MERCER GROVE
STRUCTURAL CALCULATIONS

SITE ADDRESS:

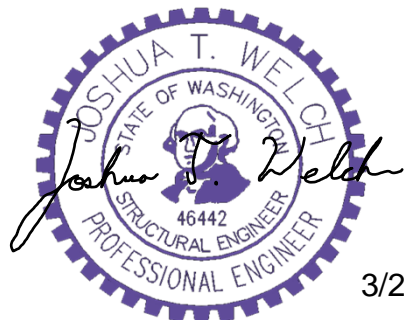38XX W. MERCER WAY

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

P.O. Box 28427

Seattle, WA 98118

tel. 206-356-9553

3/21/23

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9/13/2021

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SECTION 1: GENERAL
> assemblies

- TREE PROTECTION REVISIONS 8/18/22: CARPORT FRAMING REVISED TO REMOVE WESTERN MOST FOOTINGS AT WALKWAY & SHORT STEMWALL AT THE SE CORNER OF CARPORT. SEE REVISED CARPORT FRAMING & FOOTING DESIGN.

- CARPORT REVISION 3/20/23: CARPORT REDESIGNED FOR NEW ARCH'L.

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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			
		4x8 @ 16"oc	5.1			
		3/4" shiplap	2.3			
		miscellaneous	1.6 13%			
			12.0 psf			
	total	dead + live	42.0 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 typ	dead	3/4" hardwood	3.0	live	residential	40.0 psf
		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%			
			8.6 psf			

carport floor	dead	grating	18.7	live	residential	50.0 psf
		W8x21 @ 48"oc	5.3			
		miscellaneous	2.0 8%			
			26.0 psf			
	total	dead + live	76.0 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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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.
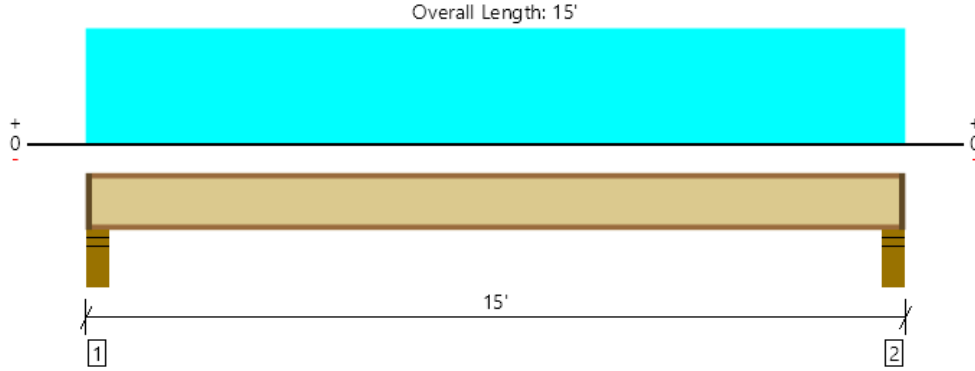
Source URL: https://www.mercerisland.gov/cpd/page/climatic-and-geographic-design-criteria

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

DECK
(1'-3'F

CLOSET

CLOSET

WALK-IN
SHOWER

FACE OF
FRAMING

FACE OF
FRAMING

A

D

B11
B10
B7
B4
B2
B3
B1
B9
B8
B6
B5
R3
R2
R1
B7B

(2)2x6
(2)2x6
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A2.0

F.O. FRAMING
& CONCRETE

FACE OF
FRAMING

F.O. FRAMING
& CONCRETE

2
3
4

roof, R1
1 piece(s) 11 7/8" TJI ® 110 @ 24" OC

Overall Length: 15'

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)			
	Total	Available	Required	Dead	Snow	Total	Accessories
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
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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
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roof, R2
1 piece(s) 11 7/8" TJI® 230 @ 24" OC
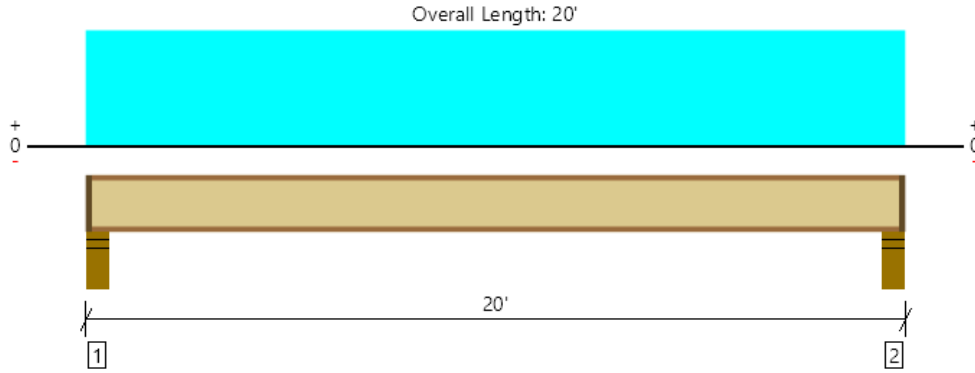
Overall Length: 20'

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)			
	Total	Available	Required	Dead	Snow	Total	Accessories
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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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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MEMBER REPORT

roof, R3
1 piece(s) 11 7/8" TJI® 230 @ 24" OC
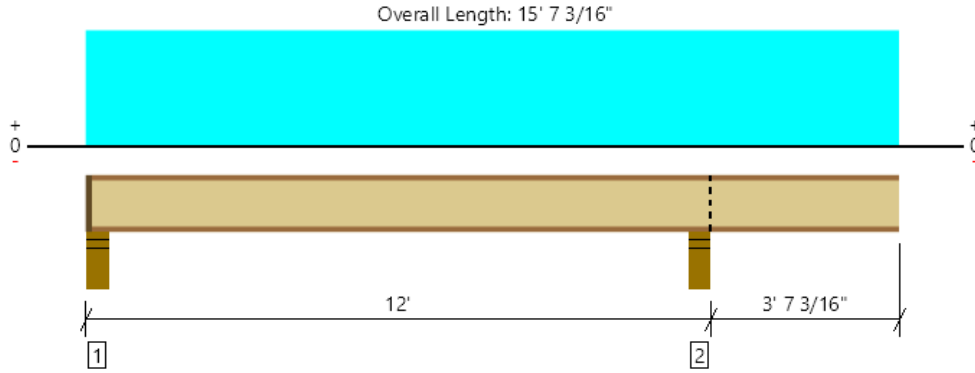
Overall Length: 15' 7 3/16"

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)			
	Total	Available	Required	Dead	Snow	Total	Accessories
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.

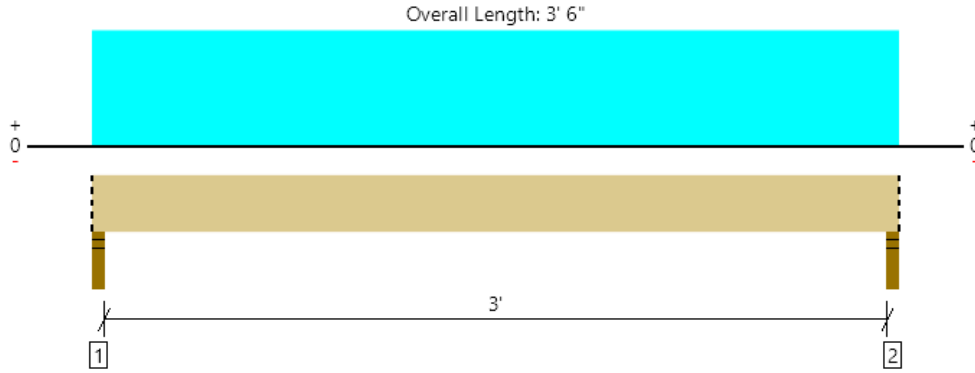| Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 15' 7 3/16"	24"	17.0	30.0	Default Load

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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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roof, B1
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL
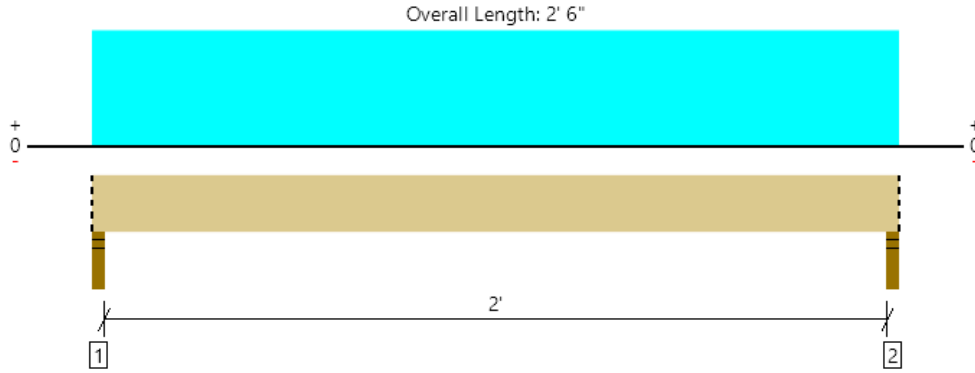
Overall Length: 2' 6"

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

Weyerhaeuser Notes

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Weyerhaeuser

roof, B2
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 3' 6"

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

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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
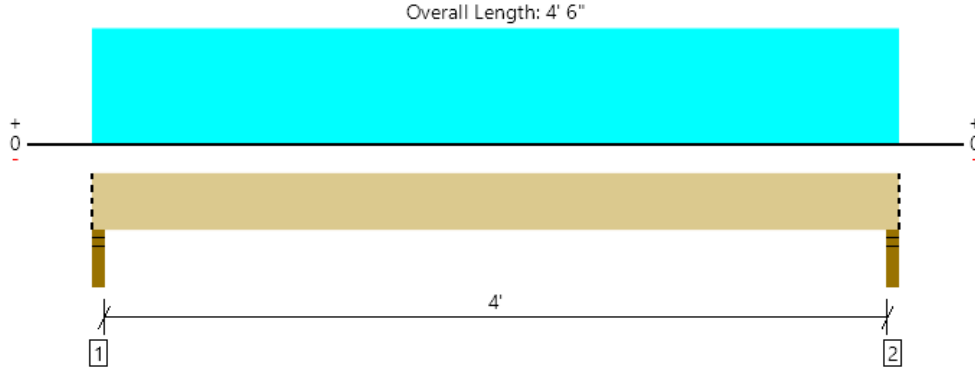
Overall Length: 4' 6"

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

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

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File Name: mercer grove
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roof, B4
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL
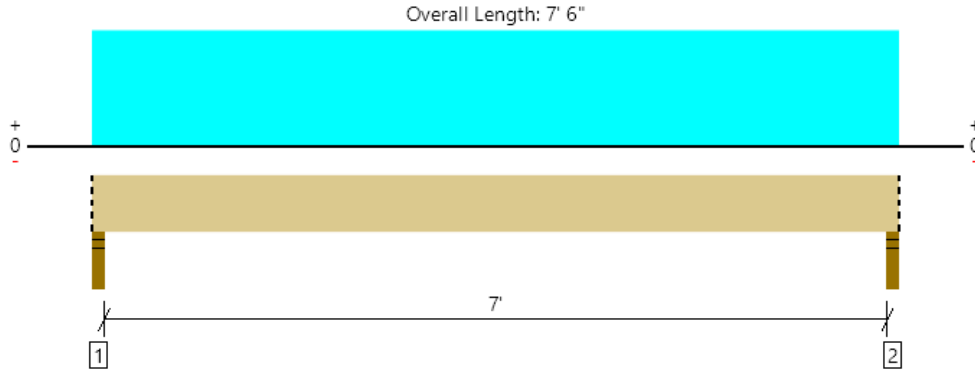
Overall Length: 7' 6"

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
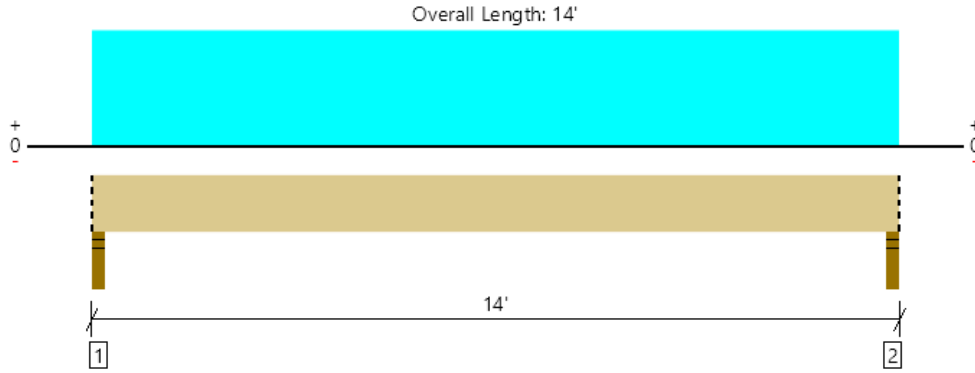
Overall Length: 14'

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.

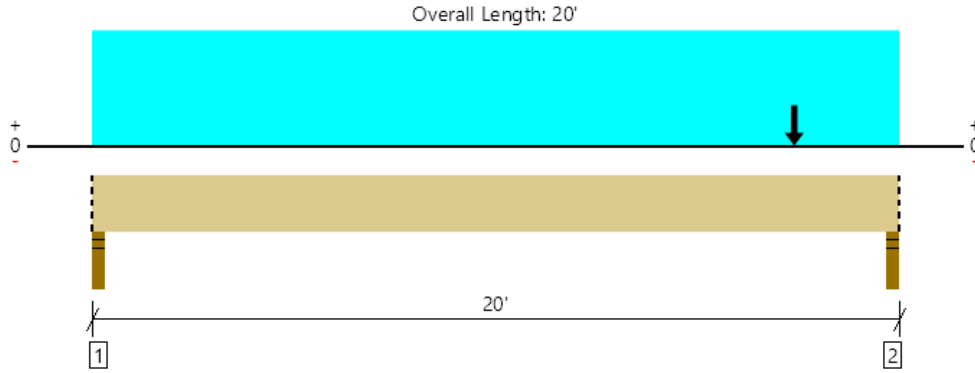| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 14'	N/A	6.5	--	
1 - Uniform (PSF)	0 to 14' (Front)	3'	17.0	30.0	Default Load

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ForteWEB Software Operator	Job Notes
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Weyerhaeuser

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File Name: mercer grove
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MEMBER REPORT

roof, B6
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 20'

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.

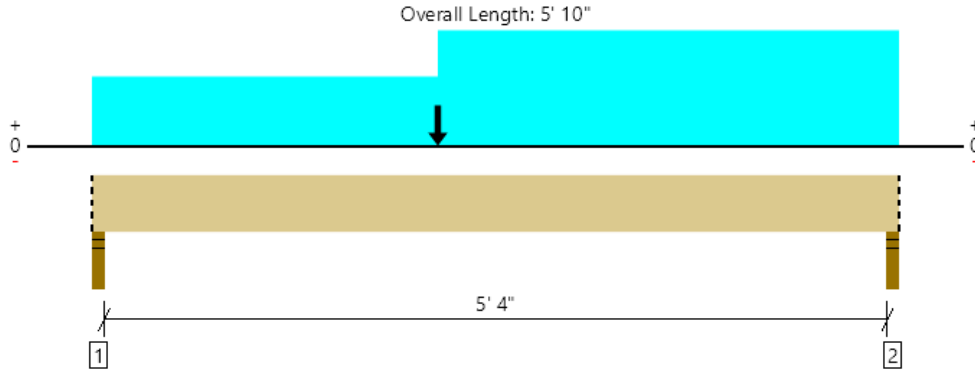| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 20' (Front)	2'	17.0	30.0	Default Load
2 - Point (lb)	17' 4 13/16" (Front)	N/A	402	630	Linked from: B5, Support 2

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ForteWEB Software Operator	Job Notes
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Weyerhaeuser

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ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

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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ForteWEB Software Operator	Job Notes
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Weyerhaeuser

roof, B8
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL
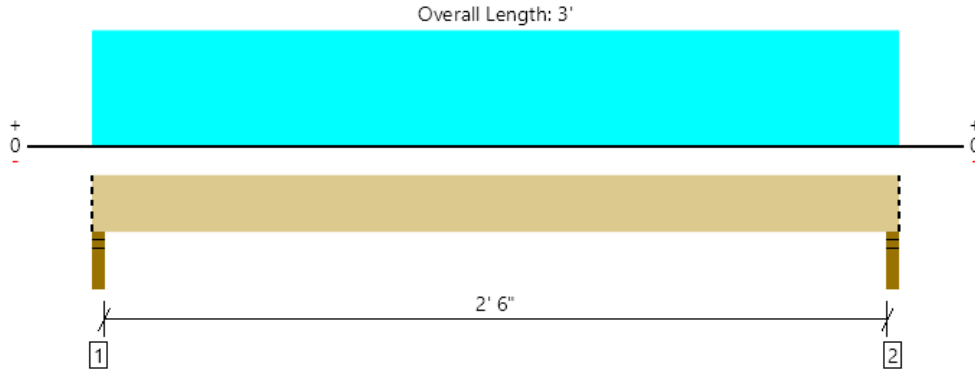
All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

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.

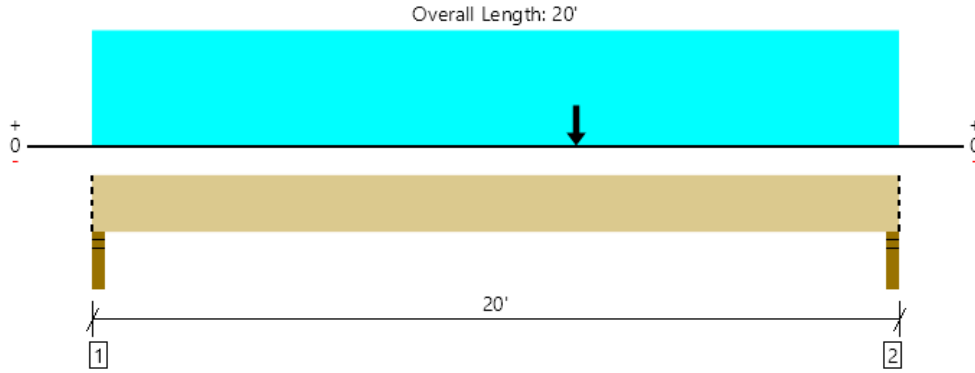| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 3'	N/A	6.5	--	
1 - Uniform (PSF)	0 to 3' (Front)	10'	17.0	30.0	Default Load

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File Name: mercer grove
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roof, B9
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 20'

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.

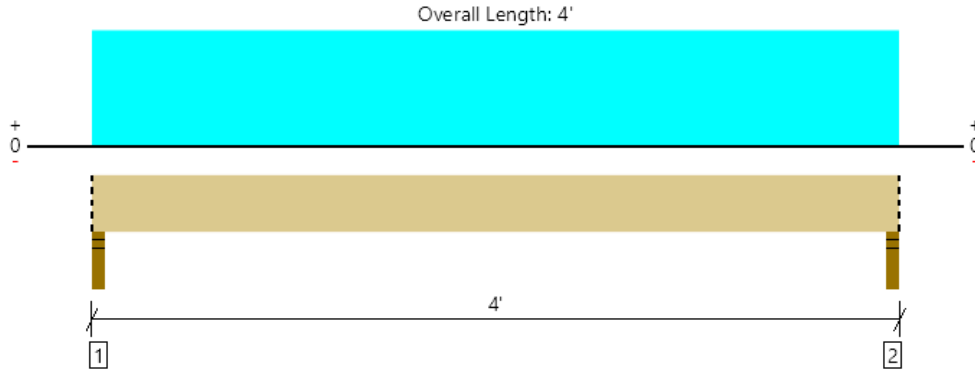| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 20' (Front)	2'	17.0	30.0	Default Load
2 - Point (lb)	12' (Front)	N/A	265	450	Linked from: B8, Support 1

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File Name: mercer grove
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MEMBER REPORT

roof, B10
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 4'

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.

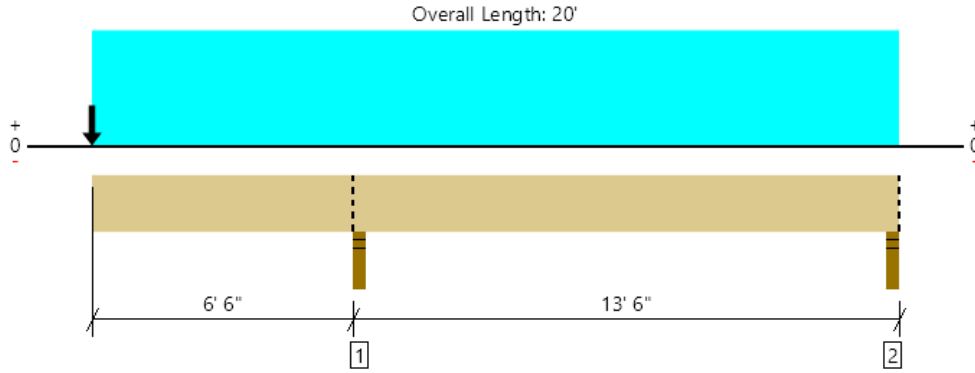| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4'	N/A	6.5	--	
1 - Uniform (PSF)	0 to 4' (Front)	10'	17.0	30.0	Default Load

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
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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
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FORTE WEB

roof, B11
1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 20'

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.

