MERCER GROVE
STRUCTURAL CALCULATIONS

SITE ADDRESS:
38XX W. MERCER WAY
MERCER ISLAND, WA. 98040

Architect

WITTMAN ESTES
6007 12th Ave. S.
Seattle, WA. 98108

Structural Engineer:

Josh T. Welch PE SE

J Welch Engineering LLC
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Seattle, WA 98118
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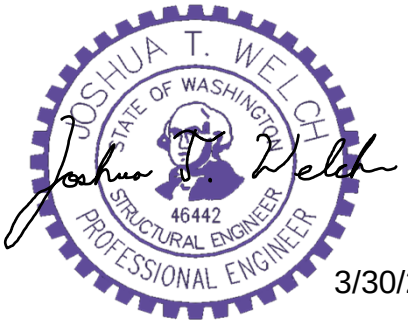

3/30/22

SECTION 1: GENERAL
> assemblies

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Assembly Weights & Applied Loading

Gravity

green rf	dead	4" green roof	36.7	live	snow + ice	30.0 psf
		sleepers & roofing	2.6			
		3/4" plywood	2.3			
		2x12 @ 24"oc	2.2			
		R38 insulation	1.4			
		5/8" gyp. wallboard	2.8			
		miscellaneous	2.1 4%			
			50.0 psf			
	total	dead + live	80.0 psf			
green rf carport	dead	4" green roof	36.7	live	snow + ice	30.0 psf
		tpo roofing	0.4			
		5/8" plywood	1.8			
		2x12 @ 24"oc	2.2			
		5/8" plywood	1.8			
		3x8 @ 21"oc	2.9			
		3/4" shiplap	2.3			
		miscellaneous	2.0 4%			
			50.0 psf			
	total	dead + live	80.0 psf			
carport rf	dead	metal roofing	1.2	live	snow + ice	30.0 psf
		5/8" plywood	1.8			
		(2)2x4 @ 24"oc	1.4			
		5/8" plywood	1.8			
		3x8 @ 21"oc	2.9			
		3/4" shiplap	2.3			
		miscellaneous	1.6 12%			
			13.0 psf			
	total	dead + live	43.0 psf			
roof	dead	solar ready zone (if used)	4.0	live	snow + ice	30.0 psf
		sleepers & roofing	2.6			
		3/4" plywood	2.3			
		2x12 @ 24"oc	2.2			
		R38 insulation	1.4			
		5/8" gyp. wallboard	2.8			
		miscellaneous	1.7 10%			
			17.0 psf			
	total	dead + live	47.0 psf			
eyebrow roof	dead			live	snow + ice	30.0 psf
		roofing	2.6			
		5/8" plywood	1.8			
		2x6 @ 24"oc	1.1			
		3/4" shiplap	2.3			
		miscellaneous	2.2 22%			
			10.0 psf			
	total	dead + live	40.0 psf			

floor	dead	3/4" hardwood	3.0	live	residential	40.0	psf
typ		3/4" plywood	2.3				
		2x12 @ 16"oc	3.3				
		5/8" gyp. wallboard	2.8				
		miscellaneous	1.6 12%				
			13.0 psf				
	total	dead + live	53.0 psf				
deck	dead	2x decking	4.3	live	residential	60.0	psf
		2x10 @ 16"oc	2.8				
		miscellaneous	1.5 17%				
	total	dead + live	68.6 psf				
carport	dead	grating	18.7	live	residential	50.0	psf
floor		W8x20 @ 48"oc	5.0				
		miscellaneous	2.3 9%				
			26.0 psf				
walls		wood siding	2.3				
		1/2" plywood	1.5				
		2x6 @ 16"oc	1.7		BA		
		R21 insulation	0.8				
		1/2" gyp. wallboard	2.2				
			8.5 psf				
interior walls		1/2" gyp. wallboard	2.2				
		2x4 @ 16"oc	1.1				
		1/2" gyp. wallboard	2.2				
			5.5 psf				

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LATERAL & SOILS GENERAL CRITERIA

Lateral

wind	wind importance factor	1.0	
	basic wind speed	90	mph
	wind exposure	C	
	topographical factor (Kzt)	1.30	
seismic	seismic importance factor	1.0	
	latitude	47.576	°
	longitude	-122.241	°
	Ss	1.418	(from ATC Hazard by location)
	S1	0.493	
	SDS	0.945	
	SD1	0.174	
	PGAm	0.214	
	site class	D	
	seismic design category	D	
	response modification factor (	6.5	(plywood sw's)

Soils

	Geo Group Northwest, Inc.	G-5275	
	Frost depth	18"	
	Allowable Bearing	2000	psf
	Allowable Bearing with E or V	2666.7	psf
	Active Unrestrained (flat)	35	psf
	Active Unrestrained (2H:1V)	50	psf
	Active Restrained (flat)	50	psf
	Active Restrained (2H:1V)	75	psf
	Passive	300.0	pcf
	Coefficient of Friction	0.35	
	Soil Unit Weight:	110	pcf
	Overturning/Sliding Safety Fa	1.5	
	Safety Factor W/Seismic	1.1	

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Published on *Mercer Island, Washington* (https://www.mercerisland.gov)

Climatic and Geographic Design Criteria

IRC TABLE R301.2 (1)
Climatic and Geographic Design Criteria

Roof Snow Load[a]	Wind Design[b]		Seismic Design Category[c]	Subject to Damage From:			Outside Design Temp–Heat/Cool	Ice Barrier Under-layment Required	Flood Hazards[e]	Air Freezing Index	Mean Annual Temp
	Speed	Topographic Effects		Weathering[d]	Frost Line Depth	Termite Decay					
25 psf	110 mph	See footnote[b]	D2	Moderate	12”	Slight to Moderate	24°F/83°F	No	NA	113	53°F

A. When using this roof snow load it will be left to the engineer’s judgment whether to consider drift or sliding snow. However, rain on snow surcharge of 5 psf must be considered for roof slopes less than 5 degrees.
B. Wind exposure category and Topographic effects (Wind Speed-up Kzt factor) shall be determined on a site-specific basis by the Engineer of Record (components and cladding need not consider topographic effects unless otherwise determined by the engineer of record).
C. From IRC Table 301.2(1).
D. Weathering may require a higher strength concrete or grade of masonry than necessary to satisfy the structural requirements of this code. The grade of masonry units shall be determined from ASTM C 34, C 55, C 62, C 73, C 90, C 129, C 145, C 216 or C 652.
E. The City of Mercer Island participates in the National Flood Insurance Program (NFIP); Regular Program (No Special Flood Hazard Area). Further NFIP participation information: CID 530083, Initial FHBM Identified 06/28/74, Initial FIRM Identified 05/16/95, Current Effective Map Date (NSFHA), Reg-Emer Date 06/30/97.

Source URL: https://www.mercerisland.gov/cpd/page/climatic-and-geographic-design-criteria

SECTION 2: Gravity Design

> key plans & framing design
> column design
> misc. calculations

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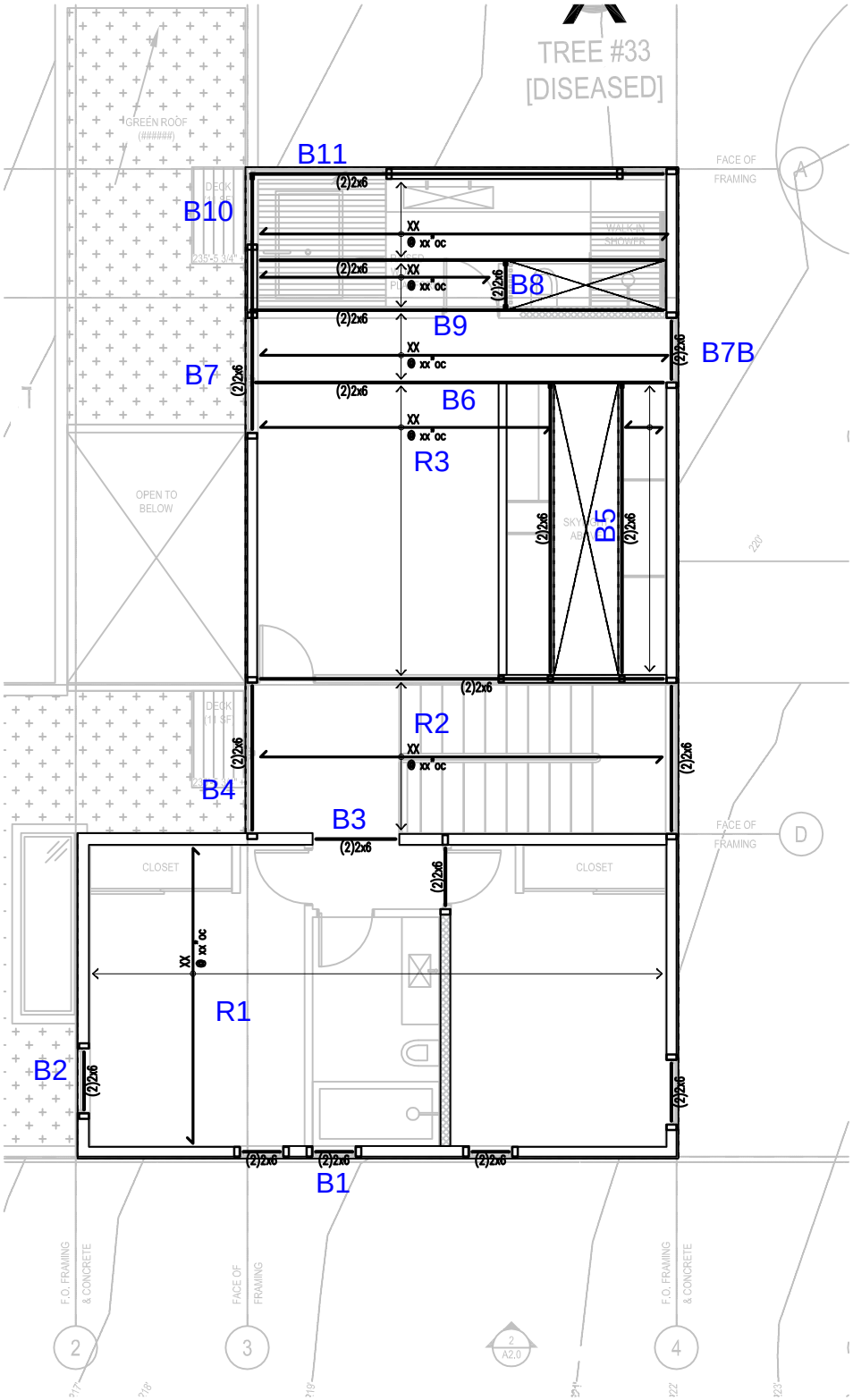
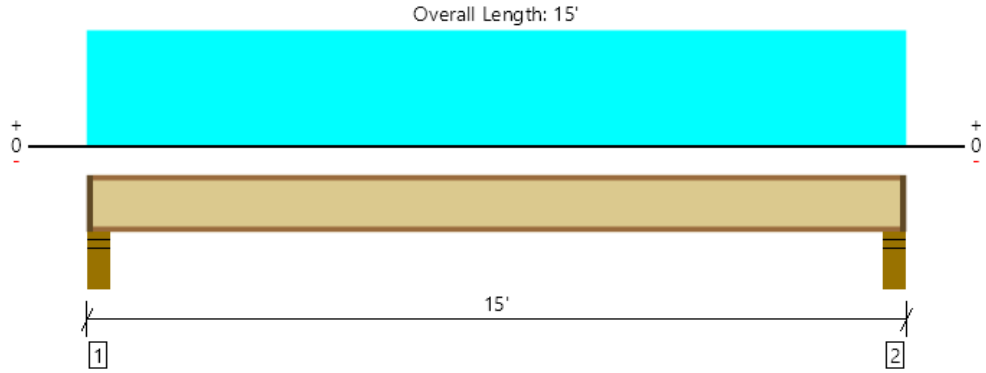

TREE #33
[DISEASED]
GREEN ROOF
(########)
DECK
235'-5 3/4"
OPEN TO
BELOW
FACE OF
FRAMING
WATER
SHOWER
CLOSET
CLOSET
B11
B10
B8
B9
B7B
B7
B6
R3
B5
R2
B4
B3
R1
B2
B1
(2)2x6
XX
xx" oc
F.O. FRAMING
& CONCRETE
FACE OF
FRAMING
2
3
4
A
D

roof, R1

1 piece(s) 11 7/8" TJI® 110 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	693 @ 4 1/2"	1581 (3.50")	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	662 @ 5 1/2"	1794	Passed (37%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2386 @ 7' 6"	3634	Passed (66%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.236 @ 7' 6"	0.475	Passed (L/725)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.369 @ 7' 6"	0.712	Passed (L/463)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) 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	Snow	Total	
1 - Stud wall - HF	5.50"	4.00"	1.75"	255	450	705	1 1/2" Rim Board
2 - Stud wall - HF	5.50"	4.00"	1.75"	255	450	705	1 1/2" 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)	3' 8" o/c	
Bottom Edge (Lu)	14' 9" 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)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 15'	24"	17.0	30.0	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
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

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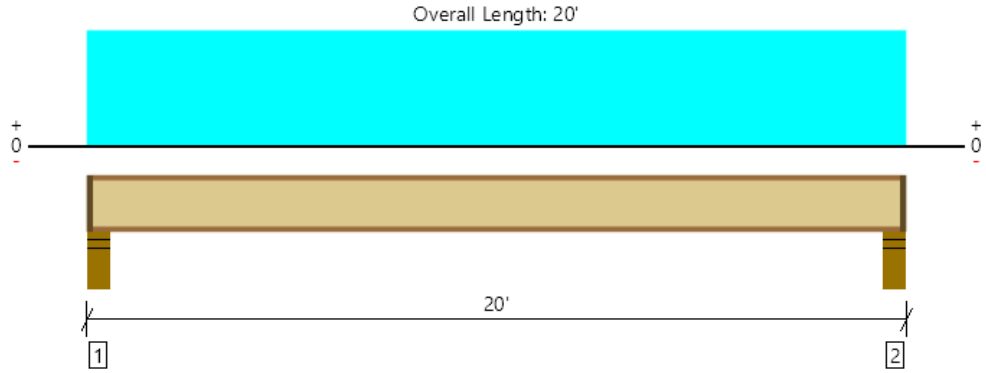
roof, R2

1 piece(s) 11 7/8" TJI® 230 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	928 @ 4 1/2"	1708 (3.50")	Passed (54%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	897 @ 5 1/2"	1903	Passed (47%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4354 @ 10'	4847	Passed (90%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.584 @ 10'	0.642	Passed (L/395)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.915 @ 10'	0.962	Passed (L/252)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) 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	Snow	Total	
1 - Stud wall - HF	5.50"	4.00"	1.75"	340	600	940	1 1/2" Rim Board
2 - Stud wall - HF	5.50"	4.00"	1.75"	340	600	940	1 1/2" 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)	3' 11" o/c	
Bottom Edge (Lu)	19' 9" 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)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 20'	24"	17.0	30.0	Default Load

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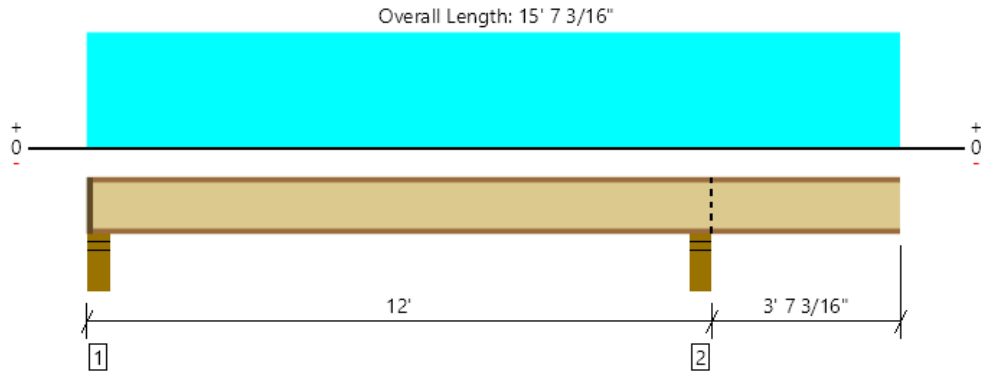
Weyerhaeuser

roof, R3

1 piece(s) 11 7/8" TJI® 230 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	518 @ 4 1/2"	1708 (3.50")	Passed (30%)	1.15	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	542 @ 11' 6 1/2"	1903	Passed (28%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1300 @ 5' 7 5/8"	4847	Passed (27%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.074 @ 5' 11 1/2"	0.380	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.111 @ 5' 10 15/16"	0.570	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) 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	Snow	Total	
1 - Stud wall - HF	5.50"	4.00"	1.75"	185	345	530	1 1/2" Rim Board
2 - Stud wall - HF	5.50"	5.50"	3.50"	346	610	956	Blocking

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- 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)	7' 7" o/c	
Bottom Edge (Lu)	9' 7" 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)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 15' 7 3/16"	24"	17.0	30.0	Default Load

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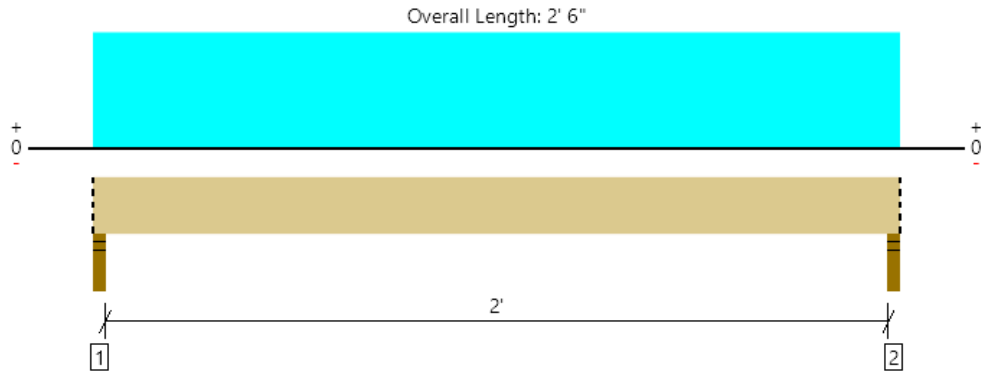
Weyerhaeuser

roof, B1

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	449 @ 1 1/2"	2126 (3.00")	Passed (21%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4 @ 1' 2 7/8"	4939	Passed (0%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	227 @ 1' 3"	9173	Passed (2%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.001 @ 1' 3"	0.112	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.002 @ 1' 3"	0.150	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	167	281	448	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	167	281	448	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)	2' 6" o/c	
Bottom Edge (Lu)	2' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 2' 6"	N/A	6.5	--	
1 - Uniform (PSF)	0 to 2' 6" (Front)	7' 6"	17.0	30.0	Default Load

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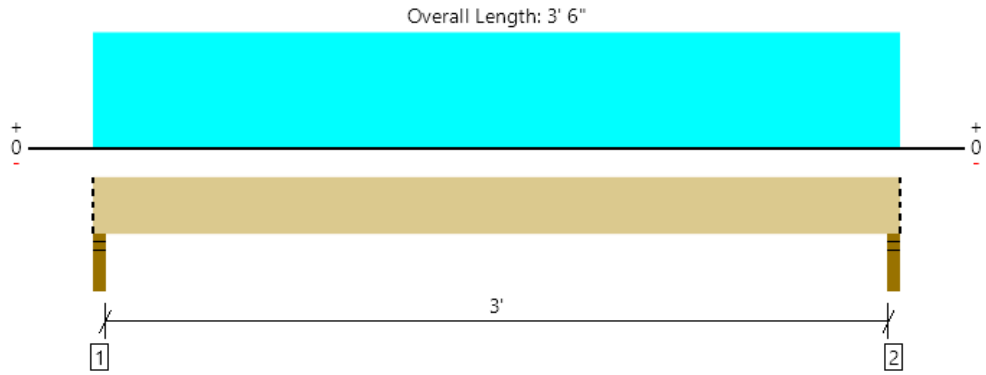
Weyerhaeuser

roof, B2

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	94 @ 1 1/2"	2126 (3.00")	Passed (4%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	27 @ 1' 2 7/8"	4939	Passed (1%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	71 @ 1' 9"	9173	Passed (1%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.000 @ 1' 9"	0.162	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.001 @ 1' 9"	0.217	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	41	53	94	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	41	53	94	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 6" o/c	
Bottom Edge (Lu)	3' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 3' 6"	N/A	6.5	--	
1 - Uniform (PSF)	0 to 3' 6" (Front)	1'	17.0	30.0	Default Load

Weyerhaeuser Notes

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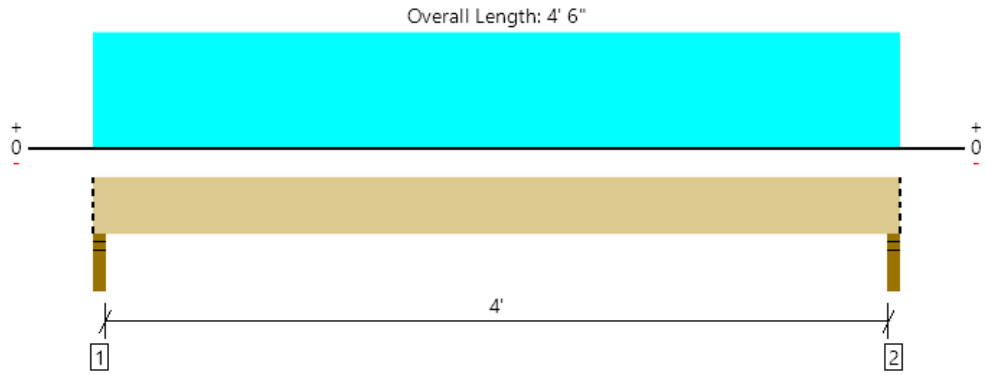
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

roof, B3

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	913 @ 1 1/2"	2126 (3.00")	Passed (43%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	410 @ 1' 2 7/8"	4939	Passed (8%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	917 @ 2' 3"	9173	Passed (10%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.009 @ 2' 3"	0.213	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.014 @ 2' 3"	0.283	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	340	574	914	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	340	574	914	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)	4' 6" o/c	
Bottom Edge (Lu)	4' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4' 6"	N/A	6.5	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	8' 6"	17.0	30.0	Default Load

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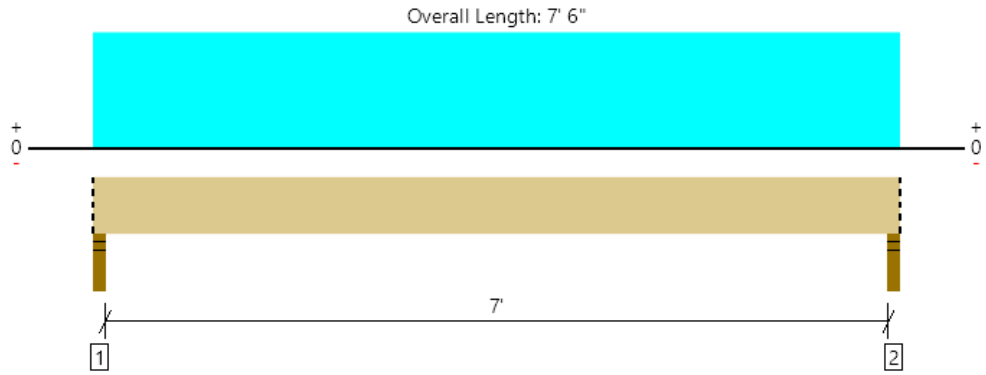
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

roof, B4

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1787 @ 1 1/2"	2126 (3.00")	Passed (84%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1196 @ 1' 2 7/8"	4939	Passed (24%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3131 @ 3' 9"	9173	Passed (34%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.063 @ 3' 9"	0.363	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.101 @ 3' 9"	0.483	Passed (L/864)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	2.52"	662	1125	1787	Blocking
2 - Stud wall - HF	3.00"	3.00"	2.52"	662	1125	1787	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)	7' 6" o/c	
Bottom Edge (Lu)	7' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 7' 6"	N/A	6.5	--	
1 - Uniform (PSF)	0 to 7' 6" (Front)	10'	17.0	30.0	Default Load

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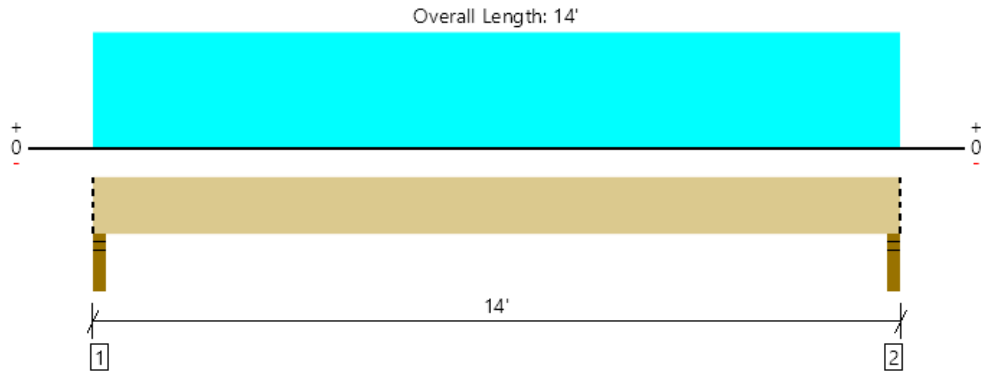
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

roof, B5

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1032 @ 1 1/2"	2126 (3.00")	Passed (49%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	850 @ 1' 2 7/8"	4939	Passed (17%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3486 @ 7'	9173	Passed (38%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.206 @ 7'	0.688	Passed (L/799)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.338 @ 7'	0.917	Passed (L/488)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	402	630	1032	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	402	630	1032	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)	10' 1" o/c	
Bottom Edge (Lu)	14' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 14'	N/A	6.5	--	
1 - Uniform (PSF)	0 to 14' (Front)	3'	17.0	30.0	Default Load

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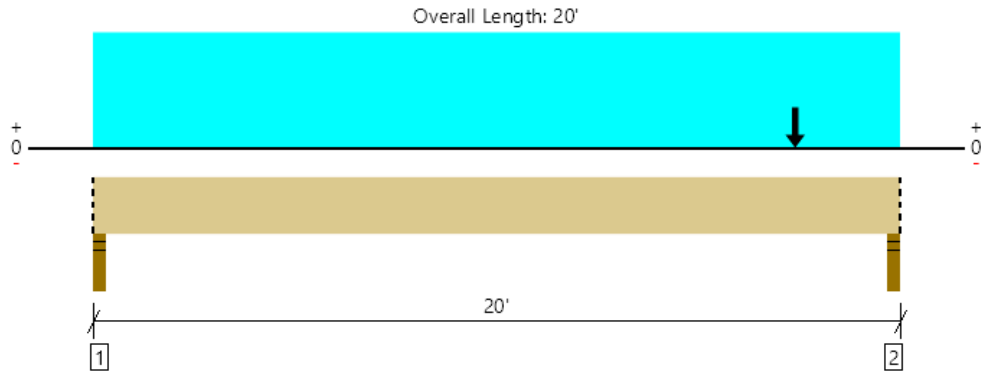
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

roof, B6

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1973 @ 19' 10 1/2"	4253 (3.00")	Passed (46%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1840 @ 18' 9 1/8"	9878	Passed (19%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6571 @ 11' 2 1/2"	18346	Passed (36%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.370 @ 10' 3 7/8"	0.988	Passed (L/641)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.647 @ 10' 3 9/16"	1.317	Passed (L/366)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	520	679	1199	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	822	1151	1973	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' o/c	
Bottom Edge (Lu)	20' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 20' (Front)	2'	17.0	30.0	Default Load
2 - Point (lb)	17' 4 13/16" (Front)	N/A	402	630	Linked from: B5, Support 2

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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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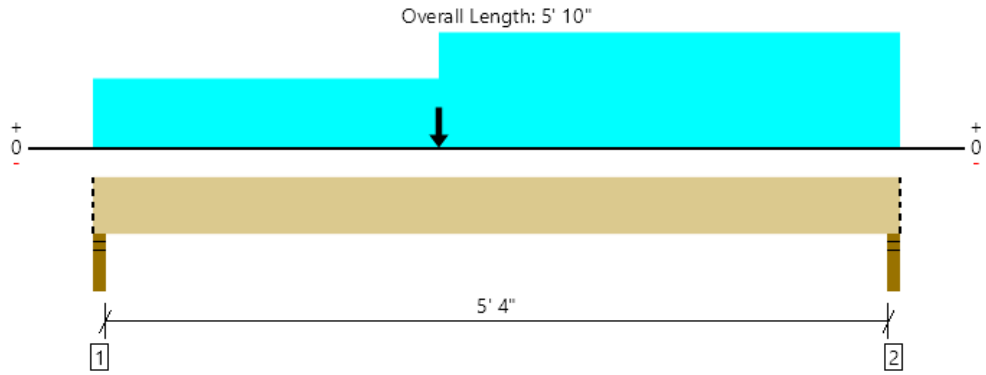
Weyerhaeuser

roof, B7

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1805 @ 5' 8 1/2"	2126 (3.00")	Passed (85%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1346 @ 1' 2 7/8"	4939	Passed (27%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3147 @ 2' 6"	9173	Passed (34%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.039 @ 2' 10 7/8"	0.279	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.064 @ 2' 10 13/16"	0.372	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	2.40"	678	1026	1704	Blocking
2 - Stud wall - HF	3.00"	3.00"	2.55"	702	1103	1805	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)	5' 10" o/c	
Bottom Edge (Lu)	5' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 5' 10"	N/A	6.5	--	
1 - Uniform (PSF)	2' 6" to 5' 10" (Front)	10'	17.0	30.0	Default Load
2 - Uniform (PSF)	0 to 2' 6" (Front)	6'	17.0	30.0	Default Load
3 - Point (lb)	2' 6" (Front)	N/A	520	679	Linked from: B6, Support 1

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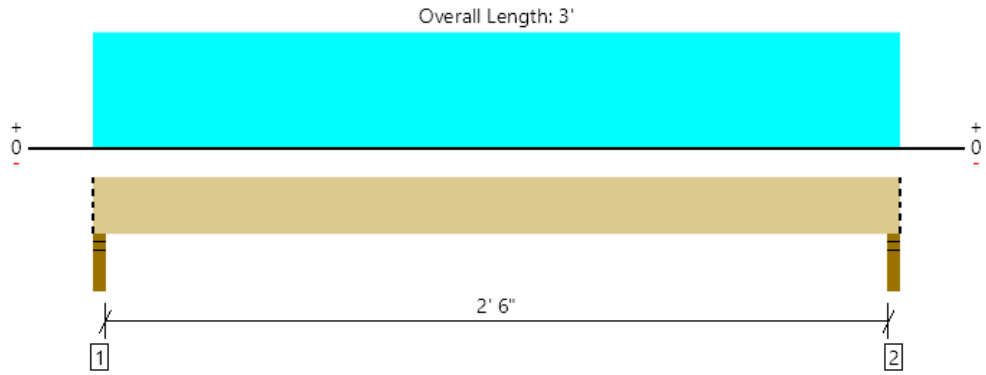
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

roof, B8

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	715 @ 1 1/2"	2126 (3.00")	Passed (34%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	124 @ 1' 2 7/8"	4939	Passed (3%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	450 @ 1' 6"	9173	Passed (5%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.003 @ 1' 6"	0.138	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.005 @ 1' 6"	0.183	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	265	450	715	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	265	450	715	Blocking

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

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 3'	N/A	6.5	--	
1 - Uniform (PSF)	0 to 3' (Front)	10'	17.0	30.0	Default Load

Weyerhaeuser Notes

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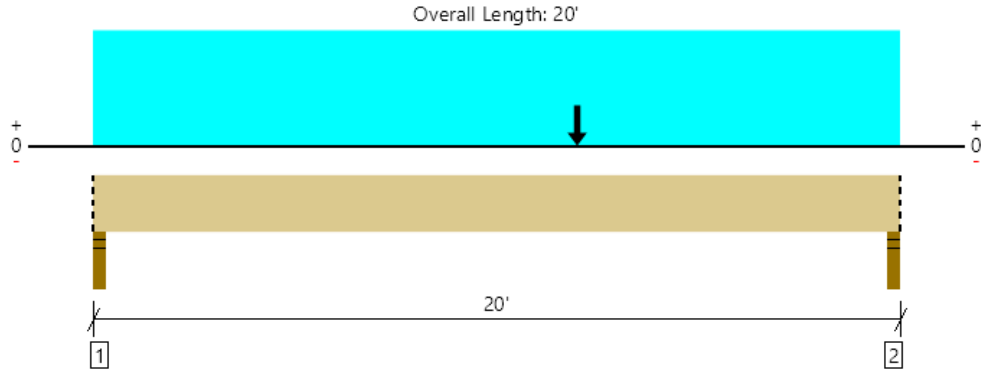
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

roof, B9

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1500 @ 19' 10 1/2"	4253 (3.00")	Passed (35%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1367 @ 18' 9 1/8"	9878	Passed (14%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	8388 @ 12'	18346	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.444 @ 10' 2 11/16"	0.988	Passed (L/534)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.760 @ 10' 2 1/2"	1.317	Passed (L/312)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	576	779	1355	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	629	871	1500	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' o/c	
Bottom Edge (Lu)	20' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 20' (Front)	2'	17.0	30.0	Default Load
2 - Point (lb)	12' (Front)	N/A	265	450	Linked from: B8, Support 1

Weyerhaeuser Notes

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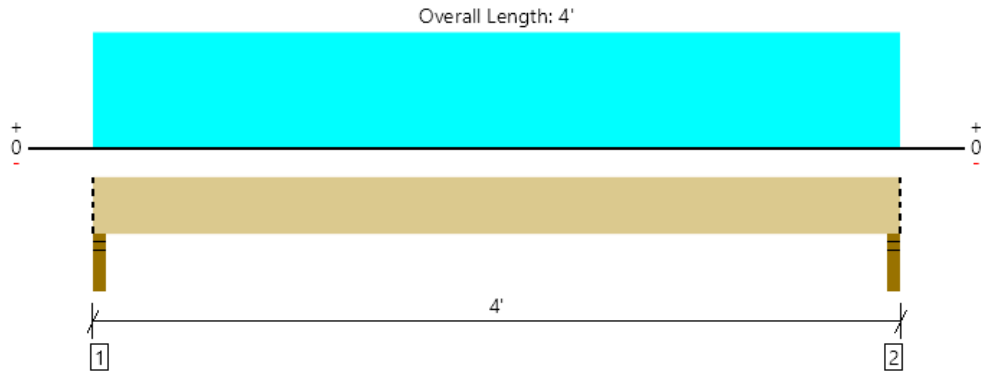
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

roof, B10

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	953 @ 1 1/2"	2126 (3.00")	Passed (45%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	362 @ 1' 2 7/8"	4939	Passed (7%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	838 @ 2'	9173	Passed (9%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.007 @ 2'	0.188	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.012 @ 2'	0.250	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	353	600	953	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	353	600	953	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)	4' o/c	
Bottom Edge (Lu)	4' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4'	N/A	6.5	--	
1 - Uniform (PSF)	0 to 4' (Front)	10'	17.0	30.0	Default Load

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ForteWEB Software Operator	Job Notes
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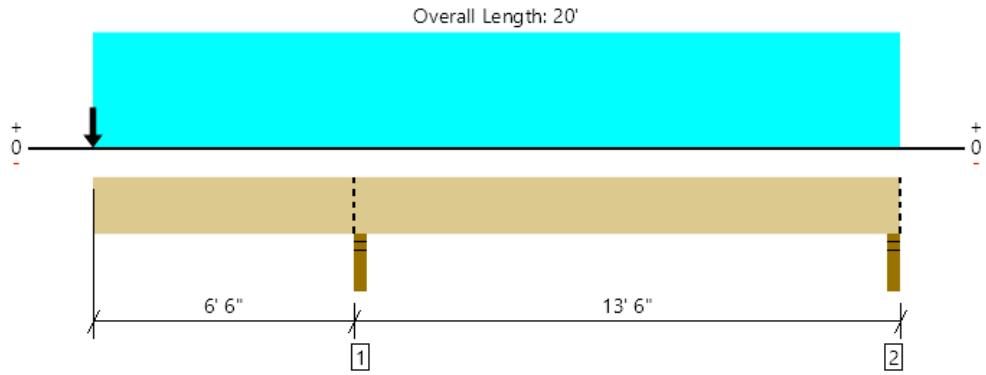
Weyerhaeuser

9/10/2021 4:43:05 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

roof, B11

1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2323 @ 6' 7 1/2"	4253 (3.00")	Passed (55%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1283 @ 5' 6 1/8"	9241	Passed (14%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-7630 @ 6' 7 1/2"	22888	Passed (33%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.351 @ 0	0.663	Passed (2L/452)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.554 @ 0	0.883	Passed (2L/288)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -272 lbs uplift at support located at 19' 10 1/2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.64"	976	1347	2323	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	-24	28/-248	28/-272	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' o/c	
Bottom Edge (Lu)	20' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 20' (Front)	1'	17.0	30.0	Default Load
2 - Point (lb)	0 (Front)	N/A	353	600	Linked from: B10, Support 2

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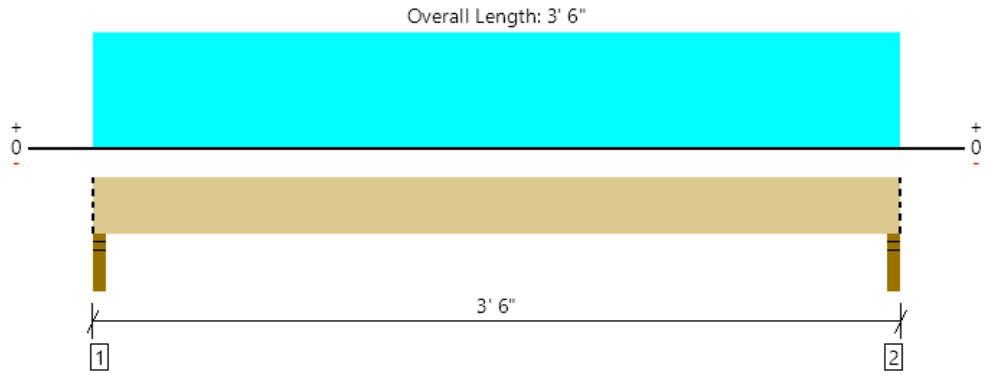
ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

roof, b7b

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	834 @ 1 1/2"	2126 (3.00")	Passed (39%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	243 @ 1' 2 7/8"	4939	Passed (5%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	629 @ 1' 9"	9173	Passed (7%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.005 @ 1' 9"	0.162	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.008 @ 1' 9"	0.217	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	309	525	834	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	309	525	834	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	3' 6" o/c	
Bottom Edge (Lu)	3' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 3' 6"	N/A	6.5	--	
1 - Uniform (PSF)	0 to 3' 6" (Front)	10'	17.0	30.0	Default Load

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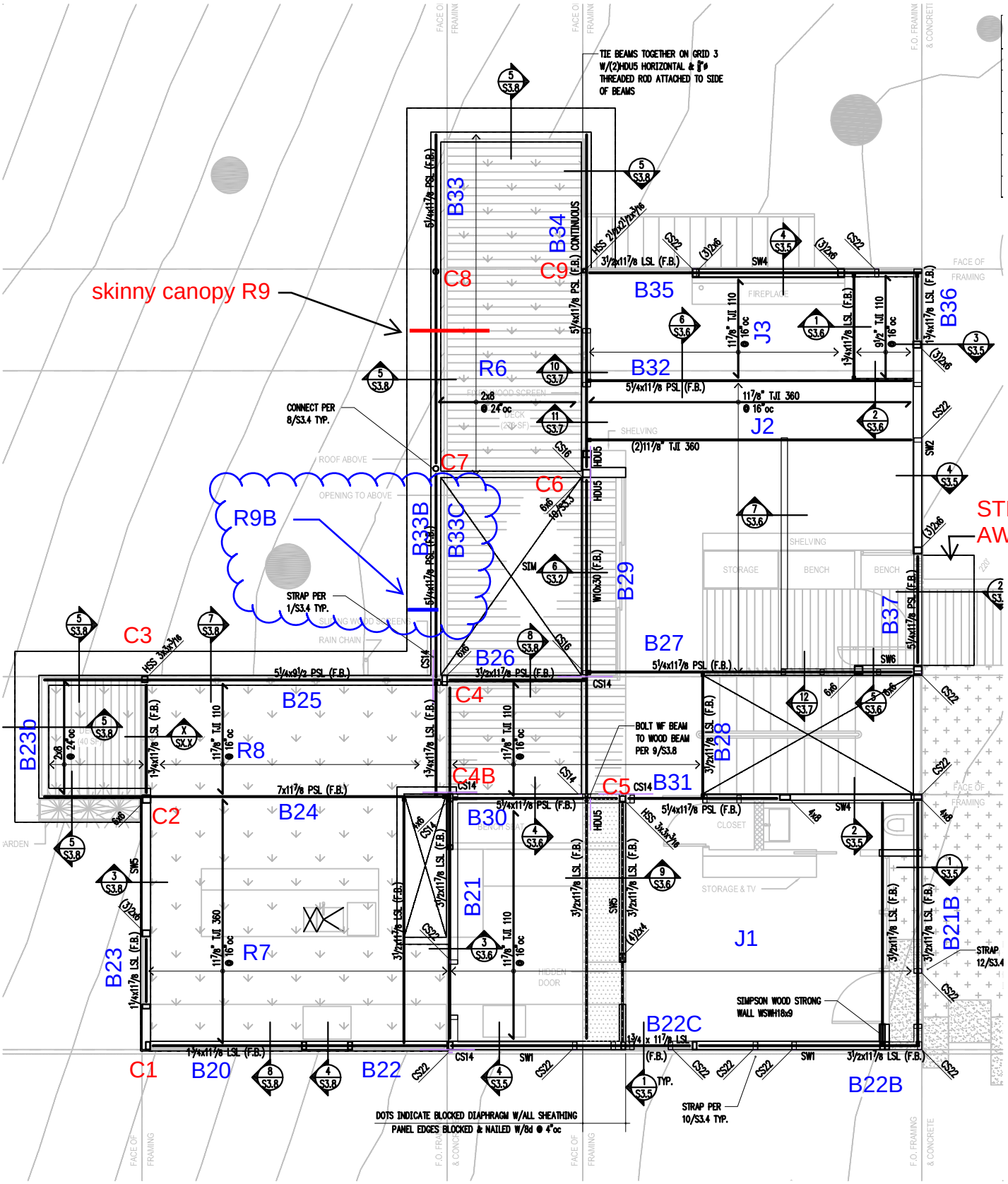
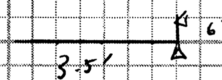
ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser


skinny canopy R9
R9B
STEEL AWNING
TIE BEAMS TOGETHER ON GRID 3 W/(2)HDU5 HORIZONTAL & ⅝" ø THREADED ROD ATTACHED TO SIDE OF BEAMS
CONNECT PER 8/S3.4 TYP.
STRAP PER 1/S3.4 TYP.
BOLT WF BEAM TO WOOD BEAM PER 9/S3.8
SIMPSON WOOD STRONG WALL WSWH18x9
STRAP PER 10/S3.4 TYP.
DOTS INDICATE BLOCKED DIAPHRAGM W/ALL SHEATHING PANEL EDGES BLOCKED & NAILED W/8d @ 4"oc
B33
B34
B35
B36
B32
B33B
B33C
B29
B37
B27
B26
B25
B23b
B28
B31
B24
B30
B21
B21B
B23
B22C
B20
B22
B22B
C1
C2
C3
C4
C4B
C5
C6
C7
C8
C9
R6
R7
R8
J1
J2
J3
SHELVING
STORAGE
BENCH
CLOSET
STORAGE & TV
FIREPLACE
HIDDEN DOOR
ROOF ABOVE
OPENING TO ABOVE
RAIN CHAIN
FACE OF FRAMING
F.O. FRAMING & CONCRETE

PROJECT: Date:

STEEL AWNING



$R_x \le -188\,DL + -368\,SL$

$R_x \le 188\,DL + 368\,SL$

$R_y \le 61\,DL + 105\,SL$

$V = 159$ $V_n/\Omega = 56{,}204$

$M = 278$ $M_n/\Omega = 758$ ft-lbs

$\Delta_{SL} = 0.26'' = 2L/110$ **USE 3/8" PL**

BOLTS TO BEAM

$R_y \le 166\,DL+SL$ /ft

(2) 3/8" ϕ LAG $Z'_{\perp} = (2)180(1.15) = 414^{\#}$ $S_{max} = 29''$

$R_x \le 556^{\#}\,DL+SL$

3/8" ϕ x 4" LAG $W' = 305(1.15)\,2.28 = 800$

$S_{max} = 17.3''$ o.c.

ANCHORS TO FLOOR

DTT2Z CAP $= 2145\,(1.15/1.6) = 1542^{\#}$

$S_{max} = 1542/556 = 2.77' = 33''$ o.c.

BLOCKING TO JOIST

$R_y \le 556^{\#}(32/12)(6''/48'') = 185^{\#}$

USE HU410

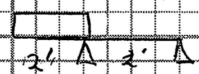
P.O. BOX 28427
Seattle, Washington 98118-9998
tel. 206.356.9553

PROJECT: MERCER CRAVE Date:

SKINNY CANOPY

RAFTER R9

W = 20 DL + 60 SL



DL 60 −20

SL 180 −60

V = 160 V_r = 1139

M = 160 M_r = 257

Δ_{TL} = 0.25" = 2L/192

Δ_{SL} = 0.19" = 2L/252

USE 2x6 @ 24" o.c. (FLATWISE)

R9 TO BEAM

R_y ≤ 240

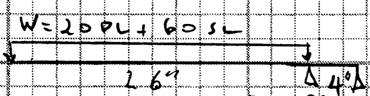
(2) 0.22 x 3" SDWS W' = (2) 151 (1.15) = 347

USE (2) 0.22 x 3" SDWS

P.O. BOX 28427
Seattle, Washington 98118-9998
tel. 206.356.9553

PROJECT: Date:

R96



DL 184 -141

SL 553 -423

V = 563 VL = 1139

M = 187 MR = 257

Δ_{TL} = 0.18" = 2L/288

USE 2x6 FLAT @24"o.c. MAX SPACE O.C.

R96 to BEAM

0.22 x 3" SDWS W' = 151(1.15) = 173#

REQ'D = 737/173 = 4.3 @ 24" o.c.

USE 2x6 @ 12" o.c. W/(3) 0.22 x 3" SDWS AT EACH BEAM

P.O. BOX 28427
Seattle, Washington 98118-9998
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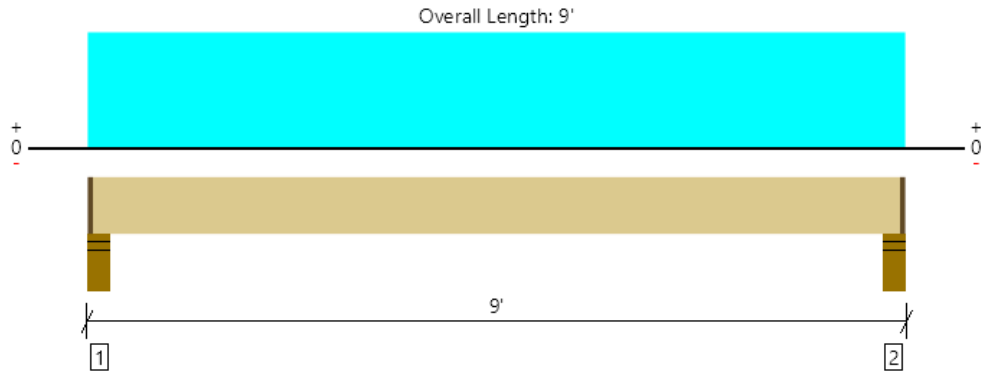
UPPER FLOOR, R6

1 piece(s) 2 x 8 HF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	703 @ 4 1/2"	2582 (4.25")	Passed (27%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	550 @ 1' 3/4"	1251	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1361 @ 4' 6"	1477	Passed (92%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.101 @ 4' 6"	0.206	Passed (L/980)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.269 @ 4' 6"	0.412	Passed (L/368)	--	1.0 D + 1.0 S (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	5.50"	4.25"	1.50"	450	270	720	1 1/4" Rim Board
2 - Stud wall - HF	5.50"	4.25"	1.50"	450	270	720	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)	3' 7" o/c	
Bottom Edge (Lu)	8' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 9'	24"	50.0	30.0	Default Load

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ForteWEB Software Operator	Job Notes
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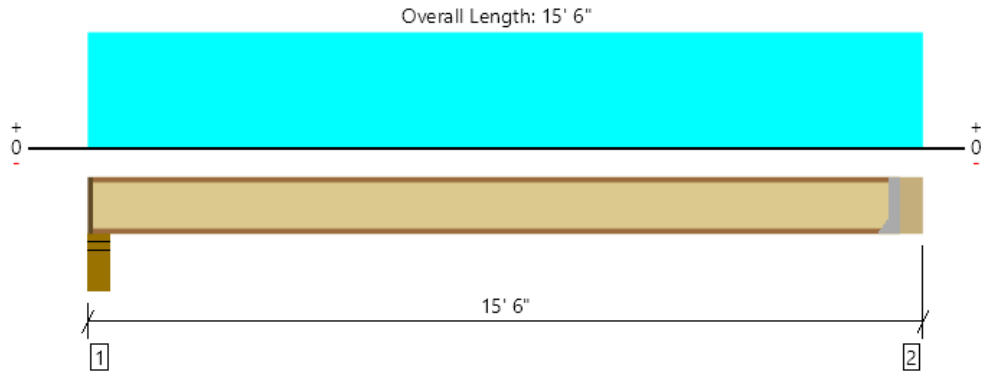
Weyerhaeuser

UPPER FLOOR, R7

1 piece(s) 11 7/8" TJI® 360 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1173 @ 15' 1/2"	1242 (1.75")	Passed (94%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1173 @ 15' 1/2"	1961	Passed (60%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4302 @ 7' 8 1/2"	7107	Passed (61%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.160 @ 7' 8 1/2"	0.367	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.427 @ 7' 8 1/2"	0.733	Passed (L/412)	--	1.0 D + 1.0 S (All Spans)
TJ-Pro™ Rating	40	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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" Panel (24" Span Rating) that is nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	5.50"	4.25"	1.75"	771	462	1233	1 1/4" Rim Board
2 - Hanger on 11 7/8" LSL beam	5.50"	Hanger[1]	1.75" / - [2]	779	468	1247	See note [1]

- 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' 6" o/c	
Bottom Edge (Lu)	14' 11" 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
2 - Face Mount Hanger	IUS2.37/11.88	2.00"	N/A	10-10d	2-Strong-Grip	

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

Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 15' 6"	24"	50.0	30.0	Default Load

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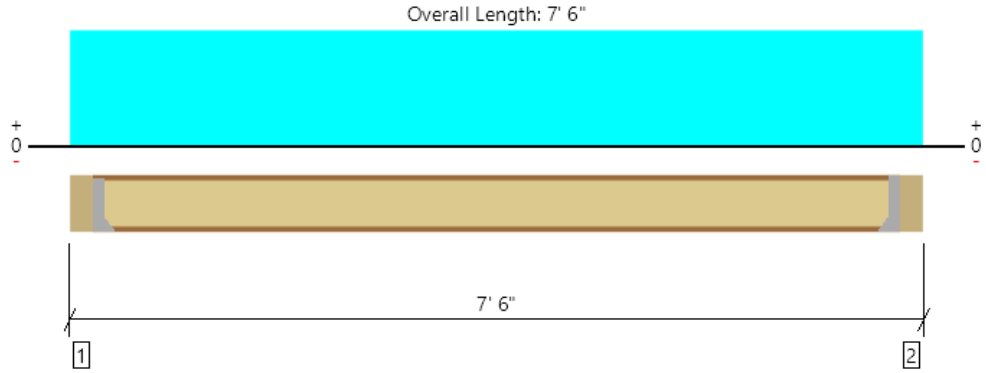
ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, R8

1 piece(s) 11 7/8" TJI® 110 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	527 @ 5 1/2"	1047 (1.75")	Passed (50%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	527 @ 5 1/2"	1794	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	867 @ 3' 9"	3634	Passed (24%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.014 @ 3' 9"	0.165	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.037 @ 3' 9"	0.329	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
TJ-Pro™ Rating	63	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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" Panel (24" Span Rating) that is nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Hanger on 11 7/8" LSL beam	5.50"	Hanger[1]	1.75" / - [2]	375	225	600	See note [1]
2 - Hanger on 11 7/8" LSL beam	5.50"	Hanger[1]	1.75" / - [2]	375	225	600	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)	6' 2" o/c	
Bottom Edge (Lu)	6' 7" 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-Strong-Grip	
2 - Face Mount Hanger	IUS1.81/11.88	2.00"	N/A	10-10dx1.5	2-Strong-Grip	

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

Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 7' 6"	24"	50.0	30.0	Default Load

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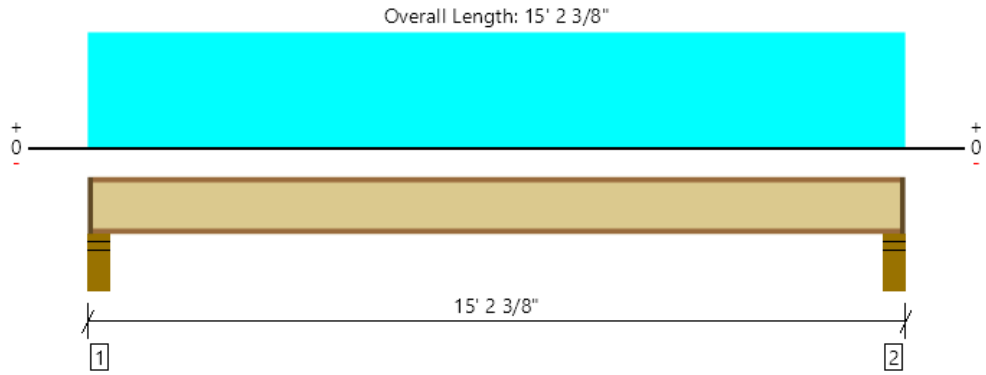
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, J1

1 piece(s) 11 7/8" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	530 @ 4 1/2"	1375 (3.50")	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	505 @ 5 1/2"	1560	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1844 @ 7' 7 3/16"	3160	Passed (58%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.196 @ 7' 7 3/16"	0.361	Passed (L/883)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.260 @ 7' 7 3/16"	0.722	Passed (L/666)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	47	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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" Panel (24" Span Rating) that is 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	Total	
1 - Stud wall - HF	5.50"	4.25"	1.75"	132	405	537	1 1/4" Rim Board
2 - Stud wall - HF	5.50"	4.25"	1.75"	132	405	537	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' 2" o/c	
Bottom Edge (Lu)	15' 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 15' 2 3/8"	16"	13.0	40.0	Default Load

