STRUCTURAL DESIGN

FOR

2419 MERCER FIRSTHILL

Submitted to: NexGen Homes

Date: *5/29/2024*

F.T. Engineering & Construction Management, LLC

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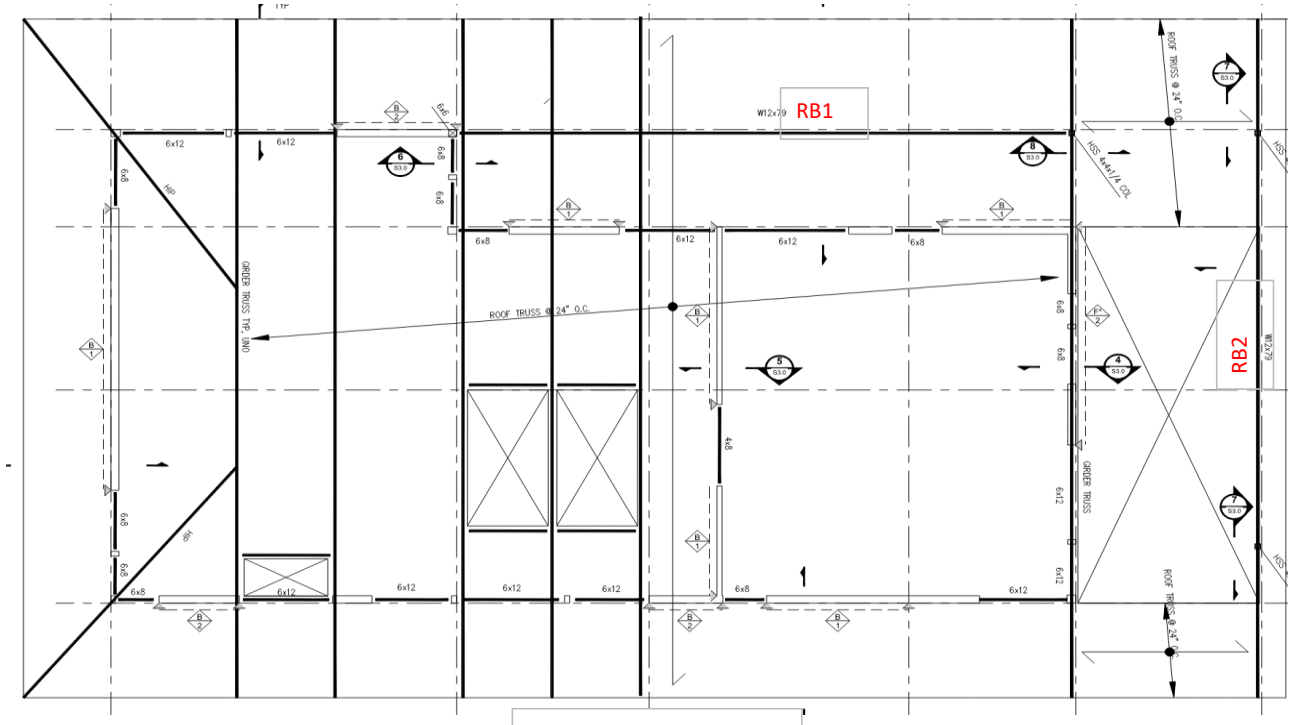
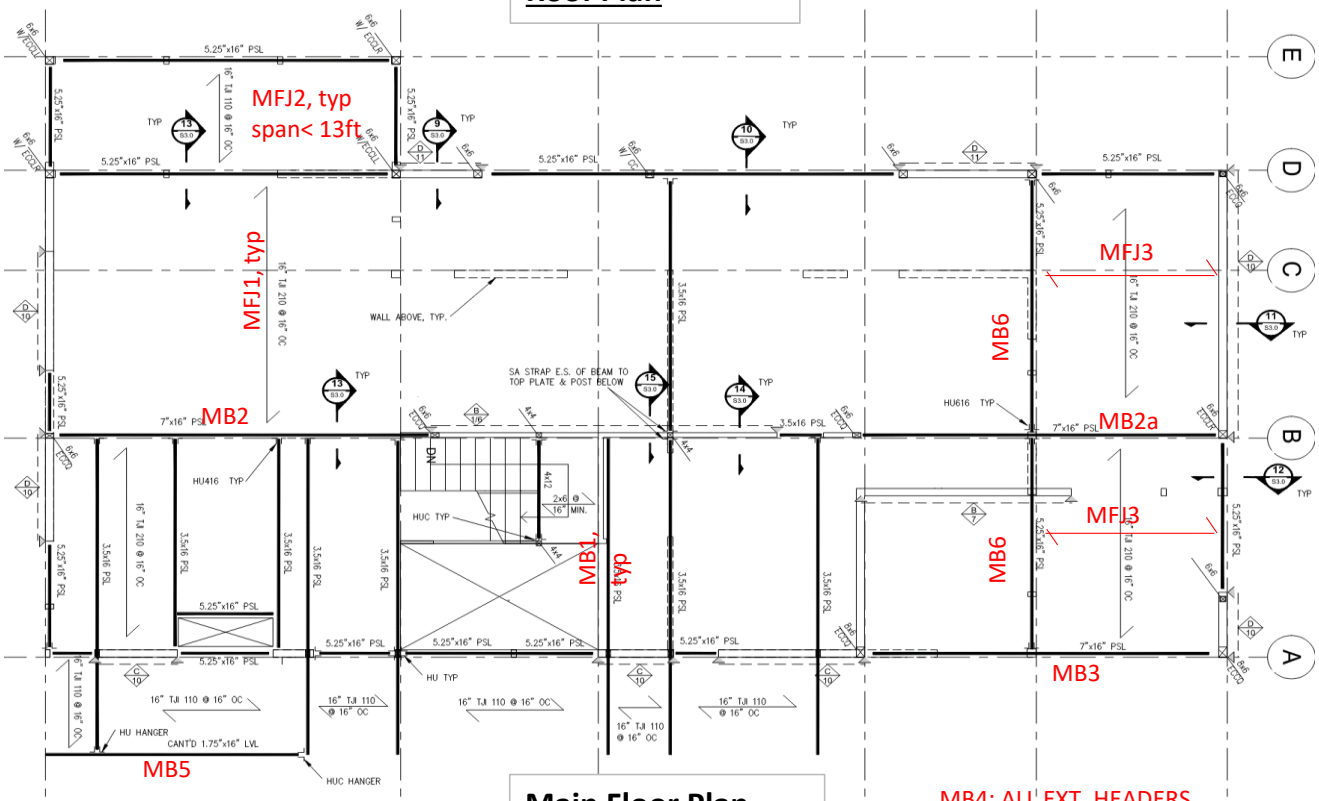
1.0 OBJECTIVE

New 2-story timber hosue with basement.



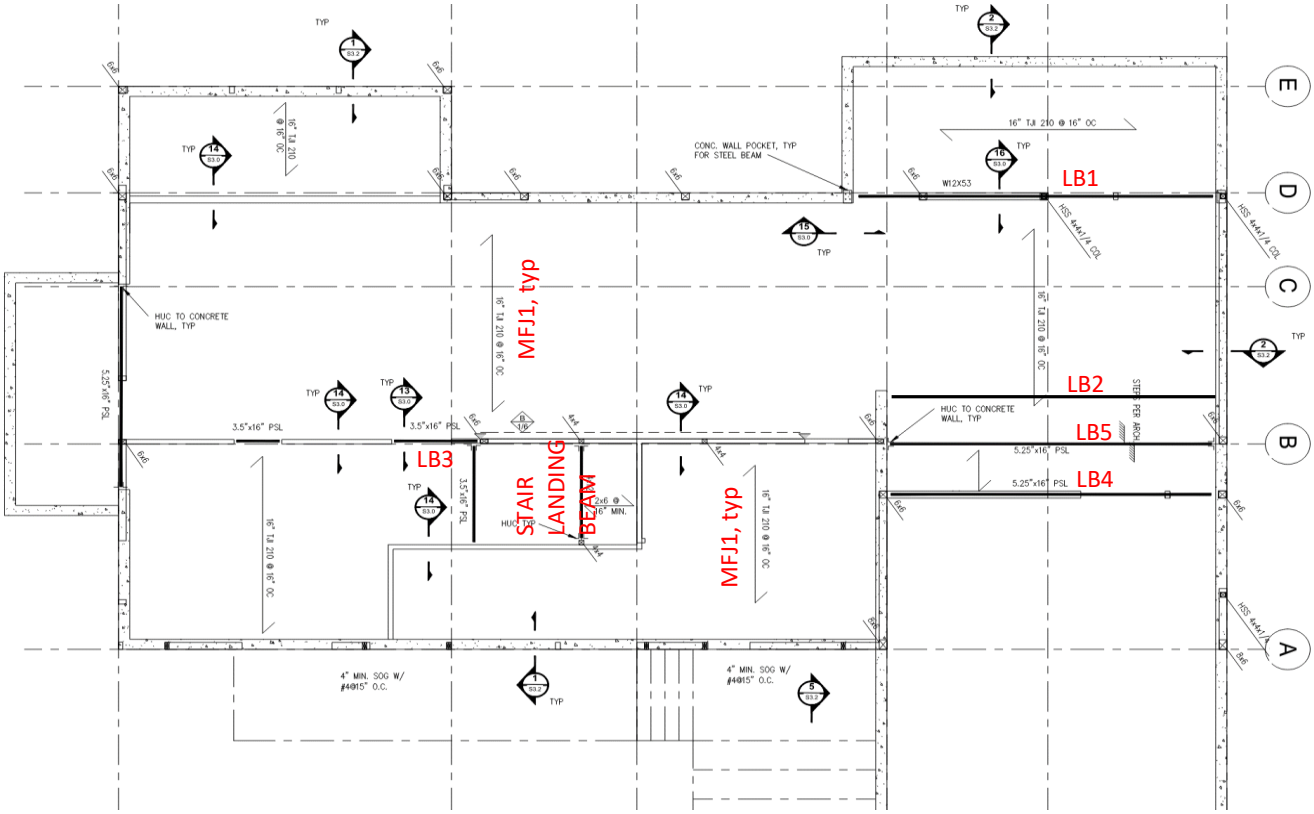
Roof Plan



Main Floor Plan

MB4: ALL EXT. HEADERS

Job Number:		Engineer:	Frankie Tsui
Job Name:	2419 Mercer Firsthill	Date:	5/29/2024
Location:	2419 72nd Ave SE, Mercer Island, WA 98040	Page:	2



Lower Floor Plan

Job Number:		Engineer:	Frankie Tsui
Job Name:	2419 Mercer Firsthill	Date:	5/29/2024
Location:	2419 72nd Ave SE, Mercer Island, WA 98040	Page:	3

2.0 LOAD

Roof live Load =	20	PSF
Floor live load =	40	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 =	20	psf
Wind Design :		
Design Wind speed =	110	mph
Exp =	B	
Seismic Design :		
Sds =	0.929	
R =	6.5	
Ω =	2.5	
Soil Bearing Capacity :		
Assumed Soil Bearing Capacity =	2500	psf
Frost Line Depth =	18	in

3.0 Garvity Framing Design

Typ Roof Header: 7.5 ft Ext

Span =	7.25	ft Max				Pdl =	0	lbs
Trib. Area =	21.50	ft (Roof)	0.00	ft (Floor)		Pll=	0	lbs
DL =	20.00	psf	15.00	psf		Ll=	0	ft
LL =	25.00	psf	40.00	psf		Lr =	7.25	ft
W =	967.50	plf	0.00	plf		Rl =	0.00	lbs
Use W =	1000.00	plf				Rr =	0.00	lbs
V=	3625.00	lb				M =	0.00	lb-ft
M=	6570.31	lb-ft						

SIZE:	b=	5.5	in	E=	1100000 psi
	d=	11.25	in	Fv=	140 psi
	S=	116.02	in^3		
	A=	61.88	in^2		
	I=	652.59	in^4		

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

F_b=	675	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		SIZE FACTOR
C_{fu}=	1		FLAT USE FACTOR
C_i=	1		INCISING FACTOR
C_r=	1		REPETITIVE MEMBER FACTOR

L=	7.25	ft	
K=	1.8		
E_{MIN}'=	400000	psi	
Le=	156.6	in	
R_B=	7.63	<50	OK

F_{bE}=	8241.81	psi
F_b*=	776.25	psi
F_{bE}/F_b*=	10.62	
C_L=	0.99	

F_b'=	772.26	psi
f"b=	679.60	psi
f'b/F'b =	0.88	OK
F'v =	161.00	psi
f"v =	87.88	psi
f'v/F'v =	0.55	OK

ΔLL+DL =	5WL4/384EI	
=	0.09	in
L/240 =	0.36	in
ΔLL =	0.05	in
L/480 =	0.18	in

Typ Roof Header: 4.5 ft Ext

Span =	4.50	ft Max						
Trib. Area =	21.50	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	20.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	967.50	plf	0.00	plf		Lr =	4.5	ft
Use W =	1000.00	plf				Rl =	0.00	lbs
V=	2250.00	lb				Rr =	0.00	lbs
M=	2531.25	lb-ft				M =	0.00	lb-ft

SIZE:	b=	5.5	in	E=	1100000 psi
	d=	7.5	in	Fv=	140 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=	1.15	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^*=	776.25	psi
F_{bE}/F_b^*=	25.66	
C_L=	1.00	

F_b'=	774.68	psi
f"b=	589.09	psi
f'b/F'b =	0.76	OK
F'v =	161.00	psi
f"v =	81.82	psi
f'v/F'v =	0.51	OK

ΔLL+DL =	5WL4/384EI	
=	0.04	in
L/240 =	0.23	in
ΔLL =	0.02	in
L/480 =	0.11	in

Typ Roof Header: 5 ft Int.

