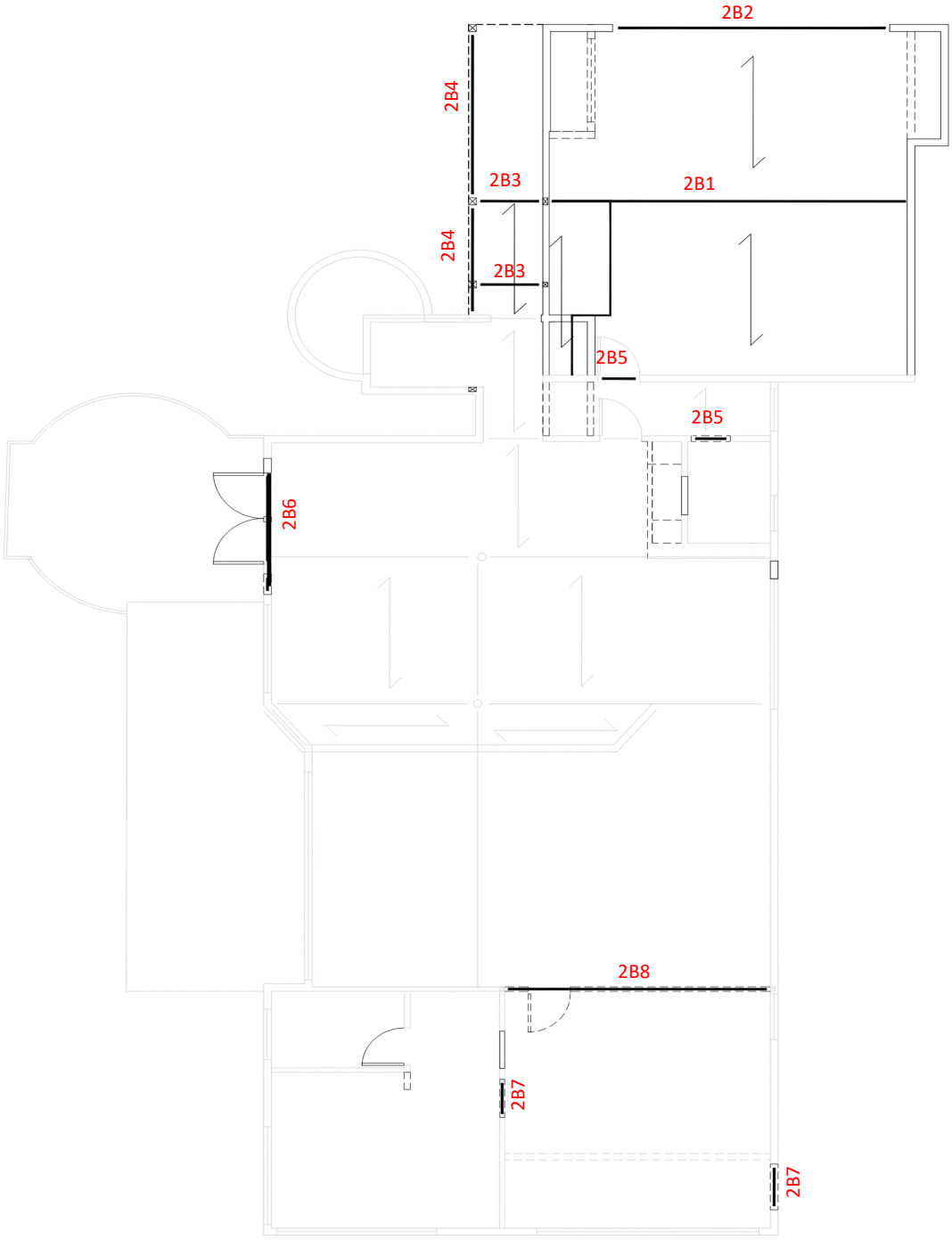
1.0 OBJECTIVE

The analysis is performed for 7545 E Mercer Way Remodel project. New 3xx sqft will be added on top of the existing garage. Since the existing garage is very stand alone itself. Wind and seismic analysis will be only perform for the garage area.

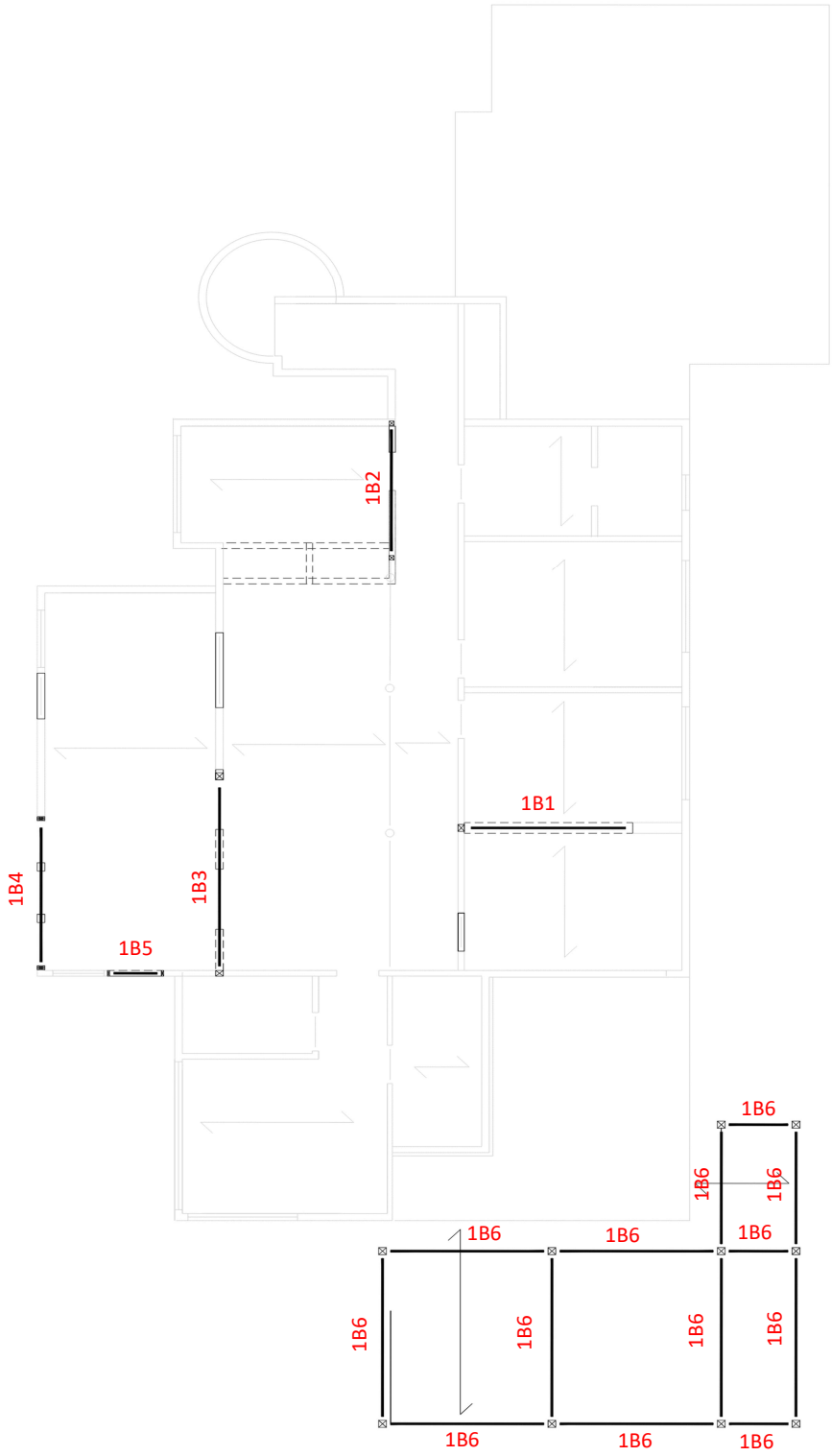


ROOF PLAN



2ND FLOOR PLAN

Job Number:		Engineer:	Frankie Tsui
Job Name:	7545 E Mercer Way Remodel	Date:	5/23/2022
Location:	7545 E Mercer Way, Mercer Island, WA	Page:	3



1ST FLOOR PLAN

Job Number:		Engineer:	Frankie Tsui
Job Name:	7545 E Mercer Way Remodel	Date:	5/23/2022
Location:	7545 E Mercer Way, Mercer Island, WA	Page:	4

2.0 LOAD

Roof Live Load =	20	PSF
Deck live load =	60	psf
Snow Load, P_f =	$0.7C_eC_tI_sP_g$	
C_e =	1	
C_t =	1	
I_s =	1	
P_g =	25	
P_f =	17.5	
Use =	25	psf
Floor Dead Load =	15	psf
Roof Dead Load =	25	psf
Wind Design :		
Design Wind speed =	110	mph
Exp =	C	
Seismic Design :		
Sds =	1.16	
R =	6.5	
Ω =	2.5	
Soil Bearing Capacity :		
Assumed Soil Bearing Capacity =	1500	psf
Frost Line Depth =	18	in

3.0 Garvity Framing Design

RB1:4X10

Span =	6.00	ft						
Trib. Area =	4.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	200.00	plf	0.00	plf		Lr =	6	ft
Use W =	300.00	plf				Rl =	0.00	lbs
V=	900.00	lb				Rr =	0.00	lbs
M=	1350.00	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.5	in	E=	1300000 psi
	d=	9.25	in	Fv=	150 psi
	S=	49.91	in^3		
	A=	32.38	in^2		
	I=	230.84	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850	psi	
C_D=	1.15		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_L=	0.99		BEAM STABILITY FACTOR
C_F=	1.2		SIZE FACTOR
C_{fu}=	1		FLAT USE FACTOR
C_i=	1		INCISING FACTOR
C_r=	1		REPETITIVE MEMBER FACTOR

L=	6.00	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	129.6	in	
R_B=	9.89	<50	OK

F_{bE}=	5763.26	psi
F_b*=	1173.00	psi
F_{bE}/F_b*=	4.91	
C_L=	0.99	

F_b'=	1158.43	psi
f"b=	324.57	psi
f'b/F'b =	0.28	OK

F'v =	172.50	psi
f"v =	41.70	psi
f'v/F'v =	0.24	OK

ΔLL+DL =	5WL4/384EI	
=	0.03	in
L/240 =	0.30	in
ΔLL =	0.01	in
L/480 =	0.15	in

RB2:4X8

Span =	7.50	ft						
Trib. Area =	4.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	200.00	plf	0.00	plf		Lr =	7.5	ft
Use W =	300.00	plf				Rl =	0.00	lbs
V=	1125.00	lb				Rr =	0.00	lbs
M=	2109.38	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.5	in	E=	1300000 psi
	d=	7.25	in	Fv=	150 psi
	S=	30.66	in^3		
	A=	25.38	in^2		
	I=	111.15	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850 psi	
C_D=	1.15	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	0.99	BEAM STABILITY FACTOR
C_F=	1.3	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	7.50	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	162	in	
R_B=	9.79	<50	OK

F_{bE}=	5882.50	psi
F_b*=	1270.75	psi
F_{bE}/F_b*=	4.63	
C_L=	0.99	

F_b'=	1253.77	psi
f"b=	825.55	psi
f'b/F'b =	0.66	OK
F'v =	172.50	psi
f"v =	66.50	psi
f'v/F'v =	0.39	OK

ΔLL+DL =	5WL4/384EI	
=	0.15	in
L/240 =	0.38	in
ΔLL =	0.05	in
L/480 =	0.19	in

RB3:4X10

Span =	6.00	ft						
Trib. Area =	12.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	600.00	plf	0.00	plf		Lr =	6	ft
Use W =	700.00	plf				Rl =	0.00	lbs
V=	2100.00	lb				Rr =	0.00	lbs
M=	3150.00	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.5	in	E=	1300000 psi
	d=	9.25	in	Fv=	150 psi
	S=	49.91	in^3		
	A=	32.38	in^2		
	I=	230.84	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850	psi
C_D=	1.15	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	0.99	BEAM STABILITY FACTOR
C_F=	1.2	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	6.00	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	129.6	in	
R_B=	9.89	<50	OK

F_{bE}=	5763.26	psi
F_b*=	1173.00	psi
F_{bE}/F_b*=	4.91	
C_L=	0.99	

F_b'=	1158.43	psi
f"b=	757.34	psi
f'b/F'b =	0.65	OK
F'v =	172.50	psi
f"v =	97.30	psi
f'v/F'v =	0.56	OK