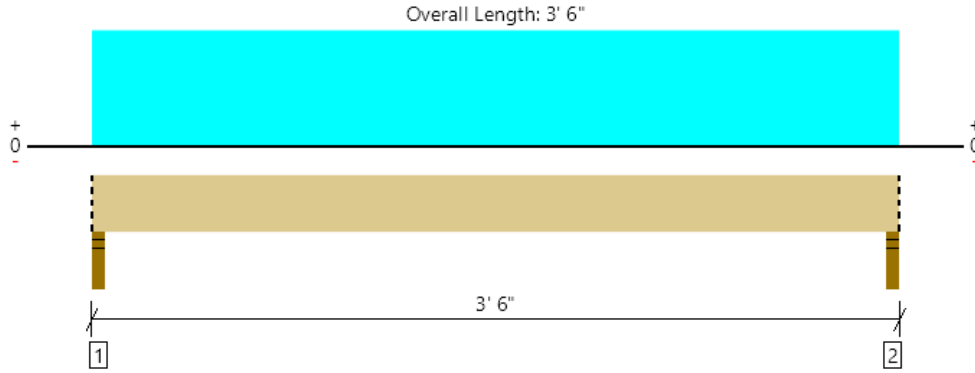| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 20'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 20' (Front)	1'	17.0	30.0	Default Load
2 - Point (lb)	0 (Front)	N/A	353	600	Linked from: B10, Support 2

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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

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, b7b
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 3' 6"

3' 6"

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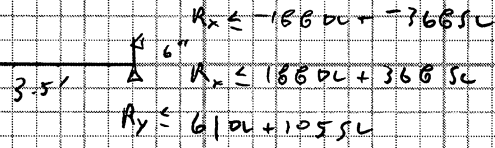
ForteWEB Software Operator	Job Notes
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Weyerhaeuser

skinny canopy R9

TIE BEAMS TOGETHER ON GRID 3 W/(2)HDU5 HORIZONTAL & ⅝"ø THREADED ROD ATTACHED TO SIDE OF BEAMS

B33
B34
C8
C9
B33 5¼x11⅞ PSL (F.B.)
CONTINUOUS
5¼x11⅞ PSL (F.B.)
3½x11⅞ LSL (F.B.)
SW4
CS22
(3)2x6
B35
FIREPLACE
1¾x11⅞ LSL (F.B.)
11⅞" TJI 110 @ 16"oc
J3
9½" TJI 110 @ 16"oc
1¾x11⅞ LSL (F.B.)
B36
CS22
(3)2x6

R6
B32
5¼x11⅞ PSL (F.B.)
2x8 @ 24"oc
WOOD SCREEN DECK (2 SF)
SHELVING
11⅞" TJI 360 @ 16"oc
J2
SW2

CONNECT PER 8/S3.4 TYP.
ROOF ABOVE
OPENING TO ABOVE
C7
C6
HDU5
B33B
B33C
R9B
5¼x11⅞ PSL (F.B.)
SIM
W10x30 (F.B.)
B29
SHELVING
STORAGE
BENCH
BENCH
B37
1¾x11⅞ LSL (F.B.)
STEEL AWNING

STRAP PER 1/S3.4 TYP.
SLIDING WOOD SCREEN
RAIN CHAIN
C3
C4
B26
3½x11⅞ PSL (F.B.)
B27
5¼x11⅞ PSL (F.B.)
CS14
SW6

HSS 3x3x7/16
5¼x9½ PSL (F.B.)
B25
B23b
2x6 @ 24"oc
1¾x11⅞ LSL (F.B.)
11⅞" TJI 110 @ 16"oc
R8
11⅞" TJI 110 @ 16"oc
BOLT WF BEAM TO WOOD BEAM PER 9/S3.8
B28
3½x11⅞ LSL (F.B.)
CS22
SW4

C2
B24
7x11⅞ PSL (F.B.)
C4B
CS14
C5
CS14
B31
5¼x11⅞ PSL (F.B.)
CLOSET
STORAGE & TV

GARDEN
1¾x11⅞ LSL (F.B.)
B23
B30
BENCH SEAT
5¼x11⅞ PSL (F.B.)
HDU5
SW5
3½x11⅞ LSL (F.B.)
3½x11⅞ LSL (F.B.)
B21
11⅞" TJI 110 @ 16"oc
HSS 3x3x7/16
B21B
3½x11⅞ LSL (F.B.)
3½x11⅞ LSL (F.B.)

11⅞" TJI 360 @ 16"oc
R7
HIDDEN DOOR
J1
STRAP 12/S3.4
SIMPSON WOOD STRONG WALL WSWH18x9

B22C
1¾x11⅞ LSL (F.B.)
C1
B20
B22
CS22
CS14
SW1
CS22
3½x11⅞ LSL (F.B.)
B22B
1¾x11⅞ LSL (F.B.)
SW1
1¾x11⅞ LSL (F.B.)
TYP.
STRAP PER 10/S3.4 TYP.

DOTS INDICATE BLOCKED DIAPHRAGM W/ALL SHEATHING PANEL EDGES BLOCKED & NAILED W/8d @ 4"oc

FACE OF FRAMING
F.O. FRAMING & CONCRETE

PROJECT: Date:

STEEL ABOVE

$R_x \leq -188 DL + -366 SL$

$R_x \leq 188 DL + 366 SL$

$R_y \leq 61 DL + 105 SL$

$V = 159$ $V_{all} = 56,204$

$M = 278$ $M_{all} = 758 \, ft-lb$

$\Delta_{SL} = 0.20'' = 2L/110$ USE $3/8'' H$

BOLTS TO BEAM

$R_y \leq 160 \, DL + L \, / \, ft$

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

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

$3/8'' \phi \times 4'' \, LAG$ $W' = 305 (1.15) \, 2.28 = 800$

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

ANCHORS TO FLOOR

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

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

BLOCKING TO JOIST

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

USE H U 410

PROJECT: MERCER CLOUD   Date:

$W = 20 D L + 60 S L$

SKINNY CANOPY

RAFTER R9

2'   ⊿   2'   ⊿

DL 60   -20
SL 180   -60

$V = 160$ $V_n = 1139$

$M = 160$ $M_n = 257$

$\Delta_{TL} = 0.254 = 2L/172$ USE 2x6 @ 24" oc

$\Delta_{SL} = 0.19" = 2L/252$ (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

PROJECT: Date:

R96   W=20 PL + 60 SL

2 6"   Δ 4'0 Δ

DL 184 - 141
SL 553 - 423

V = 363 V_r = 1139

m = 187 M_r = 257

$Δ_{1L}$ = 0.18" = 2L/288   USE 2x6 FLAT @ 24" oc
                                   MAX SPACE rec

R96 to BEAM   0.22 x 3" SDWS   W' = 157 (1.15) = 173#

RSQ'D = 737/173 = 4.3 @ 24" oc.

USE 2x6 @ 12" oc W/ (3) 0.22 x 3" SDWS
     AT EACH BEAM
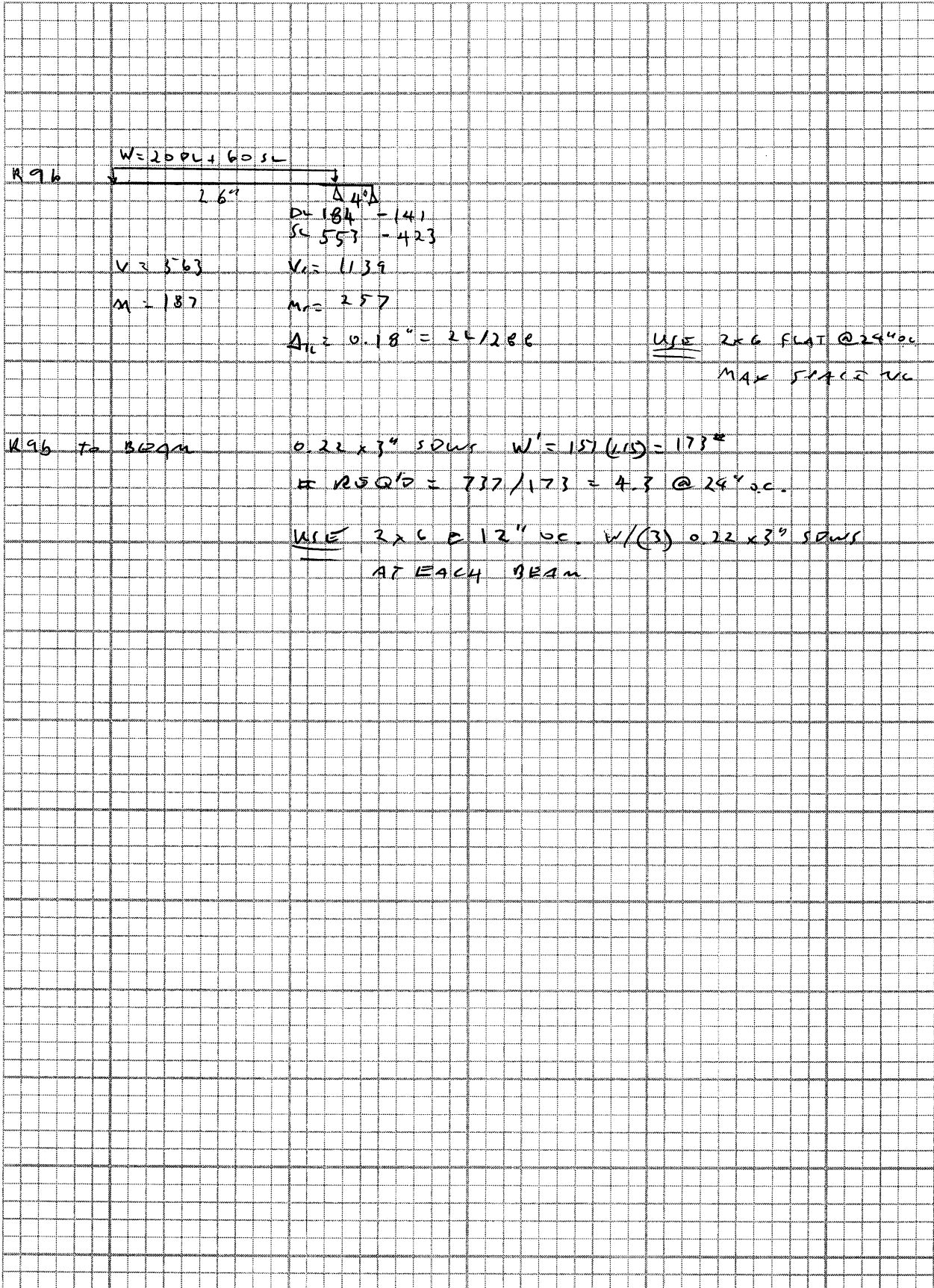
UPPER FLOOR, R6
1 piece(s) 2 x 8 HF No.2 @ 24" OC
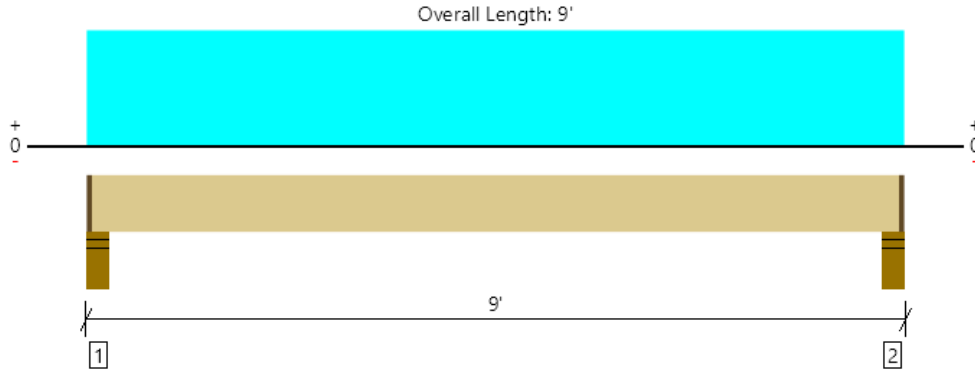
Overall Length: 9'

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

Weyerhaeuser Notes

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File Name: mercer grove
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Weyerhaeuser

UPPER FLOOR, R7
1 piece(s) 11 7/8" TJI® 360 @ 24" OC
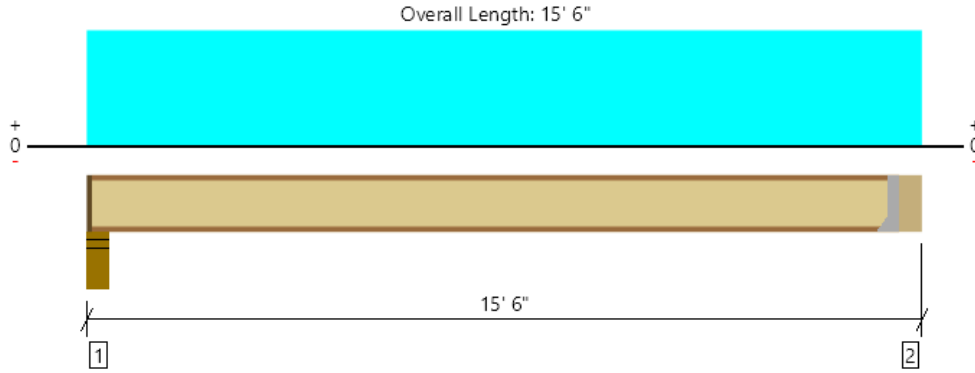
Overall Length: 15' 6"

15' 6"

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"	Hanger¹	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.
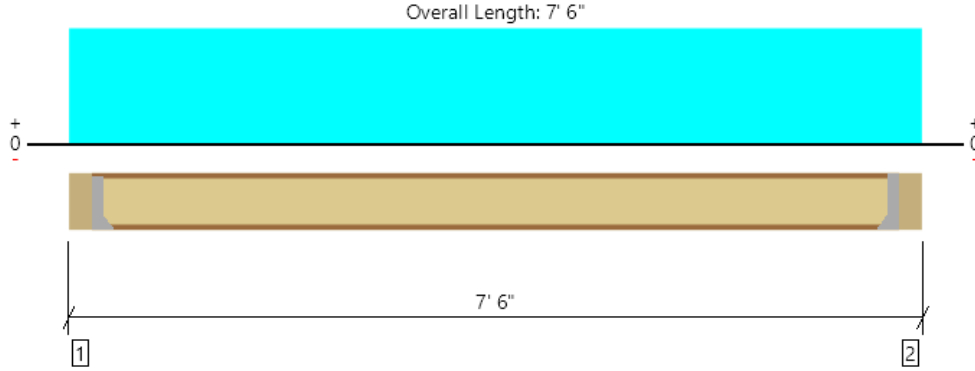
Vertical Load	Location	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 15' 6"	24"	50.0	30.0	Default Load

Weyerhaeuser Notes

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

UPPER FLOOR, R8
1 piece(s) 11 7/8" TJI ® 110 @ 24" OC

Overall Length: 7' 6"

7' 6"

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"	Hanger¹	1.75" / - ²	375	225	600	See note ¹
2 - Hanger on 11 7/8" LSL beam	5.50"	Hanger¹	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	

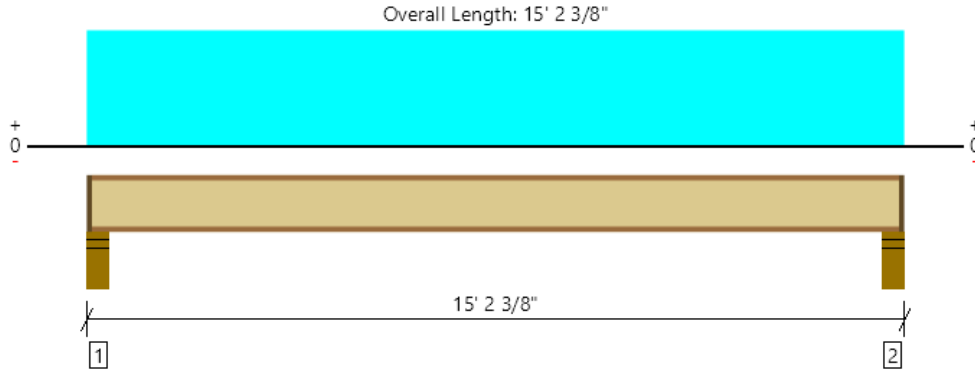- Refer to manufacturer notes and instructions for proper installation and use of all connectors.

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

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

9/10/2021 6:04:55 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

UPPER FLOOR, J1
1 piece(s) 11 7/8" TJI® 110 @ 16" OC

Overall Length: 15' 2 3/8"

15' 2 3/8"

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

Weyerhaeuser Notes

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UPPER FLOOR, J2
1 piece(s) 11 7/8" TJI® 360 @ 16" OC
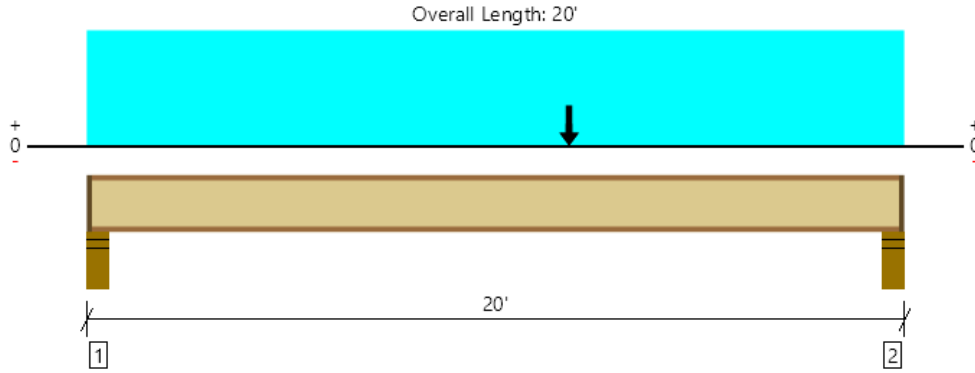
All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

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

Weyerhaeuser Notes

UPPER FLOOR, J3
1 piece(s) 9 1/2" TJI® 110 @ 16" OC
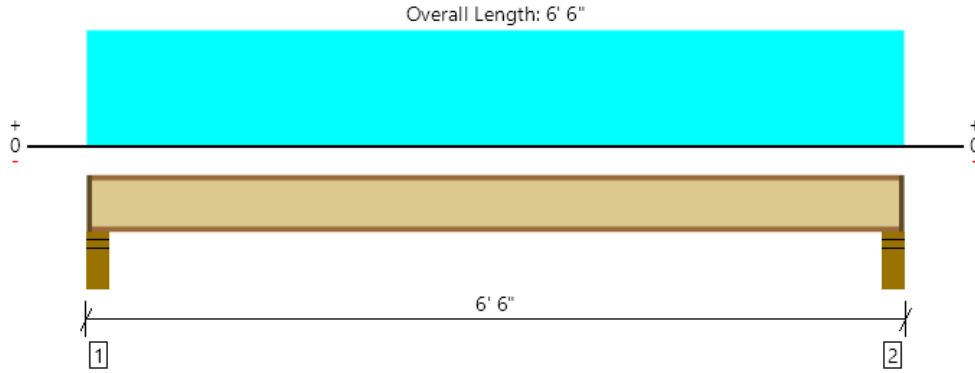
Overall Length: 6' 6"

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

Weyerhaeuser Notes

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Weyerhaeuser

UPPER FLOOR, B20
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL
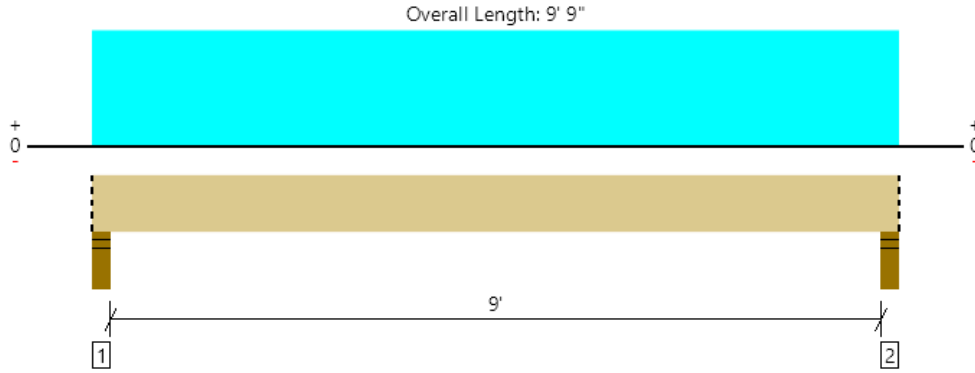
Overall Length: 9' 9"

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

Weyerhaeuser Notes

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UPPER FLOOR, B21
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
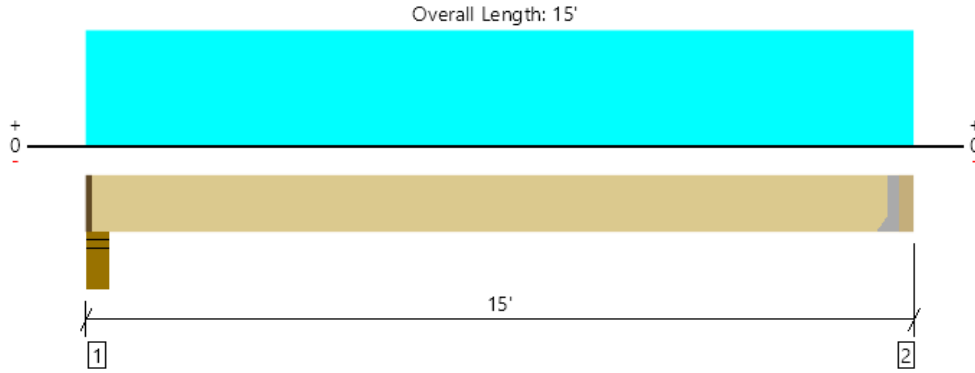
Overall Length: 15'

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"	Hanger¹	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

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

9/10/2021 6:04:55 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

UPPER FLOOR, B21B
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 15'

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

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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, B22
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL
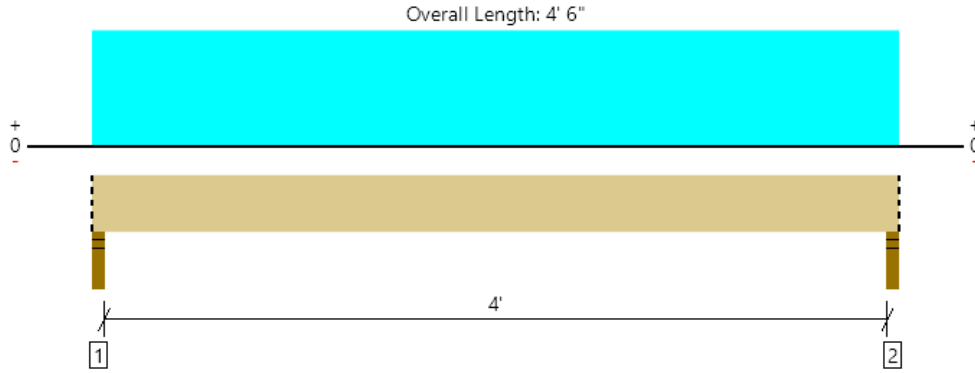
Overall Length: 4' 6"

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.