Span =	5.00	ft Max						
Trib. Area =	4.00	ft (Roof)	0.00	ft (Floor)		Pdl =	0	lbs
DL =	20.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	180.00	plf	0.00	plf		Lr =	5	ft
Use W =	200.00	plf				Rl =	0.00	lbs
V=	500.00	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=	1.15		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_L=	0.99		BEAM STABILITY FACTOR
C_F=	1		SIZE FACTOR
C_{fu}=	1		FLAT USE FACTOR
C_i=	1		INCISING FACTOR
C_r=	1		REPETITIVE MEMBER FACTOR

L=	5.00	ft	
K=	1.8		
E_{MIN}'=	470000	psi	
Le=	108	in	
R_B=	7.99	<50	OK

F_{bE}=	8823.75	psi
F_b^*=	977.50	psi
F_{bE}/F_b^*=	9.03	
C_L=	0.99	

F_b'=	971.49	psi
f"b=	244.61	psi
f'b/F'b =	0.25	OK
F'v =	172.50	psi
f"v =	29.56	psi
f'v/F'v =	0.17	OK

ΔLL+DL =	5WL4/384EI	
=	0.02	in
L/240 =	0.25	in
ΔLL =	0.01	in
L/480 =	0.13	in

RB1: W12x79

Span =	35.00	ft						
Trib. Area =	12.00	ft Roof	0.00	ft Floor		Pdl =	0	lbs
DL =	20.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	540.00	plf	0.00	plf		Lr =	35.00	ft
Use W =	600.00	plf				Rl =	0.00	lbs
V=	10500.00	lb				Rr =	0.00	lbs
M=	91.88	k-ft				M =	0.00	lb-ft

SIZE:	I=	662	in^4
	E=	29000000	psi

Allow Moment =		200	k-ft
ΔLL+DL =	5WL4/384EI		
=		1.06	in
L/240 =		1.75	in
ΔLL =		0.53	in
L/480 =		0.88	in

RB2: W12x79

Cat'd Span =	10.00	ft						
Trib. Area =	8.00	ft Roof	0.00	ft Floor		Pdl =	0	lbs
DL =	20.00	psf	15.00	psf		Pll=	0	lbs
LL =	25.00	psf	40.00	psf		Ll=	0	ft
W =	360.00	plf	0.00	plf		Lr =	10.00	ft
Use W =	450.00	plf				Rl =	0.00	lbs
V=	4500.00	lb				Rr =	0.00	lbs
M=	22.50	k-ft				M =	0.00	lb-ft

SIZE:	I=	662	in^4
	E=	29000000	psi

Allow Moment =		200	k-ft
ΔLL+DL =	WL4/8EI		
=		0.61	in
L/180 =		0.67	in
ΔLL =		0.27	in
L/240 =		0.50	in

Level			
Member Name	**Results (Max UTIL %)**	**Current Solution**	**Comments**
Floor: MFJ1	Passed (94% R)	1 piece(s) 16" TJI® 210 @ 16" OC	Web Stiffeners Required
Floor: MFJ2	Passed (72% R)	1 piece(s) 16" TJI® 110 @ 16" OC	Web Stiffeners Required
Floor: MFJ3	Passed (53% R)	1 piece(s) 9 1/2" TJI® 210 @ 16" OC	
Floor: MB1 Typ. Cant'd beam	Passed (93% ΔL)	1 piece(s) 3 1/2" x 16" 2.2E Parallam® PSL	
Floor: MB2 Beams @G-B	Passed (78% ΔL)	1 piece(s) 7" x 16" 2.2E Parallam® PSL	
Floor: MB2a Beams @G-B	Passed (101% M)	1 piece(s) 7" x 16" 2.2E Parallam® PSL	
Floor: MB3 ext Beam @G-A	Passed (78% ΔL)	1 piece(s) 7" x 16" 2.2E Parallam® PSL	
Floor: MB4 typical Ext. Beam and HD	Passed (89% R)	1 piece(s) 5 1/4" x 16" 2.2E Parallam® PSL	
Floor: MB5 Structural fasica	Passed (36% R)	1 piece(s) 1 3/4" x 16" 2.0E Microllam® LVL	
Floor: MB6 @ G5	Passed (100% R)	1 piece(s) 5 1/4" x 16" 2.2E Parallam® PSL	
Floor: LB1 Beams @G-D	Passed (62% R)	1 piece(s) W12X53 (A992) ASTM Steel	
Floor: LB2 Beams @G-B0.5	Passed (100% R)	1 piece(s) 5 1/4" x 16" 2.2E Parallam® PSL	
Floor: LB3 Beams @G-B	Passed (100% R)	1 piece(s) 3 1/2" x 16" 2.2E Parallam® PSL	
Floor: LB4 Beams @ G-A0.5	Passed (80% R)	1 piece(s) 7" x 14" 2.2E Parallam® PSL	
Floor: STAIR LANDING BEAM TYP	Passed (76% M)	1 piece(s) 4 x 12 DF No.2	
Floor: Lower floor 9.5" joist	Passed (70% R)	1 piece(s) 9 1/2" TJI® 210 @ 16" OC	
Floor: LB5 Beam @GB	Passed (71% ΔL)	1 piece(s) 3 1/2" x 14" 2.2E Parallam® PSL	

ForteWEB Software Operator	Job Notes
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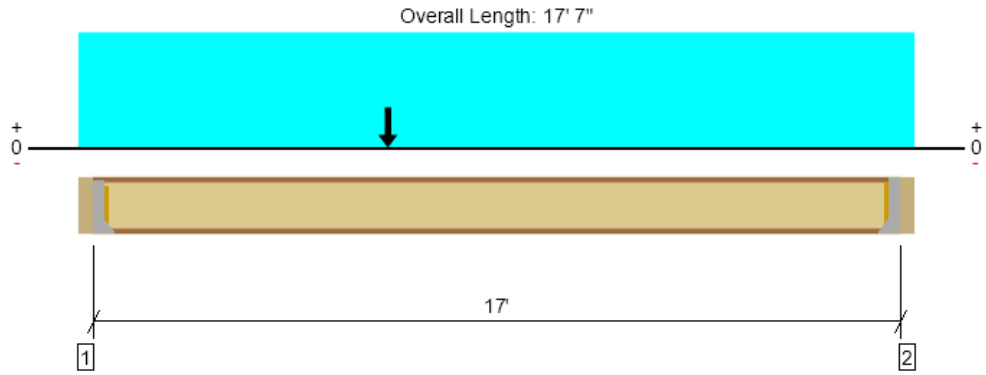
Weyerhaeuser

Level, Floor: MFJ1

1 piece(s) 16" TJI® 210 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	941 @ 3 1/2"	1005 (1.75")	Passed (94%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	941 @ 3 1/2"	2190	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	5163 @ 6' 6"	5911	Passed (87%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.194 @ 8' 6 1/2"	0.425	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.380 @ 8' 5 3/8"	0.850	Passed (L/537)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
TJ-Pro™ Rating	51	40	Passed	--	--

Member Length : 17'
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Hanger on 16" PSL beam	3.50"	Hanger[1]	1.75" / - [2]	493	469	254	1035	See note [1]
2 - Hanger on 16" PSL beam	3.50"	Hanger[1]	1.75" / - [2]	358	469	146	827	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 8" o/c	
Bottom Edge (Lu)	17' o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	IUS2.06/11.88	2.00"	N/A	10-10dx1.5	2-10dx1.5	Web Stiffeners
2 - Face Mount Hanger	IUS2.06/11.88	2.00"	N/A	10-10dx1.5	2-10dx1.5	Web Stiffeners

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

Vertical Loads	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 17' 7"	16"	15.0	40.0	-	Default Load
2 - Point (lb)	6' 6"	N/A	500	-	400	

Member Notes
Typical upper floor joist

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

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

ForteWEB Software Operator	Job Notes
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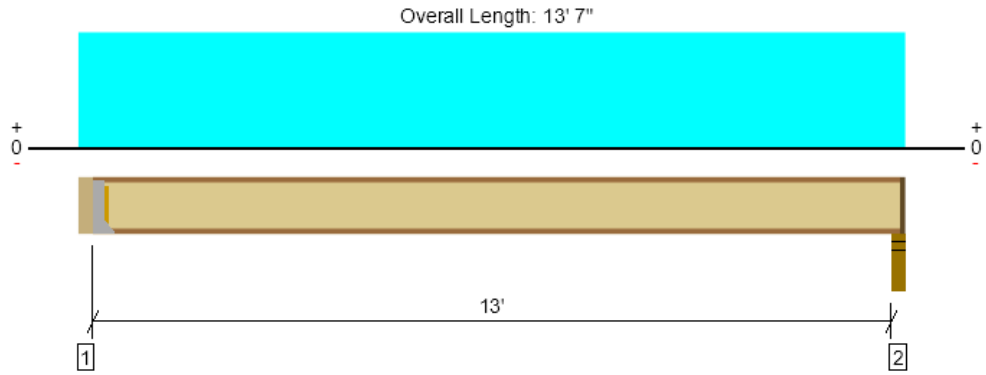
Weyerhaeuser

Level, Floor: MFJ2

1 piece(s) 16" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	654 @ 3 1/2"	910 (1.75")	Passed (72%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	654 @ 3 1/2"	2145	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2140 @ 6' 10"	4280	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.103 @ 6' 10"	0.327	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.128 @ 6' 10"	0.654	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	59	40	Passed	--	--

Member Length : 13' 2 1/4"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 16" HF beam	3.50"	Hanger[1]	1.75" / - [2]	137	547	683	See note [1]
2 - Stud wall - HF	3.50"	2.25"	1.75"	135	540	675	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 7" o/c	
Bottom Edge (Lu)	13' 2" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	IUS1.81/11.88	2.00"	N/A	10-10dx1.5	2-10dx1.5	Web Stiffeners

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 13' 7"	16"	15.0	60.0	Default Load

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
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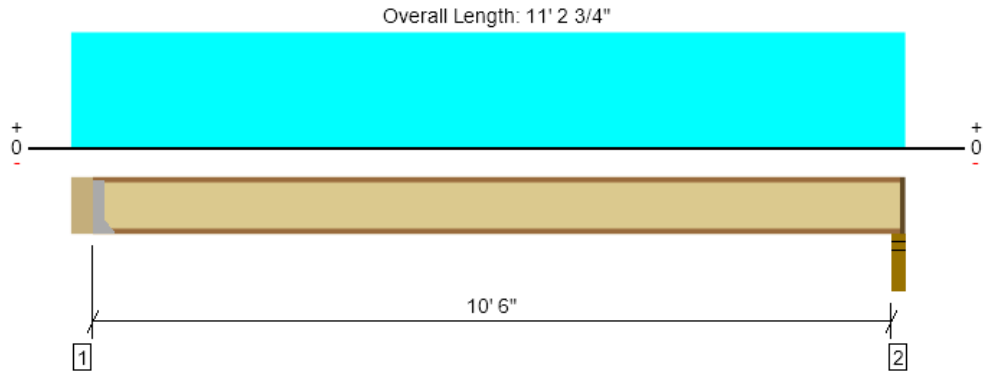
6/6/2024 1:24:34 AM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: Mercer Firsthill

Level, Floor: MFJ3

1 piece(s) 9 1/2" TJI® 210 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	529 @ 5 1/4"	1005 (1.75")	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	529 @ 5 1/4"	1330	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1400 @ 5' 8 3/4"	3000	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.122 @ 5' 8 3/4"	0.265	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.153 @ 5' 8 3/4"	0.529	Passed (L/832)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	53	40	Passed	--	--

Member Length : 10' 8 1/4"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 9 1/2" PSL beam	5.25"	Hanger[1]	1.75" / - [2]	115	458	573	See note [1]
2 - Stud wall - HF	3.50"	2.25"	1.75"	110	440	550	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.
- [2] Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' 6" o/c	
Bottom Edge (Lu)	10' 8" o/c	

- TJI joists are only analyzed using Maximum Allowable bracing solutions.
- Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	IUS2.06/9.5	2.00"	N/A	8-10dx1.5	2-Strong-Grip	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 11' 2 3/4"	16"	15.0	60.0	Default Load

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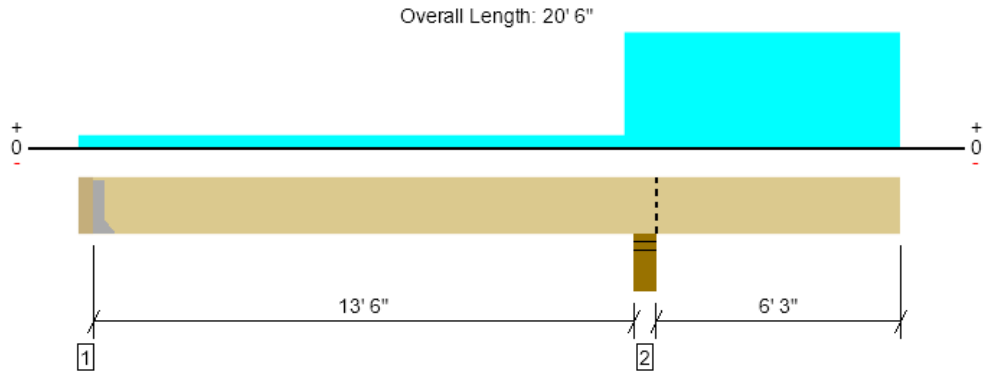
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: MB1 Typ. Cant'd beam

1 piece(s) 3 1/2" x 16" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6348 @ 14' 1/4"	7796 (5.50")	Passed (81%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3331 @ 15' 7"	10827	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-14221 @ 14' 1/4"	34955	Passed (41%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.303 @ 20' 6"	0.324	Passed (2L/514)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.384 @ 20' 6"	0.648	Passed (2L/404)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 20' 2 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -756 lbs uplift at support located at 3 1/2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 16" PSL beam	3.50"	Hanger[1]	1.50"	8	385/-764	393/-756	See note [1]
2 - Stud wall - HF	5.50"	5.50"	4.48"	1665	4683	6348	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	20' 3" o/c	
Bottom Edge (Lu)	20' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	THAC422	1.75"	N/A	22-16d	6-16d	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 20' 6"	N/A	17.5	--	
1 - Uniform (PSF)	0 to 13' 6" (Front)	1' 3 15/16"	15.0	40.0	Default Load
2 - Uniform (PLF)	13' 6" to 20' 6" (Front)	N/A	150.0	510.0	

- Side loads are assumed to not induce cross-grain tension.