ΔLL+DL =	5WL4/384EI	
=	0.07	in
L/240 =	0.30	in
ΔLL =	0.03	in
L/480 =	0.15	in

RB4:4X8

Span =	4.50	ft						
Trib. Area =	15.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	750.00	plf	0.00	plf		Lr =	4.5	ft
Use W =	850.00	plf				Rl =	0.00	lbs
V=	1912.50	lb				Rr =	0.00	lbs
M=	2151.56	lb-ft				M =	0.00	lb-ft

SIZE:

b=	3.5	in	E=	1300000	psi
d=	7.25	in	Fv=	150	psi
S=	30.66	in^3			
A=	25.38	in^2			
I=	111.15	in^4			

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850	psi
C_D=	1.15	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	0.99	BEAM STABILITY FACTOR
C_F=	1.3	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	4.50	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	97.2	in	
R_B=	7.58	<50	OK

F_{bE}=	9804.17	psi
F_b*=	1270.75	psi
F_{bE}/F_b*=	7.72	
C_L=	0.99	

F_b'=	1261.44	psi
f"b=	842.06	psi
f'b/F'b =	0.67	OK

F'v =	172.50	psi
f"v =	113.05	psi
f'v/F'v =	0.66	OK

ΔLL+DL =	5WL4/384EI	
=	0.05	in
L/240 =	0.23	in
ΔLL =	0.02	in
L/480 =	0.11	in

RB5:4X12DF#1

Span =	13.50	ft						
Trib. Area =	4.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	200.00	plf	0.00	plf		Lr =	13.5	ft
Use W =	250.00	plf				Rl =	0.00	lbs
V=	1687.50	lb				Rr =	0.00	lbs
M=	5695.31	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.5	in	E=	1700000 psi
	d=	11.25	in	Fv=	180 psi
	S=	73.83	in^3		
	A=	39.38	in^2		
	I=	415.28	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	1000	psi
C_D=	1.15	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	0.96	BEAM STABILITY FACTOR
C_F=	1.1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	13.50	ft	
K=	1.8		
E_{MIN}'=	620000	psi	
Le=	291.6	in	
R_B=	16.36	<50	OK

F_{bE}=	2778.24	psi
F_b*=	1265.00	psi
F_{bE}/F_b*=	2.20	
C_L=	0.96	

F_b'=	1217.51	psi
f"b=	925.71	psi
f'b/F'b =	0.76	OK
F'v =	207.00	psi
f"v =	64.29	psi
f'v/F'v =	0.31	OK

ΔLL+DL =	5WL4/384EI	
=	0.26	in
L/240 =	0.68	in
ΔLL =	0.11	in
L/480 =	0.34	in

TYP FLOOR JOIST:2X12

Span =	13.50	ft						
Trib. Area =	0.00	ft (Roof)	1.33	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	0.00	plf	73.33	plf		Lr =	13.5	ft
Use W =	85.00	plf				Rl =	0.00	lbs
V=	573.75	lb				Rr =	0.00	lbs
M=	1936.41	lb-ft				M =	0.00	lb-ft

SIZE:	b=	1.5	in	E=	1300000 psi
	d=	11.25	in	Fv=	150 psi
	S=	31.64	in^3		
	A=	16.88	in^2		
	I=	177.98	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850 psi	
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	0.93	BEAM STABILITY FACTOR
C_F=	1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	4.00	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	86.4	in	
R_B=	20.78	<50	OK
F_{bE}=	1305.56	psi	
F_b^*=	850.00	psi	
F_{bE}/F_b^*=	1.54		
C_L=	0.93		

F_b'=	789.59	psi	
f"b=	734.40	psi	
f'b/F'b =	0.93	OK	
F'v =	150.00	psi	
f"v =	51.00	psi	
f'v/F'v =	0.34	OK	
ΔLL+DL =	5WL4/384EI		
=	0.27	in	
L/240 =	0.68	in	
ΔLL =	0.17	in	
L/480 =	0.34	in	

2B1: 5.5 x 19.5 GLB

Span =	21.85	ft						
Trib. Area =	0.00	ft Roof	12.00	ft Floor		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	10	ft
W =	0.00	plf	660.00	plf		Lr =	11.85	ft
Use W =	760.00	plf				Rl =	0.00	lbs
V=	8303.00	lb				Rr =	0.00	lbs
M=	45355.14	lb-ft				M =	0.00	lb-ft

SIZE:

b=	5.5	in	E=	1800000	psi
d=	19.5	in	Fv=	265	psi
S=	348.56	in^3			
A=	107.25	in^2			
I=	3398.48	in^4			

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	2400	psi
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
Cv=	0.88	Volumn
C_L=	0.93	BEAM STABILITY FACTOR

L=	21.85	ft	
K=	1.83		
E_{MIN}'=	950000	psi	
Le=	479.826	in	
R_B=	17.59	<50	OK

F_{bE}=	3685.63	psi
F_b*=	2400.00	psi
F_{bE}/F_b*=	1.54	
C_L=	0.93	

F_b'=	1959.75	psi
f"b=	1561.45	psi
f'b/F'b =	0.80	OK
F'v =	265.00	psi
f"v =	116.13	psi
f'v/F'v =	0.44	OK

ΔLL+DL =	5WL4/384EI	
=	0.64	in
L/240 =	1.09	in
ΔLL =	0.40	in
L/480 =	0.55	in

2B2: 5.5 x 21 GLB

Span =	17.00	ft				Pdl =	0	lbs
Trib. Area =	15.00	ft Roof	12.00	ft Floor		Pll=	0	lbs
DL =	25.00	psf	15.00	psf		Ll=	10	ft
LL =	25.00	psf	40.00	psf		Lr =	7.00	ft
W =	750.00	plf	660.00	plf		Rl =	0.00	lbs
Use W =	1600.00	plf				Rr =	0.00	lbs
V=	13600.00	lb				M =	0.00	lb-ft
M=	57800.00	lb-ft						

SIZE:

b=	5.5	in	E=	1800000	psi
d=	21	in	Fv=	265	psi
S=	404.25	in^3			
A=	115.50	in^2			
I=	4244.63	in^4			

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	2400	psi
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
Cv=	0.89	Volumn
C_L=	0.95	BEAM STABILITY FACTOR

L=	17.00	ft	
K=	1.83		
E_{MIN}'=	950000	psi	
Le=	373.32	in	
R_B=	16.10	<50	OK

F_{bE}=	4398.75	psi
F_b*=	2400.00	psi
F_{bE}/F_b*=	1.83	
C_L=	0.95	

F_b'=	2037.98	psi
f"b=	1715.77	psi
f'b/F'b =	0.84	OK
F'v =	265.00	psi
f"v =	176.62	psi
f'v/F'v =	0.67	OK

ΔLL+DL =	5WL4/384EI	
=	0.39	in
L/240 =	0.85	in
ΔLL =	0.21	in
L/480 =	0.43	in

2B3:6x8

Span =	4.50	ft						
Trib. Area =	0.00	ft (Roof)	12.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	0.00	plf	660.00	plf		Lr =	4.5	ft
Use W =	750.00	plf				Rl =	0.00	lbs
V=	1687.50	lb				Rr =	0.00	lbs
M=	1898.44	lb-ft				M =	0.00	lb-ft

SIZE:	b=	5.5	in	E=	1100000 psi
	d=	7.5	in	Fv=	150 psi
	S=	51.56	in^3		
	A=	41.25	in^2		
	I=	193.36	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	675	psi
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	1.00	BEAM STABILITY FACTOR
C_F=	1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	4.50	ft	
K=	1.8		
E_{MIN}'=	400000	psi	
Le=	97.2	in	
R_B=	4.91	<50	OK

F_{bE}=	19917.70	psi
F_b*=	675.00	psi
F_{bE}/F_b*=	29.51	
C_L=	1.00	

F_b'=	673.82	psi
f"b=	441.82	psi
f'b/F'b =	0.66	OK
F'v =	150.00	psi
f"v =	61.36	psi
f'v/F'v =	0.41	OK

ΔLL+DL =	5WL4/384EI	
=	0.03	in
L/240 =	0.23	in
ΔLL =	0.02	in
L/480 =	0.11	in

2B4:6x12 DF#1

Span =	11.50	ft						
Trib. Area =	4.00	ft (Roof)	2.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	200.00	plf	110.00	plf		Lr =	11.5	ft
Use W =	600.00	plf				Rl =	0.00	lbs
V=	3450.00	lb				Rr =	0.00	lbs
M=	9918.75	lb-ft				M =	0.00	lb-ft

SIZE:	b=	5.5	in	E=	1100000 psi
	d=	11.5	in	Fv=	150 psi
	S=	121.23	in^3		
	A=	63.25	in^2		
	I=	697.07	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	1350	psi	
C_D=	1.15		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_L=	0.98		BEAM STABILITY FACTOR
C_F=	1		SIZE FACTOR
C_{fu}=	1		FLAT USE FACTOR
C_i=	1		INCISING FACTOR
C_r=	1		REPETITIVE MEMBER FACTOR

L=	11.50	ft	
K=	1.8		
E_{MIN}'=	400000	psi	
Le=	248.4	in	
R_B=	9.72	<50	OK

F_{bE}=	5082.97	psi
F_b*=	1552.50	psi
F_{bE}/F_b*=	3.27	
C_L=	0.98	

F_b'=	1520.07	psi
f"b=	981.82	psi
f'b/F'b =	0.65	OK
F'v =	172.50	psi
f"v =	81.82	psi
f'v/F'v =	0.47	OK

ΔLL+DL =	5WL4/384EI	
=	0.31	in
L/240 =	0.58	in
ΔLL =	0.09	in
L/480 =	0.29	in

2B5:4X10

Span =	2.50	ft						
Trib. Area =	15.00	ft (Roof)	12.00	ft (Floor)		Pdl =	240	lbs
DL =	25.00	psf	15.00	psf		Pll=	640	lbs
LL =	25.00	psf	40.00	psf		Ll=	1.5	ft
W =	750.00	plf	660.00	plf		Lr =	1	ft
Use W =	1600.00	plf				Rl =	352.00	lbs
V=	2528.00	lb				Rr =	528.00	lbs
M=	1778.00	lb-ft				M =	528.00	lb-ft

SIZE:	b=	3.5	in	E=	1300000 psi
	d=	9.25	in	Fv=	150 psi
	S=	49.91	in^3		
	A=	32.38	in^2		
	I=	230.84	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850 psi	
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	1.00	BEAM STABILITY FACTOR
C_F=	1.1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	2.50	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	54	in	
R_B=	6.39	<50	OK

F_{bE}=	13831.83	psi
F_b*=	935.00	psi
F_{bE}/F_b*=	14.79	
C_L=	1.00	

F_b'=	931.64	psi
f"b=	427.48	psi
f'b/F'b =	0.46	OK
F'v =	150.00	psi
f"v =	117.13	psi
f'v/F'v =	0.78	OK

ΔLL+DL =	5WL4/384EI	
=	0.01	in
L/240 =	0.13	in
ΔLL =	0.00	in
L/480 =	0.06	in

2B6:3.5X12 GLB

Span =	8.75	ft						
Trib. Area =	4.00	ft Roof	2.00	ft Floor		Pdl =	1575	lbs
DL =	25.00	psf	15.00	psf		Pll=	2520	lbs
LL =	25.00	psf	40.00	psf		Ll=	3	ft
W =	200.00	plf	110.00	plf		Lr =	5.75	ft
Use W =	500.00	plf				Rl =	2691.00	lbs
V=	4878.50	lb				Rr =	1404.00	lbs
M=	12858.16	lb-ft				M =	8073.00	lb-ft

SIZE:	b=	3.5	in	E=	1800000 psi
	d=	12	in	Fv=	265 psi
	S=	84.00	in^3		
	A=	42.00	in^2		
	I=	504.00	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	2400	psi	
C_D=	1		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
Cv=	1.06		Volumn
C_L=	0.97		BEAM STABILITY FACTOR

L=	8.75	ft	
K=	1.83		
E_{MIN}'=	950000	psi	
Le=	192.15	in	
R_B=	13.72	<50	OK

F_{bE}=	6056.47	psi
F_b*=	2400.00	psi
F_{bE}/F_b*=	2.52	
C_L=	0.97	

F_b'=	2462.33	psi
f"b=	1836.88	psi
f'b/F'b =	0.75	OK
F'v =	265.00	psi
f'v =	174.23	psi
f'v/F'v =	0.66	OK