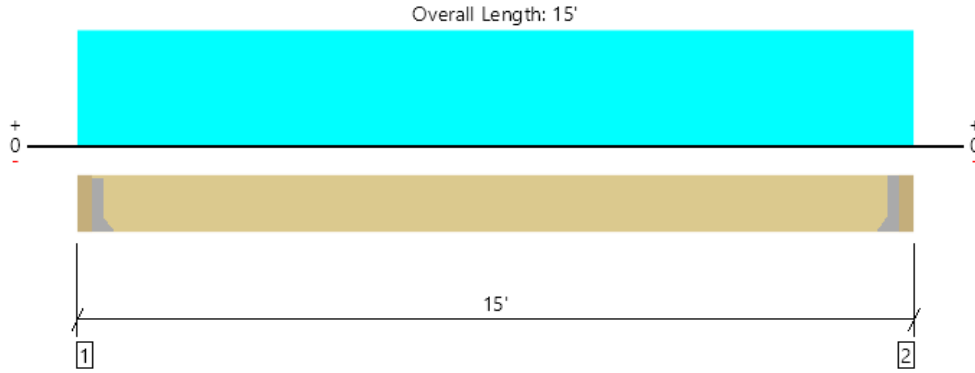| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 4' 6"	N/A	6.5	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	7' 6"	50.0	30.0	Default Load

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

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UPPER FLOOR, B22B
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
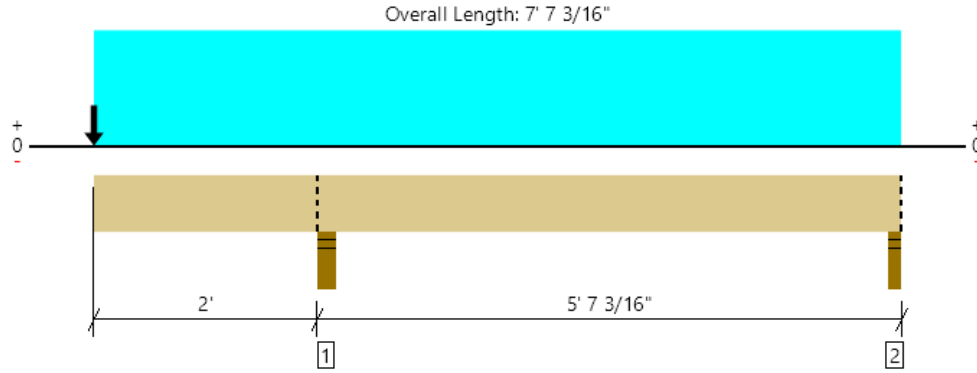
Overall Length: 7' 7 3/16"

2'   5' 7 3/16"

1   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)	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

MEMBER REPORT
UPPER FLOOR, B22C
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
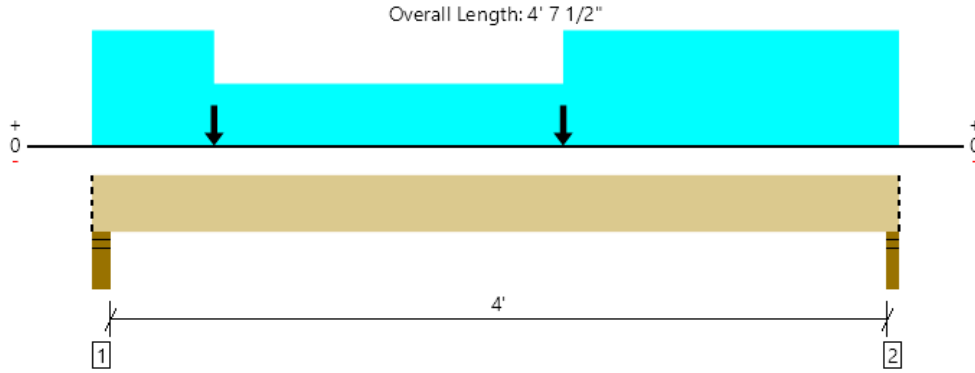
Overall Length: 4' 7 1/2"

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)	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

FORTE WEB

UPPER FLOOR, b23
1 piece(s) 1 1/4" x 11 7/8" 1.3E TimberStrand® LSL
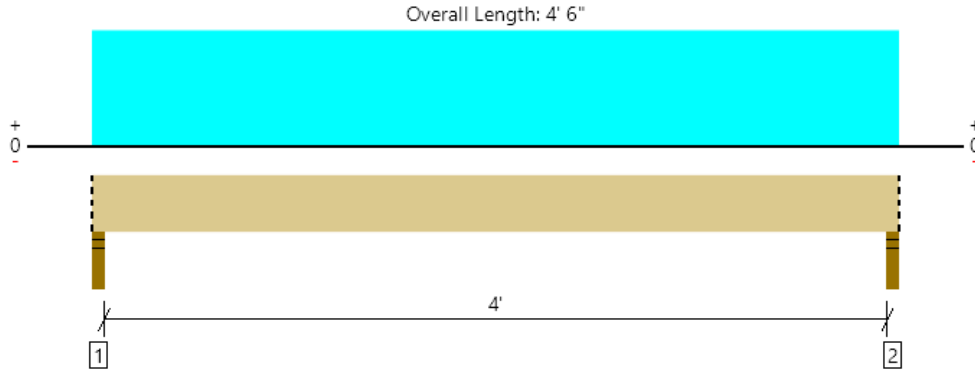
Overall Length: 4' 6"

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

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

9/10/2021 6:04:55 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove
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MEMBER REPORT

UPPER FLOOR, b23b
1 piece(s) 1 3/4" x 5 1/2" 2.0E Microllam® LVL

Overall Length: 11' 3"

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)			
	Total	Available	Required	Dead	Snow	Total	Accessories
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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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, B24
1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL
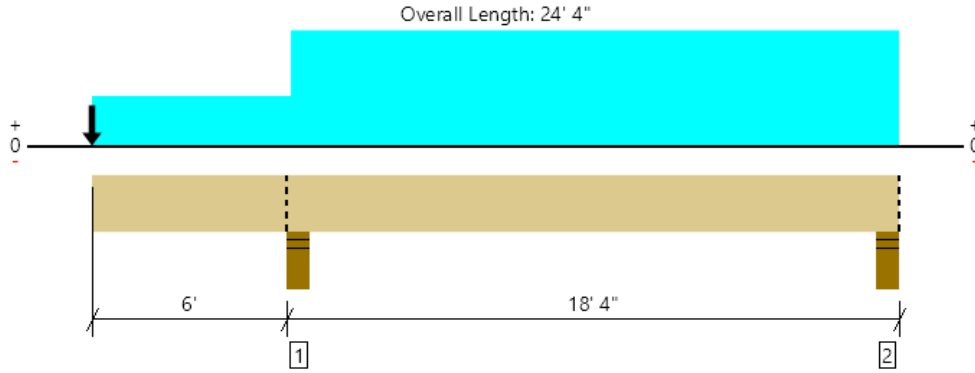
Overall Length: 24' 4"

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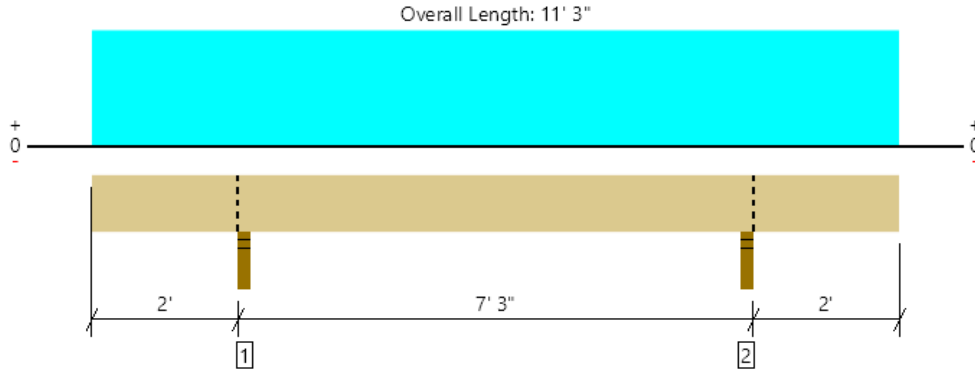
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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

Weyerhaeuser

FORTE WEB

UPPER FLOOR, B25
1 piece(s) 5 1/4" x 9 1/2" 2.0E Parallam® PSL
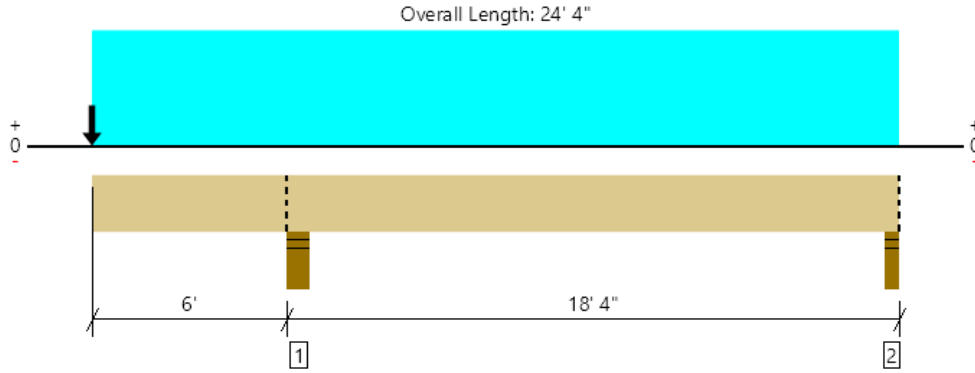
Overall Length: 24' 4"

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

Weyerhaeuser

FORTEWEB

UPPER FLOOR, B26
1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL
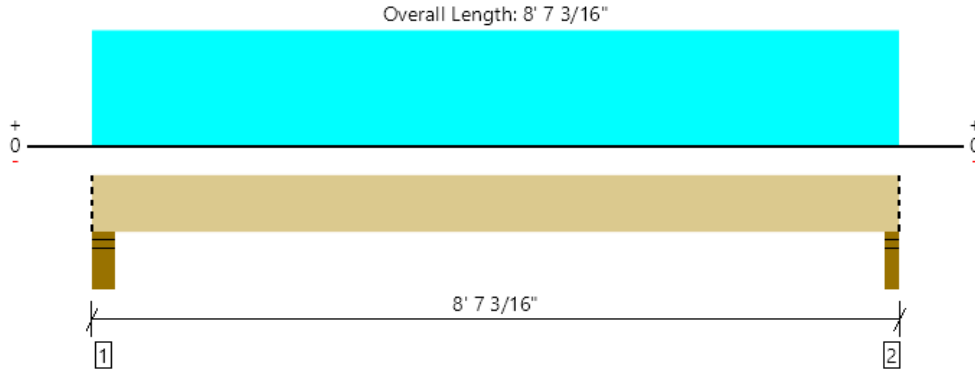
Overall Length: 8' 7 3/16"

8' 7 3/16"

1 | 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)	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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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
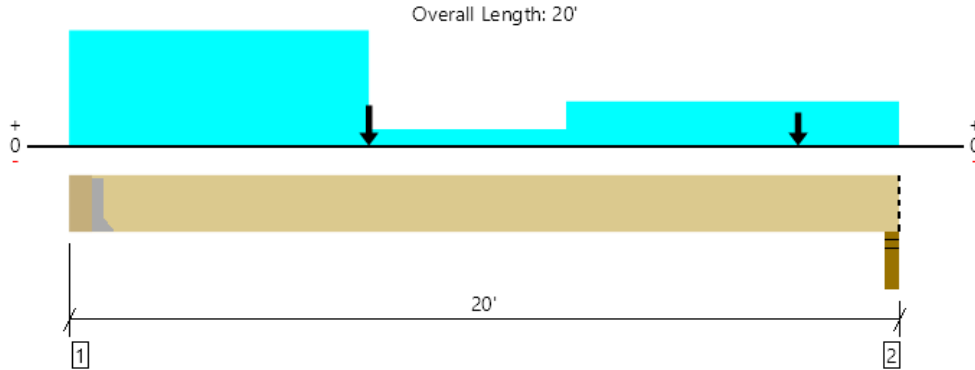
Overall Length: 20'

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"	Hanger¹	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

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9/10/2021 6:04:55 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove
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ForteWEB Software Operator	Job Notes		
Josh Welch J Welch Engineering LLC (206) 356-9553 joshtwelch@gmail.com		Weyerhaeuser	9/10/2021 6:04:55 PM UTC ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16 File Name: mercer grove

UPPER FLOOR, B28
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
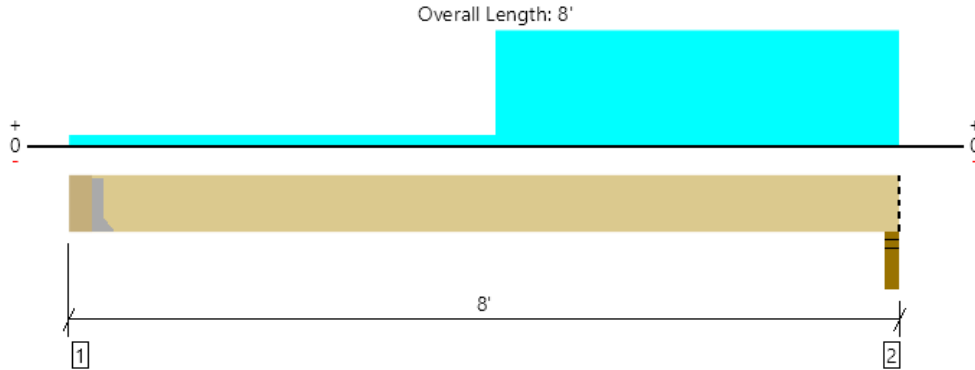
Overall Length: 8'

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"	Hanger¹	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

Weyerhaeuser Notes

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

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9/10/2021 6:04:55 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

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$W_1 = 17 DL + 5 JLL$

$W_2 = 202 DL + 180 SL$

$+ 241 DL + 400 LL + 1245L$

$P_1 = 2467 DL + 1799 LL + 1675 SL$

$V_2 = 225 DL + 1755 SL$

B29

W₁   P₁   W₂   P₂

7.5'   19.5'

0'

DL 3255	4877
LL 2905	4091
SL 2153	3705

$V = 10,098$

$M = 53,507$

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

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

$\Delta_{TL} = 0.67" = L/267$

$\Delta_{LL} = 0.35" = L/662$ USE W10x30

B29 TO B70 $R_y = 705 = 0.4 DL + 0.75(LL + SL)$

CHECK SHEAR-b   PL

$e \leq 2"$

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

$\frac{1}{2}" \times 11" \ PL \ M_{n/\Omega} = 14.8 \ k-in \geq M \ OK$

USE $\frac{1}{2}" \ PL \times 11" \ WIDE$

W/ (4) 5/8" ∅ BOLTS

e   R_y

UPPER FLOOR, B30
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 10' 6"

10' 6"

1   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)	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	

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PASSED

UPPER FLOOR, B31
1 piece(s) 3 1/2" x 11 7/8" 2.0E Parallam® PSL
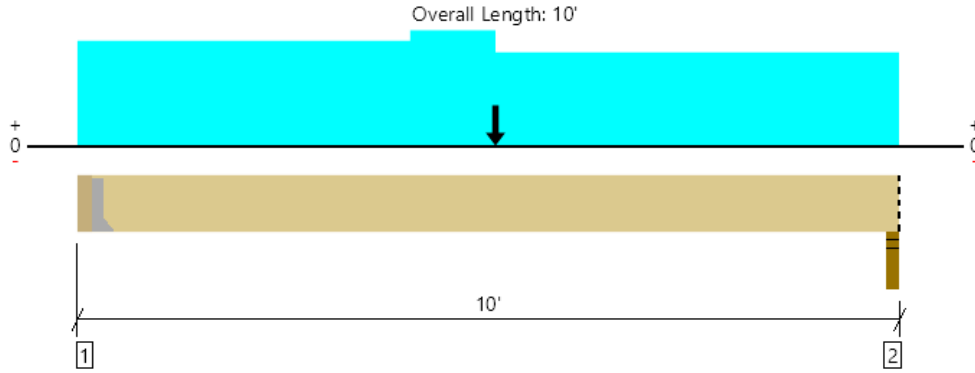
All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

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"	Hanger¹	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.