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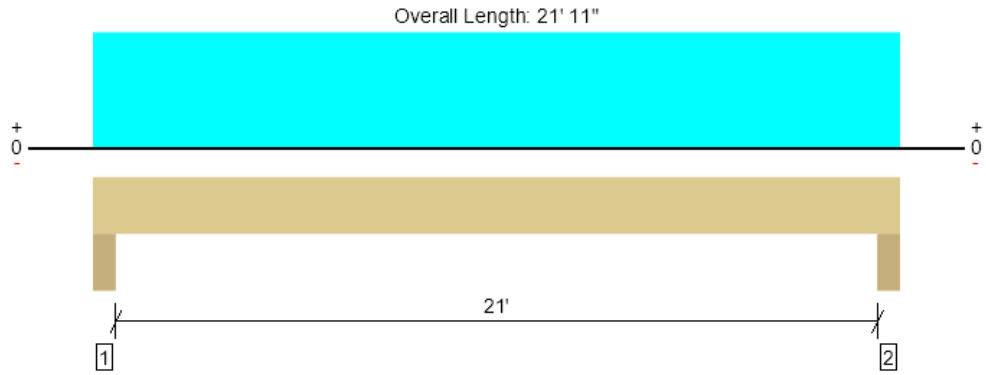
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: MB2 Beams @G-B

1 piece(s) 7" x 16" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9424 @ 4"	24063 (5.50")	Passed (39%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	7883 @ 1' 9 1/2"	21653	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	48543 @ 10' 11 1/2"	69909	Passed (69%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.555 @ 10' 11 1/2"	0.708	Passed (L/459)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.796 @ 10' 11 1/2"	1.063	Passed (L/320)	--	1.0 D + 1.0 L (All Spans)

Member Length : 21' 11"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - HF	5.50"	5.50"	2.15"	2849	6575	9424	None
2 - Column - HF	5.50"	5.50"	2.15"	2849	6575	9424	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	21' 11" o/c	
Bottom Edge (Lu)	21' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 21' 11"	N/A	35.0	--	
1 - Uniform (PSF)	0 to 21' 11" (Top)	15'	15.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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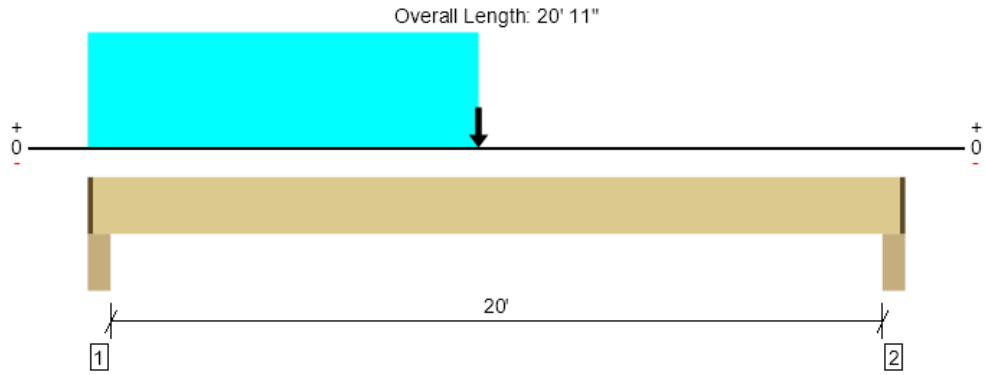
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Level, Floor: MB2a Beams @G-B

1 piece(s) 7" x 16" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	12237 @ 4"	18594 (4.25")	Passed (66%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	10584 @ 1' 9 1/2"	21653	Passed (49%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	70335 @ 10'	69909	Passed (101%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.547 @ 10'	0.675	Passed (L/444)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.918 @ 10'	1.013	Passed (L/265)	--	1.0 D + 1.0 L (All Spans)

Member Length : 20' 8 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - HF	5.50"	4.25"	2.80"	4898	7438	1154	12336	1 1/4" Rim Board
2 - Column - HF	5.50"	4.25"	1.56"	2877	3962	346	6839	1 1/4" Rim Board

• Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6" o/c	
Bottom Edge (Lu)	20' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 20' 9 3/4"	N/A	35.0	--	--	
1 - Uniform (PSF)	0 to 10' (Top)	15'	15.0	40.0	-	Floor
2 - Uniform (PSF)	0 to 10' (Top)	6'	20.0	-	25.0	Roof
3 - Point (lb)	10' (Top)	N/A	1350	5400	-	Deck
4 - Point (lb)	10' (Front)	N/A	2250	-	-	Wall

• Side loads are assumed to not induce cross-grain tension.

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ForteWEB Software Operator	Job Notes
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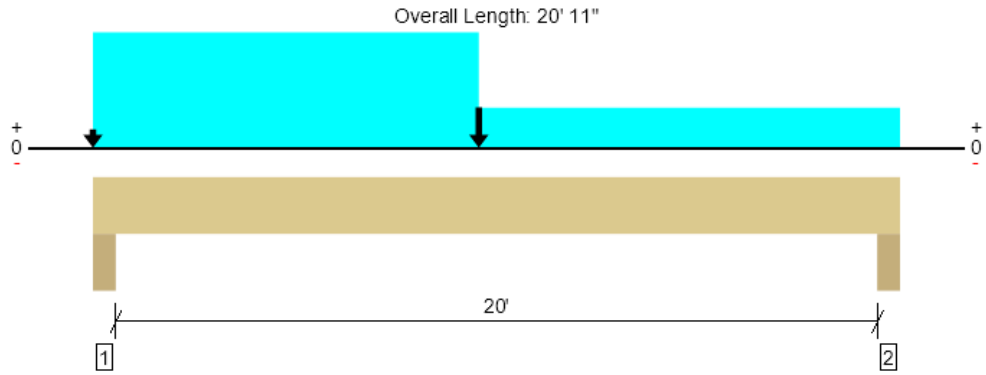
Weyerhaeuser

Level, Floor: MB3 ext Beam @G-A

1 piece(s) 7" x 16" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	11283 @ 4"	24063 (5.50")	Passed (47%)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	7696 @ 1' 9 1/2"	21653	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	47481 @ 10'	69909	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.396 @ 10'	0.506	Passed (L/613)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Total Load Defl. (in)	0.745 @ 10'	1.013	Passed (L/326)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)

Member Length : 20' 11"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Factored	
1 - Column - HF	5.50"	5.50"	2.58"	5518	3806	3880	11283	None
2 - Column - HF	5.50"	5.50"	1.65"	3372	3730	1420	7235	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	20' 11" o/c	
Bottom Edge (Lu)	20' 11" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Comments
0 - Self Weight (PLF)	0 to 20' 11"	N/A	35.0	--	--	
1 - Uniform (PLF)	0 to 20' 11" (Top)	N/A	150.0	280.0	-	Floor
2 - Point (lb)	10' (Top)	N/A	640	-	800	Roof point load
3 - Uniform (PSF)	0 to 10' (Top)	18'	20.0	-	25.0	Roof Truss
4 - Point (lb)	10' (Top)	N/A	630	1680	-	Floor point load
5 - Point (PLF)	0 (Front)	1'	150.0	-	-	wall

• Side loads are assumed to not induce cross-grain tension.

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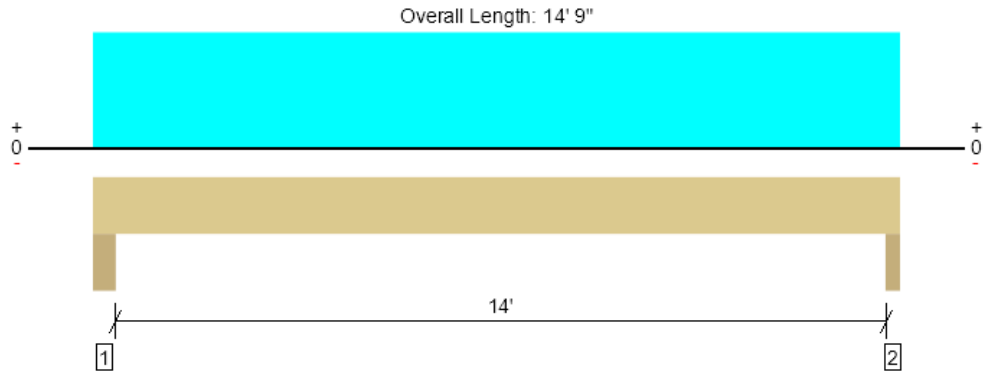
ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: MB4 typical Ext. Beam and HD

1 piece(s) 5 1/4" x 16" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	10217 @ 14' 7"	11484 (3.50")	Passed (89%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	7940 @ 1' 9 1/2"	18676	Passed (43%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	35568 @ 7' 5 1/2"	60297	Passed (59%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.204 @ 7' 5 1/2"	0.356	Passed (L/837)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.374 @ 7' 5 1/2"	0.712	Passed (L/457)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

Member Length : 14' 9"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Factored	
1 - Column - HF	5.50"	5.50"	3.19"	4745	3580	4028	10451	None
2 - Column - HF	3.50"	3.50"	3.11"	4639	3500	3938	10217	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	14' 9" o/c	
Bottom Edge (Lu)	14' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 14' 9"	N/A	26.3	--	--	
1 - Uniform (PLF)	0 to 14' 9" (Top)	N/A	430.0	-	540.0	Default Load
2 - Uniform (PLF)	0 to 14' 9" (Front)	N/A	180.0	480.0	-	

• Side loads are assumed to not induce cross-grain tension.

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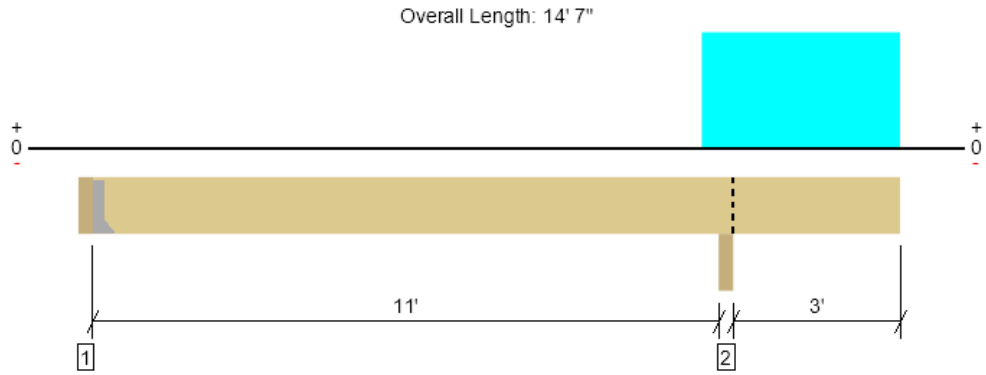
ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: MB5 Structural fasica

1 piece(s) 1 3/4" x 16" 2.0E Microllam® LVL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1361 @ 11' 5 1/4"	3828 (3.50")	Passed (36%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	547 @ 12' 11"	5320	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-1624 @ 11' 5 1/4"	15557	Passed (10%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.029 @ 14' 7"	0.200	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.038 @ 14' 7"	0.315	Passed (2L/999+)	--	1.0 D + 1.0 L (Alt Spans)

Member Length : 14' 3 1/2"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (0.2") and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 16" PSL beam	3.50"	Hanger[1]	1.50"	7	2/-107	9/-99	See note [1]
2 - Beam - PSL	3.50"	3.50"	1.50"	396	964	1361	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	14' 4" o/c	
Bottom Edge (Lu)	14' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	IUS1.81/11.88	2.00"	N/A	10-10dx1.5	2-10dx1.5	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 14' 7"	N/A	8.2	--	
1 - Uniform (PSF)	11' to 14' 7" (Front)	4'	20.0	60.0	Default Load

- Side loads are assumed to not induce cross-grain tension.

Weyerhaeuser Notes

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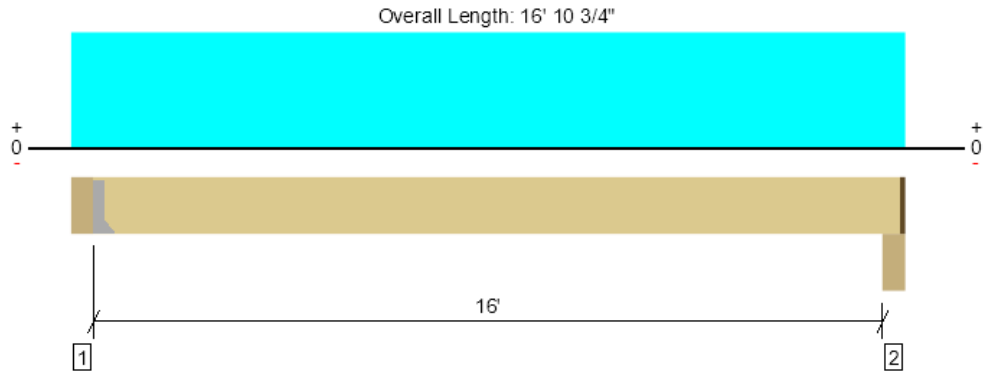
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: MB6 @ G5

1 piece(s) 5 1/4" x 16" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5855 @ 5 1/4"	5855 (1.78")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4887 @ 1' 9 1/4"	16240	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	23605 @ 8' 6"	52432	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.175 @ 8' 6"	0.403	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.310 @ 8' 6"	0.806	Passed (L/625)	--	1.0 D + 1.0 L (All Spans)

Member Length : 16' 4 1/4"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on 16" PSL beam	5.25"	Hanger[1]	1.78"	2677	3485	6162	See note [1]
2 - Column - HF	5.50"	4.25"	1.84"	2652	3442	6095	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	16' 4" o/c	
Bottom Edge (Lu)	16' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Face Mount Hanger	HGUS5.50/12	4.00"	N/A	56-10d	20-10d	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	5 1/4" to 16' 9 1/2"	N/A	26.3	--	
1 - Uniform (PSF)	0 to 16' 10 3/4" (Front)	6'	15.0	60.0	Default Load
2 - Uniform (PLF)	0 to 16' 10 3/4" (Front)	N/A	150.0	-	Wall
3 - Uniform (PLF)	0 to 16' 10 3/4" (Front)	N/A	50.0	50.0	roof above

- Side loads are assumed to not induce cross-grain tension.