ΔLL+DL =	5WL4/384EI	
=	0.16	in
L/240 =	0.44	in
ΔLL =	0.08	in
L/480 =	0.22	in

2B7:4X8

Span =	2.50	ft						
Trib. Area =	15.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	1.5	ft
W =	750.00	plf	0.00	plf		Lr =	1	ft
Use W =	800.00	plf				Rl =	0.00	lbs
V=	1000.00	lb				Rr =	0.00	lbs
M=	625.00	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.5	in	E=	1300000 psi
	d=	7.25	in	Fv=	150 psi
	S=	30.66	in^3		
	A=	25.38	in^2		
	I=	111.15	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850	psi
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	1.00	BEAM STABILITY FACTOR
C_F=	1.1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	2.50	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	54	in	
R_B=	5.65	<50	OK

F_{bE}=	17647.51	psi
F_b^*=	935.00	psi
F_{bE}/F_b^*=	18.87	
C_L=	1.00	

F_b'=	932.40	psi
f"b=	244.61	psi
f'b/F'b =	0.26	OK
F'v =	150.00	psi
f"v =	59.11	psi
f'v/F'v =	0.39	OK

ΔLL+DL =	5WL4/384EI	
=	0.00	in
L/240 =	0.13	in
ΔLL =	0.00	in
L/480 =	0.06	in

2B8: 3.5 x 12 GLB

Span =	16.00	ft						
Trib. Area =	9.00	ft Roof	0.00	ft Floor		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	6	ft
W =	450.00	plf	0.00	plf		Lr =	10.00	ft
Use W =	450.00	plf				Rl =	0.00	lbs
V=	3600.00	lb				Rr =	0.00	lbs
M=	14400.00	lb-ft				M =	0.00	lb-ft

SIZE:

b=	3.5	in	E=	1800000 psi
d=	12	in	Fv=	265 psi
S=	84.00	in^3		
A=	42.00	in^2		
I=	504.00	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	2400	psi
C_D=	1.15	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
Cv=	1.00	Volumn
C_L=	0.88	BEAM STABILITY FACTOR

L=	16.00	ft	
K=	1.83		
E_{MIN}'=	950000	psi	
Le=	351.36	in	
R_B=	18.55	<50	OK

F_{bE}=	3312.13	psi
F_b*=	2760.00	psi
F_{bE}/F_b*=	1.20	
C_L=	0.88	

F_b'=	2417.51	psi
f"b=	2057.14	psi
f'b/F'b =	0.85	OK
F'v =	304.75	psi
f'v =	128.57	psi
f'v/F'v =	0.42	OK

ΔLL+DL =	5WL4/384EI	
=	0.73	in
L/240 =	0.80	in
ΔLL =	0.37	in
L/480 =	0.40	in

1B1:GLB3.5x10.5

Span =	10.00	ft						
Trib. Area =	0.00	ft Roof	10.00	ft Floor		Pdl =	0	lbs
DL =	15.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	6	ft
W =	0.00	plf	550.00	plf		Lr =	4.00	ft
Use W =	650.00	plf				Rl =	0.00	lbs
V=	3250.00	lb				Rr =	0.00	lbs
M=	8125.00	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.5	in	E=	1800000 psi
	d=	10.5	in	Fv=	265 psi
	S=	64.31	in^3		
	A=	36.75	in^2		
	I=	337.64	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	2400	psi
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
Cv=	1.06	Volumn
C_L=	0.97	BEAM STABILITY FACTOR

L=	10.00	ft	
K=	1.83		
E_{MIN}'=	950000	psi	
Le=	219.6	in	
R_B=	13.72	<50	OK

F_{bE}=	6056.47	psi
F_b*=	2400.00	psi
F_{bE}/F_b*=	2.52	
C_L=	0.97	

F_b'=	2462.33	psi
f"b=	1516.03	psi
f'b/F'b =	0.62	OK
F'v =	265.00	psi
f'v =	132.65	psi
f'v/F'v =	0.50	OK

ΔLL+DL =	5WL4/384EI	
=	0.24	in
L/240 =	0.50	in
ΔLL =	0.15	in
L/480 =	0.25	in

1B2:GLB3.125x10.5

Span =	10.00	ft						
Trib. Area =	0.00	ft Roof	10.00	ft Floor		Pdl =	0	lbs
DL =	15.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	6	ft
W =	0.00	plf	550.00	plf		Lr =	4.00	ft
Use W =	650.00	plf				Rl =	0.00	lbs
V=	3250.00	lb				Rr =	0.00	lbs
M=	8125.00	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.125	in	E=	1800000 psi
	d=	10.5	in	Fv=	265 psi
	S=	57.42	in^3		
	A=	32.81	in^2		
	I=	301.46	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	2400	psi	
C_D=	1		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
Cv=	1.07		Volumn
C_L=	0.96		BEAM STABILITY FACTOR

L=	10.00	ft	
K=	1.83		
E_{MIN}'=	950000	psi	
Le=	219.6	in	
R_B=	15.37	<50	OK

F_{bE}=	4828.18	psi
F_b*=	2400.00	psi
F_{bE}/F_b*=	2.01	
C_L=	0.96	

F_b'=	2456.74	psi
f"b=	1697.96	psi
f'b/F'b =	0.69	OK
F'v =	265.00	psi
f'v =	148.57	psi
f'v/F'v =	0.56	OK

ΔLL+DL =	5WL4/384EI	
=	0.27	in
L/240 =	0.50	in
ΔLL =	0.17	in
L/480 =	0.25	in

1B3:GLB3.5x15

Span =	13.00	ft						
Trib. Area =	0.00	ft Roof	11.00	ft Floor		Pdl =	0	lbs
DL =	15.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	6	ft
W =	0.00	plf	605.00	plf		Lr =	7.00	ft
Use W =	950.00	plf				Rl =	0.00	lbs
V=	6175.00	lb				Rr =	0.00	lbs
M=	20068.75	lb-ft				M =	0.00	lb-ft

SIZE:

b=	3.5	in	E=	1800000	psi
d=	15	in	Fv=	265	psi
S=	131.25	in^3			
A=	52.50	in^2			
I=	984.38	in^4			

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	2400	psi
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
Cv=	0.99	Volumn
C_L=	0.91	BEAM STABILITY FACTOR

L=	13.00	ft	
K=	1.83		
E_{MIN}'=	950000	psi	
Le=	285.48	in	
R_B=	18.70	<50	OK

F_{bE}=	3261.17	psi
F_b*=	2400.00	psi
F_{bE}/F_b*=	1.36	
C_L=	0.91	

F_b'=	2168.12	psi
f"b=	1834.86	psi
f'b/F'b =	0.85	OK
F'v =	265.00	psi
f"v =	176.43	psi
f'v/F'v =	0.67	OK

ΔLL+DL =	5WL4/384EI	
=	0.34	in
L/240 =	0.65	in
ΔLL =	0.16	in
L/480 =	0.33	in

1B4:4X12

Span =	10.00	ft						
Trib. Area =	6.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	1.5	ft
W =	300.00	plf	0.00	plf		Lr =	8.5	ft
Use W =	350.00	plf				Rl =	0.00	lbs
V=	1750.00	lb				Rr =	0.00	lbs
M=	4375.00	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.5	in	E=	1300000 psi
	d=	11.25	in	Fv=	150 psi
	S=	73.83	in^3		
	A=	39.38	in^2		
	I=	415.28	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850 psi	
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	0.98	BEAM STABILITY FACTOR
C_F=	1.1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	10.00	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	216	in	
R_B=	14.08	<50	OK

F_{bE}=	2843.21	psi
F_b^*=	935.00	psi
F_{bE}/F_b^*=	3.04	
C_L=	0.98	

F_b'=	913.38	psi
f"b=	711.11	psi
f'b/F'b =	0.78	OK
F'v =	150.00	psi
f"v =	66.67	psi
f'v/F'v =	0.44	OK

ΔLL+DL =	5WL4/384EI	
=	0.15	in
L/240 =	0.50	in
ΔLL =	0.06	in
L/480 =	0.25	in

1B5:4X6

Span =	3.25	ft						
Trib. Area =	4.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	25.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	1.5	ft
W =	200.00	plf	0.00	plf		Lr =	1.75	ft
Use W =	300.00	plf				Rl =	0.00	lbs
V=	487.50	lb				Rr =	0.00	lbs
M=	396.09	lb-ft				M =	0.00	lb-ft

SIZE:	b=	3.5	in	E=	1300000 psi
	d=	5.5	in	Fv=	150 psi
	S=	17.65	in^3		
	A=	19.25	in^2		
	I=	48.53	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850	psi
C_D=	1	LOAD DURATION FACTOR
C_M=	1	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	1.00	BEAM STABILITY FACTOR
C_F=	1.1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	3.25	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	70.2	in	
R_B=	5.61	<50	OK

F_{bE}=	17894.33	psi
F_b^*=	935.00	psi
F_{bE}/F_b^*=	19.14	
C_L=	1.00	

F_b'=	932.44	psi
f"b=	269.36	psi
f'b/F'b =	0.29	OK
F'v =	150.00	psi
f"v =	37.99	psi
f'v/F'v =	0.25	OK

ΔLL+DL =	5WL4/384EI	
=	0.01	in
L/240 =	0.16	in
ΔLL =	0.00	in
L/480 =	0.08	in

TYP DECK JOIST:2X12

Span =	11.25	ft						
Trib. Area =	0.00	ft (Roof)	1.33	ft (deck)		Pdl =	0	lbs
DL =	25.00	psf	12.00	psf		Pll=	0	lbs
LL =	25.00	psf	60.00	psf		Ll=	0	ft
W =	0.00	plf	96.00	plf		Lr =	11.25	ft
Use W =	100.00	plf				Rl =	0.00	lbs
V=	562.50	lb				Rr =	0.00	lbs
M=	1582.03	lb-ft				M =	0.00	lb-ft

SIZE:	b=	1.5	in	E=	1300000 psi
	d=	11.25	in	Fv=	150 psi
	S=	31.64	in^3		
	A=	16.88	in^2		
	I=	177.98	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	850 psi	
C_D=	1	LOAD DURATION FACTOR
C_M=	0.85	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	0.95	BEAM STABILITY FACTOR
C_F=	1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	4.00	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	86.4	in	
R_B=	20.78	<50	OK

F_{bE}=	1305.56	psi
F_b*=	722.50	psi
F_{bE}/F_b*=	1.81	
C_L=	0.95	

F_b'=	684.74	psi
f"b=	600.00	psi
f'b/F'b =	0.88	OK
F'v =	127.50	psi
f"v =	50.00	psi
f'v/F'v =	0.39	OK

ΔLL+DL =	5WL4/384EI	
=	0.16	in
L/240 =	0.56	in
ΔLL =	0.12	in
L/480 =	0.28	in

TYP DECK BEAM :6X12DF#1

Span =	11.25	ft MAX						
Trib. Area =	0.00	ft (Roof)	8.00	ft (deck)		Pdl =	0	lbs
DL =	25.00	psf	12.00	psf		Pll=	0	lbs
LL =	25.00	psf	60.00	psf		Ll=	0	ft
W =	0.00	plf	576.00	plf		Lr =	11.25	ft
Use W =	600.00	plf				Rl =	0.00	lbs
V=	3375.00	lb				Rr =	0.00	lbs
M=	9492.19	lb-ft				M =	0.00	lb-ft

SIZE:	b=	5.5	in	E=	1600000 psi
	d=	11.5	in	Fv=	170 psi
	S=	121.23	in^3		
	A=	63.25	in^2		
	I=	697.07	in^4		

$F_b' = C_D * C_M * C_t * C_F * C_i * C_P$

F_b=	1300 psi	
C_D=	1	LOAD DURATION FACTOR
C_M=	0.85	WET SERVICE FACTOR
C_t=	1	TEMP. FACTOR
C_L=	1.00	BEAM STABILITY FACTOR
C_F=	1	SIZE FACTOR
C_{fu}=	1	FLAT USE FACTOR
C_i=	1	INCISING FACTOR
C_r=	1	REPETITIVE MEMBER FACTOR