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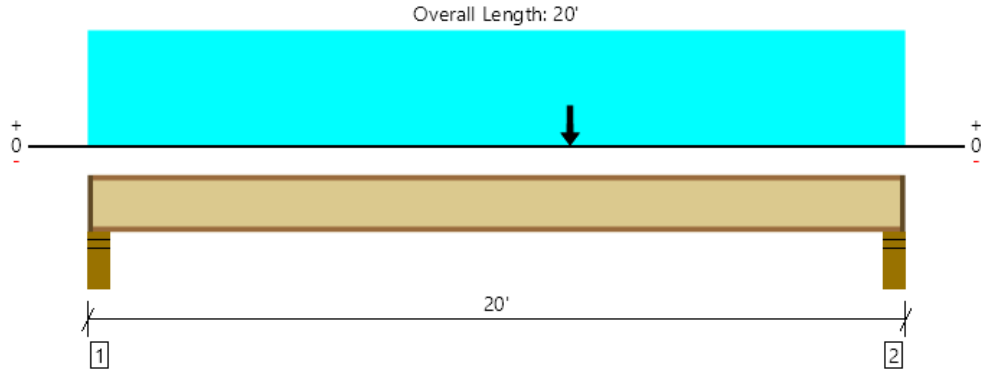
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, J2

1 piece(s) 11 7/8" TJI® 360 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	915 @ 19' 7 1/2"	1505 (3.50")	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	890 @ 19' 6 1/2"	1705	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	5670 @ 11' 9 5/8"	7107	Passed (80%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.484 @ 10' 2 9/16"	0.481	Passed (L/477)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.833 @ 10' 3 3/16"	0.962	Passed (L/277)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
TJ-Pro™ Rating	43	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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" Panel (24" Span Rating) that is nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	5.50"	4.25"	1.75"	321	533	165	1019	1 1/4" Rim Board
2 - Stud wall - HF	5.50"	4.25"	1.75"	389	533	241	1163	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)	3' 9" o/c	
Bottom Edge (Lu)	19' 10" o/c	

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

Vertical Loads	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 20'	16"	13.0	40.0	-	Default Load
2 - Point (PLF)	11' 9 5/8"	16"	100.0	-	-	WALL
3 - Point (PLF)	11' 9 5/8"	16"	173.0	-	305.0	Linked from: R3, Support 2

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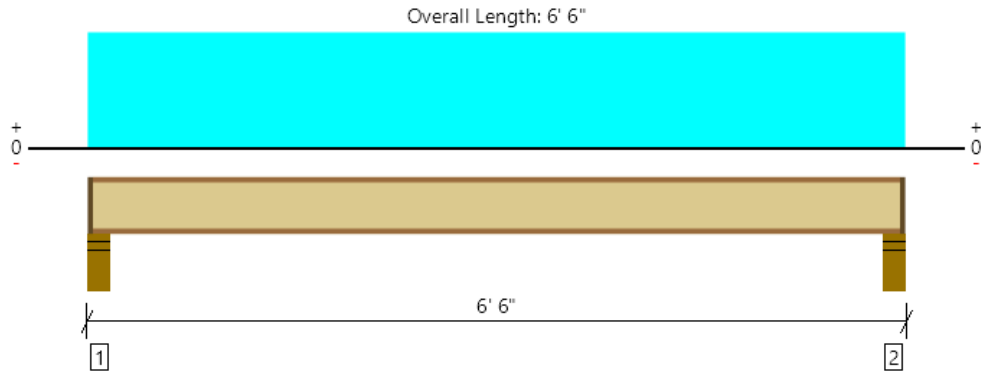
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, J3

1 piece(s) 9 1/2" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	222 @ 4 1/2"	1375 (3.50")	Passed (16%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	197 @ 5 1/2"	1220	Passed (16%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	292 @ 3' 3"	2500	Passed (12%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.012 @ 3' 3"	0.144	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.016 @ 3' 3"	0.287	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	71	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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" Panel (24" Span Rating) that is nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	4.25"	1.75"	56	173	229	1 1/4" Rim Board
2 - Stud wall - HF	5.50"	4.25"	1.75"	56	173	229	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' 4" o/c	
Bottom Edge (Lu)	6' 4" 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 6' 6"	16"	13.0	40.0	Default Load

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

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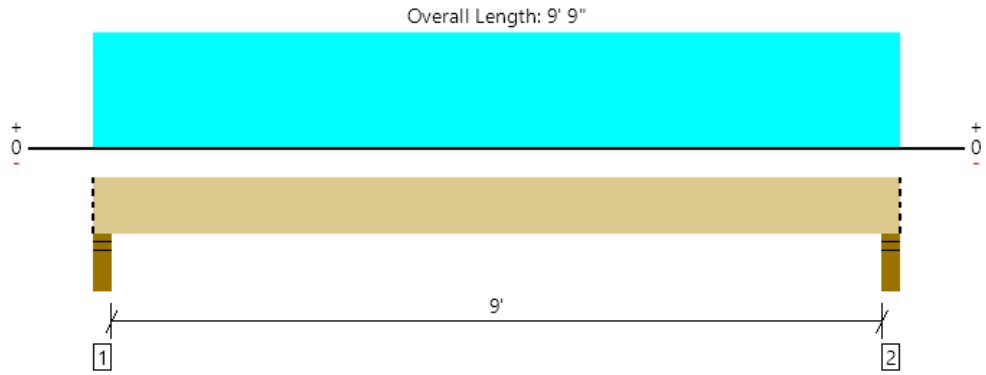
UPPER FLOOR, B20

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2957 @ 3"	3189 (4.50")	Passed (93%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2129 @ 1' 4 3/8"	4939	Passed (43%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6487 @ 4' 10 1/2"	9173	Passed (71%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.115 @ 4' 10 1/2"	0.463	Passed (L/964)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.310 @ 4' 10 1/2"	0.617	Passed (L/358)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	4.50"	4.50"	4.17"	1860	1097	2957	Blocking
2 - Stud wall - HF	4.50"	4.50"	4.17"	1860	1097	2957	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)	4' 8" o/c	
Bottom Edge (Lu)	9' 9" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 9' 9"	N/A	6.5	--	
1 - Uniform (PSF)	0 to 9' 9" (Front)	7' 6"	50.0	30.0	Default Load

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

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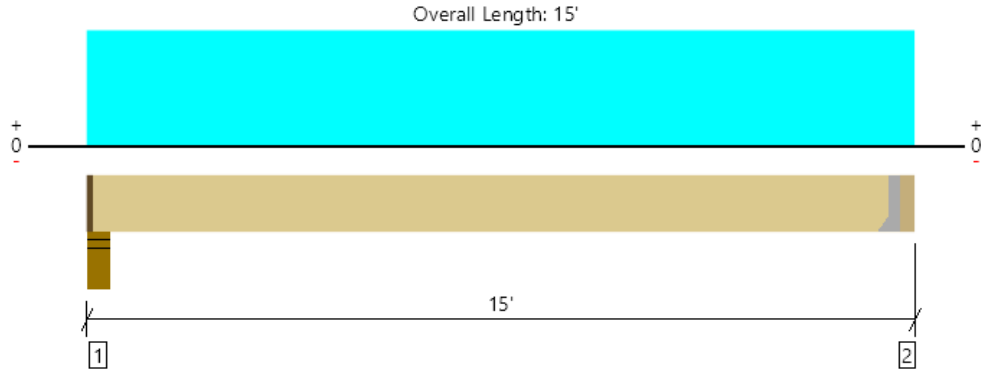
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B21

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1614 @ 14' 8 1/2"	4725 (1.50")	Passed (34%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1314 @ 13' 8 5/8"	8590	Passed (15%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	5476 @ 7' 6 1/4"	15953	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.071 @ 7' 6 1/4"	0.359	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.306 @ 7' 6 1/4"	0.719	Passed (L/564)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Stud wall - HF	5.50"	4.00"	1.50"	1292	301	226	1819	1 1/2" Rim Board
2 - Hanger on 11 7/8" HF beam	3.50"	Hanger[1]	1.50"	1283	299	224	1806	See note [1]

- 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)	14' 7" o/c	
Bottom Edge (Lu)	14' 7" 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
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-16d	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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/2" to 14' 8 1/2"	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 15' (Front)	1'	13.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 15' (Front)	1'	50.0	-	30.0	Default Load
3 - Uniform (PSF)	0 to 15' (Front)	9' 7 3/16"	10.0	-	-	Default Load

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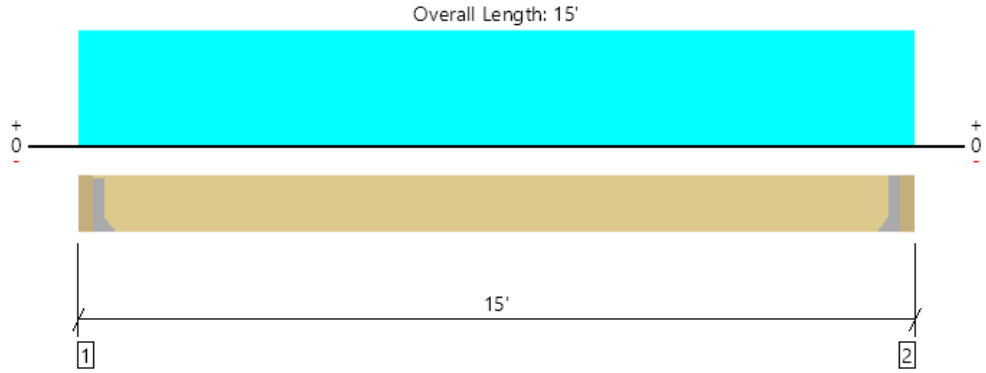
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B21B

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1380 @ 3 1/2"	4725 (1.50")	Passed (29%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1113 @ 1' 3 3/8"	8590	Passed (13%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4650 @ 7' 6"	15953	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.072 @ 7' 6"	0.360	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.264 @ 7' 6"	0.721	Passed (L/656)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" HF beam	3.50"	Hanger[1]	1.50"	1039	300	225	1564	See note [1]
2 - Hanger on 11 7/8" HF beam	3.50"	Hanger[1]	1.50"	1039	300	225	1564	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)	14' 5" o/c	
Bottom Edge (Lu)	14' 5" 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	LUS410	2.00"	N/A	8-10d	6-10d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-10d	6-10d	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 14' 8 1/2"	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 15' (Front)	1'	13.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 15' (Front)	1'	17.0	-	30.0	Default Load
3 - Uniform (PSF)	0 to 15' (Front)	9' 7 3/16"	10.0	-	-	Default Load

Weyerhaeuser Notes

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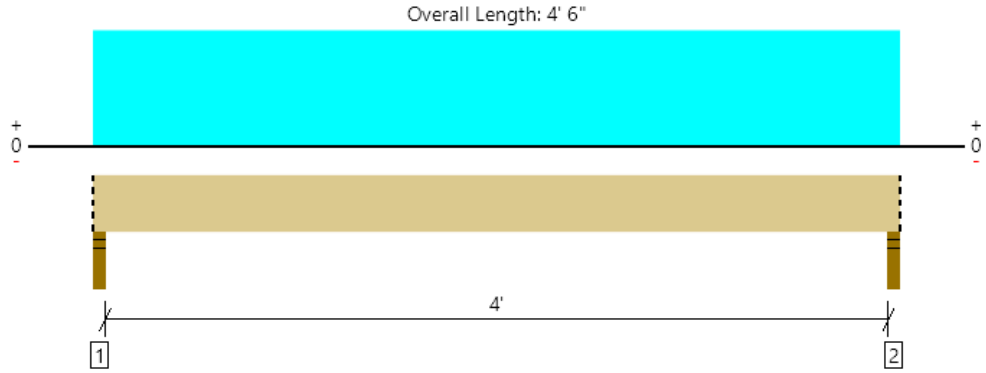
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B22

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1365 @ 1 1/2"	2126 (3.00")	Passed (64%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	613 @ 1' 2 7/8"	4939	Passed (12%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1369 @ 2' 3"	9173	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.008 @ 2' 3"	0.213	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.022 @ 2' 3"	0.283	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.93"	858	506	1364	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.93"	858	506	1364	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)	4' 6" o/c	
Bottom Edge (Lu)	4' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4' 6"	N/A	6.5	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	7' 6"	50.0	30.0	Default Load

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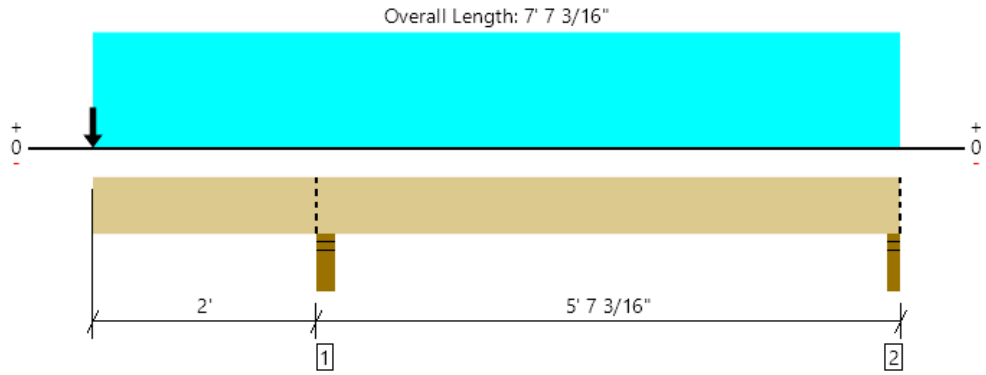
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B22B

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5245 @ 2' 2 1/4"	6379 (4.50")	Passed (82%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1860 @ 1' 1/8"	8590	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-4162 @ 2' 2 1/4"	15953	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.025 @ 0	0.219	Passed (2L/999+)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.063 @ 0	0.292	Passed (2L/834)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- 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	Total	
1 - Stud wall - HF	4.50"	4.50"	3.70"	2607	2009	1507	6123	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	69	831/-260	526	1426/-260	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)	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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 7' 7 3/16"	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 7' 7 3/16" (Front)	7' 6"	12.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 7' 7 3/16" (Front)	7' 6"	15.0	-	30.0	Default Load
3 - Point (lb)	0 (Front)	N/A	1039	300	225	Linked from: B21B, Support 1

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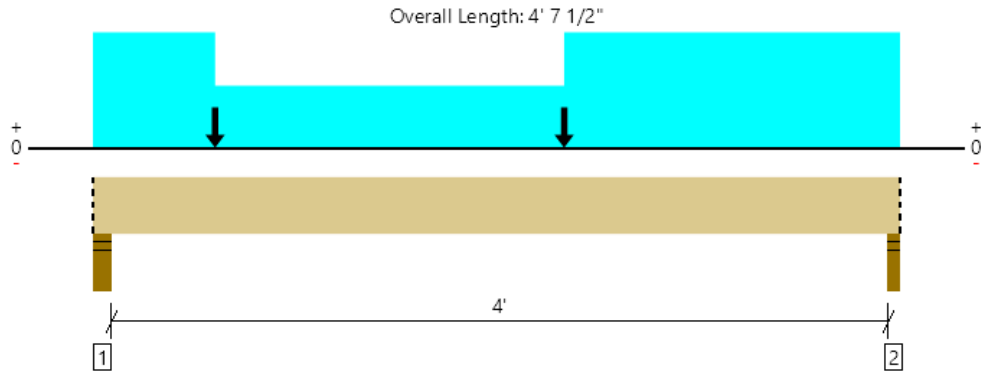
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B22C

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1437 @ 4' 6"	4253 (3.00")	Passed (34%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	681 @ 3' 4 5/8"	9878	Passed (7%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	1462 @ 2' 8 3/8"	18346	Passed (8%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.007 @ 2' 8 3/8"	0.213	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.011 @ 2' 8 3/8"	0.283	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	4.50"	4.50"	1.50"	584	713	608	1905	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	522	675	544	1741	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)	4' 8" o/c	
Bottom Edge (Lu)	4' 8" 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 4' 7 1/2"	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 4' 7 1/2" (Front)	7' 6"	12.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 8 3/8" (Front)	7' 6"	15.0	-	30.0	Default Load
3 - Point (lb)	8 3/8" (Front)	N/A	167	-	281	Linked from: B1, Support 1
4 - Point (lb)	2' 8 3/8" (Front)	N/A	167	-	281	Linked from: B1, Support 2
5 - Uniform (PSF)	2' 8 3/8" to 4' 7 1/2" (Front)	7' 6"	15.0	-	30.0	Default Load

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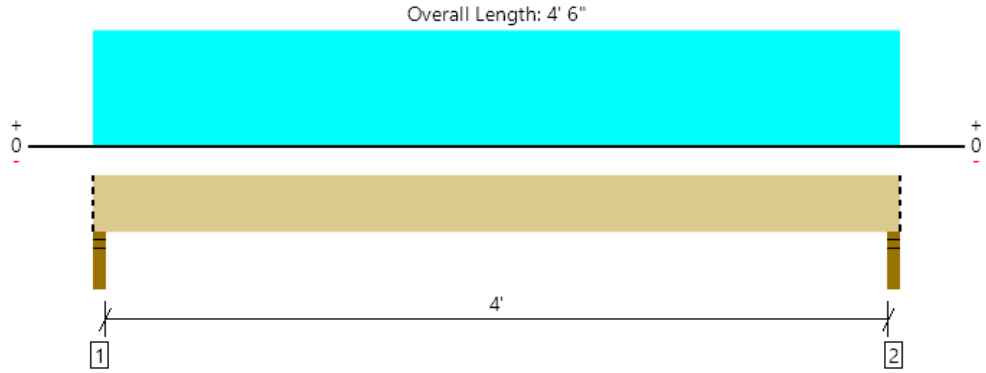
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, b23

1 piece(s) 1 1/4" x 11 7/8" 1.3E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	190 @ 1 1/2"	1519 (3.00")	Passed (12%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	85 @ 1' 2 7/8"	4837	Passed (2%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	190 @ 2' 3"	4791	Passed (4%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.002 @ 2' 3"	0.213	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.005 @ 2' 3"	0.283	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	122	68	190	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	122	68	190	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)	4' 6" o/c	
Bottom Edge (Lu)	4' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4' 6"	N/A	4.3	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	1'	50.0	30.0	Default Load

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

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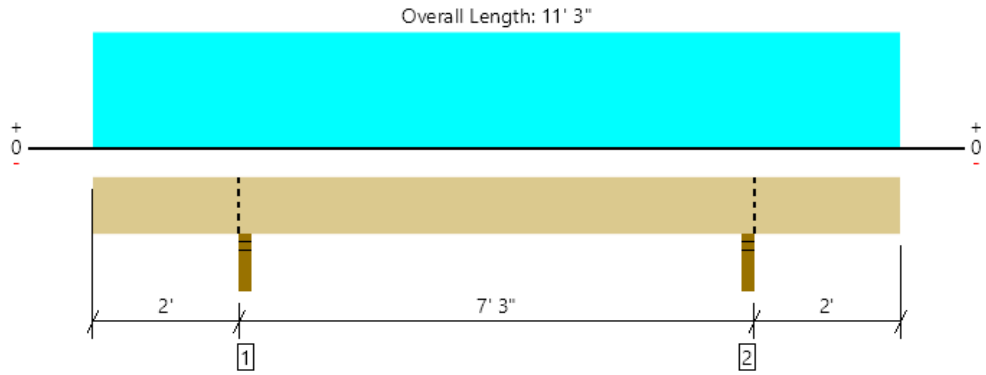
Weyerhaeuser

UPPER FLOOR, b23b

1 piece(s) 1 3/4" x 5 1/2" 2.0E Microllam® LVL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	475 @ 2' 1 1/2"	2126 (3.00")	Passed (22%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	251 @ 2' 8 1/2"	2103	Passed (12%)	1.15	1.0 D + 1.0 S (Adj Spans)
Moment (Ft-lbs)	388 @ 5' 7 1/2"	2444	Passed (16%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.056 @ 5' 7 1/2"	0.350	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.072 @ 5' 7 1/2"	0.467	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	128	347	475	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	128	347	475	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)	11' 3" o/c	
Bottom Edge (Lu)	11' 3" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 11' 3"	N/A	2.8	--	
1 - Uniform (PSF)	0 to 11' 3" (Front)	2'	10.0	30.0	Default Load

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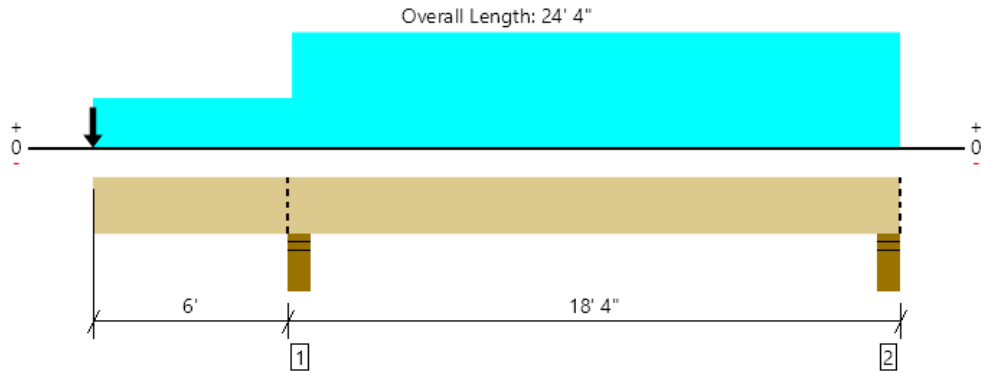
ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B24

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	11526 @ 6' 2 3/4"	15593 (5.50")	Passed (74%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	7392 @ 7' 5 3/8"	18481	Passed (40%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	31121 @ 15' 7 7/16"	45776	Passed (68%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.341 @ 15' 3 1/2"	0.889	Passed (L/626)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.928 @ 15' 3 5/8"	1.185	Passed (L/230)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Upward deflection on left cantilever exceeds 0.4".
- 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	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	4.07"	6921	4605	11526	Blocking
2 - Stud wall - HF	5.50"	5.50"	2.72"	4902	2820	7722	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)	24' 4" o/c	
Bottom Edge (Lu)	24' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 24' 4"	N/A	26.0	--	
1 - Uniform (PSF)	0 to 6' (Front)	3' 7 1/2"	50.0	30.0	Default Load
2 - Uniform (PSF)	0 to 6' (Front)	2'	10.0	30.0	Default Load
3 - Uniform (PSF)	6' to 24' 4" (Front)	10' 9"	50.0	30.0	Default Load
4 - Point (lb)	0 (Front)	N/A	128	347	Linked from: b23b, Support 1

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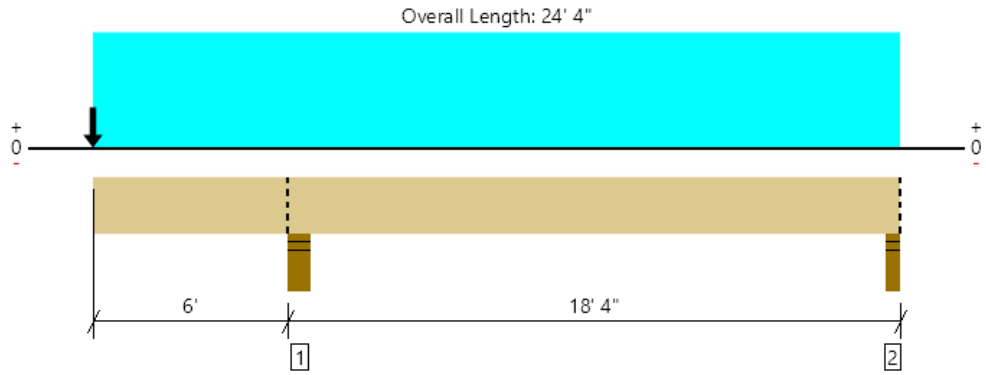
ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B25

1 piece(s) 5 1/4" x 9 1/2" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6917 @ 6' 2 3/4"	11694 (5.50")	Passed (59%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3647 @ 7' 3"	11089	Passed (33%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	11888 @ 16' 3 3/4"	22523	Passed (53%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.325 @ 0	0.415	Passed (2L/460)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.879 @ 15' 8 1/4"	0.897	Passed (L/245)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Upward deflection on left cantilever exceeds 0.4".

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	3.25"	3703	3215	6918	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	1702	1390	3092	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)	24' 4" o/c	
Bottom Edge (Lu)	24' 4" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 24' 4"	N/A	15.6	--	
1 - Uniform (PSF)	0 to 24' 4" (Front)	3' 7 1/2"	50.0	30.0	Default Load
2 - Uniform (PSF)	0 to 24' 4" (Front)	2'	10.0	30.0	Default Load
3 - Point (lb)	0 (Front)	N/A	128	347	Linked from: b23b, Support 2

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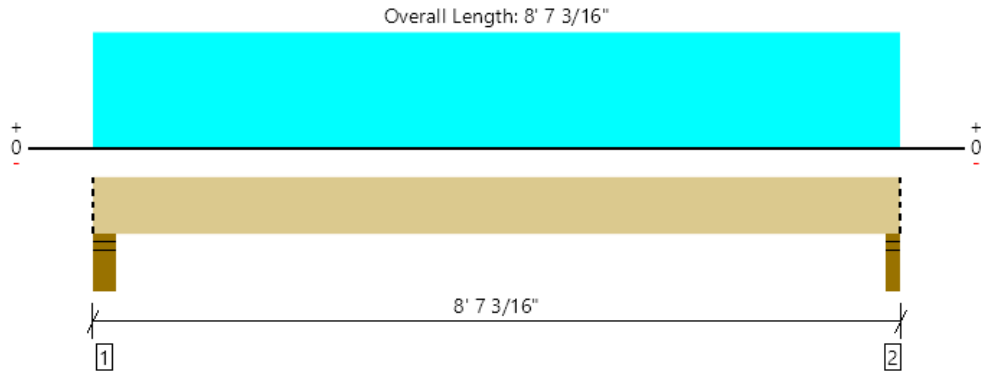
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B26

1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1320 @ 8' 5 3/16"	4961 (3.50")	Passed (27%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	919 @ 1' 5 3/8"	9241	Passed (10%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2567 @ 4' 4 5/8"	22888	Passed (11%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.014 @ 4' 4 5/8"	0.270	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.038 @ 4' 4 5/8"	0.405	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/360) 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	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	1.50"	879	493	1372	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	845	474	1319	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)	8' 7" o/c	
Bottom Edge (Lu)	8' 7" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 7 3/16"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 8' 7 3/16" (Front)	3' 9"	50.0	30.0	Default Load

Weyerhaeuser Notes

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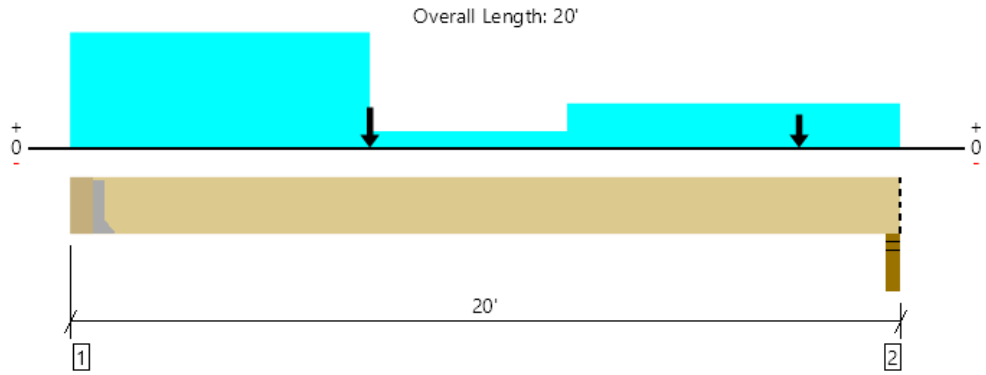
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B27

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2642 @ 5 1/2"	4922 (1.50")	Passed (54%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2378 @ 1' 5 3/8"	12053	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	11575 @ 7'	29854	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.295 @ 9' 4 3/4"	0.484	Passed (L/789)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.516 @ 9' 8 9/16"	0.969	Passed (L/451)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" PSL beam	5.50"	Hanger[1]	1.50"	956	1799	76	2831	See note [1]
2 - Stud wall - HF	3.50"	3.50"	1.50"	1196	738	554	2488	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)	19' 7" o/c	
Bottom Edge (Lu)	19' 7" 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	HU610	2.50"	N/A	18-16d	8-16d	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	5 1/2" to 20'	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 7' (Front)	4'	13.0	40.0	-	Default Load
2 - Uniform (PSF)	11' 9" to 20' (Front)	10'	6.0	-	-	Default Load
3 - Uniform (PSF)	0 to 20' (Front)	8"	13.0	40.0	-	Default Load
4 - Point (lb)	17' 6" (Front)	N/A	402	-	630	Linked from: B5, Support 1
5 - Point (lb)	7' (Front)	N/A	337	884	-	Linked from: B28, Support 2

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

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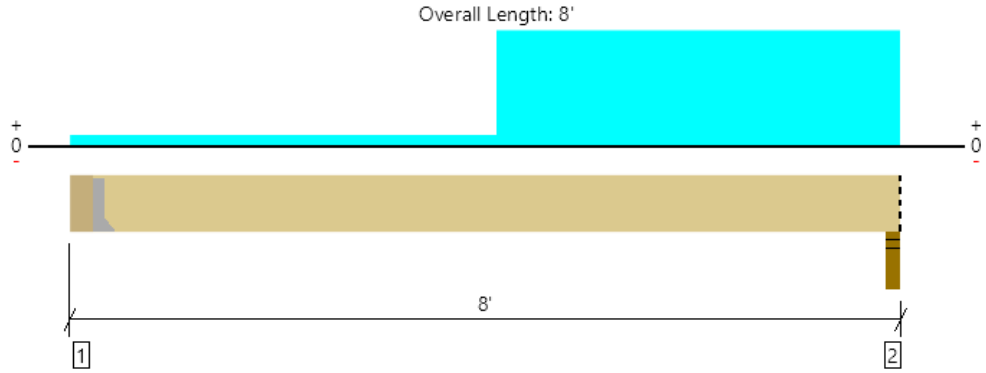
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

UPPER FLOOR, B28

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1221 @ 7' 10"	4961 (3.50")	Passed (25%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	718 @ 6' 8 5/8"	8590	Passed (8%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1700 @ 4' 10 11/16"	15953	Passed (11%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.019 @ 4' 4 3/8"	0.184	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.026 @ 4' 4 1/4"	0.369	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" PSL beam	5.50"	Hanger[1]	1.50"	168	370	538	See note [1]
2 - Stud wall - HF	3.50"	3.50"	1.50"	337	884	1221	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)	7' 7" o/c	
Bottom Edge (Lu)	7' 7" 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	LUS410	2.00"	N/A	8-10dx1.5	6-10d	

- 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 1/2" to 8'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 8' (Front)	8"	13.0	40.0	Default Load
2 - Uniform (PSF)	4' to 8' (Front)	6' 6"	13.0	40.0	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
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

PROJECT: Date:

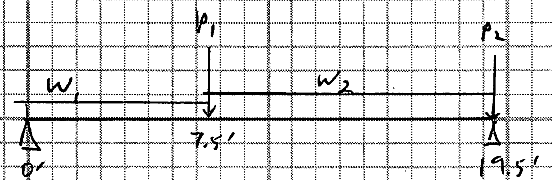
$W_1 = 170DL + 53LL$

$W_2 = 202DL + 180SL$
$+ 241DL + 400LL + 124SL$

$P_1 = 2463DL + 1799LL + 1675SL$

$P_2 = 2250DL + 1355SL$

B29



	0'	19.5'
DL	3255	4877
LL	2905	4091
SL	2153	3305

V = 10,098

M = 52,507

$V_{n/\Omega}$ = 63,000

$M_{n/\Omega}$ = 91,717

Δ_{TL} = 0.67" = L/267

Δ_{LL} = 0.35" = L/666

USE W10x30

B29 TO B30

$R_y \leq$ 7050# DL + 0.75(LL+SL)

CHECK BEAM E-6 PL

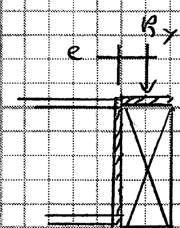
$e \leq 2"$

M = R_y e = 14,100 in-lbs.

1/2" x 11" PL $M_{n/\Omega}$ = 14.6 K-in ≥ M OK

USE 1/2" PL x 11" WIDE

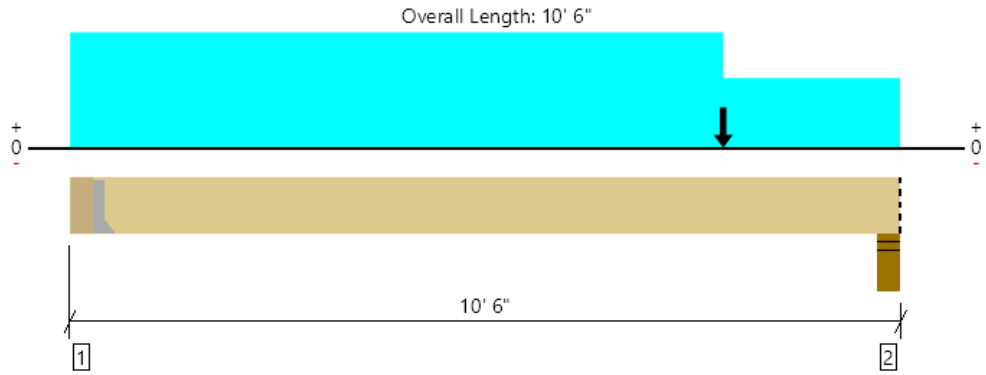
W/(4) 5/8" ø BOLTS



P.O. BOX 28427
Seattle, Washington 98118-9998
tel. 206.356.9553

UPPER FLOOR, B30

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6469 @ 5 1/2"	6469 (1.97")	Passed (100%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	10270 @ 9' 5/8"	13861	Passed (74%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	21090 @ 6' 11 3/4"	34332	Passed (61%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.142 @ 5' 7 1/16"	0.243	Passed (L/821)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.279 @ 5' 6 13/16"	0.485	Passed (L/418)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" PSL beam	5.50"	Hanger[1]	1.97"	3493	2210	2351	8054	See note [1]
2 - Stud wall - HF	5.50"	5.50"	5.23"	5278	4167	3633	13078	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)	10' 1" o/c	
Bottom Edge (Lu)	10' 1" 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	APHH610	3.00"	N/A	14-SDS25300	6-SDWS22312STN	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	5 1/2" to 10' 6"	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 8' 2 3/8" (Front)	3' 6"	50.0	-	30.0	Default Load
2 - Uniform (PSF)	0 to 10' 6" (Front)	7' 6"	13.0	40.0	-	Default Load
3 - Uniform (PSF)	0 to 10' 6" (Front)	10'	10.0	-	-	
4 - Uniform (PSF)	8' 2 3/8" to 10' 6" (Front)	3' 6"	13.0	40.0	-	Default Load
5 - Uniform (PSF)	0 to 8' 2 3/8" (Front)	7' 6"	17.0	-	30.0	
6 - Point (lb)	8' 2 3/8" (Front)	N/A	662	-	1125	Linked from: B4, Support 1
7 - Point (lb)	8' 2 3/8" (Front)	N/A	3255	2905	2153	

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

Weyerhaeuser Notes

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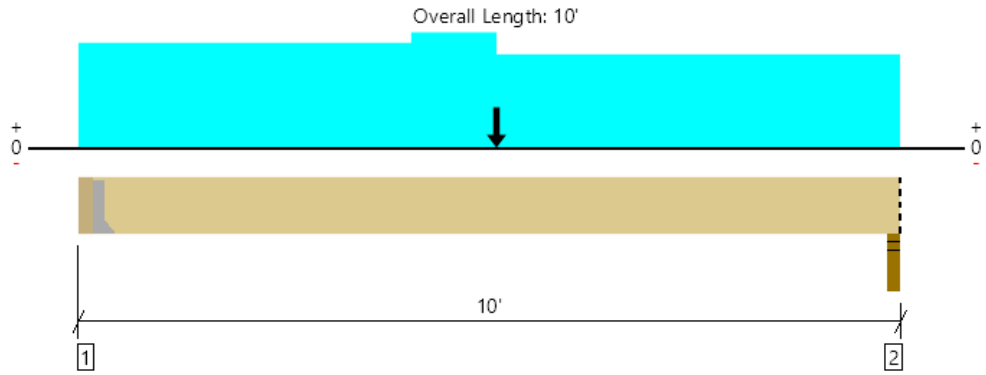
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

UPPER FLOOR, B31

1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4234 @ 3 1/2"	4234 (1.94")	Passed (100%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	3107 @ 1' 3 3/8"	8035	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	9651 @ 5'	19902	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.118 @ 5'	0.240	Passed (L/973)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.203 @ 5'	0.479	Passed (L/565)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" PSL beam	3.50"	Hanger[1]	1.94"	1758	2328	1296	5382	See note [1]
2 - Stud wall - HF	3.00"	3.00"	2.92"	1816	1842	1254	4912	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)	9' 9" o/c	
Bottom Edge (Lu)	9' 9" 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	HHUS48	3.00"	N/A	22-16d	8-16d	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 10'	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 10' (Front)	7' 6"	13.0	40.0	-	Default Load
2 - Uniform (PSF)	4' to 10' (Front)	10'	10.0	-	-	
3 - Uniform (PSF)	0 to 5' (Front)	4'	13.0	40.0	-	Default Load
4 - Uniform (PSF)	0 to 10' (Front)	8' 6"	17.0	-	30.0	
5 - Point (lb)	5' (Front)	N/A	168	370	-	Linked from: B28, Support 1

Weyerhaeuser Notes

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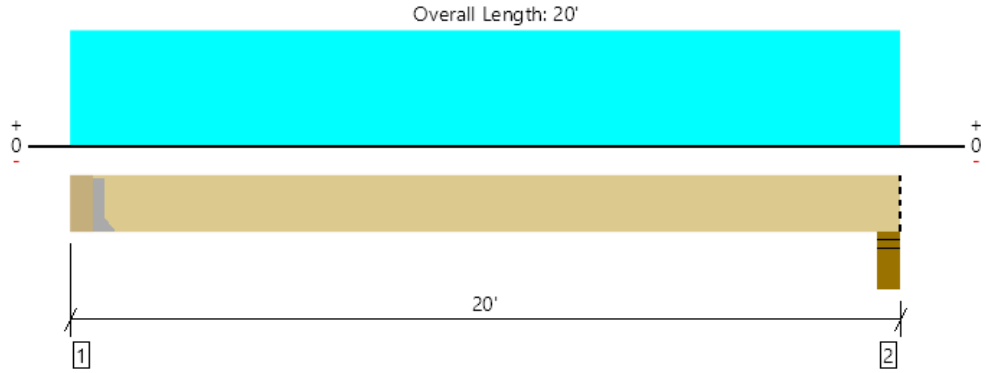
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B32

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2223 @ 5 1/2"	4922 (1.50")	Passed (45%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1994 @ 1' 5 3/8"	12053	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	10677 @ 10' 3/4"	29854	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.348 @ 10' 3/4"	0.480	Passed (L/662)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.504 @ 10' 3/4"	0.960	Passed (L/458)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" PSL beam	5.50"	Hanger[1]	1.50"	710	1610	2320	See note [1]
2 - Stud wall - HF	5.50"	5.50"	1.50"	710	1590	2300	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)	19' 7" o/c	
Bottom Edge (Lu)	19' 7" 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	HU610	2.50"	N/A	18-10d	8-10d	

- 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 1/2" to 20'	N/A	19.5	--	
1 - Uniform (PSF)	0 to 20' (Front)	4'	13.0	40.0	Default Load

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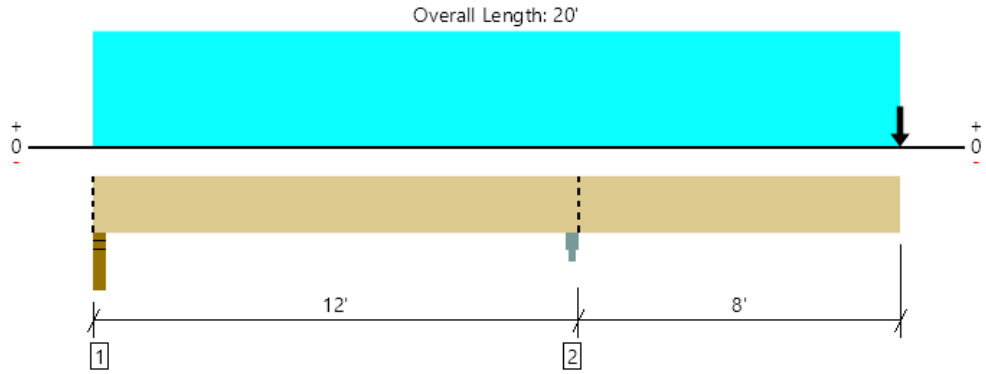
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B33

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8863 @ 11' 10 1/2"	9844 (3.00")	Passed (90%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3958 @ 10' 9 1/8"	13861	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-19686 @ 11' 10 1/2"	25749	Passed (76%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.512 @ 20'	0.813	Passed (2L/380)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.938 @ 20'	1.083	Passed (2L/208)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Moment capacity over cantilever support 2 has been reduced by 25% to lessen the effects of buckling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	795	811/-201	1606/-201	Blocking
2 - Column Cap - steel	3.00"	3.00"	2.70"	4873	3991	8864	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' o/c	
Bottom Edge (Lu)	20' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20'	N/A	19.5	--	
1 - Uniform (PSF)	0 to 20' (Front)	4' 9"	50.0	30.0	Default Load
2 - Uniform (PSF)	0 to 20' (Front)	2'	10.0	30.0	Default Load
3 - Point (lb)	20' (Front)	N/A	128	347	Linked from: b23b, Support 1

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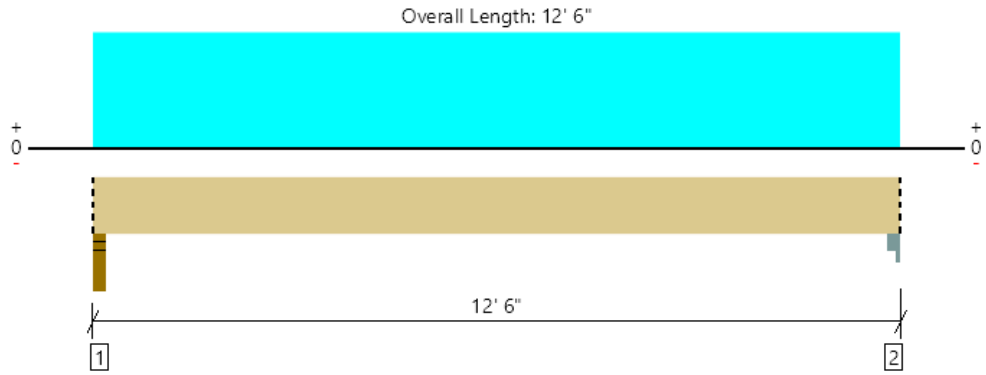
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B33B

2 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2376 @ 1 1/2"	4253 (3.00")	Passed (56%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1905 @ 1' 2 7/8"	9081	Passed (21%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	7130 @ 6' 3"	20525	Passed (35%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.158 @ 6' 3"	0.613	Passed (L/933)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.217 @ 6' 3"	0.817	Passed (L/678)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.68"	651	1725	2376	Blocking
2 - Column Cap - steel	3.00"	3.00"	1.50"	651	1725	2376	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)	12' 6" o/c	
Bottom Edge (Lu)	12' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 12' 6"	N/A	12.1	--	
1 - Uniform (PSF)	0 to 12' 6" (Front)	9' 2 3/8"	10.0	30.0	Default Load

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

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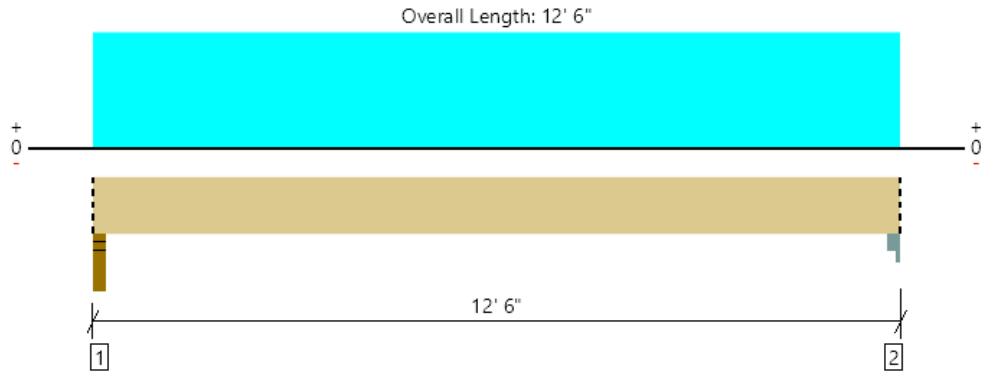
Weyerhaeuser

UPPER FLOOR, B33C

1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1788 @ 1 1/2"	2126 (3.00")	Passed (84%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1433 @ 1' 2 7/8"	4541	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5366 @ 6' 3"	10263	Passed (52%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.240 @ 6' 3"	0.613	Passed (L/613)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.327 @ 6' 3"	0.817	Passed (L/450)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	2.52"	475	1313	1788	Blocking
2 - Column Cap - steel	3.00"	3.00"	1.50"	475	1313	1788	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)	7' 11" o/c	
Bottom Edge (Lu)	12' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 12' 6"	N/A	6.1	--	
1 - Uniform (PSF)	0 to 12' 6" (Front)	7'	10.0	30.0	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
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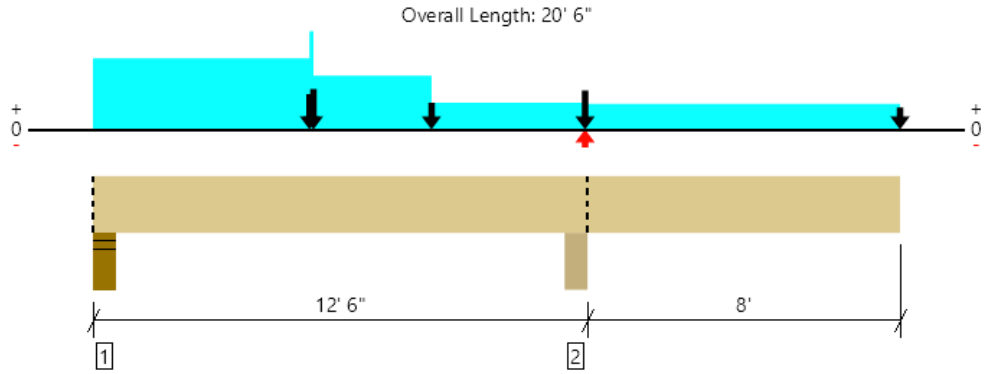
Weyerhaeuser

UPPER FLOOR, B34

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern) [Group]
Member Reaction (lbs)	13425 @ 12' 3 1/4"	18047 (5.50")	Passed (74%)	--	1.0 D + 1.0 S (All Spans) [1]
Shear (lbs)	7038 @ 11' 5/8"	13861	Passed (51%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans) [1]
Moment (Ft-lbs)	-19468 @ 12' 3 1/4"	25749	Passed (76%)	1.15	1.0 D + 1.0 S (All Spans) [1]
Live Load Defl. (in)	0.419 @ 20' 6"	0.411	Passed (2L/472)	--	1.0 D + 1.0 S (Alt Spans) [1]
Total Load Defl. (in)	0.546 @ 20' 6"	0.823	Passed (2L/362)	--	1.0 D + 1.0 S (Alt Spans) [1]

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Right cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Moment capacity over cantilever support 2 has been reduced by 25% to lessen the effects of buckling.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	3.39"	3535	2674	2221	8430	Blocking
2 - Beam - PSL	5.50"	5.50"	4.09"	7576	1676/-66	5849	15101/-66	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' 6" o/c	
Bottom Edge (Lu)	20' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

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Weyerhaeuser

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20' 6"	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 12' 6" (Front)	10'	10.0	-	-	Default Load
2 - Uniform (PSF)	5' 6" to 8' 7 3/16" (Front)	10'	17.0	-	30.0	
3 - Uniform (PSF)	0 to 20' 6" (Front)	4' 6"	50.0	-	30.0	
4 - Uniform (PSF)	12' 6" to 20' 6" (Front)	2'	10.0	-	30.0	
5 - Point (lb)	5' 6" (Front)	N/A	702	-	1103	Linked from: B7, Support 2
6 - Point (lb)	8' 7 3/16" (Front)	N/A	353	-	600	Linked from: B10, Support 1
7 - Point (lb)	12' 6" (Front)	N/A	353	-	600	Linked from: B10, Support 2
8 - Uniform (PLF)	0 to 5' 7 3/16" (Front)	N/A	240.8	399.8	123.8	Linked from: J2, Support 1
9 - Point (lb)	20' 6" (Front)	N/A	128	-	347	Linked from: b23b, Support 2
10 - Point (lb)	5' 7 3/16" (Front)	N/A	710	1610	-	Linked from: B32, Support 1
11 - Point (lb)	12' 6" (Front)	N/A	568	501/-66	153	Linked from: B35, Support 1

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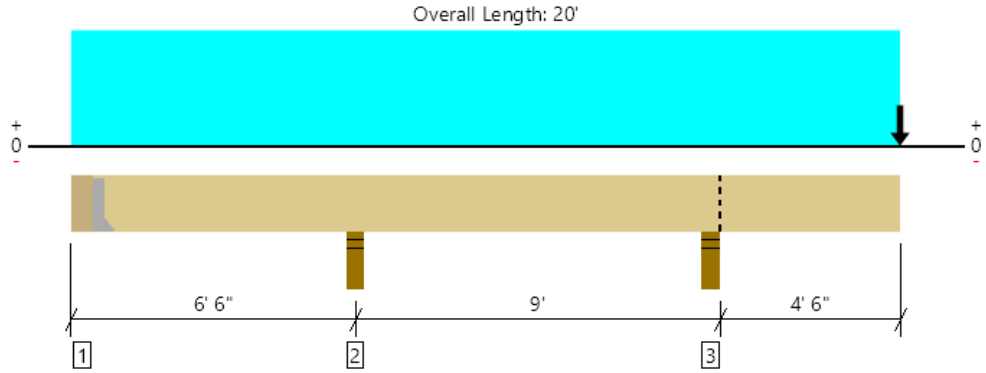
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

UPPER FLOOR, B35

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4556 @ 15' 3 3/4"	6379 (4.50")	Passed (71%)	--	1.0 D + 0.75 L + 0.75 S (Adj Spans)
Shear (lbs)	2099 @ 16' 5 7/8"	9878	Passed (21%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-8456 @ 15' 3 3/4"	18346	Passed (46%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.174 @ 20'	0.234	Passed (2L/646)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.360 @ 20'	0.469	Passed (2L/312)	--	1.0 D + 0.75 L + 0.75 S (Alt Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Hanger on 11 7/8" PSL beam	5.25"	Hanger[1]	1.50"	568	501/-66	153	1222/-66	See note [1]
2 - Stud wall - HF	4.50"	4.50"	1.50"	559	1243	-614	1802/-614	None
3 - Stud wall - HF	4.50"	4.50"	3.21"	2615	1458	1130	5203	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)	19' 7" o/c	
Bottom Edge (Lu)	19' 7" 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	LUS410	2.00"	N/A	8-10dx1.5	6-10d	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	5 1/4" to 20'	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 20' (Front)	3' 3"	13.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 20' (Front)	10'	10.0	-	-	Default Load
3 - Point (lb)	20' (Front)	N/A	643	89	669	Linked from: X, Support 2

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Weyerhaeuser

Weyerhaeuser Notes

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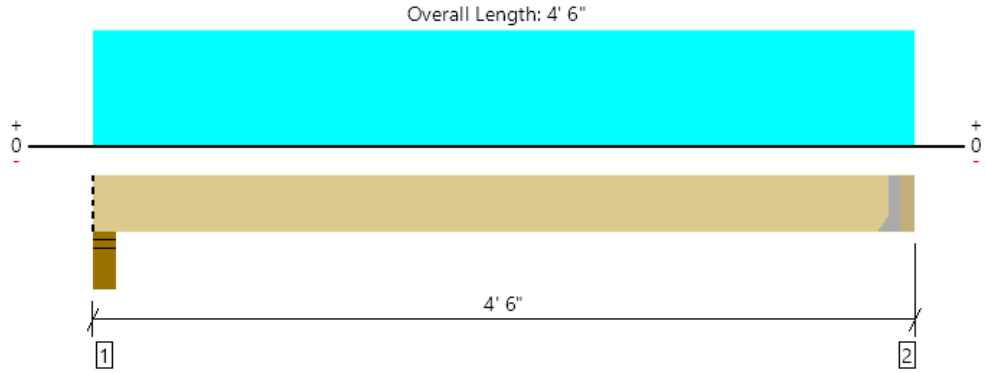
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

UPPER FLOOR, B36

1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1142 @ 4' 2 1/2"	2363 (1.50")	Passed (48%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	559 @ 3' 2 5/8"	4939	Passed (11%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1106 @ 2' 3 1/4"	9173	Passed (12%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.008 @ 2' 3 1/4"	0.097	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.016 @ 2' 3 1/4"	0.194	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Stud wall - HF	5.50"	5.50"	1.89"	657	91	681	1429	Blocking
2 - Hanger on 11 7/8" LSL beam	3.50"	Hanger[1]	1.50"	643	89	669	1401	See note [1]

- 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)	4' 3" o/c	
Bottom Edge (Lu)	4' 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
2 - Face Mount Hanger	IUS1.81/11.88	2.00"	N/A	10-10d	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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4' 2 1/2"	N/A	6.5	--	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	1'	13.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 4' 6" (Front)	10'	10.0	-	-	Default Load
3 - Uniform (PSF)	0 to 4' 6" (Front)	10'	17.0	-	30.0	Default Load

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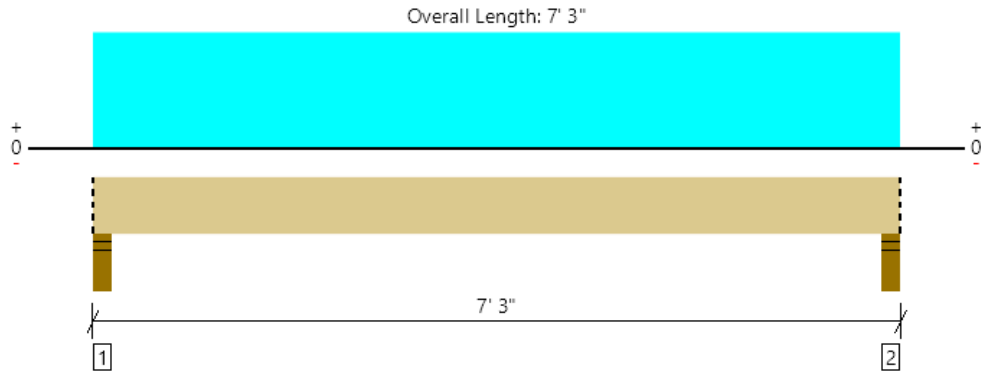
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, B37