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

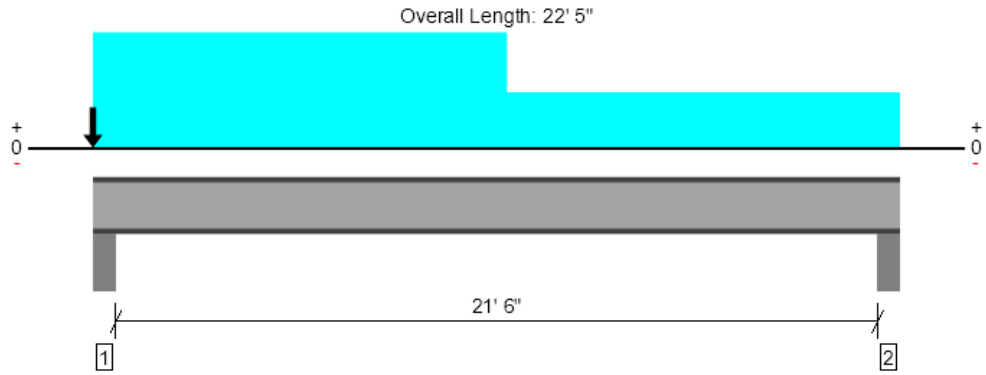
ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

6/6/2024 1:24:34 AM UTC
ForteWEB v3.8, Engine: V8.4.1.22, Data: V8.1.6.2
File Name: Mercer Firsthill

Level, Floor: LB1 Beams @G-D

1 piece(s) W12X53 (A992) ASTM Steel



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	31223 @ 4"	50325 (5.50")	Passed (62%)	--	1.0 D + 0.75 L + 0.75 Lr (All Spans)
Shear (lbs)	17799 @ 5 1/2"	83490	Passed (21%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	88660 @ 10' 2"	146898	Passed (60%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.322 @ 11' 5/16"	0.544	Passed (L/812)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.604 @ 10' 11 13/16"	1.087	Passed (L/432)	--	1.0 D + 1.0 L (All Spans)

Member Length : 22' 5"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Bearing reinforcement may be required for support located at 4".
- Bearing reinforcement may be required for point load located at 0".
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (Cb) of 1.0 has been assumed.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Factored	
1 - Pocket - concrete	5.50"	5.50"	5.50"	15028	11632	9963	31223	None
2 - Pocket - concrete	5.50"	5.50"	5.50"	6505	7866	1075	14372	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Roof Live (1.25)	Comments
0 - Self Weight (PLF)	0 to 22' 5"	N/A	53.0	--	--	
1 - Uniform (PSF)	0 to 11' 6" (Top)	15'	20.0	-	25.0	Roof
2 - Uniform (PSF)	0 to 11' 6" (Top)	8'	15.0	40.0	-	Main Floor
3 - Uniform (PSF)	0 to 22' 5" (Top)	8'	15.0	40.0	-	Lower Floor
4 - Point (lb)	0 (Top)	N/A	3960	-	4950	Roof steel beam
5 - Point (lb)	0 (Top)	N/A	1420	-	1775	Roof cant'd truss
6 - Point (lb)	0 (Top)	N/A	720	1920	-	Main floor point
7 - Uniform (PSF)	0 to 22' 5" (Top)	5'	60.0	60.0	-	Lower floor deck

- Side loads are assumed to not induce cross-grain tension.

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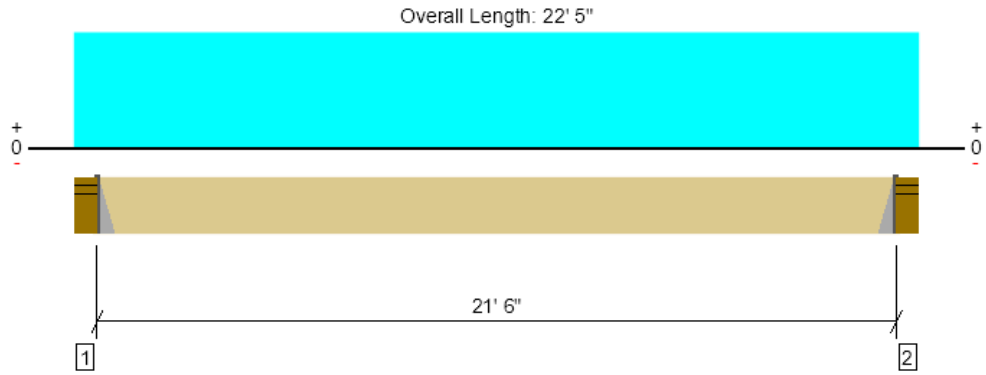
ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: LB2 Beams @G-B0.5

1 piece(s) 5 1/4" x 16" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6195 @ 5 1/2"	6195 (1.89")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	5426 @ 1' 9 1/2"	16240	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	33296 @ 11' 2 1/2"	52432	Passed (64%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.517 @ 11' 2 1/2"	0.538	Passed (L/499)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.744 @ 11' 2 1/2"	1.075	Passed (L/347)	--	1.0 D + 1.0 L (All Spans)

Member Length : 21' 6"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on HF studWall	5.50"	Hanger[1]	1.89"	1963	4483	6447	See note [1]
2 - Hanger on HF studWall	5.50"	Hanger[1]	1.89"	1963	4483	6447	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	21' 6" o/c	
Bottom Edge (Lu)	21' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	
2 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	5 1/2" to 21' 11 1/2"	N/A	26.3	--	
1 - Uniform (PLF)	0 to 22' 5" (Top)	N/A	150.0	400.0	

- Side loads are assumed to not induce cross-grain tension.

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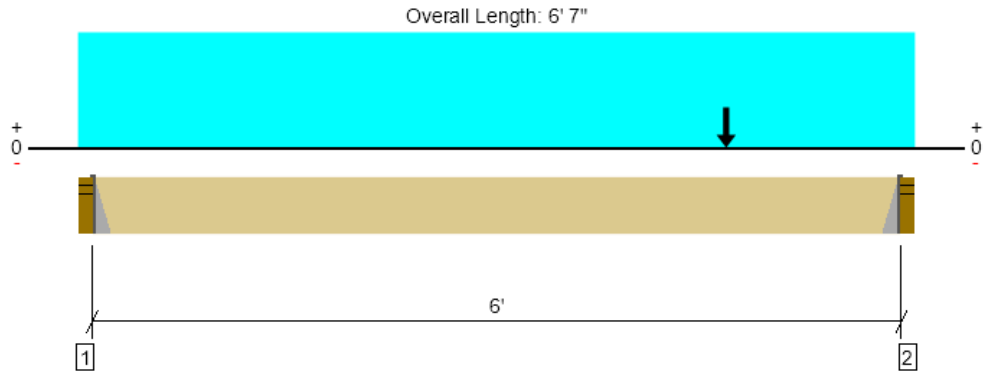
ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: LB3 Beams @G-B

1 piece(s) 3 1/2" x 16" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	11167 @ 6' 3 1/2"	11167 (5.11")	Passed (100%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	9774 @ 4' 11 1/2"	10827	Passed (90%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	13722 @ 5'	34955	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.038 @ 3' 6 1/2"	0.150	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.051 @ 3' 6 7/16"	0.300	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 6'
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on HF studWall	3.50"	Hanger[1]	2.24"	1355	3783	5138	See note [1]
2 - Hanger on HF studWall	3.50"	Hanger[1]	5.11"	2841	8567	11408	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' o/c	
Bottom Edge (Lu)	6' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	
2 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 6' 3 1/2"	N/A	17.5	--	
1 - Uniform (PLF)	0 to 6' 7" (Top)	N/A	225.0	600.0	
2 - Point (lb)	5' (Front)	N/A	2250	6000	
3 - Point (lb)	5' (Front)	N/A	360	2400	Stair

- Side loads are assumed to not induce cross-grain tension.

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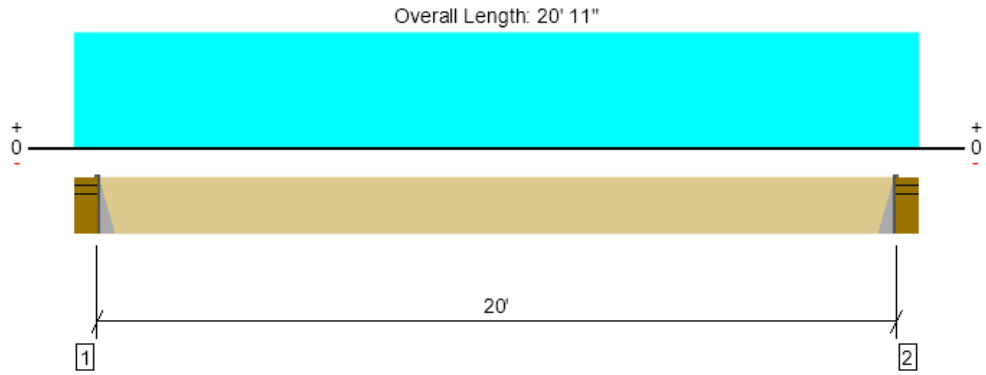
ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: LB4 Beams @ G-A0.5

1 piece(s) 7" x 14" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5256 @ 5 1/2"	6563 (1.50")	Passed (80%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4643 @ 1' 7 1/2"	18947	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	26281 @ 10' 5 1/2"	54324	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.387 @ 10' 5 1/2"	0.500	Passed (L/620)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.565 @ 10' 5 1/2"	1.000	Passed (L/424)	--	1.0 D + 1.0 L (All Spans)

Member Length : 20'
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Hanger on HF studWall	5.50"	Hanger[1]	1.50"	1718	3765	5483	See note [1]
2 - Hanger on HF studWall	5.50"	Hanger[1]	1.50"	1718	3765	5483	See note [1]

- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	20' o/c	
Bottom Edge (Lu)	20' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie

Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
1 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	
2 - Top Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	5 1/2" to 20' 5 1/2"	N/A	30.6	--	
1 - Uniform (PSF)	0 to 20' 11" (Top)	9'	15.0	40.0	

- Side loads are assumed to not induce cross-grain tension.

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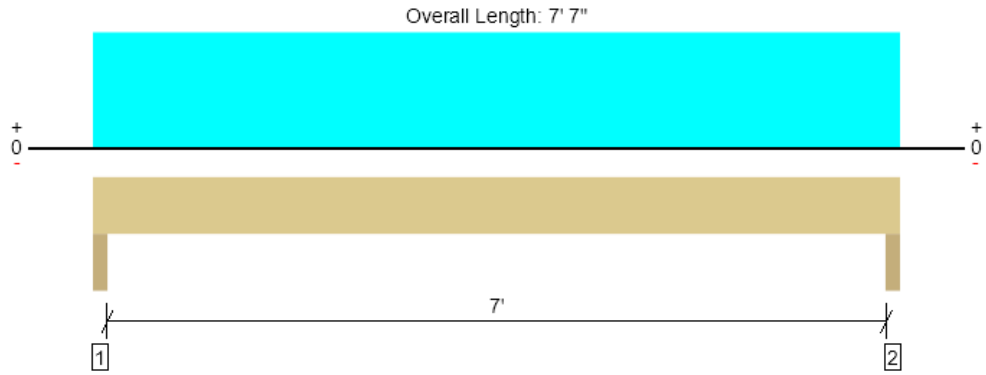
ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: STAIR LANDING BEAM TYP

1 piece(s) 4 x 12 DF No.2



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2654 @ 2"	7656 (3.50")	Passed (35%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1794 @ 1' 2 3/4"	4725	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4599 @ 3' 9 1/2"	6091	Passed (76%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.056 @ 3' 9 1/2"	0.181	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.065 @ 3' 9 1/2"	0.363	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

Member Length : 7' 7"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Column - HF	3.50"	3.50"	1.50"	379	2275	2654	None
2 - Column - HF	3.50"	3.50"	1.50"	379	2275	2654	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	7' 7" o/c	
Bottom Edge (Lu)	7' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 7' 7"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 7' 7" (Front)	6'	15.0	100.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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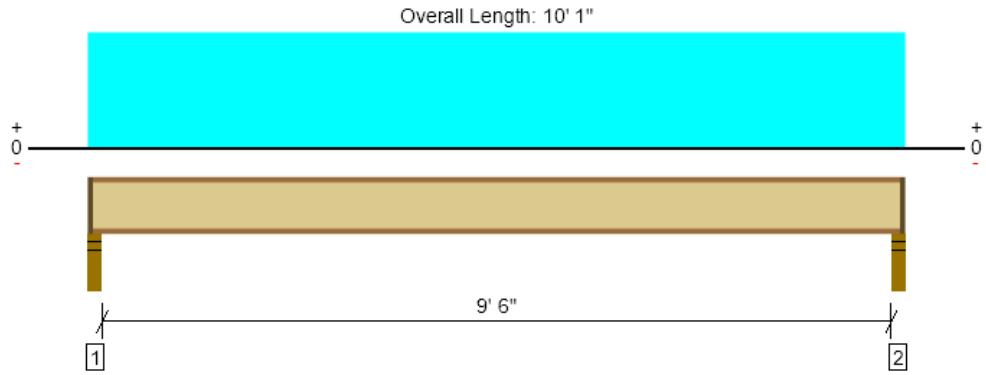
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Frankie Tsui F.T. Engineering & Construction Management, LLC (509) 822-0489 f.t.eng.cm@gmail.com	

Weyerhaeuser

Level, Floor: Lower floor 9.5" joist

1 piece(s) 9 1/2" TJI® 210 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	790 @ 2 1/2"	1134 (2.25")	Passed (70%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	760 @ 3 1/2"	1330	Passed (57%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1869 @ 5' 1/2"	3000	Passed (62%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.089 @ 5' 1/2"	0.242	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.177 @ 5' 1/2"	0.483	Passed (L/655)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	59	40	Passed	--	--

Member Length : 9' 10 1/2"
System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

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

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Stud wall - HF	3.50"	2.25"	1.75"	403	403	807	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.75"	403	403	807	1 1/4" Rim Board

• Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 8" o/c	
Bottom Edge (Lu)	9' 11" o/c	

•TJI joists are only analyzed using Maximum Allowable bracing solutions.
•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 10' 1"	16"	60.0	60.0	Default Load

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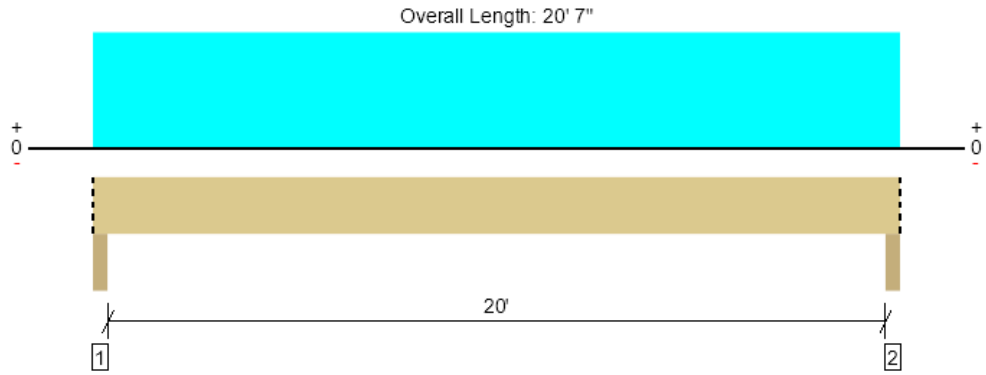
Weyerhaeuser

Level, Floor: LB5 Beam @GB

1 piece(s) 3 1/2" x 14" 2.2E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2422 @ 2"	4961 (3.50")	Passed (49%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2079 @ 1' 5 1/2"	9473	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	12062 @ 10' 3 1/2"	27162	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.361 @ 10' 3 1/2"	0.506	Passed (L/673)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.531 @ 10' 3 1/2"	1.013	Passed (L/457)	--	1.0 D + 1.0 L (All Spans)

Member Length : 20' 7"
System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2021
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Factored	
1 - Beam - HF	3.50"	3.50"	1.71"	775	1647	2422	Blocking
2 - Beam - HF	3.50"	3.50"	1.71"	775	1647	2422	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	20' 7" o/c	
Bottom Edge (Lu)	20' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 20' 7"	N/A	15.3	--	
1 - Uniform (PSF)	0 to 20' 7" (Front)	4'	15.0	40.0	Default Load

• Side loads are assumed to not induce cross-grain tension.