L=	4.00	ft	
K=	1.8		
E_{MIN}'=	580000	psi	
Le=	86.4	in	
R_B=	5.73	<50	OK

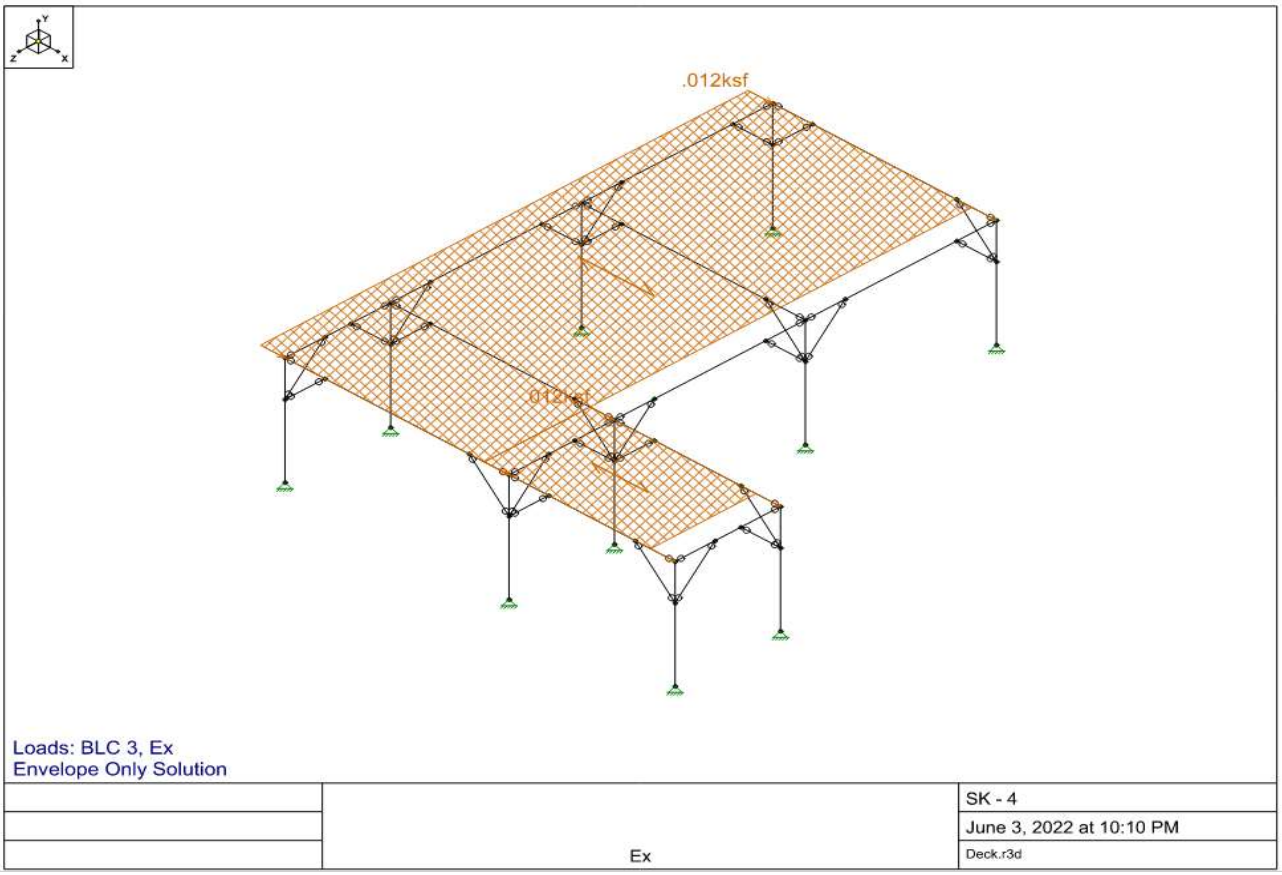
F_{bE}=	21189.61	psi
F_b*=	1105.00	psi
F_{bE}/F_b*=	19.18	
C_L=	1.00	

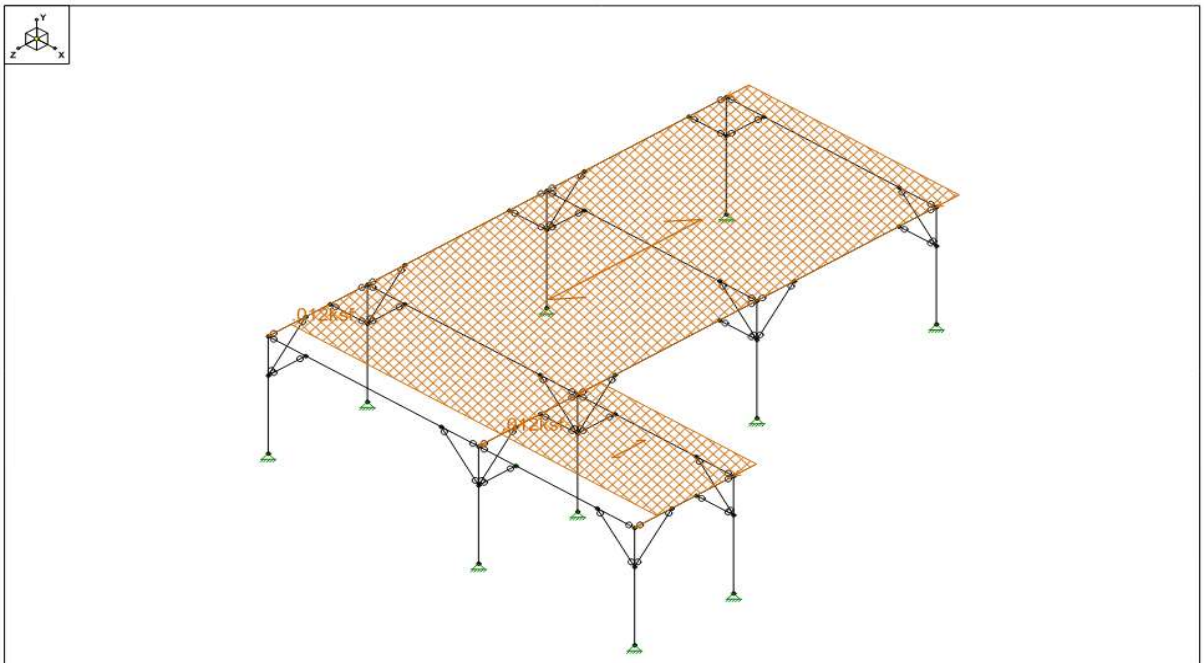
F_b'=	1101.98	psi
f"b=	939.59	psi
f'b/F'b =	0.85	OK
F'v =	144.50	psi
f"v =	80.04	psi
f'v/F'v =	0.55	OK

ΔLL+DL =	5WL4/384EI	
=	0.19	in
L/240 =	0.56	in
ΔLL =	0.16	in
L/480 =	0.28	in

Deck Frame: RISA 3D

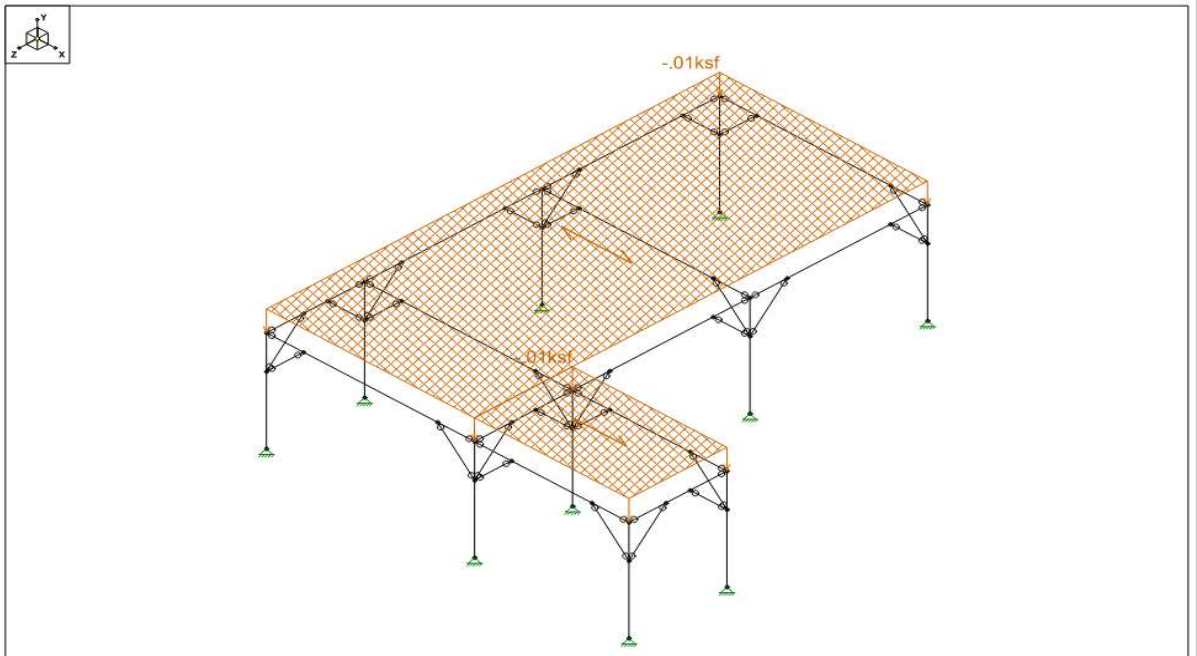
Seismic Design :		
Sds =	1.16	
R =	1.5	
Ω =	1.5	
Deck DL =	10	psf
Deck DL W/ Column and Brace =	15	psf
Ex = Ez =	DL x Sds /R	
	11.6	psf
Use	12	psf





Loads: BLC 4, Ez
Envelope Only Solution

		SK - 6
		June 3, 2022 at 10:11 PM
	Ez	Deck.r3d



Loads: BLC 1, DL
Envelope Only Solution

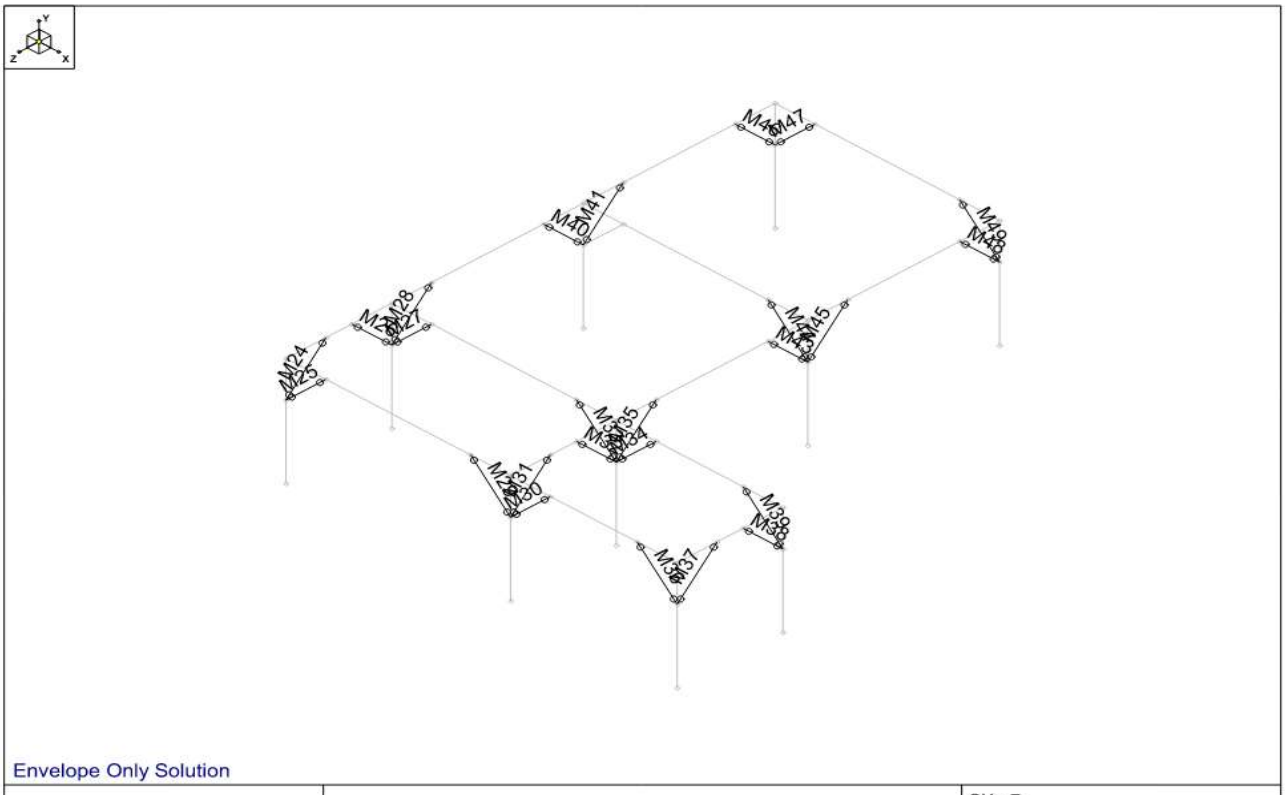
		SK - 5
		June 3, 2022 at 10:11 PM
	DL	Deck.r3d

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...	Surface...
1	DL	DL		-1					2	
3	Ex	ELX							2	
4	Ez	ELZ							2	