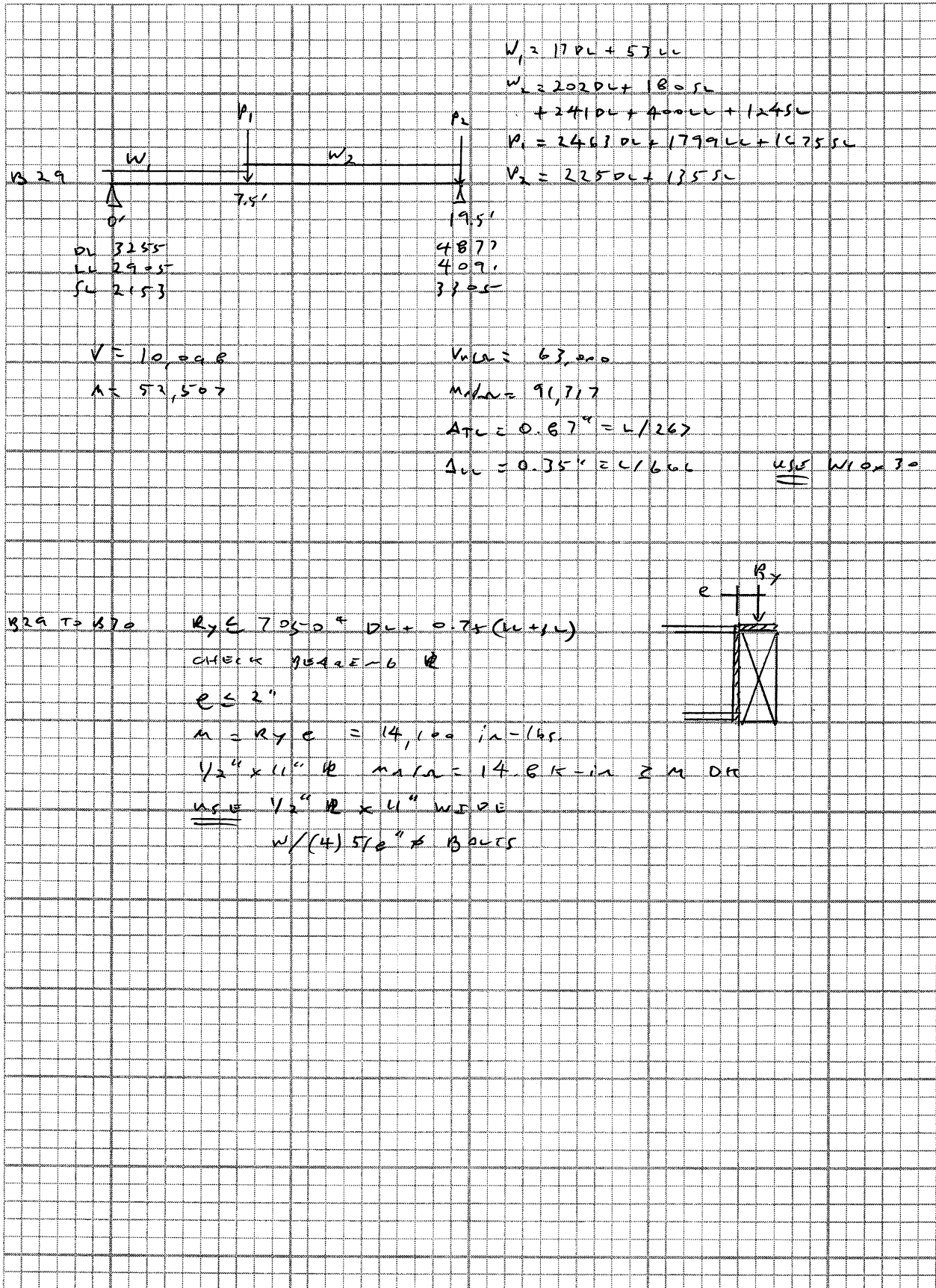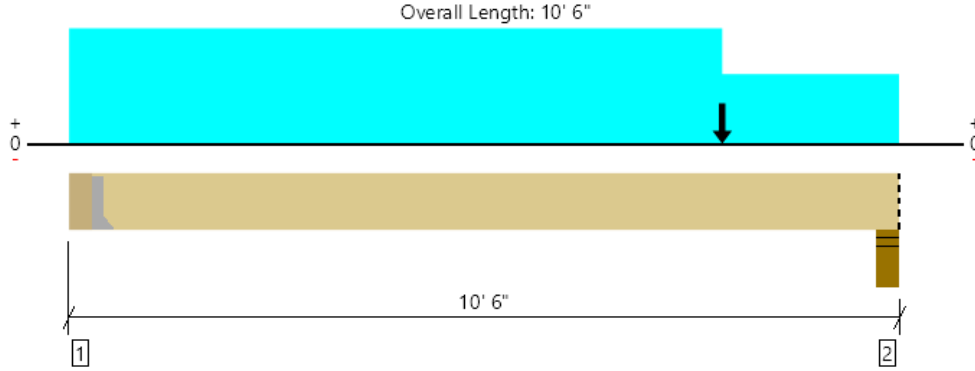| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 10'	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 10' (Front)	7' 6"	13.0	40.0	-	Default Load
2 - Uniform (PSF)	4' to 10' (Front)	10'	10.0	-	-	
3 - Uniform (PSF)	0 to 5' (Front)	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

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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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9/10/2021 6:04:55 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

UPPER FLOOR, B32
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 20'

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"	Hanger¹	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

Weyerhaeuser Notes

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ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

UPPER FLOOR, B33
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 20'

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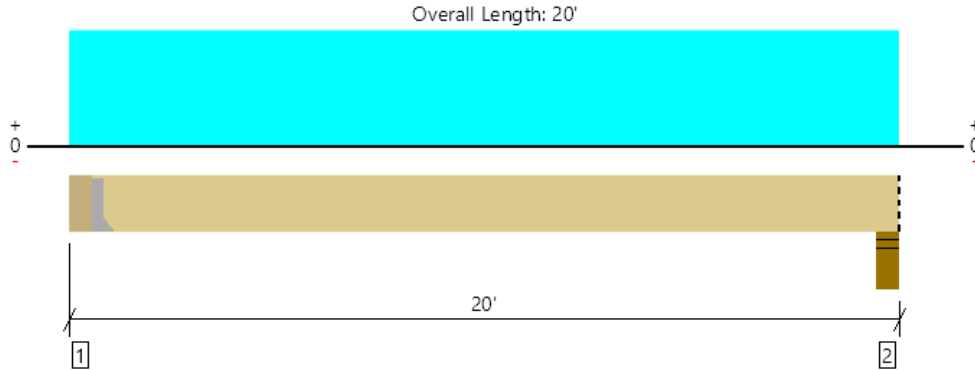
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

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ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

UPPER FLOOR, B33B
2 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL

Overall Length: 12' 6"

12' 6"

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

Weyerhaeuser Notes

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

UPPER FLOOR, B33C
1 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL
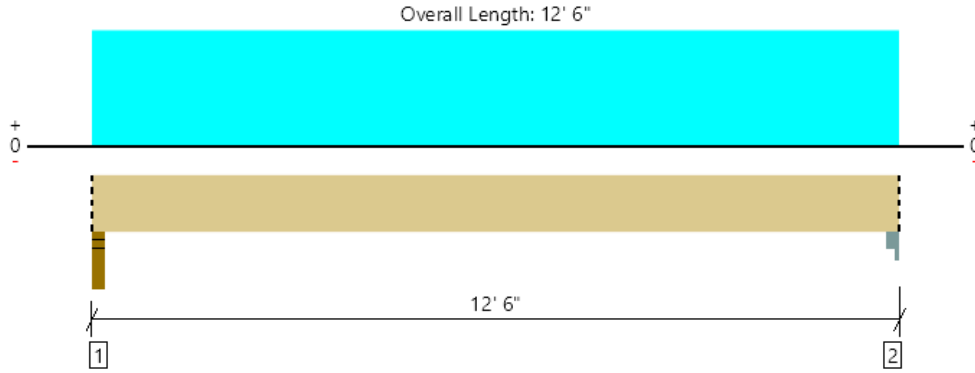
Overall Length: 12' 6"

12' 6"

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

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3/16/2022 10:09:13 PM UTC

ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16

File Name: mercer grove

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MEMBER REPORT

UPPER FLOOR, B34
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL

Overall Length: 20' 6"

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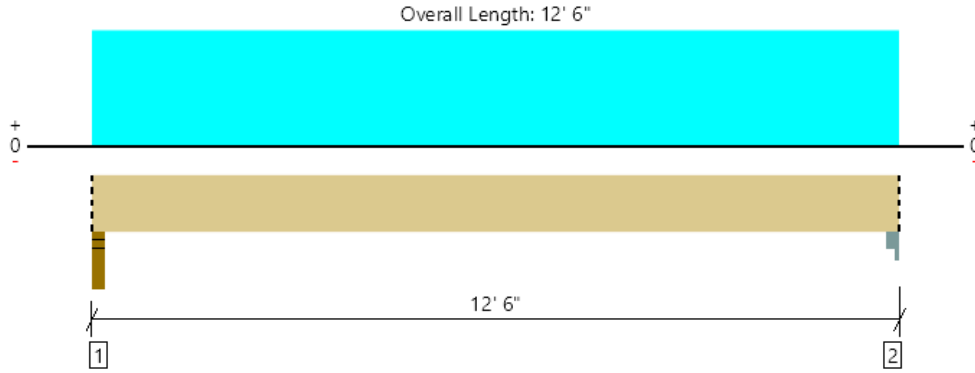
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
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9/10/2021 6:04:55 PM UTC

ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16

File Name: mercer grove

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FORTE WEB

UPPER FLOOR, B35
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
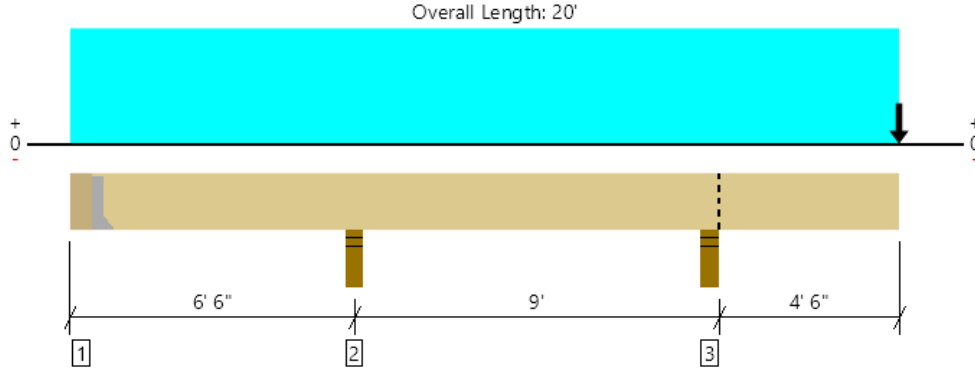
All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

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"	Hanger¹	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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ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16

File Name: mercer grove

UPPER FLOOR, B36
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL
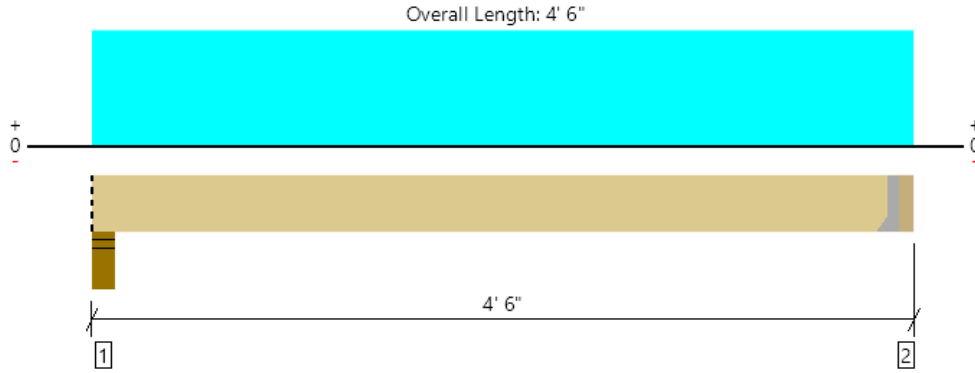
Overall Length: 4' 6"

4' 6"

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

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

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)

• 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"	Hanger¹	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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ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

UPPER FLOOR, B37
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL
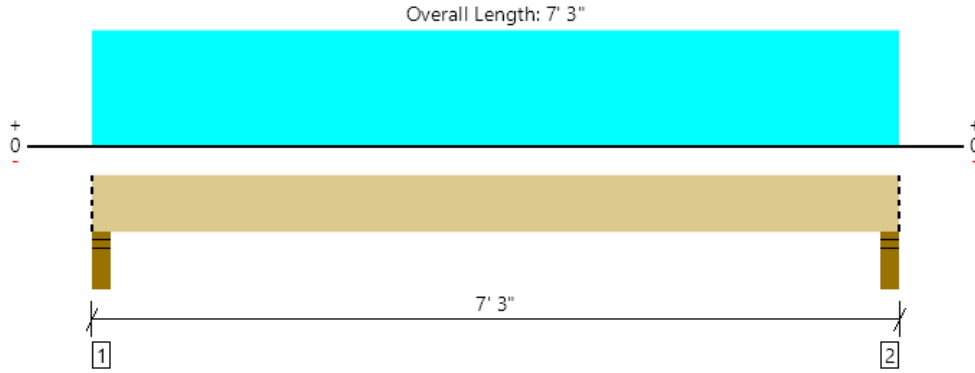
Overall Length: 7' 3"

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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Weyerhaeuser

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

B47
C12x20.7
DECK ABOVE

B49
C12x20.7

2x8 (P.T.)
@ 16" oc
J6

B50

3" PIPE
STD

C22

C21

3" PIPE
STD

B48
C12x20.7

B44   C17

B40

DECK ABOVE

J4

2x8 (P.T.)
@ 16" oc

3½x11⅞ PSL (F.B.)

CS14

B40

3½x11⅞ PSL (F.B.)

(2)CS14

B43   C16

KITCHEN ISLAND
CABINET ABOVE PER
ARCH'L SEE NOTE 6

11⅞" TJI 110
@ 16" oc

B42   C15

(2)4" PIPE
STD

W10x39 (F.B.)

HSS 3x3x3/16
4/S3.2

W12x50 (F.B.)

CONNECT PER
3/S3.2 TYP.

(2)4" PIPE
STD

11⅞" TJI 110
@ 16" oc

(2)4" PIPE
STD

W12x72 (F.B.)

CONNECT PER
8/S3.2 TYP.

CS16

C19

ANCHOR WF BEAM TO
PSL W/HDU5 & ⅞"Ø
THRU-BOLT

CONNECT PER
8/S3.2

C18

HSS 3x3x3/16
4/S3.2

STRAP PER
10/S3.4 TYP.

C23

3½x11⅞ LSL (F.B.)

3½x11⅞ LSL (F.B.)

CS16

CS16

B54
W10x22 (F.B.)

HDU5

B40B

3½x11⅞ LSL (F.B.)

6x6

B41

3½x11⅞ PSL (F.B.)

(3)CS14

CLOSET

(3)CS16

7x11⅞ PSL (F.B.)

B52

B51
3½x11⅞ LSL (F.B.)

(3)CS16

6x6

6x6

SW5

SW5

6x6

3½x11⅞ LSL (F.B.)

(2)11⅞" TJI 360

J5

11⅞" TJI 360
@ 16" oc

3½x11⅞ LSL (F.B.)

SW1

STORAGE

5¼x11⅞ PSL (F.B.)

6x6

B45

B55

B56

5¼x11⅞ PSL (F.B.)

SW4

4x8

C20

4x8

2x8¹⁷ STRAP PER
12/S3.4 TYP.

FACE OF
FRAMING

HOUSE ABOVE

HOLDOWN PER
11/S3.2 TYP.

W10x30

B53

C24

3'-0" BLOCK ALL FLOOR
SHEATHING PANEL EDGES

HDU2

J6

2x6 (P.T.)
@ 16" oc

HDU2

STRAPS
PER 12/S

STRAPS
10/S3.4

(4)CS14

(3)CS14

(3)CS14

FACE OF
FRAMING

CS22

BACKFILL BE
WALLS W/GE
PER SECTION
GENERAL
STRUCTURAL

HDU5

HDU2

HDU2

HDU2

ANCHOR SIMPSC
WALL TO FOOTI
W/(2)1"Ø WSW+
10" INTO FOOTI

BLOCK ALL FLOOR SHEATHING PANEL EDGES & NAIL W/8d @ 2½"oc TYP. BETWEEN GRIDS C & E

BLOCK ALL FLOOR SHEATHING PANEL
EDGES & NAIL W/8d @ 2½"oc TYP.

HOUSE ABOVE

FACE OF
FRAMING

F.O. FRAMING
& CONCRETE

FACE OF
FRAMING

F.O. FRAMING
& CONCRETE

1   2   3   2/A2.0   4

PROJECT: Date:

$$W_1 = 2125 DL + 300 LL -$$

$$W_2 = 5875 DL + 300 LL + 225 SL$$

$$P_1 = 32480 DL + 10975 SL$$

$$P_2 = 18660 DL + 10975 SL$$

$$P_3 = 8360 DL + 5065 SL$$

W42

P_1 $\quad$ P_2 $\quad$ P_3 $\quad\quad$ P_3

W_1 $\quad\quad$ W_2

9.5' 12'

6.5' $\quad\quad\quad$ 18.25'

DL	10,496	1143
LL	425 = 2	1213
SL	3149	620

$$V = 9065$$

$$M = 35,450$$

$$V_{ult} = 62.49 \, k$$

$$M_{ult} = 116.771 \, k\text{-}ft$$

$$\Delta_{TL} = 0.74'' = L/458 \quad\quad use \; W18 \times 39$$

PROJECT: MERCER GROVE   Date:

$P_0 = 206 DL + 660 LL$

$P_1 = 3660 DL + 3215 SL + 143 DL + 660 LL$

$P_2 = 2866 DL + 691 LL + 1395 SL$

$W_1 = 18 DL$

$W_2 = 152.5 DL + 140 LL +$

$W_3 = 152.5 DL + 380 LL + 100 SL$

B44

P_0 P_1 P_2

W_1 W_2 W_3

6.3'   24.3'

12.5'   32.5'

DL	9,683	1801
LL	4977	2670
SL	4703	527

$V \leq 9000$

$M \leq 54,519$

$V_{n/a} = 90.2 K$

$M_{n/a} = 179.4 k\text{-}ft$

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

$\Delta_{LL} = 0.054$

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

$P_0 = 206 DL + 660 LL$

$P_1 = 8282 DL + 4605 SL + 143 DL + 660 LL$

$P_2 = 8163 DL + 2215 LL + 5190 SL$

$W_1 = 18 DL +$

$W_2 = 165 DL + 443 LL$

B43

P_0 P_1 P_2

W_1 W_2

6.3'   24.7'

12.5'   32.5'

DL	17,865	3603
LL	12,215	4171
SL	8080	1715

$V \leq 17,235$

$M \leq 49,051$

$V_{n/a} = 105.7 K$

$M_{n/a} = 269.4 k\text{-}ft$

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

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

$\Delta_{SL} = 0.1'' = 2L/3000$ USE W12x72

                                            or W10x88

PROJECT: MERCER GROVE   Date:

$$1870 DL + 2169 LL + 5275 L$$
$$V = 1470 DL + 2122 LL + 654$$

B54

DL 234   1630
LL 334   2335
SL 66   461

V = 3972 $V_{n/s}$ = 48,920

M = 3972 $M_{n/s}$ = 64,620

Δ_{TL} = 0.01"   USE W10×22

W_1 = 350 DL + 400 LL
W_2 = 520 DL + 400 LL + 300 SL
W_3 = 650 DL + 800 LL + 300 SL
W_4 = 962 DL + 800 LL + 481 SL
V = 3610 DL + 1921 LL + 690 SL
P_1 = 657 DL + 657 LL
P_2 = 7,0 DL + 1590 LL

B53

         P_1 P_2 P_3
    W_1 W_2 W_3 W_4

    4'   6.5'   10'   6.5'

DL   1400 LL   2245
LL   13377   2956
SL   4853   2256

V = 14 PLL $V_{u/s}$ = 63 K

M = 52,080 $M_{u/s}$ = 91.3 K-ft

Δ_{TL} = 0.48" = L/325   USE W18×30

10/13/21 B53 CANTILEVER REDUCED & SWITCHED TO WOOD BEAM

B29

$R = 12066$

$W = 70 DL + 240 LL$
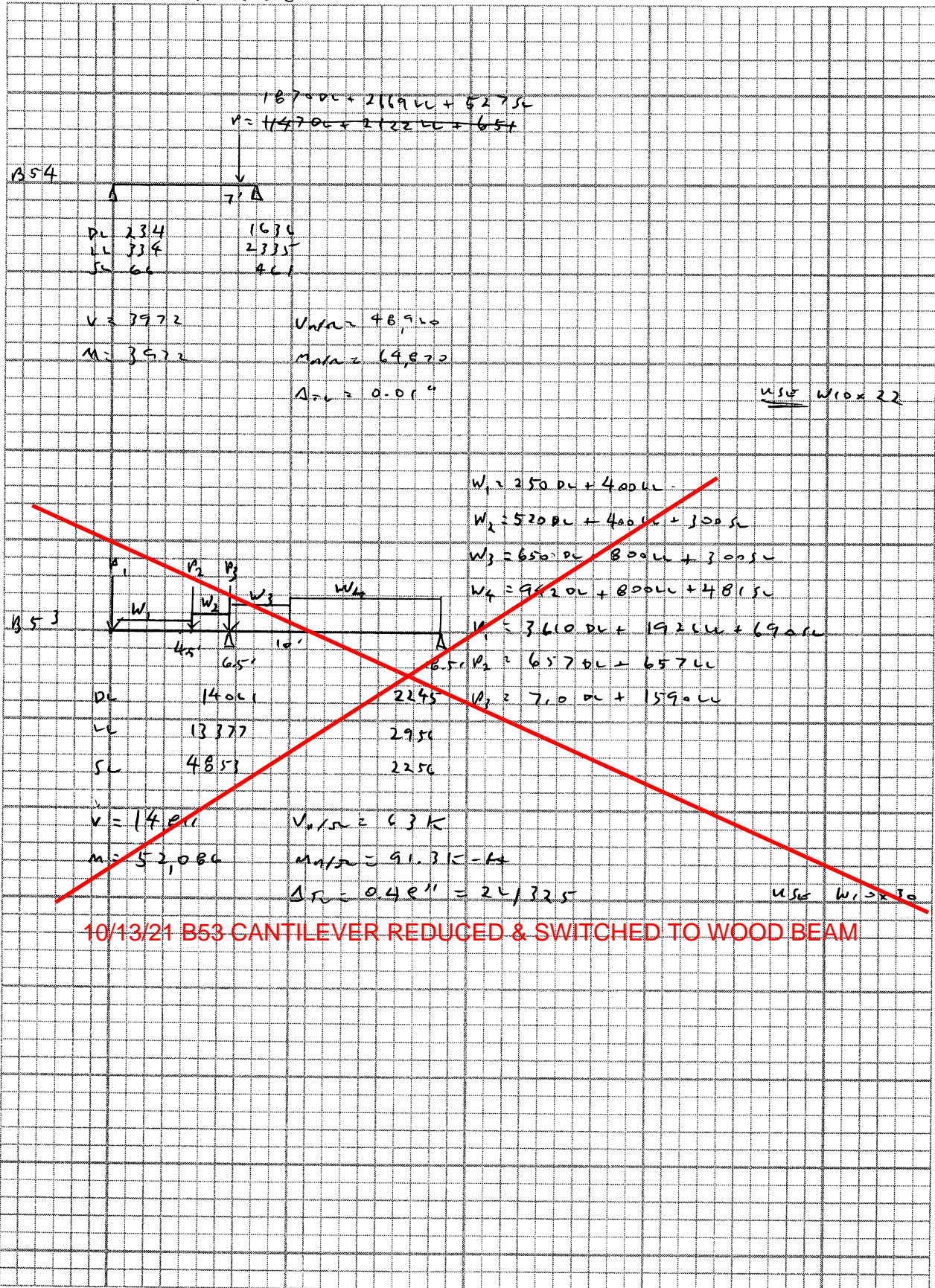
0'   12'

| | DL | 207 | 1243 |
| LL | 950 | 3610 |

$V = 2524$ $V_n/\Omega = 43,769$

$M = 8269$ $M_n/\Omega = 32,174$

$\Delta_{TL} = 0.1'' = 2L/1680$ USE $C12 \times 20.7$

B48

$W = 70 DL + 240 LL$

12-5-1

DL 438
LL 1500

$V = 1738$ $V_n/\Omega = 43,769$

$M = 6056$ $M_n/\Omega = 32,174$

$\Delta_{TL} \leq 0.1'' = L/1500$ USE $C12 \times 20.7$

B49   To column $R_y \leq 1243 DL + 3610 LL = 4853$

$e \leq 6''$

$M \leq R_y e = 29,118$ in-lbs.