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Weyerhaeuser

4.0 Column and Foundation Design

Column: 6x6DF#1

SIZE: b= 5.5 in
d= 5.5 in

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

F_C=	1000	psi	COMPRESSION PARALLEL TO GAIN
C_D=	1.15		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_F=	1		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.569		COLUMN STABILITY FACTOR

L=	11.00	ft	F_{CE}=	827.708333
d=	5.5	in	F_C*=	1150
K=	1		F_{CE}/FC*=	0.71974638
E_{MIN}'=	580000	psi	C_P=	0.569
c=	0.8			
Le=	132	in		
Le/d=	24.00	<50	OK	

Fc'= 654.66 psi

Allowable P= F'c X A

= 19804 lb

Column: 4x4DF@2

SIZE: b= 3.5 in
d= 3.5 in

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

F_C=	1350	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		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.234		COLUMN STABILITY FACTOR

L=	11.00	ft	
d=	3.5	in	
K=	1		
E_{MIN}'=	580000	psi	
c=	0.8		
Le=	132	in	
Le/d=	37.71	<50	OK

F_{CE}=	335.1877
F_C*=	1350
F_{CE}/FC*=	0.248287
C_P=	0.234

Fc'= 315.89 psi

Allowable P= F'c X A

= 3870 lb

Column: 4x6DF#1

SIZE: b= 3.5 in
d= 5.5 in

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

F_C=	1500	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		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.226		COLUMN STABILITY FACTOR

L=	11.00	ft	
d=	3.5	in	
K=	1		
E_{MIN}'=	620000	psi	
c=	0.8		
Le=	132	in	
Le/d=	37.71	<50	OK

F_{CE}=	358.3041
F_C*=	1500
F_{CE}/FC*=	0.238869
C_P=	0.226

Fc'= 338.57 psi

Allowable P= F'c X A

= 6517 lb

Column: 2x6

SIZE: b= 1.5 in
d= 5.5 in

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

F_C=	800	psi	COMPRESSION PARALLEL TO GAIN
C_D=	1.15		LOAD DURATION FACTOR
C_M=	1		WET SERVICE FACTOR
C_t=	1		TEMP. FACTOR
C_F=	1		SIZE FACTOR
C_i=	1		INCISING FACTOR
C_P=	0.549		COLUMN STABILITY FACTOR

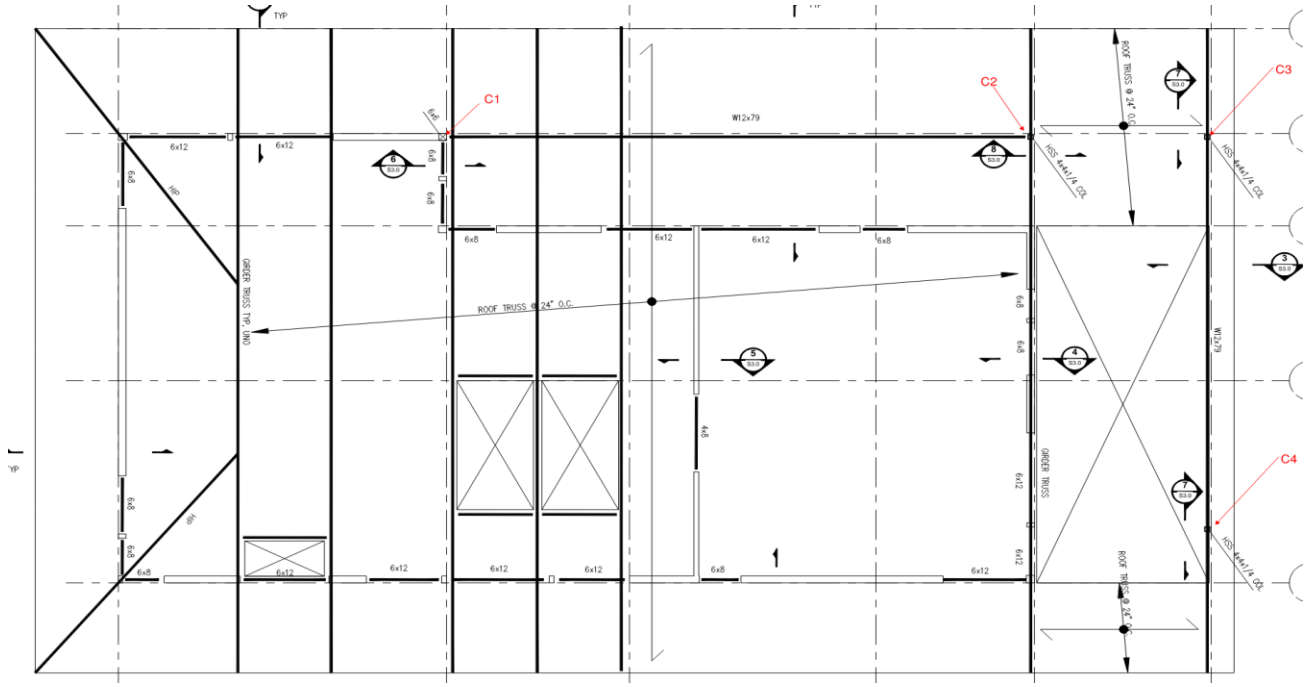
L=	11.00	ft	
d=	5.5	in	
K=	1		
E_{MIN}'=	440000	psi	
c=	0.8		
Le=	132	in	
Le/d=	24.00	<50	OK

F_{CE}=	627.9167
F_C*=	920
F_{CE}/FC*=	0.682518
C_P=	0.549

Fc'= 505.01 psi

Allowable P= F'c X A

= 4166.31 lb



ROOF FRAMING PLAN

24x36: SCALE 1/4" = 1'-0"

Job Number:	2024020	Engineer:	Frankie Tsui
Job Name:	2419 Mercer Firsthill	Date:	5/29/2024
Location:	2419 72nd Ave SE, Mercer Island, WA 98040	Page:	32

COLUMN AT ROOF

Roof:	psf	Floor:	psf	Deck:	psf
DL=	20	DL =	15	DL =	10
LL =	25	LL =	40	LL =	60
Sum =	45		55		70

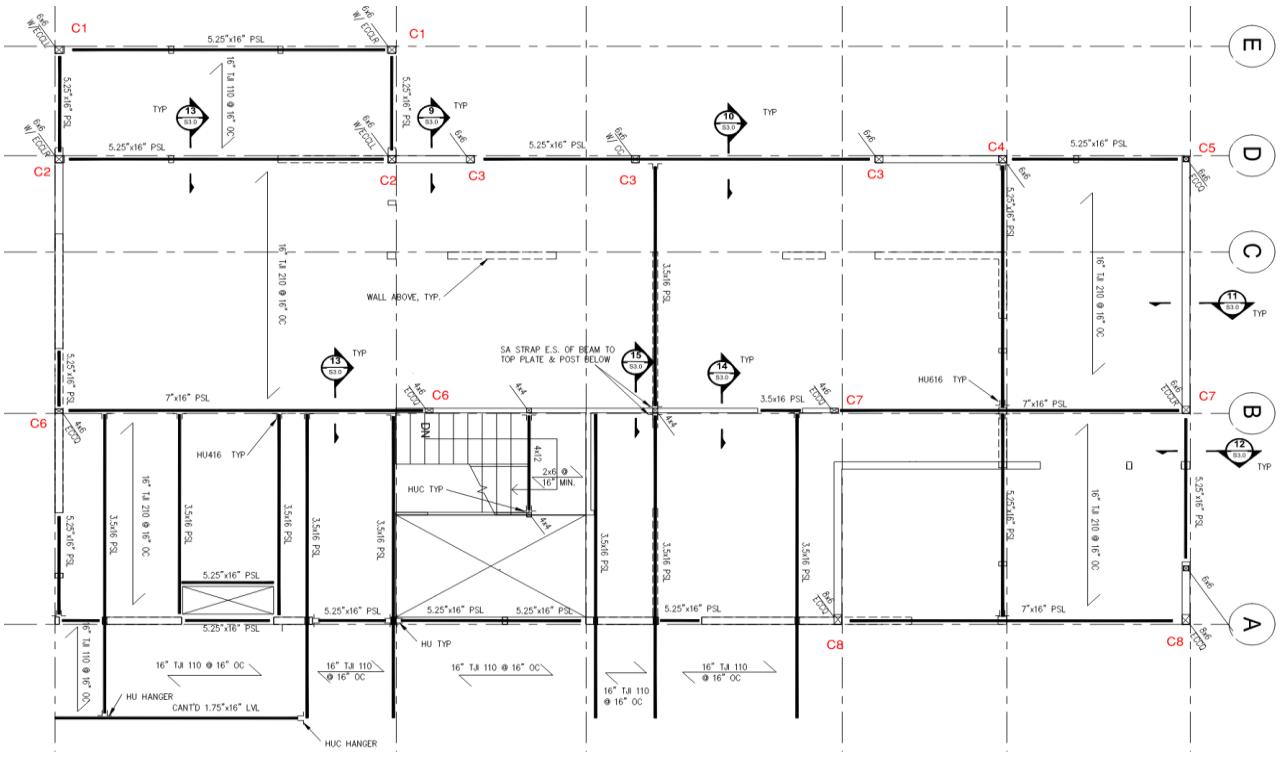
Assumed allowable Soil Bearing = 1500 psf

C1	trib (ft)	Load (Lbs)			
Roof:	175	7875	lbs		
Floor:	0	0	lbs		
Deck:	0	0	lbs		
		7875	lbs	use 6x6 col	
				ALLOW LOAD =	19804 LBS

C2	trib (ft)	Load (Lbs)			
Roof:	230	10350	lbs		
Floor:	0	0	lbs		
Deck:	0	0	lbs		
		10350	lbs	use HSS4X4X1/4	
				ALLOW LOAD =	58000 LBS

C3	trib (ft)	Load (Lbs)			
Roof:	91	4095	lbs		
Floor:	0	0	lbs		
Deck:	0	0	lbs		
		4095	lbs	use HSS4X4X1/4	
				ALLOW LOAD =	58000 LBS

C4	trib (ft)	Load (Lbs)			
Roof:	42	1890	lbs		
Floor:	0	0	lbs		
Deck:	0	0	lbs		
		1890	lbs	use HSS4X4X1/4	
				ALLOW LOAD =	58000 LBS



UPPER FLOOR FRAMING PLAN

24x36: SCALE 1/4" = 1'-0"

Job Number:	2024020	Engineer:	Frankie Tsui
Job Name:	2419 Mercer Firsthill	Date:	5/29/2024
Location:	2419 72nd Ave SE, Mercer Island, WA 98040	Page:	34

COLUMN AT UPPER FLOOR

	Roof: psf	Floor: psf	Deck: psf
DL=	20	15	10
LL =	25	40	60
Sum =	45	55	70

Assumed allowable Soil Bearing = 1500 psf

C1	trib (ft)	Load (Lbs)		
Roof:	0	0	lbs	
Floor:	0	0	lbs	
Deck:	35	2450	lbs	
		2450	lbs	use 6x6 col
				ALLOW LOAD = 19804 LBS
				Req'd ftg area = 0.98 sqft

C2	trib (ft)	Load (Lbs)		
Roof:	215	9675	lbs	
Floor:	80	4400	lbs	
Deck:	35	2450	lbs	
		16525	lbs	use 6x6 col
				ALLOW LOAD = 19804 LBS
				Req'd ftg area = 6.61 sqft

Ok on Retaining Wall

C3	trib (ft)	Load (Lbs)		
Roof:	180	8100	lbs	
Floor:	96	5280	lbs	
Deck:	42	2940	lbs	
		16320	lbs	use 6x6 col
				ALLOW LOAD = 19804 LBS
				Req'd ftg area = 6.528 sqft

Ok on Retaining Wall

C4	trib (ft)	Load (Lbs)		
Roof:	230	10350	lbs	
Floor:		0	lbs	
Deck:	48	3360	lbs	
		13710	lbs	use 6x6 col
				ALLOW LOAD = 19804 LBS
				Req'd ftg area = 5.484 sqft

Ok on Retaining Wall

C5	trib (ft)	Load (Lbs)		
Roof:	91	4095	lbs	
Floor:		0	lbs	
Deck:	48	3360	lbs	
		7455	lbs	use 6x6 col
				ALLOW LOAD = 19804 LBS
				Req'd ftg area = 2.982 sqft