Load Combinations

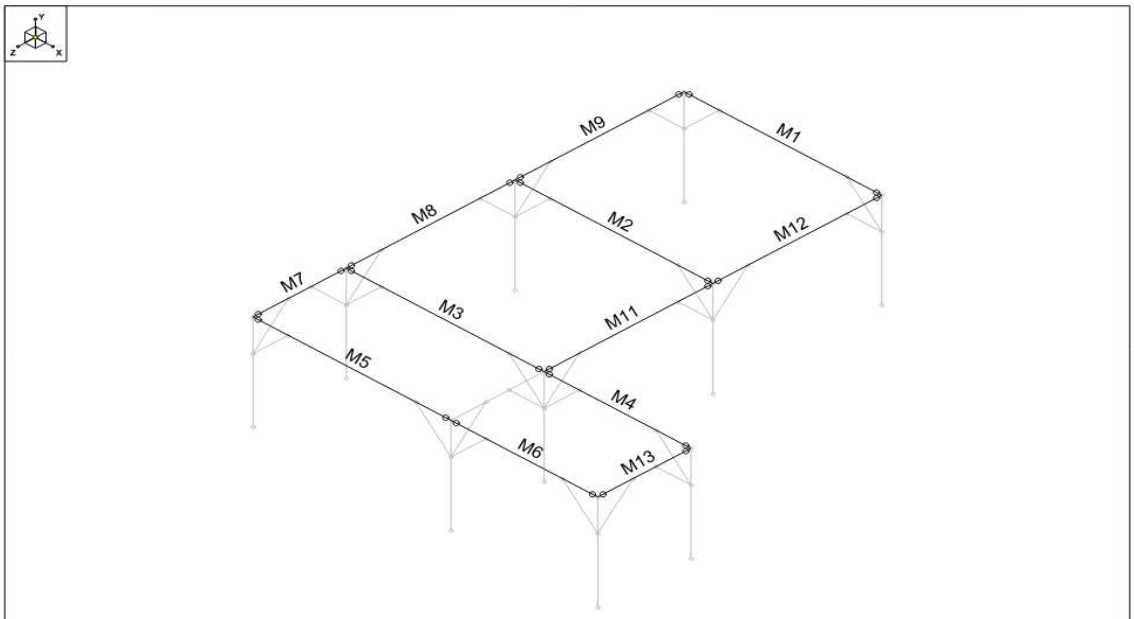
	Description	Solve	P...	S...	B...	Fa...	BLC	Factor	BLC	Factor	BLC	Factor	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	Ex				E...	1																		
2	Ez				E...	1																		
3	DL+0.7Ex	Yes			DL	1	ELX	.7																
4	DL + 0.7Ez	Yes			DL	1	ELZ	.7																
5	0.6DL+0.7Ex				DL	.6	ELX	.7																
6	0.6DL+0.7Ez				DL	.6	ELZ	.7																



Envelope Maximum Member Section Forces

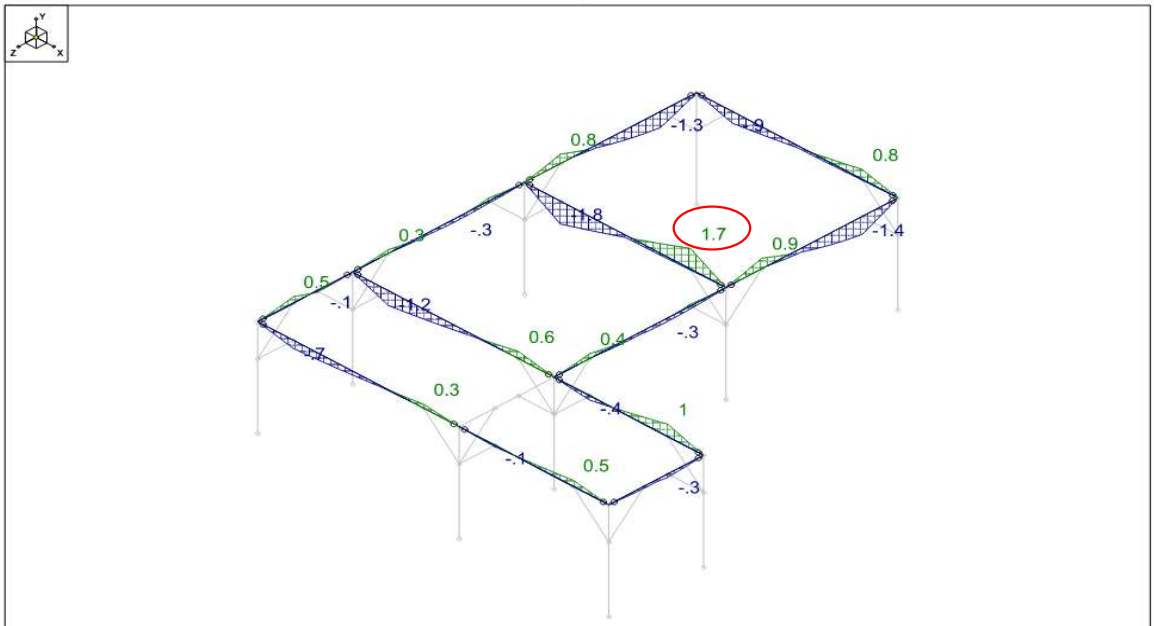
	Member		Axial[k]	Loc[ft]	LC	y Shear...	Loc[...	LC	z Shear...	Loc[...	LC	Torque[...	Loc[...	LC	y-y Mome...	Loc[...	LC	z-z Mome...	Loc[...	LC
1	M24	max	1.238	0	4	.005	0	4	0	0	4	.045	0	3	0	0	4	0	0	4
2		min	.018	2.828	3	-.005	2.828	3	0	0	3	-.056	0	4	0	0	3	-.003	1.414	3
3	M25	max	.024	0	4	.005	0	4	0	0	4	.056	0	4	0	0	4	0	0	4
4		min	-.555	2.828	3	-.005	2.828	3	0	0	3	-.045	0	3	0	0	3	-.003	1.414	3
5	M26	max	.347	0	3	.005	0	4	0	0	4	-.046	0	3	0	0	4	0	0	4
6		min	-.604	2.828	4	-.005	2.828	3	0	0	3	-.056	0	4	0	0	3	-.003	1.414	3
7	M27	max	.045	0	4	.005	0	4	0	0	4	.114	0	4	0	0	4	0	0	4
8		min	-1.094	2.828	3	-.005	2.828	3	0	0	3	-.045	0	3	0	0	3	-.003	1.414	3
9	M28	max	.731	0	4	.005	0	4	0	0	4	.091	0	3	0	0	4	0	0	4
10		min	.357	2.828	3	-.005	2.828	3	0	0	3	-.057	0	4	0	0	3	-.003	1.414	3
11	M29	max	.525	0	3	.005	0	4	0	0	4	-.039	0	3	0	0	4	0	0	4
12		min	.162	2.828	4	-.005	2.828	3	0	0	3	-.072	0	4	0	0	3	-.003	1.414	3
13	M30	max	.153	0	4	.005	0	4	0	0	4	.046	0	4	0	0	4	0	0	4
14		min	-.189	2.828	3	-.005	2.828	3	0	0	3	-.036	0	3	0	0	3	-.003	1.414	3
15	M31	max	1.477	0	4	.005	0	4	0	0	4	.075	0	3	0	0	4	0	0	4
16		min	.03	2.828	3	-.005	2.828	3	0	0	3	.026	0	4	0	0	3	-.003	1.414	3
17	M32	max	.394	0	3	.005	0	4	0	0	4	.033	0	4	0	0	4	0	0	4
18		min	-.736	2.828	4	-.005	2.828	3	0	0	3	-.044	0	3	0	0	3	-.003	1.414	3
19	M33	max	.873	0	3	.005	0	4	0	0	4	-.036	0	3	0	0	4	0	0	4
20		min	.163	2.828	4	-.005	2.828	3	0	0	3	-.122	0	4	0	0	3	-.003	1.414	3
21	M34	max	.171	0	4	.005	0	4	0	0	4	.051	0	4	0	0	4	0	0	4
22		min	-.611	2.828	3	-.005	2.828	3	0	0	3	-.033	0	3	0	0	3	-.003	1.414	3
23	M35	max	.836	0	4	.005	0	4	0	0	4	.113	0	3	0	0	4	0	0	4
24		min	.395	2.828	3	-.005	2.828	3	0	0	3	.037	0	4	0	0	3	-.003	1.414	3
25	M36	max	.606	0	3	.005	0	4	0	0	4	-.051	0	4	0	0	4	0	0	4
26		min	.011	2.828	4	-.005	2.828	3	0	0	3	-.052	0	3	0	0	3	-.003	1.414	3
27	M37	max	.405	0	4	.005	0	4	0	0	4	.052	0	3	0	0	4	0	0	4
28		min	.031	2.828	3	-.005	2.828	3	0	0	3	.051	0	4	0	0	3	-.003	1.414	3
29	M38	max	.02	0	3	.005	0	4	0	0	4	.05	0	4	0	0	4	0	0	4
30		min	-.339	2.828	4	-.005	2.828	3	0	0	3	-.003	0	3	0	0	3	-.003	1.414	3
31	M39	max	1.219	0	3	.005	0	4	0	0	4	.003	0	3	0	0	4	0	0	4
32		min	.011	2.828	4	-.005	2.828	3	0	0	3	-.05	0	4	0	0	3	-.003	1.414	3
33	M40	max	.629	0	3	.005	0	4	0	0	4	-.063	0	4	0	0	4	0	0	4
34		min	.16	2.828	4	-.005	2.828	3	0	0	3	-.089	0	3	0	0	3	-.003	1.414	3
35	M41	max	1.474	0	4	.005	0	4	0	0	4	.084	0	3	0	0	4	0	0	4
36		min	.652	2.828	3	-.005	2.828	3	0	0	3	-.068	0	4	0	0	3	-.003	1.414	3
37	M43	max	.538	0	3	.005	0	4	0	0	4	.06	0	4	0	0	4	0	0	4
38		min	.076	2.828	4	-.005	2.828	3	0	0	3	-.097	0	3	0	0	3	-.003	1.414	3
39	M44	max	1.973	0	3	.005	0	4	0	0	4	.004	0	3	0	0	4	0	0	4
40		min	.049	2.828	4	-.005	2.828	3	0	0	3	-.126	0	4	0	0	3	-.003	1.414	3
41	M45	max	1.597	0	4	.005	0	4	0	0	4	.093	0	3	0	0	4	0	0	4
42		min	.557	2.828	3	-.005	2.828	3	0	0	3	.066	0	4	0	0	3	-.003	1.414	3
43	M46	max	.082	0	3	.005	0	4	0	0	4	-.061	0	4	0	0	4	0	0	4
44		min	-1.047	2.828	4	-.005	2.828	3	0	0	3	-.069	0	3	0	0	3	-.003	1.414	3
45	M47	max	.063	0	4	.005	0	4	0	0	4	.069	0	3	0	0	4	0	0	4
46		min	-.909	2.828	3	-.005	2.828	3	0	0	3	.061	0	4	0	0	3	-.003	1.414	3
47	M48	max	.095	0	3	.005	0	4	0	0	4	.057	0	4	0	0	4	0	0	4
48		min	-1.219	2.828	4	-.005	2.828	3	0	0	3	-.076	0	3	0	0	3	-.003	1.414	3
49	M49	max	1.014	0	3	.005	0	4	0	0	4	.076	0	3	0	0	4	0	0	4
50		min	.055	2.828	4	-.005	2.828	3	0	0	3	-.057	0	4	0	0	3	-.003	1.414	3

Max Axil =	1900	lbs	
Ω =	1.5		
Design Axial and Conn, P =	2850	lbs	
Use 4x6 DF#2:			
A =	19.25	in2	
F'c =	1350	psi	
Cd =	1.6		
P allow =	41580	lbs	> P
Z =	780	lbs	(3/4" Dia Bolt)
Cd =	1.6		
(3) 3/4" Dia Bolt, Z =	3744	lbs	> P OK