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3761 @ 3"	9568 (4.50")	Passed (39%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2345 @ 1' 4 3/8"	13861	Passed (17%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	5909 @ 3' 7 1/2"	34332	Passed (17%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.023 @ 3' 7 1/2"	0.169	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.044 @ 3' 7 1/2"	0.338	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Stud wall - HF	4.50"	4.50"	1.77"	1789	1449	1181	4419	Blocking
2 - Stud wall - HF	4.50"	4.50"	1.77"	1789	1449	1181	4419	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)	7' 3" o/c	
Bottom Edge (Lu)	7' 3" 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 7' 3"	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 7' 3" (Front)	10'	10.0	-	-	WALL
2 - Uniform (PSF)	0 to 7' 3" (Front)	1' 4"	17.0	-	30.0	ROOF
3 - Uniform (PLF)	0 to 7' 3" (Front)	N/A	291.8	399.8	180.8	Linked from: J2, Support 2
4 - Uniform (PSF)	0 to 7' 3" (Front)	3' 6"	17.0	-	30.0	AWNING

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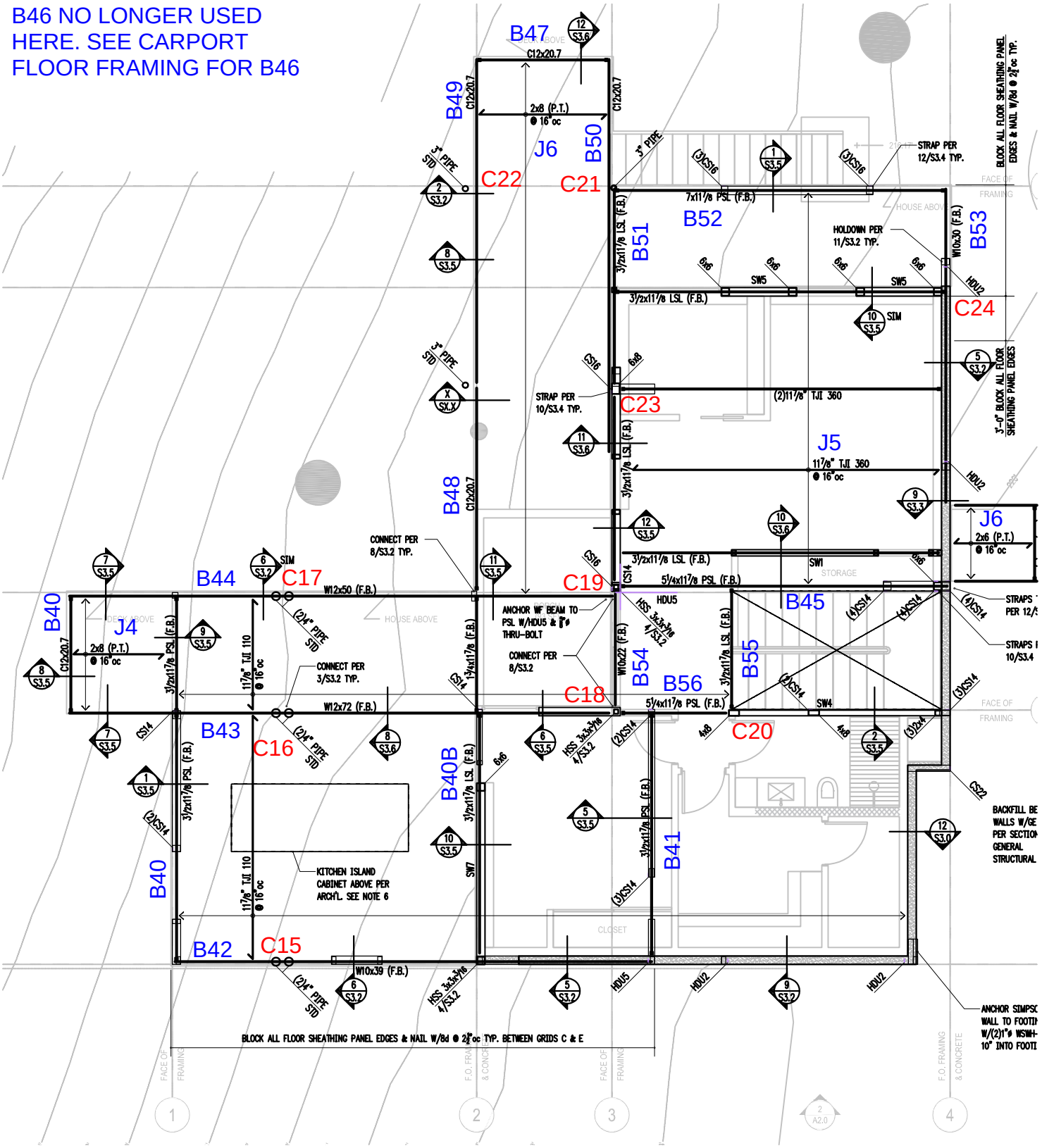
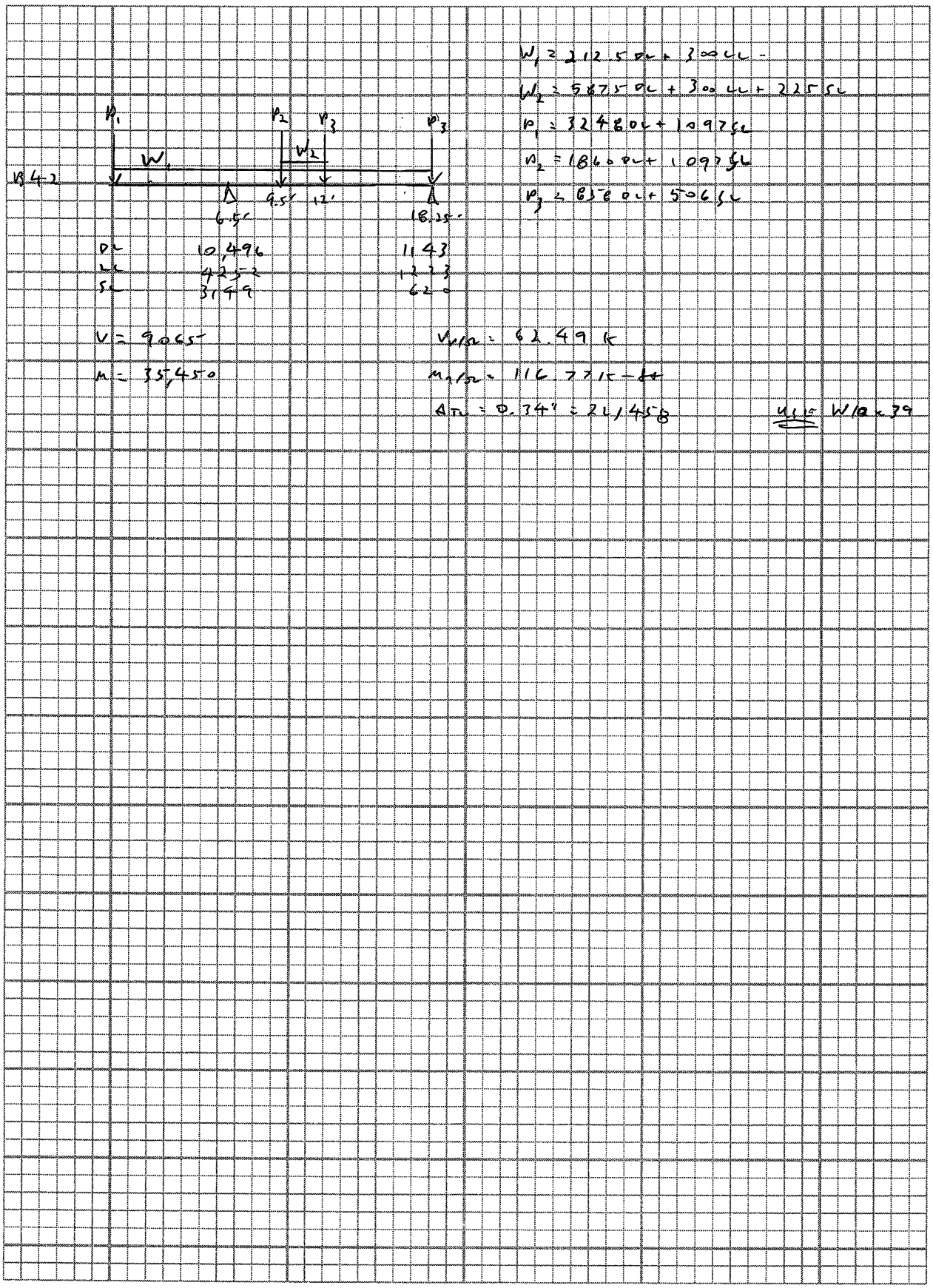
B46 NO LONGER USED
HERE. SEE CARPORT
FLOOR FRAMING FOR B46



PROJECT: Date:



P.O. BOX 28427
Seattle, Washington 98118-9998
tel. 206.356.9553

PROJECT: MERCER GROVE Date:

$P_0 = 2060\ell + 660\ell\ell$

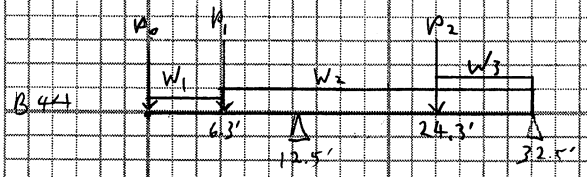
$P_1 = 3660D\ell + 3215S\ell + 1430\ell + 660\ell\ell$

$P_2 = 2866D\ell + 691\ell\ell + 1395S\ell$

$W_1 = 180\ell$

$W_2 = 152.5D\ell + 140\ell\ell +$

$W_3 = 152.5D\ell + 380\ell\ell + 100S\ell$



DL	9,183	1801
LL	4977	2670
SL	4707	527

$V \leq 9000$

$M \leq 54,5[illegible]9$

$V_{max} = 90.2K$

$M_{max} = 179.4K-Ft$

$\Delta_{TL} \leq 0.32'' = 2L/469$

$\Delta_{LL} = 0.05''$

$\Delta_{SL} = 0.15''$ USE W12x50

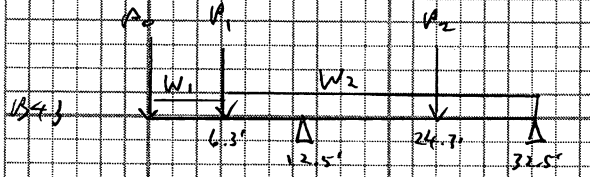
$P_0 = 2060\ell + 660\ell\ell$

$P_1 = 8262D\ell + 4605S\ell + 1430\ell + 660\ell\ell$

$P_2 = 8183D\ell + 2215\ell\ell + 5190S\ell$

$W_1 = 180\ell + 2$

$W_2 = 1650\ell + 440\ell\ell$



DL	17,865	3603
LL	12,245	4171
SL	8080	1715

$V \leq 17,235$

$M \leq 49[illegible]$

$V_{max} = 105.7K$

$M_{max} = 269.4K-Ft$

$\Delta_{TL} = 0.35'' = 2L/857$

$\Delta_{LL} = 0.07'' = 2L/4286$

$\Delta_{SL} = 0.1[illegible]'' = 2L/3[illegible]$ USE W12x72 or W10x88

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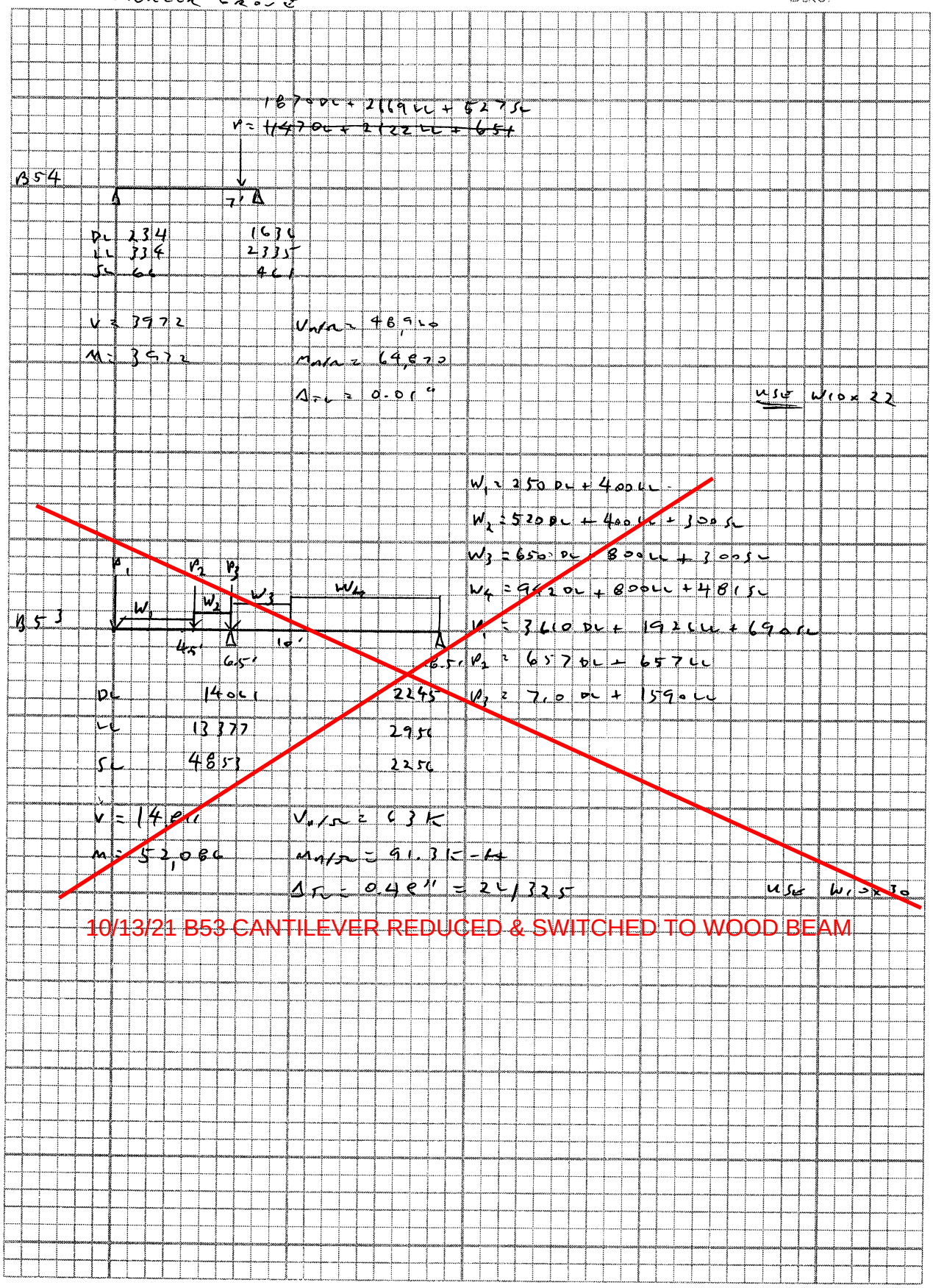
PROJECT: Mercer Crest Date:



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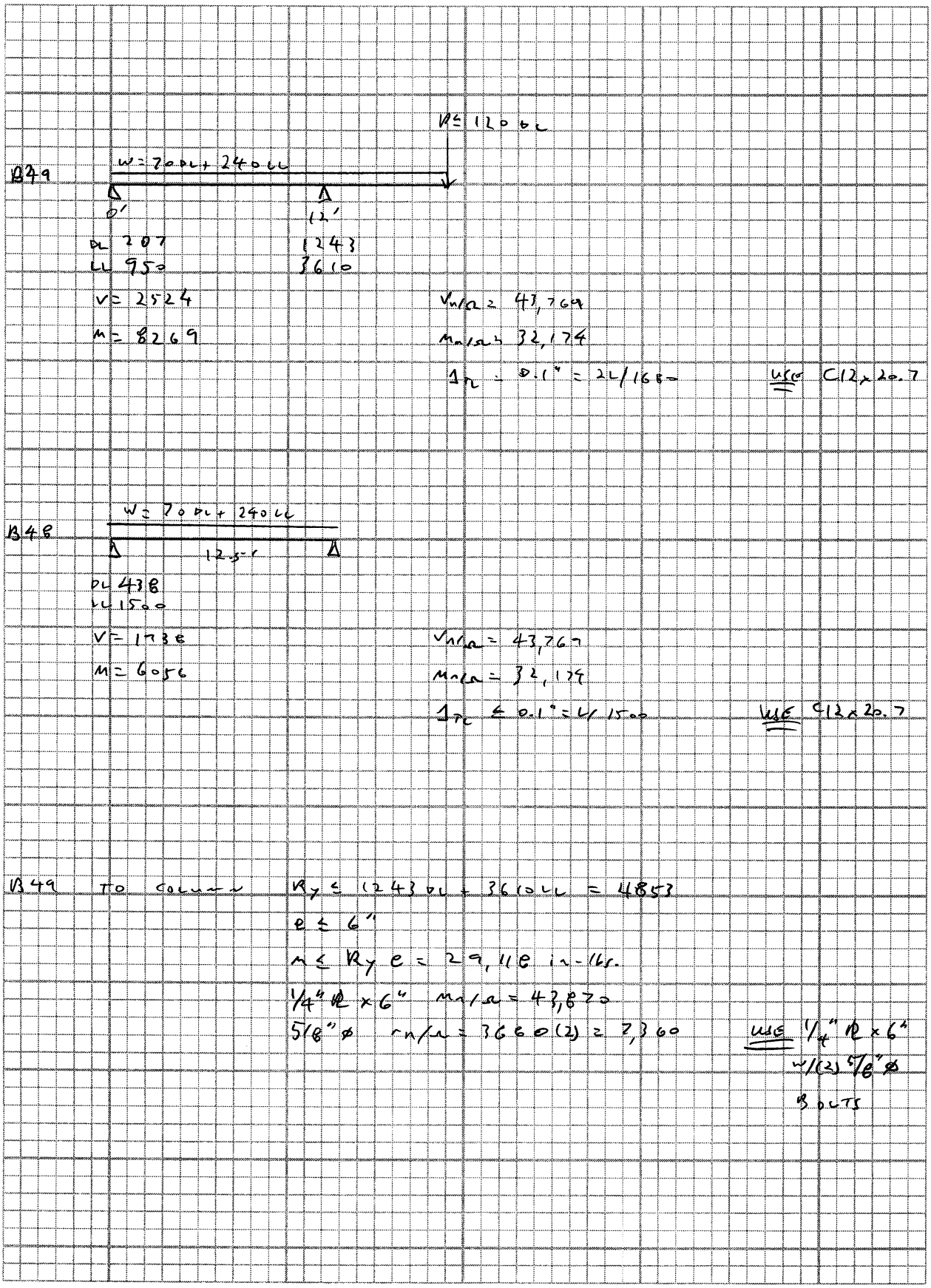
PROJECT: Date:



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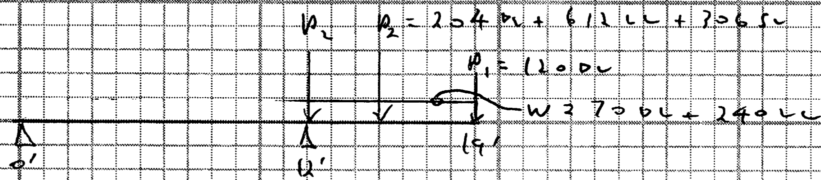
tel. 206.356.9553

PROJECT: Date:

B50



	0'	12'
DL	263	1282
LL	643	3547
SL	77	689

V ≤ 3064 — V allow = 43,769

M ≤ 10,770 — M allow = 24,122

Δ_{TL} = 0.2" = L/840 — USE C12x20.7

B50 TO C21 — R_y ≤ 4829

5/8"φ V allow = 3,680# — # REQ'D = 1.3

USE (2) 5/8"φ BOLTS

B52 TO B57 — R_y ≤ 3361 DL+LL — USE HGU7.25-SDS

CAP = 13,160 DOWN

CAP = 9460 UP

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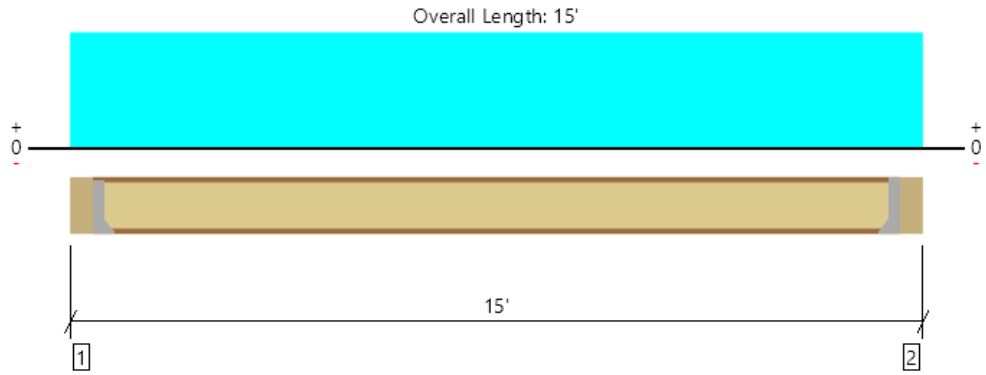
MAIN FLOOR, J4

1 piece(s) 11 7/8" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	516 @ 5 1/2"	910 (1.75")	Passed (57%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	516 @ 5 1/2"	1560	Passed (33%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1818 @ 7' 6"	3160	Passed (58%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.178 @ 7' 6"	0.352	Passed (L/947)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.245 @ 7' 6"	0.704	Passed (L/689)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	50	45	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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" Panel (24" Span Rating) that is nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c..

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 11 7/8" HF beam	5.50"	Hanger[1]	1.75" / - [2]	150	400	550	See note [1]
2 - Hanger on 11 7/8" HF beam	5.50"	Hanger[1]	1.75" / - [2]	150	400	550	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)	4' 2" o/c	
Bottom Edge (Lu)	14' 1" o/c	

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

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-Strong-Grip	
2 - Face Mount Hanger	IUS1.81/11.88	2.00"	N/A	10-10dx1.5	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 15'	16"	15.0	40.0	Default Load

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

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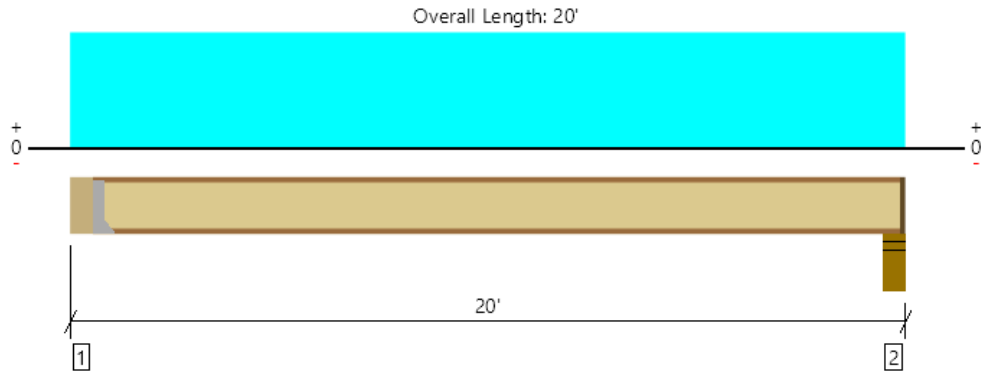
Weyerhaeuser

MAIN FLOOR, J5

1 piece(s) 11 7/8" TJI® 360 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	703 @ 5 1/2"	1080 (1.75")	Passed (65%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	703 @ 5 1/2"	1705	Passed (41%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3367 @ 10' 1/2"	6180	Passed (54%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.394 @ 10' 1/2"	0.479	Passed (L/583)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.542 @ 10' 1/2"	0.958	Passed (L/424)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	42	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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" Panel (24" Span Rating) that is nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 11 7/8" HF beam	5.50"	Hanger[1]	1.75" / - [2]	201	536	737	See note [1]
2 - Stud wall - HF	5.50"	4.25"	1.75"	199	531	730	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' 1" o/c	
Bottom Edge (Lu)	19' 5" 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	IUS2.37/11.88	2.00"	N/A	10-10dx1.5	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 20'	16"	15.0	40.0	Default Load

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

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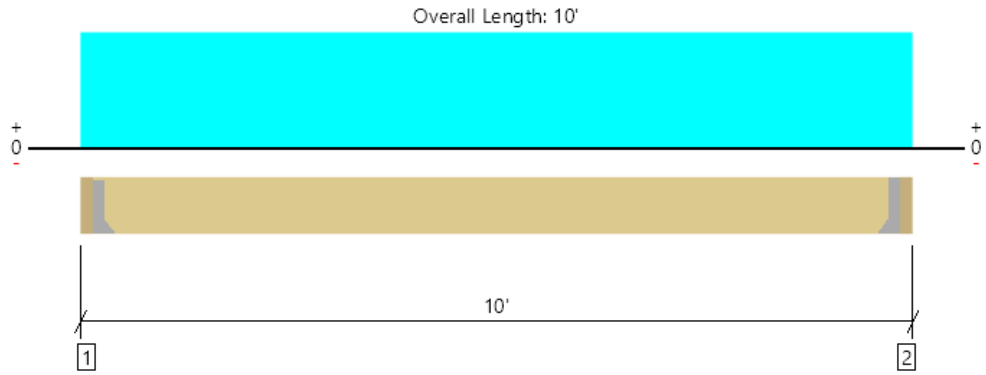
Weyerhaeuser

MAIN FLOOR, J6

1 piece(s) 2 x 8 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	456 @ 3"	911 (1.50")	Passed (50%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	398 @ 10 1/4"	1088	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1083 @ 5'	1284	Passed (84%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.237 @ 5'	0.237	Passed (L/482)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.284 @ 5'	0.475	Passed (L/401)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 7 1/4" HF beam	3.00"	Hanger[1]	1.50"	80	400	480	See note [1]
2 - Hanger on 7 1/4" HF beam	3.00"	Hanger[1]	1.50"	80	400	480	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)	9' 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 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	
2 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 10'	16"	12.0	60.0	Default Load

Weyerhaeuser Notes

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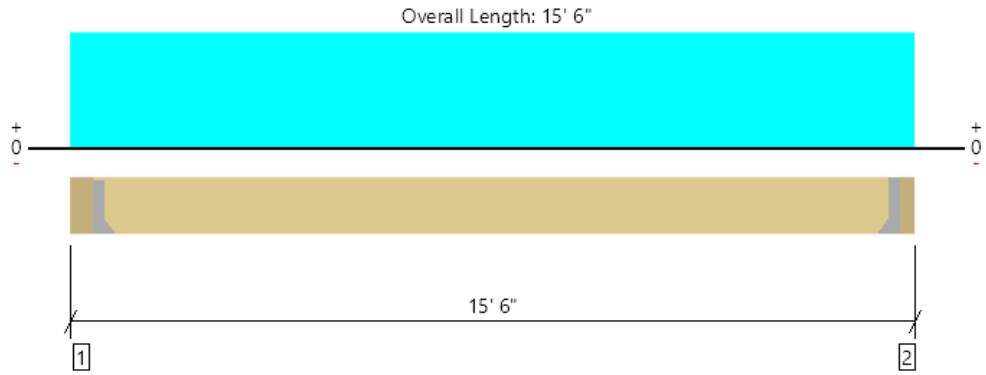
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B40

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1700 @ 5 1/2"	4725 (1.50")	Passed (36%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1392 @ 1' 5 3/8"	8590	Passed (16%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	5928 @ 7' 10"	15953	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.079 @ 7' 10"	0.369	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.347 @ 7' 10"	0.738	Passed (L/511)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger[1]	1.50"	1388	313	235	1936	See note [1]
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.50"	1361	307	230	1898	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)	14' 9" o/c	
Bottom Edge (Lu)	14' 9" 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	LUS410	2.00"	N/A	8-16d	6-16d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-16d	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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	5 1/2" to 15' 2 1/2"	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 15' 6" (Front)	1'	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 15' 6" (Front)	10'	10.0	-	-	Default Load
3 - Uniform (PSF)	0 to 15' 6" (Front)	1'	50.0	-	30.0	Default Load

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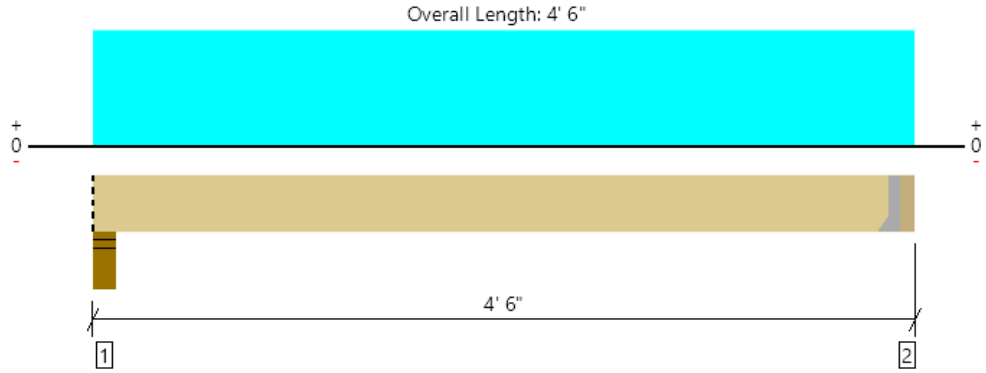
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B40B

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	742 @ 4' 2 1/2"	4725 (1.50")	Passed (16%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	333 @ 3' 2 5/8"	8590	Passed (4%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	659 @ 2' 3 1/4"	15953	Passed (4%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.001 @ 2' 3 1/4"	0.097	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.005 @ 2' 3 1/4"	0.194	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Stud wall - DF	5.50"	5.50"	1.50"	677	121	136	934	Blocking
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.50"	660	119	134	913	See note [1]

- 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)	4' 3" o/c	
Bottom Edge (Lu)	4' 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
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-10dx1.5	6-10d	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4' 2 1/2"	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	1' 4"	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 4' 6" (Front)	20'	10.0	-	-	Default Load
3 - Uniform (PSF)	0 to 4' 6" (Front)	1'	50.0	-	30.0	Default Load
4 - Uniform (PSF)	0 to 4' 6" (Front)	1'	15.0	-	30.0	Default Load

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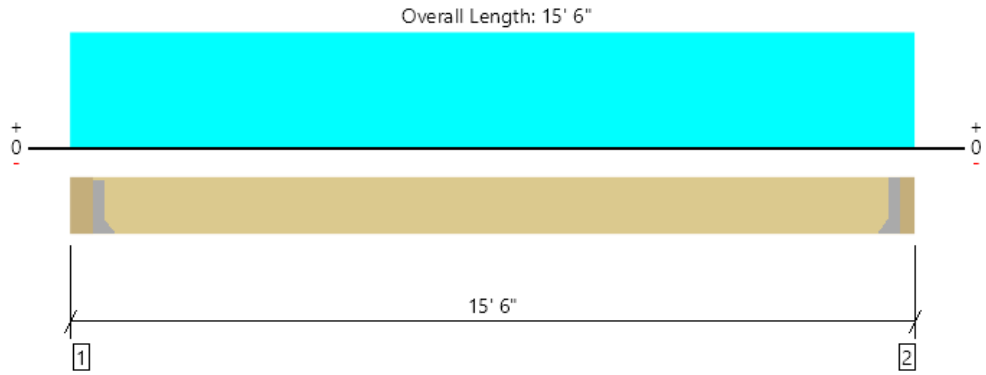
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B41

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1079 @ 5 1/2"	4725 (1.50")	Passed (23%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	934 @ 1' 5 3/8"	8590	Passed (11%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3979 @ 7' 10"	15953	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.080 @ 7' 10"	0.369	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.220 @ 7' 10"	0.738	Passed (L/804)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger[1]	1.50"	722	418	1140	See note [1]
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.50"	709	409	1118	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)	14' 9" o/c	
Bottom Edge (Lu)	14' 9" 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	LUS410	2.00"	N/A	8-10dx1.5	6-10d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-10dx1.5	6-10d	

- 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 1/2" to 15' 2 1/2"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 15' 6" (Front)	1' 4"	15.0	40.0	Default Load
2 - Uniform (PSF)	0 to 15' 6" (Front)	10'	6.0	-	Default Load

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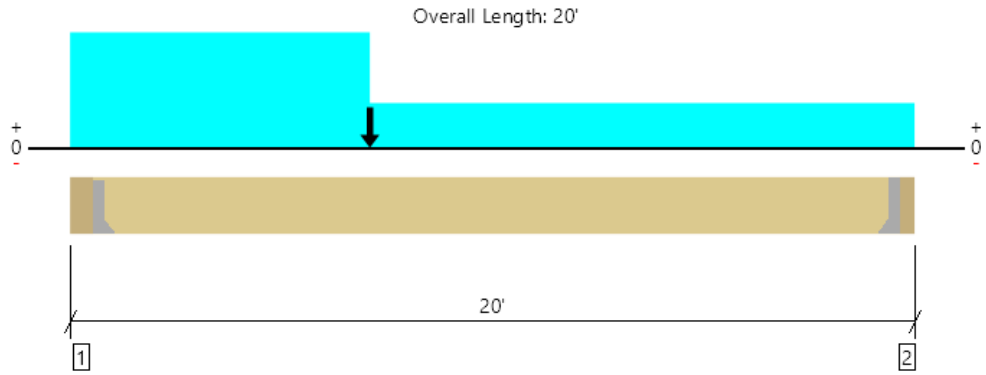
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B45

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2955 @ 5 1/2"	4922 (1.50")	Passed (60%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2689 @ 1' 5 3/8"	12053	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	13592 @ 7'	29854	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.327 @ 9' 4 1/16"	0.481	Passed (L/706)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.583 @ 9' 7"	0.962	Passed (L/396)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger[1]	1.50"	1118	1950	3068	See note [1]
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.50"	1013	823	1836	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)	19' 3" o/c	
Bottom Edge (Lu)	19' 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	HUC612	2.50"	N/A	22-16d	8-16d	
2 - Face Mount Hanger	U610	2.00"	N/A	14-16d	6-10d	

- 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 1/2" to 19' 8 1/2"	N/A	19.5	--	
1 - Uniform (PSF)	0 to 20' (Front)	8"	15.0	40.0	Default Load
2 - Uniform (PSF)	7' to 20' (Front)	10'	6.0	-	Default Load
3 - Uniform (PSF)	0 to 7' (Front)	4'	13.0	40.0	Default Load
4 - Point (lb)	7' (Front)	N/A	412	1120	Linked from: B55, Support 2

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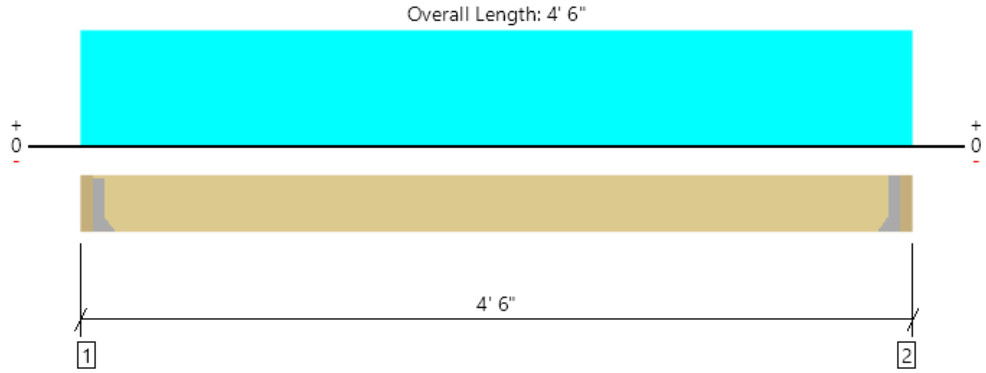
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B46
2 piece(s) 2 x 6 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	988 @ 3"	2813 (1.50")	Passed (35%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	762 @ 8 1/2"	1980	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	988 @ 2' 3"	1475	Passed (67%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.036 @ 2' 3"	0.100	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.043 @ 2' 3"	0.200	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 5 1/2" HF beam	3.00"	Hanger[1]	1.50"	166	945	1111	See note [1]
2 - Hanger on 5 1/2" HF beam	3.00"	Hanger[1]	1.50"	166	945	1111	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)	4' o/c	
Bottom Edge (Lu)	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	HU26-2	2.50"	N/A	12-10dx1.5	6-10d	
2 - Face Mount Hanger	HU26-2	2.50"	N/A	12-10dx1.5	6-10d	

- 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)	3" to 4' 3"	N/A	4.2	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	7'	10.0	60.0	Default Load

Weyerhaeuser Notes

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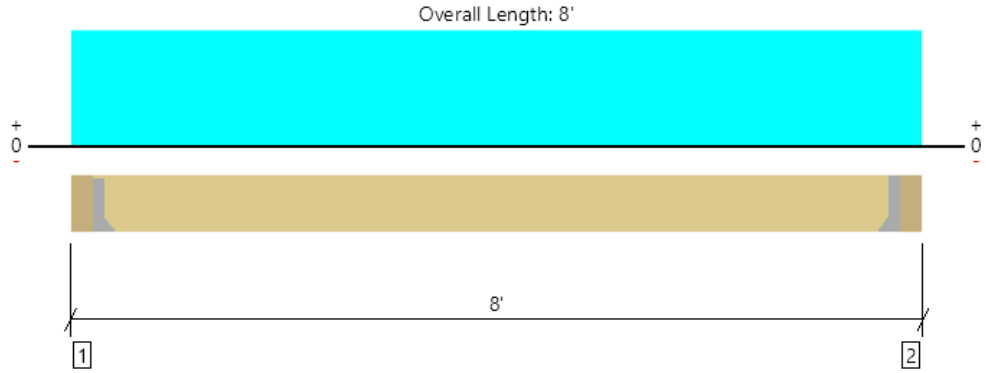
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B47

2 piece(s) 2 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1088 @ 5 1/4"	2813 (1.50")	Passed (39%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	904 @ 1' 1/2"	2610	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1939 @ 4'	2365	Passed (82%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.091 @ 4'	0.178	Passed (L/936)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.116 @ 4'	0.356	Passed (L/736)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 7 1/4" HF beam	5.25"	Hanger[1]	1.50"	260	960	1220	See note [1]
2 - Hanger on 7 1/4" HF beam	5.25"	Hanger[1]	1.50"	260	960	1220	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)	7' 2" o/c	
Bottom Edge (Lu)	7' 2" 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	LUS28-2	2.00"	N/A	6-16d	4-16d	
2 - Face Mount Hanger	LUS28-2	2.00"	N/A	6-16d	4-16d	

- 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)	5 1/4" to 7' 6 3/4"	N/A	5.5	--	
1 - Uniform (PSF)	0 to 8' (Front)	4'	15.0	60.0	Default Load

Weyerhaeuser Notes

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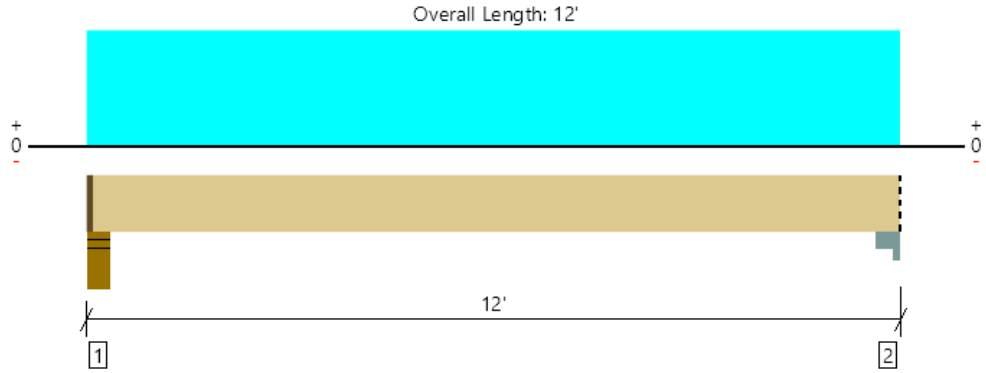
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B51

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5520 @ 4"	5670 (4.00")	Passed (97%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4273 @ 1' 5 3/8"	8590	Passed (50%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	15029 @ 5' 11 3/4"	15953	Passed (94%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.346 @ 5' 11 3/4"	0.376	Passed (L/392)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.509 @ 5' 11 3/4"	0.565	Passed (L/266)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) 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	Total	
1 - Stud wall - HF	5.50"	4.00"	3.89"	1810	3827	5637	1 1/2" Rim Board
2 - Column Cap - steel	6.00"	6.00"	1.80"	1824	3853	5677	Blocking

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- 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)	10' 9" o/c	
Bottom Edge (Lu)	11' 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)	1 1/2" to 12'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 12' (Front)	10'	15.0	40.0	Default Load
2 - Uniform (PSF)	0 to 12' (Front)	10'	10.0	-	Default Load
3 - Uniform (PSF)	0 to 12' (Front)	4'	10.0	60.0	Default Load

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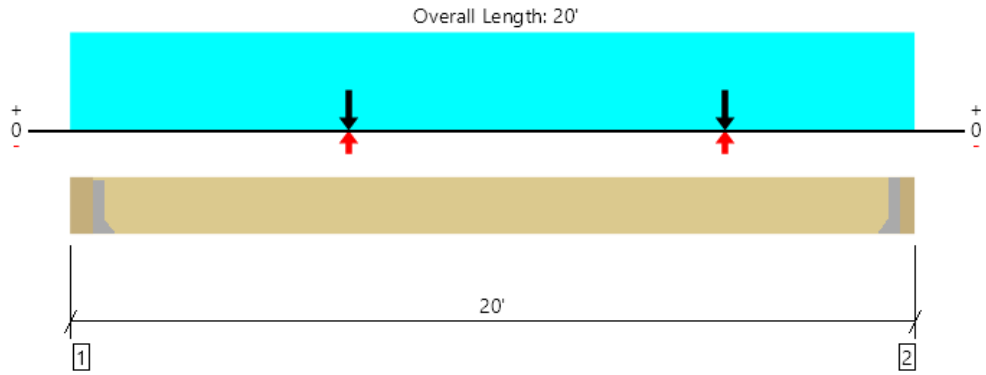
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B52

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3716 @ 19' 8 1/2"	6563 (1.50")	Passed (57%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3537 @ 18' 8 5/8"	16071	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	17702 @ 9' 1 5/8"	39805	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.309 @ 10' 11/16"	0.481	Passed (L/748)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.650 @ 10' 3/4"	0.962	Passed (L/355)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Snow	Total	
1 - Hanger on 11 7/8" PSL beam	5.50"	Hanger[1]	1.50"	1916	1528	-556	3444/-556	See note [1]
2 - Hanger on 11 7/8" PSL beam	3.50"	Hanger[1]	1.50"	2003	1758	-672	3761/-672	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)	19' 3" o/c	
Bottom Edge (Lu)	19' 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	HHUS7.25/10	3.31"	N/A	30-10d	10-10d	
2 - Face Mount Hanger	HHUS7.25/10	3.31"	N/A	30-10d	10-10d	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	5 1/2" to 19' 8 1/2"	N/A	26.0	--	--	
1 - Uniform (PSF)	0 to 20' (Front)	1'	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 20' (Front)	10'	10.0	-	-	Default Load
3 - Point (lb)	6' 6" (Front)	N/A	559	1243	-614	Linked from: B35, Support 2
4 - Point (lb)	15' 6" (Front)	N/A	559	1243	-614	Linked from: B35, Support 2

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

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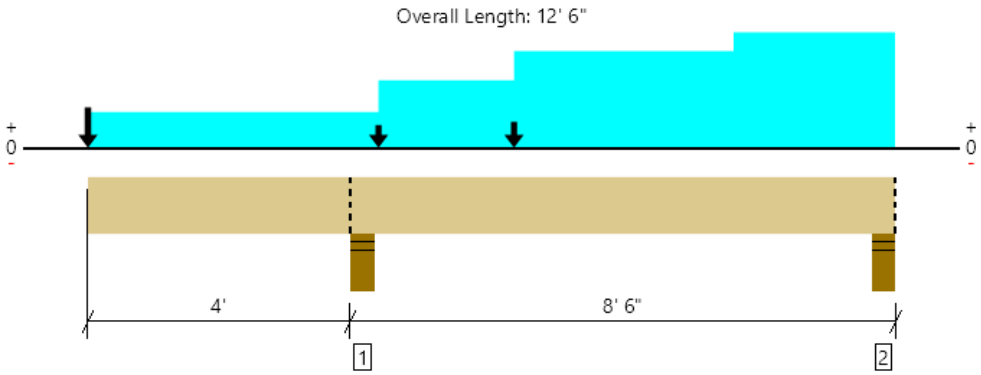
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

MAIN FLOOR, B53

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	19290 @ 4' 3"	26250 (6.00")	Passed (73%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	9019 @ 5' 5 7/8"	16071	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-29633 @ 4' 3"	39805	Passed (74%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.191 @ 0	0.213	Passed (2L/532)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.423 @ 0	0.425	Passed (2L/242)	--	1.0 D + 1.0 L (Alt Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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.
- -321 lbs uplift at support located at 12' 2". Strapping or other restraint may be required.
- 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	Total	
1 - Stud wall - DF	6.00"	6.00"	4.41"	10590	8692	2909	22191	Blocking
2 - Stud wall - DF	5.50"	5.50"	1.50"	1169	3765/-1490	1499	6433/-1490	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)	12' 6" o/c	
Bottom Edge (Lu)	12' 6" 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 12' 6"	N/A	26.0	--	--	
1 - Uniform (PSF)	0 to 12' 6" (Front)	10'	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 12' 6" (Front)	10'	10.0	-	-	Default Load
3 - Uniform (PSF)	4' 6" to 12' 6" (Front)	10'	10.0	-	-	Default Load
4 - Uniform (PSF)	6' 7 3/16" to 10' (Front)	10'	13.0	40.0	-	Default Load
5 - Uniform (PSF)	4' 6" to 12' 6" (Front)	10'	17.0	-	30.0	Default Load
6 - Uniform (PLF)	10' to 12' 6" (Front)	N/A	291.8	399.8	180.8	Linked from: J2, Support 2
7 - Point (lb)	6' 7 3/16" (Front)	N/A	710	1590	-	Linked from: B32, Support 2
8 - Point (lb)	4' 6" (Front)	N/A	657	91	681	Linked from: B36, Support 1
9 - Point (lb)	0 (Front)	N/A	3610	1926	690	Linked from: B52, Support 2

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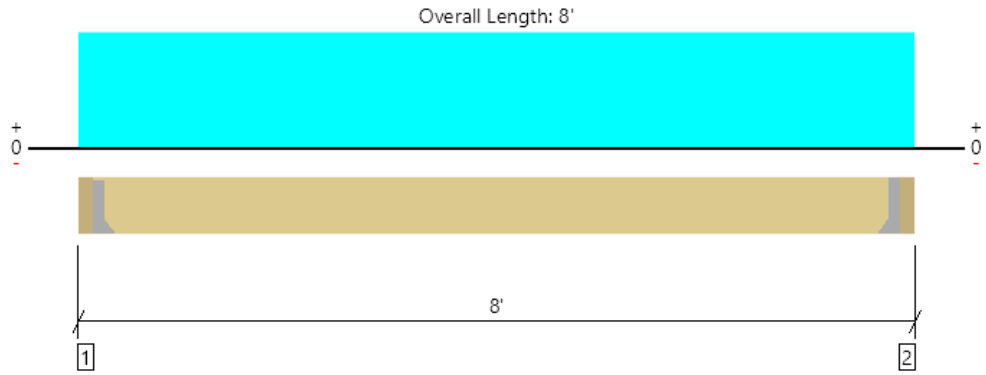
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

MAIN FLOOR, B55

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1424 @ 3 1/2"	4725 (1.50")	Passed (30%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1044 @ 1' 3 3/8"	8590	Passed (12%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2640 @ 4'	15953	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.032 @ 4'	0.185	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.044 @ 4'	0.371	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" HF beam	3.50"	Hanger[1]	1.50"	412	1120	1532	See note [1]
2 - Hanger on 11 7/8" HF beam	3.50"	Hanger[1]	1.50"	412	1120	1532	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)	7' 5" o/c	
Bottom Edge (Lu)	7' 5" 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	LUS410	2.00"	N/A	8-16d	6-16d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-16d	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 7' 8 1/2"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 8' (Front)	1'	13.0	40.0	Default Load
2 - Uniform (PSF)	0 to 8' (Front)	6'	13.0	40.0	Default Load

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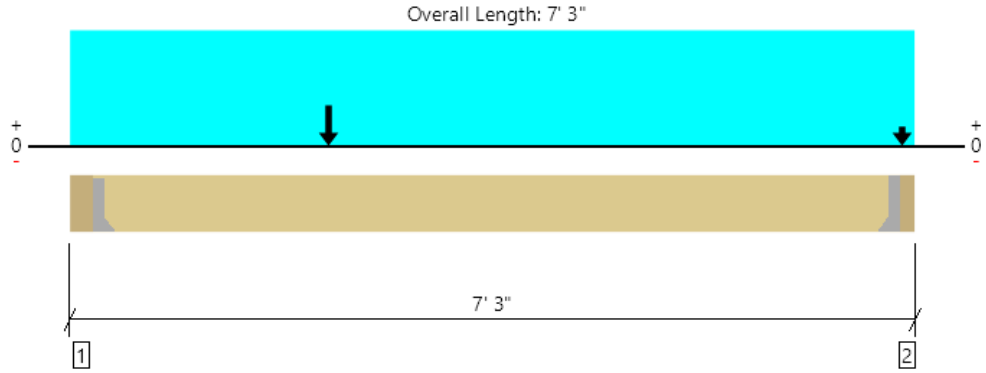
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B56

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	13781 @ 5 1/2"	13781 (4.20")	Passed (100%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	12104 @ 1' 5 3/8"	12053	Passed (100%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	22397 @ 2' 3 5/8"	29854	Passed (75%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.075 @ 3' 5 5/8"	0.162	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.138 @ 3' 5 9/16"	0.325	Passed (L/566)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger[1]	4.20"	6364	6664	3537	16565	See note [1]
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	1.98"	3311	4712	1400	9423	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' 6" o/c	
Bottom Edge (Lu)	6' 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 - Face Mount Hanger	Connector not found	N/A	N/A	N/A	N/A	
2 - Face Mount Hanger	HGUS5.50/10	4.00"	N/A	46-10d	16-10d	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	5 1/2" to 6' 11 1/2"	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 7' 3" (Front)	7' 6"	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 7' 3" (Front)	4'	13.0	40.0	-	Default Load
3 - Point (lb)	2' 3 5/8" (Front)	N/A	5477	4184	3641	Linked from: B30, Support 2
4 - Point (lb)	2' 3 5/8" (Front)	N/A	1758	2328	1296	Linked from: B31, Support 1
5 - Point (lb)	2' 3 5/8" (Front)	N/A	709	409	-	Linked from: B41, Support 2
6 - Point (lb)	7' (Front)	N/A	412	1120	-	Linked from: B55, Support 2

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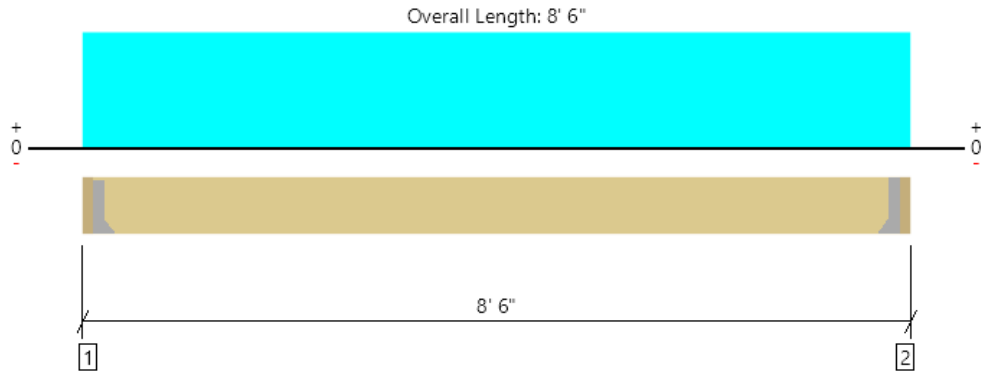
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

MAIN FLOOR, deck joist
1 piece(s) 2 x 8 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	397 @ 2 1/2"	911 (1.50")	Passed (44%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	321 @ 9 3/4"	1088	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	762 @ 4' 3"	1284	Passed (59%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.132 @ 4' 3"	0.202	Passed (L/736)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.153 @ 4' 3"	0.404	Passed (L/636)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Hanger on 7 1/4" HF beam	2.50"	Hanger[1]	1.50"	57	340	142	539	See note [1]
2 - Hanger on 7 1/4" HF beam	2.50"	Hanger[1]	1.50"	57	340	142	539	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)	8' 1" o/c	
Bottom Edge (Lu)	8' 1" 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	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	
2 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 8' 6"	16"	10.0	60.0	25.0	Default Load

Weyerhaeuser Notes

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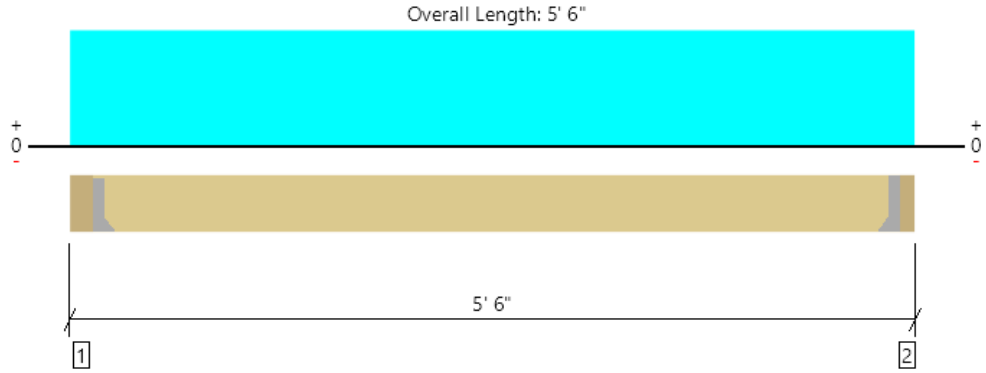
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, DECK BEAM
1 piece(s) 2 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	751 @ 5 1/2"	911 (1.50")	Passed (82%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	532 @ 1' 3/4"	1088	Passed (49%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	847 @ 2' 10"	1117	Passed (76%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.050 @ 2' 10"	0.119	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.058 @ 2' 10"	0.237	Passed (L/975)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Snow	Total	
1 - Hanger on 7 1/4" HF beam	5.50"	Hanger[1]	1.50"	127	723	301	1151	See note [1]
2 - Hanger on 7 1/4" HF beam	3.50"	Hanger[1]	1.50"	120	680	283	1083	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)	4' 9" o/c	
Bottom Edge (Lu)	4' 9" 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	LU26	1.50"	N/A	6-16d	4-10dx1.5	
2 - Face Mount Hanger	LU26	1.50"	N/A	6-16d	4-10dx1.5	

- 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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	5 1/2" to 5' 2 1/2"	N/A	2.8	--	--	
1 - Uniform (PSF)	0 to 5' 6" (Front)	4' 3"	10.0	60.0	25.0	Default Load

Weyerhaeuser Notes

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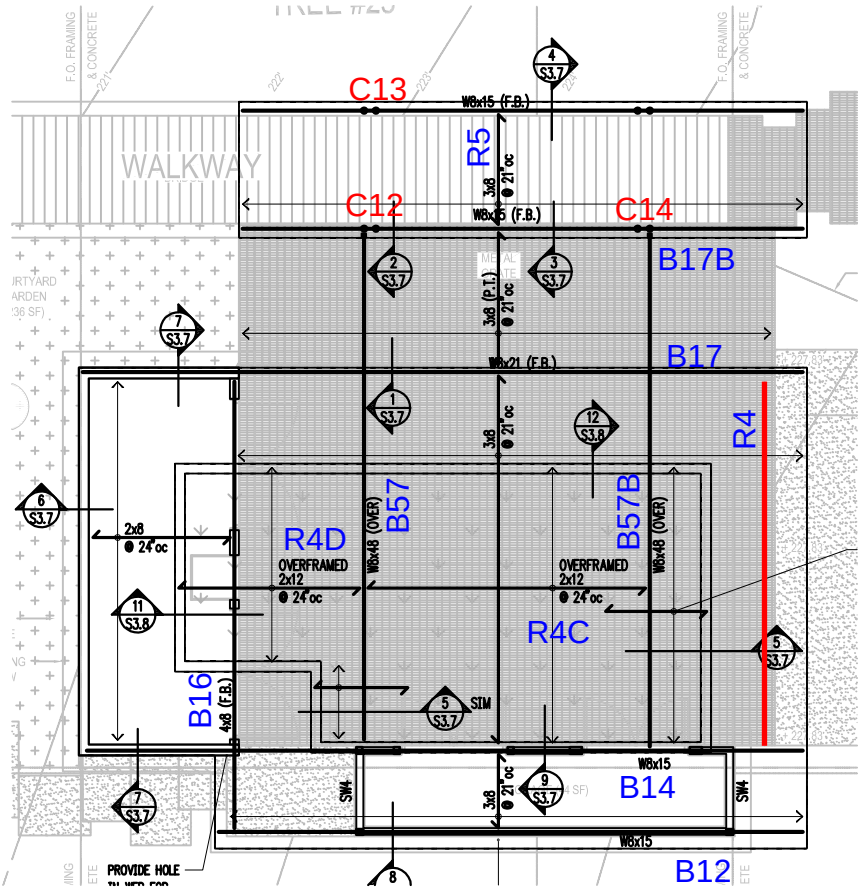
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

CARPORT ROOF KEY



NO LONGER USED: R4B, B13, B15, B18, B19

RAFTERS & JOISTS (SLOPED AND FLAT)

Material:
Doug-Fir No. 1
Fb = 1000 psi
Fv = 180 psi
E = 1.7 x 10^6 psi

Loading:
DL = 13 psf
LL = 30 psf
s = 21 in.
Cd = 1.15

Notes: Analysis does not consider axial loads.
Lengths shown are horizontal not diagonal.
Input loads are vertical loads.
Repetitive member factor included in Mr.