Ok on Retaining Wall

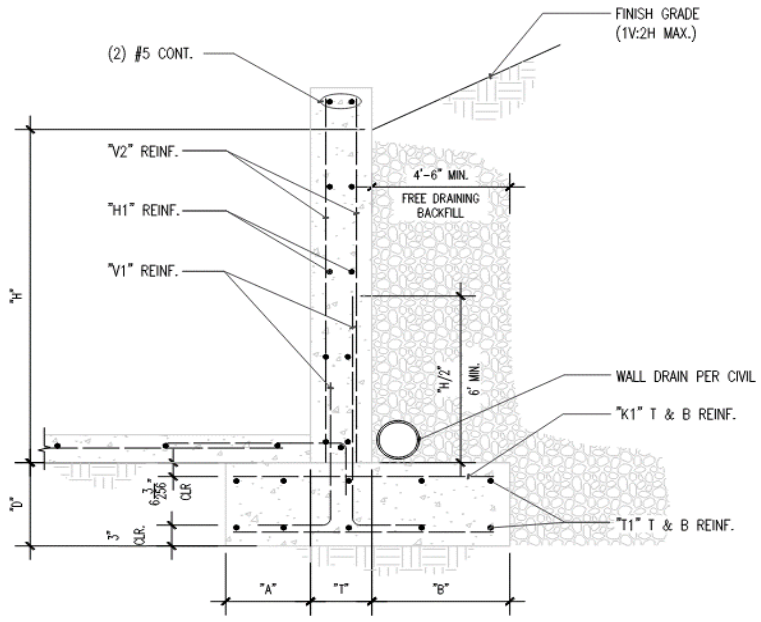
C6	trib (ft)	Load (Lbs)		
Roof:		0	lbs	
Floor:	165	9075	lbs	
Deck:		0	lbs	
		9075	lbs	use 6x6 col
				ALLOW LOAD = 19804 LBS
				Req'd ftg area = 3.63 sqft

Use 3x3 ftg

C7	trib (ft)	Load (Lbs)		
Roof:		0	lbs	
Floor:	150	8250	lbs	
Deck:		0	lbs	
		8250	lbs	use 6x6 col
				ALLOW LOAD = 19804 LBS
				Req'd ftg area = 3.3 sqft
				Ok on Retaining Wall

C8	trib (ft)	Load (Lbs)		
Roof:		0	lbs	
Floor:	150	8250	lbs	
Deck:		0	lbs	
		8250	lbs	use 6x6 col
				ALLOW LOAD = 19804 LBS
				Req'd ftg area = 3.3 sqft
				Ok on Retaining Wall

Basement Wall Design



RETAINING WALL REINFORCING SCHEDULE									
DIMENSIONS					REINFORCING				
"H"	"A"	"B"	"T"	"D"	"HI"	"V1"	"V2"	"K1"	"T1"
8'-6"	3'-6"	4'-6"	10"	20"	#5 @ 12" O.C.	#7 @ 6" O.C.	#7 @ 6" O.C.	#5 @ 12" O.C.	#5 @ 12" O.C.
4'-0"	1'-0"	1'-0"	10"	10"	#4 @ 16" O.C.	#4 @ 12" O.C.	#4 @ 12" O.C.	#4 @ 12" O.C.	#4 @ 12" O.C.

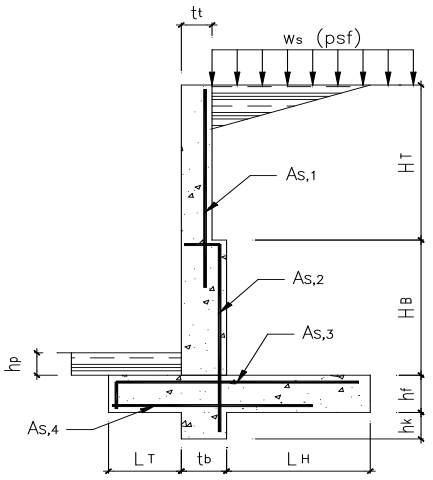
GEO SOIL REPORT PROVIDED BY NGA, INC(NO. 1502724):
ALLOWABLE SOIL BEARING = 2500 PSF
ACTIVE PRESSURE = 40 PCF
AT REST PRESSURE = 60 PCF
PASSIVE PRESSURE = 200 PCF
SEISMIC LOAD = 8H

8 / S3.2 RETAINING WALL
SCALE: NTS

8.5 ft tall wall Design

INPUT DATA & DESIGN SUMMARY

CONCRETE STRENGTH	f_c'	=	5	ksi		
REBAR YIELD STRESS	f_y	=	60	ksi		
LATERAL SOIL PRESSURE	P_a	=	60	pcf (equivalent fluid pressure)		
PASSIVE PRESSURE	P_p	=	200	psf / ft		
BACKFILL SPECIFIC WEIGHT	γ_b	=	125	pcf		
SURCHARGE WEIGHT	w_s	=	100	psf		
SEISMIC	E	=	8	H		
Ka	Ka	=	0.5			
FRICTION COEFFICIENT	μ	=	0.35			
ALLOW SOIL PRESSURE	Q_a	=	2.5	ksf		
THICKNESS OF TOP STEM	t_t	=	10	in		
THICKNESS OF KEY & STEM	t_b	=	10	in		
TOE WIDTH	L_T	=	3.5	ft		
HEEL WIDTH	L_H	=	4.5	ft		
HEIGHT OF TOP STEM	H_T	=	5	ft		
HEIGHT OF BOT. STEM	H_B	=	4	ft		
FOOTING THICKNESS	h_f	=	20	in		
KEY DEPTH	h_k	=	0	in		
SOIL OVER TOE	h_p	=	0	in		
TOP STEM VERT. REINF. ($A_{s,1}$)		#	7	@	6	in o.c., at each face
$A_{s,1}$ LOCATION (0=at soil face, 1=at middle, 2=at each face)					2	at each face
TOP STEM HORIZ. REINF. (ACI 11.1.4)			#	5	@ 24 in o.c., at each face	
BOT. STEM VERT. REINF. ($A_{s,2}$)		#	7	@	6	in o.c., at each face
$A_{s,2}$ LOCATION (0=at soil face, 1=at middle, 2=at each face)					2	at each face
BOT. STEM HORIZ. REINF. (ACI 11.1.4)			#	5	@ 24 in o.c., at each face	
TOP REINF.OF FOOTING ($A_{s,3}$)		#	5	@	12	in
BOT. REINF.OF FOOTING ($A_{s,4}$)		#	5	@	12	in

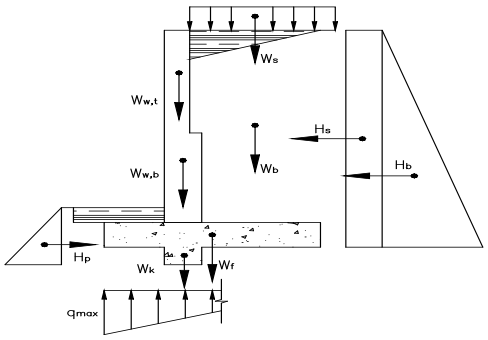


[THE WALL DESIGN IS ADEQUATE.]

ANALYSIS

SERVICE LOADS

$H_b = 0.5\ P_a\ (H_T + H_B + h_f)^2$	=	3.41	kips
$H_s = w_s\ P_a\ (H_T + H_B + h_f) / \gamma_b$	=	2.09	kips
$H_p = 0.5\ P_p\ (h_p + h_f + h_k)^2$	=	0.28	kips
$W_s = w_s\ (L_H + t_b - t_t)$	=	0.45	kips
$W_b = [H_T\ (L_H + t_b - t_t) + H_B\ L_H]\ \gamma_b$	=	5.06	kips
$W_f = h_f\ (L_H + t_b + L_T)\ \gamma_c$	=	2.21	kips
$W_k = h_k\ t_b\ \gamma_c$	=	0.00	kips
$W_{w,t} = t_t\ H_T\ \gamma_c$	=	0.63	kips
$W_{w,b} = t_b\ H_B\ \gamma_c$	=	0.50	kips



FACTORED LOADS

$\gamma H_b = 1.6\ H_b$	=	5.46	kips
$\gamma H_s = 1.6\ H_s$	=	3.34	kips
$\gamma W_s = 1.6\ W_s$	=	0.72	kips
$\gamma W_b = 1.2\ W_b$	=	6.08	kips
$\gamma W_f = 1.2\ W_f$	=	2.65	kips
$\gamma W_k = 1.2\ W_k$	=	0.00	kips
$\gamma W_{w,t} = 1.2\ W_{w,t}$	=	0.75	kips
$\gamma W_{w,b} = 1.2\ W_{w,b}$	=	0.60	kips

OVERTURNING MOMENT

	H	γH	y	H y	γH y
H_b	3.41	5.46	3.56	12.1363	19.42
H_s	2.09	3.34	5.33	11.1407	17.83
Σ	5.50	8.80		**23.277**	37.24

RESISTING MOMENT

	W	γW	x	W x	γW x
W_s	0.45	0.72	6.58	2.96	4.74
W_b	5.06	6.08	6.58	33.33	39.99
W_f	2.21	2.65	4.42	9.75	11.70
W_k	0.00	0.00	3.92	0.00	0.00
$W_{w,t}$	0.63	0.75	3.92	2.45	2.94
$W_{w,b}$	0.50	0.60	3.92	1.96	2.35
Σ	8.85	10.80		**50.45**	61.73

M_{HP} = 0.15 ft-kips/ft

OVERTURNING FACTOR OF SAFETY (1806.1)

$$SF = \frac{\Sigma Wx + M_{HP}}{\Sigma Hy} = 2.17402 \quad > \quad 1.5$$

[Satisfactory]

CHECK SOIL BEARING CAPACITY (ACI 318 13.3.1.1)

$L = L_T \quad t_b \quad L_H$ = 8.83 ft

$e = \frac{L}{2} - \frac{\Sigma Wx - \Sigma Hy - M_{HP}}{\Sigma W}$ = 1.36 ft

$$q_{MAX} = \begin{cases} \frac{\Sigma W\left(1+\frac{6e}{L}\right)}{BL}, & for \quad e \le \frac{L}{6} \\ \frac{2\Sigma W}{3B(0.5L-e)}, & for \quad e > \frac{L}{6} \end{cases}$$

= 1.93 ksf < Q_a **[Satisfactory]**

CHECK FLEXURE CAPACITY, $A_{s,1}$ & $A_{s,2}$, FOR STEM (ACI 318 13, 21, & 22)

$M_u = \gamma\left(\frac{P_a y^3}{6} \quad \frac{P_a y^2 w_s}{2\gamma_b}\right)$

	At top stem		At base of bottom stem	
=	17.46	ft-kips ,	31.42	ft-kips

$P_u = \gamma W_w$

=	0.75	kips ,	1.35	kips

$\phi M_n = \phi\left[A_S f_y\left(d \quad \frac{A_S f_y - P_u}{1.7 b f'_c}\right)\right]$

=	37.07	ft-kips ,	37.10	ft-kips
	>	M_u	>	M_u
	[Satisfactory]		**[Satisfactory]**	

where

d	=	7.56	in ,	7.56	in
b	=	12	in ,	12	in
ϕ	=	0.9	(ACI 318 21.2)	0.9	(ACI 318 21.2)
A_s	=	1.2	in^2 ,	1.2	in^2
ρ	=	0.013		0.013	

$\rho_{MAX} = \frac{0.85\beta_1 f'_C}{f_y}\frac{\varepsilon_u}{\varepsilon_u + \varepsilon_t}$

=	0.024		0.024	
	>	ρ	>	ρ
	[Satisfactory]		**[Satisfactory]**	

$\rho_{MIN} = 0.0018\frac{t}{d}$

=	0.002		0.002	
	<	ρ	<	ρ
	[Satisfactory]		**[Satisfactory]**	

CHECK SHEAR CAPACITY FOR STEM (ACI 318 13.2.7.2 & 22.5)

$V = \gamma\left(\frac{P_a y^2}{2} \quad \frac{w_s P_a y}{\gamma_b}\right)$

	At top stem		At base of bottom stem	
=	8.80	kips ,	8.80	kips

$\phi V_n = 2\phi b d\sqrt{f'_c}$

=	9.63	kips ,	9.63	kips
	>	V_u	>	V_u
	[Satisfactory]		**[Satisfactory]**	

where ϕ = 0.75 (ACI 318 21.2)

CHECK HEEL FLEXURE CAPACITY, $A_{s,3}$, FOR FOOTING (ACI 318 13.2.7.1, 21, & 22)

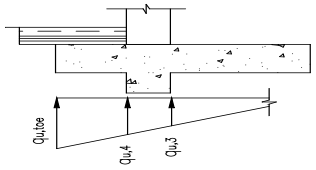
$\rho_{MAX} = \frac{0.85\beta_1 f'_C}{f_y}\frac{\varepsilon_u}{\varepsilon_u + \varepsilon_t}$ = 0.024 $\rho_{MIN} = \frac{0.0018}{2}\frac{h_f}{d}$ = 0.001

$$M_{u,3} = \begin{cases} \frac{L_H}{2}\left(\gamma w_s \quad w_b \quad \frac{L_H}{L} \quad w_f\right) \quad \frac{(q_{u,3} + 2q_{u,heel})bL_H^2}{6}, & for \quad e_u \quad \frac{L}{6} \\ \frac{L_H}{2}\left(\gamma w_s + + w_b \quad \frac{L_H}{L} \quad w_f\right) \quad \frac{q_{u,3} b S^2}{6}, & for \quad e_u \quad \frac{L}{6} \end{cases}$$

= 17.15 ft-kips

(cont'd)

$$\rho = \frac{0.85 f_c' \left(1 - \sqrt{1 - \frac{M_{u,3}}{0.383 b d^2 f_c'}}\right)}{f_y} = 0.001$$



where d = 18.19 in, $q_{u,toe}$ = 3.17 ksf
e_u = 2.15 ft, $q_{u,heel}$ = n/a ksf
S = 2.47 ft, $q_{u,3}$ = 1.15 ksf