Envelope Only Solution

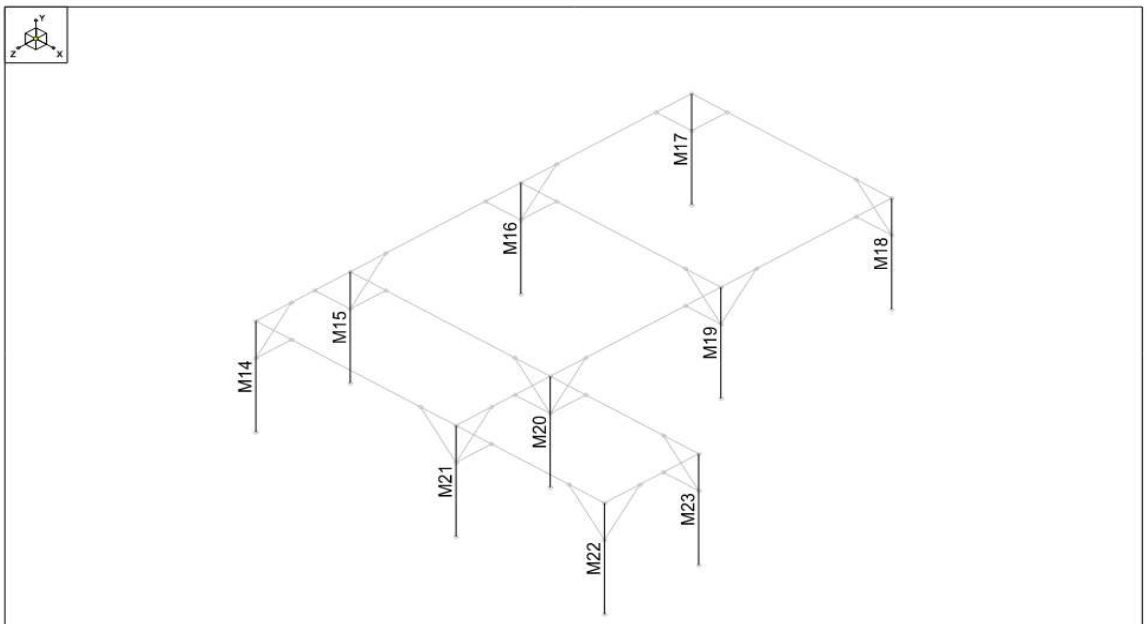
	Beam Label	SK - 8
		June 3, 2022 at 10:19 PM
		Deck.r3d



Envelope Only Solution
Member z Bending Moments (k-ft) (Enveloped)

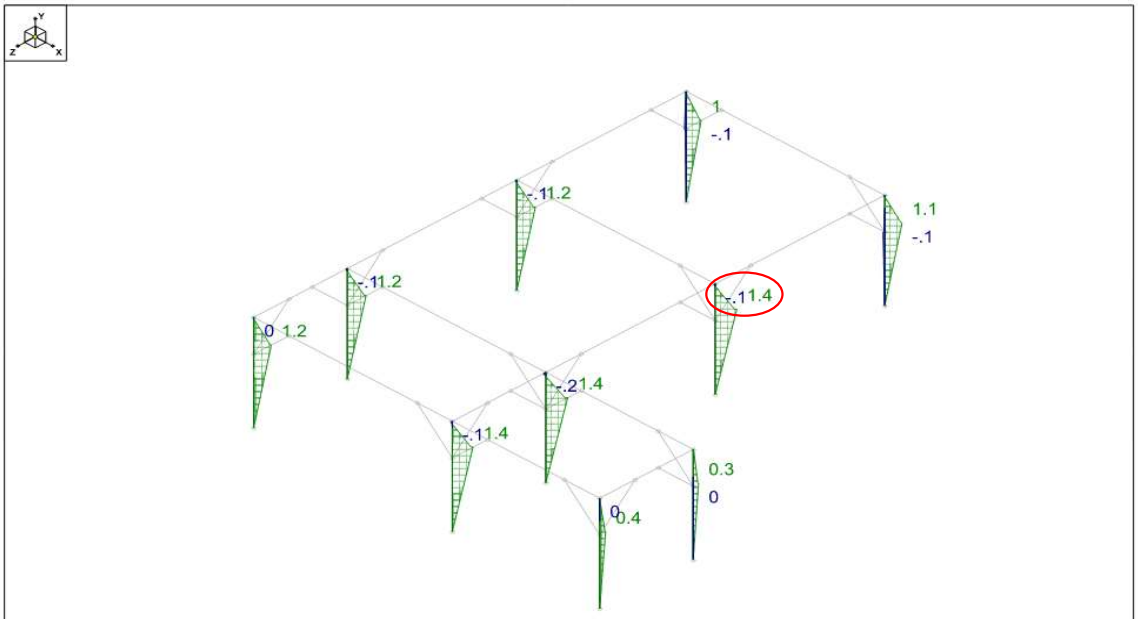
	Beam Moment	SK - 9
		June 3, 2022 at 10:20 PM
		Deck.r3d

Max Beam Moment = 1700 lb-ft < 9492.19 lb-ft TYP DECK BEAM :6X12DF#1
Ok



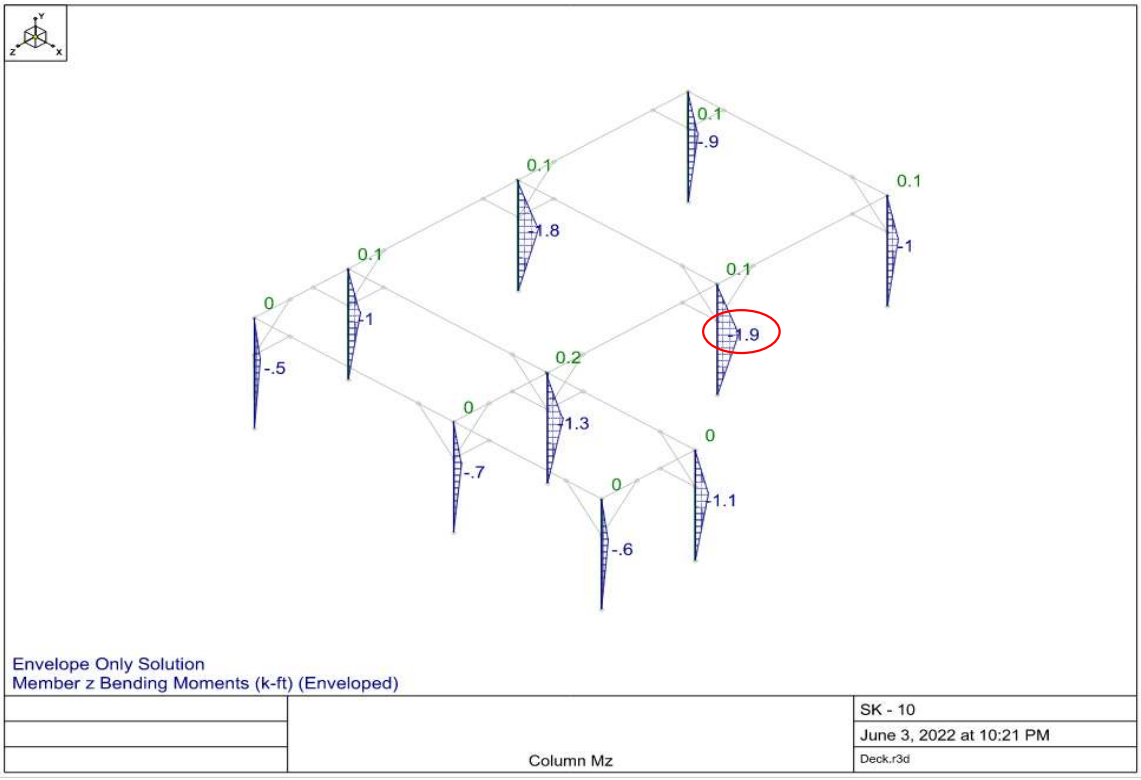
Envelope Only Solution

		SK - 12
		June 3, 2022 at 10:22 PM
	Column Label	Deck.r3d



Envelope Only Solution
Member y Bending Moments (k-ft) (Enveloped)

		SK - 11
		June 3, 2022 at 10:22 PM
	Column My	Deck.r3d



Max Moment =	1900	lbs-ft
Use 6x6 Col		
A =	30.25	in2
S =	27.73	in3
Cd =	1.6	
Requ'd fb =	513.8993	psi
Use DF#1		
fb =	psi	

Column Design:

Column: 6x6FD#1

SIZE: b= 5.5 in

d= 5.5 in

$Fc' = C_D * C_M * C_t * C_F * C_i * C_P$

F_C=	1000	psi	COMPRESSION PARALLEL TO GAIN
C_D=	1		LOAD DURATION FACTOR
C_M=	0.85		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_F=	1		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.853		COLUMN STABILITY FACTOR

L=	8.00	ft	
d=	5.5	in	
K=	1		
E_{MIN}'=	580000	psi	
c=	0.8		
Le=	96	in	
Le/d=	17.45	<50	OK

F_{CE}=	1564.886
F_C*=	850
F_{CE}/FC*=	1.841042
C_P=	0.853

Fc'= 724.89 psi

Allowable P= F'c X A

= 21927.89 lb

Column: 6x6

SIZE: b= 5.5 in
d= 5.5 in

$Fc' = C_D * C_M * C_t * C_F * C_i * C_P$

F_C=	575	psi	COMPRESSION PARALLEL TO GAIN
C_D=	1		LOAD DURATION FACTOR
C_M=	0.85		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_F=	1		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.883		COLUMN STABILITY FACTOR

L=	8.00	ft	
d=	5.5	in	
K=	1		
E_{MIN}'=	400000	psi	
c=	0.8		
Le=	96	in	
Le/d=	17.45	<50	OK

F_{CE}=	1079.232
F_C*=	488.75
F_{CE}/FC*=	2.208147
C_P=	0.883

Fc'= 431.32 psi
Allowable P= F'c X A
= 13047.51 lb

Column: 4x6

SIZE: b= 3.5 in
d= 5.5 in

$Fc' = C_D * C_M * C_t * C_F * C_i * C_P$

F_C=	1300	psi	COMPRESSION PARALLEL TO GAIN
C_D=	1		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_F=	1.1		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.327		COLUMN STABILITY FACTOR

L=	8.00	ft	
d=	3.5	in	
K=	1		
E_{MIN}'=	470000	psi	
c=	0.8		
Le=	96	in	
Le/d=	27.43	<50	OK

F_{CE}=	513.527
F_C*=	1430
F_{CE}/FC*=	0.35911
C_P=	0.327

Fc'= 467.99 psi
Allowable P= F'c X A
= 9008.87 lb

Column: 4x4

SIZE: b= 3.5 in
d= 3.5 in

$F_c' = C_D * C_M * C_t * C_F * C_i * C_P$

F_C=	1300	psi	COMPRESSION PARALLEL TO GAIN
C_D=	1		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_F=	1.15		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.315		COLUMN STABILITY FACTOR

L=	8.00	ft	
d=	3.5	in	
K=	1		
E_{MIN}'=	470000	psi	
c=	0.8		
Le=	96	in	
Le/d=	27.43	<50	OK

F_{CE}=	513.527
F_C*=	1495
F_{CE}/FC*=	0.343496
C_P=	0.315

Fc'= 470.35 psi
Allowable P= F'c X A
= 5761.74 lb

Column: 2x4

SIZE: b= 1.5 in
d= 3.5 in

$F_c' = C_D * C_M * C_t * C_F * C_i * C_P$

F_C=	800	psi	COMPRESSION PARALLEL TO GAIN
C_D=	1		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_F=	1.15		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.449		COLUMN STABILITY FACTOR

L=	8.00	ft	
d=	3.5	in	
K=	1		
E_{MIN}'=	440000	psi	
c=	0.8		
Le=	96	in	
Le/d=	27.43	<50	OK

F_{CE}=	480.7487
F_C*=	920
F_{CE}/FC*=	0.522553
C_P=	0.449

Fc'= 413.32 psi
Allowable P= F'c X A
= 2169.92 lb

Column Load

Roof:	psf	Floor:	psf	Deck:	psf
DL=	25	DL =	15	DL =	10
LL =	25	LL =	40	LL =	60
Sum =	50		55		70

		Area	Load (Lbs)
C1:	Roof:	173	8625
	2nd:	127	6958
	Main:		0
	Deck:		0
	Wall:		0
	Total:		15583
C2:	Roof:		0
	2nd:	161	8855
	Main:		0
	Deck:		0
	Wall:		0
	Total:		8855
C3:	Roof:	173	8625
	2nd:	35	1898
	Main:		0
	Deck:		0
	Wall:	120	1800
	Total:		12323
C4:	Roof:	68	3375
	2nd:	54	2970
	Main:		0
	Deck:		0
	Wall:	108	1620
	Total:		7965
C5:	Roof:	68	3375
	2nd:	54	2970
	Main:		0
	Deck:		0
	Wall:	108	1620
	Total:		7965
C6:	Roof:	30	1500
	2nd:	24	1320
	Main:		0
	Deck:		0
	Wall:	120	1800
	Total:		4620