$1/4'' R \times 6''$ $M_n/\Omega = 43,820$

$5/8'' \phi$ $r_n/\Omega = 3660(2) = 7,360$ USE $1/4'' R \times 6''$
                                              w/(2) $5/8'' \phi$
                                              BOLTS

P_2 $P_2 = 204 DL + 612 LL + 706 SL$

$P_1 = 120 DL$

W 370 DL + 240 LL

B50

0'   0'   14'

DL = 263   1282
LL = 643   3547
SL = 77   669

V = 3084 $V_{n/\Omega} = 43,709$

M = 13,730 $M_{n/\Omega} = 24,122$

                            $\Delta_{LL} = 0.2'' = L/840$ use C12x20.7

B50 TO C21 $R_y = 4829$

5/8" ϕ $r_n/\Omega = 7,680^{\#}$ # $R_u/Q_0 = 1.3$

USE (2) 5/8" ϕ BOLTS

B52 TO B57 $R_y = 3761$ DL+LL   use HGU7.25-SDS

                                            CAP = 13,160 down

                                            CAP = 9460 up
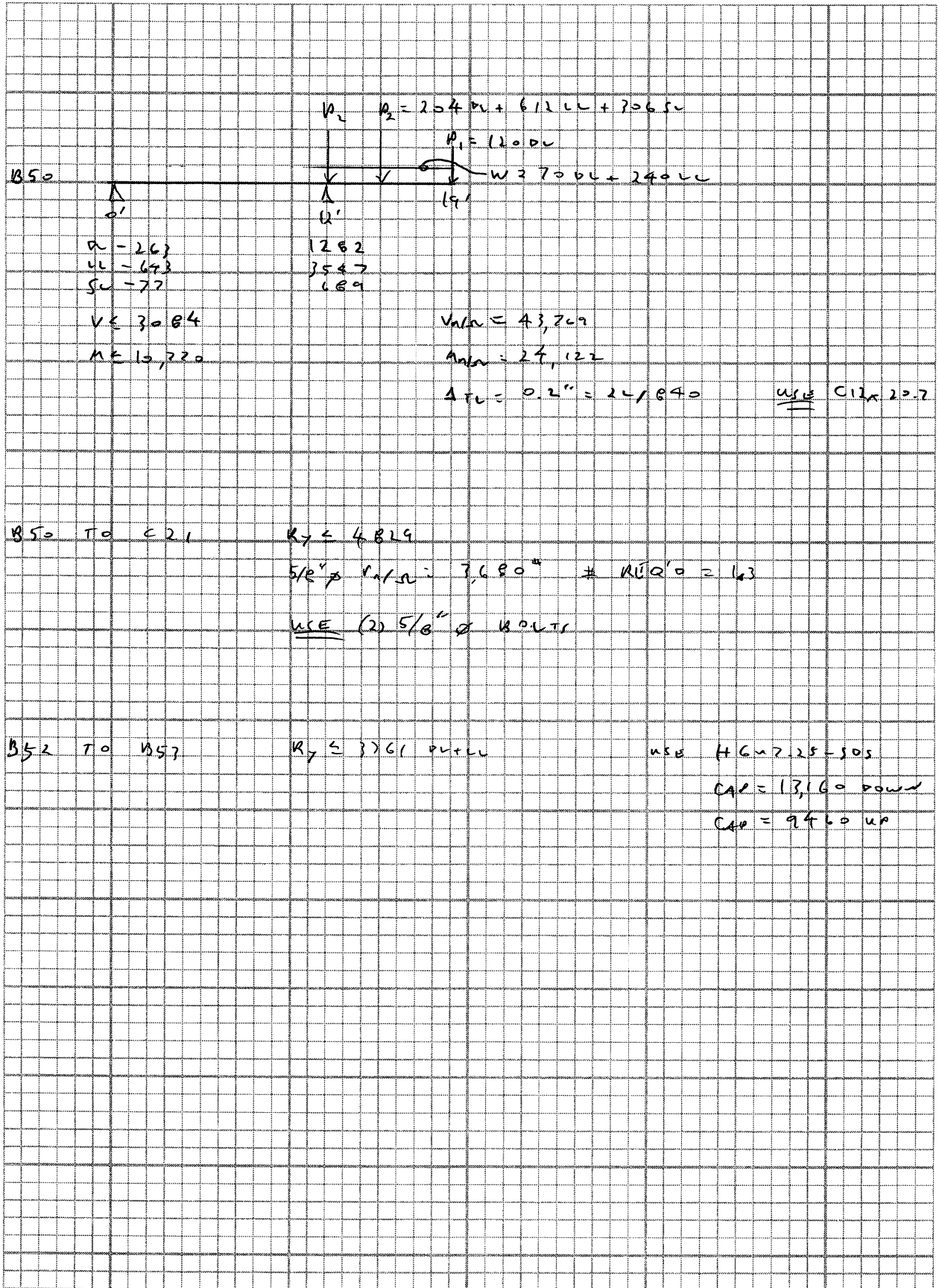
MAIN FLOOR, J4
1 piece(s) 11 7/8" TJI ® 110 @ 16" OC
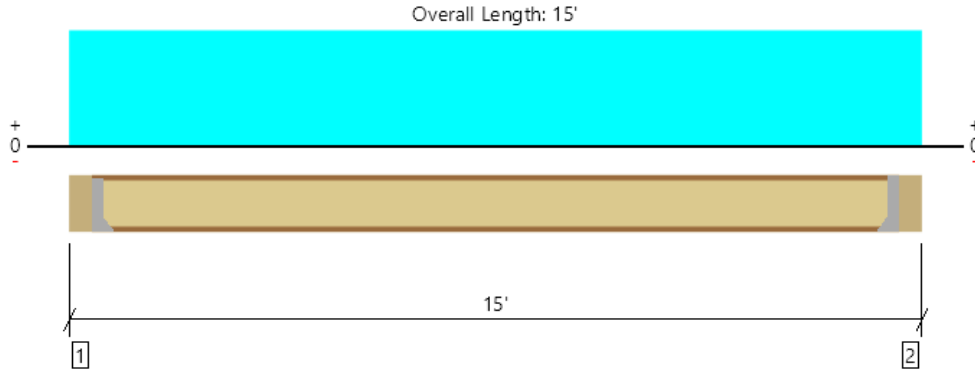
Overall Length: 15'

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)			
	Total	Available	Required	Dead	Floor Live	Total	Accessories
1 - Hanger on 11 7/8" HF beam	5.50"	Hanger¹	1.75" / - ²	150	400	550	See note ¹
2 - Hanger on 11 7/8" HF beam	5.50"	Hanger¹	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

Weyerhaeuser Notes

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

Weyerhaeuser

MAIN FLOOR, J5
1 piece(s) 11 7/8" TJI® 360 @ 16" OC
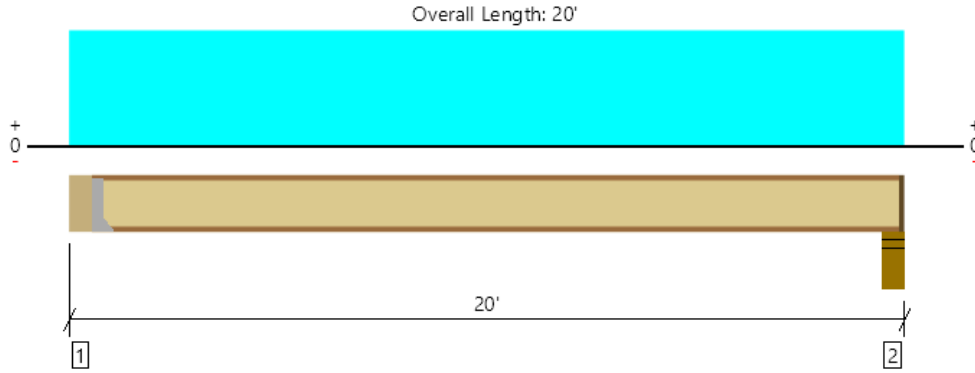
Overall Length: 20'

20'

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"	Hanger¹	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

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

Weyerhaeuser

MAIN FLOOR, J6
1 piece(s) 2 x 8 HF No.2 @ 16" OC
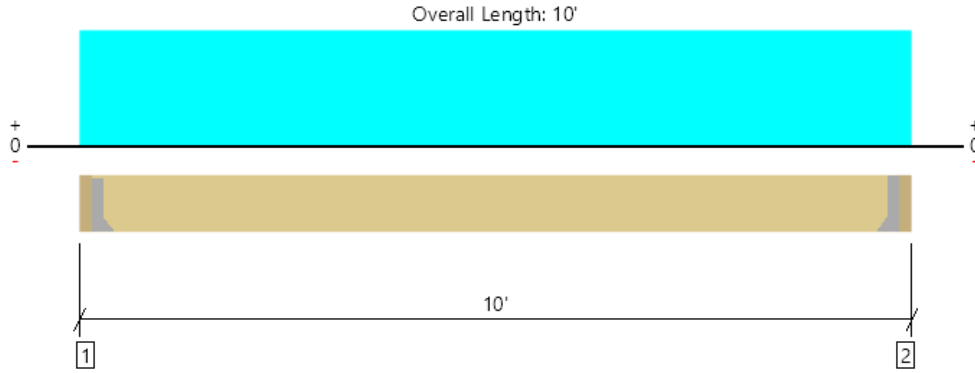
Overall Length: 10'

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"	Hanger¹	1.50"	80	400	480	See note ¹
2 - Hanger on 7 1/4" HF beam	3.00"	Hanger¹	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

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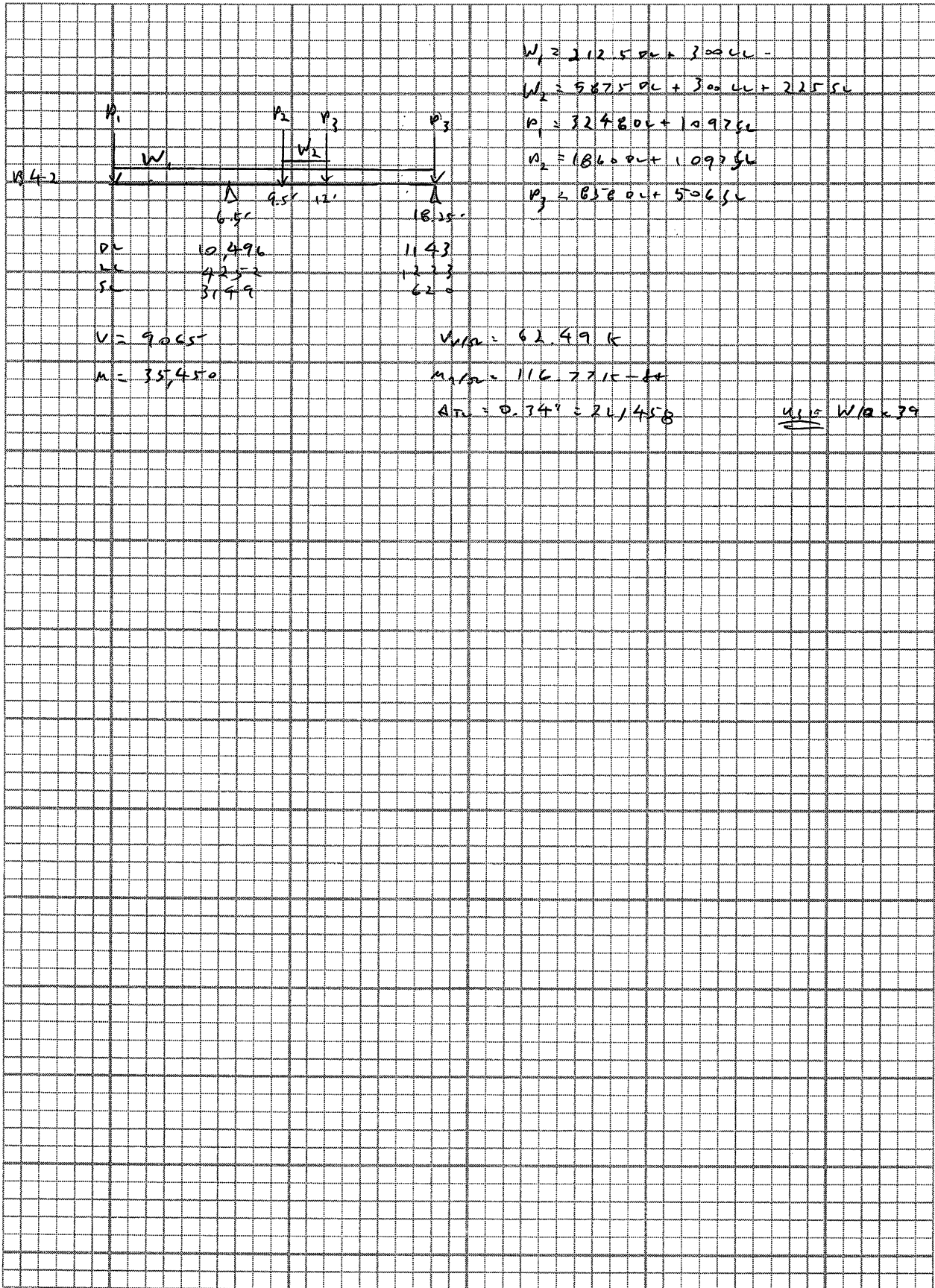J Welch Engineering LLC
(206) 356-9553
joshtwelch@gmail.com	

Weyerhaeuser

MAIN FLOOR, B40
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
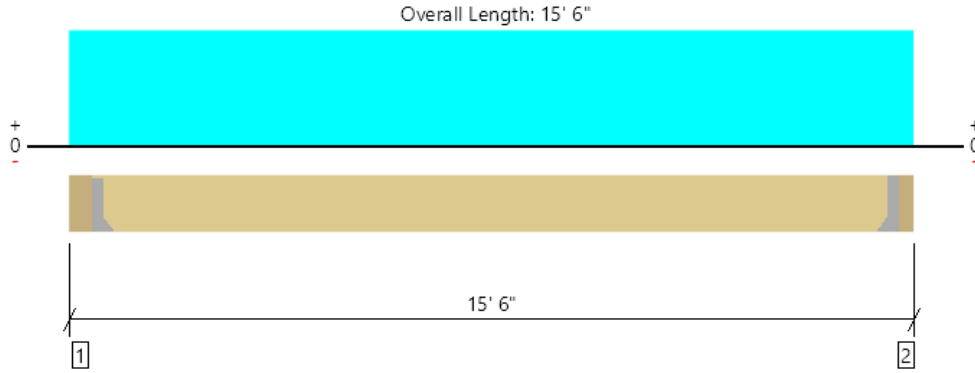
Overall Length: 15' 6"

15' 6"

1   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)	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)

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

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

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"	Hanger¹	1.50"	1388	313	235	1936	See note ¹
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger¹	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

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

Weyerhaeuser

MEMBER REPORT

PASSED

MAIN FLOOR, B40B
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
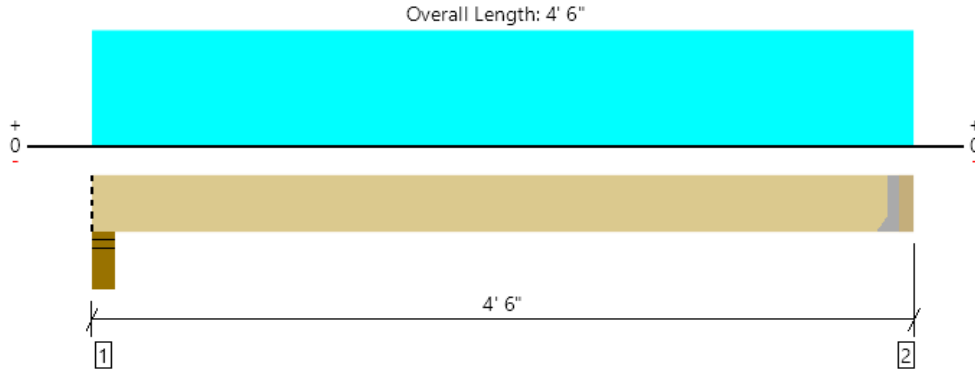
Overall Length: 4' 6"

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"	Hanger¹	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
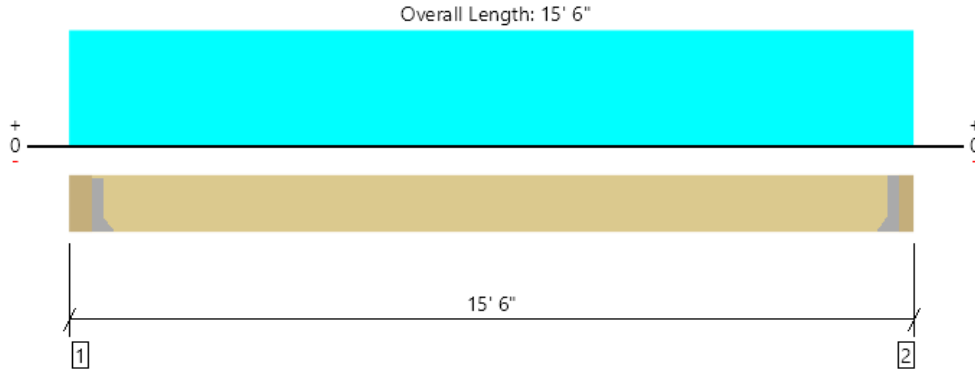
Overall Length: 15' 6"

15' 6"

1   2

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

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

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)

• 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

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
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Weyerhaeuser