SLOPE & EQUIVALENT NORMAL LOAD

	slope :12	FLAT	2	3	4	5	6	7	8	9	10	11	18
	angle		9	14	18	23	27	30	34	37	40	43	56
	w_{perp} (plf)	75.25	74	73	71	69	67	65	63	60	58	55	42

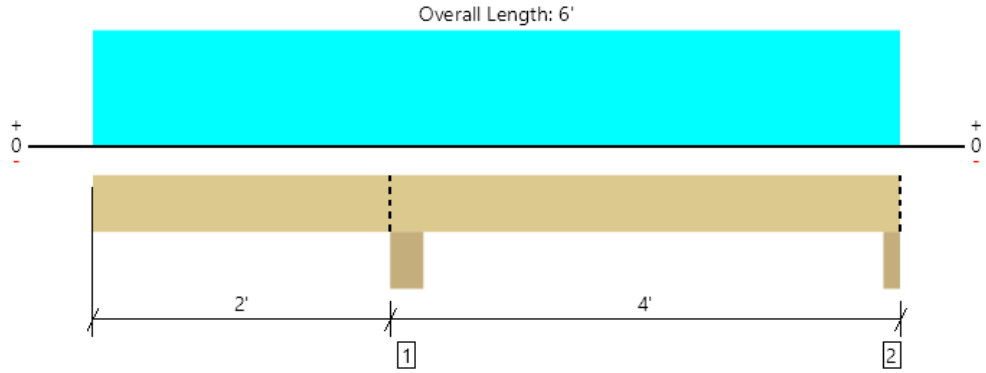
MAXIMUM HORIZONTAL LENGTH (FT)

	3x4	Vr	1208	32.1										
	I = 8.932	Mr	844	9.5	9.4	9.3	9.2	9.1	9.0	8.8	8.6	8.5	8.3	8.1	7.1
	S = 5.104	TL/	240	**7.7**	**7.6**	**7.5**	**7.4**	**7.3**	**7.1**	**6.9**	**6.8**	**6.6**	**6.4**	**6.2**	**5.2**
	A = 8.75	LL/	360	9.1	9.0	8.9	8.8	8.6	8.4	8.2	8.0	7.8	7.6	7.4	6.1
					2	3	4	5	6	7	8	9	10	11	12
	3x6	Vr	1898	50.4										
	I = 34.66	Mr	1806	13.9	13.8	13.6	13.5	13.3	13.1	12.9	12.6	12.4	12.1	11.9	10.3
	S = 12.6	TL/	240	**12.0**	**11.9**	**11.8**	**11.6**	**11.4**	**11.2**	**10.9**	**10.6**	**10.4**	**10.1**	**9.8**	**8.1**
	A = 13.75	LL/	360	14.3	14.1	14.0	13.8	13.5	13.3	12.9	12.6	12.3	12.0	11.7	9.6
R4>>	**3x8**	Vr	2501	66.5										
	I = 79.39	Mr	2896	17.5	17.4	17.3	17.1	16.9	16.6	16.3	16.0	15.7	15.4	15.1	13.1
	S = 21.9	TL/	240	**15.9**	**15.7**	**15.5**	**15.3**	**15.0**	**14.7**	**14.4**	**14.0**	**13.7**	**13.3**	**12.9**	**10.7**
	A = 18.13	LL/	360	18.8	18.6	18.4	18.2	17.8	17.5	17.1	16.6	16.2	15.8	15.4	12.7
					2	3	4	5	6	7	8	9	10	11	12
	3x10	Vr	3191	84.8										
	I = 164.9	Mr	4322	21.4	21.3	21.1	20.9	20.6	20.3	19.9	19.6	19.2	18.8	18.4	16.0
	S = 35.65	TL/	240	**20.2**	**20.0**	**19.8**	**19.5**	**19.2**	**18.8**	**18.3**	**17.9**	**17.4**	**17.0**	**16.5**	**13.7**
	A = 23.13	LL/	360	24.0	23.8	23.5	23.2	22.8	22.3	21.8	21.2	20.7	20.1	19.6	16.2
	3x12	Vr	3881	103.2										
	I = 296.6	Mr	5812	24.9	24.7	24.5	24.2	23.9	23.5	23.1	22.7	22.2	21.8	21.3	18.5
	S = 52.73	TL/	240	**24.6**	**24.4**	**24.1**	**23.8**	**23.3**	**22.8**	**22.3**	**21.8**	**21.2**	**20.6**	**20.1**	**16.6**
	A = 28.13	LL/	360	29.2	28.9	28.6	28.2	27.7	27.1	26.5	25.8	25.2	24.5	23.8	19.7

Cf = 1

UPPER FLOOR, R4 OUTRIGGER

2 piece(s) 2 x 4 DF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	774 @ 2' 4"	9720 (8.00")	Passed (8%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	301 @ 2' 11 1/2"	1449	Passed (21%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-436 @ 2' 4"	911	Passed (48%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.054 @ 0	0.200	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.126 @ 0	0.233	Passed (2L/446)	--	1.0 D + 1.0 S (Alt Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/240).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Beam - HF	8.00"	8.00"	1.50"	484	290	774	Blocking
2 - Beam - HF	4.00"	4.00"	1.50"	116	94	210	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)	6' o/c	
Bottom Edge (Lu)	6' o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 6'	24"	50.0	30.0	Default Load

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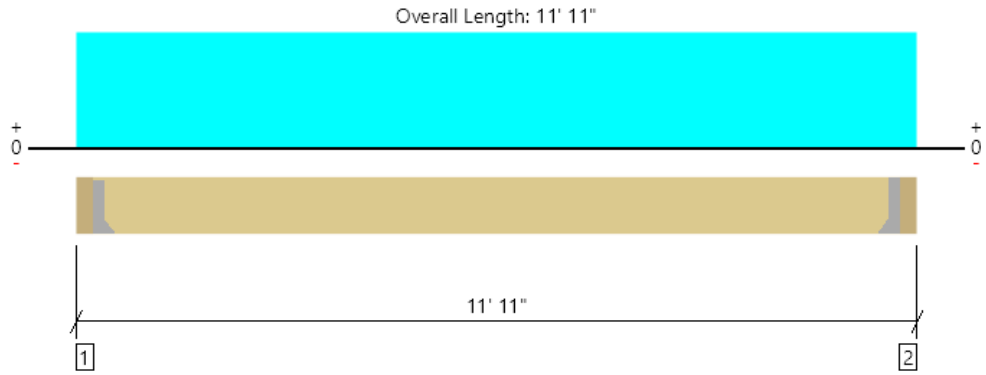
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, R4C

1 piece(s) 2 x 12 HF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	900 @ 4"	911 (1.50")	Passed (99%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	750 @ 1' 3 1/4"	1941	Passed (39%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2531 @ 5' 11 1/2"	2964	Passed (85%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.093 @ 5' 11 1/2"	0.375	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.249 @ 5' 11 1/2"	0.563	Passed (L/542)	--	1.0 D + 1.0 S (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Hanger on 11 1/4" HF beam	4.00"	Hanger[1]	1.50"	596	358	954	See note [1]
2 - Hanger on 11 1/4" HF beam	4.00"	Hanger[1]	1.50"	596	358	954	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)	3' 8" o/c	
Bottom Edge (Lu)	11' 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	LUS28	1.75"	N/A	6-10dx1.5	4-10d	
2 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	4-10d	

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 11' 11"	24"	50.0	30.0	Default Load

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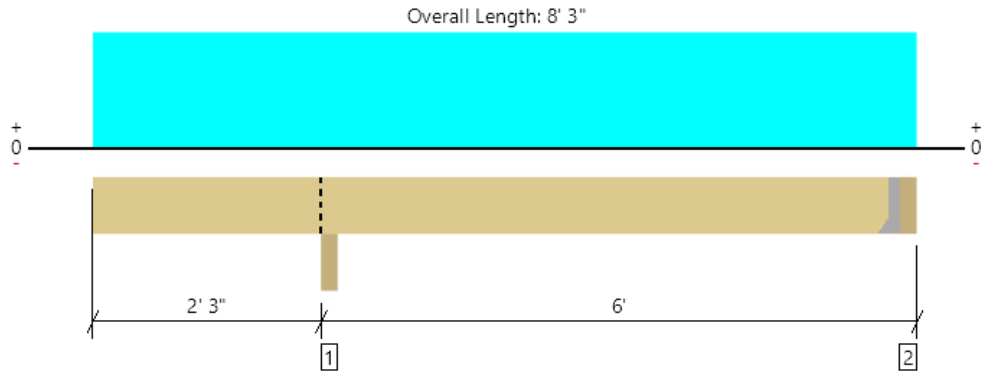
ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, R4D

1 piece(s) 2 x 12 HF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	371 @ 7' 11"	911 (1.50")	Passed (41%)	--	1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	348 @ 3' 6 1/4"	1941	Passed (18%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-467 @ 2' 5"	2964	Passed (16%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.004 @ 5' 3 3/8"	0.183	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.009 @ 5' 4 9/16"	0.275	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Overhang deflection criteria: LL (2L/360) and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Beam - HF	4.00"	4.00"	1.50"	570	342	912	Blocking
2 - Hanger on 11 1/4" HF beam	4.00"	Hanger[1]	1.50"	255	169	424	See note [1]

- 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)	7' 11" o/c	
Bottom Edge (Lu)	7' 11" 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
2 - Face Mount Hanger	LUS28	1.75"	N/A	6-10dx1.5	3-10d	

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 8' 3"	24"	50.0	30.0	Default Load

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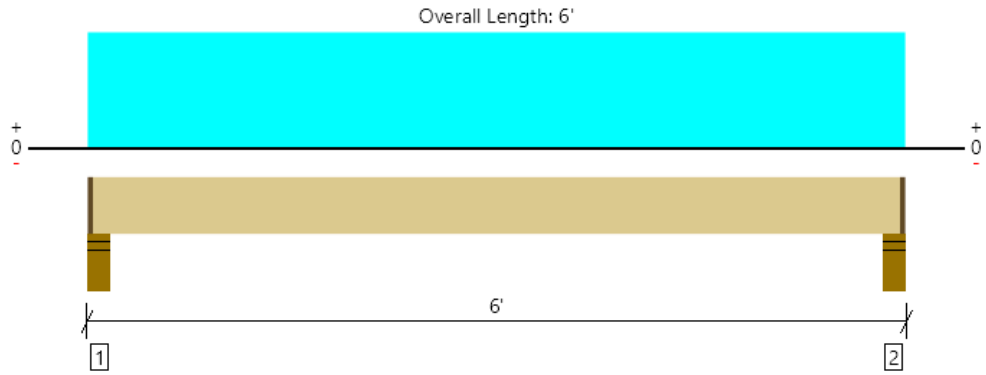
ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

UPPER FLOOR, R5

1 piece(s) 2 x 6 HF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	463 @ 4 1/2"	2582 (4.25")	Passed (18%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	333 @ 11"	949	Passed (35%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	551 @ 3'	921	Passed (60%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.038 @ 3'	0.131	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.101 @ 3'	0.262	Passed (L/623)	--	1.0 D + 1.0 S (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	5.50"	4.25"	1.50"	300	180	480	1 1/4" Rim Board
2 - Stud wall - HF	5.50"	4.25"	1.50"	300	180	480	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)	5' 10" o/c	
Bottom Edge (Lu)	5' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 6'	24"	50.0	30.0	Default Load

Weyerhaeuser Notes

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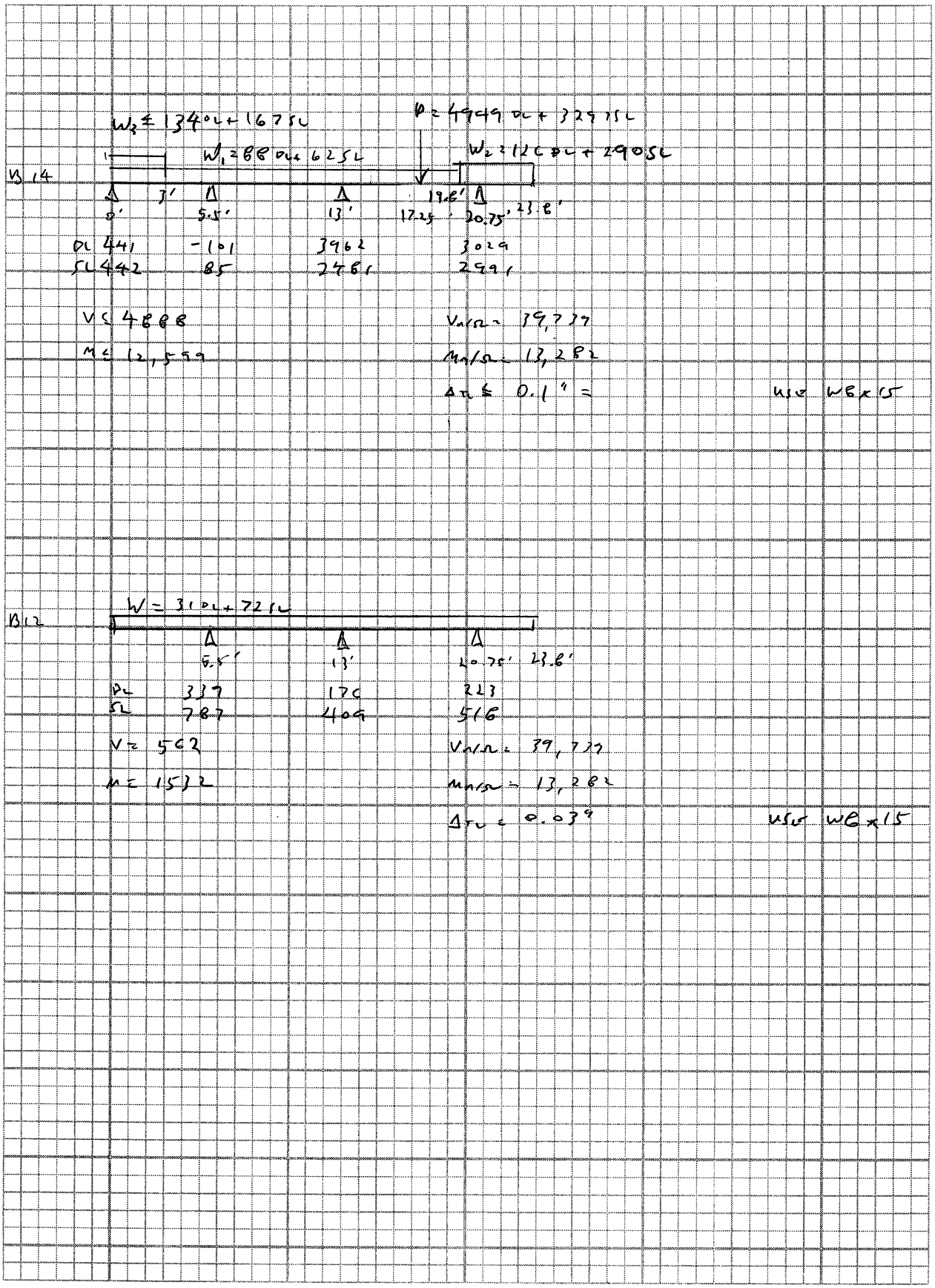
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

PROJECT: Date:



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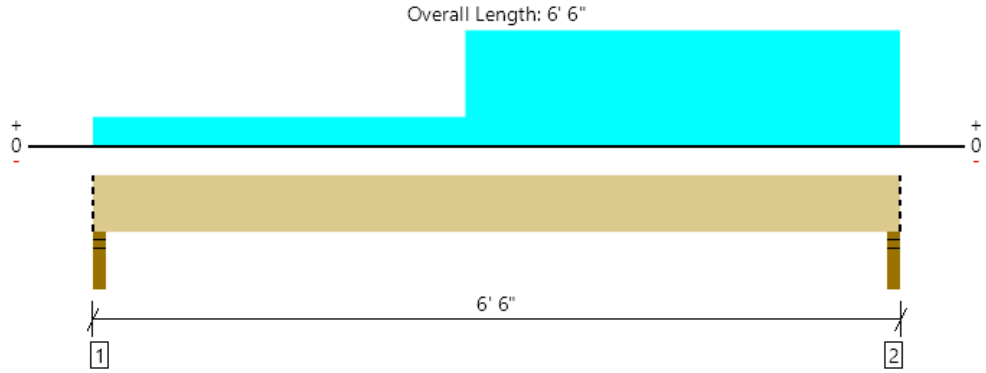
UPPER FLOOR, B16

1 piece(s) 4 x 8 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1698 @ 6' 4 1/2"	4253 (3.00")	Passed (40%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1172 @ 5' 7 3/4"	3502	Passed (33%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2135 @ 3' 8 7/8"	3438	Passed (62%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.037 @ 3' 4 1/4"	0.313	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.081 @ 3' 4 1/2"	0.417	Passed (L/931)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	460	473	933	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	938	760	1698	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)	6' 6" o/c	
Bottom Edge (Lu)	6' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	6.4	--	
1 - Uniform (PSF)	0 to 6' 6" (Front)	3' 3"	17.0	30.0	Default Load
2 - Uniform (PLF)	3' to 6' 6" (Front)	N/A	285.0	171.0	Linked from: R4C, Support 1

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ForteWEB Software Operator	Job Notes
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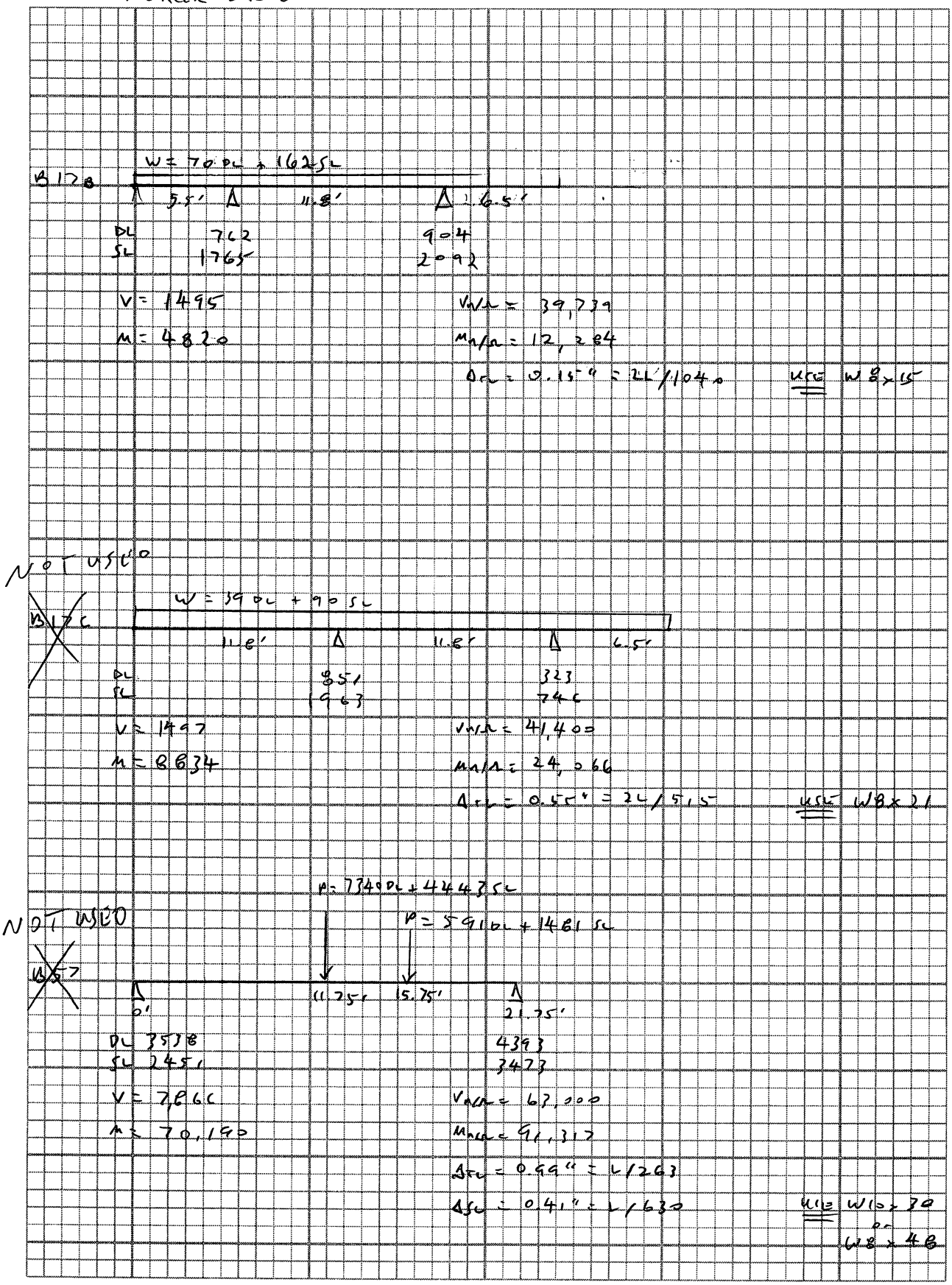
Weyerhaeuser

PROJECT: MERCER GROVE Date:



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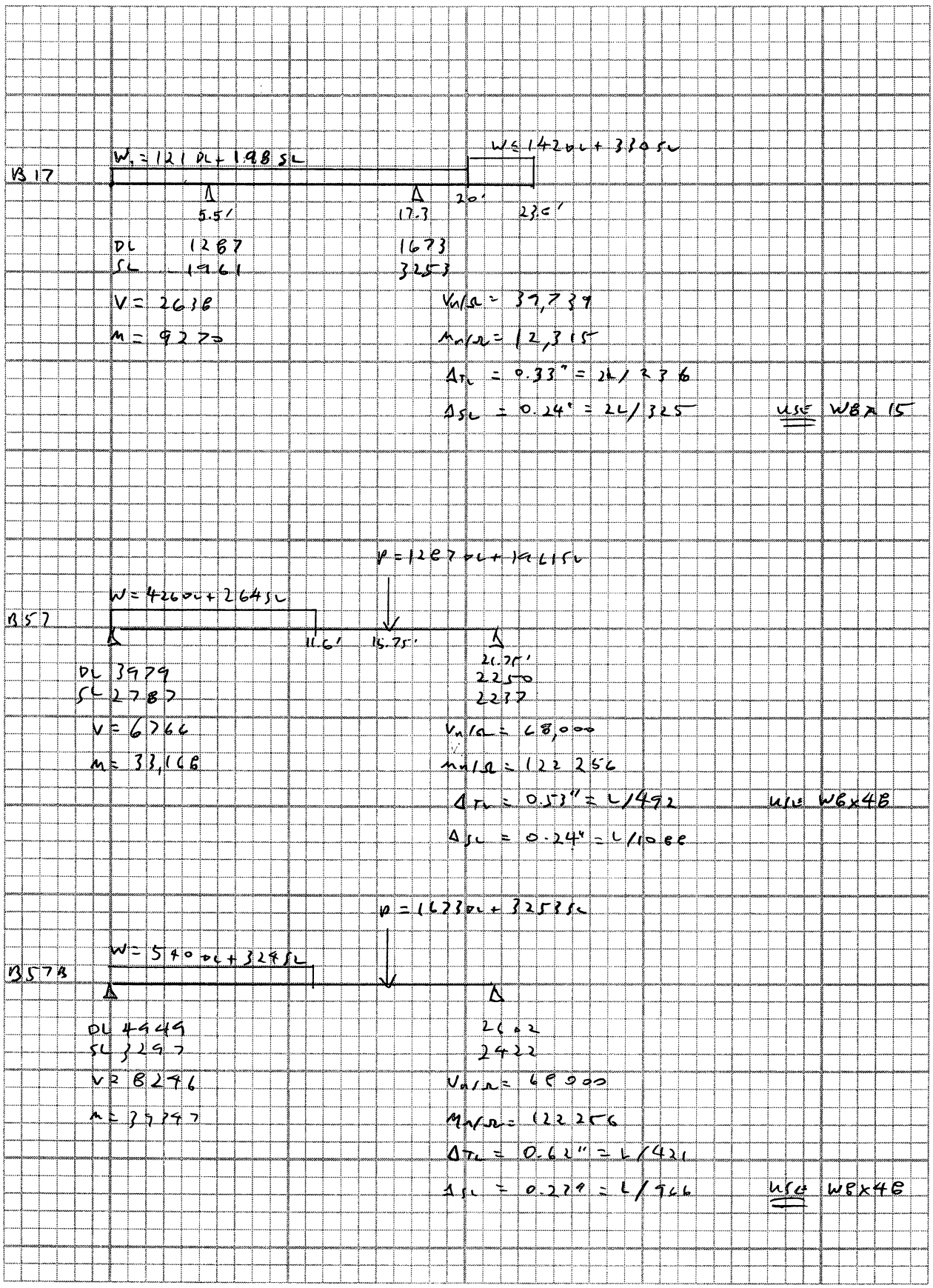
PROJECT: Date:



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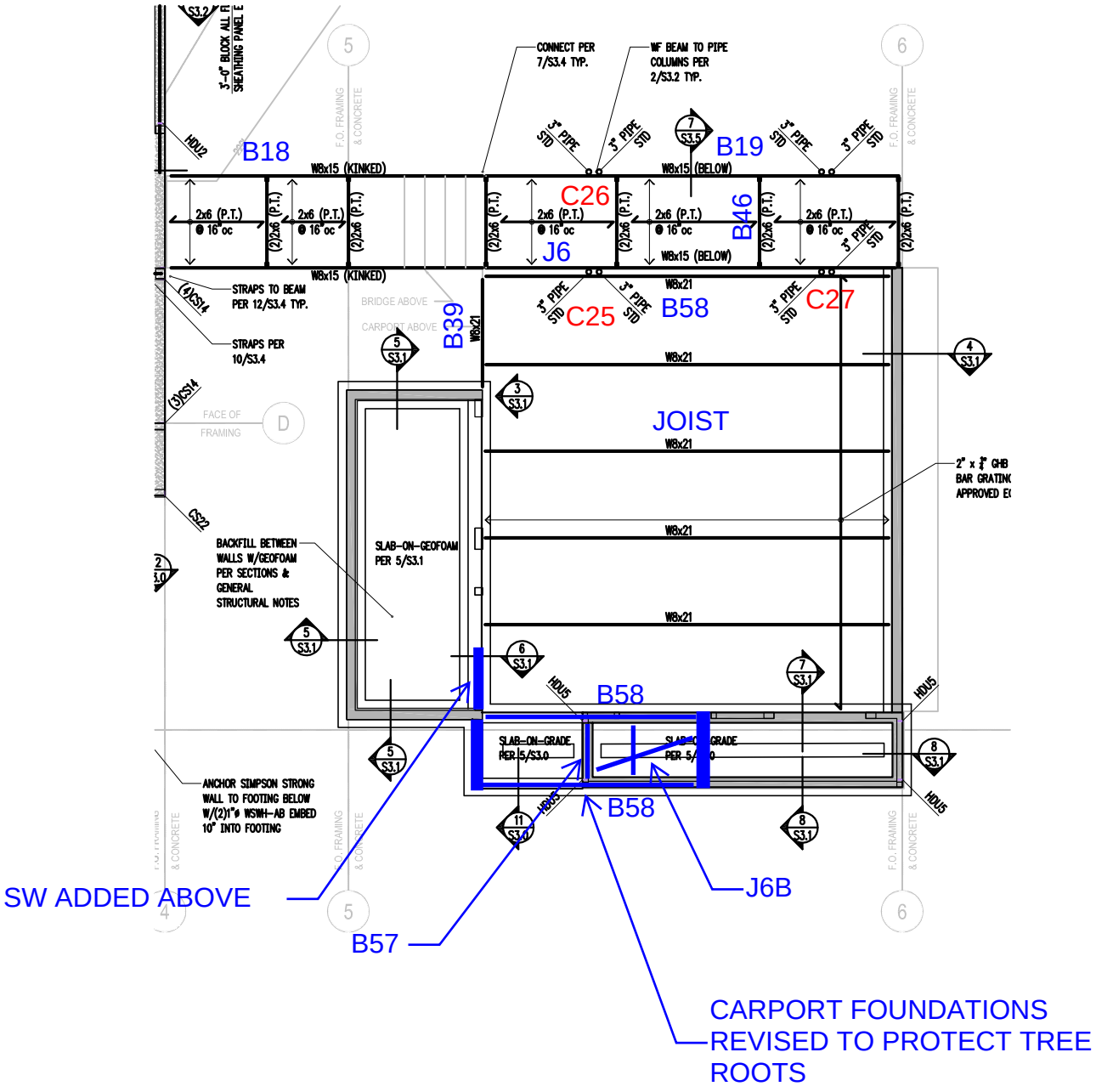
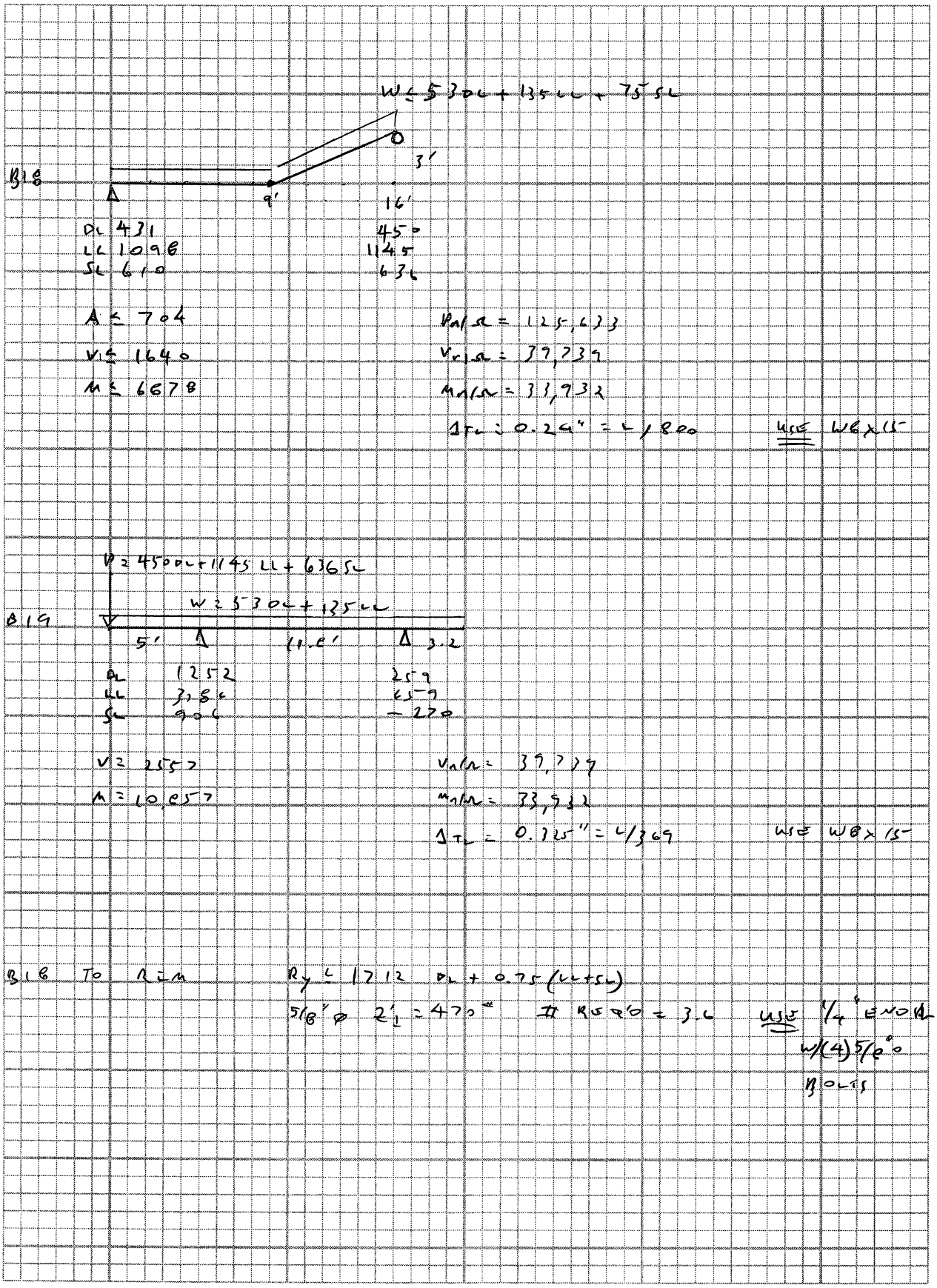

CONNECT PER 7/S3.4 TYP.
WF BEAM TO PIPE COLUMNS PER 2/S3.2 TYP.
B18
B19
C26
J6
B46
C25
B58
C27
B39
JOIST
STRAPS TO BEAM PER 12/S3.4 TYP.
STRAPS PER 10/S3.4
BRIDGE ABOVE
CARPORT ABOVE
FACE OF FRAMING
BACKFILL BETWEEN WALLS W/GEOFOAM PER SECTIONS & GENERAL STRUCTURAL NOTES
SLAB-ON-GEOFOAM PER 5/S3.1
SLAB-ON-GRADE PER 5/S3.0
ANCHOR SIMPSON STRONG WALL TO FOOTING BELOW W/(2)1"ø WSWH-AB EMBED 10" INTO FOOTING
SW ADDED ABOVE
B57
J6B
CARPORT FOUNDATIONS REVISED TO PROTECT TREE ROOTS

PROJECT: Date:



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PROJECT: MERCER GROVE Date:

GRATING FOR CANOPY

W ≤ 20 psf DL + 50 psf LL = 70 psf

C = 2000 lb LL

L ≤ 51"

USE 2" x ¾" 6#B McNichols Bar grating

CAPACITY: W = 898 Δ = 0.259

C = 2246 Δ = 0.207

L ≤ 60"

JOIST

W = 110.5 plf DL + 217 plf LL

20'

DL 1105

LL 2170

V = 3275

M = 16,175

V_n/Ω = 41,900

M_n/Ω = 50,898

Δ_{LL} = 0.35" = L/683

USE W8x21 @ 51" o.c.

BIG

W ≤ 380 DL + 1680 LL

21'

DL 379

LL 1680

V = 2079

M = 10,915

V_n/Ω = 32,243

M_n/Ω = 37,425

Δ_{LL} = 0.69" = L/365

USE W6x20 or W8x21

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PROJECT: MERCER GROVE Date:

P = 1105 DL + 2130 LL

B39

0' 2' 6.5'

DL 765 340

LL 1475 653

V = 2279

M = 4448

V_{nA} = 26,754

M_{nA} = 28948

Δ_{TL} = 0.02" = L/4337

USE W18x119

V = 340 DL + 2000 LL

W = 55.3 DL + 104.3 LL

B58

5.5' 11.5' 83

DL 1198 -481

LL 4202

V = 8227

M = 15,281

V_{nA} = 41,900

M_{nA} = 42,547

Δ_{TL} = 0.34" = L/388

USE W24x207

B39 TO CONC. WALL

R_y = 765 DL + 2000 LL

R_{yn} = 4118 e = 2.5"

M = R_{yn} e/12 = 8576 ft-lbs.

USE (4) 5/8" Ø x 5" TITEN HD

SEE SIMPSON STRONG-TIE ANALYSIS ATTACHED

B58 TO HSS COLUMNS

R_y = 1198 DL + 4202 LL = 5400

e = 5"

M = R_y e = 27,450

1/4" R x 6" M_{nA} = 43,870 USE 1/4" R x 6"

5/8" Ø r_{nv} = 36.80 W/(2) 5/8" Ø BOLTS

= ROOD = 1.5

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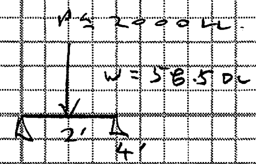
PROJECT: Date:

CARPORT LEDGER



DL 117
LL 1000

V = 1117

M = 2117

V_n/Ω = 12,934

M_n/Ω = 2665

Δ_{TL} = 0.09" = L/619

SEE SIMPSON STRONG-TIE ANALYSIS FOR ANCHOR BOLTS

USE L3 x 4 x 1/4 W/ 1/2" ⌀ BOLTS @ 48" o.c. MAX.

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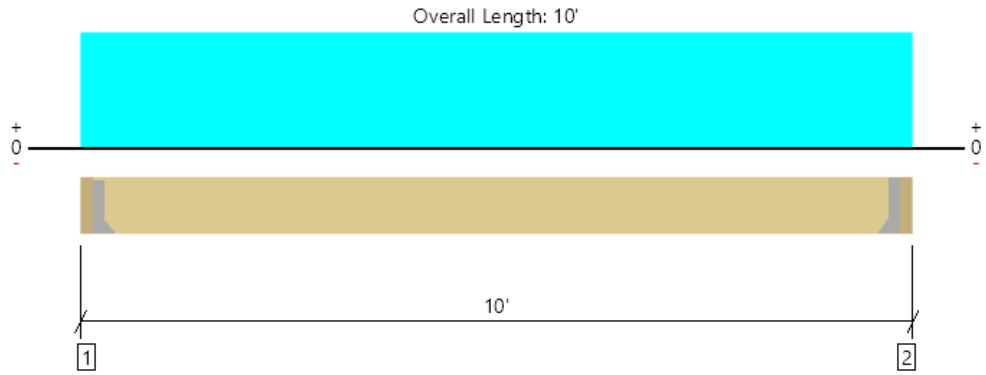
MAIN FLOOR, J6

1 piece(s) 2 x 8 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	456 @ 3"	911 (1.50")	Passed (50%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	398 @ 10 1/4"	1088	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1083 @ 5'	1284	Passed (84%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.237 @ 5'	0.237	Passed (L/482)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.284 @ 5'	0.475	Passed (L/401)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 7 1/4" HF beam	3.00"	Hanger[1]	1.50"	80	400	480	See note [1]
2 - Hanger on 7 1/4" HF beam	3.00"	Hanger[1]	1.50"	80	400	480	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)	9' 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 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	
2 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	

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

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 10'	16"	12.0	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

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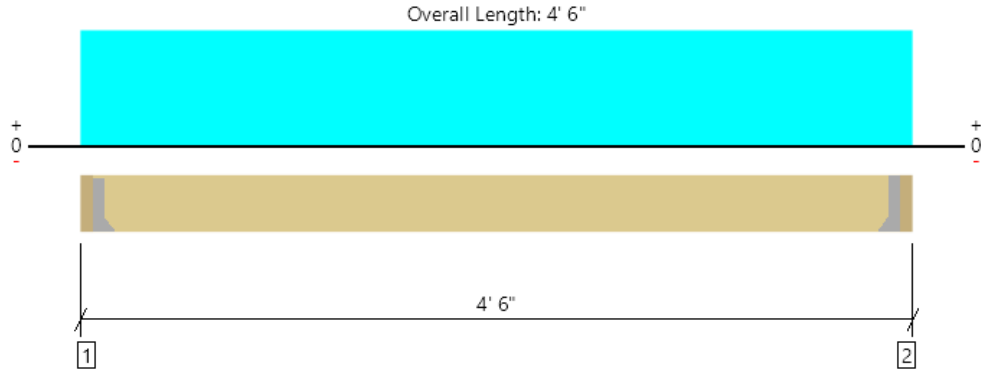
Weyerhaeuser

MAIN FLOOR, B46
2 piece(s) 2 x 6 DF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	988 @ 3"	2813 (1.50")	Passed (35%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	762 @ 8 1/2"	1980	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	988 @ 2' 3"	1475	Passed (67%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.036 @ 2' 3"	0.100	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.043 @ 2' 3"	0.200	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 5 1/2" HF beam	3.00"	Hanger[1]	1.50"	166	945	1111	See note [1]
2 - Hanger on 5 1/2" HF beam	3.00"	Hanger[1]	1.50"	166	945	1111	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)	4' o/c	
Bottom Edge (Lu)	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	HU26-2	2.50"	N/A	12-10dx1.5	6-10d	
2 - Face Mount Hanger	HU26-2	2.50"	N/A	12-10dx1.5	6-10d	

- 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)	3" to 4' 3"	N/A	4.2	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	7'	10.0	60.0	Default Load

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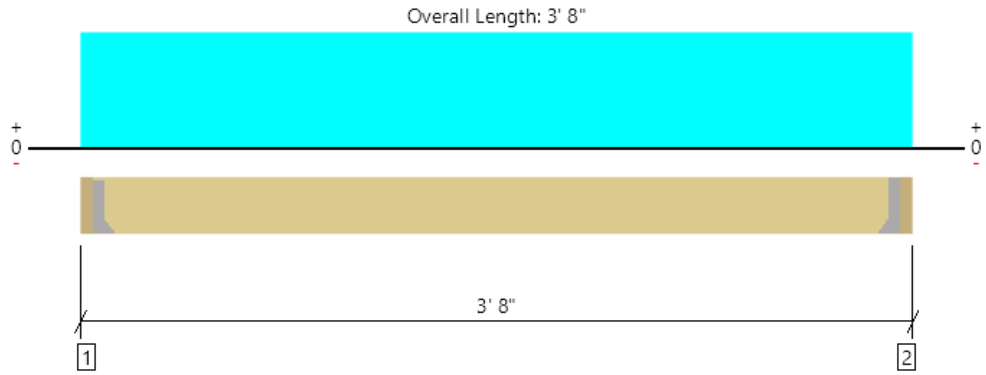
Weyerhaeuser

MAIN FLOOR, J6B

1 piece(s) 2 x 6 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	194 @ 3"	911 (1.50")	Passed (21%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	138 @ 8 1/2"	825	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	154 @ 1' 10"	801	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.004 @ 1' 10"	0.079	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.010 @ 1' 10"	0.158	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A	--	N/A

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2018
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 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 5 1/2" HF beam	3.00"	Hanger[1]	1.50"	127	98	225	See note [1]
2 - Hanger on 5 1/2" HF beam	3.00"	Hanger[1]	1.50"	127	98	225	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)	3' 2" o/c	
Bottom Edge (Lu)	3' 2" 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	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	
2 - Face Mount Hanger	LU26	1.50"	N/A	6-10dx1.5	4-10dx1.5	

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

Vertical Loads	Location (Side)	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 3' 8"	16"	12.0	40.0	Default Load
2 - Uniform (PSF)	0 to 3' 8"	16"	40.0	-	CONCRETE TOPPING

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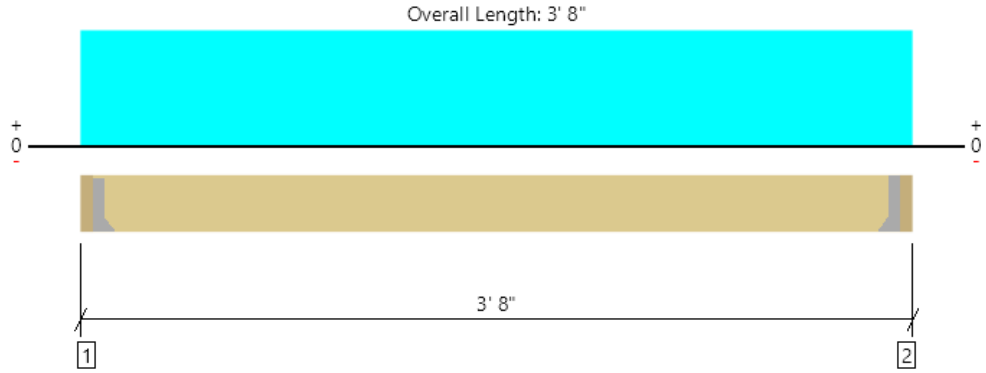
MAIN FLOOR, B57

2 piece(s) 2 x 6 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	246 @ 3"	1823 (1.50")	Passed (14%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	175 @ 8 1/2"	1650	Passed (11%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	195 @ 1' 10"	1393	Passed (14%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.001 @ 1' 10"	0.079	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.007 @ 1' 10"	0.158	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Total	
1 - Hanger on 5 1/2" HF beam	3.00"	Hanger[1]	1.50"	235	49	284	See note [1]
2 - Hanger on 5 1/2" HF beam	3.00"	Hanger[1]	1.50"	235	49	284	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)	3' 2" o/c	
Bottom Edge (Lu)	3' 2" 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	LUS26-2	2.00"	N/A	4-10dx1.5	3-10d	
2 - Face Mount Hanger	LUS26-2	2.00"	N/A	4-10dx1.5	3-10d	

- 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)	3" to 3' 5"	N/A	4.2	--	
1 - Uniform (PSF)	0 to 3' 8" (Front)	8"	12.0	40.0	Default Load
2 - Uniform (PSF)	0 to 3' 8" (Front)	8"	40.0	-	CONCRETE TOPPING
3 - Uniform (PSF)	0 to 3' 8" (Front)	9'	10.0	-	WALL

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC-ES under evaluation reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

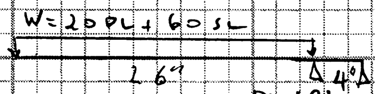
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

PROJECT: Date:

R96



DL 184 -141
SL 553 -423

V = 363 V_L = 1139

M = 187 M_r = 257

Δ_{LL} = 0.18" = L/288

USE 2x6 FLAT @24" o.c.
MAX SPACE o.c.

R96 to BEAM

0.22 x 3" SDWS W' = 151 (1.15) = 173#

REQ'D = 737/173 = 4.3 @ 24" o.c.

USE 2x6 @ 12" o.c. W/(3) 0.22 x 3" SDWS
AT EACH BEAM

P.O. BOX 28427
Seattle, Washington 98118-9998
tel. 206.356.9553

Company:		Date:	6/30/2021
Engineer:		Page:	1/5
Project:			
Address:			
Phone:			
E-mail:			

1.Project information

Customer company:
Customer contact name:
Customer e-mail:
Comment:

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

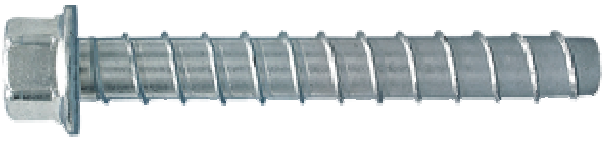
General
Design method:ACI 318-14
Units: Imperial units

Anchor Information:
Anchor type: Concrete screw
Material: Carbon Steel
Diameter (inch): 0.625
Nominal Embedment depth (inch): 4.000
Effective Embedment depth, h_{ef} (inch): 2.970
Code report: ICC-ES ESR-2713
Anchor category: 1
Anchor ductility: No
h_{min} (inch): 6.00
c_{ac} (inch): 4.50
C_{min} (inch): 1.75
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 6.00
State: Cracked
Compressive strength, f'_c (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: A tension, A shear
Supplemental reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: No
Ignore 6do requirement: Not applicable
Build-up grout pad: No

Base Plate
Length x Width x Thickness (inch): 7.50 x 6.00 x 0.25

Recommended Anchor
Anchor Name: Titen HD® - 5/8"Ø Titen HD, hnom:4" (102mm)
Code Report: ICC-ES ESR-2713

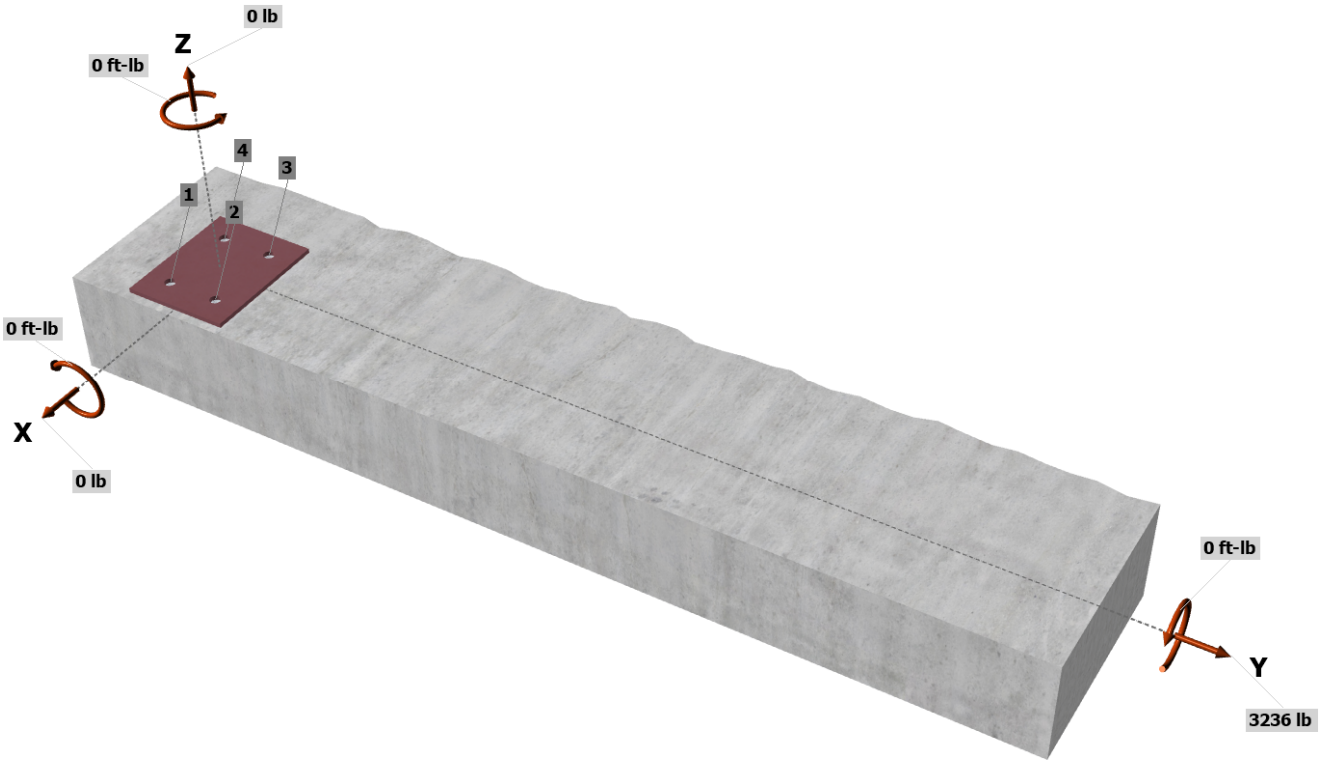


Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: U = 1.2(D + F) + 1.6(L) + 0.5(Lr or S or R)
Seismic design: No
Anchors subjected to sustained tension: Not applicable
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: No

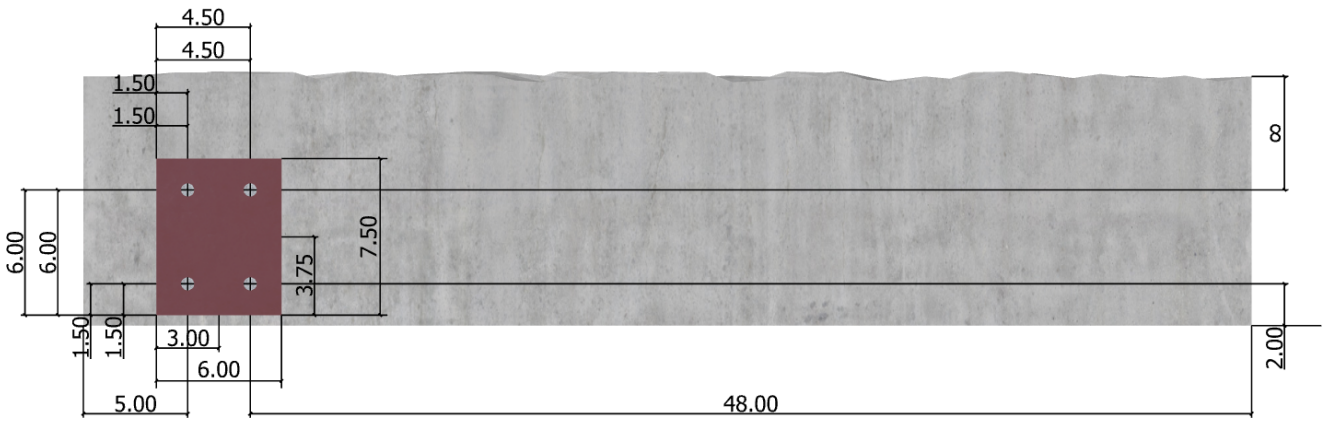
Service level loads:

	D	F	L	Lr/S/R	*Strength level loads*
N_a [lb]:	0	0	0	0	*0*
V_{ax} [lb]:	0	0	0	0	*0*
V_{ay} [lb]:	1114	0	1118	220	*3236*
M_x [ft-lb]:	0	0	0	0	*0*
M_y [ft-lb]:	0	0	0	0	*0*
M_z [ft-lb]:	0	0	0	0	*0*

<Figure 1>



<Figure 2>

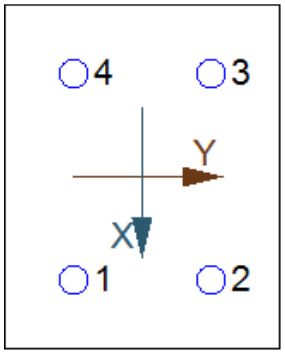


3. Resulting Anchor Forces

Anchor	Tension load, N_{ua} (lb)	Shear load x, V_{uax} (lb)	Shear load y, V_{uay} (lb)	Shear load combined, $\sqrt{(V_{uax})^2+(V_{uay})^2}$ (lb)
1	0.0	0.0	809.0	809.0
2	0.0	0.0	809.0	809.0
3	0.0	0.0	809.0	809.0
4	0.0	0.0	809.0	809.0
Sum	0.0	0.0	3236.0	3236.0

Maximum concrete compression strain (‰): 0.00
Maximum concrete compression stress (psi): 0
Resultant tension force (lb): 0
Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis, e'_{Vy} (inch): 0.00

<Figure 3>



8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
10000	1.0	0.60	6000

9. Concrete Breakout Strength of Anchor in Shear (Sec. 17.5.2)

Shear perpendicular to edge in y-direction:

$V_{by} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5}; 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
2.97	0.625	1.00	2500	51.00	137638

$\phi V_{cbgy} = \phi\,(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. 17.3.1 & Eq. 17.5.2.1b)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgy} (lb)
498.00	11704.50	1.000	0.708	1.000	3.571	137638	0.75	11101

Shear parallel to edge in x-direction:

$V_{by} = \min|7(l_e / d_a)^{0.2}\sqrt{d_a}\lambda_a\sqrt{f'_c}c_{a1}^{1.5}; 9\lambda_a\sqrt{f'_c}c_{a1}^{1.5}|$ (Eq. 17.5.2.2a & Eq. 17.5.2.2b)

l_e (in)	d_a (in)	λ_a	f'_c (psi)	c_{a1} (in)	V_{by} (lb)
2.97	0.625	1.00	2500	2.00	1069

$\phi V_{cbgx} = \phi\ (2)(A_{Vc} / A_{Vco})\Psi_{ec,V}\Psi_{ed,V}\Psi_{c,V}\Psi_{h,V}V_{by}$ (Sec. 17.3.1, 17.5.2.1(c) & Eq. 17.5.2.1b)

A_{Vc} (in²)	A_{Vco} (in²)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
27.00	18.00	1.000	1.000	1.000	1.000	1069	0.75	2405

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.5.3)

$\phi V_{cpg} = \phi k_{cp} N_{cbg} = \phi k_{cp} (A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.3.1 & Eq. 17.5.3.1b)

k_{cp}	A_{Nc} (in^2)	A_{Nco} (in^2)	$\Psi_{ec,N}$	$\Psi_{ed,N}$	$\Psi_{c,N}$	$\Psi_{cp,N}$	N_b (lb)	ϕ	ϕV_{cpg} (lb)
2.0	130.47	79.39	1.000	0.835	1.000	1.000	4351	0.70	8355

11. Results

11. Interaction of Tensile and Shear Forces (Sec. D.7)?

Shear	Factored Load, V_{ua} (lb)	Design Strength, øV_n (lb)	Ratio	Status
Steel	809	6000	0.13	Pass
T Concrete breakout y+	**3236**	**11101**	**0.29**	**Pass (Governs)**
|| Concrete breakout x+	**1618**	**2405**	**0.67**	**Pass (Governs)**
Pryout	3236	8355	0.39	Pass

5/8"Ø Titen HD, hnom:4" (102mm) meets the selected design criteria.