C7:	Roof:	23	1125
	2nd:	18	990
	Main:		0
	Deck:		0
	Wall:	48	720
	Total:		2835
C8:	Roof:	17	825
	2nd:	13	688
	Main:		0
	Deck:		0
	Wall:	72	1080
	Total:		2593
C9:	Roof:		0
	2nd:	13	688
	Main:		0
	Deck:		0
	Wall:		0
	Total:		688
C10:	Roof:	32	1600
	2nd:		0
	Main:		0
	Deck:		0
	Wall:	48	720
	Total:		2320
C11:	Roof:	20	1000
	2nd:	12	660
	Main:		0
	Deck:		0
	Wall:	24	360
	Total:		2020
C12:	Roof:		0
	2nd:		0
	Main:	49	2671
	Deck:		0
	Wall:		0
	Total:		2671
C13:	Roof:	78	3900
	2nd:		0
	Main:	33	1788
	Deck:		0
	Wall:		0
	Total:		5688

C14:	Roof:	90	4500
	2nd:	32	1760
	Main:	45	2475
	Deck:		0
	Wall:		0
	Total:		8735

C15:	Roof:		0
Foundation	2nd:	120	6600
	Main:	45	2475
	Deck:		0
	Wall:		0
	Total:		9075

C15:	Roof:		0
Col only	2nd:		0
	Main:	45	2475
	Deck:		0
	Wall:		0
	Total:		2475

C16:	Roof:	24	1200
	2nd:		0
	Main:		0
	Deck:		0
	Wall:	36	540
	Total:		1740

C17:	Roof:	30	1500
	2nd:		0
	Main:		0
	Deck:		0
	Wall:	36	540
	Total:		2040

C18:	Roof:		0
	2nd:		0
	Main:		0
	Deck:	80	5600
	Wall:		0
	Total:		5600

	Column Load (lbs)	Use Col	Allow load (lbs)	FTG WT lbs	Req'd size (ft)	Use FTG size (ft)	Use FTG THK (in)	#4 E.W. Rebars
C1:	15583	6x6DF	21927.89	2400	3.46	4	12	5
C2:	8855	6x6	13047.51	2400	2.74	4	12	5
C3:	12323	6x6DF	21927.89	2400	3.13	4	12	5
C4:	7965	6x6	13047.51	1125	2.46	3	10	4
C5:	7965	6x6	13047.51	1125	2.46	3	10	4
C6:	4620	6x6	13047.51	1125	1.96	3	10	4
C7:	2835	4x6	9008.87	375	1.46			
C8:	2593	6x6	13047.51	1125	1.57	3	10	4
C9:	688	4x6	9008.87	375	0.84			
C10:	2320	(2)2x4	4339.833	375	1.34			
C11:	2020	(2)2x4	4339.833	375	1.26			
C12:	2671	4X4	5761.74	375	1.43			
C13:	5688	4X6	9008.87	1125	2.13	3	10	4
C14:	8735	4X6	9008.87	2400	2.72	4	12	5
C15:	9075	4X6	9008.87	2400	2.77	4	12	5
C16:	1740	4X6	9008.87	375	1.19			
C17:	2040	(2)2x4	4339.833	375	1.27			
C18:	5600	6X6DF	21927.89	781	2.06	2.5	10	3

	Column Load (lbs)
C7:	2835
C9:	688
C10:	2320
C11:	2020
C12:	2671
C16:	1740
C17:	2040

On existing wall foundation or new wall foundation
The exisitng wall foundation assumed min 16" width
With 12" depth total. Effection bearing area = (12"+12") * 15"
area = 2.5 sqft. Allowable load = 2.5 x 1500 = 3750 lbs

4.0 FOUNDATION DESIGN

Assumed Soil Bearing Capacity = 1500 psf

Frost Line Depth = 18 in

	Use FTG size (ft)	Use FTG THK (in)	Factor Vu(lbs)	Min Mu (lb-ft/ft)	Assumed LRFD (1.6) Shear ϕVc	Check	Moment ϕMn/ft	Check
C1:	4	12.00	24932	3117	112393	OK	7910	OK
C2:	4	12.00	14168	1771	112411	OK	7910	OK
C3:	4	12.00	19716	2465	112430	OK	7910	OK
C4:	3	10.00	12744	1593	78254	OK	6128	OK
C5:	3	10.00	12744	1593	78267	OK	6128	OK
C6:	3	10.00	7392	924	78280	OK	6128	OK
C7:								
C8:	3	10.00	4148	519	78306	OK	6128	OK
C9:								
C10:								
C11:								
C12:								
C13:	3	10.00	9100	1138	78371	OK	6129	OK
C14:	4	12.00	13976	1747	112636	OK	7910	OK
C15:	4	12.00	14520	1815	112655	OK	7910	OK
C16:								
C17:								
C18:	2.5	10.00	8960	1120	78436	OK	6117	OK

bo	d	f'c	Shear ϕVc	Check	#4/ft As/ft	a (in)	Moment ϕMn/ft	Check
76	9	3000	112393	OK	0.20	0.10	7910	OK
76	9	3001	112411	OK	0.20	0.10	7910	OK
76	9	3002	112430	OK	0.20	0.10	7910	OK
68	7	3003	78254	OK	0.20	0.13	6128	OK
68	7	3004	78267	OK	0.20	0.13	6128	OK
68	7	3005	78280	OK	0.20	0.13	6128	OK
68	7	3007	78306	OK	0.20	0.13	6128	OK
68	7	3012	78371	OK	0.20	0.13	6129	OK
76	9	3013	112636	OK	0.20	0.10	7910	OK
76	9	3014	112655	OK	0.20	0.10	7910	OK
68	7	3017	78436	OK	0.20	0.15	6117	OK

5.0 Lateral Analysis

New addition Roof:

Roof DL	25.00	PSF
2nd Floor DL	15.00	PSF
IntWall	10.00	PSF
Ext Wall	15.00	PSF

Roof

Diaphragm Area:		805.00	sq. ft.
Height of Diaphragm:		13.00	ft
	Weight of Diaphragm:	20125.00	lbs
Wall Weights Below:			
Wall Height:		10.30	ft
Concrete Wall Lengths:		0.00	lf
Int wall Wall Lengths:		77.00	lf
Ext Wall Perimeter:		106.00	lf
Concrete Wall Weight:		150.00	psf
Int Wall Weight:		10.00	psf
Ext Wall Wall Weight:		15.00	psf
	Weight of Walls Below:	12154.00	lbs
	Seismic Weight at Roof:	**32279.00**	**lbs**

2nd Floor

Diaphragm Area:		650.00	sq. ft.
Height of Diaphragm:		8.60	ft
	Weight of Diaphragm:	9750.00	lbs
Wall Weights Below:			
Wall Height:		7.70	ft
Concrete Wall Lengths:		0.00	lf
Int wall Wall Lengths:		24.00	lf
Ext Wall Perimeter:		92.00	lf
Concrete Wall Weight:		150.00	psf
Int Wall Weight:		10.00	psf
Ext Wall Wall Weight:		15.00	psf
	Weight of Walls Below:	6237.00	lbs
	Seismic Weight at Flor:	**28141.00**	**lbs**

Garage Base Shear:

V= CS*w
CS = SDS / (R/Ie)
SDS = 1.16
R(N-S) = 6.5 Table 12.2-1 ASCE 7-10
R(E-W) = 6.5 Table 12.2-1 ASCE 7-10
V = 11.93 kips
$0.7V_E$ = 8.35 kips

Seismic Loads

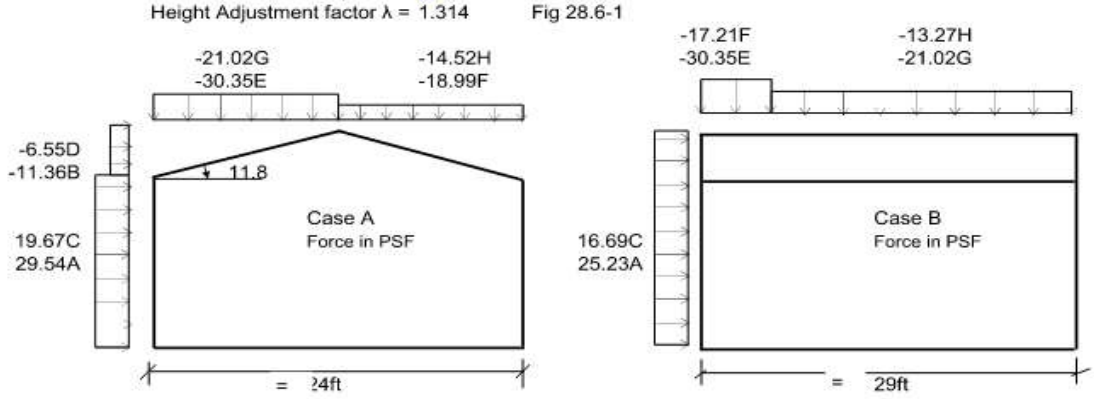
Floor	Seismic Weight	Height	W*h	w*h/Σw*h	V
Roof	32.28 kips	21.60 ft	697.23	0.74	**8.85 kips**
2nd	28.14 kips	8.60 ft	242.01	0.26	**3.07 kips**

	$0.7V_E$ (Kips)
Roof	6.20
2nd	2.15

28.4 Envelope Procedure,

MWFRS For Low-Rise Building. Part 2: Enclosed Simple Diaphragm Building (≤ 60 ft)

Roof Height h =	22	feet	
Roof Pitch =	2.50	:12	= 11.77 Degree
Building & Structure Risk Category =	II, standard		IBC T-1604.5
Wind Speed V =	110	MPH	Fig. 26.5-1A, MRI = 700 yrs
Topography factor K_{zt} =	1.00		26.8, Figure 26.8-1
Exposure	C		
Height Adjustment factor λ =	1.314	Fig 28.6-1	



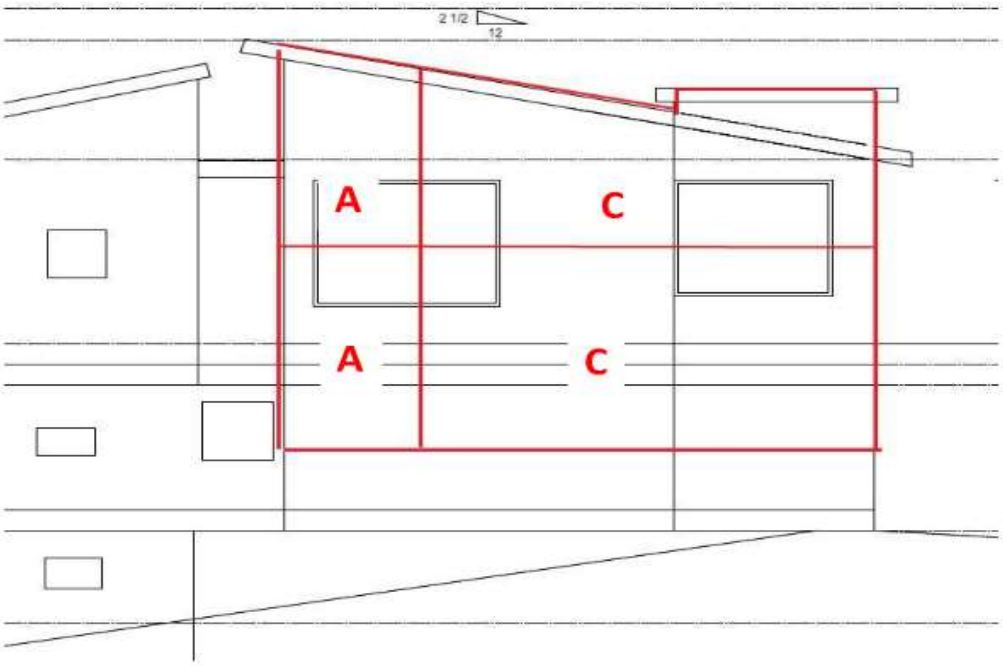
Plus and minus signs signify pressures acting toward and away from projected surfaces, respectively.

For Case B use Θ = 0°

Total horizontal load shall not be less than that determined by assume p_s = 0 in zones B & D

a= 10% of least horizontal dimension or 0.4h, whichever smaller, but bot less than either 4% of least horizontal dimention or 3ft.