MAIN FLOOR, B45
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL
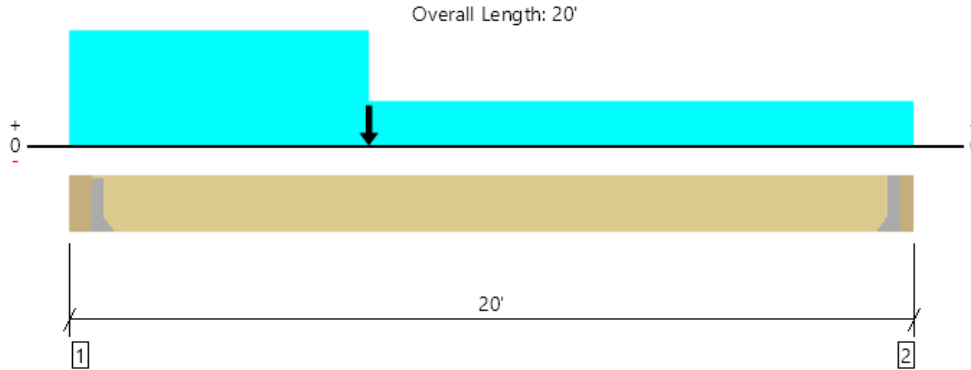
Overall Length: 20'

20'

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)

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

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

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

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
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Weyerhaeuser

MAIN FLOOR, B46
2 piece(s) 2 x 6 DF No.2
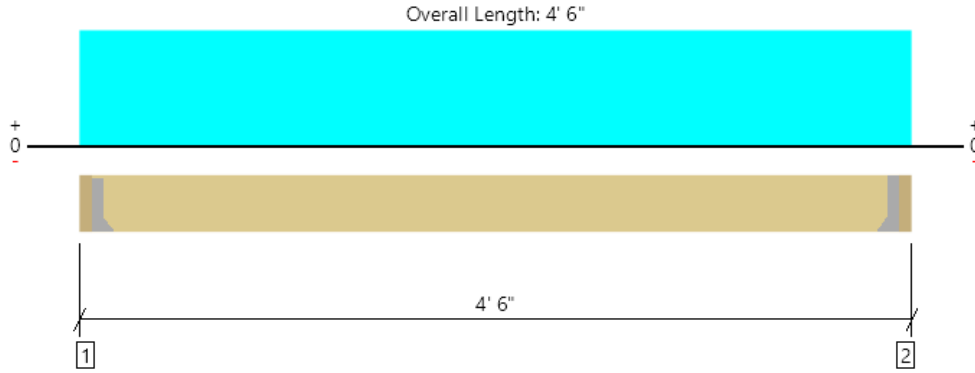
Overall Length: 4' 6"

4' 6"

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"	Hanger¹	1.50"	166	945	1111	See note ¹
2 - Hanger on 5 1/2" HF beam	3.00"	Hanger¹	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, B47
2 piece(s) 2 x 8 DF No.2
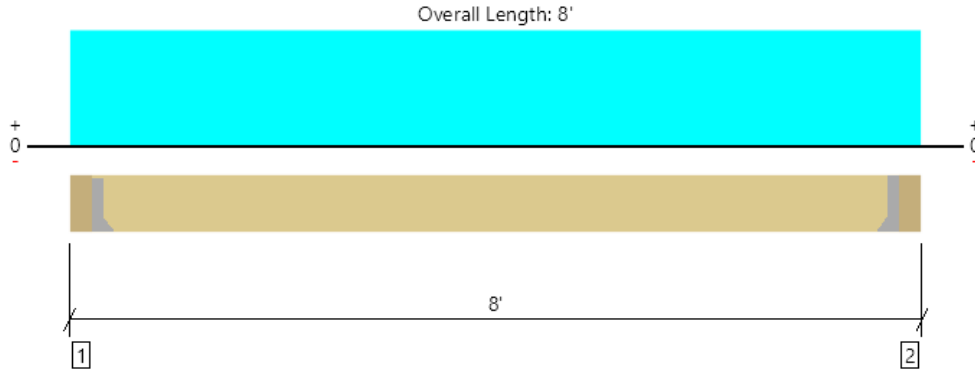
Overall Length: 8'

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)

- 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.

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

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"	Hanger¹	1.50"	260	960	1220	See note ¹
2 - Hanger on 7 1/4" HF beam	5.25"	Hanger¹	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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9/10/2021 8:22:34 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

MAIN FLOOR, B51
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 12'

12'

1   2

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

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

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)

• 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

Weyerhaeuser Notes

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Weyerhaeuser

9/10/2021 10:53:11 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove
Page 77 of 207 Page 1 / 1

MEMBER REPORT

MAIN FLOOR, B52
1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL
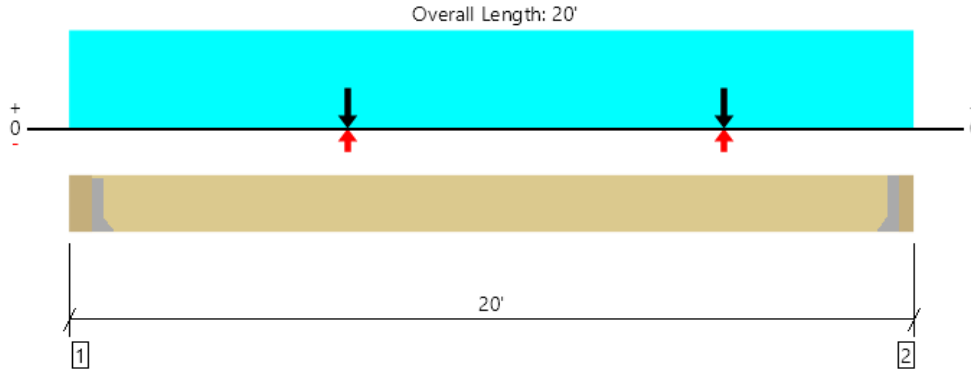
Overall Length: 20'

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

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

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)

• 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"	Hanger¹	1.50"	1916	1528	-556	3444/-556	See note ¹
2 - Hanger on 11 7/8" PSL beam	3.50"	Hanger¹	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

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Weyerhaeuser

MAIN FLOOR, B53
1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL
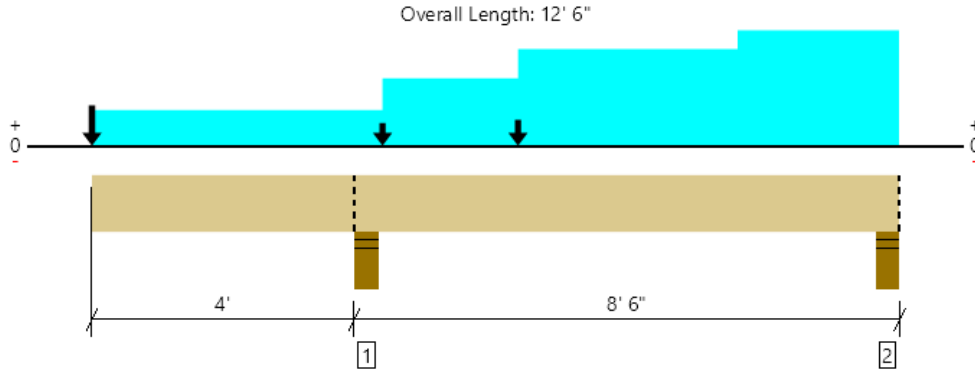
Overall Length: 12' 6"

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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PASSED

MAIN FLOOR, B55
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
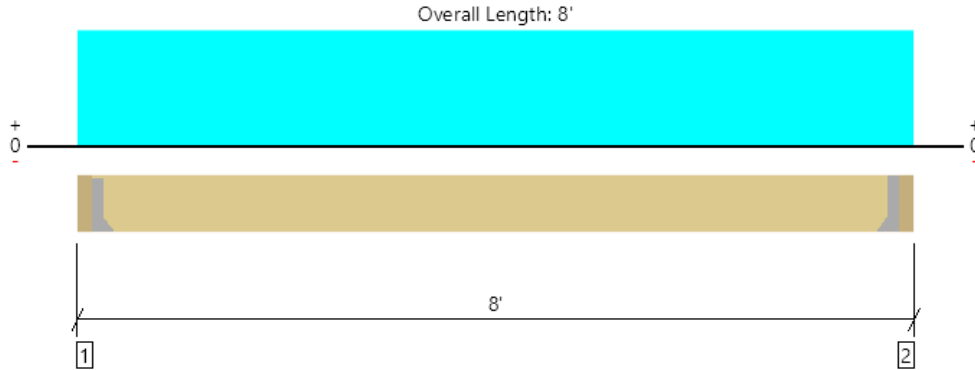
Overall Length: 8'

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"	Hanger¹	1.50"	412	1120	1532	See note ¹
2 - Hanger on 11 7/8" HF beam	3.50"	Hanger¹	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.

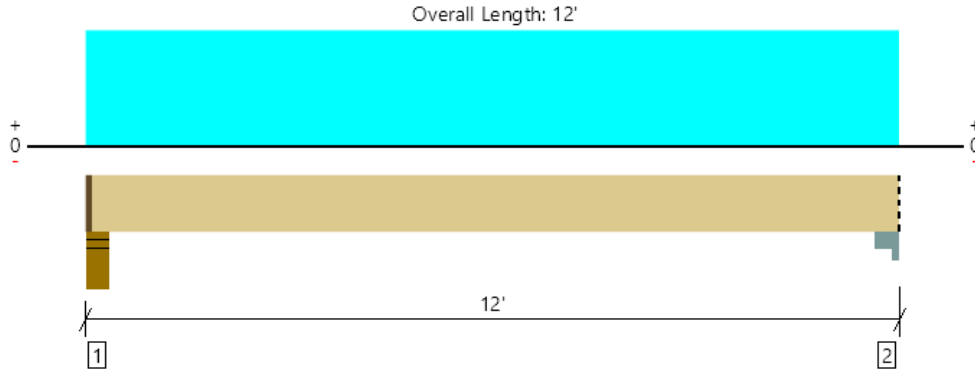| Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	3 1/2" to 7' 8 1/2"	N/A	13.0	--	
1 - Uniform (PSF)	0 to 8' (Front)	1'	13.0	40.0	Default Load
2 - Uniform (PSF)	0 to 8' (Front)	6'	13.0	40.0	Default Load

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

9/10/2021 8:22:34 PM UTC
ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

MAIN FLOOR, B56
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL
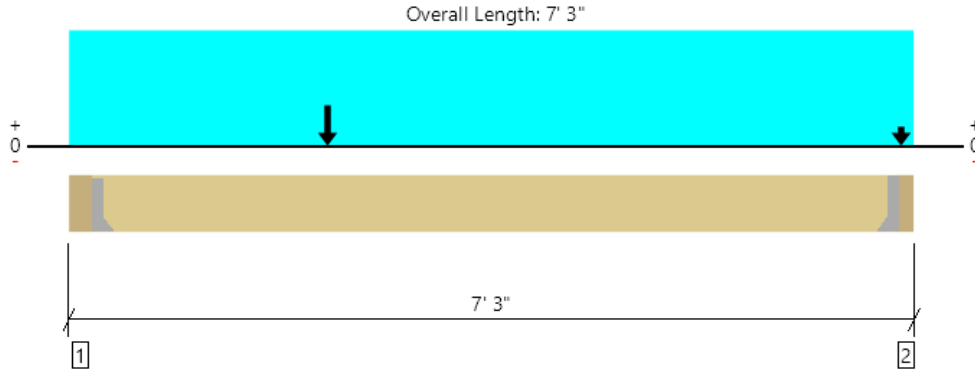
Overall Length: 7' 3"

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

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

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)

• 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"	Hanger¹	4.20"	6364	6664	3537	16565	See note ¹
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger¹	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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9/10/2021 8:22:34 PM UTC
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File Name: mercer grove
Page 83 of 207 Page 22 / 25

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

MAIN FLOOR, deck joist
1 piece(s) 2 x 8 HF No.2 @ 16" OC
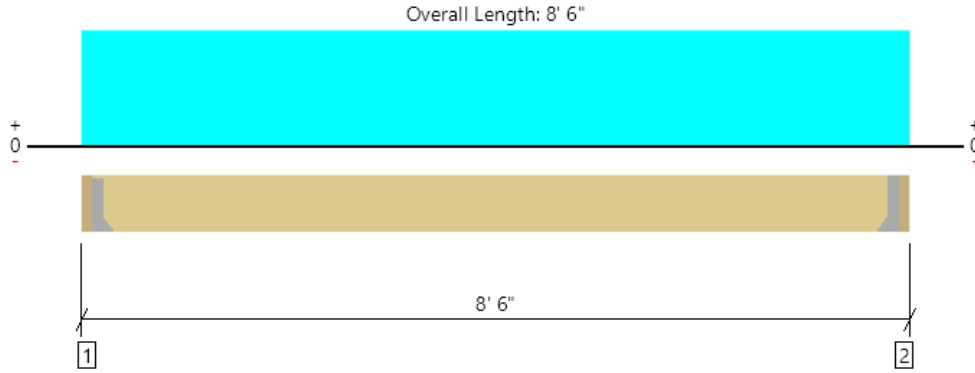
Overall Length: 8' 6"

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"	Hanger¹	1.50"	57	340	142	539	See note ¹
2 - Hanger on 7 1/4" HF beam	2.50"	Hanger¹	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
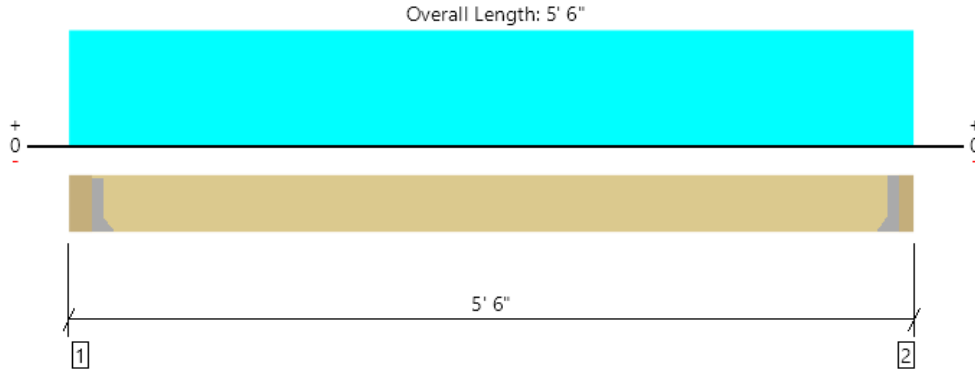
Overall Length: 5' 6"

5' 6"

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

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

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)

• 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"	Hanger¹	1.50"	127	723	301	1151	See note ¹
2 - Hanger on 7 1/4" HF beam	3.50"	Hanger¹	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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Weyerhaeuser

5

6

F.O. FRAMING
& CONCRETE

F.O. FRAMING
& CONCRETE

ENTRY
BRIDGE

3" PIPE
STD

3" PIPE STD

3" PIPE
STD

3" PIPE STD

W6x15 (F.B.)

C10

B13

$\frac{2}{S3.7}$

C11

D

R4

2x

@ 24 oc

$\frac{6}{S3.7}$

$\frac{5}{S3.7}$

C12

B14

C13

W8x15

SW6

$\frac{9}{S3.7}$

PROVIDE HOLE
IN WEB FOR
WOOD BEAM TO
PASS THROUGH
WF BEAM

$\frac{8}{S3.7}$

F.O. FRAMING
& CONCRETE

F.O. FRAMING
& CONCRETE

5

6

SECOND FLOOR FRAMING PLAN

WF BEAM TO PIPE
COLUMNS PER
3/S3.2 TYP.

CONNECT PER
7/S3.4 &
7/S3.2 TYP.

B18
B19
B19

W8xX (KINKED)
W8x15 (BELOW)

2x6 (P.T.) ● 16" oc
(2)2x6
2x6 (P.T.) ● 16" oc
(2)2x6
(2)2x6 (P.T.)
2x6 (P.T.) ● 16" oc
(2)2x6
2x6 (P.T.) ● 16" oc
(2)2x6
2x6 (P.T.) ● 16" oc
(2)2x6
2x6 (P.T.) ● 16" oc
(2)2x6
2x6 (P.T.) ● 16" oc

J6
B20

3" PIPE STD
W8x15 (KINKED)
W8x15 (BELOW)

B15
C25
B16
B21
C26
B17
C27
B19

3" PIPE STD
3" PIPE STD

W8x21
W8x21

B22

W8x21

JOIST

2" x ¾" GHB MCNICHOLS
BAR GRATING OR
APPROVED EQUAL
TYP. U.N.O.

W8x21

W8x21

B23
C28
C29
W8xX

B25
F.O. FRAMING & CONCRETE
E

W8x21

B24
W8x21

5
6

Page 88 of 207

PROJECT: MERCER GROVE   Date:

CARPORT ROOF BEAMS

B13

$$W = 185 DL + 467 SL$$

1.6'	17.1' 23.2'
DL 1523	2769
SL 3845	6990

$$V = 5662 \qquad V_n/\Omega = 77,444$$
$$M = 13,505 \qquad M_n/\Omega = 42,415$$

$$\Delta \leq 0.29'' = L/691 \qquad \underline{USE \ W8 \times 18}$$

B14

$$W = 176 DL + 447 SL$$

0.6'	18.5' 23.2'
DL 1574	2509
SL 3986	6223

$$V = 5871 \qquad V_n/\Omega = 77,444$$
$$M = 21,568 \qquad M_n/\Omega = 42,415$$

$$\Delta \leq 0.67'' = L/320 \qquad \underline{USE \ W8 \times 18}$$

JOIST
$$W = 150.5 DL + 212.5 LL$$
22'

DL 1216   1216
LL 2336   2336

V = 3554 $V_{ALL} = 41,400$
M = 19542 $M_{ALL} = 22,070$

$\Delta_{LL} = 0.64" = L/412.5$ USE W8x21

$W = 53 DL + 135 LL + 75 SL$ $W = 53 DL + 135 LL$
16'

B1R
0'   7.5'   10'   16'

DL 431   444
LL 1096   1131
SL 602   211

V = 1864 $V_{ALL} = 39,239$
M = 6340 $M_{ALL} = 32,206$

$\Delta \le 0.27" = L/716$ USE W6x15

$W = 53 DL + 135 LL + 75 SL$
B1R
16.5'

DL 437   437
LL 1114   1114
SL 619   619

V = 1736 $V_{ALL} = 39,239$
M = 7164 $M_{ALL} = 32,206$

$\Delta \le 0.32" = L/618$ USE W8x15

PROJECT: Date:

$P = 444 DL + 1131 LL + 211 SL$

$P = 1116 DL + 2842 LL + 444 SL$

B16

$\overset{4.5'}{\underset{4'}{}}$ 9'

DL = 1323   2997
LL = 3366   7626
SL = 544   1365

$V = 5928$ $V_n/_\Omega = 41,400$

$M = 18,737$ $M_n/_\Omega = 50,896$

                   $\Delta_{TL} = 0.24" = 2L/500$ USE W8x21

$P = -1327 DL + -3366 LL + -544 SL$

$W = 10.5 DL + 263 LL$

B22

   7'   800
DL 263   35 LL
LL 92   -123
SL -371

$V = 2847$ $V_n/_\Omega = 41,400$

$M = 7190$ $M_n/_\Omega = 50,896$

                   $\Delta = 0.16" = L/1667$ USE W6x21

$W = 263 DL + 92 LL + 371 SL$

B15

   2'
DL 175   86
LL 61   71
SL -247   -124

$V = 232$ $V_n/_\Omega = 41,400$

$M = 506$ $M_n/_\Omega = 50,896$

                   $\Delta = 0$ USE W6x21

$W_1 = 55.25 DL + 103 LL$

$p = 886 DL + 314 LL + -124 SL$

$p = 2977 DL + 762 LL + 1365 SL$

$W_2 = 90 DL + 247 LL +$

B21

	W_1			
		6.75'		
	1.6'		16.9'	22.5'

	DL	228	3394	-924
	LL	4768	6824	-2210
	SL	423	741	-303

$V = 6888$ $V_{a/a} = 59,400$

$M = 31,234$ $M_{a/a} = 99,800$

$\Delta = 0.22'' = L/835$ USE W8x40

$p = 806 DL + 1356 LL + -173 SL$
$V = -924 DL + -2210 LL + 303 SL$
$p = 4170 DL + 1146 LL + 619 SL$
$p = 848 DL + 2160 LL + 619 SL$

B17

			4'		5'

	DL	-191	1421
	LL	-1180	3765
	SL	-377	171.1

$V = 3762$ $V_{a/a} = 41,400$

$M = 14,996$ $M_{a/a} = 50,898$

$\Delta = 0.24'' = 2L/580$ USE W8x21

$p = 1574 DL + 3996 SL$ $p = 2509 DL + 6773 SL$

$W = 110.5 DL + 217 LL$

B23

	0.5'		18.5'	
	0'			22.5'