12. Warnings

- Designer must exercise own judgement to determine if this design is suitable.

- Refer to manufacturer's product literature for hole cleaning and installation instructions.

COLUMN DESIGN - AXIAL

This worksheet to be used to design columns under axial loading per NDS sections 3.6 & 3.7.
Material properties shown are per general structural notes and NDS
Steel columns shown are per AISC table 4

Pmax: design axial load
l: height
b: braced length
d: un-braced length
P⊥ : Allowble ⊥ to grain capacity
Pn: Allowble || to grain capacity

Materials List

Type	Spec.	size	$E_{min\ x10^6}$ (psi)	Fc (psi)	Fb (psi)
1	HF#2	2"-4"	0.47	1300	820
2	HF#1	5x5 ≤	0.47	850	975
3	DF#1	2"-4"	0.62	1500	1000
4	DF#1	5x5 ≤	0.58	925	1350
5	CE	2"-4"	0.33	650	700
6	PSL		1.03	2900	2900

	Loads						Dimensions					Material Properties												Axial	Plate Crushing			
MARK	DL (lbs)	LL (lbs)	SL (lbs)	$E_{vert.}$ (lbs)	$W_{vert.}$ (lbs)	Pmax (k)	l (ft.)	b (in.)	d (in.)	Le/d		Type #	$E_{min\ x10^6}$ (psi)	Fc (psi)	Fb (psi)	c	Kf	Cd	C other	FcE (psi)	F*c (psi)	F'c (psi)	Cp	P_n (k)	$Fc^{\perp}$ (psi)	$P^{\perp}$ (k)		Use
SECOND FLOOR																												
C1	1860	0	1097	0	0	3.0	9.5	3.00	5.5	20.7	ok	1	0.47	1300	820	0.80	1	1	1	899	1300	720	0.55	11.88	625	10.31	OK	(2)2x6
C2	6921	0	4605	0	0	11.5	9.5	5.50	5.5	20.7	ok	1	0.47	1300	820	0.80	1	1	1	899	1300	720	0.55	21.79	625	18.91	OK	6x6
C3	3703	0	3215	0	0	6.9	9.5	9.00	3.5																625	19.69	OK	HSS 3x3x3/16
C4	2581	0	1883	0	0	4.5	9.5	3.50	5.5	20.7	ok	3	0.62	1500	1000	0.80	1	1	1	1186	1500	908	0.61	17.48	625	12.03	OK	4x6
C4B	8395	2509	5171	0	0	14.2	9.5	9.25	3.5	32.6	ok	3	0.62	1500	1000	0.80	1	1.15	1	480	1725	449	0.26	14.53	625	20.23	OK	4x10
C5	7036	6495	4929	0	0	15.6	9.5	5.50	5.5	20.7	ok	4	0.58	925	1350	0.80	1	1	1	1110	925	694	0.75	20.98	625	18.91	OK	HSS 3x3x3/16
C6	8412	6765	5526	0	0	17.6	9.5	5.50	5.5	20.7	ok	4	0.58	925	1350	0.80	1	1	1	1110	925	694	0.75	20.98	625	18.91	OK	6x6
C6B	3680	2674	2425	0	0	7.5	9.5	4.50	5.5	20.7	ok	1	0.47	1300	820	0.80	1	1	1	899	1300	720	0.55	17.83	625	15.47	OK	6x6
C7	795	0	811	0	0	1.6	9.5	3.50	3.5	32.6	ok	1	0.47	1300	820	0.80	1	1	1	364	1300	340	0.26	4.17	625	7.66	OK	4x4
C8	4873	0	3991	0	0	8.9	9.5	6.00	5.0																625	18.75	OK	3" PIPE CAP = 25.4K
C9	7576	1676	5849	0	0	13.4	9.5	9.00	3.0																625	16.88	OK	HSS 2.5x2.5x3/16 CAP =14.1K
CARPORT RF																												
C10	2103	1449	1778	0	0	4.5	9.5	3.00	5.5	20.7	ok	1	0.47	1300	820	0.80	1	1	1	899	1300	720	0.55	11.88	625	10.31	OK	(2)2x6
C11	3299	2187	2332	0	0	6.7	9.5	4.50	5.5	20.7	ok	1	0.47	1300	820	0.80	1	1	1	899	1300	720	0.55	17.83	625	15.47	OK	(2)2x6
C12	3012	0	4002	0	0	7.0	9.5																					3" PIPE CAP = 25.4K
C13	452	0	1046	0	0	1.5	9.5																					3" PIPE CAP = 25.4K
C14	3506	0	4514	0	0	8.0	9.5																					3" PIPE CAP = 25.4K
CARPORT FLR.																												
C26	1704	3186	1952	0	0	5.6	2.0																					3" PIPE CAP = 25.4K
C25	5462	7478	4908	0	0	14.8	2.0																					3" PIPE CAP = 25.4K
C27	3848	2659	4514	0	0	9.2	2.0																					3" PIPE CAP = 25.4K
FIRST FLOOR																												
C15	10496	4252	3149	0	0	16.0	14.0																					4" PIPE CAP = 33.2K
C16	17865	12215	8080	0	0	33.1	14.0																					4" PIPE CAP = 33.2K
C17	9183	4973	4903	0	0	16.6	14.0																					4" PIPE CAP = 33.2K
C18	10201	11169	5318	0	0	22.6	8.5																					HSS 3x3x3/16 CAP = 24 K
C19	3437	5005	527	0	0	8.4	8.5																					HSS 3x3x3/16 CAP = 24 K
C20	6364	6664	3537	0	0	14.0	8.5	3.50	7.3	14.1	ok	1	0.47	1300	820	0.80	1	1	1	1952	1300	1053	0.81	26.72	625	15.86	OK	4x8
C21	12345	10027	6599	0	0	24.8	8.5																					3" PIPE CAP = 25.4K
C22	6716	4089	3991	0	0	12.8	8.5																					3" PIPE CAP = 25.4K
C23	10010	9198	5526	0	0	21.1	8.5	7.25	5.5	18.5	ok	4	0.58	925	1350	0.80	1	1	1	1386	925	749	0.81	29.86	625	24.92	OK	6x8
C24	11506	1291	2609	0	0	14.4	8.5																					CONC. WALL

P.O. BOX 28427
Seattle, Washington 98118-9998
tel. 206 356 9553

SECTION 3: LATERAL

> diaphragm & shearwall capacities
> horizontal force distribution & key plans
> shearwall design
> seismic & wind worksheets
> beams supporting SW overturning
> misc. calculations

P.O. BOX 28427
Seattle, Washington 98118-9998
tel. 206 356 9553

Diaphragm & Shearwall Capacities

The following capacities are used for plywood shearwalls & diaphragms.
Reference NDS table 4.2A & 4.2C for plywood diaphragm capacities.
Reference NDS table 4.3A for plywood shearwall capacities.
U.N.O. Sheathing material is Wood Structural Panels-Sheathing.
U.N.O. Hem-Fir used for supporting studs, Rafters & Joists calculations
$\Phi = 0.8$
$\Omega = 2.5$

Type	Sheathing	Fastener	Pen. (in)	spacing	spacing at blocking	$\Phi\ v'_{s,seismic}$	$\Phi\ v'_{s,wind}$
Typical Roof	0.47	8d Common	2.03125	6"oc	n/a	267.8	375.7
Typ. Blocked Roof	0.47	8d Common	2.03125	6"oc	6"oc	401.8	561.7
Typical Floor	0.72	8d Common	1.78125	6"oc	n/a	267.8	375.7
Typ. Blocked Floor	0.72	8d Common	1.78125	6"oc	6"oc	401.8	561.7
Med. Blocked Floor	0.72	8d Common	1.78125	4"oc	4"oc	535.7	751.4
Max. Blocked Floor	0.72	8d Common	1.78125	2.5"oc	2.5"oc	788.6	1104.8

Shearwall Callout	sheathing	Fastener	Pen. (in)	spacing	Studs	$v'_{s,seismic} / \Omega$	$v'_{s,wind} / \Omega$
SW1	15/32"	8d Common	2	6"oc	2x Hem-fir	241.8	339.5
SW2	15/32"	8d Common	2	4"oc	2x Hem-fir	353.4	495.2
SW3	15/32"	8d Common	2	3"oc	2x Hem-fir	455.7	637.1
SW4	15/32"	8d Common	2	2"oc	3x Doug-Fir	675.0	945.0
SW5	15/32" 2-Sides	8d Common	2	3"oc	3x Doug-Fir	911.4	1274.1
SW6	15/32" 2-Sides	10d Common	2	2"oc	3x Doug-Fir	1540.0	2155.0

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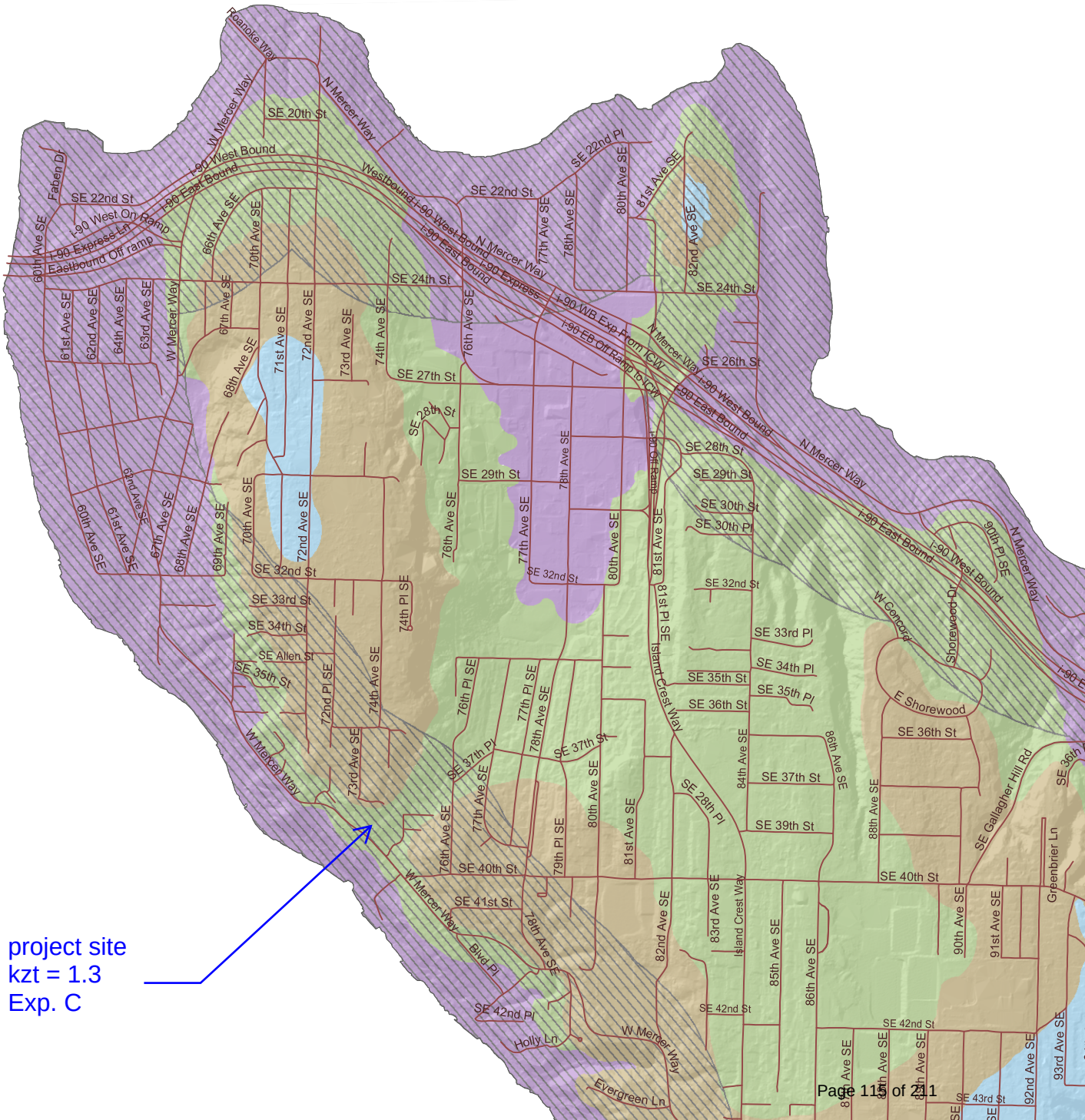
Seattle, Washington 98118-9998
tel. 206 356 9553

Mercer Island Wind Exposu
and Wind Speed-Up (Topographic

by Development Services Group (DSG), City of Mercer Island
April 2009



Hazards by Location

Search Information

Coordinates: 47.576, -122.241

Elevation: 197 ft

Timestamp: 2021-06-02T17:47:41.173Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D

Basic Parameters

Name	Value	Description
S_S	1.418	MCE_R ground motion (period=0.2s)
S_1	0.493	MCE_R ground motion (period=1.0s)
S_{MS}	1.418	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.945	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.902	Coefficient of risk (0.2s)
CR_1	0.897	Coefficient of risk (1.0s)
PGA	0.607	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.668	Site modified peak ground acceleration
T_L	6	Long-period transition period (s)

SsRT	1.418	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.572	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.518	Factored deterministic acceleration value (0.2s)
S1RT	0.493	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.55	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.412	Factored deterministic acceleration value (1.0s)
PGAd	1.202	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

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

Disclaimer

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

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Hazards by Location

Search Information

Coordinates: 47.576, -122.241

Elevation: 197 ft

Timestamp: 2021-06-02T17:55:58.613Z

Hazard Type: Wind

ASCE 7-16

MRI 10-Year	67 mph
MRI 25-Year	73 mph
MRI 50-Year	78 mph
MRI 100-Year	83 mph
Risk Category I	92 mph
Risk Category II	97 mph
Risk Category III	104 mph
Risk Category IV	108 mph

ASCE 7-10

MRI 10-Year	72 mph
MRI 25-Year	79 mph
MRI 50-Year	85 mph
MRI 100-Year	91 mph
Risk Category I	100 mph
Risk Category II	110 mph
Risk Category III-IV	115 mph

ASCE 7-05

ASCE 7-05 Wind Speed	85 mph

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

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.

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this website does not imply approval by the governing building code bodies responsible for building code approval and interpretation for the building site described by latitude/longitude location in the report.

SEISMIC DESIGN - HOUSE

ASCE 7-16
Equivalent Lateral Force Procedure

Occupancy Category	II		Table 1-1
Seismic Design Category	D		Table 11.6-1
Importance Factor	1.00		Table 11.5-1
Site Class	D		Table 20.3-1
S_S	141.80	%g	(from USGS Seismic Hazard Curves, 2008 data)
S_1	49.30	%g	(from USGS Seismic Hazard Curves, 2008 data)
F_a	1.00		Table 11.4-1
F_v	1.81		Table 11.4-2
C_t	0.02		Table 12.8-2
x	0.75		Table 12.8-2
h_n	30.25	feet	(height to highest level)

$S_{MS} = Fa*Ss$	1.4180		Eq. 11.4-1
$S_{M1} = Fv*S1$	0.8923		Eq. 11.4-2
$S_{DS} = (2/3)*S_{MS}$	0.9453	g	Eq. 11.4-3
$S_{D1} = (2/3)*S_{M1}$	0.5949	g	Eq. 11.4-4
Period $T_a = C_t*h_n\text{^}x$	0.2580	s	Eq. 12.8-7
T_o	0.1259	s	per section 11.4.6
T_S	0.6293	s	per section 11.4.6
S_a	0.9453	g	per section 11.4.6

R	6.5	Table 12.2-1
Ωo	2.5	Table 12.2-1
C_d	4	Table 12.2-1
Analysis type okay	Yes	Table 12.6-1

Equivalent Lateral Force Procedure (section 12.8)

Cs	0.1454		Eq. 12.8-2
W, weight	127,801	lb	per table below
V	18,587	lb	Eq. 12.8-1

Vertical Force Distribution (section 12.8.3)
k = 1.00

Level	Hx (ft)	Area (ft2)	Wt. (psf)	Wt. (k)	Wall allow (psf)	Wall Wt. (k)	Total Wt. (k)	WxHx (k-ft)	Cvx (%)	(LRFD) V (k)
roof	30.25	1051	15	15.8	5	5.3	21.0	635.9	25.6	4.75
2nd flr.	21.00	2846	15	42.7	10	28.5	71.1	1494.0	60.1	11.17
1st floor	10.00	1782	15	26.7	5	8.9	35.6	356.4	14.3	2.66
							127.8	2486.2	100.0	18.6

Diaphragm Force per 12.10-1

Level	Fi	Σ Fi	Wi	Σ Wi	Fpx	min.	max.	**Fpx**	Fpx/V
roof	4.75	4.75	21.0	21.0	**4.75**	3.97	7.95	4.75	1.00
2nd flr.	11.17	11.17	71.1	71.1	**11.17**	13.45	26.90	13.45	1.20
1st floor	2.66	7.42	35.6	56.7	**4.67**	6.74	13.48	6.74	2.53

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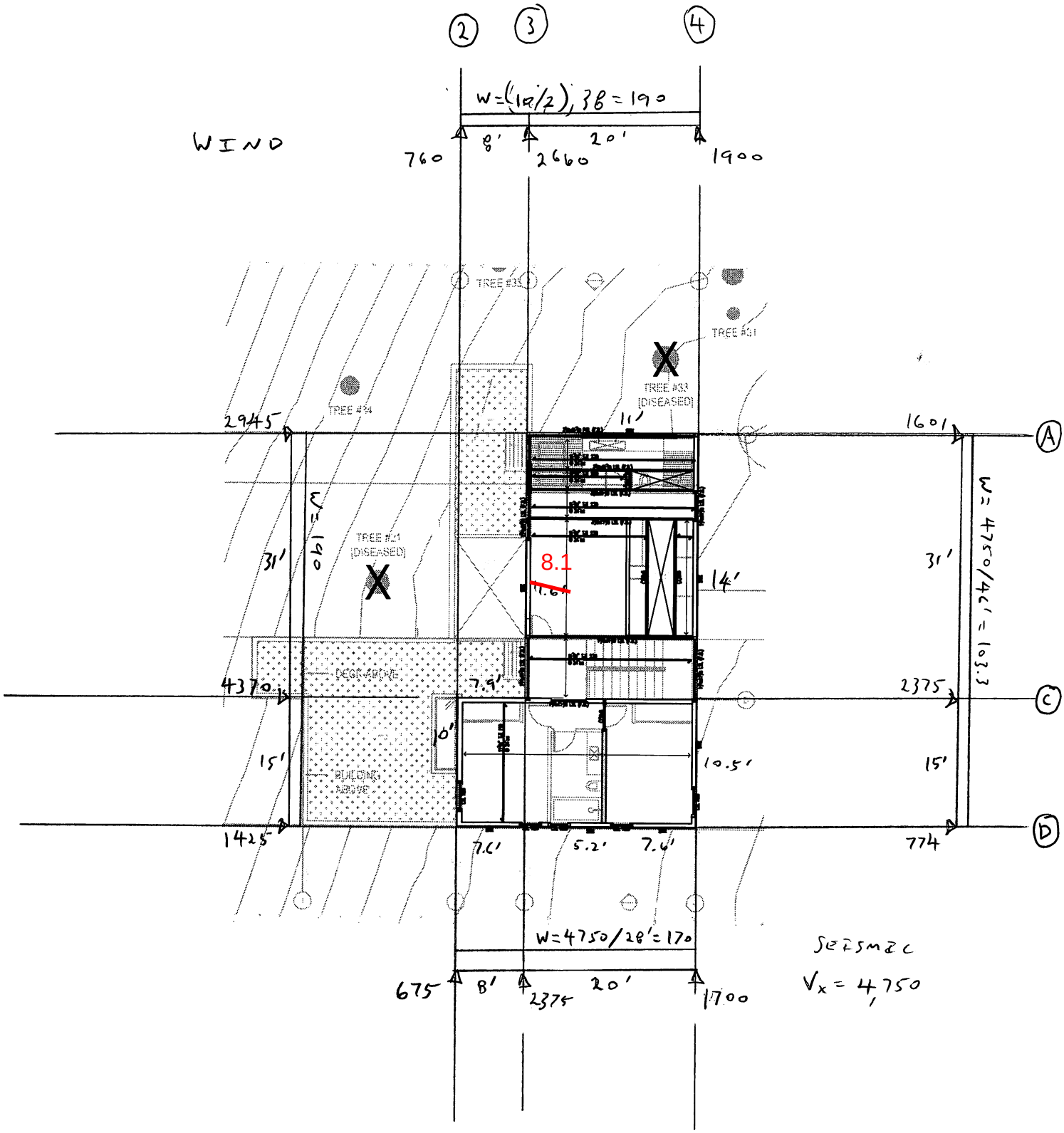
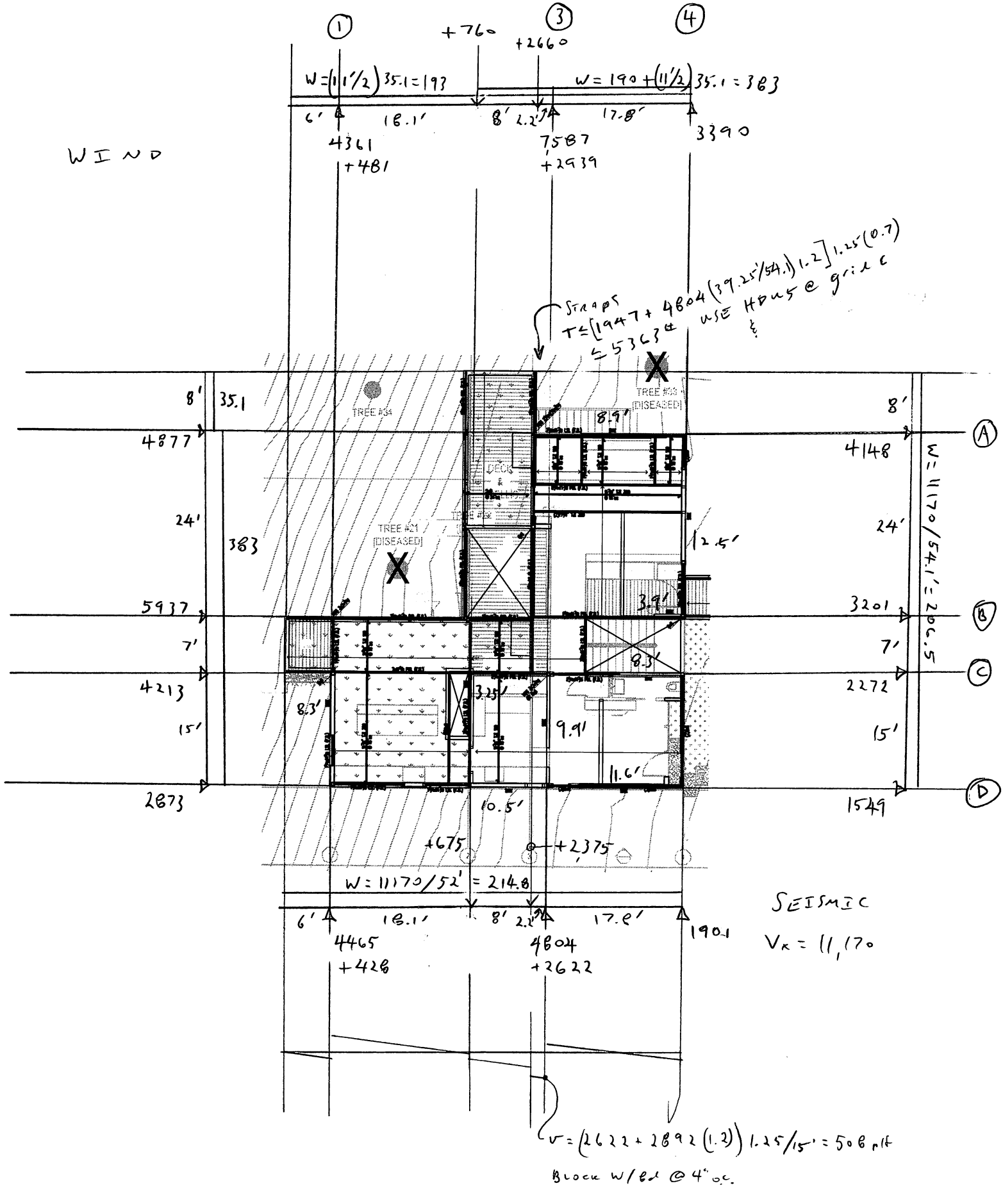
WATER ROOF

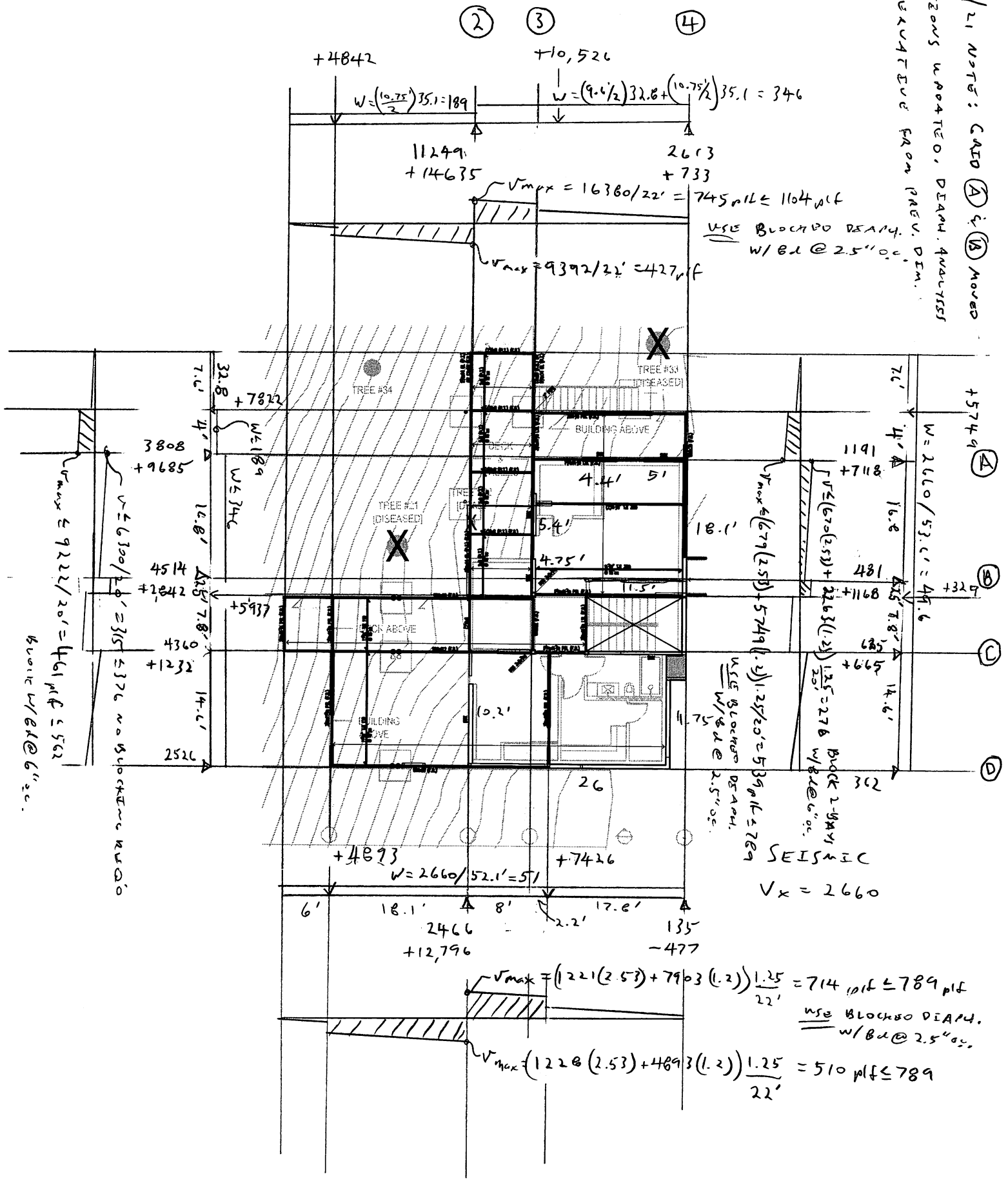

2
3
4
W=(18/2), 38=190
WIND
760
8'
2660
20'
1900
TREE #35
TREE #31
TREE #33
[DISEASED]
TREE #34
2945
11'
1601
A
W=190
TREE #32
[DISEASED]
31'
8.1
14'
31'
W=4750/40'=103.3
4370
7.9'
2375
C
10'
15'
10.5'
15'
BUILDING ABOVE
1425
7.0'
5.2'
7.6'
774
D
W=4750/28'=170
675
8'
2375
20'
1700
Seismic
Vx = 4,750

2nd floor


WIND
W=(11 1/2) 35.1 = 193
W = 190 + (11 1/2) 35.1 = 383
+760
+2660
6' 18.1' 8' 2.2' 17.8'
4361
+481
7587
+2939
3390
STRAPS
T = [1947 + 4804 (39.25'/54.1') 1.2] 1.25 (0.7)
= 5363 #
USE HDU5 @ grid C
&
TREE #34
TREE #33 [DISEASED]
TREE #21 [DISEASED]
DECK
8'
35.1
4877
24'
383
5937
7'
4213
15'
2873
8.9'
12.5'
3.9'
8.3'
3.25'
9.9'
11.6'
10.5'
4148
3201
2272
1549
A
B
C
D
W = 11170/54.1' = 206.5
+675
+2375
W = 11170/52' = 214.8
6' 18.1' 8' 2.8' 17.8'
4465
+428
4804
+2622
1901
SEISMIC
V = 11,170
V = (2622 + 2892 (1.2)) 1.25/15' = 508 plf
Block w/ bol @ 4" o.c.

FIRST FLOOR

10/13/21 NOTE: CALCS (A) & (B) MOVED REACTIONS UPDATED, DIAPH. ANALYSES CONSERVATIVE FROM PREV. DIM.



Lateral Force Distribution & Plywood Shearwall Design

SEISMIC

Wall DL (psf) = 10
floor DL (psf) = 12
Roof DL (psf) = 15
S_{DS} = 0.94

SWx = Shearwall per 8/S3.1
P_X = Point Load From Header (DL)
E = Earthquake
W = Wind

Notes:
Wind and Seismic Loads input as LRFD then converted to ASD for v & O.T.
Basic Load Combinations Per ASCE 7-16 (Basic Combinations for ASD)
Base Shear Comparison Shown Below Shearwall Groups
* In lieu of reducing SW capacity, v(max) will be divided by 2w/l for SW sizing

ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

ROOF	E	UNFACTORED		SW	L	h	V/ΣL	Aspect		v(max)*	SW	O.T.	O.T.	DL Trib. Length(ft)			DL max	P_{left}	P_{right}	T_L	T_R	Holdown		C_{LL} (k)	C1	C2	MIN. POST	
GRID	V	V_{above}	V_{total} (K)	MARK	(ft)	(ft)	(klf)	Ratio	ρ	ASD(klf)		above	MAX.(k)	wall	floor	roof	(k)	(k)	(k)	(k)	(k)	L/R		< =	(k)	(k)	L/R	
2	0.68	0.00	0.68	A	10.0	8.0	0.1	0.80	1.3	0.061	SW1	0.0	0.49	8	0	1	0.48	0.0	0.0	0.27	0.27	CS22	CS22	0.00	1.50	1.50	(2)2x6	(2)2x6
3	2.38	0.00	2.38	A	8.1	8.0	0.3	0.99	1.3	0.267	SW2	0.0	2.13	8	0	6	0.68	0.7	0.7	1.51	1.50	CS16	CS16	1.03	3.48	3.48	(2)2x6	(2)2x6
4	1.70	0.00	1.70	A	10.5	8.0	0.1	0.76	1.3	0.063	SW1	0.0	0.51	8	0	1	0.50	0.0	0.7	0.27	-0.04	CS22	CS22	0.00	1.52	1.60	(2)2x6	(2)2x6
				A	14.0	8.0	0.1	0.57	1.3	0.063	SW1	0.0	0.51	8	0	1	0.67	0.7	1.1	-0.12	-0.34	CS22	CS22	1.68	2.74	2.80	(2)2x6	(2)2x6
TOTAL	4.75	0.00	4.75																									
A	0.77	0.00	0.77	1	11.0	8.0	0.1	0.73	1.3	0.064	SW1	0.0	0.51	8	0	0	0.44	1.0	0.0	-0.15	0.32	CS22	CS22	1.35	2.53	2.40	(2)2x6	(2)2x6
C	2.38	0.00	2.38	1	7.9	8.0	0.3	1.01	1.3	0.274	SW2	0.0	2.19	8	0	8	0.76	0.0	0.7	1.83	1.52	CS14	CS14	1.13	3.51	3.60	(2)2x6	(2)2x6
D	1.60	0.00	1.60	1	7.6	8.0	0.1	1.05	1.3	0.071	SW1	0.0	0.57	8	0	8	0.73	0.0	0.2	0.23	0.15	CS22	CS22	0.28	1.66	1.69	(2)2x6	(2)2x6
				2	5.2	8.0	0.1	1.54	1.3	0.071	SW1	0.0	0.57	8	0	8	0.52	0.2	0.2	0.25	0.25	CS22	CS22	0.28	1.69	1.69	(2)2x6	(2)2x6
				3	7.6	8.0	0.1	1.05	1.3	0.071	SW1	0.0	0.57	8	0	8	0.76	0.2	0.0	0.14	0.22	CS22	CS22	0.28	1.69	1.67	(2)2x6	(2)2x6
TOTAL	4.75	0.00	4.75																									

ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

2ND FLR.	E	UNFACTORED		SW	L	h	V/ΣL	Aspect		v(max)*	SW	O.T.	O.T.	DL Trib. Length(ft)			DL max	P_{left}	P_{right}	T_L	T_R	Holdown		C_{LL} (k)	C1	C2	MIN. POST	
GRID	V	V_{above}	V_{total} (K)	MARK	(ft)	(ft)	(klf)	Ratio	ρ	ASD(klf)		above	MAX.(k)	wall	floor	roof	(k)	(k)	(k)	(k)	(k)	L/R		< =	(k)	(k)	L/R	
1	4.47	0.43	4.89	A	8.3	10.0	0.6	1.20	1.3	0.536	SW5	0.0	5.36	10	0	1	0.48	0.1	6.9	5.08	1.90	(2)CS14	CS14	4.61	8.51	10.37	(3)2x6	6x6
3	4.80	2.62	7.43	A	9.9	10.0	0.8	1.01	1.3	0.683	SW5	0.0	6.83	10	1	0	0.57	0.0	7.2	6.56	3.17	(3)CS14	(2)CS14	11.45	7.84	15.82	(4)2x4	HSS
4	1.90	1.70	3.60	A	12.5	10.0	0.3	0.80	1.3	0.262	SW2	0.5	3.13	18	10	1	1.97	2.8	1.8	0.91	1.37	HDU2	HDU2	4.90	7.43	7.30	(3)2x6	(3)2x6
TOTAL	11.17	4.75	15.92																									
A	4.15	0.77	4.92	1	8.9	10.0	0.6	1.12	1.3	0.503	SW4	0.5	5.54	18	3	1	1.04	1.5	2.6	4.34	3.83	(3)CS16	(3)CS16	3.9	8.34	8.48	(3)2x6	(3)2x6
B	3.20	0.00	3.20	1	3.9	10.0	0.8	2.56	1.3	0.958	SW6	0.0	7.47	10	1	0	0.21	0.0	3.3	7.37	5.83	(4)CS14	HDU8	4.52	8.48	10.44	6x6	6x6
C	2.27	2.38	4.65	1	12.3	10.0	0.4	0.81	1.3	0.344	SW2	0.0	3.44	10	8	8	1.86	1.8	0.7	1.72	2.26	CS14	HDU2	4.2	7.02	6.87	4x8	4x8
D	1.55	1.60	3.15	1	10.5	10.0	0.1	0.95	1.3	0.130	SW1	0.6	1.87	18	8	8	2.01	2.2	0.9	-0.08	0.53	HDU2	HDU2	3.52	5.37	5.20	(2)2x6	(2)2x6
				2	11.6	10.0	0.1	0.86	1.3	0.130	SW1	0.6	1.87	18	8	8	2.26	0.9	2.6	0.41	-0.41	HDU2	HDU2	3.52	5.20	5.43	(2)2x6	(3)2x6
TOTAL	11.17	4.75	15.92																									

ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

1ST FLR.	E	UNFACTORED		SW	L	h	V/ΣL	Aspect		v(max)*	SW	O.T.	O.T.	DL Trib. Length(ft)			DL max	P_{left}	P_{right}	T_L	T_R	Holdown		C_{LL} (k)	C1	C2	MIN. POST	
GRID	V	V_{above}	V_{total} (K)	MARK	(ft)	(ft)	(klf)	Ratio	ρ	ASD(klf)		above	MAX.(k)	wall	floor	roof	(k)	(k)	(k)	(k)	(k)	L/R		< =	(k)	(k)	L/R	
2	2.47	12.80	15.26	A	10.6	5.5	1.4	0.52	1.3	1.310	SW6	0.0	7.21	6	1	0	0.38	10.5	0.0	2.11	7.03	HDU14	HDU14	7.40	16.05	11.96	HSS	6x6
4	0.14	3.12	3.26	A	18.1	8.0	0.2	0.44	1.3	0.164	CONC																	
TOTAL	2.60	15.92	18.52																									
A	1.19	7.12	8.31	1	5.5	8.0	1.5	1.45	1.3	1.375	CONC																	
B	0.48	1.17	1.65	1	8.5	8.0	0.2	0.94	1.3	0.177	SW3	0.0	1.41	8	1	0	0.41	0.0	0.0	1.22	1.22	HDU5	HDU5	0.00	2.42	2.42	(2)2x4	(2)2x4
C	0.63	5.31	5.94	1	12.6	8.0	0.5	0.63	1.3	0.429	SW4	3.4	6.87	18	15	8	2.98	5.5	0.9	-0.52	5.07	HDU5	HDU8	9.6	14.15	8.04	4x8	4x6
D	0.36	3.15	3.51	1	23.6	8.0	0.1	0.34	1.3	0.135	CONC																	
TOTAL	2.66	16.75	19.41																									

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Lateral Force Distribution & Plywood Shearwall Design

WIND

Wall DL (psf) = 10
floor DL (psf) = 12
Roof DL (psf) = 15

SWx = Shearwall per 8/S3.1
P_X = Point Load From Header (DL)
E = Earthquake
W = Wind

Notes:
Wind and Seismic Loads input as LRFD then converted to ASD for v & O.T.
Basic Load Combinations Per ASCE 7-16 (Basic Combinations for ASD)
Base Shear Comparison Shown Below Shearwall Groups
* In lieu of reducing SW capacity, v(max) will be divided by 2w/l for SW sizing

ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

ROOF	W	UNFACTORED		SW	L	h	V/ΣL	Aspect		v(max)*	SW	O.T.	O.T.	DL Trib. Length(ft)			DL max	P_{left}	P_{right}	T_L	T_R	Holdown		C_{LL} (k)	C1	C2	MIN. POST	
GRID	V	V_{above}	V_{total} (K)	MARK	(ft)	(ft)	(klf)	Ratio	ρ	ASD(klf)		above	MAX.(k)	wall	floor	roof	(k)	(k)	(k)	(k)	(k)	L/R		< =	(k)	(k)	L/R	
2	0.76	0.00	0.76	A	10.0	8.0	0.1	0.80	1.3	0.046	SW1	0.0	0.36	8	0	1	0.48	0.0	0.0	0.08	0.08	CS22	CS22	0.00	0.46	0.46	(2)2x6	(2)2x6
3	2.66	0.00	2.66	A	8.1	8.0	0.3	0.99	1.3	0.197	SW1	0.0	1.58	8	0	6	0.68	0.7	0.7	0.77	0.76	CS16	CS16	1.03	2.78	2.80	(2)2x6	(2)2x6
4	1.90	0.00	1.90	A	14.0	8.0	0.1	0.57	1.3	0.047	SW1	0.0	0.37	8	0	1	0.67	0.0	0.7	-0.03	-0.42	CS22	CS22	0.00	0.47	1.13	(2)2x6	(2)2x6
				A	10.5	8.0	0.1	0.76	1.3	0.047	SW1	0.0	0.37	8	0	1	0.50	0.7	1.1	-0.32	-0.61	CS22	CS22	1.68	2.29	2.76	(2)2x6	(2)2x6
TOTAL	5.32	0.00	5.32																									
A	2.95	0.00	2.95	1	11.0	8.0	0.3	0.73	1.3	0.161	SW1	0.0	1.29	8	0	1	0.52	1.0	0.0	0.39	0.99	CS22	CS22	1.35	3.05	2.05	(2)2x6	(2)2x6
C	4.37	0.00	4.37	1	7.9	8.0	0.6	1.01	1.3	0.332	SW2	0.0	2.66	8	0	8	0.76	0.0	0.7	2.20	1.80	CS14	CS14	1.13	3.03	3.69	(2)2x6	(2)2x6
D	1.43	0.00	1.43	1	7.6	8.0	0.1	1.05	1.3	0.042	SW1	0.0	0.34	8	0	8	0.73	0.0	0.2	-0.10	-0.20	CS22	CS22	0.28	0.65	0.82	(2)2x6	(2)2x6
				2	5.2	8.0	0.1	1.54	1.3	0.042	SW1	0.0	0.34	8	0	8	0.52	0.2	0.2	-0.08	-0.08	CS22	CS22	0.28	0.83	0.83	(2)2x6	(2)2x6
				3	7.6	8.0	0.1	1.05	1.3	0.042	SW1	0.0	0.34	8	0	8	0.76	0.2	0.0	-0.22	-0.12	CS22	CS22	0.28	0.83	0.66	(2)2x6	(2)2x6
TOTAL	8.74	0.00	8.74																									

ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

2ND FLR.	W	UNFACTORED		SW	L	h	V/ΣL	Aspect		v(max)*	SW	O.T.	O.T.	DL Trib. Length(ft)			DL max	P_{left}	P_{right}	T_L	T_R	Holdown		C_{LL} (k)	C1	C2	MIN. POST	
GRID	V	V_{above}	V_{total} (K)	MARK	(ft)	(ft)	(klf)	Ratio	ρ	ASD(klf)		above	MAX.(k)	wall	floor	roof	(k)	(k)	(k)	(k)	(k)	L/R		< =	(k)	(k)	L/R	
1	4.36	0.48	4.84	A	8.3	10.0	0.6	1.20	1.3	0.350	SW5	0.0	3.50	10	0	1	0.48	0.1	6.9	3.14	-0.94	(2)CS14	CS14	4.61	6.32	13.11	(3)2x6	6x6
3	7.59	2.94	10.53	A	9.9	10.0	1.1	1.01	1.3	0.638	SW5	0.0	6.38	10	1	0	0.57	0.0	7.2	6.03	1.69	(3)CS14	(2)CS14	11.45	6.50	20.72	(4)2x4	HSS
4	3.39	1.90	5.29	A	12.5	10.0	0.4	0.80	1.3	0.254	SW2	0.4	2.91	18	10	1	1.97	2.8	1.8	0.07	0.66	HDU2	HDU2	4.90	8.94	7.96	(3)2x6	(3)2x6
TOTAL	15.34	5.32	20.66																									
A	4.88	2.95	7.82	1	8.9	10.0	0.9	1.12	1.3	0.527	SW4	1.3	6.56	18	3	1	1.04	1.5	2.6	5.01	4.36	(3)CS16	(3)CS16	3.9	9.64	10.72	(3)2x6	(3)2x6
B	5.94	0.00	5.94	1	3.9	10.0	1.5	2.56	1.3	0.913	SW6	0.0	9.13	10	1	0	0.21	0.0	3.3	9.01	7.03	(4)CS14	(4)CS14	4.52	9.24	13.65	6x6	6x6
C	4.21	4.37	8.58	1	12.3	10.0	0.7	0.81	1.3	0.419	SW2	0.0	4.19	10	8	8	1.86	1.8	0.7	1.98	2.67	CS14	HDU2	4.2	8.42	7.27	4x8	4x8
D	2.87	1.43	4.30	1	10.5	10.0	0.2	0.95	1.3	0.117	SW1	0.3	1.50	18	8	8	2.01	2.2	0.9	-0.99	-0.22	HDU2	HDU2	3.52	6.30	5.00	(2)2x6	(2)2x6
				2	11.6	10.0	0.2	0.86	1.3	0.117	SW1	0.3	1.50	18	8	8	2.26	0.9	2.6	-0.37	-1.42	HDU2	HDU2	3.52	5.01	6.76	(2)2x6	(3)2x6
TOTAL	17.90	8.74	26.64																									

ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

1ST FLR.	W	UNFACTORED		SW	L	h	V/ΣL	Aspect		v(max)*	SW	O.T.	O.T.	DL Trib. Length(ft)			DL max	P_{left}	P_{right}	T_L	T_R	Holdown		C_{LL} (k)	C1	C2	MIN. POST	
GRID	V	V_{above}	V_{total} (K)	MARK	(ft)	(ft)	(klf)	Ratio	ρ	ASD(klf)		above	MAX.(k)	wall	floor	roof	(k)	(k)	(k)	(k)	(k)	L/R		< =	(k)	(k)	L/R	
2	11.25	14.64	25.88	A	10.6	5.5	2.4	0.52	1.3	1.465	SW7	0.0	8.06	6	1	0	0.38	0.0	0.0	7.83	7.83	HDU14	HDU14	0.00	8.13	8.13	HSS	6x6
4	2.61	6.02	8.64	A	18.1	8.0	0.5	0.44	1.3	0.286	CONC																	
TOTAL	13.86	20.66	34.52																									
A	3.81	9.69	13.49	1	5.5	8.0	2.5	1.45	1.3	1.472	CONC																	
B	4.51	2.84	7.36	1	8.5	8.0	0.9	0.94	1.3	0.519	SW3	0.0	4.15	8	1	0	0.41	0.0	0.0	3.91	3.91	HDU5	HDU5	0.00	4.25	4.25	(2)2x4	(2)2x4
C	4.36	9.82	14.18	1	12.6	8.0	1.1	0.63	1.3	0.675	SW4	4.2	9.59	18	15	8	2.98	5.5	0.9	0.34	7.29	HDU5	HDU8	9.6	20.34	10.92	4x8	4x6
D	2.53	4.30	6.82	1	23.6	8.0	0.3	0.34	1.3	0.173	CONC																	
TOTAL	15.21	26.64	41.85																									

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Shearwall drift analysis

SWx = Shearwall per 8/S3.1
E = Earthquake
Cd = 4
I = 1

NOTES:

Strap	T	# 8d	V/nail	en	Astrap	Lstrap	FL/AE	Δa
CS22	845	7	121	0.01	0.08	32.50	0.01	0.02
CS16	1705	13	131	0.01	0.08	44.50	0.03	0.04
CS14	2460	18	137	0.01	0.09	54.50	0.05	0.06
Δa FOR HOLDOWNS:				HDU2	0.09		HDU8	0.12
				HDU5	0.12		HDU14	0.17

ROOF	E	UNFACTORED		SW	L	h	V/ΣL	SW	Holdown		MIN. POST		column	E	Ga	Anchor	NDS Eq. 4.3-1	drift	Δa	drift
GRID	V	V_{above}	$V_{total\ (K)}$	MARK	(ft)	(ft)	(klf)		L/R		L/R		area (si)	x 10^6	k/in	Δa	Δsw	Δ Cd /I	.025h	check
2	0.68	0.00	0.68	A	10.0	8.0	0.1	SW1	CS22	CS22	(2)2x6	(2)2x6	16.50	1.30	10.00	0.02	0.07	**0.29**	2.70	**Okay**
3	2.38	0.00	2.38	A	8.1	8.0	0.3	SW2	CS16	CS16	(2)2x6	(2)2x6	16.50	1.30	13.00	0.04	0.23	**0.91**	2.70	**Okay**
4	1.70	0.00	1.70	A	14.0	8.0	0.1	SW1	CS22	CS22	(2)2x6	(2)2x6	16.50	1.30	10.00	0.02	0.11	**0.44**	2.70	**Okay**
TOTAL	4.75	0.00	4.75																	
A	0.77	0.00	0.77	1	11.0	8.0	0.1	SW1	CS22	CS22	(2)2x6	(2)2x6	16.50	1.30	10.00	0.02	0.07	**0.29**	2.70	**Okay**
C	2.38	0.00	2.38	1	7.9	8.0	0.3	SW2	CS14	CS14	(2)2x6	(2)2x6	16.50	1.30	13.00	0.06	0.25	**1.01**	2.70	**Okay**
D	1.60	0.00	1.60	1	7.6	8.0	0.1	SW1	CS22	CS22	(2)2x6	(2)2x6	16.50	1.30	10.00	0.02	0.09	**0.34**	2.70	**Okay**
				2	5.2	8.0	0.1	SW1	CS22	CS22	(2)2x6	(2)2x6	16.50	1.30	10.00	0.02	0.10	**0.39**	2.70	**Okay**
				3	7.6	8.0	0.1	SW1	CS22	CS22	(2)2x6	(2)2x6	16.50	1.30	10.00	0.02	0.09	**0.34**	2.70	**Okay**
TOTAL	4.75	0.00	4.75																	

2ND FLR.	E	UNFACTORED		SW	L	h	V/ΣL	SW	Holdown		MIN. POST		column	E	Ga	Anchor	NDS Eq. 4.3-1	drift	Δa	drift
GRID	V	V_{above}	$V_{total\ (K)}$	MARK	(ft)	(ft)	(klf)		L/R		L/R		area (si)	x 10^6	k/in	Δa	Δsw	Δ Cd /I	.025h	check
1	4.47	0.43	4.89	A	8.3	10.0	0.6	SW5	(2)CS14	CS14	(3)2x6	6x6	24.75	1.60	30.00	0.06	0.28	**1.13**	3.30	**Okay**
3	4.80	2.62	7.43	A	9.9	10.0	0.8	SW5	(3)CS14	(2)CS14	(4)2x4	HSS	21.00	1.60	30.00	0.06	0.33	**1.31**	3.30	**Okay**
4	1.90	1.70	3.60	A	12.5	10.0	0.3	SW2	HDU2	HDU2	(3)2x6	(3)2x6	24.75	1.30	13.00	0.09	0.30	**1.19**	3.30	**Okay**
TOTAL	11.17	4.75	15.92																	
A	4.15	0.77	4.92	1	8.9	10.0	0.6	SW4	(3)CS16	(3)CS16	(3)2x6	(3)2x6	24.75	1.30	20.00	0.06	0.36	**1.44**	3.30	**Okay**
B	3.20	0.00	3.20	1	3.9	10.0	0.8	SW6	(4)CS14	HDU8	6x6	6x6	24.75	1.60	44.00	0.12	0.53	**2.11**	3.30	**Okay**
C	2.27	2.38	4.65	1	12.3	10.0	0.4	SW2	CS14	HDU2	4x8	4x8	25.38	1.30	13.00	0.09	0.37	**1.48**	3.30	**Okay**
D	1.55	1.60	3.15	1	10.5	10.0	0.1	SW1	HDU2	HDU2	(2)2x6	(2)2x6	16.50	1.30	10.00	0.04	0.19	**0.74**	3.30	**Okay**
				2	11.6	10.0	0.1	SW1	HDU2	HDU2	(2)2x6	(3)2x6	16.50	1.30	10.00	0.04	0.18	**0.73**	3.30	**Okay**
TOTAL	11.17	4.75	15.92																	

1ST FLR.	E	UNFACTORED		SW	L	h	V/ΣL	SW	Holdown		MIN. POST		column	E	Ga	Anchor	NDS Eq. 4.3-1	drift	Δa	drift
GRID	V	V_{above}	$V_{total\ (K)}$	MARK	(ft)	(ft)	(klf)		L/R		L/R		area (si)	x 10^6	k/in	Δa	Δsw	Δ Cd /I	.025h	check
2	2.47	12.80	15.26	A	10.6	5.5	1.4	SW6	HDU14	HDU14	HSS	6x6	30.25	1.60	44.00	0.17	0.27	**1.09**	2.70	**Okay**
4	0.14	3.12	3.26	A	18.1	8.0	0.2	CONC												
TOTAL	2.60	15.92	18.52																	
A	1.19	7.12	8.31	1	5.5	8.0	1.5	CONC												
B	0.48	1.17	1.65	1	8.5	8.0	0.2	SW3	HDU5	HDU5	(2)2x4	(2)2x4	10.50	1.30	15.00	0.12	0.22	**0.87**	2.70	**Okay**
C	0.63	5.31	5.94	1	12.6	8.0	0.5	SW4	HDU5	HDU8	4x8	4x6	19.25	1.30	20.00	0.12	0.27	**1.07**	2.70	**Okay**
D	0.36	3.15	3.51	1	23.6	8.0	0.1	CONC												
TOTAL	2.66	16.75	19.41																	

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Cantilever diaphragm drift analysis

SWx = Shearwall per 8/S3.1
E = Earthquake
Cd = 4
I = 1

NOTES: DIAPHRAGM DEFLECTIONS CALCULATED AS CANTILEVERED DIAPHRAGM W/POINT LOAD AT END WITH EQUATION 4.2-3 OF 2021 SDPWS.
CANTILEVERED DIAPHRAGM SECTION TREATED AS 1-STORY FOR ASPECT RATIO.
SEE SHEARWALL DEFLECTION WORKSHEET FOR DRIFT CHECKS ELSEWHERE.