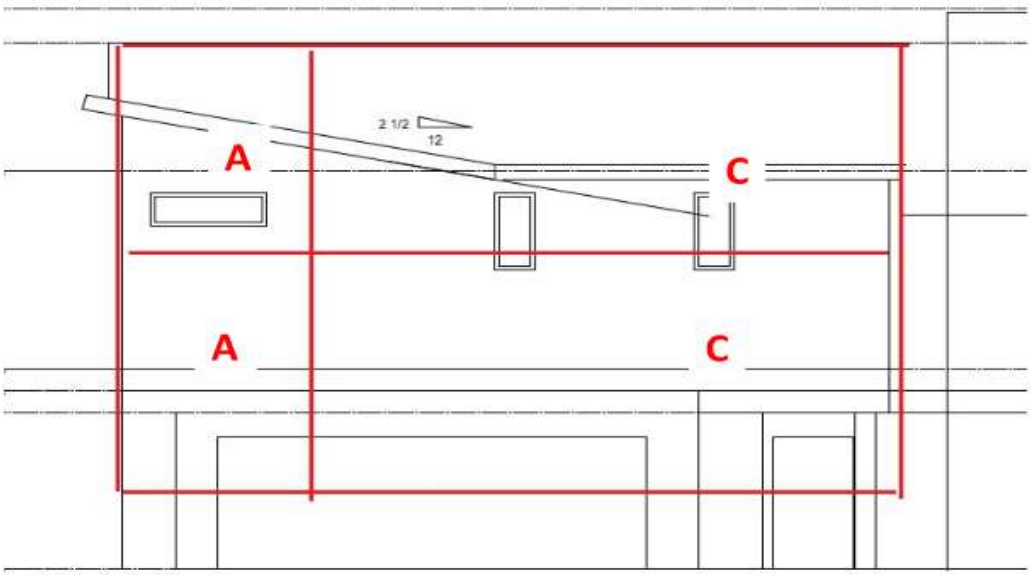
10 % of least dimension=	2.4 ft	
40 % of the eave height =	8.8 ft	
4 % of least dimension or 3 ft=	3.0 ft	⇐



	Section	Wind pressure	Area (sqft)	Wind force (kips)
	A	29.5	50	1.48
Roof	C	19.7	111	2.18
	A	29.5	65	1.92
2nd	C	19.7	190	3.74
			Sum W =	9.32
			0.6W =	5.59

	$0.6V_w$ (Kips)
Roof	2.20
2nd	3.39

Wind Area - N-S



	Section	Wind pressure	Area (sqft)	Wind force (kips)
Roof	A	29.5	52	1.54
	C	19.7	200	3.93
2nd	A	29.5	65	1.92
	C	19.7	245	4.82
			Sum W =	12.21
			0.6W =	7.32

	$0.6V_w$ (Kips)
Roof	3.28
2nd	4.04

Wind Area - N-S

New Addition Lateral Summary

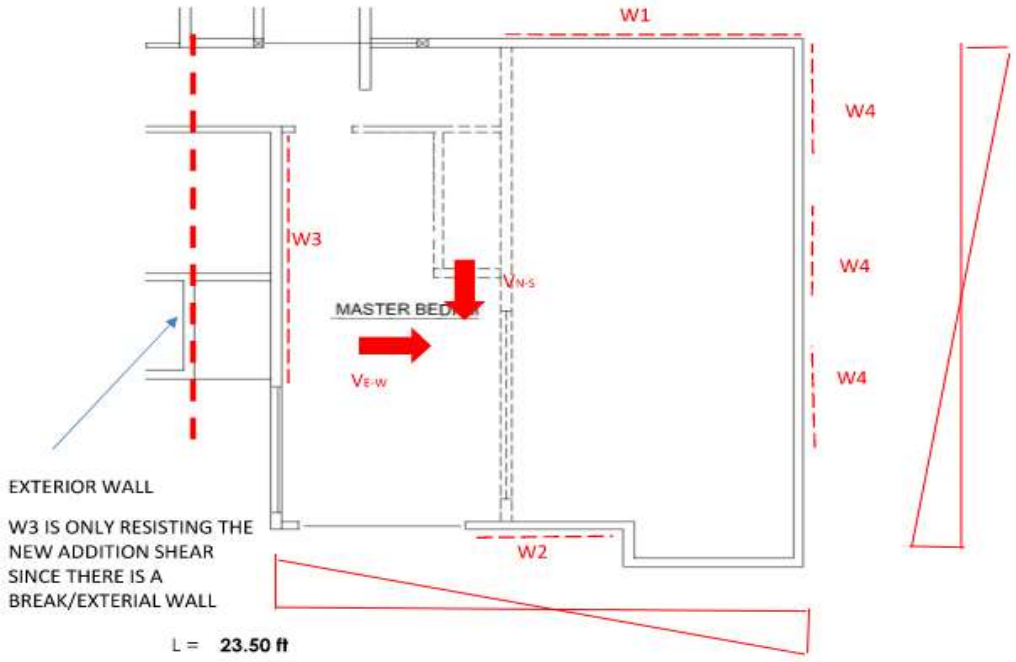
Lateral Loading N-S Direction

	0.7VE (Kips)	0.7VE (Kips)	0.6Vw (Kips)	0.6Vw (Kips)	Control Load
Roof	6.20	6.20	2.20	2.20	6.20
2nd	2.15	8.35	3.39	5.59	8.35

Lateral Loading E-W Direction

	0.7VE (Kips)	0.7VE (Kips)	0.6Vw (Kips)	0.6Vw (Kips)	Control Load
Roof	6.20	6.20	3.28	3.28	6.20
2nd	2.15	8.35	4.04	7.32	8.35

Floor layout



Roof:

V_{E-W} = **6.2**

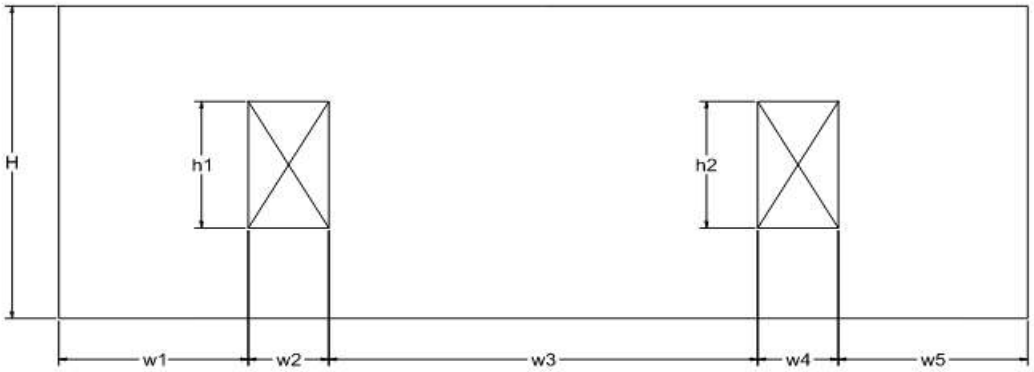
V_{N-S} = **6.2**

Max Diaph Shear = 132 plf

	Shear Line	H(ft)	Shear (lbs)	Wall	Wall Shear
E-W	W1	12.5	3099	**13.8 ft**	**225 plf**
	W2	12.5	3099	**7.5 ft**	**413 plf**
N-S	W3	12.5	3099	**14.5 ft**	**214 plf**
	W4	12.5	1033	**5.0 ft**	**207 plf**

Wall Pier Loading (Wall Reactions are Treated as Perforated Shearwalls)

Wall	Wall Length	W(DL)	Total Tension(0.6D)	Shear Strength	HD	Shear Wall	Allowable Shear	RATIO
W1	13.75 ft	238 plf	1837	225 plf	MST 48	B	380.0 plf	0.59
W2	7.50 ft	238 plf	4630	413 plf	MST 60	D	560.0 plf	0.74
W3	14.50 ft	338 plf	1203	214 plf	MST 48	c	420.0 plf	0.51
W4	5.00 ft	338 plf	2076	207 plf	MST 48	B	380.0 plf	0.54



Inputs: w4 Roof

Load to Shear Line =	3100 lbs	
Controlling Load Case =	Seismic	
H =	10.00 ft	
h1 =	3.50 ft	
h2 =	3..5	
Max Opening Height =	3.50 ft	
Full Height Sheathing =	87.10%	
C_o =	0.95	NDS Table 4.3.3.5

Wall Pier Inputs

		Aspect Ratio	
w1 =	8.50 ft	1.20 : 1	***Pier 1***
w2 =	1.50 ft		
w3 =	6.00 ft	1.70 : 1	***Pier 2***
w4 =	1.50 ft		
w5 =	5.75 ft	1.70 : 1	***Pier 3***
TOTAL =	23.25 ft		

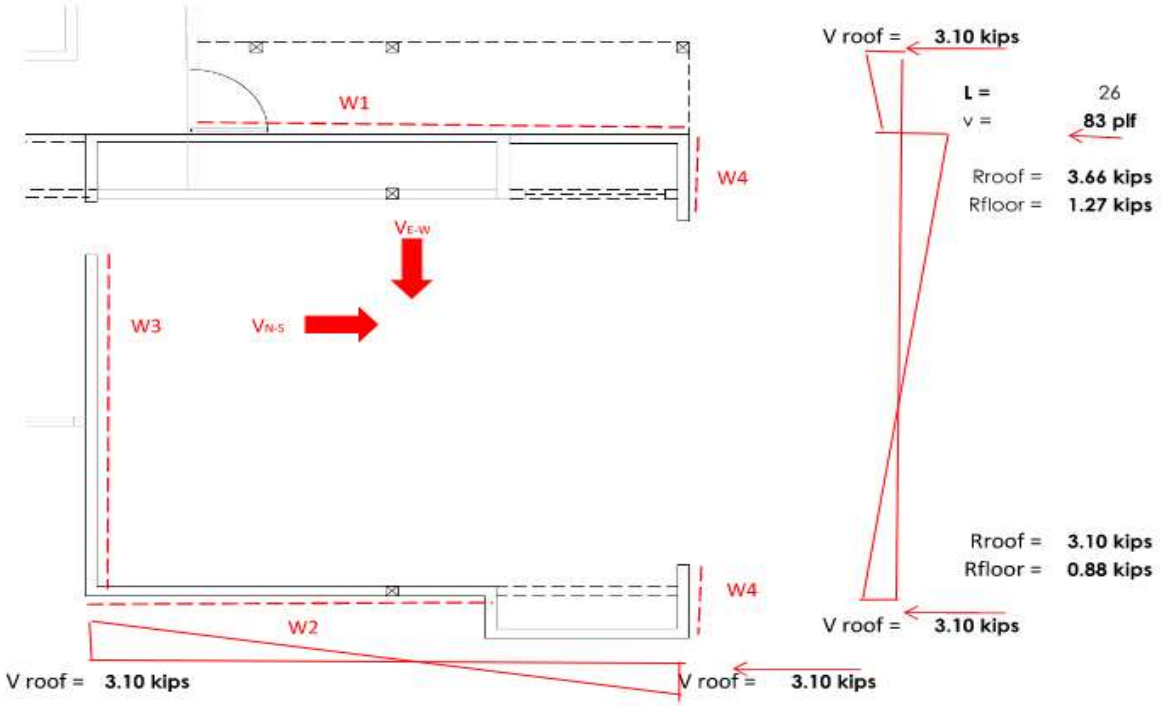
Results

Wall Pier	Aspect Ratio	Co	**Req'd Shear Strength**
Pier 1	1	0.95	**161 plf**
Pier 2	1	0.95	**161 plf**
Pier 3	1	0.95	**161 plf**

Results - Overturning

Uniform DL =	338 plf
Overturning Moment =	31000 lbs-ft
Resisting Moment (0.6D) =	54732 lbs-ft
Tension =	-1021 lbs

Floor layout



H		Roof	2nd
12.5	V_{E-W} =	**6.20 kips**	**2.15 kips**
9	V_{N-S} =	**6.20 kips**	**2.15 kips**

	Shear Line	H(ft)	Roof Shear (lbs)	H(ft)	2ndd Shear (lbs)	Wall L (ft)	Wall V (plf)
E-W	W1	12.5	**3662 lbs**	9	**1271 lbs**	19.0	**259.6**
	W2	12.5	**3099 lbs**	9	**880 lbs**	15.0	**265.2**
N-S	W3	12.5	**3099 lbs**	9	**1076 lbs**	16.0	**260.9**
	W4a	12.5	**1684 lbs**	9	**585 lbs**	4.2	**544.5**
	W4b	12.5	**1415 lbs**	9	**491 lbs**	3.5	**544.5**

Wall Pier Loading (Wall Reactions are Treated as Perforated Shearwalls)

Wall	Wall Length	W(DL)	Total Tension(0.6D)	Shear Strength	HD	Shear Wall	Allowable Shear	RATIO
W1	19.00 ft	323 plf	2908	260 plf	HDU2	B	380.0 plf	0.68
W2	15.00 ft	323 plf	3518	265 plf	HDU2 / HDU5	B	380.0 plf	0.70
W3	16.00 ft	398 plf	2861	261 plf	HDU2	B	380.0 plf	0.69
W4a	4.17 ft	398 plf	9456	544 plf	HHDQ14	D	560.0 plf	0.97
W4b	3.50 ft	398 plf	9535	544 plf	HHDQ14	D	560.0 plf	0.97