$(A_{S,3})_{required}$ = 0.22 in^2 / ft < $A_{S,3}$ **[Satisfactory]**

CHECK TOE FLEXURE CAPACITY, $A_{S,4}$, FOR FOOTING (ACI 318 13.2.7.1, 21, & 22)

$$\rho_{MAX} = \frac{0.85 \beta_1 f_C'}{f_y} \frac{\varepsilon_u}{\varepsilon_u + \varepsilon_t} = 0.024 \qquad \rho_{MIN} = MIN\left(\frac{4}{3}\rho,\ \frac{0.0018}{2}\frac{h_f}{d}\right) = 0.001$$

$$M_{u,4} = \frac{\left(q_{u,4} + 2q_{u,toe}\right) b L_T^2}{6} \frac{L_T^2}{2L} \gamma w_f = 14.27 \text{ ft-kips}$$

where d = 16.69 in
$q_{u,4}$ = 1.54 ksf

$$\rho = \frac{0.85 f_c' \left(1 - \sqrt{1 - \frac{M_{u,4}}{0.383 b d^2 f_c'}}\right)}{f_y} = 0.001$$

$(A_{S,4})_{required}$ = 0.22 in^2 / ft < $A_{S,4}$ **[Satisfactory]**

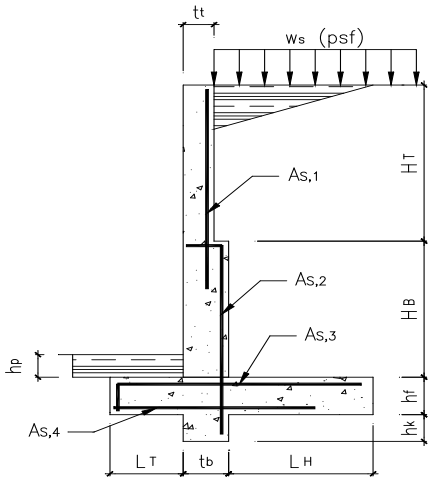
CHECK SLIDING CAPACITY (2015 IBC 1807.2.3)

1.5 (H_b + H_s) = 8.25 kips > $H_p + \mu \Sigma W$ = 3.37 kips Use slab for the sliding resisting

4 ft tall wall Design

INPUT DATA & DESIGN SUMMARY

CONCRETE STRENGTH	f_c'	=	5	ksi		
REBAR YIELD STRESS	f_y	=	60	ksi		
LATERAL SOIL PRESSURE	P_a	=	60	pcf (equivalent fluid pressure)		
PASSIVE PRESSURE	P_p	=	200	psf / ft		
BACKFILL SPECIFIC WEIGHT	γ_b	=	125	pcf		
SURCHARGE WEIGHT	w_s	=	100	psf		
SEISMIC	E	=	8	H		
Ka	Ka	=	0.5			
FRICTION COEFFICIENT	μ	=	0.35			
ALLOW SOIL PRESSURE	Q_a	=	2.5	ksf		
THICKNESS OF TOP STEM	t_t	=	8	in		
THICKNESS OF KEY & STEM	t_b	=	8	in		
TOE WIDTH	L_T	=	1	ft		
HEEL WIDTH	L_H	=	2	ft		
HEIGHT OF TOP STEM	H_T	=	2	ft		
HEIGHT OF BOT. STEM	H_B	=	2	ft		
FOOTING THICKNESS	h_f	=	10	in		
KEY DEPTH	h_k	=	0	in		
SOIL OVER TOE	h_p	=	0	in		
TOP STEM VERT. REINF. ($A_{s,1}$)		#	4	@	12	in o.c., at each face
$A_{s,1}$ LOCATION (0=at soil face, 1=at middle, 2=at each face)					2	at each face
TOP STEM HORIZ. REINF. (ACI 11.1.4)			#	4	@ 25 in o.c., at each face	
BOT. STEM VERT. REINF. ($A_{s,2}$)		#	4	@	12	in o.c., at each face
$A_{s,2}$ LOCATION (0=at soil face, 1=at middle, 2=at each face)					2	at each face
BOT. STEM HORIZ. REINF. (ACI 11.1.4)			#	4	@ 25 in o.c., at each face	
TOP REINF.OF FOOTING ($A_{s,3}$)		#	4	@	12	in
BOT. REINF.OF FOOTING ($A_{s,4}$)		#	4	@	12	in

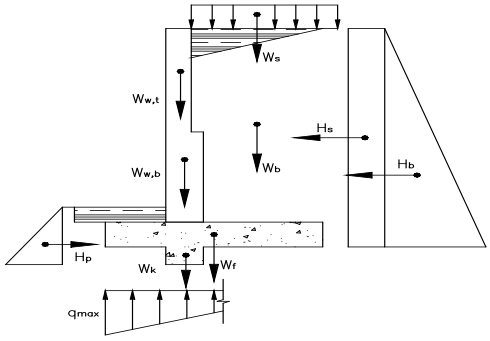


[THE WALL DESIGN IS ADEQUATE.]

ANALYSIS

SERVICE LOADS

$H_b = 0.5\ P_a\ (H_T + H_B + h_f)^2$	=	0.70	kips
$H_s = w_s\ P_a\ (H_T + H_B + h_f) / \gamma_b$	=	0.72	kips
$H_p = 0.5\ P_p\ (h_p + h_f + h_k)^2$	=	0.07	kips
$W_s = w_s\ (L_H + t_b - t_t)$	=	0.20	kips
$W_b = [H_T\ (L_H + t_b - t_t) + H_B\ L_H]\ \gamma_b$	=	1.00	kips
$W_f = h_f\ (L_H + t_b + L_T)\ \gamma_c$	=	0.46	kips
$W_k = h_k\ t_b\ \gamma_c$	=	0.00	kips
$W_{w,t} = t_t\ H_T\ \gamma_c$	=	0.20	kips
$W_{w,b} = t_b\ H_B\ \gamma_c$	=	0.20	kips



FACTORED LOADS

$\gamma H_b = 1.6\ H_b$	=	1.12	kips
$\gamma H_s = 1.6\ H_s$	=	1.15	kips
$\gamma W_s = 1.6\ W_s$	=	0.32	kips
$\gamma W_b = 1.2\ W_b$	=	1.20	kips
$\gamma W_f = 1.2\ W_f$	=	0.55	kips
$\gamma W_k = 1.2\ W_k$	=	0.00	kips
$\gamma W_{w,t} = 1.2\ W_{w,t}$	=	0.24	kips
$\gamma W_{w,b} = 1.2\ W_{w,b}$	=	0.24	kips

OVERTURNING MOMENT

	H	γH	y	H y	γH y
H_b	0.70	1.12	1.61	1.12912	1.81
H_s	0.72	1.15	2.42	1.74235	2.79
Σ	1.42	2.27		**2.87147**	4.59

RESISTING MOMENT

	W	γW	x	W x	γW x
W_s	0.20	0.32	2.67	0.53	0.85
W_b	1.00	1.20	2.67	2.67	3.20
W_f	0.46	0.55	1.83	0.84	1.01
W_k	0.00	0.00	1.33	0.00	0.00
$W_{w,t}$	0.20	0.24	1.33	0.27	0.32
$W_{w,b}$	0.20	0.24	1.33	0.27	0.32
Σ	2.06	2.55		**4.57**	5.70

M_{HP} = 0.02 ft-kips/ft

OVERTURNING FACTOR OF SAFETY (1806.1)

$$SF = \frac{\Sigma Wx + M_{HP}}{\Sigma Hy} = 1.59949 \quad > \quad 1.5$$

[Satisfactory]

(cont'd)

CHECK SOIL BEARING CAPACITY (ACI 318 13.3.1.1)

$L = L_T - t_b - L_H$ = 3.67 ft

$e = \frac{L}{2} - \frac{\Sigma Wx - \Sigma Hy - M_{HP}}{\Sigma W}$ = 0.68 ft

$$q_{MAX} = \begin{cases} \frac{\Sigma W\left(1+\frac{6e}{L}\right)}{BL}, & for \quad e \le \frac{L}{6} \\ \frac{2\Sigma W}{3B(0.5L-e)}, & for \quad e > \frac{L}{6} \end{cases}$$

= 0.71 ksf < Q_a **[Satisfactory]**

CHECK FLEXURE CAPACITY, $A_{S,1}$ & $A_{S,2}$, FOR STEM (ACI 318 13, 21, & 22)

$M_u = \gamma\left(\frac{P_a y^3}{6} - \frac{P_a y^2 w_s}{2\gamma_b}\right)$

$P_u = \gamma W_w$

$\phi M_n = \phi\left[A_S f_y\left(d - \frac{A_S f_y - P_u}{1.7 b f_c'}\right)\right]$

		At top stem		At base of bottom stem	
M_u =		0.67	ft-kips ,	2.00	ft-kips
P_u =		0.12	kips ,	0.36	kips
ϕM_n =		5.52	ft-kips ,	5.52	ft-kips
		>	M_u	>	M_u
		[Satisfactory]		**[Satisfactory]**	
where	d =	6.25	in ,	6.25	in
	b =	12	in ,	12	in
	ϕ =	0.9	(ACI 318 21.2)	0.9	(ACI 318 21.2)
	A_s =	0.2	in^2 ,	0.2	in^2
	ρ =	0.003		0.003	
$\rho_{MAX} = \frac{0.85\beta_1 f_c'}{f_y}\frac{\varepsilon_u}{\varepsilon_u+\varepsilon_t}$ =		0.024		0.024	
		>	ρ	>	ρ
		[Satisfactory]		**[Satisfactory]**	
$\rho_{MIN} = 0.0018\frac{t}{d}$ =		0.002		0.002	
		<	ρ	<	ρ
		[Satisfactory]		**[Satisfactory]**	

CHECK SHEAR CAPACITY FOR STEM (ACI 318 13.2.7.2 & 22.5)

$V = \gamma\left(\frac{P_a y^2}{2} - \frac{w_s P_a y}{\gamma_b}\right)$

$\phi V_n = 2\phi b d\sqrt{f_c'}$

	At top stem		At base of bottom stem	
V_u =	1.57	kips ,	1.57	kips
ϕV_n =	7.95	kips ,	7.95	kips
	>	V_u	>	V_u
	[Satisfactory]		**[Satisfactory]**	

where ϕ = 0.75 (ACI 318 21.2)

CHECK HEEL FLEXURE CAPACITY, $A_{S,3}$, FOR FOOTING (ACI 318 13.2.7.1, 21, & 22)

$\rho_{MAX} = \frac{0.85\beta_1 f_C'}{f_y}\frac{\varepsilon_u}{\varepsilon_u+\varepsilon_t}$ = 0.024

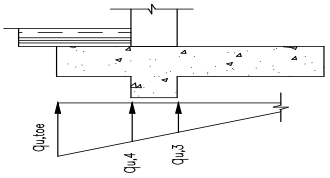
$\rho_{MIN} = \frac{0.0018}{2}\frac{h_f}{d}$ = 0.001

$$M_{u,3} = \begin{cases} \frac{L_H}{2}\left(\gamma w_s + w_b\right)\frac{L_H}{L} - w_f\frac{(q_{u,3}+2q_{u,heel})bL_H^2}{6}, & for \quad e_u \le \frac{L}{6} \\ \frac{L_H}{2}\left(\gamma w_s + w_b\right)\frac{L_H}{L} - w_f\frac{q_{u,3}bS^2}{6}, & for \quad e_u > \frac{L}{6} \end{cases}$$

= 0.38 ft-kips

(cont'd)

$$\rho = \frac{0.85 f_c' \left(1 - \sqrt{1 - \frac{M_{u,3}}{0.383 b d^2 f_c'}}\right)}{f_y} = 0.001$$



where

d	=	8.25	in	$q_{u,\,toe}$	=	3.91	ksf
e_u	=	1.40	ft	$q_{u,\,heel}$	=	n/a	ksf
S	=	-0.36	ft	$q_{u,\,3}$	=	-1.09	ksf

$(A_{S,3})_{required}$ = 0.11 in^2 / ft < $A_{S,3}$ **[Satisfactory]**

CHECK TOE FLEXURE CAPACITY, $A_{S,4}$, FOR FOOTING (ACI 318 13.2.7.1, 21, & 22)

$$\rho_{MAX} = \frac{0.85 \beta_1 f_C'}{f_y} \frac{\varepsilon_u}{\varepsilon_u + \varepsilon_t} = 0.024 \qquad \rho_{MIN} = MIN\left(\frac{4}{3}\rho,\ \frac{0.0018}{2}\frac{h_f}{d}\right) = 0.001$$

$$M_{u,4} = \frac{\left(q_{u,4} + 2q_{u,toe}\right) b L_T^2}{6} \frac{L_T^2}{2L} \gamma w_f = 1.38 \text{ ft-kips}$$

where

d	=	6.75	in
$q_{u,\,4}$	=	0.91	ksf

$$\rho = \frac{0.85 f_c' \left(1 - \sqrt{1 - \frac{M_{u,4}}{0.383 b d^2 f_c'}}\right)}{f_y} = 0.001$$

$(A_{S,4})_{required}$ = 0.06 in^2 / ft < $A_{S,4}$ **[Satisfactory]**

CHECK SLIDING CAPACITY (2015 IBC 1807.2.3)

1.5 (H_b + H_s) = 2.13 kips > H_p + μ ΣW = 0.79 kips Use Slab for Sliding resisting

5.0 Lateral Analysis

Dead Load: (only at the timber framing Area)

Roof DL	**20.00**	**PSF**
Floor DL	**15.00**	**PSF**
IntWall	**10.00**	**PSF**
Ext Wall	**15.00**	**PSF**

Roof

Diaphragm Area:		2851.00	sq. ft.
Height of Diaphragm:		11.00	ft
	Weight of Diaphragm:	57020.00	lbs

Wall Weights Below:

Wall Height:		10.00	ft
Concrete Wall Lengths:		0.00	lf
Int wall Wall Lengths:		160.00	lf
Ext Wall Perimeter:		170.00	lf
Concrete Wall Weight:		150.00	psf
Int Wall Weight:		10.00	psf
Ext Wall Wall Weight:		15.00	psf
	Weight of Walls Below:	20750.00	lbs
	Seismic Weight at Roof:	**77770.00**	**lbs**

Main Floor

Diaphragm Area:		2400.00	sq. ft.
Height of Diaphragm:		12.50	ft
	Weight of Diaphragm:	36000.00	lbs

Wall Weights Below:

Wall Height:		11.00	ft
Concrete Wall Lengths:		0.00	lf
Int wall Wall Lengths:		140.00	lf
Ext Wall Perimeter:		206.00	lf
Concrete Wall Weight:		150.00	psf
Int Wall Weight:		10.00	psf
Ext Wall Wall Weight:		15.00	psf
	Weight of Walls Below:	24695.00	lbs
	Seismic Weight at Flor:	**81445.00**	**lbs**