T	# 8d	V/nail	en	Astrap	Lstrap	FL/AE	Δa
1705	13	131	0.01	0.08	44.50	0.03	0.04
2460	18	137	0.01	0.09	54.50	0.05	0.06
						HDU5	0.11
						HDU14	0.17

	E	UNFACTORED		SW	W	L or H	V/ΣL	Aspect	SW OR DIAPHRAGM	CHORD ANCHOR		CHORD		column	E	Ga	Chord Splice	NDS Eq. 4.2-3	drift	Δa	drift
Drift Check	V	V_{above}	$V_{total\ (K)}$	MARK	(ft)	(ft)	(klf)	Ratio		**L/R**		**L/R**		area (si)	x 10^6	k/in	Δc	δ	δ Cd /I	.025h	check
ROOF																					
GRID 1 SW	4.47	0.43	4.89	A	8.3	10.0	**0.6**	1.20	**SW5**	**(2)CS14**	**CS14**	(3)2x6	6x6	24.75	1.60	30.00	0.04	0.26	**1.04**	3.00	**Okay**
FLOOR																					
GRID 1 Diaph.	0.77	4.89	5.66		22.0	18.1	**0.3**	0.82	**BLOCKED DIAPH. W/10d @ 2.5"oc**	**W10x39**	**HDU5**	W10x39	W12x50	11.50	29.00	15.00	0.11	0.40	**1.61**	2.70	**Okay**
GRID 2 SW	2.47	12.80	15.26	A	10.6	5.5	**1.4**	0.52	**SW6**	**HDU14**	**HDU14**	HSS	6x6	30.25	1.60	44.00	0.17	0.27	**1.09**	2.70	**Okay**
																	TOTAL	0.67	**2.70**	**2.70**	**Okay**

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SIMPSON STRONG-TIE COMPANY INC.
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5956 W. Las Positas Blvd., Pleasanton, CA 94588.
www.strongtie.com

Job Name: MERCER GROVE
Wall Name: 4
Application: 1st Story Wood Floor Systems

Design Criteria:

* 2018 International Bldg Code
* Seismic R=6.5
* 2500 psi concrete
* ASD Design Shear = 827 lbs
* Floor Joist Depth = 12"
* Nominal wall height = 9 ft

Selected Strong-Wall® Panel Solution:

Model	Type	W (in)	H (in)	T (in)	Sill Anchor	End Anchor Bolts	Total Axial Load (lbs)	Actual Uplift (lbs)
WSWH18x9	Wood	18	105.25	3.5	N/A	2 - 1"	2000	5217 lb

Actual Shear & Drift Distribution:

Model	Actual Shear (lbs)		Allowable Shear (lbs)		Actual / Allow Shear	Actual Drift (in)	Drift Limit (in)
WSWH18x9	827	≤	1475	OK	0.56	0.24	0.47

Notes:

1. Strong-Wall High-Strength Wood Shearwalls have been evaluated to the 2018 IBC/IRC. See www.strongtie.com for additional design and installation information.

2. Anchor templates are recommended for proper anchor bolt placement, and are required in some jurisdictions.

3. The applied vertical load shall be a concentric point load or a uniformly distributed load not exceeding the allowable vertical load. Alternatively, the load may be applied anywhere along the width of the panel if imposed by a continuous bearing vertical load transfer element such as a rimboard or beam. For eccentric axial loads applied directly to the panel, the allowable vertical load shall be divided by two.

4. Panels may be trimmed to a minimum height of 74½".

5. Raised Floor Application requires WSWH-RF__KT Connection Kit based on panel width (example: WSWH-RF18KT).

Disclaimer:

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www.strongtie.com

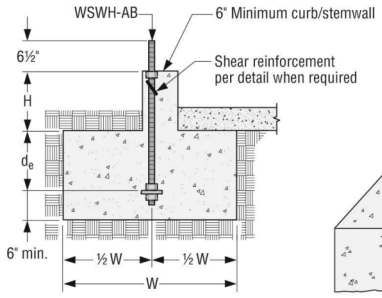
Job Name: MERCER GROVE
Wall Name: 4
Application: 1st Story Wood Floor Systems

Design Criteria:

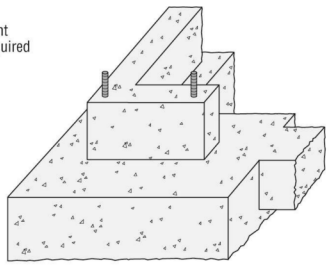
* Stemwall - Perimeter
* 2018 International Bldg Code
* Seismic R=6.5
* 2500 psi concrete

Anchor Solution Details:

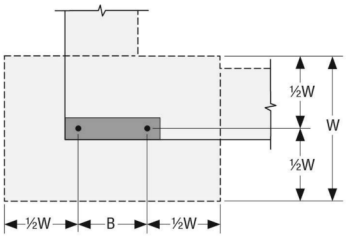
Stemwall Installation



Stemwall Section View

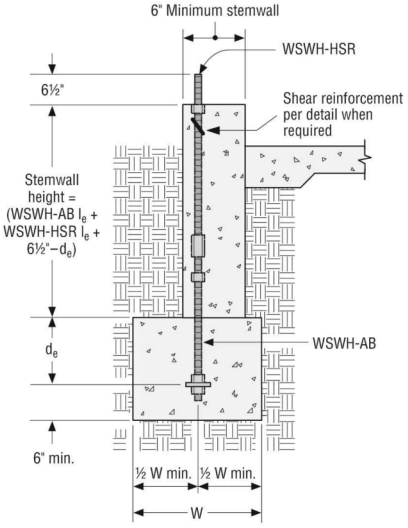


Perspective View
(Slab not shown for clarity)



Footing Plan

Stemwall Extension Installation



Section at Stemwall
WSWH-AB and WSWH-HSR
Extension Application

Anchor Solution Assuming Cracked Concrete Design:

Model	W	de	B	Anchor Bolt	Strength
WSWH18x9	30	10	14	WSWH-AB	High Strength

Anchor Solution Assuming Uncracked Concrete Design:

Model	W	de	B	Anchor Bolt	Strength
WSWH18x9	30	10	14	WSWH-AB	High Strength

Notes:

1. Anchorage designs conform to ACI 318-14 and 318-11 Appendix D with no supplementary reinforcement for cracked and uncracked concrete as noted.
2. Anchorage strength indicates required grade of anchor bolt. Standard (ASTM F1554 grade 36) or High Strength (HS)(ASTM A449).
3. Seismic indicates Seismic Design Category C though F. Detached 1 & 2 family dwellings in SDC C may use wind anchorage solutions. Seismic anchorage designs conform to ACI 318-11 section D.3.3.4.3 and ACI 318-14 section 17.2.3.4.3
4. Foundation dimensions are for anchorage only. Foundation design (size and reinforcement) by others. The registered design professional may specify alternate embedment, footing size or anchor bolt.

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Job Name: MERCER GROVE
Wall Name: 4
Application: 1st Story Wood Floor Systems

Design Criteria:

* 2018 International Bldg Code
* Wind
* 2500 psi concrete
* ASD Design Shear = 1302 lbs
* Floor Joist Depth = 12"
* Nominal wall height = 9 ft

Selected Strong-Wall® Panel Solution:

Model	Type	W (in)	H (in)	T (in)	Sill Anchor	End Anchor Bolts	Total Axial Load (lbs)	Actual Uplift (lbs)
WSWH18x9	Wood	18	105.25	3.5	N/A	2 - 1"	2000	8788 lb

Actual Shear & Drift Distribution:

Model	Actual Shear (lbs)		Allowable Shear (lbs)		Actual / Allow Shear	Actual Drift (in)	Drift Limit (in)
WSWH18x9	1302	≤	1935	OK	0.67	0.38	0.60

Notes:

1. Strong-Wall High-Strength Wood Shearwalls have been evaluated to the 2018 IBC/IRC. See www.strongtie.com for additional design and installation information.

2. Anchor templates are recommended for proper anchor bolt placement, and are required in some jurisdictions.

3. The applied vertical load shall be a concentric point load or a uniformly distributed load not exceeding the allowable vertical load. Alternatively, the load may be applied anywhere along the width of the panel if imposed by a continuous bearing vertical load transfer element such as a rimboard or beam. For eccentric axial loads applied directly to the panel, the allowable vertical load shall be divided by two.

4. Panels may be trimmed to a minimum height of 74½".

5. Raised Floor Application requires WSWH-RF__KT Connection Kit based on panel width (example: WSWH-RF18KT).

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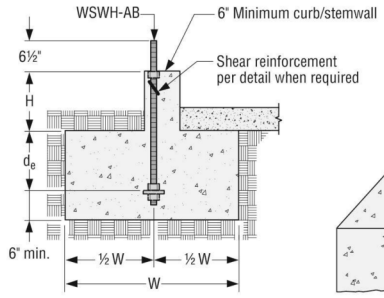
Job Name: MERCER GROVE
Wall Name: 4
Application: 1st Story Wood Floor Systems

Design Criteria:

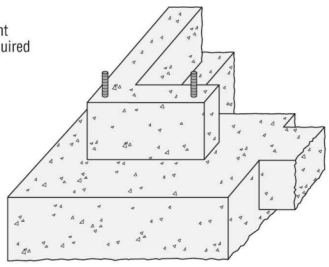
* Stemwall - Perimeter
* 2018 International Bldg Code
* Wind
* 2500 psi concrete

Anchor Solution Details:

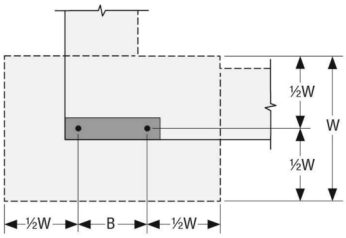
Stemwall Installation



Stemwall Section View

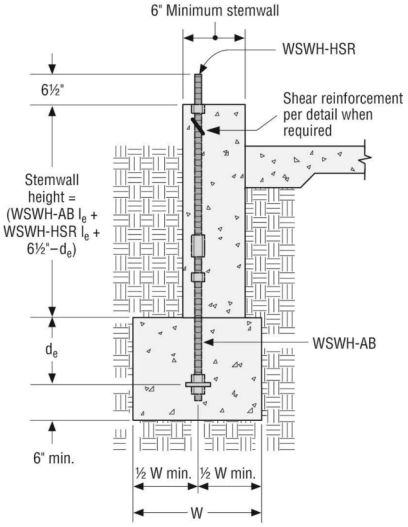


Perspective View
(Slab not shown for clarity)



Footing Plan

Stemwall Extension Installation



Section at Stemwall
WSWH-AB and WSWH-HSR
Extension Application

Anchor Solution Assuming Cracked Concrete Design:

Model	W	de	B	Anchor Bolt	Strength
WSWH18x9	21	7	14	WSWH-AB	High Strength

Anchor Solution Assuming Uncracked Concrete Design:

Model	W	de	B	Anchor Bolt	Strength
WSWH18x9	21	7	14	WSWH-AB	High Strength

Notes:

1. Anchorage designs conform to ACI 318-14 and 318-11 Appendix D with no supplementary reinforcement for cracked and uncracked concrete as noted.
2. Anchorage strength indicates required grade of anchor bolt. Standard (ASTM F1554 grade 36) or High Strength (HS)(ASTM A449).
3. Wind includes Seismic Design Category A and B and detached 1 and 2 family dwellings in SDC C.
4. Foundation dimensions are for anchorage only. Foundation design (size and reinforcement) by others. The registered design professional may specify alternate embedment, footing size or anchor bolt.

SEISMIC DESIGN - CARPORT

ASCE 7-16
Equivalent Lateral Force Procedure

Occupancy Category	II		Table 1-1
Seismic Design Category	D		Table 11.6-1
Importance Factor	1.00		Table 11.5-1
Site Class	D		Table 20.3-1
S_S	141.80	%g	(from USGS Seismic Hazard Curves, 2008 data)
S_1	49.30	%g	(from USGS Seismic Hazard Curves, 2008 data)
F_a	1.00		Table 11.4-1
F_v	1.81		Table 11.4-2
C_t	0.02		Table 12.8-2
x	0.75		Table 12.8-2
h_n	10.00	feet	(height to highest level)

$S_{MS} = Fa*Ss$	1.4180		Eq. 11.4-1
$S_{M1} = Fv*S1$	0.8923		Eq. 11.4-2
$S_{DS} = (2/3)*S_{MS}$	0.9453	g	Eq. 11.4-3
$S_{D1} = (2/3)*S_{M1}$	0.5949	g	Eq. 11.4-4
Period $T_a = C_t*h_n\text{^}x$	0.1125	s	Eq. 12.8-7
T_o	0.1259	s	per section 11.4.6
T_S	0.6293	s	per section 11.4.6
S_a	0.0885	g	per section 11.4.6

R	6.5		Table 12.2-1
Ωo	2.5		Table 12.2-1
C_d	4		Table 12.2-1
Analysis type okay	Yes		Table 12.6-1

Equivalent Lateral Force Procedure (section 12.8)

Cs	0.1454		Eq. 12.8-2
W, weight	34,633	lb	per table below
V	5,037	lb	Eq. 12.8-1

Vertical Force Distribution (section 12.8.3)
k = 1.00

Level	Hx (ft)	Area (ft2)	Wt. (psf)	Wt. (k)	Wall length (ft.)	Wall Wt. (k)	Total Wt. (k)	WxHx (k-ft)	Cvx (%)	(LRFD) V (k)
green roof	10.00	250	50	12.5	0	0.0	12.5	125.0	36.1	1.82
roof	10.00	848	13	11.0	38.75	1.7	12.8	127.7	36.9	1.86
conc walls	10.00	0	0	0.0	27.75	9.4	9.4	93.7	27.0	1.36
							34.6	346.3	100.0	5.0

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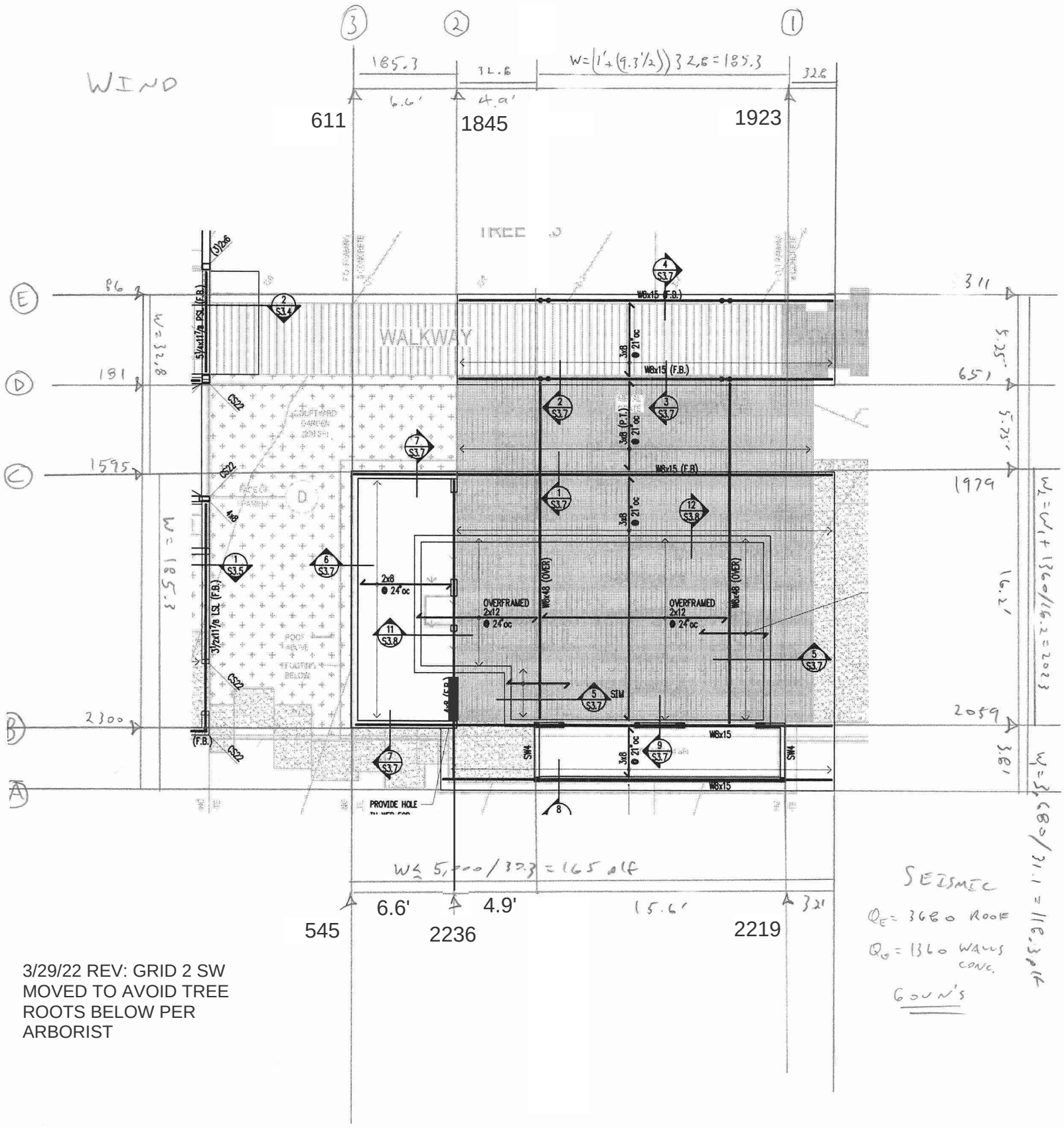

3/29/22 REV: GRID 2 SW MOVED TO AVOID TREE ROOTS BELOW PER ARBORIST

Lateral Force Distribution & Plywood Shearwall Design

SEISMIC

Wall DL (psf) =	10	SWx = Shearwall per 8/S3.1	Notes: Wind and Seismic Loads input as LRFD then converted to ASD for v & O.T.
floor DL (psf) =	0	P_X = Point Load From Header (DL)	Basic Load Combinations Per ASCE 7-16 (Basic Combinations for ASD)
Roof DL (psf) =	50	E = Earthquake	Base Shear Comparison Shown Below Shearwall Groups
S_{DS} =	0.95	W = Wind	* In lieu of reducing SW capacity, v(max) will be divided by 2w/l for SW sizing

CARPORT

ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

ROOF	E	UNFACTORED		SW	L	h	V/ΣL	Aspect		v(max)*	SW	O.T.	O.T.	DL Trib. Length(ft)			DL max	P_{left}	P_{right}	T_L	T_R	Holdown		C_{LL} (k)	C1	C2	MIN. POST	
GRID	V	V_{above}	$V_{total\ (K)}$	MARK	(ft)	(ft)	(klf)	Ratio	ρ	ASD(klf)		above	MAX.(k)	wall	floor	roof	(k)	(k)	(k)	(k)	(k)	L/R		< =	(k)	(k)	L/R	
1	2.22	0.00	2.22	A	3.6	8.1	**0.6**	**2.25**	**1.3**	**0.631**	**SW4**	0.0	4.54	8	0	2	0.33	0.0	0.0	4.39	4.39	**HDU5**	**HDU5**	**0.00**	5.57	5.57	4x6	4x6
2	2.24	0.00	2.24	A	2.3	8.1	**1.0**	**3.48**	**1.3**	**1.518**	**SW6**	0.0	7.07	8	0	4	0.32	0.0	0.0	6.92	6.92	**HDU8**	**HDU8**	**0.00**	8.11	8.11	(3)2x4	(3)2x4
3	0.55	0.00	0.55	A	16.2	8.1	**0.0**	0.50	**1.3**	**0.031**	**CONC**																	
TOTAL	4.46	0.00	4.46																									
E	0.31	0.00	0.31	1	CANTILEVER COLUMNS																							
D	0.65	0.00	0.65	1	CANTILEVER COLUMNS																							
C	1.98	0.00	1.98	1	6.6	8.1	**0.3**	1.23	**1.3**	**0.273**	**CONC**																	
B	2.06	0.00	2.06	1	6.6	8.1	**0.3**	1.23	**1.3**	**0.284**	**CONC**																	
TOTAL	2.94	0.00	2.94																									

** AT GRID 2 SW ATTACH TOP PLATE TO BEAM W/1/4"x6" SDS
CAP = 560 LBS, MAX SPACE = (560/1518)*12 = 4.4"

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Lateral Force Distribution & Plywood Shearwall Design

SEISMIC

Wall DL (psf) =	10	SWx = Shearwall per 8/S3.1	Notes: Wind and Seismic Loads input as LRFD then converted to ASD for v & O.T.
floor DL (psf) =	0	P_X = Point Load From Header (DL)	Basic Load Combinations Per ASCE 7-16 (Basic Combinations for ASD)
Roof DL (psf) =	0	E = Earthquake	Base Shear Comparison Shown Below Shearwall Groups
S_{DS} =	0.95	W = Wind	* In lieu of reducing SW capacity, v(max) will be divided by 2w/l for SW sizing

CARPORT

ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

ROOF	W	UNFACTORED		SW	L	h	V/ΣL	Aspect		v(max)*	SW	O.T.	O.T.	DL Trib. Length(ft)			DL max	P_{left}	P_{right}	T_L	T_R	Holdown		C_{LL} (k)	C1	C2	MIN. POST	
GRID	V	V_{above}	$V_{total\ (K)}$	MARK	(ft)	(ft)	(klf)	Ratio	ρ	ASD(klf)		above	MAX.(k)	wall	floor	roof	(k)	(k)	(k)	(k)	(k)	L/R		< =	(k)	(k)	L/R	
1	1.92	0.00	1.92	A	3.6	8.1	0.5	2.25	1.3	0.321	SW1	0.0	2.60	8	0	2	0.15	0.0	0.0	2.51	2.51	HDU5	HDU5	0.00	2.68	2.68	4x6	4x6
2	1.85	0.00	1.85	A	2.3	8.1	0.8	3.48	1.3	0.475	SW6	0.0	3.85	8	0	2	0.09	0.0	0.0	3.79	3.79	HDU8	HDU8	0.00	3.93	3.93	4x6	4x6
3	0.61	0.00	0.61	A	16.2	8.1	0.0	0.50	1.3	0.023	CONC																	
TOTAL	3.77	0.00	3.77																									
E	0.09	0.00	0.09	1	CANTILEVER COLUMNS																							
D	0.18	0.00	0.18	1	CANTILEVER COLUMNS																							
C	1.60	0.00	1.60	1	6.6	8.1	0.2	1.23	1.3	0.145	CONC																	
B	2.30	0.00	2.30	1	6.6	8.1	0.3	1.23	1.3	0.209	CONC																	
TOTAL	1.86	0.00	1.86																									

** AT GRID 2 SW ATTACH TOP PLATE TO BEAM W/1/4"x6" SDS
CAP = 560 LBS, MAX SPACE = (560/1518)*12 = 4.4"

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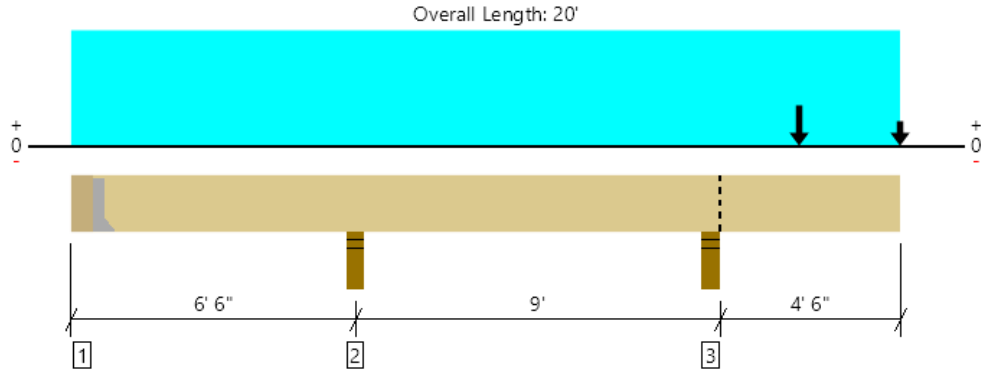
UPPER FLOOR, Copy of B35 FOR OT

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5834 @ 15' 3 3/4"	6379 (4.50")	Passed (91%)	--	1.0 D + 0.45 W + 0.75 L + 0.75 S (Adj Spans)
Shear (lbs)	3066 @ 16' 5 7/8"	13743	Passed (22%)	1.60	1.0 D + 0.45 W + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-8456 @ 15' 3 3/4"	18346	Passed (46%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.259 @ 20'	0.234	Failed (2L/434)	--	1.0 D + 0.45 W + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.446 @ 20'	0.469	Passed (2L/252)	--	1.0 D + 0.45 W + 0.75 L + 0.75 S (Alt Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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.
- -241 lbs uplift at support located at 6' 6". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)						Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Wind	Seismic	Total	
1 - Hanger on 11 7/8" PSL beam	5.25"	Hanger[1]	1.50"	568	501/-66	153	230	150/-150	1602/-216	See note [1]
2 - Stud wall - HF	4.50"	4.50"	1.50"	559	1243	-614	-922	601/-601	2403/-2137	None
3 - Stud wall - HF	4.50"	4.50"	4.12"	2615	1458	1130	2842	1852/-1852	9897/-1852	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)	19' 7" o/c	
Bottom Edge (Lu)	19' 7" 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	HUC410	2.50"	N/A	14-10dx1.5	6-10d	

- 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)	Snow (1.15)	Wind (1.60)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	5 1/4" to 20'	N/A	13.0	--	--	--	--	
1 - Uniform (PSF)	0 to 20' (Front)	3' 3"	13.0	40.0	-	-	-	Default Load
2 - Uniform (PSF)	0 to 20' (Front)	10'	10.0	-	-	-	-	Default Load
3 - Point (lb)	20' (Front)	N/A	643	89	669	-	-	Linked from: X, Support 2
4 - Point (lb)	17' 6" (Front)	N/A	-	-	-	2150	1401	E x OVERSTRENGTH

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

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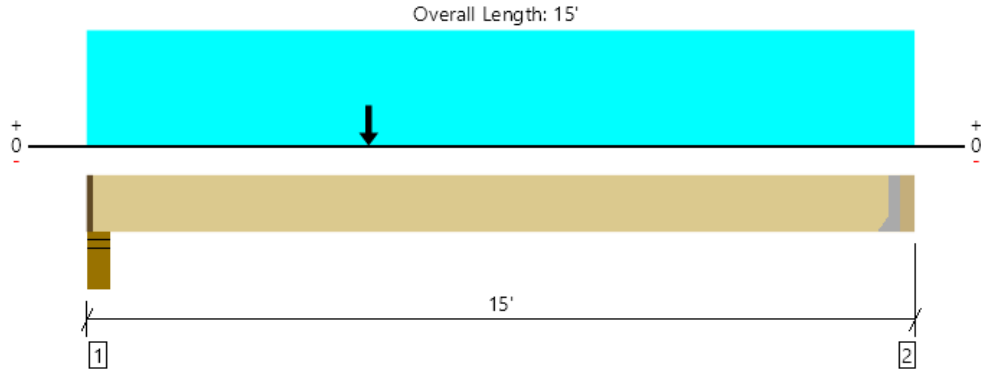
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

UPPER FLOOR, Copy of B21 FOR OT

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1853 @ 14' 8 1/2"	4725 (1.50")	Passed (39%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1314 @ 13' 8 5/8"	8590	Passed (15%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	5476 @ 7' 6 1/4"	15953	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.164 @ 7' 2 3/16"	0.359	Passed (L/999+)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.398 @ 7' 4 9/16"	0.719	Passed (L/433)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Wind	Seismic	Total	
1 - Stud wall - HF	5.50"	4.00"	1.50"	1292	301	226	397	890/-890	3106/-890	1 1/2" Rim Board
2 - Hanger on 11 7/8" HF beam	3.50"	Hanger[1]	1.50"	1283	299	224	203	456/-456	2465/-456	See note [1]

- 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)	14' 7" o/c	
Bottom Edge (Lu)	14' 7" 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
2 - Face Mount Hanger	HUC410	2.50"	N/A	18-10dx1.5	10-10d	

- 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)	Snow (1.15)	Wind (1.60)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	1 1/2" to 14' 8 1/2"	N/A	13.0	--	--	--	--	
1 - Uniform (PSF)	0 to 15' (Front)	1'	13.0	40.0	-	-	-	Default Load
2 - Uniform (PSF)	0 to 15' (Front)	1'	50.0	-	30.0	-	-	Default Load
3 - Uniform (PSF)	0 to 15' (Front)	9' 7 3/16"	10.0	-	-	-	-	Default Load
4 - Point (lb)	5' 2 3/8" (Front)	N/A	-	-	-	600	1346	E X OVERSTRENGTH

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

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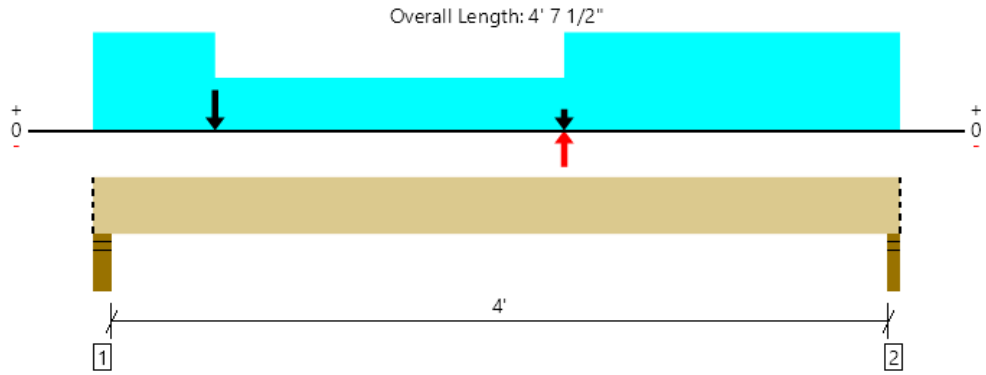
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1809 @ 4' 6"	2126 (3.00")	Passed (85%)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1062 @ 3' 4 5/8"	6872	Passed (15%)	1.60	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	2144 @ 2' 8 3/8"	12762	Passed (17%)	1.60	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.023 @ 2' 8 3/8"	0.213	Passed (L/999+)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.031 @ 2' 8 3/8"	0.283	Passed (L/999+)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -211 lbs uplift at support located at 4' 6". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)						Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Wind	Seismic	Total	
1 - Stud wall - HF	4.50"	4.50"	2.75"	568	713	608	267	737/-737	2893/-737	Blocking
2 - Stud wall - HF	3.00"	3.00"	2.55"	507	675	544	-267	737/-737	2463/-1004	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)	4' 8" o/c	
Bottom Edge (Lu)	4' 8" 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)	Wind (1.60)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 4' 7 1/2"	N/A	6.5	--	--	--	--	
1 - Uniform (PSF)	0 to 4' 7 1/2" (Front)	7' 6"	12.0	40.0	-	-	-	Default Load
2 - Uniform (PSF)	0 to 8 3/8" (Front)	7' 6"	15.0	-	30.0	-	-	Default Load
3 - Point (lb)	8 3/8" (Front)	N/A	167	-	281	-	-	Linked from: B1, Support 1
4 - Point (lb)	2' 8 3/8" (Front)	N/A	167	-	281	-	-	Linked from: B1, Support 2
5 - Uniform (PSF)	2' 8 3/8" to 4' 7 1/2" (Front)	7' 6"	15.0	-	30.0	-	-	Default Load
6 - Point (lb)	8 3/8" (Front)	N/A	-	-	-	567	1566	E X OVERSTRENGTH
7 - Point (lb)	2' 8 3/8" (Front)	N/A	-	-	-	-567	-1566	E X OVERSTRENGTH

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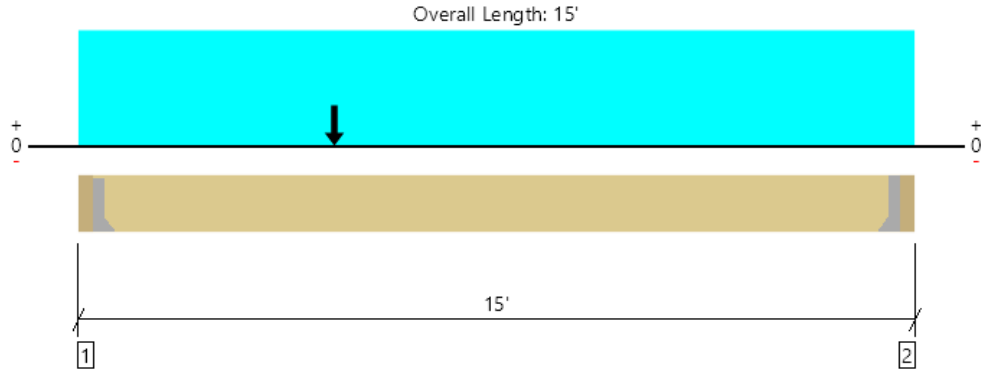
UPPER FLOOR, Copy of B21B FOR OT

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1896 @ 3 1/2"	4725 (1.50")	Passed (40%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1113 @ 1' 3 3/8"	8590	Passed (13%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4650 @ 7' 6"	15953	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.162 @ 7' 1 3/8"	0.360	Passed (L/999+)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.352 @ 7' 3 7/8"	0.721	Passed (L/491)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Wind	Seismic	Total	
1 - Hanger on 11 7/8" HF beam	3.50"	Hanger[1]	1.50"	1039	300	225	433	982/-982	2979/-982	See note [1]
2 - Hanger on 11 7/8" HF beam	3.50"	Hanger[1]	1.50"	1039	300	225	184	419/-419	2167/-419	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)	14' 5" o/c	
Bottom Edge (Lu)	14' 5" 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	LUS410	2.00"	N/A	8-10d	6-10d	
2 - Face Mount Hanger	LUS410	2.00"	N/A	8-10d	6-10d	

- 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)	Snow (1.15)	Wind (1.60)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	3 1/2" to 14' 8 1/2"	N/A	13.0	--	--	--	--	
1 - Uniform (PSF)	0 to 15' (Front)	1'	13.0	40.0	-	-	-	Default Load
2 - Uniform (PSF)	0 to 15' (Front)	1'	17.0	-	30.0	-	-	Default Load
3 - Uniform (PSF)	0 to 15' (Front)	9' 7 3/16"	10.0	-	-	-	-	Default Load
4 - Point (lb)	4' 7 3/16" (Front)	N/A	-	-	-	617	1401	

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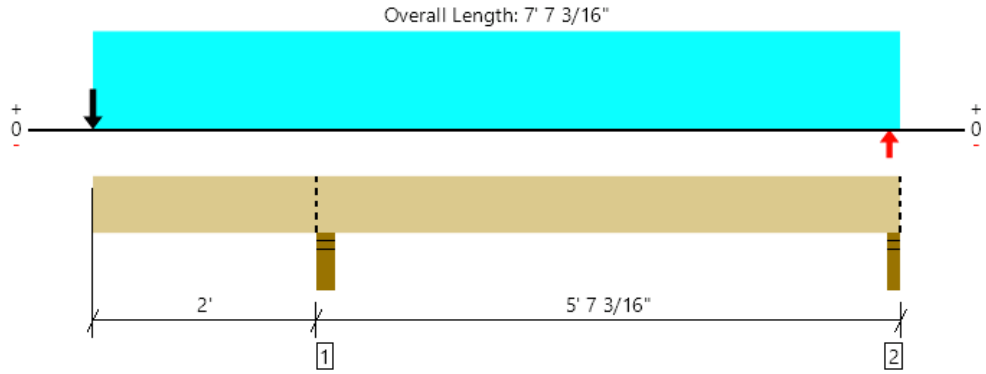
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

UPPER FLOOR, Copy of B22B FOR OT

1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6407 @ 2' 2 1/4"	6379 (4.50")	Passed (100%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1860 @ 1' 1/8"	8590	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-4162 @ 2' 2 1/4"	15953	Passed (26%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.054 @ 0	0.219	Passed (2L/968)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
Total Load Defl. (in)	0.092 @ 0	0.292	Passed (2L/572)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- 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	Wind	Seismic	Total	
1 - Stud wall - HF	4.50"	4.50"	4.52"	2607	2009	1507	802	2214/-2214	9139/-2214	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	69	831/-260	526	-802	2214/-2214	3640/-3276	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)	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)	Snow (1.15)	Wind (1.60)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 7' 7 3/16"	N/A	13.0	--	--	--	--	
1 - Uniform (PSF)	0 to 7' 7 3/16" (Front)	7' 6"	12.0	40.0	-	-	-	Default Load
2 - Uniform (PSF)	0 to 7' 7 3/16" (Front)	7' 6"	15.0	-	30.0	-	-	Default Load
3 - Point (lb)	0 (Front)	N/A	1039	300	225	-	-	Linked from: B21B, Support 1
4 - Point (lb)	0 (Front)	N/A	-	-	-	567	1566	E x OVERSTRENGTH
5 - Point (lb)	7' 6" (Front)	N/A	-	-	-	-567	-1566	E x OVERSTRENGTH

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

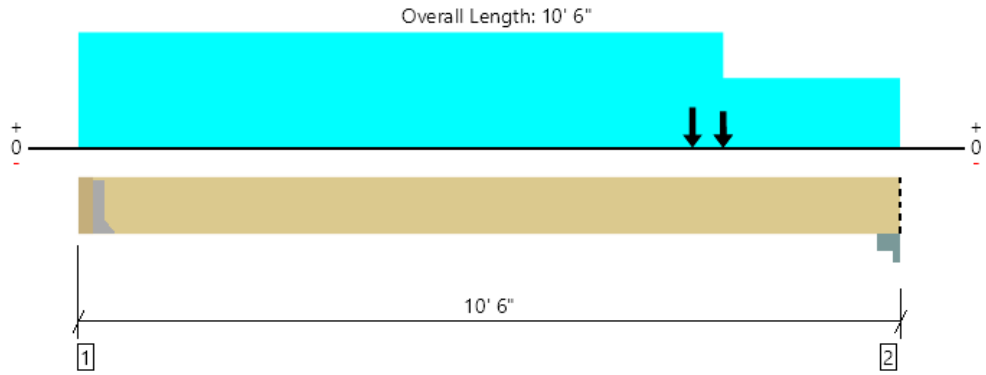
ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

9/14/2021 5:05:10 AM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

UPPER FLOOR, Copy of B30 FOR OT

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	7336 @ 3 1/2"	7336 (2.24")	Passed (100%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	10605 @ 9' 5/8"	13861	Passed (77%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	21817 @ 6' 11 1/16"	34332	Passed (64%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.207 @ 5' 7"	0.247	Passed (L/572)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.355 @ 5' 6 7/16"	0.494	Passed (L/334)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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	Wind	Seismic	Total	
1 - Hanger on 11 7/8" PSL beam	3.50"	Hanger[1]	2.24"	3491	2179	2316	1062	1442/-1442	10490/-1442	See note [1]
2 - Column Cap - steel	5.50"	5.50"	4.23"	5539	4220	3679	3371	4574/-4574	21383/-4574	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)	10' 3" o/c	
Bottom Edge (Lu)	10' 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	HGUS5.50/10	4.00"	N/A	46-10d	16-10d	

- 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)	Snow (1.15)	Wind (1.60)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	3 1/2" to 10' 6"	N/A	19.5	--	--	--	--	
1 - Uniform (PSF)	0 to 8' 2 3/8" (Front)	3' 6"	50.0	-	30.0	-	-	Default Load
2 - Uniform (PSF)	0 to 10' 6" (Front)	7' 6"	13.0	40.0	-	-	-	Default Load
3 - Uniform (PSF)	0 to 10' 6" (Front)	10'	10.0	-	-	-	-	
4 - Uniform (PSF)	8' 2 3/8" to 10' 6" (Front)	3' 6"	13.0	40.0	-	-	-	Default Load
5 - Uniform (PSF)	0 to 8' 2 3/8" (Front)	7' 6"	17.0	-	30.0	-	-	
6 - Point (lb)	8' 2 3/8" (Front)	N/A	662	-	1125	-	-	Linked from: B4, Support 1
7 - Point (lb)	7' 9 5/8" (Front)	N/A	-	-	-	4433	6016	
8 - Point (lb)	8' 2 3/8" (Front)	N/A	3510	2927	2164	-	-	Linked from: B29, Support 1

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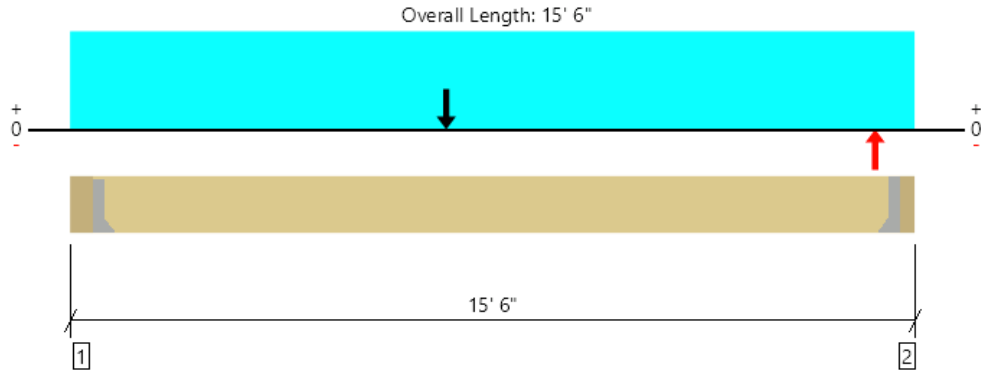
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

MAIN FLOOR, Copy of B40 FOR OT

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	6893 @ 5 1/2"	6893 (2.10")	Passed (100%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	6710 @ 1' 5 3/8"	19285	Passed (35%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	40193 @ 6' 10"	47766	Passed (84%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	-0.778 @ 7' 5 9/16"	0.369	Failed (L/227)	--	0.6 D - 0.7 E (All Spans)
Total Load Defl. (in)	0.921 @ 7' 6 1/8"	0.738	Failed (L/192)	--	1.0 D + 0.7 E (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

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

OKAY E INCLUDES OVERSTRENGTH FACTOR

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger[1]	2.10"	1436	313	235	7903/-7903	9887/-7903	See note [1]
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	2.10"	1409	307	230	7903/-7903	9849/-7903	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)	14' 9" o/c	
Bottom Edge (Lu)	14' 9" 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	56-16d	20-16d	
2 - Face Mount Hanger	HGUS5.50/12	4.00"	N/A	56-16d	20-16d	

- 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)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	5 1/2" to 15' 2 1/2"	N/A	19.5	--	--	--	
1 - Uniform (PSF)	0 to 15' 6" (Front)	1'	15.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 15' 6" (Front)	10'	10.0	-	-	-	Default Load
3 - Uniform (PSF)	0 to 15' 6" (Front)	1'	50.0	-	30.0	-	Default Load
4 - Point (lb)	6' 10" (Front)	N/A	-	-	-	14725	E X OVERSTRENGTH
5 - Point (lb)	14' 9" (Front)	N/A	-	-	-	-14725	E X OVERSTRENGTH

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

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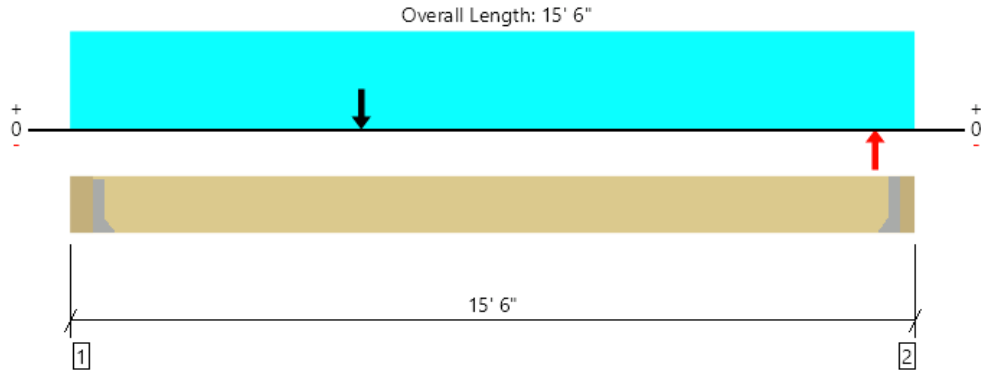
MAIN FLOOR, Copy of B41 FOR OT
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9149 @ 5 1/2"	9149 (2.79")	Passed (100%)	--	1.0 D + 0.7 E (All Spans)
Shear (lbs)	9050 @ 1' 5 3/8"	19285	Passed (47%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	43130 @ 5' 3 5/8"	47766	Passed (90%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	-0.850 @ 7' 1/16"	0.369	Failed (L/208)	--	0.6 D - 0.7 E (All Spans)
Total Load Defl. (in)	0.926 @ 7' 7/8"	0.738	Failed (L/191)	--	1.0 D + 0.7 E (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

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

OKAY E INCLUDES OVERSTRENGTH FACTOR

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Seismic	Total	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger[1]	2.79"	770	418	12022/-12022	13210/-12022	See note [1]
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	2.79"	757	409	12022/-12022	13188/-12022	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)	14' 9" o/c	
Bottom Edge (Lu)	14' 9" 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	HGU5.50-SDS H=11.813	5.25"	N/A	36-SDS25212	24-SDS25212	
2 - Face Mount Hanger	HGU5.50-SDS H=11.813	5.25"	N/A	36-SDS25212	24-SDS25212	

- 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)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	5 1/2" to 15' 2 1/2"	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 15' 6" (Front)	1' 4"	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 15' 6" (Front)	10'	6.0	-	-	Default Load
3 - Point (lb)	5' 3 5/8" (Front)	N/A	-	-	18764	E x OVERSTRENGTH
4 - Point (lb)	14' 9" (Front)	N/A	-	-	-18764	E x OVERSTRENGTH

ForteWEB Software Operator	Job Notes
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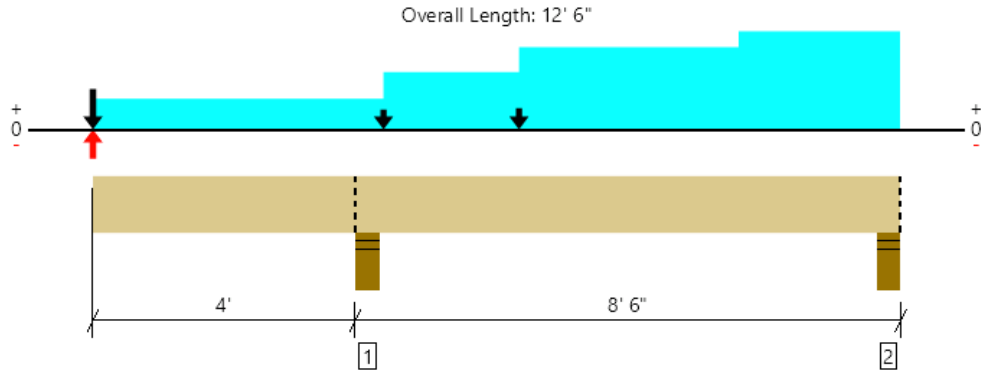
MAIN FLOOR, Copy of B53 FOR OT
1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern) [Group]
Member Reaction (lbs)	24777 @ 4' 3"	26250 (6.00")	Passed (94%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans) [1]
Shear (lbs)	9019 @ 5' 5 7/8"	16071	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans) [1]
Moment (Ft-lbs)	-29633 @ 4' 3"	39805	Passed (74%)	1.00	1.0 D + 1.0 L (All Spans) [1]
Live Load Defl. (in)	0.423 @ 0	0.213	Failed (2L/242)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans) [1]
Total Load Defl. (in)	0.655 @ 0	0.425	Failed (2L/156)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans) [1]

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240). Upward deflection on left cantilever exceeds overhang deflection criteria.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -962 lbs uplift at support located at 4' 3". Strapping or other restraint may be required.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

OKAY, E INCLUDES OVERSTRENGTH FACTOR

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Stud wall - DF	6.00"	6.00"	5.66"	10590	8692	2909	10451/-10451	32642/-10451	Blocking
2 - Stud wall - DF	5.50"	5.50"	1.50"	1169	3765/-1490	1499	3651/-3651	10084/-5141	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)	12' 6" o/c	
Bottom Edge (Lu)	12' 6" 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)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 12' 6"	N/A	26.0	--	--	--	
1 - Uniform (PSF)	0 to 12' 6" (Front)	10'	15.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 12' 6" (Front)	10'	10.0	-	-	-	Default Load
3 - Uniform (PSF)	4' 6" to 12' 6" (Front)	10'	10.0	-	-	-	Default Load
4 - Uniform (PSF)	6' 7 3/16" to 10' (Front)	10'	13.0	40.0	-	-	Default Load
5 - Uniform (PSF)	4' 6" to 12' 6" (Front)	10'	17.0	-	30.0	-	Default Load
6 - Uniform (PLF)	10' to 12' 6" (Front)	N/A	291.8	399.8	180.8	-	Linked from: J2, Support 2
7 - Point (lb)	6' 7 3/16" (Front)	N/A	710	1590	-	-	Linked from: B32, Support 2
8 - Point (lb)	4' 6" (Front)	N/A	657	91	681	-	Linked from: B36, Support 1
9 - Point (lb)	0 (Front)	N/A	3610	1926	690	6800/-6800	Linked from: Copy of B52 FOR OT, Support 2

ForteWEB Software Operator	Job Notes
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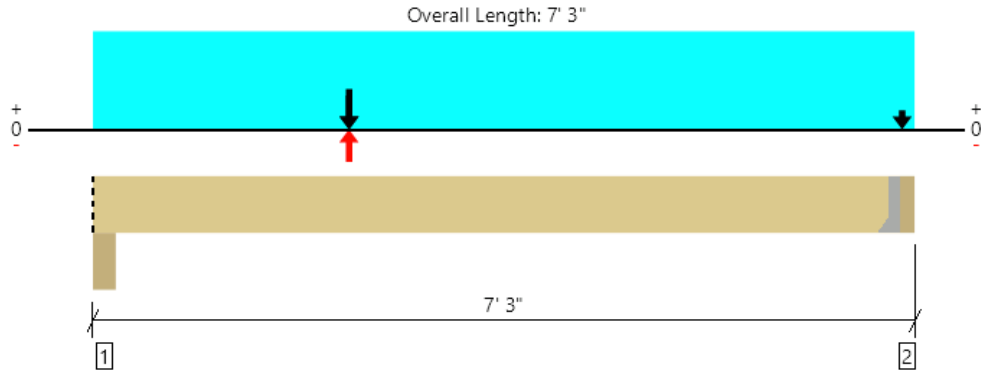
MAIN FLOOR, COPY OF B56 FOR OT

1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern) [Group]
Member Reaction (lbs)	18079 @ 4"	18047 (5.50")	Passed (100%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans) [1]
Shear (lbs)	11745 @ 1' 5 3/8"	12053	Passed (97%)	1.00	1.0 D + 1.0 L (All Spans) [1]
Moment (Ft-lbs)	23288 @ 2' 3 5/8"	29854	Passed (78%)	1.00	1.0 D + 1.0 L (All Spans) [1]
Live Load Defl. (in)	0.130 @ 3' 4 13/16"	0.166	Passed (L/613)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans) [1]
Total Load Defl. (in)	0.196 @ 3' 4 13/16"	0.331	Passed (L/405)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans) [1]

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -470 lbs uplift at support located at 6' 11 1/2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Column - DF	5.50"	5.50"	5.51"	6148	6529	3464	8449/-8449	24590/-8449	Blocking
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger[1]	2.62"	3385	4830	1465	3573/-3573	13253/-3573	See note [1]

- 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)	7' o/c	
Bottom Edge (Lu)	7' 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
2 - Face Mount Hanger	HGUS5.50/10	4.00"	N/A	46-16d	16-16d	

- 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)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 6' 11 1/2"	N/A	19.5	--	--	--	
1 - Uniform (PSF)	0 to 7' 3" (Front)	7' 6"	15.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 7' 3" (Front)	4'	13.0	40.0	-	-	Default Load
3 - Point (lb)	2' 3 5/8" (Front)	N/A	1758	2328	1296	-	Linked from: B31, Support 1
4 - Point (lb)	7' (Front)	N/A	412	1120	-	-	Linked from: B55, Support 2
5 - Point (lb)	2' 3 5/8" (Front)	N/A	5278	4167	3633	-	Linked from: B30, Support 2
6 - Point (lb)	2' 3 5/8" (Front)	N/A	757	409	-	12022/-12022	Linked from: Copy of B41 FOR OT, Support 2

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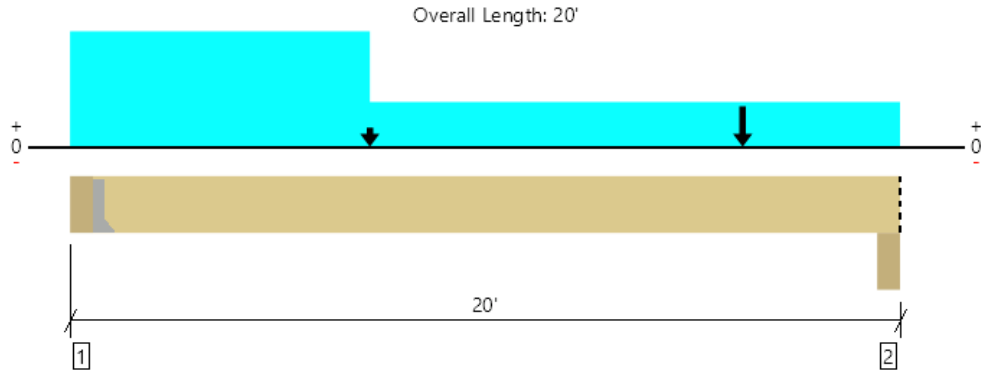
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

MAIN FLOOR, Copy of B45 FOR OT
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4486 @ 5 1/2"	4922 (1.50")	Passed (91%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	12589 @ 18' 6 5/8"	19285	Passed (65%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	44688 @ 16' 1 3/16"	47766	Passed (94%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	-1.411 @ 11' 4 1/8"	0.480	Failed (L/163)	--	0.6 D - 0.7 E (All Spans)
Total Load Defl. (in)	1.658 @ 11' 1 1/4"	0.960	Failed (L/139)	--	1.0 D + 0.7 E (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

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

OKAY E INCLUDES OVERSTRENGTH FACTOR

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Seismic	Total	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger[1]	1.50"	1116	1949	3811/-3811	6876/-3811	See note [1]
2 - Column - DF	5.50"	5.50"	3.88"	1021	825	16711/-16711	18557/-16711	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)	17' 1" o/c	
Bottom Edge (Lu)	19' 7" 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	HUCQ612-SDS	3.00"	N/A	14-SDS25212	6-SDS25212	

- 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)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	5 1/2" to 20'	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 20' (Front)	8"	15.0	40.0	-	Default Load
2 - Uniform (PSF)	7' to 20' (Front)	10'	6.0	-	-	Default Load
3 - Uniform (PSF)	0 to 7' (Front)	4'	13.0	40.0	-	Default Load
4 - Point (lb)	7' (Front)	N/A	412	1120	-	Linked from: B55, Support 2
5 - Point (lb)	16' 1 3/16" (Front)	N/A	-	-	20522	E x OVERSTRENGTH

ForteWEB Software Operator	Job Notes
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com	

Weyerhaeuser

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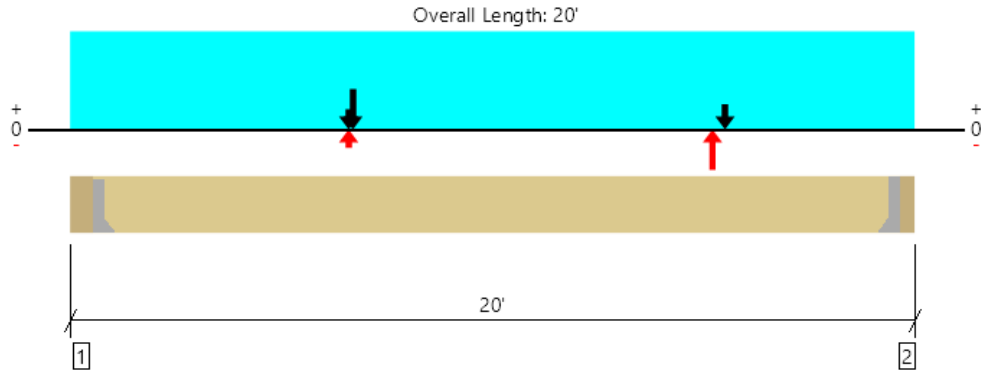
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

MAIN FLOOR, Copy of B52 FOR OT

1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9099 @ 19' 8 1/2"	9099 (2.08")	Passed (100%)	--	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	8930 @ 18' 8 5/8"	25713	Passed (35%)	1.60	1.0 D - 0.525 E + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	40720 @ 6' 7 3/16"	63688	Passed (64%)	1.60	1.0 D + 0.7 E (All Spans)
Live Load Defl. (in)	0.518 @ 7' 9 15/16"	0.481	Failed (L/446)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.998 @ 8' 10 9/16"	0.962	Failed (L/231)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2018
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.