	DL	3263	3706
	LL	2396	2366
	SL	531	5240

$V = 9033$ $V_{a/a} = 45,942$

$M = 34,764$ $M_{a/a} = 67,868$

$\Delta_{LL} = 0.54'' = 2L/500$

$\Delta_{SL} = 0.6'' = 2L/450$ USE W8x28

D.24

W = 55.3 DL + 106.5 LL

DL 6.22
LL 119.2

V = 1620   Vn/Ωn = 41,400
M = 10,238   Mn/Ωn = 50,698

A = 0.35 ≤ L/77.   W6x21

P = 3263 DL + 2396 LL + 5731 SL

P = 622 DL + 119.8 LL

D.25

0'   36'   8.25

DL —1181   5066
LL —1257   5352
SL —684   5815

V = 10,429   Vn/Ωn = 41,400
M = 11,130   Mn/Ωn = 50,698

A = 0.133 ≤ L/   W8x21

PROJECT: MERCER GROVE   Date:

GRATING FOR CARPORT   W = 20 psf DL + 50 psf LL = 70 psf

C = 2000 lb LL

L ≤ 51"

USE 2" x 1/4" 64B McNichols Bar grating

CAPACITY: W = 898   Δ = 0.259

C = 2246   Δ = 0.207

L ≤ 60"

Joists   W = 1105 DL + 2130 LL

20'

DL 1105
LL 2130

V = 3235

M = 16,175

Vn/Ω = 41,400

Mn/Ω = 50,898
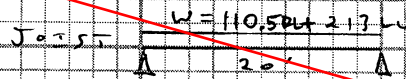
Δ_LL = 0.35" = L/683   USE W8x21
@ 51" oc

Bm   W = 380 DL + 1600 LL

21'
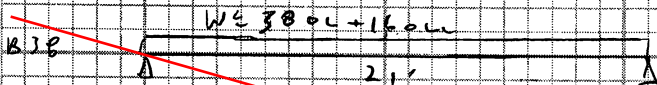
DL 379
LL 1680

V = 2079

M = 10,915

Vn/Ω = 32,240
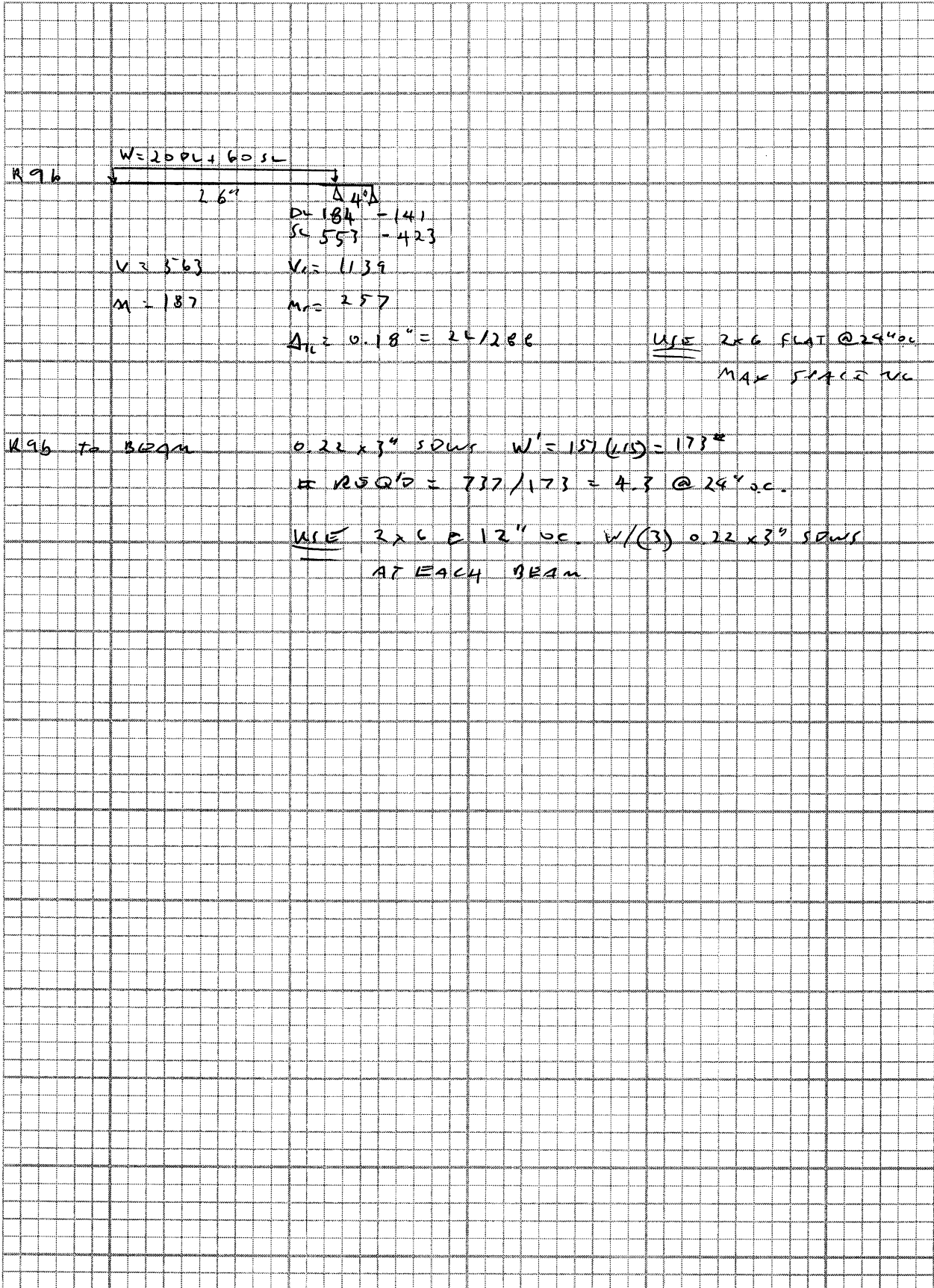
Mn/Ω = 37,925

Δ_LL = 0.69" = L/365   USE W6x20
or
W6x21

R96

$W = 20 PL + 60 SL$

26"

$\Delta = 4"\Delta$

DL 184 - 141
SL 553 - 423

$V = 563$ $V_r = 1139$

$m = 187$ $M_r = 257$

$\Delta_{TL} = 0.18" = 2L/266$ USE 2x6 FLAT @24"oc

MAX SPACING

R96 to BEAM $0.22 \times 3"$ SDWS $W' = 157 (1.15) = 173^{\#}$

RSQ'D = 737/173 = 4.3 @ 24" oc.

USE 2x6 @ 12" oc W/ (3) 0.22 x 3" SDWS

AT EACH BEAM

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

SIMPSON Strong-Tie®

Anchor Designer™
Software
Version 3.0.7947.1

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

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.
Simpson Strong-Tie Company Inc.   5956 W. Las Positas Boulevard Pleasanton, CA 94588 Phone: 925.560.9000 Fax: 925.847.3871 www.strongtie.com
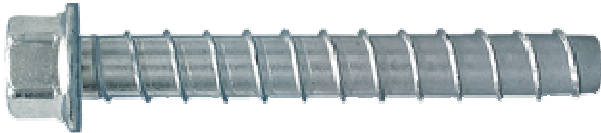
SIMPSON Strong-Tie®	Anchor Designer™ Software Version 3.0.7947.1	Company:	Date:	6/30/2021
		Engineer:	Page:	2/5
		Project:		
		Address:		
		Phone:		
		E-mail:		

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>

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.
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SIMPSON Strong-Tie

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Phone:			
E-mail:			

<Figure 2>

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

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Engineer:	
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Address:	
Phone:	
E-mail:	

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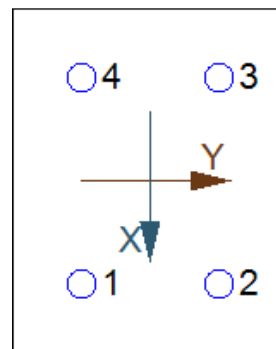
8. Steel Strength of Anchor in Shear (Sec. 17.5.1)

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} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	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} (in^2)	A_{Vco} (in^2)	$\Psi_{ec,V}$	$\Psi_{ed,V}$	$\Psi_{c,V}$	$\Psi_{h,V}$	V_{by} (lb)	ϕ	ϕV_{cbgx} (lb)
27.00	18.00	1.000	1.000	1.000	1.000	1069	0.75	2405

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.
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		Address:			
		Phone:			
		E-mail:			

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, ϕV_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.

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.
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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
$P^{\perp}$: Allowble $\perp$ 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

MARK	Loads DL (lbs)	LL (lbs)	SL (lbs)	E vert. (lbs)	W vert. (lbs)	Pmax (k)	Dimensions l (ft.)	b (in.)	d (in.)	Le/d		Type #	Material Properties E min x10^6 (psi)	Fc (psi)	Fb (psi)	c	Kf	Cd	C other	FcE (psi)	F*c (psi)	F'c (psi)	Cp	Axial Pn (k)	Plate Crushing Fc⊥ (psi)	P⊥ (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	1523	0	3845	0	0	5.4	8.5																					4" X-STR. PIPE CAP = 32.9K
C11	2769	0	6990	0	0	9.8	8.5																					4" X-STR. PIPE CAP = 32.9K
C12	1574	0	3998	0	0	5.6	8.5																					HSS 3x3x3/16 CAP = 24 K
C13	2509	0	6373	0	0	8.9	8.5																					HSS 3x3x3/16 CAP = 24 K
CARPORT FLR.																												
C25	3651	4496	4268	0	0	10.2	4.0																					4" X-STR. PIPE CAP = 84.4K
C26	6163	8444	7731	0	0	18.3	4.0																					4" X-STR. PIPE CAP = 84.4K
C27	1423	3798	1711	0	0	5.6	2.0																					FOUNDATION
C28	5066	5352	5815	0	0	13.4	2.0																					FOUNDATION
C29	3306	2396	5240	0	0	9.0	2.0																					FOUNDATION
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

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SECTION 3: LATERAL
> diaphragm & shearwall capacities
> horizontal force distribution & key plans
> shearwall design
> seismic & wind worksheets
> beams supporting SW overturning
> misc. calculations

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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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Mercer Island Wind Exposur
and Wind Speed-Up (Topographic

by Development Services Group (DSG), City of Mercer Island
April 2009
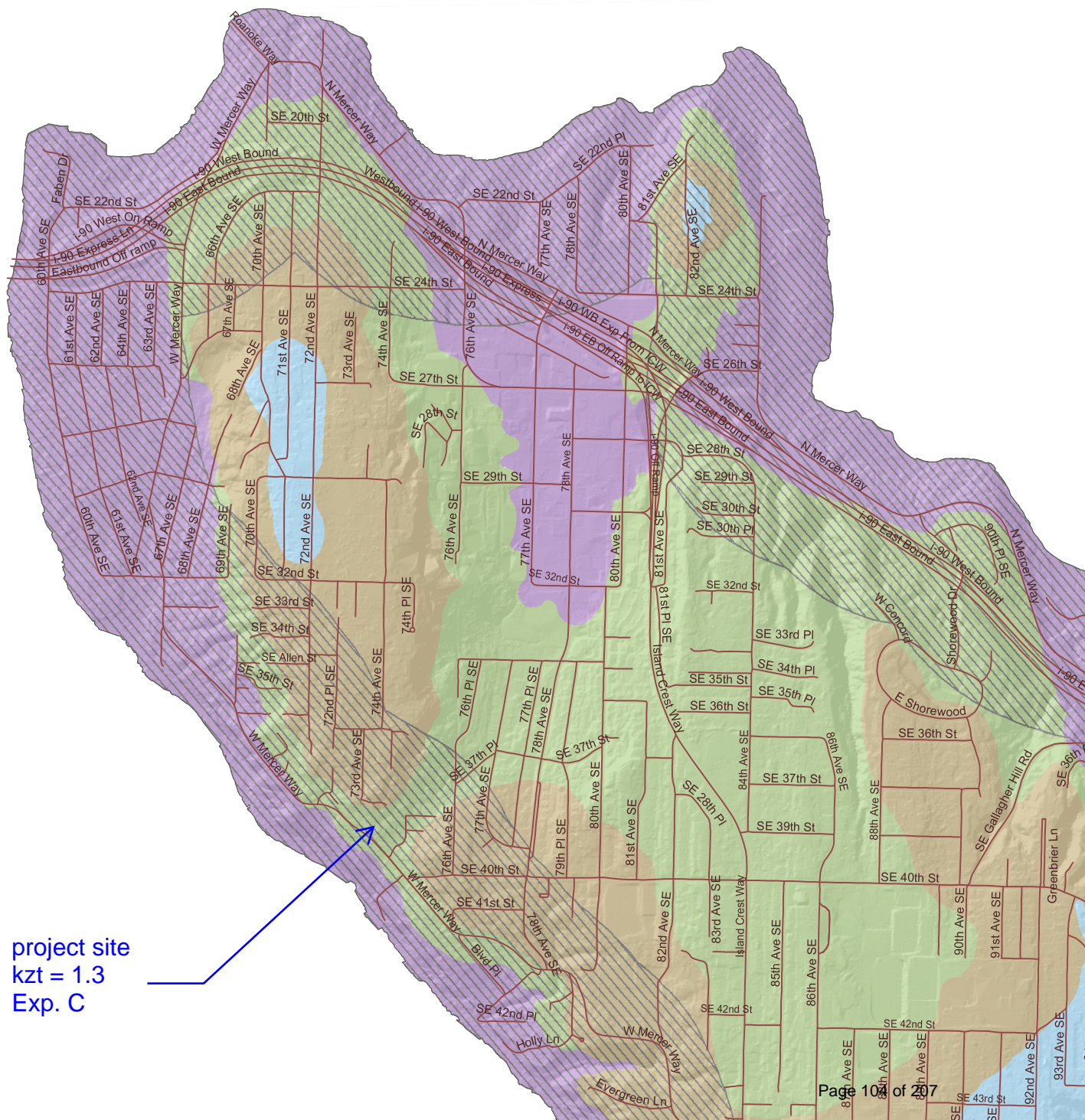
project site
kzt = 1.3
Exp. C

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

197 ft

Map data ©2021 Google

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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ATC Hazards by Location

Search Information

Coordinates: 47.576, -122.241

Elevation: 197 ft

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

Hazard Type: Wind

197 ft

Map data ©2021 Google

ASCE 7-16		ASCE 7-10		ASCE 7-05	
MRI 10-Year	67 mph	MRI 10-Year	72 mph	ASCE 7-05 Wind Speed	85 mph
MRI 25-Year	73 mph	MRI 25-Year	79 mph		
MRI 50-Year	78 mph	MRI 50-Year	85 mph		
MRI 100-Year	83 mph	MRI 100-Year	91 mph		
Risk Category I	92 mph	Risk Category I	100 mph		
Risk Category II	97 mph	Risk Category II	110 mph		
Risk Category III	104 mph	Risk Category III-IV	115 mph		
Risk Category IV	108 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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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)

$S_{MS} = F_a \cdot S_s$	1.4180	Eq. 11.4-1
$S_{M1} = F_v \cdot S_1$	0.8923	Eq. 11.4-2
$S_{DS} = (2/3) \cdot S_{MS}$	0.9453 g	Eq. 11.4-3
$S_{D1} = (2/3) \cdot S_{M1}$	0.5949 g	Eq. 11.4-4
Period $T_a = C_t \cdot h_n{}^x$	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
Ω_o	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)

C_s	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	Area	Wt.	Wt.	Wall allow	Wall Wt.	Total Wt.	WxHx	Cvx	(LRFD) V
	(ft)	(ft2)	(psf)	(k)	(psf)	(k)	(k)	(k-ft)	(%)	(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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UPPER ROOF

WIND

② ③ ④

$W = (18/2), 3B = 190$

760   8'   2660   20'   1900

TREE #35

TREE #31

X
TREE #33
[DISEASED]

2945   11'   1601   Ⓐ

TREE #34

$W = 190$

TREE #21
[DISEASED]
X

31'   8.1   14'   31' $W = 4750/46' = 103.3$

4370   7.9'   2375   Ⓒ

BUILDING ABOVE

8'   10.5'

DEGRADAME

15'   15'

1425   7.6'   5.2'   7.6'   774   Ⓓ

$W = 4750/28' = 170$

675   8'   2375   20'   1700

SEISMIC
$V_x = 4,750$

2nd FLOOR

WIND

① +760 ③ +2660 ④

$W = (11\frac{1}{2}) 35.1 = 193$ $W = 190 + (11\frac{1}{2}) 35.1 = 383$

6'   18.1'   8' 2.2'   17.8'

4361   7587   3390
+481   +2939

STRAPS
$T \leq [1947 + 4804 (39.25'/54.1) 1.2] 1.25 (0.7)$
$\leq 5363^{\#}$ use HD4S @ grid C

8'   35.1   8'
4877   4148   Ⓐ

24'   383   24'

$W = 11170/54.1' = 206.5$

8.9'

12.5'

3.9'

5937   3201   Ⓑ
7'   7'   Ⓒ
4213   2272
                8.3'   8.3'
15'   15'
                3.25'   9.9'
2873   10.5'   11.6'   1549   Ⓓ

TREE #34
TREE #21 [DISEASED]
TREE #33 [DISEASED]
DECK

+675   +2375

$W = 11170/52' = 214.8$

6'   18.1'   8' 2.2'   17.8'

4465   4804   1901
+428   +2622

SEISMIC
$V_R = 11,170$

$V = (2622 + 2892 (1.2)) 1.25/15' = 506$ plf

Block w/ed @ 4" o.c.

10/13/21 NOTE: GRID Ⓐ & Ⓑ MOVED
REACTIONS UPDATED. DIAPH. ANALYSIS
CONSERVATIVE FROM PREV. DIM.

② ③ ④

+4842   +10,526

$W = \left(\frac{10.75}{2}\right) 35.1 = 189$ $W = \left(9.6\frac{1}{2}\right) 32.6 + \left(\frac{10.75}{2}\right) 35.1 = 346$

11249   2613
+14635   +733

$V_{max} = 16360/22' = 745 \,plf \leq 1104 \,plf$

USE BLOCKED DIAPH.
w/ 8d @ 2.5" o.c.

$V_{max} = 9392/22' = 427 \,plf$

X TREE #3
(DISEASED)

7.6'   32.8
+7822   BUILDING ABOVE
3808 $W = 18.4$ 4.4'   5'   18.1'   7.6'   4' $W = 2660/53.1' = 49.6$
+9685 $W = 34.6$ TREE #34   5.4'   1191   +5744 Ⓐ
16.8'   +7118
$V_{max} \leq 9722/20'$ TREE   4.75' $V = 6(670-2.53) + 32.6(1.2)$ 16.8'
[DISEASED]   1.5'   +5744(1.2))1.25/20'   431   Ⓑ
4514   X $V = 6390/20' = 316 \leq 376$ no blocking req'd   +1168   +325
+2842   18.1'   Ⓒ
$= 461 \,plf \leq 562$ FLOOR ABOVE $= 579 \,plf \leq 789$ 635   14.6'
4360   +5937   USE BLOCKED DIAPH.   +665
+1232   14.6'   w/ 8d @ 2.5" o.c. $1.25/20' = 276$ BLOCK 2-BAYS w/ 8d @ 2.5"o.c.
2526   10.2'   BUILDING ABOVE   11.75'   362   Ⓓ
block w/ 8d@6" o.c.   26

6'   18.1'   8'   2.2'   17.6'   SEISMIC
+4673 $W = 2660/52.1' = 51$ +7426 $V_x = 2660$
2466   135
+12,796   −477

$V_{max} = \left(1221(2.53) + 7903(1.2)\right)\frac{1.25}{22'} = 714 \,plf \leq 789 \,plf$

USE BLOCKED DIAPH.
w/ 8d @ 2.5" o.c.