Base Shear:

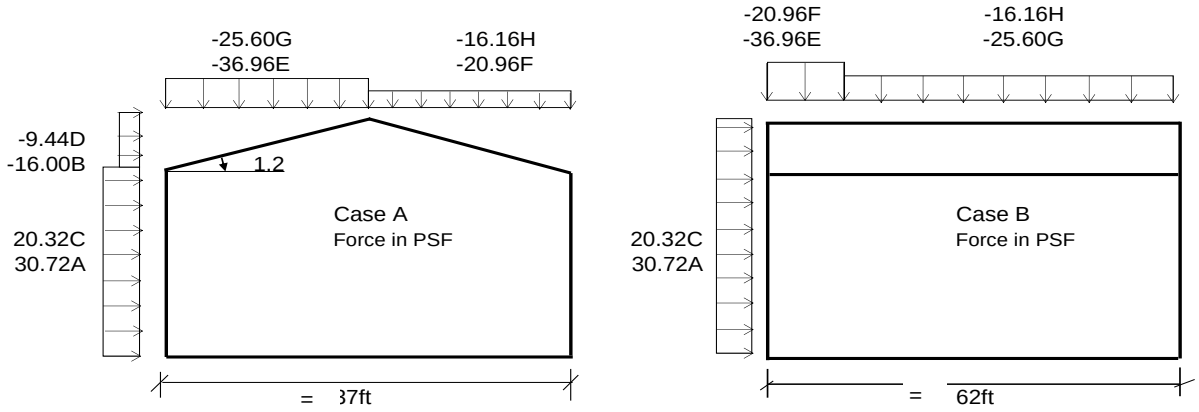
V= CS*w
CS = SDS / (R/Ie)
SDS = 0.929
R(N-S) = 6.5
R(E-W) = 6.5
V = 22.76 kips
$0.7V_E$ = 15.93 kips

Seismic Loads

Floor	Seismic Weight	Height	W*h	w*h/Σw*h	V
Roof	77.77 kips	23.50 ft	1827.60	0.64	**14.61 kips**
Main	81.45 kips	12.50 ft	1018.06	0.36	**8.14 kips**
	159.22 kips		2845.66		

	$0.7V_E$ (Kips)
Roof	10.23
Main	5.70

Roof Height h =	20	feet	
Roof Pitch =	0.25	:12	= 1.19 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} =	1.60		26.8, Figure 26.8-1
Exposure	B		
Height Adjustment factor λ =	1		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=	3.7 ft	⇐
40 % of the eave height =	8.0 ft	
4 % of least dimension or 3 ft=	3.0 ft	

	Section	Wind pressure	Area (sqft)	Wind force (kips)
	B	16.0	44.28	0.71
	D	9.4	69.12	0.65
	A	30.7	31.98	0.98
Roof	C	20.3	46.995	0.95
	A	30.7	68.06	2.09
Main	C	20.3	106.24	2.16
			Sum W =	7.55
			0.6W =	4.53

	$0.6V_w$ (Kips)
Roof	1.98
Main	2.55

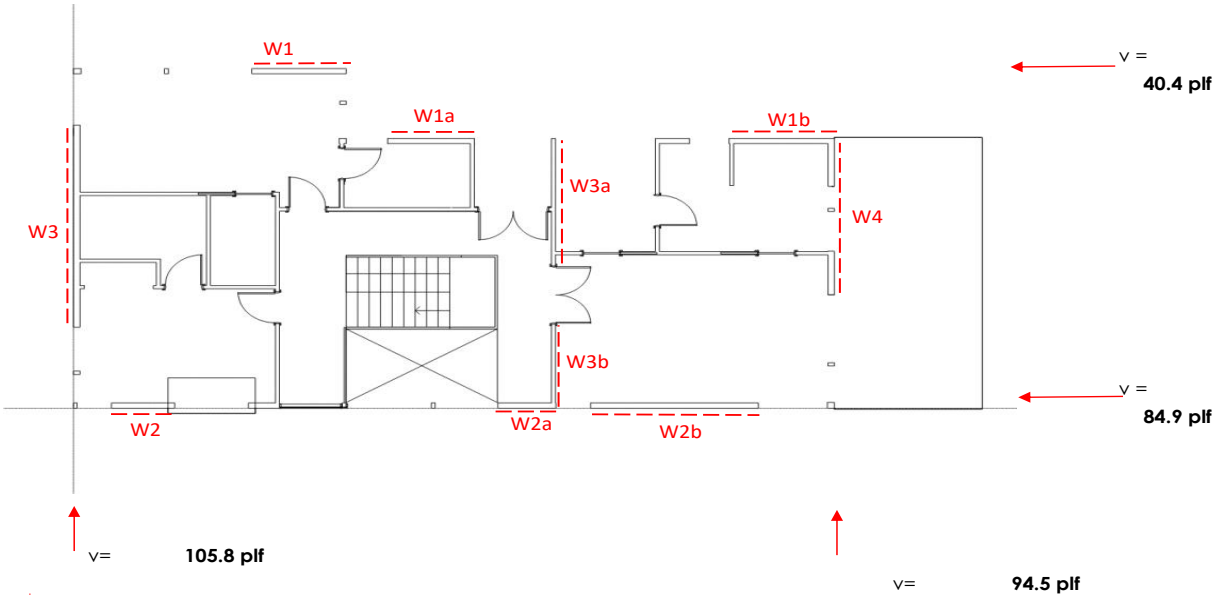
Wind Area -CASE A

	Section	Wind pressure	Area (sqft)	Wind force (kips)
	A	30.7	75.44	2.32
Roof	C	20.3	251.76	5.12
	A	30.7	68.06	2.09
Main	C	20.3	272.24	5.53
			Sum W =	15.06
			0.6W =	9.03

	$0.6V_w$ (Kips)
Roof	4.46
Main	4.57

Wind Area - CASE B

Roof layout



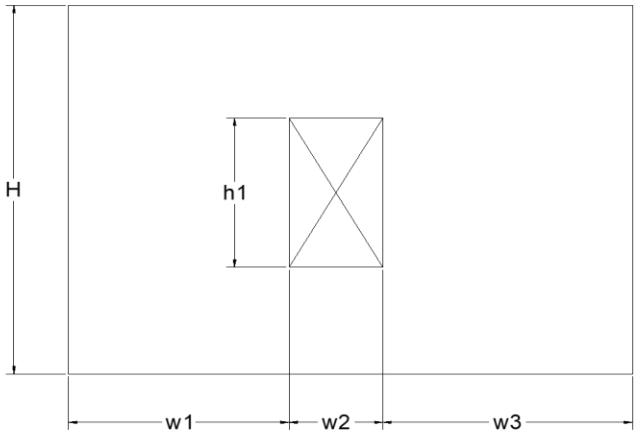
Roof: **Max diaph shear =** 105.90 plf

V = **10.23 kips**

Shear Line	H(ft)	Trib (ft)	Shear (lbs)	Wall	Wall Shear
W1	11	10	2224	**6.8 ft**	**325 plf**
W1a	11	7	1516	**6.3 ft**	**243 plf**
W1b	11	8	1820	**7.5 ft**	**243 plf**
W2	11	6	1258	**4.5 ft**	**280 plf**
W2a	11	5	1175	**4.2 ft**	**280 plf**
W2b	11	10	2237	**8.0 ft**	**280 plf**
W3	11	22	3173	**17.5 ft**	**181 plf**
W3a	11	16	2325	**11.0 ft**	**211 plf**
W3b	11	11	1585	**7.5 ft**	**211 plf**
W4	11	22	3148	**8.0 ft**	**393 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	6.83 ft	595 plf	2360	325 plf	MST48	B	380.0 plf	0.86
W1a	6.25 ft	465 plf	1797	243 plf	MST37	B	380.0 plf	0.64
W1b	7.50 ft	465 plf	1622	243 plf	MST37	B	380.0 plf	0.64
W2	4.50 ft	225 plf	2772	280 plf	MST48	B	380.0 plf	0.74
W2a	4.20 ft	595 plf	2327	280 plf	MST48	B	380.0 plf	0.74
W2b	8.00 ft	595 plf	1648	280 plf	MST37	B	380.0 plf	0.74
W3	17.50 ft	305 plf	393	181 plf	MST37	B	380.0 plf	0.48
W3a	11.00 ft	205 plf	1648	211 plf	MST37	B	380.0 plf	0.56
W3b	7.50 ft	205 plf	1864	211 plf	MST37	B	380.0 plf	0.56
W4	8.00 ft	185 plf	2029	631 plf	MST48	F	760.0 plf	0.83



Inputs: W4 ROOF

Total Load to Shearwall =	3148 lbs	
Controlling Load Case =	Seismic	
H =	10.00 ft	
h1 =	4.50 ft	
Full Height Sheathing =	58.18%	
C_o =	0.82	NDS Table 4.3.3.5

Wall Pier Inputs

		Aspect Ratio	
w1 =	4.20 ft	2.40 : 1	***Pier 1***
w2 =	5.75 ft		
w3 =	3.80 ft	2.60 : 1	***Pier 2***
TOTAL =	13.75 ft		

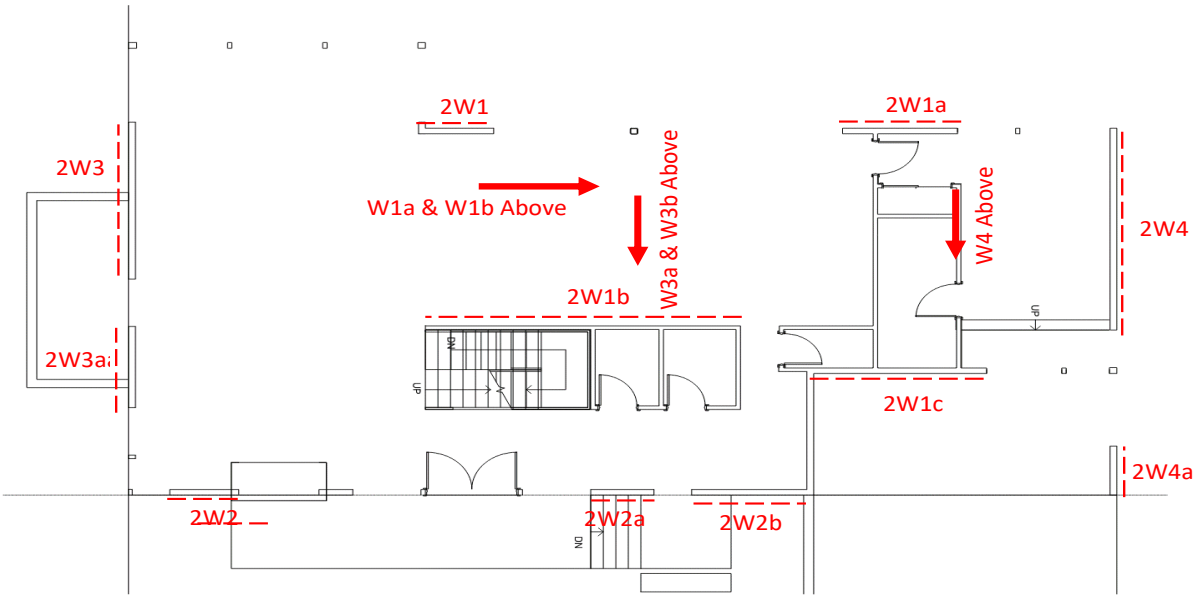
Results

Wall Pier	Aspect Ratio	C_o	**Req'd Shear Strength**
Pier 1	0.84	0.82	**571 plf**
Pier 2	0.76	0.82	**631 plf**

Results - Overturning

Uniform DL =	185 plf
Overturning Moment Above =	0 lbs-ft
Total Overturning Moment =	38387 lbs-ft
Resisting Moment Above =	0 lb-ft
Total Resisting Moment (0.6D) =	10493 lbs-ft
Tension =	2029 lbs
Wall Shear =	631 plf

W1a & W1b Above = **3336 lbs**
W3a & W3b Above = **3910 lbs**
W4 Above = **3148 lbs**



	Roof	Main
Shear =	**10.23 kips**	**5.70 kips**

Shear Line	H(ft)	Roof Shear (lbs)	H(ft)	Main Shear (lbs)	Wall L (ft)	Wall V (plf)
2W1	23.5	1724	13	618	5.0	**468.3**
2W1a	23.5	2585	13	927	7.5	**468.3**
2W1b	23.5	1251	13	1883	20.0	**156.7**
2W1c	23.5	0	13	1304	9.0	**144.9**
2W2	23.5	1266	13	353	4.5	**359.9**
2W2a	23.5	1154	13	322	4.1	**359.9**
2W2b	23.5	2251	13	628	8.0	**359.9**
2W3	23.5	3678	13	1890	12.8	**435.0**
2W3a	23.5	1868	13	960	6.5	**435.0**
2W4	23.5	3770	13	2293	16.5	**367.5**
2W4a	23.5	914	13	556	4.0	**367.5**

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
2W1	5.00 ft	785 plf	8469	468 plf	HHDQ14	D	560.0 plf	0.84
2W1a	7.50 ft	785 plf	7880	468 plf	HHDQ11	D	560.0 plf	0.84
2W1b	20.00 ft	245 plf	1177	157 plf	mst37/HDU2	B	380.0 plf	0.41
2W1c	9.00 ft	155 plf	1393	145 plf	HDU2	B	380.0 plf	0.38
2W2	4.50 ft	763 plf	6564	360 plf	HHDQ11	C	420.0 plf	0.86
2W2a	4.10 ft	763 plf	6656	360 plf	HHDQ11	C	420.0 plf	0.86
2W2b	8.00 ft	763 plf	5763	360 plf	HHDQ11	C	420.0 plf	0.86
2W3	12.80 ft	508 plf	6649	435 plf	HHDQ11	D	560.0 plf	0.78
2W3a	6.50 ft	508 plf	7608	435 plf	HHDQ11	D	560.0 plf	0.78
2W4	16.50 ft	368 plf	5288	368 plf	HHDQ11	D	560.0 plf	0.66
2W4a	4.00 ft	368 plf	6666	368 plf	HHDQ11	D	560.0 plf	0.66