OKAY E INCLUDES OVERSTRENGTH FACTOR

Supports	Bearing Length			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Hanger on 11 7/8" PSL beam	5.50"	Hanger[1]	1.62"	2365	1575	-174	6800/-6800	10740/-6974	See note [1]
2 - Hanger on 11 7/8" PSL beam	3.50"	Hanger[1]	2.08"	3610	1926	690	6800/-6800	13026/-6800	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)	19' 3" o/c	
Bottom Edge (Lu)	19' 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	HHUS7.25/10	3.31"	N/A	30-16d	10-16d	
2 - Face Mount Hanger	HGU7.25-SDS H=11.813	5.25"	N/A	36-SDS25212	24-SDS25212	

- 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)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	5 1/2" to 19' 8 1/2"	N/A	26.0	--	--	--	
1 - Uniform (PSF)	0 to 20' (Front)	1'	15.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 20' (Front)	10'	10.0	-	-	-	Default Load
3 - Point (lb)	6' 6" (Front)	N/A	559	1243	-614	-	Linked from: B35, Support 2
4 - Point (lb)	15' 6" (Front)	N/A	2615	1458	1130	-	Linked from: B35, Support 3
5 - Point (lb)	6' 7 3/16" (Front)	N/A	-	-	-	15220	E x OVERSTRENGTH
6 - Point (lb)	15' 2 3/8" (Front)	N/A	-	-	-	-15220	E x OVERSTRENGTH

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

SECTION 4: FOUNDATION

P.O. BOX 28427
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tel. 206 356 9553

FOOTING DESIGN -- LOAD SUMMARY

Allowable bearing = 2000 psf
with 1/3 increase for E/W = 2666.67 psf
E = 0.7 QE x RHO
W = 0.6 W

	W1	W2	F1	F2	RF1	RF2
DL	9	100	13	15	50	15
LL	0	0	40	60	0	0
SL	0	0	0	30	30	30

Notes:
L1 is the length tributary loads are applied to.
L2 is the width of footing.
L3 is the length of footing.
See foundation key plan for mark locations

C1 = DL + LL
C2 = DL + SL
C3 = DL + 0.75(SL+LL)
C4 = DL + 0.75(E+LL)
C5 = DL + 0.75(E+LL+SL)

	POINT LOADS (LBS)				Max. Tributary Areas (Ft.)						Min. Footing Dimensions					Total Load (lbs)				BEARING (Ksf)					
MARK	DL	LL	SL	E/W	W1	W2	F1	F2	RF1	RF2	SW	T (in)	L1 ft.	L2 (in)	L3 (ft.)	DL	LL	SL	E/W	C1	C2	C3	C4	C5	max.
HOUSE																									
C15	10496	4252	3149	0	0	0	0	0	0	0	2.4	12	4	48	4	12896	4252	3149	0	1.07	1.00	1.15	1.01	1.15	1.15
C16	17865	12215	8080	0	0	0	0	0	0	0	3.0375	12	4.5	54	4.5	20903	12215	8080	0	1.64	1.43	1.78	1.48	1.78	1.78
C17	9183	4973	4903	0	0	0	0	0	0	0	1.35	12	3	36	3	10533	4973	4903	0	1.72	1.72	1.99	1.58	1.99	1.99
C18	10201	11169	5318	0	8	2	0	0	0	0	2.2	11	4	48	4	13489	11169	5318	0	1.54	1.18	1.62	1.37	1.62	1.62
C19	3437	5005	527	0	8	2	10	0	0	0	0.75167	11	2.05	16	4.1	5013	5825	527	0	1.98	1.01	1.79	1.72	1.79	1.98
C20	6364	6664	3537	0	0	0	0	0	0	0	1.20313	11	3.5	30	3.5	7567	6664	3537	0	1.63	1.27	1.74	1.44	1.74	1.74
C21	12345	10027	6599	0	0	0	0	0	0	0	1.8	9	4	48	4	14145	10027	6599	0	1.51	1.30	1.66	1.35	1.66	1.66
C22	6716	4089	3991	0	0	0	0	0	0	0	1.0125	9	3	36	3	7729	4089	3991	0	1.31	1.30	1.53	1.20	1.53	1.53
C23	10010	9198	5526	0	8	2	10	0	0	0	1.8	9	2	48	4	12614	9998	5526	0	1.41	1.13	1.52	1.26	1.52	1.52
C24	11506	1291	2609	0	0	8	0	0	0	0	1.05	9	2	28	4	14156	1291	2609	0	1.66	1.80	1.83	1.62	1.83	1.83
C26	1704	3186	1952	0	0	0	0	0	0	0	0.45	9	2	24	2	2154	3186	1952	0	1.34	1.03	1.50	1.14	1.50	1.50
C25	5462	7478	4908	0	0	0	0	0	0	0	1.0125	9	3	36	3	6475	7478	4908	0	1.55	1.26	1.75	1.34	1.75	1.75
C27	3848	2659	4514	0	0	0	0	0	0	0	1.35	12	3	36	3	5198	2659	4514	0	0.87	1.08	1.18	0.80	1.18	1.18

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SPREAD FOOTING DESIGN -- SQUARE

for 2000 psf Allowable Bearing Pressure

f'c = 3,000 psi
fy = 60 ksi

1'-6" square

P =	5.63 k	one-way:					
Pu =	9.17 k	phi Vc =	8.80 k	Vu =	1.91 k	o.k.	
p =	2,500 psf	(2) #4 each way					
h =	9.00 in	phi Mn =	6.05 k-ft	Mu =	1.72 k-ft	o.k.	
d =	5.25 in						
b =	18.00 in	two-way:					
bo =	35.00 in	phi Vc =	34.22 k	Vu =	7.00 k	o.k.	

2'-0" square

P =	8.00 k	one-way:					
Pu =	13.04 k	phi Vc =	11.73 k	Vu =	3.67 k	o.k.	
p =	2,000 psf	(3) #4 each way					
h =	9.00 in	phi Mn =	9.03 k-ft	Mu =	3.26 k-ft	o.k.	
d =	5.25 in						
b =	24.00 in	two-way:					
bo =	35.00 in	phi Vc =	34.22 k	Vu =	11.31 k	o.k.	

2'-6" square

P =	12.50 k	one-way:					
Pu =	20.38 k	phi Vc =	14.67 k	Vu =	6.62 k	o.k.	
p =	2,000 psf	(3) #4 each way					
h =	9.00 in	phi Mn =	9.11 k-ft	Mu =	6.37 k-ft	o.k.	
d =	5.25 in						
b =	30.00 in	two-way:					
bo =	35.00 in	phi Vc =	34.22 k	Vu =	18.64 k	o.k.	

3'-0" square

P =	18.00 k	one-way:					
Pu =	29.34 k	phi Vc =	24.30 k	Vu =	8.76 k	o.k.	
p =	2,000 psf	(4) #4 each way					
h =	11.00 in	phi Mn =	26.77 k-ft	Mu =	11.00 k-ft	o.k.	
d =	7.25 in						
b =	36.00 in	two-way:					
bo =	43.00 in	phi Vc =	58.06 k	Vu =	26.72 k	o.k.	

4'-0" square

P =	32.00 k	one-way:					
Pu =	52.16 k	phi Vc =	32.40 k	Vu =	18.20 k	o.k.	
p =	2,000 psf	(6) #4 each way					
h =	11.00 in	phi Mn =	40.26 k-ft	Mu =	26.08 k-ft	o.k.	
d =	7.25 in						
b =	48.00 in	two-way:					
bo =	61.00 in	phi Vc =	82.36 k	Vu =	49.54 k	o.k.	

4'-6" square

P =	40.50 k	one-way:					
Pu =	66.02 k	phi Vc =	36.45 k	Vu =	24.14 k	o.k.	
p =	2,000 psf	(6) #4 each way					
h =	11.00 in	phi Mn =	40.26 k-ft	Mu =	37.13 k-ft	o.k.	
d =	7.25 in						
b =	54.00 in	two-way:					
bo =	61.00 in	phi Vc =	82.36 k	Vu =	63.40 k	o.k.	

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SPREAD FOOTING DESIGN -- RECTANGULAR

for 2000 psf Max. Allowable Bearing Pressure

f'c =	3,000	psi						
fy =	60	ksi						
16" wide x 4'-10" long								
P =	12.89	k	one-way:					
Pu =	21.01	k	phi Vc =	8.57	k	Vu =	8.42	k o.k.
p =	2,000	psf	(2) #4 bottom					
h =	9.00	in	phi Mn =	13.42	k-ft	Mu =	12.69	k-ft o.k.
d =	5.75	in						
b =	16.00	in						
l =	58.00	in	two-way:					
bo =	47.00	in	phi Vc =	50.33	k	Vu =	19.07	k o.k.
24" wide x 3'-6" long								
P =	14.00	k	one-way:					
Pu =	22.82	k	phi Vc =	12.85	k	Vu =	8.29	k o.k.
p =	2,000	psf	(3) #4 bottom					
h =	9.00	in	phi Mn =	14.57	k-ft	Mu =	9.98	k-ft o.k.
d =	5.75	in						
b =	24.00	in						
l =	42.00	in	two-way:					
bo =	45.00	in	phi Vc =	48.19	k	Vu =	20.88	k o.k.

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Seattle, Washington 98118-9998
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This Wall in File: C:\Users\josh\Dropbox\New Projects\Whidbey Farmhouse\engineering\RETAINING WALLS

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License : KW-06061184
License To : J Welch Engineering LLC

Cantilevered Retaining Wall

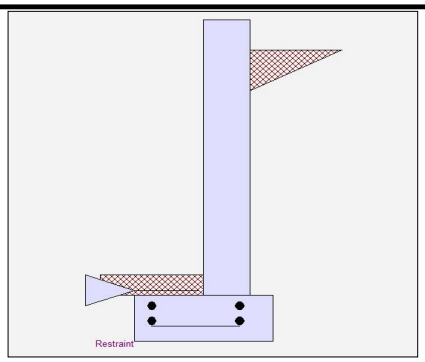
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	50.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	1.66	OK
Slab Resists All Sliding !			
Total Bearing Load	=	942 lbs	
...resultant ecc.	=	5.95 in	
Soil Pressure @ Toe	=	1,245 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,742 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	9.4 psi	OK
Footing Shear @ Heel	=	3.0 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	451.3 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.186**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	512.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	682.7
Moment.....Allowable	=	3,655.6
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	6.8
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.25
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	40,000.0

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0384 in2/ft	
(4/3) * As :	0.0512 in2/ft	Min Stem T&S Reinf Area 0.778 in2
200bd/fy : 200(12)(6.25)/40000 :	0.375 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.173 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 13.89 in #4@ 27.78 in
Provided Area :	0.2 in2/ft	#5@ 21.53 in #5@ 43.06 in
Maximum Area :	1.27 in2/ft	#6@ 30.56 in #6@ 61.11 in

Footing Data

Toe Width	=	1.00 ft
Heel Width	=	1.00
Total Footing Width	=	2.00
Footing Thickness	=	9.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 40,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,742	0	psf
Mu' : Upward	=	8,152	0	ft-#
Mu' : Downward	=	1,602	42	ft-#
Mu: Design	=	546	42	ft-#
Actual 1-Way Shear	=	9.41	3.01	psi
Allow 1-Way Shear	=	75.00	40.00	psi

Toe Reinforcing = # 4 @ 12.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 12.34 in, #5@ 19.13 in, #6@ 27.16 in, #7@ 37.03 in, #8@ 48.76 in, #9@ 6
Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
Key: No key defined

Min footing T&S reinf Area 0.39 in2
Min footing T&S reinf Area per foot 0.19 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 12.35 in	#4@ 24.69 in
#5@ 19.14 in	#5@ 38.27 in
#6@ 27.16 in	#6@ 54.32 in

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	451.3	1.58	714.5			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
=						
Soil Over HL (ab. water tbl)				173.3	1.83	317.8
Soil Over HL (bel. water tbl)					1.83	317.8
Watre Table						
Sloped Soil Over Heel =						
Surcharge Over Heel =						
Adjacent Footing Load =						
Axial Dead Load on Stem =						
* Axial Live Load on Stem =						
Soil Over Toe =				43.3	0.50	21.7
Surcharge Over Toe =				50.0	0.50	25.0
Stem Weight(s) =				450.0	1.33	600.0
Earth @ Stem Transitions =						
Footing Weight =				225.0	1.00	225.0
Key Weight =						
Vert. Component =						
Total =	451.3	**O.T.M.** =	714.5	**Total =** 941.7 lbs	**R.M.=**	1,189.4

Resisting/Overturning Ratio = **1.66**
Vertical Loads used for Soil Pressure = 941.7 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	200.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.097	in

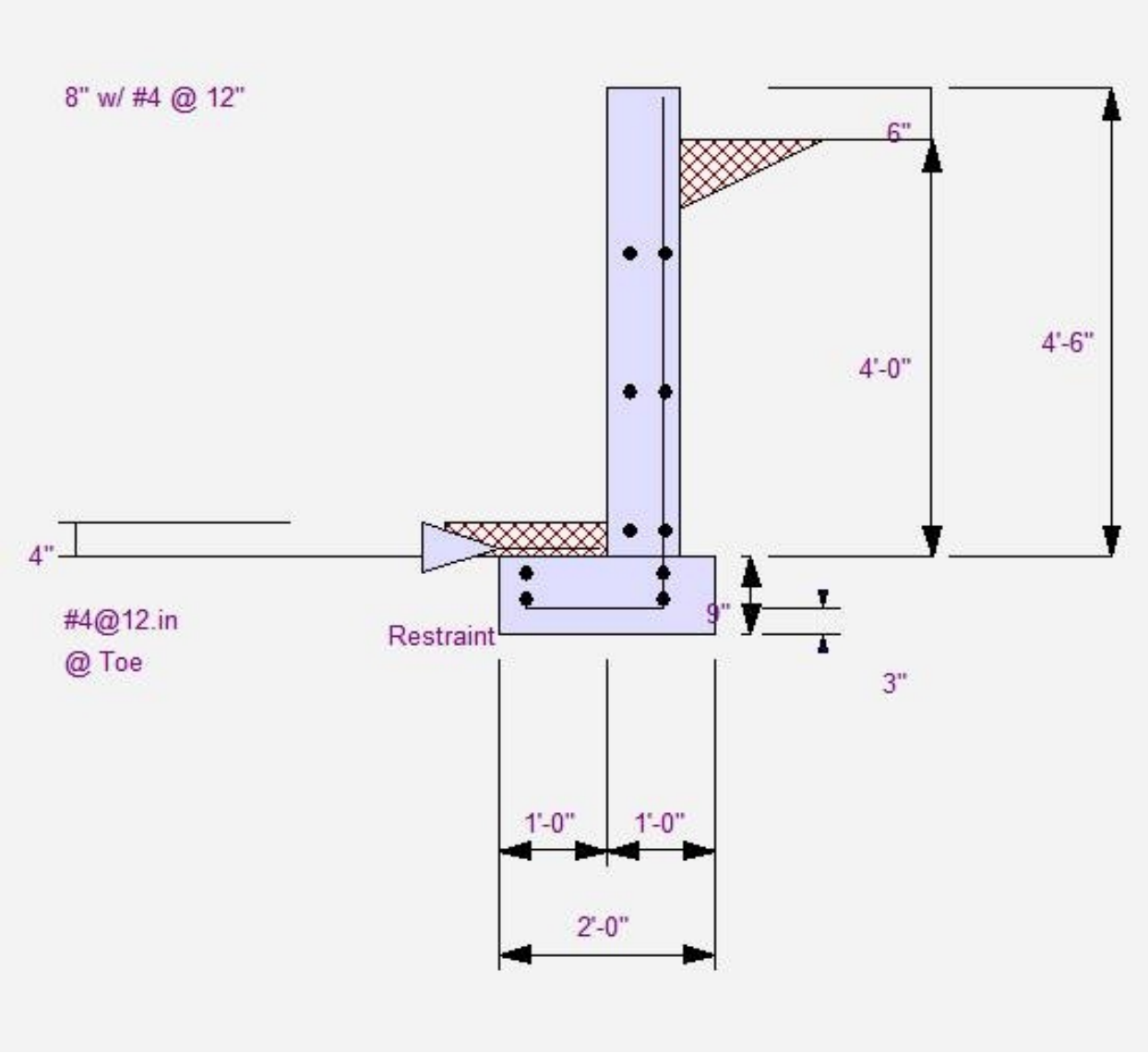
The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

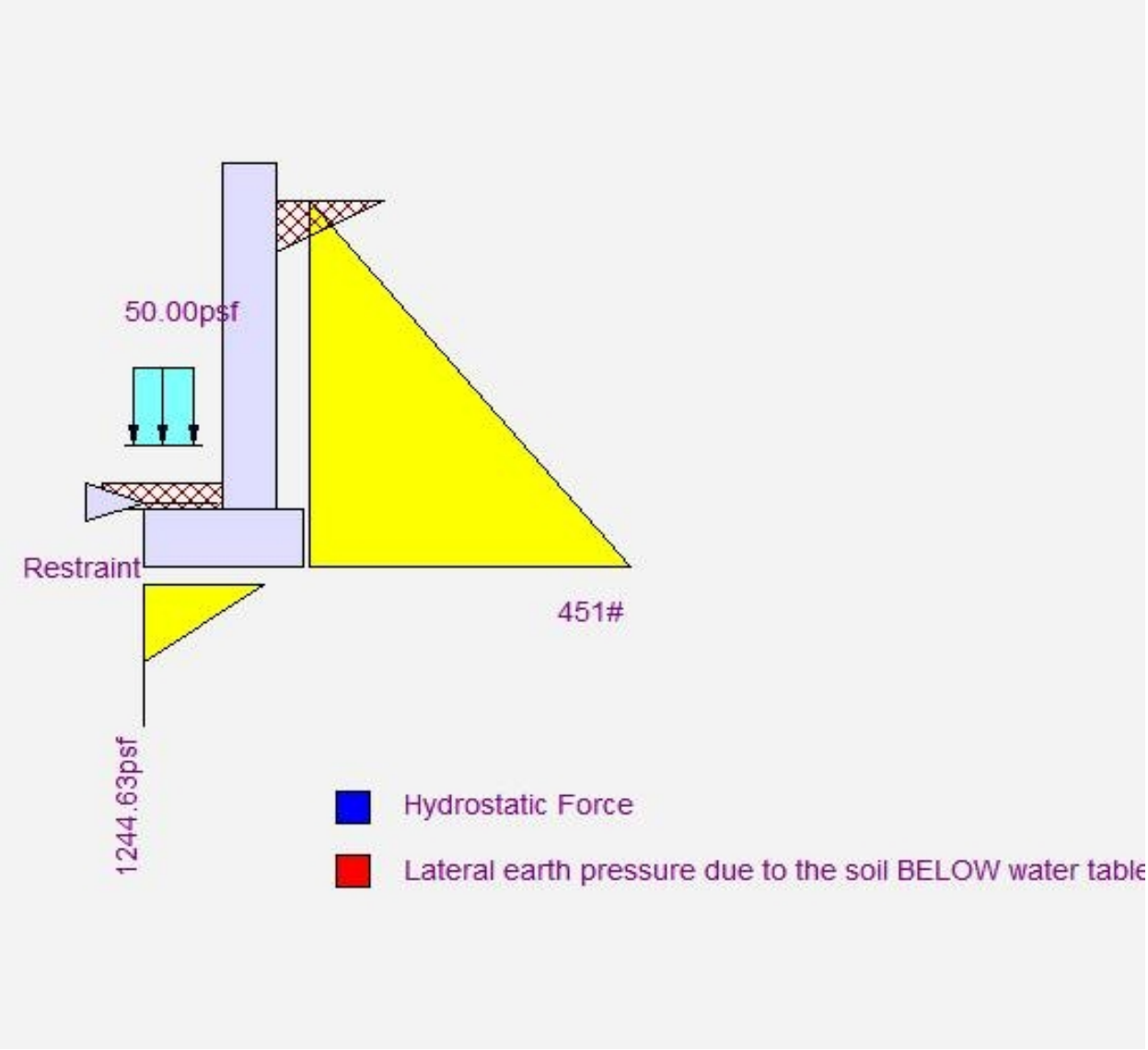
Rebar Lap & Embedment Lengths Information

(Applying TMS 402 provisions) or (Applying IBC modifications to TMS 402 provisions)

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment =	15.60 in
Development length for #4 bar specified in this stem design segment =	12.00 in
Hooked embedment length into footing for #4 bar specified in this stem design segment =	6.00 in
As Provided =	0.2000 in2/ft
As Required =	0.1728 in2/ft


8" w/ #4 @ 12"
6"
4'-0"
4'-6"
4"
#4@12.in
@ Toe
Restraint
9"
3"
1'-0"
1'-0"
2'-0"


50.00psf
Restraint
451#
1244.63psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table

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Cantilevered Retaining Wall

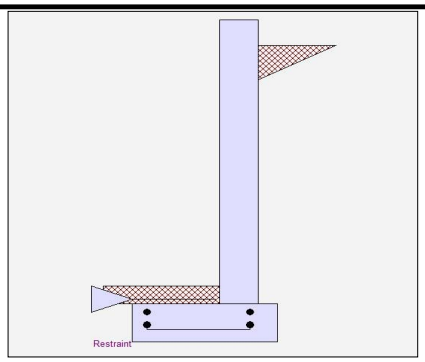
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	5.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	50.0
Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Design Summary

Wall Stability Ratios

Overturning	=	1.55	OK
Slab Resists All Sliding !			

Total Bearing Load	=	1,188 lbs	
...resultant ecc.	=	7.90 in	
Soil Pressure @ Toe	=	1,338 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,873 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	16.4 psi	OK
Footing Shear @ Heel	=	3.6 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	661.3 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.364**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	800.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	1,333.3
Moment.....Allowable	=	3,655.6
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	10.7
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.25
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	40,000.0

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0749 in2/ft	
(4/3) * As :	0.0999 in2/ft	Min Stem T&S Reinf Area 0.950 in2
200bd/fy : 200(12)(6.25)/40000 :	0.375 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.173 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.1728 in2/ft	#4@ 13.89 in #4@ 27.78 in
Provided Area :	0.2 in2/ft	#5@ 21.53 in #5@ 43.06 in
Maximum Area :	1.27 in2/ft	#6@ 30.56 in #6@ 61.11 in

Footing Data

Toe Width	=	1.50 ft
Heel Width	=	1.00
Total Footing Width	=	2.50
Footing Thickness	=	9.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 40,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,873	0	psf
Mu' : Upward	=	18,168	0	ft-#
Mu' : Downward	=	3,605	51	ft-#
Mu: Design	=	1,214	51	ft-#
Actual 1-Way Shear	=	16.41	3.63	psi
Allow 1-Way Shear	=	75.00	40.00	psi

Toe Reinforcing = # 4 @ 12.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 12.34 in, #5@ 19.13 in, #6@ 27.16 in, #7@ 37.03 in, #8@ 48.76 in, #9@ 6
Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
Key: No key defined

Min footing T&S reinf Area 0.49 in2
Min footing T&S reinf Area per foot 0.19 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 12.35 in	#4@ 24.69 in
#5@ 19.14 in	#5@ 38.27 in
#6@ 27.16 in	#6@ 54.32 in

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	661.3	1.92	1,267.4			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
=						
Soil Over HL (ab. water tbl)				216.7	2.33	505.6
Soil Over HL (bel. water tbl)					2.33	505.6
Watre Table						
Sloped Soil Over Heel =						
Surcharge Over Heel =						
Adjacent Footing Load =						
Axial Dead Load on Stem =						
* Axial Live Load on Stem =						
Soil Over Toe =				65.0	0.75	48.8
Surcharge Over Toe =				75.0	0.75	56.3
Stem Weight(s) =				550.0	1.83	1,008.3
Earth @ Stem Transitions =						
Footing Weight =				281.3	1.25	351.6
Key Weight =						
Vert. Component =						
Total =	661.3	**O.T.M.** =	1,267.4	**Total =** 1,187.9 lbs	**R.M.=**	1,970.5

Resisting/Overturning Ratio = **1.55**
Vertical Loads used for Soil Pressure = 1,187.9 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	200.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.102	in

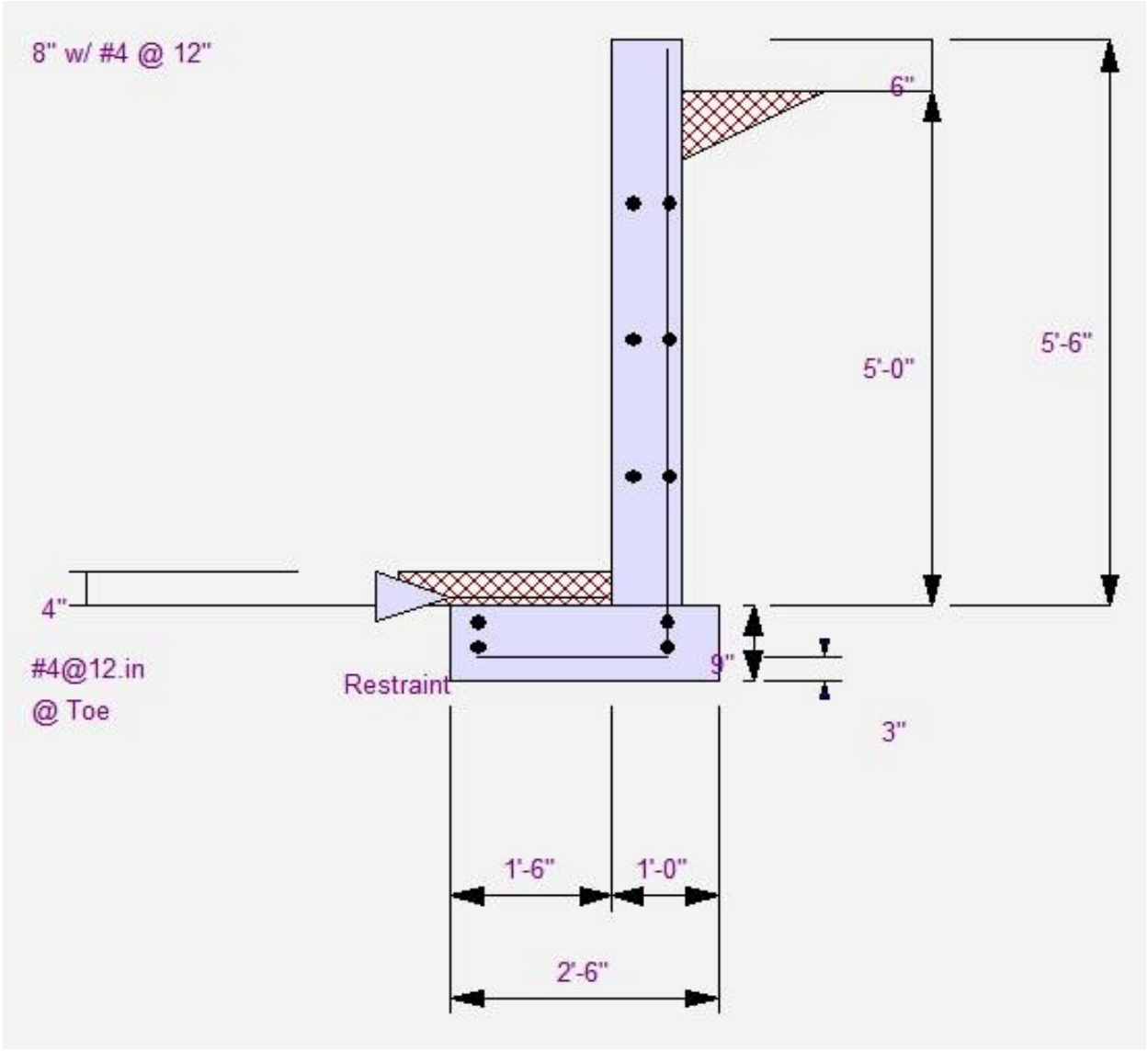
The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

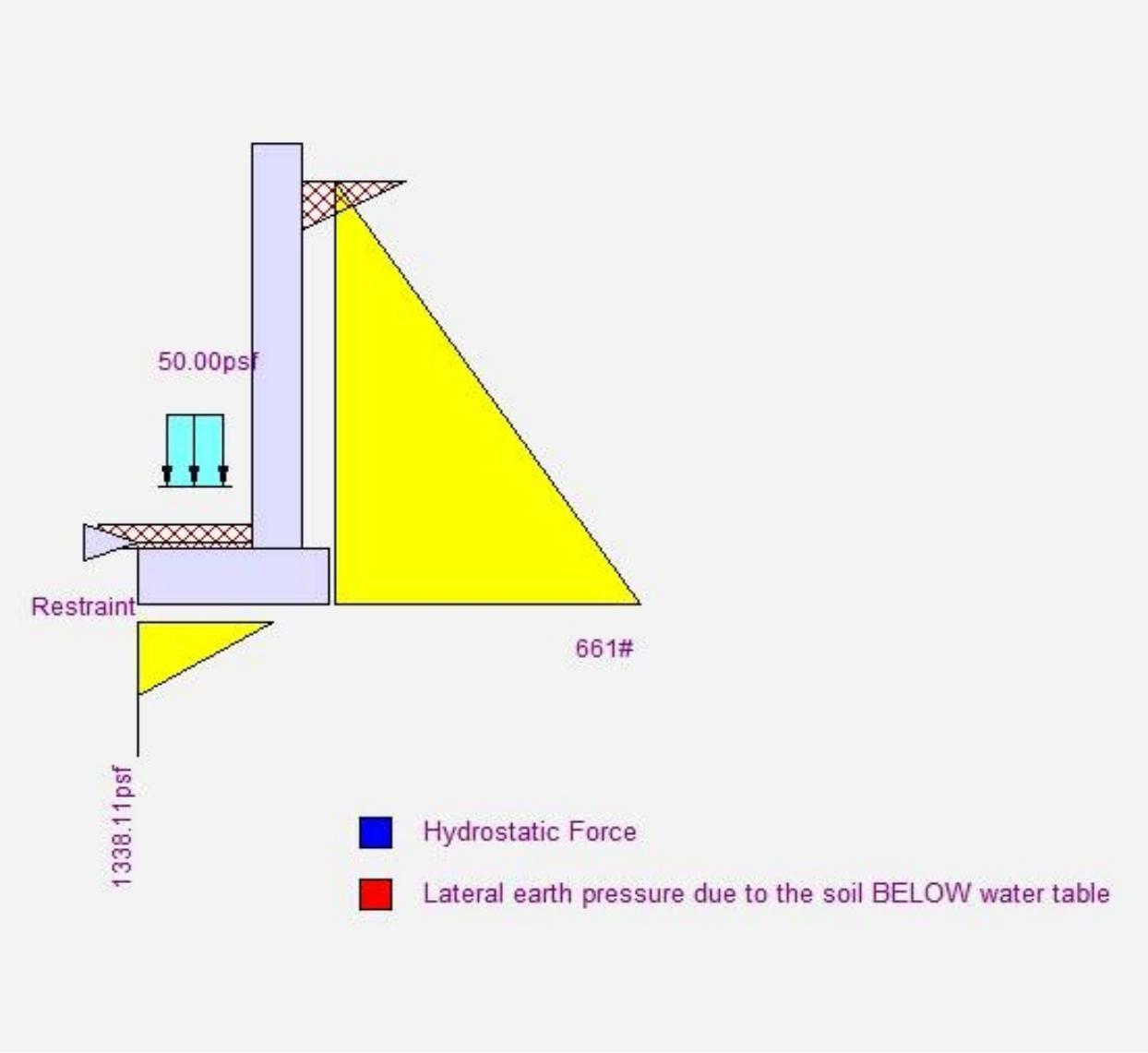
Rebar Lap & Embedment Lengths Information

(Applying TMS 402 provisions) or (Applying IBC modifications to TMS 402 provisions)

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment =	15.60 in
Development length for #4 bar specified in this stem design segment =	12.00 in
Hooked embedment length into footing for #4 bar specified in this stem design segment =	6.00 in
As Provided =	0.2000 in2/ft
As Required =	0.1728 in2/ft


8" w/ #4 @ 12"
6"
5'-0"
5'-6"
4"
#4@12.in
@ Toe
Restraint
9"
3"
1'-6"
1'-0"
2'-6"


50.00psf
Restraint
661#
1338.11psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table

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Cantilevered Retaining Wall

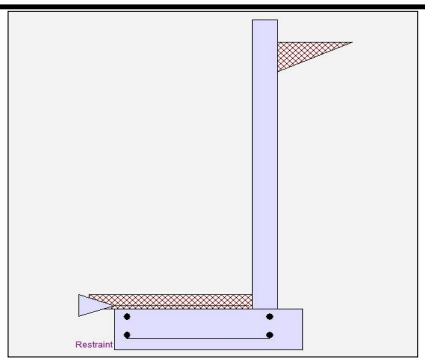
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	50.0
NOT Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.79	OK
Slab Resists All Sliding !			
Total Bearing Load	=	1,512 lbs	
...resultant ecc.	=	7.10 in	
Soil Pressure @ Toe	=	785 psf	OK
Soil Pressure @ Heel	=	22 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,199 psf	
ACI Factored @ Heel	=	33 psf	
Footing Shear @ Toe	=	13.1 psi	OK
Footing Shear @ Heel	=	4.6 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	956.8 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD LRFD
Thickness	=	6.00
Rebar Size	=	# 5
Rebar Spacing	=	15.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.530**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	1,152.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	2,304.0
Moment.....Allowable	=	4,346.7
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	22.9
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	4.19
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	75.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1323 in2/ft		
(4/3) * As :	0.1765 in2/ft	Min Stem T&S Reinf Area 0.842 in2	
200bd/fy : 200(12)(4.1875)/60000 :	0.1675 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.130 in2/ft	
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.1675 in2/ft	#4@ 18.52 in	#4@ 37.04 in
Provided Area :	0.248 in2/ft	#5@ 28.70 in	#5@ 57.41 in
Maximum Area :	0.5673 in2/ft	#6@ 40.74 in	#6@ 81.48 in

Footing Data

Toe Width	=	2.75 ft
Heel Width	=	1.00
Total Footing Width	=	3.75
Footing Thickness	=	11.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 40,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,199	33	psf
Mu' : Upward	=	41,463	11	ft-#
Mu' : Downward	=	13,476	138	ft-#
Mu: Design	=	2,332	127	ft-#
Actual 1-Way Shear	=	13.08	4.58	psi
Allow 1-Way Shear	=	75.00	40.00	psi

Toe Reinforcing = # 5 @ 15.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 10.10 in, #5@ 15.65 in, #6@ 22.22 in, #7@ 30.30 in, #8@ 39.89 in, #9@ 5
Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
Key: No key defined

Min footing T&S reinf Area 0.89 in2
Min footing T&S reinf Area per foot 0.24 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 10.10 in	#4@ 20.20 in
#5@ 15.66 in	#5@ 31.31 in
#6@ 22.22 in	#6@ 44.44 in

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	956.8	2.31	2,206.0			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
=						
Soil Over HL (ab. water tbl)				390.0	3.50	1,365.0
Soil Over HL (bel. water tbl)					3.50	1,365.0
Watre Table						
Sloped Soil Over Heel =						
Surcharge Over Heel =						
Adjacent Footing Load =						
Axial Dead Load on Stem =						
* Axial Live Load on Stem =						
Soil Over Toe =				119.2	1.38	163.9
Surcharge Over Toe =						
Stem Weight(s) =				487.5	3.00	1,462.5
Earth @ Stem Transitions =						
Footing Weight =				515.6	1.88	966.8
Key Weight =						
Vert. Component =						
Total =	956.8	**O.T.M.** =	2,206.0	**Total =** 1,512.3 lbs	**R.M.=**	3,958.2

Resisting/Overturning Ratio = **1.79**
Vertical Loads used for Soil Pressure = 1,512.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	200.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.047	in

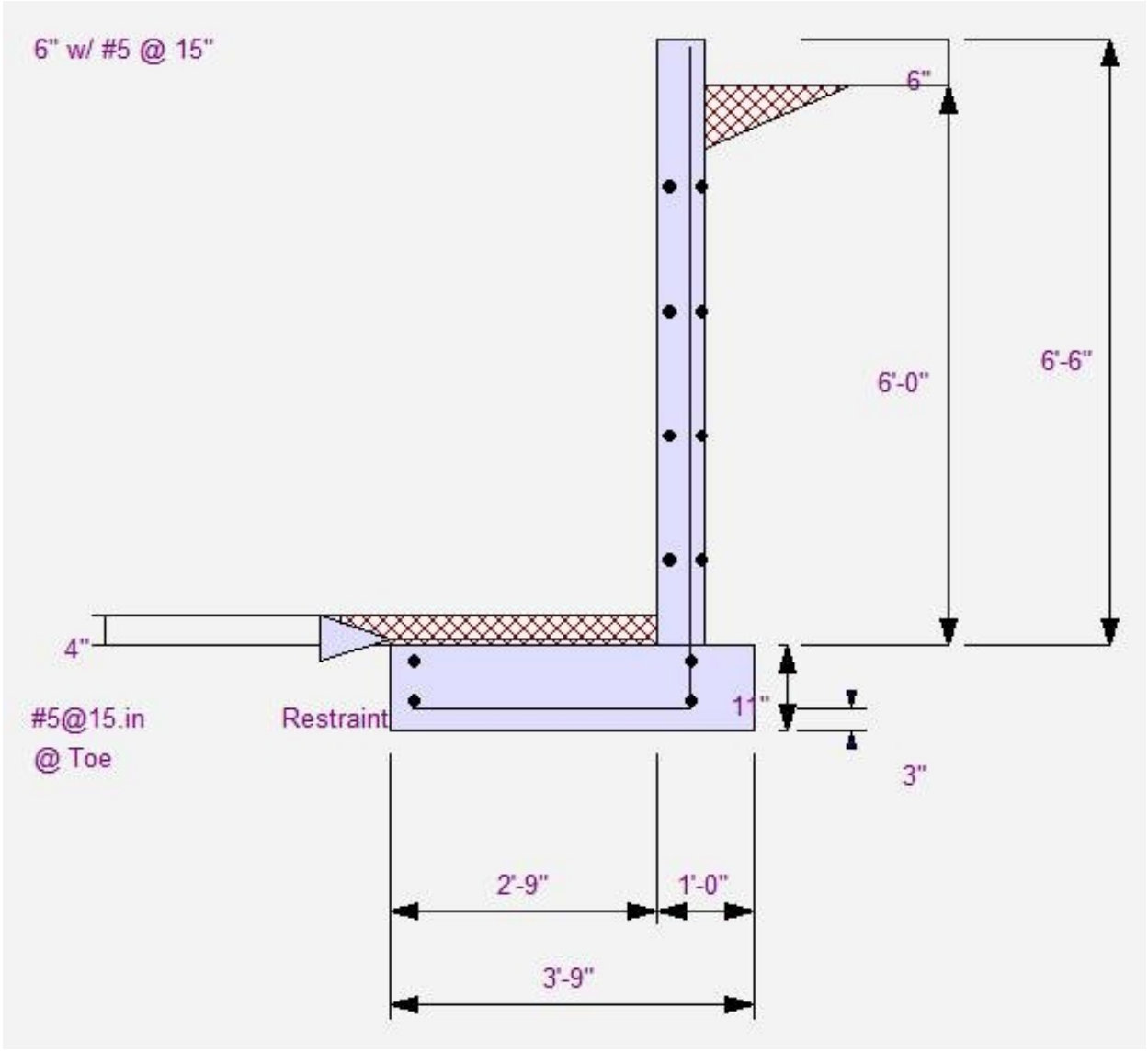
The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

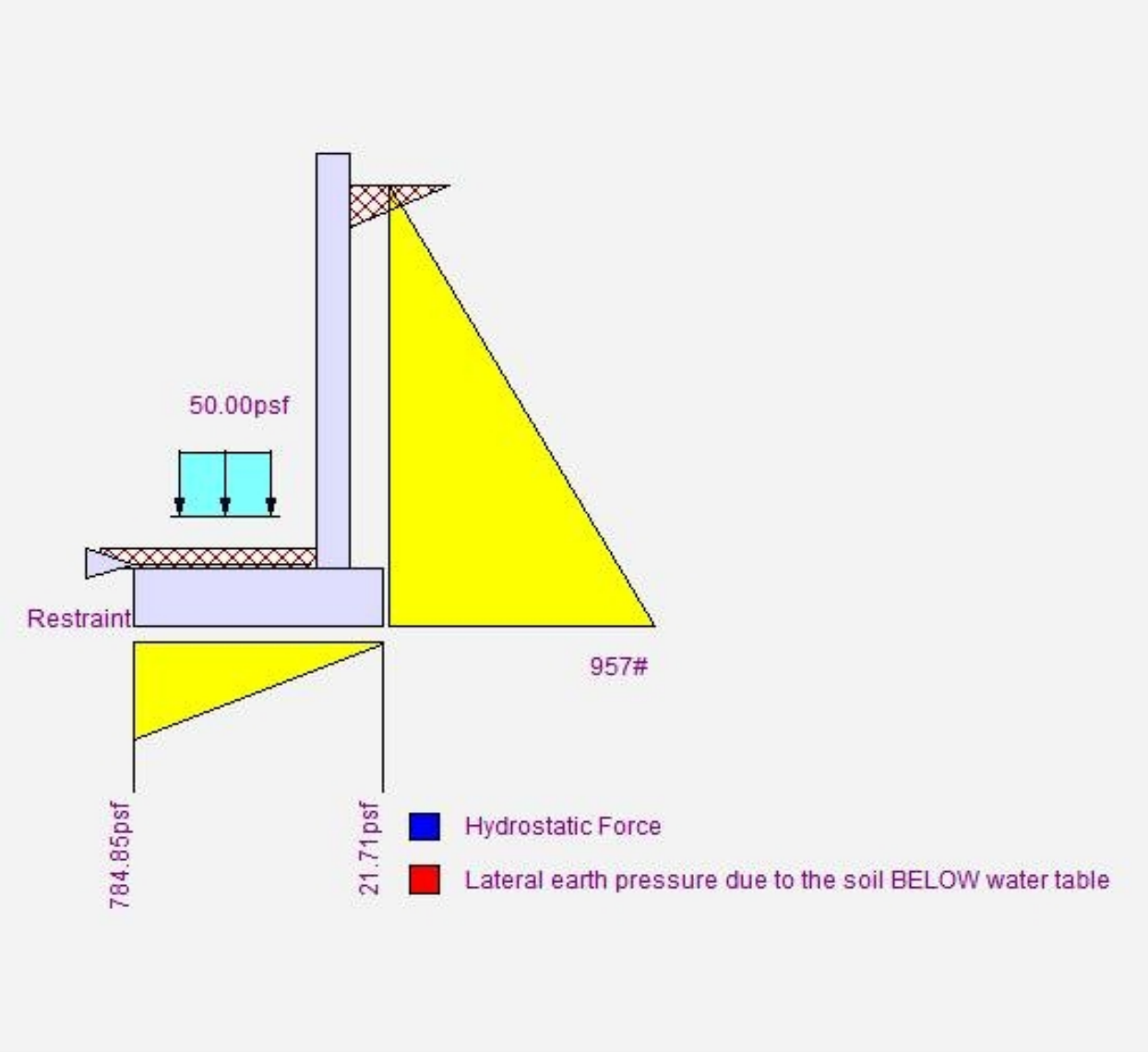
Rebar Lap & Embedment Lengths Information

(Applying TMS 402 provisions) or (Applying IBC modifications to TMS 402 provisions)

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment =	23.40 in
Development length for #5 bar specified in this stem design segment =	18.00 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	7.09 in
As Provided =	0.2480 in2/ft
As Required =	0.1675 in2/ft


6" w/ #5 @ 15"
6"
6'-0"
6'-6"
4"
#5@15.in
@ Toe
Restraint
11"
3"
2'-9"
1'-0"
3'-9"


50.00psf
Restraint
957#
784.85psf
21.71psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table

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Cantilevered Retaining Wall

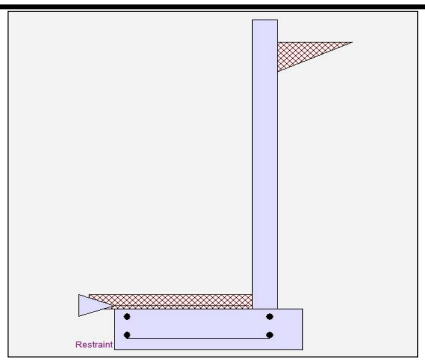
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,667.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	50.0
NOT Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	55.333
Total Seismic Force	=	382.722

Design Summary

Wall Stability Ratios

Overturning	=	1.26	Ratio < 1.5!
Slab Resists All Sliding !			
Total Bearing Load	=	1,512 lbs	
...resultant ecc.	=	14.45 in	
Soil Pressure @ Toe	=	1,503 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,667 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,295 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	18.2 psi	OK
Footing Shear @ Heel	=	5.1 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	1,224.7 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

	Bottom
	Stem OK
Design Height Above Ftg ft =	0.00
Wall Material Above "Ht" =	Concrete
Design Method =	LRFD LRFD
Thickness =	6.00
Rebar Size =	# 5
Rebar Spacing =	15.00
Rebar Placed at =	Edge
Design Data	
fb/FB + fa/Fa =	**0.759**
Total Force @ Section	
Service Level lbs =	
Strength Level lbs =	1,484.0
Moment....Actual	
Service Level ft-# =	
Strength Level ft-# =	3,300.0
Moment.....Allowable =	4,346.7
Shear.....Actual	
Service Level psi =	
Strength Level psi =	29.5
Shear.....Allowable psi =	75.0
Anet (Masonry) in2 =	
Rebar Depth 'd' in =	4.19
Masonry Data	
f'm psi =	
Fs psi =	
Solid Grouting =	
Modular Ratio 'n' =	
Wall Weight psf =	75.0
Short Term Factor =	
Equiv. Solid Thick. =	
Masonry Block Type =	Medium Weight
Masonry Design Method =	ASD
Concrete Data	
f'c psi =	2,500.0
Fy psi =	60,000.0

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.1896 in2/ft	
(4/3) * As :	0.2527 in2/ft	Min Stem T&S Reinf Area 0.842 in2
200bd/fy : 200(12)(4.1875)/60000 :	0.1675 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.130 in2/ft
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.1896 in2/ft	#4@ 18.52 in #4@ 37.04 in
Provided Area :	0.248 in2/ft	#5@ 28.70 in #5@ 57.41 in
Maximum Area :	0.5673 in2/ft	#6@ 40.74 in #6@ 81.48 in

Footing Data

Toe Width	=	2.75 ft
Heel Width	=	1.00
Total Footing Width	=	3.75
Footing Thickness	=	11.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 40,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,295	0	psf
Mu' : Upward	=	57,623	0	ft-#
Mu' : Downward	=	13,476	138	ft-#
Mu: Design	=	3,679	138	ft-#
Actual 1-Way Shear	=	18.24	5.10	psi
Allow 1-Way Shear	=	75.00	40.00	psi

Toe Reinforcing = # 5 @ 15.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 10.10 in, #5@ 15.65 in, #6@ 22.22 in, #7@ 30.30 in, #8@ 39.89 in, #9@ 5
Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
Key: No key defined

Min footing T&S reinf Area 0.89 in2
Min footing T&S reinf Area per foot 0.24 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 10.10 in	#4@ 20.20 in
#5@ 15.66 in	#5@ 31.31 in
#6@ 22.22 in	#6@ 44.44 in

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	956.8	2.31	2,206.0			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
Seismic Earth Load =	267.9	3.46	926.5			
=						
Total =	1,224.7	**O.T.M.** =	3,132.5			
				Soil Over HL (ab. water tbl)	390.0	3.50	1,365.0
				Soil Over HL (bel. water tbl)		3.50	1,365.0
				Watre Table			
				Sloped Soil Over Heel =			
				Surcharge Over Heel =			
				Adjacent Footing Load =			
				Axial Dead Load on Stem =			
				* Axial Live Load on Stem =			
				Soil Over Toe =	119.2	1.38	163.9
				Surcharge Over Toe =			
				Stem Weight(s) =	487.5	3.00	1,462.5
				Earth @ Stem Transitions =			
				Footing Weight =	515.6	1.88	966.8
				Key Weight =			
				Vert. Component =			
				Total =	1,512.3 lbs	**R.M.=**	3,958.2

Resisting/Overturning Ratio = **1.26**
Vertical Loads used for Soil Pressure = 1,512.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	200.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.090	in

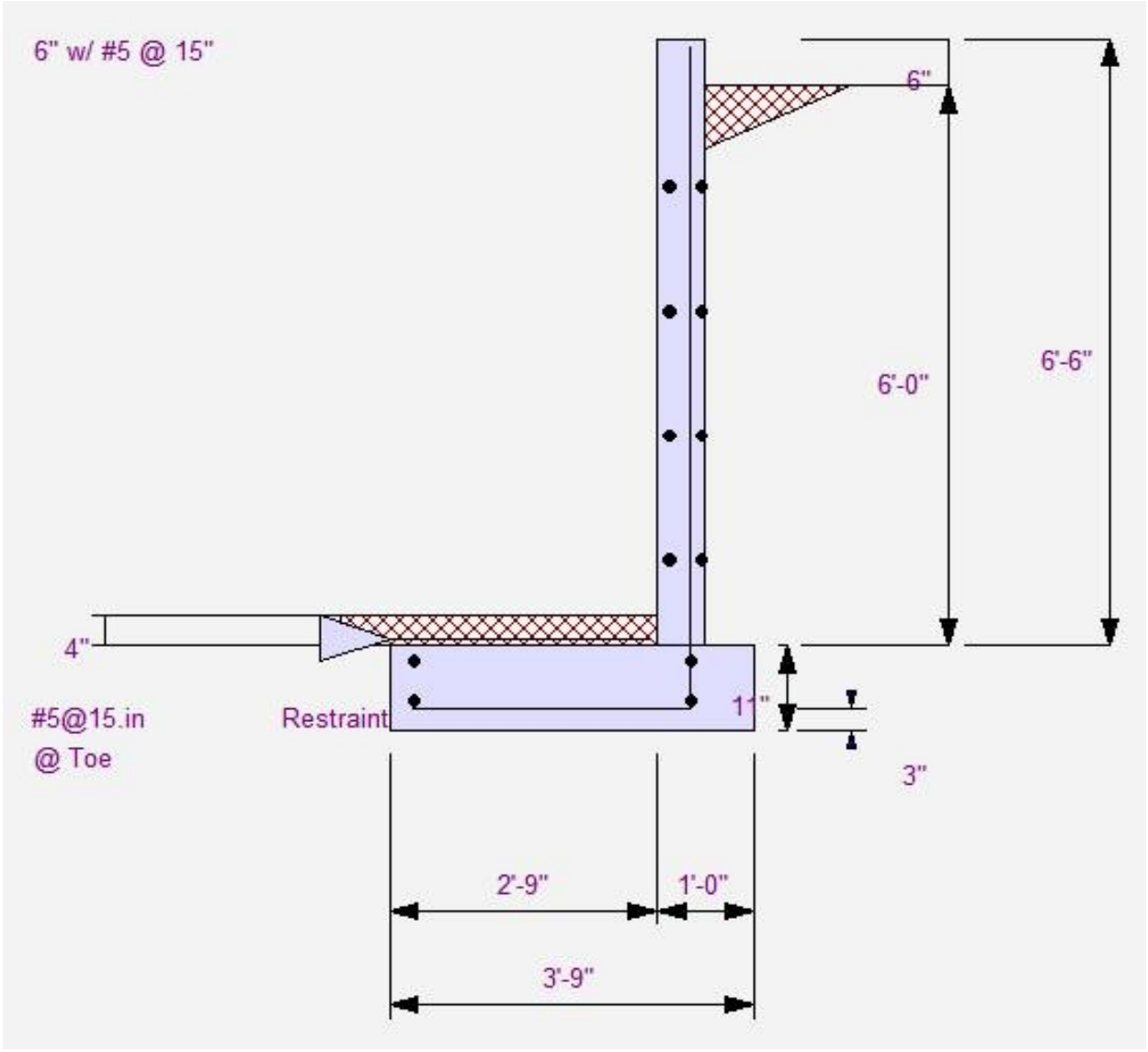
The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

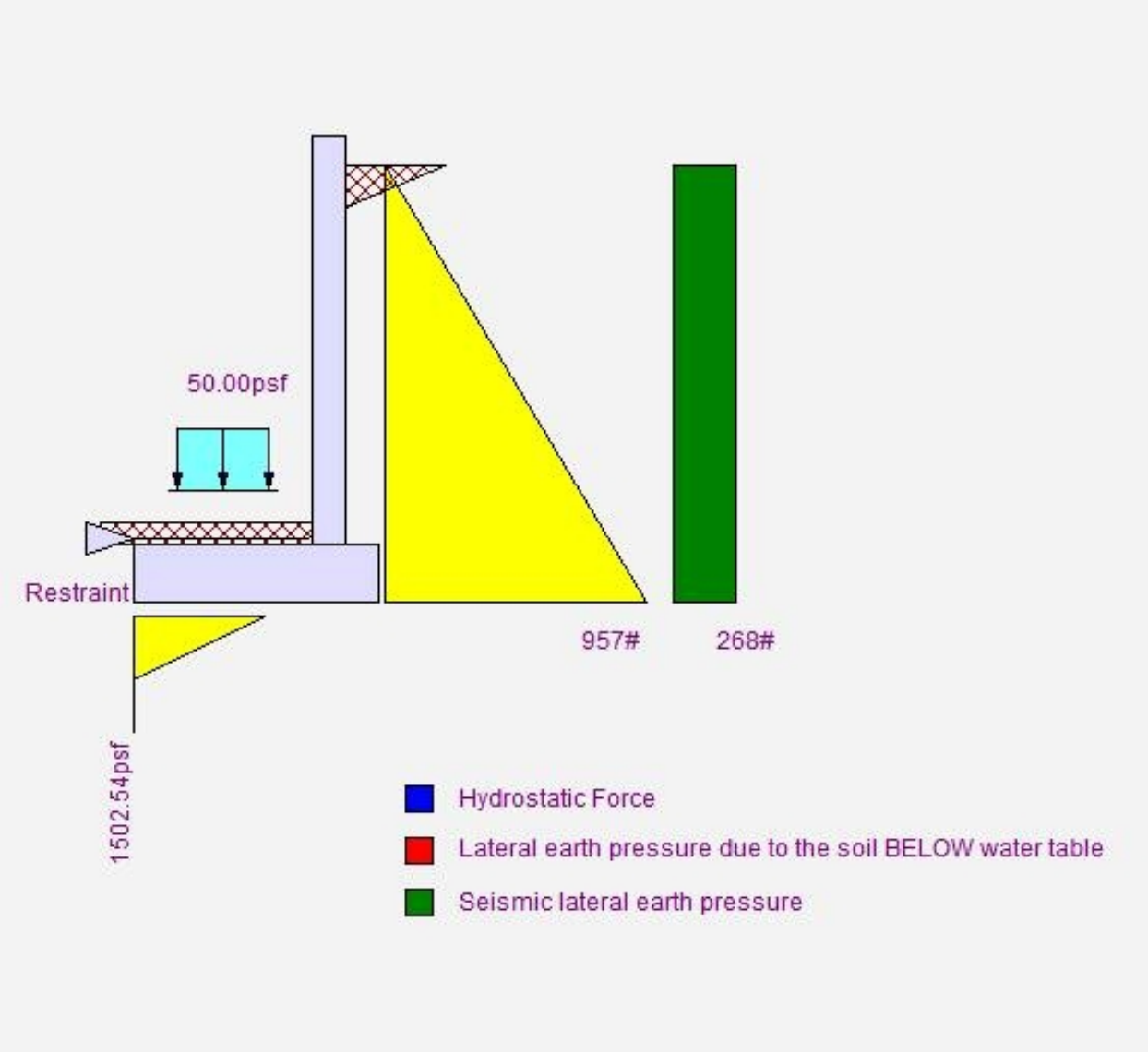
Rebar Lap & Embedment Lengths Information

(Applying TMS 402 provisions) or (Applying IBC modifications to TMS 402 provisions)

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment =	23.40 in
Development length for #5 bar specified in this stem design segment =	18.00 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	8.03 in
As Provided =	0.2480 in2/ft
As Required =	0.1896 in2/ft


6" w/ #5 @ 15"
6"
6'-0"
6'-6"
4"
#5@15.in
@ Toe
Restraint
11"
3"
2'-9"
1'-0"
3'-9"


50.00psf
Restraint
957#
268#
1502.54psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table
Seismic lateral earth pressure

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Cantilevered Retaining Wall

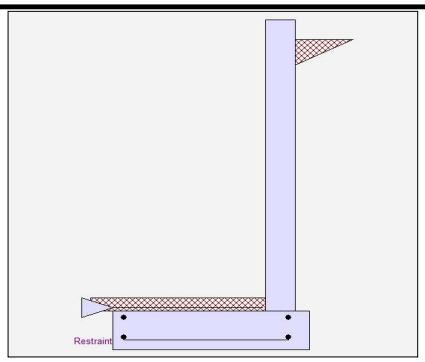
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	7.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
NOT Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.75	OK
Slab Resists All Sliding !			
Total Bearing Load	=	1,880 lbs	
...resultant ecc.	=	10.66 in	
Soil Pressure @ Toe	=	920 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,288 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	16.4 psi	OK
Footing Shear @ Heel	=	3.5 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	1,280.0 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD LRFD
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	13.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.485**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	1,568.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	3,658.7
Moment.....Allowable	=	7,532.8
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	21.1
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.19
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.1385 in2/ft	
(4/3) * As :	0.1847 in2/ft	Min Stem T&S Reinf Area 1.296 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.173 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.1847 in2/ft	#4@ 13.89 in #4@ 27.78 in
Provided Area :	0.2862 in2/ft	#5@ 21.53 in #5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in #6@ 61.11 in

Footing Data

Toe Width	=	3.50 ft
Heel Width	=	1.00
Total Footing Width	=	4.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,288	0	psf
Mu' : Upward	=	67,658	0	ft-#
Mu' : Downward	=	17,052	71	ft-#
Mu: Design	=	4,217	71	ft-#
Actual 1-Way Shear	=	16.39	3.53	psi
Allow 1-Way Shear	=	75.00	40.00	psi

Toe Reinforcing = # 5 @ 13.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
Key: No key defined

Min footing T&S reinf Area 1.17 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,280.0	2.67	3,413.3			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
=						
Soil Over HL (ab. water tbl)				303.3	4.33	1,314.4
Soil Over HL (bel. water tbl)					4.33	1,314.4
Watre Table						
Sloped Soil Over Heel =						
Surcharge Over Heel =						
Adjacent Footing Load =						
Axial Dead Load on Stem =						
* Axial Live Load on Stem =						
Soil Over Toe =				151.7	1.75	265.4
Surcharge Over Toe =						
Stem Weight(s) =				750.0	3.83	2,875.0
Earth @ Stem Transitions =						
Footing Weight =				675.0	2.25	1,518.8
Key Weight =						
Vert. Component =						
Total =	1,280.0	**O.T.M.** =	3,413.3	**Total =** 1,880.0 lbs	**R.M.=**	5,973.6

Resisting/Overturning Ratio = **1.75**
Vertical Loads used for Soil Pressure = 1,880.0 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	200.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.053	in

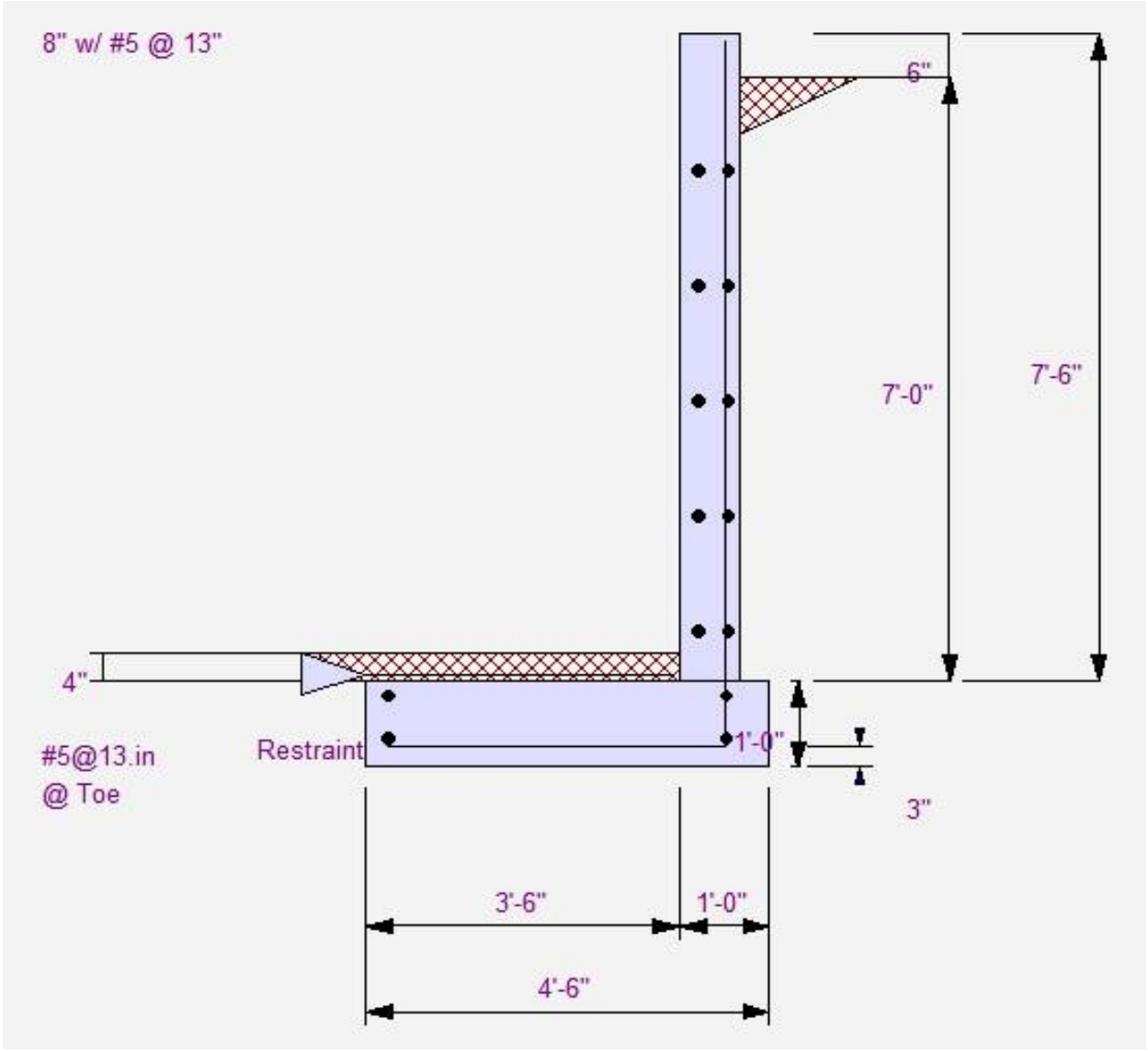
The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

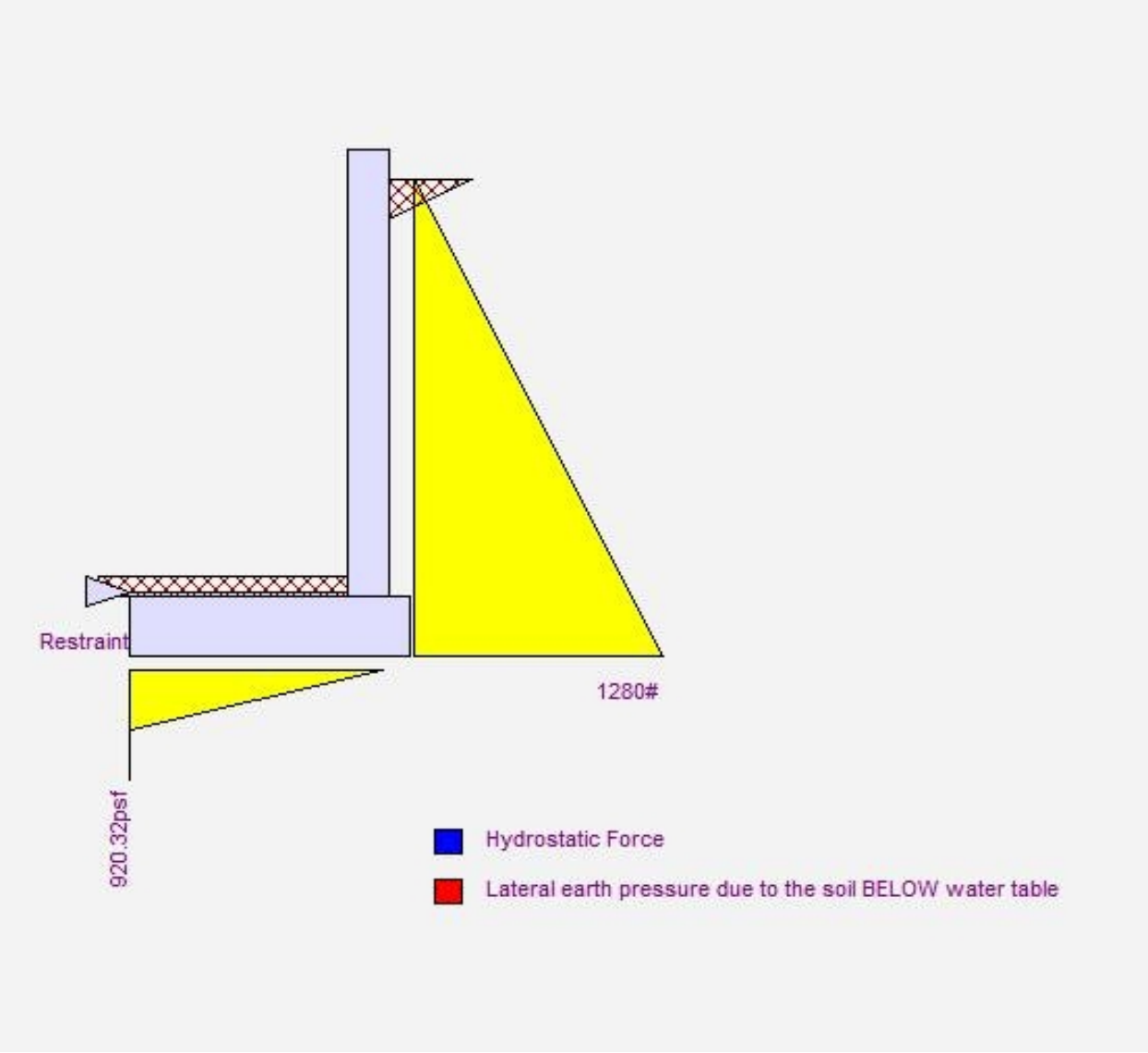
Rebar Lap & Embedment Lengths Information

(Applying TMS 402 provisions) or (Applying IBC modifications to TMS 402 provisions)

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment =	23.40 in
Development length for #5 bar specified in this stem design segment =	18.00 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	6.78 in
As Provided =	0.2862 in2/ft
As Required =	0.1847 in2/ft


8" w/ #5 @ 13"
6"
7'-0"
7'-6"
4"
#5@13.in
@ Toe
Restraint
1'-0"
3"
3'-6"
1'-0"
4'-6"


Restraint
1280#
920.32psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table

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Cantilevered Retaining Wall

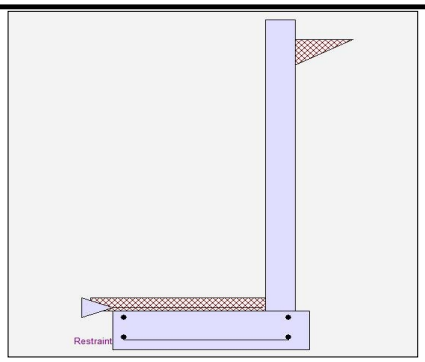
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	7.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,667.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
NOT Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	64.000
Total Seismic Force	=	512.000

Design Summary

Wall Stability Ratios

Overturning	=	1.23	Ratio < 1.5!

Slab Resists All Sliding !

Total Bearing Load	=	1,880 lbs	
...resultant ecc.	=	19.81 in	
Soil Pressure @ Toe	=	2,091 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,667 psf	

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	2,928 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	19.0 psi	OK
Footing Shear @ Heel	=	3.5 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	1,638.4 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

	Bottom
	Stem OK
Design Height Above Ftg ft =	0.00
Wall Material Above "Ht" =	Concrete
Design Method =	LRFD LRFD
Thickness =	8.00
Rebar Size =	# 5
Rebar Spacing =	13.00
Rebar Placed at =	Edge
Design Data	
fb/FB + fa/Fa =	**0.693**
Total Force @ Section	
Service Level lbs =	
Strength Level lbs =	2,016.0
Moment....Actual	
Service Level ft-# =	
Strength Level ft-# =	5,226.7
Moment.....Allowable =	7,532.8
Shear.....Actual	
Service Level psi =	
Strength Level psi =	27.2
Shear.....Allowable psi =	75.0
Anet (Masonry) in2 =	
Rebar Depth 'd' in =	6.19
Masonry Data	
f'm psi =	
Fs psi =	
Solid Grouting =	
Modular Ratio 'n' =	
Wall Weight psf =	100.0
Short Term Factor =	
Equiv. Solid Thick. =	
Masonry Block Type =	Medium Weight
Masonry Design Method =	ASD
Concrete Data	
f'c psi =	2,500.0
Fy psi =	60,000.0

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1979 in2/ft		
(4/3) * As :	0.2639 in2/ft	Min Stem T&S Reinf Area 1.296 in2	
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.173 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.2475 in2/ft	#4@ 13.89 in	#4@ 27.78 in
Provided Area :	0.2862 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Footing Data

Toe Width	=	3.50 ft
Heel Width	=	1.00
Total Footing Width	=	4.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	2,928	0	psf
Mu' : Upward	=	91,616	0	ft-#
Mu' : Downward	=	17,052	71	ft-#
Mu: Design	=	6,214	71	ft-#
Actual 1-Way Shear	=	18.98	3.53	psi
Allow 1-Way Shear	=	75.00	40.00	psi

Toe Reinforcing = # 5 @ 13.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
Key: No key defined

Min footing T&S reinf Area 1.17 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 9.26 in	#4@ 18.52 in
#5@ 14.35 in	#5@ 28.70 in
#6@ 20.37 in	#6@ 40.74 in

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,280.0	2.67	3,413.3			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
Seismic Earth Load =	358.4	4.00	1,433.6			
=						
Soil Over HL (ab. water tbl)				303.3	4.33	1,314.4
Soil Over HL (bel. water tbl)					4.33	1,314.4
Watre Table						
Sloped Soil Over Heel =						
Surcharge Over Heel =						
Adjacent Footing Load =						
Axial Dead Load on Stem =						
* Axial Live Load on Stem =						
Soil Over Toe =				151.7	1.75	265.4
Surcharge Over Toe =						
Stem Weight(s) =				750.0	3.83	2,875.0
Earth @ Stem Transitions =						
Footing Weight =				675.0	2.25	1,518.8
Key Weight =						
Vert. Component =						
Total =	1,638.4	**O.T.M.** =	4,846.9	**Total =** 1,880.0 lbs	**R.M.=**	5,973.6

Resisting/Overturning Ratio = **1.23**
Vertical Loads used for Soil Pressure = 1,880.0 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	200.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.121	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

Rebar Lap & Embedment Lengths Information

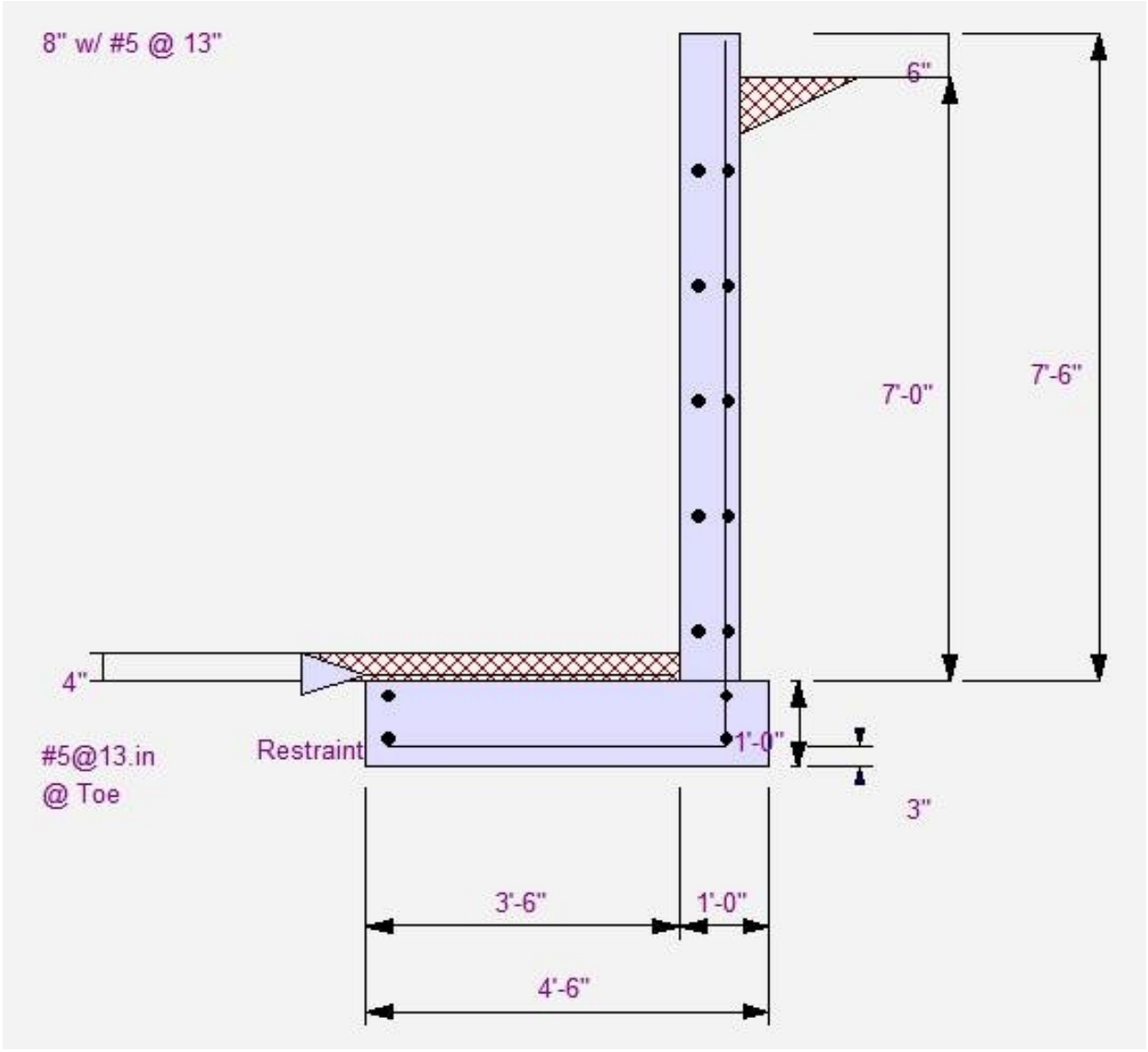
(Applying TMS 402 provisions) or (Applying IBC modifications to TMS 402 provisions)

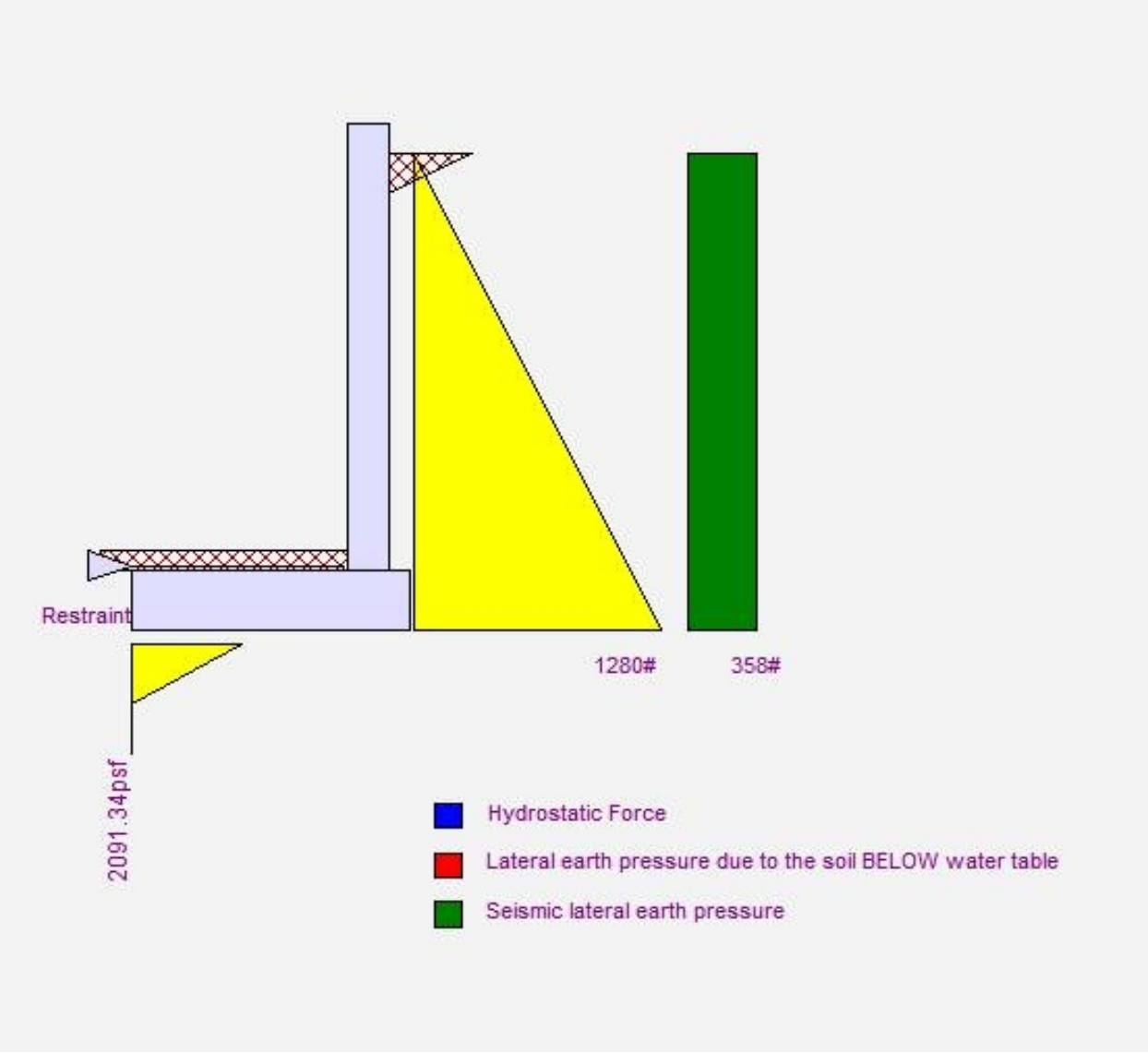
Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment =	23.40 in
Development length for #5 bar specified in this stem design segment =	18.00 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	9.08 in
As Provided =	0.2862 in2/ft
As Required =	0.2475 in2/ft

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16




Restraint
1280#
358#
2091.34psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table
Seismic lateral earth pressure

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Cantilevered Retaining Wall

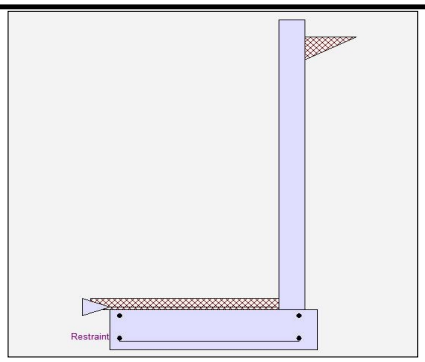
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
NOT Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.72	OK
Slab Resists All Sliding !			
Total Bearing Load	=	2,332 lbs	
...resultant ecc.	=	13.50 in	
Soil Pressure @ Toe	=	987 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,382 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	16.4 psi	OK
Footing Shear @ Heel	=	3.4 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	1,680.6 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD LRFD
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.672**
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	2,048.0
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	5,461.3
Moment.....Allowable	=	8,121.3
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	27.6
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.19
Masonry Data		
f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	100.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	Medium Weight
Masonry Design Method	=	ASD
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.2068 in2/ft	
(4/3) * As :	0.2757 in2/ft	Min Stem T&S Reinf Area 1.469 in2
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.173 in2/ft
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :
	==========	One layer of : Two layers of :
Required Area :	0.2475 in2/ft	#4@ 13.89 in #4@ 27.78 in
Provided Area :	0.31 in2/ft	#5@ 21.53 in #5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in #6@ 61.11 in

Footing Data

Toe Width	=	4.40 ft
Heel Width	=	1.00
Total Footing Width	=	5.40
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	1,382	0	psf
Mu' : Upward	=	110,712	0	ft-#
Mu' : Downward	=	30,434	81	ft-#
Mu: Design	=	6,690	81	ft-#
Actual 1-Way Shear	=	16.43	3.38	psi
Allow 1-Way Shear	=	75.00	40.00	psi

Toe Reinforcing = # 5 @ 12.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 7.93 in, #5@ 12.30 in, #6@ 17.46 in, #7@ 23.80 in, #8@ 31.34 in, #9@ 39
Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
Key: No key defined

Min footing T&S reinf Area 1.63 in2
Min footing T&S reinf Area per foot 0.30 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 7.94 in	#4@ 15.87 in
#5@ 12.30 in	#5@ 24.60 in
#6@ 17.46 in	#6@ 34.92 in

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,680.6	3.06	5,135.0			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
=						
Soil Over HL (ab. water tbl)				346.7	5.23	1,814.2
Soil Over HL (bel. water tbl)					5.23	1,814.2
Watre Table						
Sloped Soil Over Heel =						
Surcharge Over Heel =						
Adjacent Footing Load =						
Axial Dead Load on Stem =						
* Axial Live Load on Stem =						
Soil Over Toe =				190.7	2.20	419.5
Surcharge Over Toe =						
Stem Weight(s) =				850.0	4.73	4,023.3
Earth @ Stem Transitions =						
Footing Weight =				945.0	2.70	2,551.5
Key Weight =						
Vert. Component =						
Total =	1,680.6	**O.T.M.** =	5,135.0	**Total =** 2,332.3 lbs	**R.M.=**	8,808.5

Resisting/Overturning Ratio = **1.72**
Vertical Loads used for Soil Pressure = 2,332.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	200.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.054	in

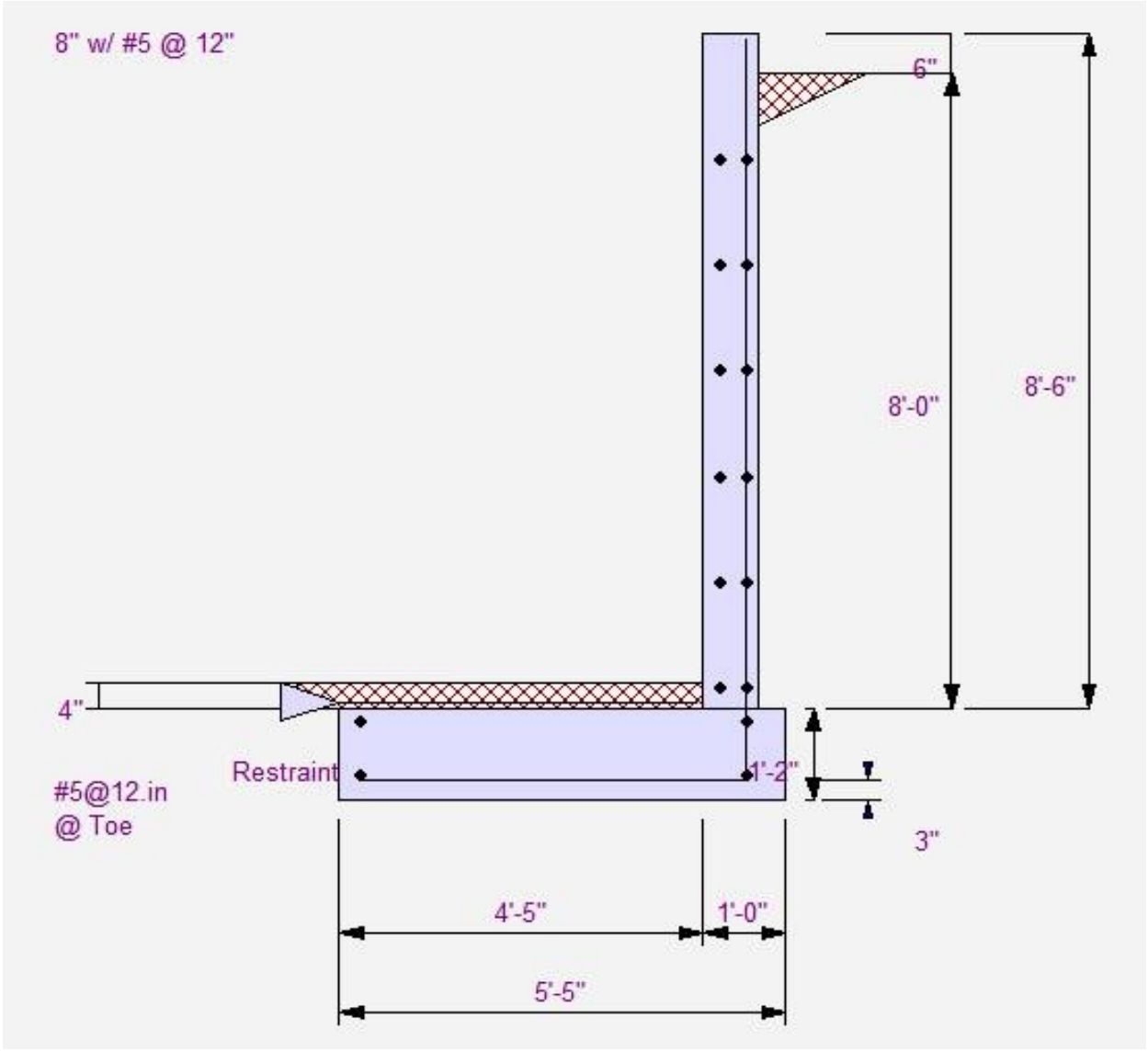
The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

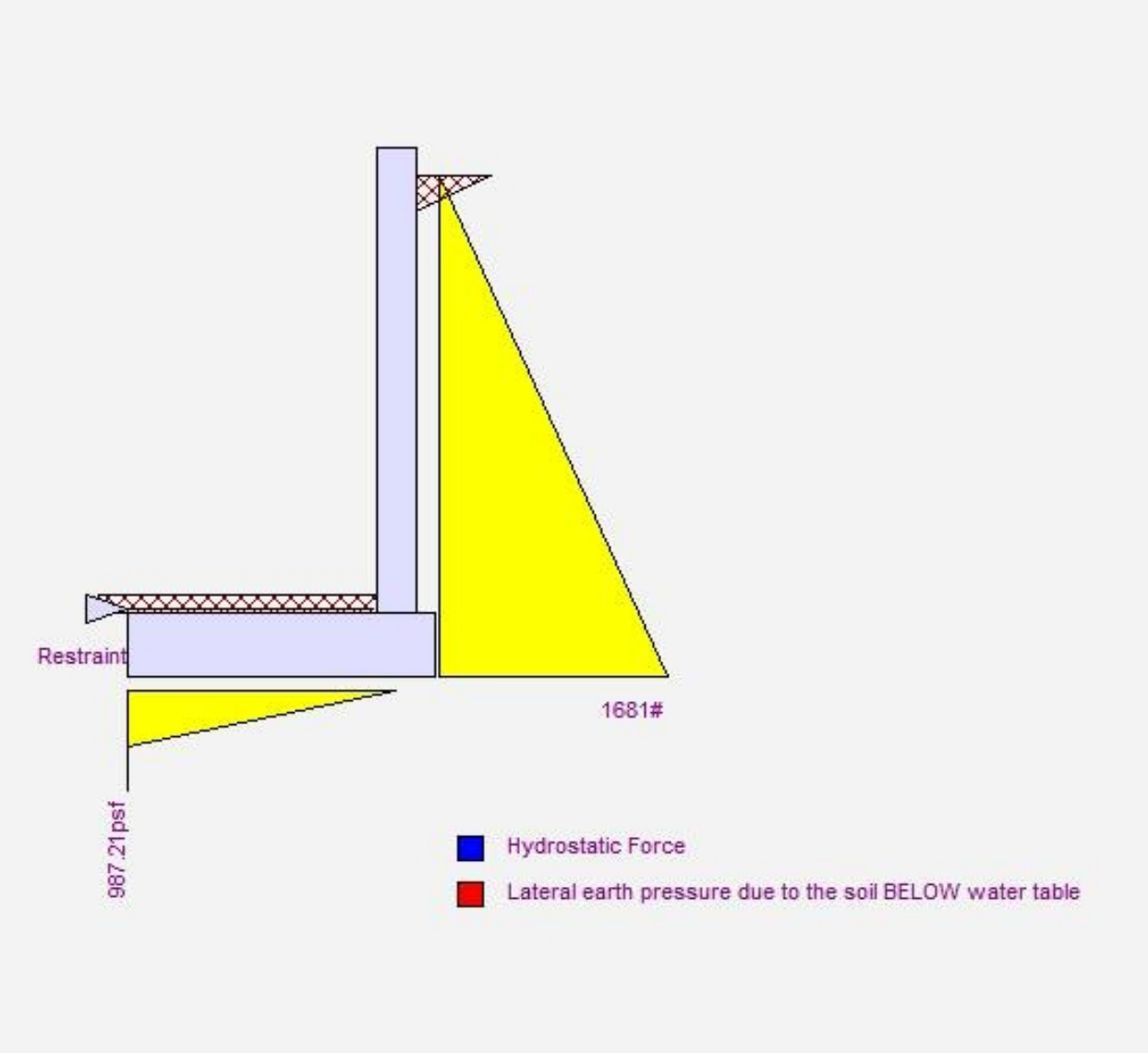
Rebar Lap & Embedment Lengths Information

(Applying TMS 402 provisions) or (Applying IBC modifications to TMS 402 provisions)

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment =	23.40 in
Development length for #5 bar specified in this stem design segment =	18.00 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	8.38 in
As Provided =	0.3100 in2/ft
As Required =	0.2475 in2/ft


8" w/ #5 @ 12"
6"
8'-0"
8'-6"
4"
Restraint
1'-2"
#5@12.in
@ Toe
3"
4'-5"
1'-0"
5'-5"


Restraint
1681#
987.21psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table

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Cantilevered Retaining Wall

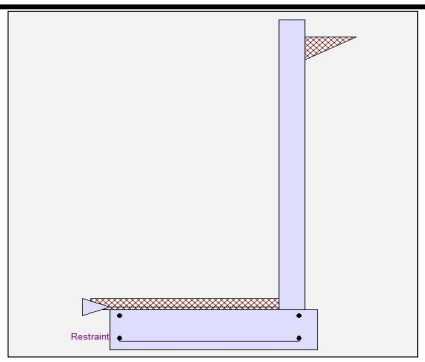
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,667.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	200.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
NOT Used for Sliding & Overturning		

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Axial Load Applied to Stem

Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method : Uniform

Multiplier Used	=	8.000
(Multiplier used on soil density)		
Uniform Seismic Force	=	73.333
Total Seismic Force	=	672.222

Design Summary

Wall Stability Ratios

Overturning	=	1.21	Ratio < 1.5!

Slab Resists All Sliding !

Total Bearing Load	=	2,332 lbs	
...resultant ecc.	=	24.60 in	
Soil Pressure @ Toe	=	2,391 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,667 psf	

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	3,347 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	18.1 psi	OK
Footing Shear @ Heel	=	3.4 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	2,151.1 lbs

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

	Bottom
	Stem OK
Design Height Above Ftg ft =	0.00
Wall Material Above "Ht" =	Concrete
Design Method =	LRFD LRFD
Thickness =	8.00
Rebar Size =	# 5
Rebar Spacing =	12.00
Rebar Placed at =	Edge
Design Data	
fb/FB + fa/Fa =	**0.961**
Total Force @ Section	
Service Level lbs =	
Strength Level lbs =	2,634.7
Moment....Actual	
Service Level ft-# =	
Strength Level ft-# =	7,808.0
Moment.....Allowable =	8,121.3
Shear.....Actual	
Service Level psi =	
Strength Level psi =	35.5
Shear.....Allowable psi =	75.0
Anet (Masonry) in2 =	
Rebar Depth 'd' in =	6.19
Masonry Data	
f'm psi =	
Fs psi =	
Solid Grouting =	
Modular Ratio 'n' =	
Wall Weight psf =	100.0
Short Term Factor =	
Equiv. Solid Thick. =	
Masonry Block Type =	Medium Weight
Masonry Design Method =	ASD
Concrete Data	
f'c psi =	2,500.0
Fy psi =	60,000.0

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.2957 in2/ft		
(4/3) * As :	0.3942 in2/ft	Min Stem T&S Reinf Area 1.469 in2	
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.173 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	==========	One layer of :	Two layers of :
Required Area :	0.2957 in2/ft	#4@ 13.89 in	#4@ 27.78 in
Provided Area :	0.31 in2/ft	#5@ 21.53 in	#5@ 43.06 in
Maximum Area :	0.8382 in2/ft	#6@ 30.56 in	#6@ 61.11 in

Footing Data

Toe Width	=	4.40 ft
Heel Width	=	1.00
Total Footing Width	=	5.40
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	3,347	0	psf
Mu' : Upward	=	146,924	0	ft-#
Mu' : Downward	=	30,434	81	ft-#
Mu: Design	=	9,708	81	ft-#
Actual 1-Way Shear	=	18.10	3.38	psi
Allow 1-Way Shear	=	75.00	40.00	psi

Toe Reinforcing = # 5 @ 12.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, phi Tu = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 7.93 in, #5@ 12.30 in, #6@ 17.46 in, #7@ 23.80 in, #8@ 31.34 in, #9@ 39
Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
Key: No key defined

Min footing T&S reinf Area 1.63 in2
Min footing T&S reinf Area per foot 0.30 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 7.94 in	#4@ 15.87 in
#5@ 12.30 in	#5@ 24.60 in
#6@ 17.46 in	#6@ 34.92 in

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,680.6	3.06	5,135.0			
HL Act Pres (be water tbl)						
Hydrostatic Force						
Buoyant Force =						
Surcharge over Heel =						
Surcharge Over Toe =						
Adjacent Footing Load =						
Added Lateral Load =						
Load @ Stem Above Soil =						
Seismic Earth Load =	470.6	4.58	2,156.7			
=						
Soil Over HL (ab. water tbl)				346.7	5.23	1,814.2
Soil Over HL (bel. water tbl)					5.23	1,814.2
Watre Table						
Sloped Soil Over Heel =						
Surcharge Over Heel =						
Adjacent Footing Load =						
Axial Dead Load on Stem =						
* Axial Live Load on Stem =						
Soil Over Toe =				190.7	2.20	419.5
Surcharge Over Toe =						
Stem Weight(s) =				850.0	4.73	4,023.3
Earth @ Stem Transitions =						
Footing Weight =				945.0	2.70	2,551.5
Key Weight =						
Vert. Component =						
Total =	2,151.1	**O.T.M.** =	7,291.7	**Total =** 2,332.3 lbs	**R.M.=**	8,808.5

Resisting/Overturning Ratio = **1.21**
Vertical Loads used for Soil Pressure = 2,332.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	200.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.131	in

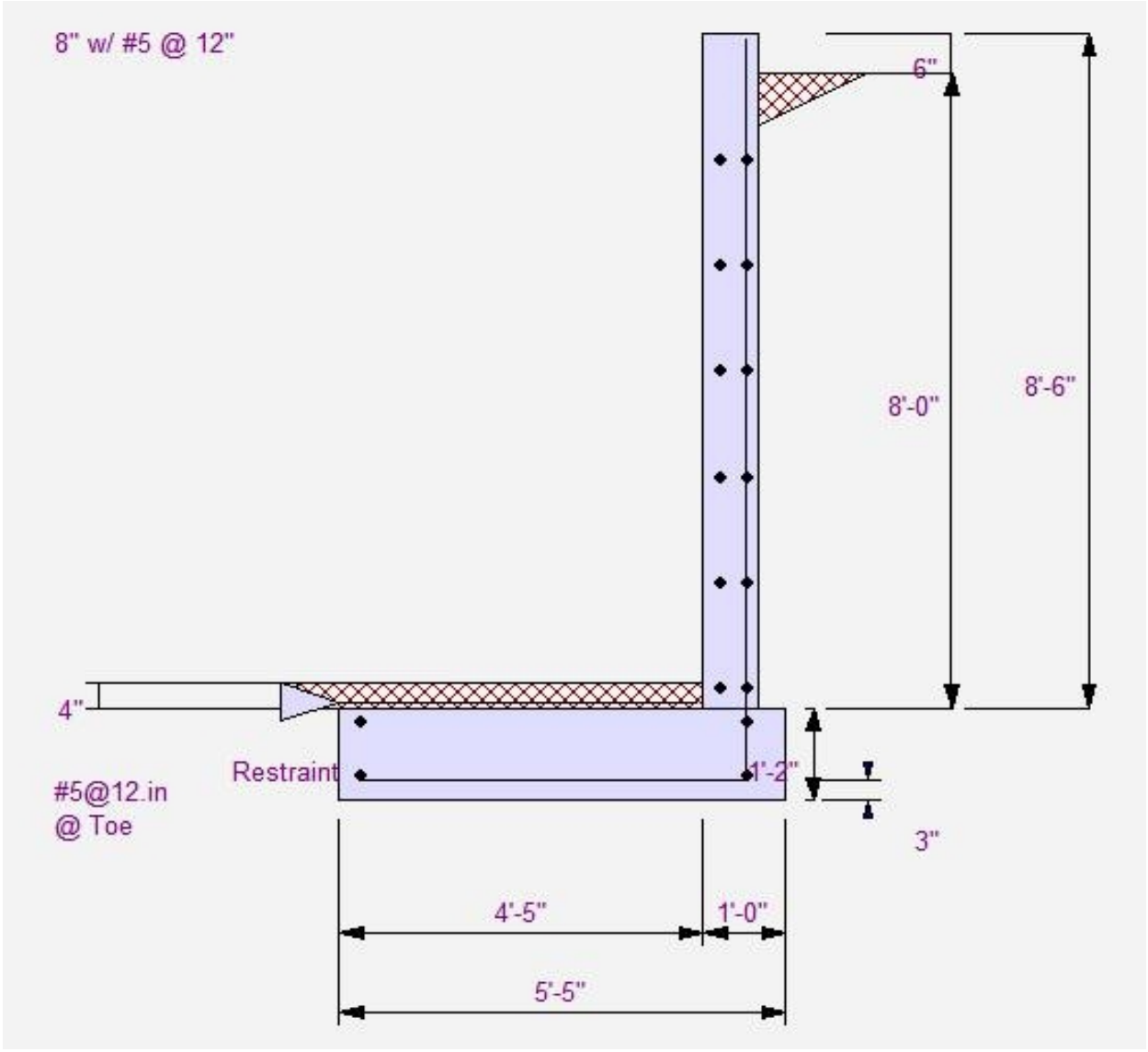
The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

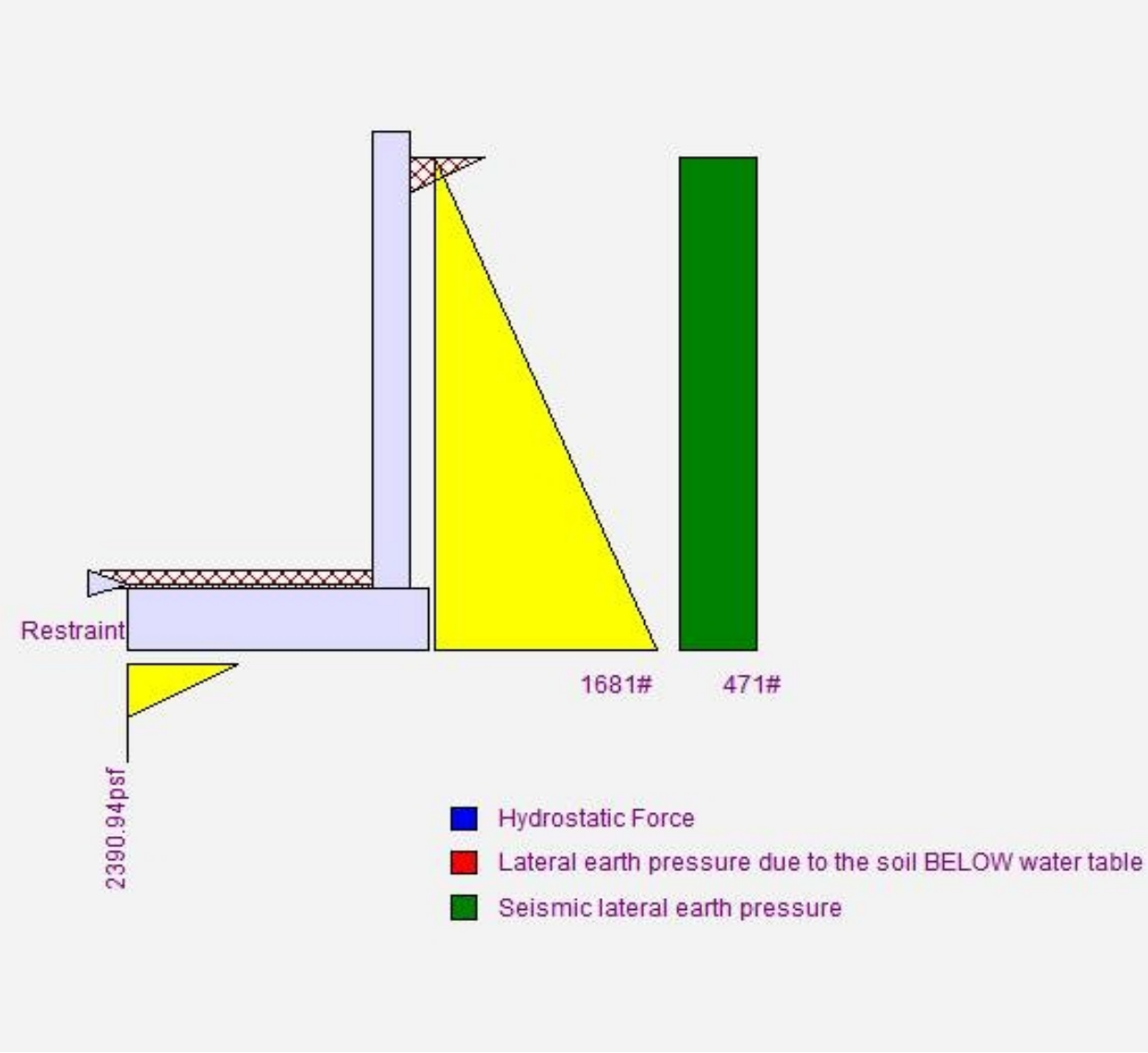
Rebar Lap & Embedment Lengths Information

(Applying TMS 402 provisions) or (Applying IBC modifications to TMS 402 provisions)

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment =	23.40 in
Development length for #5 bar specified in this stem design segment =	18.00 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	10.01 in
As Provided =	0.3100 in2/ft
As Required =	0.2957 in2/ft


8" w/ #5 @ 12"
6"
8'-0"
8'-6"
4"
Restraint
1'-2"
#5@12.in
@ Toe
3"
4'-5"
1'-0"
5'-5"


Restraint
1681#
471#
2390.94psf
Hydrostatic Force
Lateral earth pressure due to the soil BELOW water table
Seismic lateral earth pressure