$V_{max} = \left(1228(2.53) + 4693(1.2)\right)\frac{1.25}{22'} = 510 \,plf \leq 789$

J Welch Engineering LLC

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) =	12	P_X = Point Load From Header (DL)		Basic Load Combinations Per ASCE 7-16 (Basic Combinations for ASD)
Roof DL (psf) =	15	E = Earthquake		Base Shear Comparison Shown Below Shearwall Groups
S_{DS} =	0.94	W = Wind		* 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 GRID	E V	UNFACTORED V_{above}	V_{total} (K)	SW MARK	L (ft)	h (ft)	V/ΣL (klf)	Aspect Ratio	ρ	v(max)* ASD(klf)	SW above	O.T. MAX.(k)	DL Trib. wall	Length(ft) floor	roof	DL max (k)	P_{left} (k)	P_{right} (k)	T_L (k)	T_R (k)	Holdown L/R	C_{LL}(k) <=	C1 (k)	C2 (k)	MIN. POST 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	0.2	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. GRID	E V	UNFACTORED V_{above}	V_{total} (K)	SW MARK	L (ft)	h (ft)	V/ΣL (klf)	Aspect Ratio	ρ	v(max)* ASD(klf)	SW above	O.T. MAX.(k)	DL Trib. wall	Length(ft) floor	roof	DL max (k)	P_{left} (k)	P_{right} (k)	T_L (k)	T_R (k)	Holdown L/R	C_{LL}(k) <=	C1 (k)	C2 (k)	MIN. POST 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. GRID	E V	UNFACTORED V_{above}	V_{total} (K)	SW MARK	L (ft)	h (ft)	V/ΣL (klf)	Aspect Ratio	ρ	v(max)* ASD(klf)	SW above	O.T. MAX.(k)	DL Trib. wall	Length(ft) floor	roof	DL max (k)	P_{left} (k)	P_{right} (k)	T_L (k)	T_R (k)	Holdown L/R	C_{LL}(k) <=	C1 (k)	C2 (k)	MIN. POST 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

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

GRID	V	V_{above}	V_{total} (K)	SW MARK	L (ft)	h (ft)	V/ΣL (klf)	Aspect Ratio	ρ	v(max) ASD(klf)	SW above	O.T. MAX.(k)	wall	floor	roof	DL max (k)	P_{left} (k)	P_{right} (k)	T_L (k)	T_R (k)	Holdown L/R	C_{LL} (k) <=	C1 (k)	C2 (k)	MIN. POST 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	0.2	-0.22	-0.12	CS22 CS22	0.28	0.83	0.66	(2)2x6 (2)2x6
TOTAL	8.74	0.00	8.74																						

2ND FLR. — ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

GRID	V	V_{above}	V_{total} (K)	SW MARK	L (ft)	h (ft)	V/ΣL (klf)	Aspect Ratio	ρ	v(max) ASD(klf)	SW above	O.T. MAX.(k)	wall	floor	roof	DL max (k)	P_{left} (k)	P_{right} (k)	T_L (k)	T_R (k)	Holdown L/R	C_{LL} (k) <=	C1 (k)	C2 (k)	MIN. POST 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																						

1ST FLR. — ASD LOADS (0.7 E & 0.6 W) USED FOR ANALYSIS

GRID	V	V_{above}	V_{total} (K)	SW MARK	L (ft)	h (ft)	V/ΣL (klf)	Aspect Ratio	ρ	v(max) ASD(klf)	SW above	O.T. MAX.(k)	wall	floor	roof	DL max (k)	P_{left} (k)	P_{right} (k)	T_L (k)	T_R (k)	Holdown L/R	C_{LL} (k) <=	C1 (k)	C2 (k)	MIN. POST 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   NOTES:
E = Earthquake
Cd = 4
I = 1

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	Vabove	Vtotal (K)	MARK	(ft)	(ft)	(klf)		L/R		L/R		area (si)	x10^6	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	Vabove	Vtotal (K)	MARK	(ft)	(ft)	(klf)		L/R		L/R		area (si)	x10^6	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	Vabove	Vtotal (K)	MARK	(ft)	(ft)	(klf)		L/R		L/R		area (si)	x10^6	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

Drift Check	E V	UNFACTORED V_above	V_total (K)	SW MARK	W (ft)	L or H (ft)	V/ΣL (klf)	Aspect Ratio	SW OR DIAPHRAGM	CHORD ANCHOR L/R		CHORD L/R		column area (si)	E x 10^6	Ga k/in	Chord Splice Δc	NDS Eq. 4.2-3 δ	drift δ Cd /I	Δa .025h	drift 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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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:

It is the Designer's responsibility to verify product suitability under applicable building codes. In order to verify code listed applications please refer to the appropriate product code reports at www.strongtie.com or contact Simpson Strong-Tie Company Inc. at 1-800-999-5099.

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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
* Seismic R=6.5
* 2500 psi concrete

Anchor Solution Details:

Stemwall Extension Installation

Stemwall Installation

Stemwall Section View

Perspective View
(Slab not shown for clarity)

Footing Plan

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

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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).

Disclaimer:

It is the Designer's responsibility to verify product suitability under applicable building codes. In order to verify code listed applications please refer to the appropriate product code reports at www.strongtie.com or contact Simpson Strong-Tie Company Inc. at 1-800-999-5099.
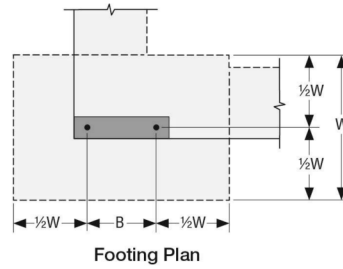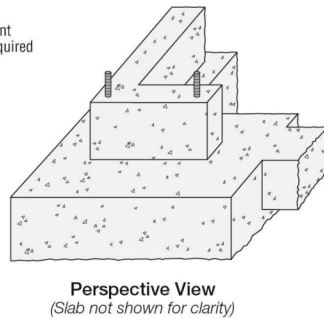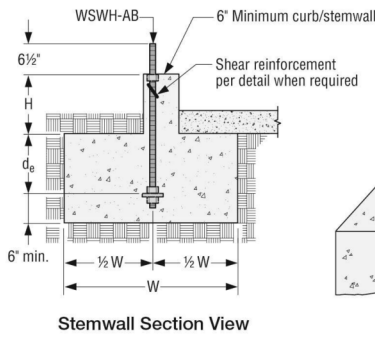
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Job Name: MERCER GROVE

Wall Name: 4

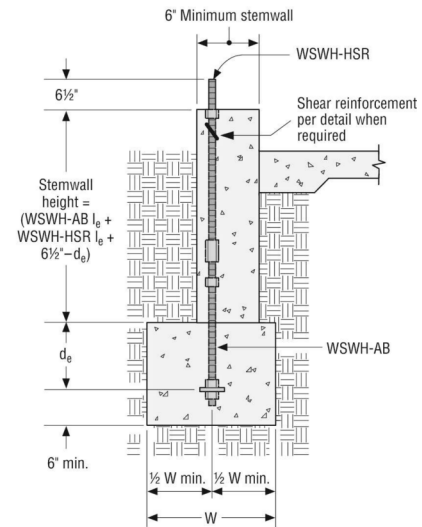**Application:** 1st Story Wood Floor Systems

Design Criteria:

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

Anchor Solution Details:

Stemwall Extension Installation

Stemwall Installation

Stemwall Section View

Perspective View
(Slab not shown for clarity)

Footing Plan

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	9.50 feet	(height to highest level)

$S_{MS} = F_a*S_s$	1.4180	Eq. 11.4-1
$S_{M1} = F_v*S_1$	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 $T_a = C_t*h_n{}^x$	0.1082 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	0.0866 g	per section 11.4.6

R	6.5	Table 12.2-1
Ω_o	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	9,709 lb	per table below
V	1,412 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)
roof	9.50	696	12	8.4	45.6	1.4	9.7	92.2	100.0	1.41
							9.7	92.2	100.0	1.4

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WIND

$W = (1 + (8.5'/2)) 32.8 = 172.2$

② ①

32.8

18.7'   4.5'

1610   1758

⑤ ⑥

F.O. FRAMING & CONCRETE   F.O. FRAMING & CONCRETE

3" PIPE STD   3" PIPE STD   3" PIPE STD   3" PIPE STD

W6x18

4.6'

499   714

CANT. COLUMN

Ⓐ

2 / S3.7

4x8 DF #2 OR BETTER @ 16 oc

21.2'

D

8 / S3.7

5 / S3.7

$W = 1401/29.0' = 47$

32.8

693   593   Ⓑ

172.2   SWX   W6x18   SWX   41

9 / S3.7

345   SWX   94   Ⓒ

8 / S3.7

F.O. FRAMING & CONCRETE   F.O. FRAMING & CONCRETE

⑤ ⑥
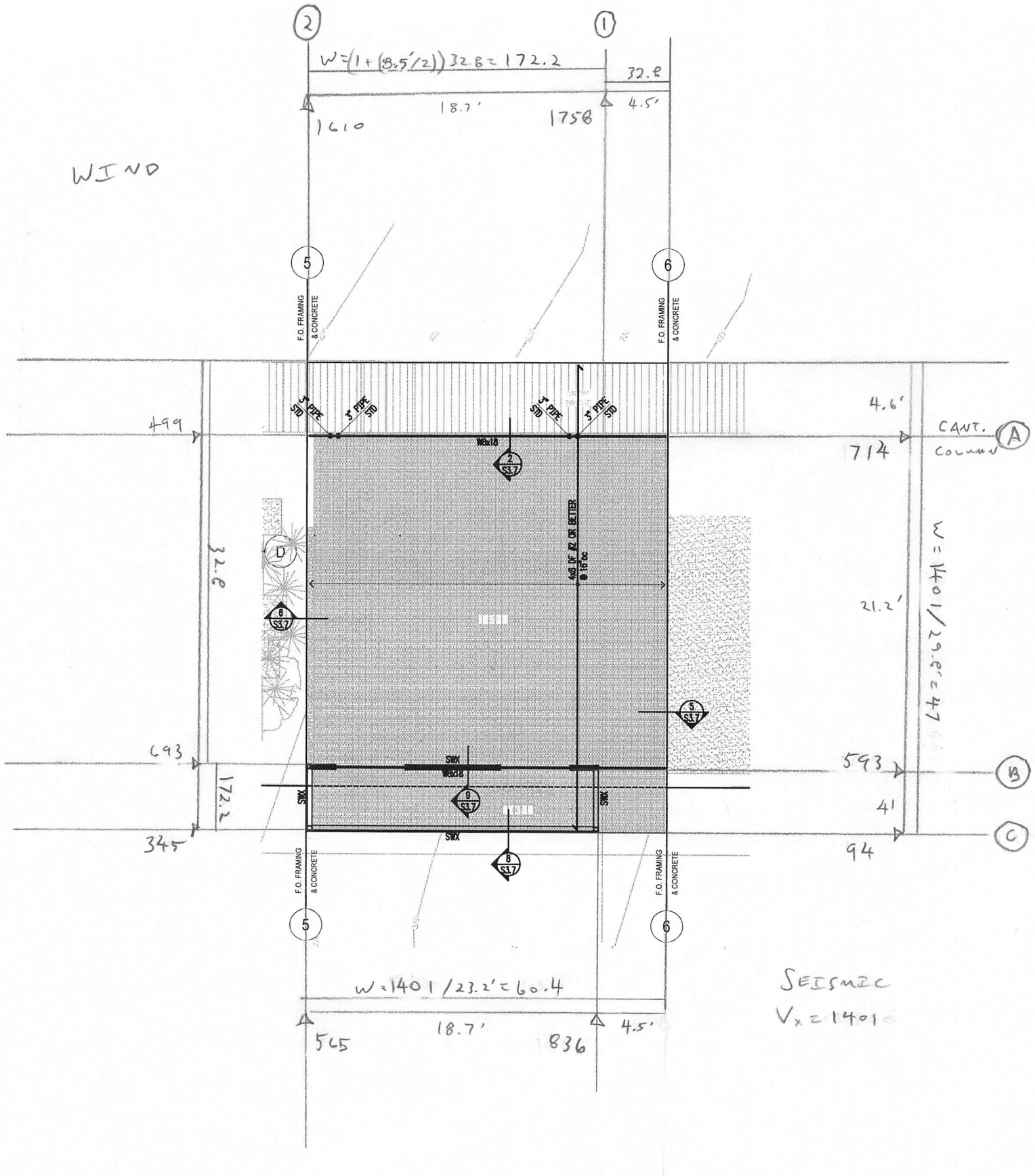
$W = 1401/23.2' = 60.4$

SEISMIC

$V_x = 1401$

18.7'   4.5'

505   836

Lateral Force Distribution & Plywood Shearwall Design

WIND

Wall DL (psf) =	10
floor DL (psf) =	0
Roof DL (psf) =	0
S_{DS} =	0.95

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

CARPORT

ROOF GRID	W V	UNFACTORED V_{above}	$V_{total (K)}$	SW MARK	L (ft)	h (ft)	V/ΣL (klf)	Aspect Ratio	ρ	v(max)* ASD(klf)	SW	O.T. above	O.T. MAX.(k)	DL Trib. Length(ft) wall	floor	roof	DL max (k)	P_{left} (k)	P_{right} (k)	T_L (k)	T_R (k)	Holdown L/R	C_{LL} (k) < =	C1 (k)	C2 (k)	MIN. POST L/R
1	1.61	0.00	1.61	A	4.0	8.5	0.4	2.13		0.242	SW1	0.0	2.05	9	0	1	0.17	0.0	0.0	1.95	1.95	HDU2 HSS	0.00	2.14	2.14	(2)2x4 (2)2x4
2	1.76	0.00	1.76	A	4.0	8.5	0.4	2.13		0.264	SW1	0.0	2.24	9	0	1	0.17	0.0	0.0	2.14	2.14	HDU2 HSS	0.00	2.33	2.33	(2)2x4 (2)2x4
TOTAL	3.37	0.00	3.37	1																						
A	0.50	0.00	0.50	1	CANTILEVER COLUMNS																					
B	0.69	0.00	0.69	1	6.0	8.5	0.1	1.42		0.069	SW1	0.0	0.59	9	0	0	0.26	0.0	0.0	0.44	0.44	HDU2 HDU2	0.00	0.67	0.67	(2)2x4 (2)2x4
C	0.35	0.00	0.35	1	18.7	8.5	0.0	0.45		0.011	SW1	0.0	0.09	9	0	2	0.79	0.0	0.0	-0.38	-0.38	NONE NONE	0.00	0.18	0.18	(2)2x4 (2)2x4
TOTAL	1.19	0.00	1.19																							

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

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Lateral Force Distribution & Plywood Shearwall Design   **WIND**

Wall DL (psf) =	10	SWx = Shearwall per 8/S3.1	Notes:
floor DL (psf) =	0	P_X = Point Load From Header (DL)	
Roof DL (psf) =	0	E = Earthquake	
S_{DS} =	0.95	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

CARPORT

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

ROOF GRID	W / V	UNFACTORED V_{above}	UNFACTORED $V_{total (K)}$	SW MARK	L (ft)	h (ft)	V/ΣL (klf)	Aspect Ratio	ρ	v(max)* ASD(klf)	SW	O.T. above	O.T. MAX.(k)	DL Trib. Length(ft) wall	floor	roof	DL max (k)	P_{left} (k)	P_{right} (k)	T_L (k)	T_R (k)	Holdown L/R	C_{LL} (k) < =	C1 (k)	C2 (k)	MIN. POST L/R
1	1.61	0.00	1.61	A	4.0	8.5	0.4	2.13		0.242	SW1	0.0	2.05	9	0	1	0.17	0.0	0.0	1.95	1.95	HDU2 HSS	0.00	2.14	2.14	(2)2x4 (2)2x4
2	1.76	0.00	1.76	A	4.0	8.5	0.4	2.13		0.264	SW1	0.0	2.24	9	0	1	0.17	0.0	0.0	2.14	2.14	HDU2 HSS	0.00	2.33	2.33	(2)2x4 (2)2x4
TOTAL	3.37	0.00	3.37																							
A	0.50	0.00	0.50	1	CANTILEVER COLUMNS																					
B	0.69	0.00	0.69	1	6.0	8.5	0.1	1.42		0.069	SW1	0.0	0.59	9	0	0	0.26	0.0	0.0	0.44	0.44	HDU2 HDU2	0.00	0.67	0.67	(2)2x4 (2)2x4
C	0.35	0.00	0.35	1	18.7	8.5	0.0	0.45		0.011	SW1	0.0	0.09	9	0	2	0.79	0.0	0.0	-0.38	-0.38	NONE NONE	0.00	0.18	0.18	(2)2x4 (2)2x4
TOTAL	1.19	0.00	1.19																							

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Seattle, Washington 98118-9998
tel. 206 356 9553

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$P_y \leq [2891 \, DLL + 6886 \, SL] / 2 \, columns$

CANT COLUMN

C12 & C14

$P_x \leq \dfrac{714^\#}{4} (65/1.25) = 928^\#/column \quad E$

8.5'

$P_y \leq (3194 \, DL + 8444 \, LL + 741 \, SL)/2 \, columns$

H. BRACE $E_x = 2900$ CHECK DRIFT
TO CONC
WALL   4'

$\Delta_a = 0.025 \, (9.8) \, 12 = 2.94''$

$\delta_x = 1.25 \, (2.3'') = 2.88 \leq \Delta_a \quad OK$

DL 3194
LL 4222
SL 3866
$E_x = 1972$

COLUMN $P \leq 9260$ $Pn/\Omega = 84.4 \, k$ 11% STRESSED OK

$V \leq 1972$ $Vn/\Omega = 26,774$

$M \leq 7888$ $Mn/\Omega = 9734$

$\Delta_x = 2.3'' \quad E$ USE 4" X-STRONG

H. BRACE $T \leq 2900 \, (1.25) \times 4 \times 0.7 \div \cos 21° = 10.9/k$

$A_{reqd} = 10.9 \, (1.67/36) = 0.5$

USE 5/8" Ø TIE ROD
A36 or BETTER

SLIDING $R_x \leq 1972 \, (2) \, 0.7 = 2761$

$Passive = (233 + (467/2))(16/12) \, 3.5 = 2177$

$Friction = 0.35 \, (2450 + 3907) \, 0.6 = 1335$

TOTAL RESISTANCE = 3512 > R_x OK

USE 3.5' SQ × 16" DP FOOTING

CARPORT WALL SLEDGING: $P_x \le 10.9$ K, $\cos 21° = 10.18$ K

$$\text{friction} = 0.35 (1200 + 230) 0.6 (10')$$
$$= 3003$$

$$\text{PASSIVE} = 700 (14') = 9800$$

$$\text{TOTAL} = 12800 \ge P_x \quad \text{OK}$$

CARPORT JOIST TO WALL? $V_u \le 10.9$ K $/0.7 \times 1.25 = 19.5$ K

(4) $\tfrac{3}{4}'' \phi$ BOLTS $\phi r_n = (4) 7.95^K = 31.8$ OK

H BRACE TO WF BEAM: $P_x = 10.18$ K

$\tfrac{3}{16}''$ fillet $\ell_{req'd} = 10.18 / 2.784 = 3.7''$

USE $6'' \times 3'' \times \tfrac{3}{8}''$ SHEAR TAB

W/ $\tfrac{3}{16}''$ FILLET ALL AROUND

CARPORT SW ② TO HSS: $T \le 1950$

$\tfrac{5}{8}'' \phi \quad Z'_n = 650 (1.6) = 1040$

REQ'D = (2) $\tfrac{5}{8}'' \phi$ B=LT

CARPORT B21 TO C26: $P_y \le 1697$ DL + 4222 LL + 370.5 SL

≤ 5919 DLTLL

$M_y \le 35,514$ in-lbs $\le M_n/\Omega = 42,815$ in-lbr

$P_x \le 2900 (0.7) 1.25 = 2538$

$M_x \le 15,228$ in-lbs $\le M_n/\Omega = 273$ k-in

USE $\tfrac{1}{4}''$ STIFFENER R BETWEEN COLUMN SHEAR TABS.

Company:		Date:	9/8/2022
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Project:			
Address:			
Phone:			
E-mail:			

SIMPSON Strong-Tie

Anchor Designer™ Software
Version 3.1.2209.3

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 318-19
Units: Imperial units

Anchor Information:
Anchor type: Cast-in-place
Material: F1554 Grade 36
Diameter (inch): 0.750
Effective Embedment depth, h_{ef} (inch): 8.000
Anchor category: -
Anchor ductility: Yes
h_{min} (inch): 9.50
C_{min} (inch): 0.88
S_{min} (inch): 3.00

Base Material
Concrete: Normal-weight
Concrete thickness, h (inch): 48.00
State: Cracked
Compressive strength, f'$_c$ (psi): 2500
$\Psi_{c,V}$: 1.0
Reinforcement condition: Supplementary reinforcement not present
Supplemental edge reinforcement: Not applicable
Reinforcement provided at corners: Yes
Ignore concrete breakout in tension: No
Ignore concrete breakout in shear: Yes
Ignore 6do requirement: Yes
Build-up grout pad: Yes

Base Plate
Length x Width x Thickness (inch): 4.00 x 28.00 x 0.50

Recommended Anchor
Anchor Name: J- or L-Bolt - 3/4"Ø J- or L-Bolt, F1554 Gr. 36

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Project:			
Address:			
Phone:			
E-mail:			

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Load and Geometry
Load factor source: ACI 318 Section 5.3
Load combination: not set
Seismic design: Yes
Anchors subjected to sustained tension: Not applicable
Ductility section for tension: 17.10.5.2 not applicable
Ductility section for shear: 17.10.6.3 (c) is satisfied
Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

Strength level loads:

N_{ua} [lb]: 0
V_{uax} [lb]: 0
V_{uay} [lb]: 19500
M_{ux} [ft-lb]: 0
M_{uy} [ft-lb]: 0
M_{uz} [ft-lb]: 0
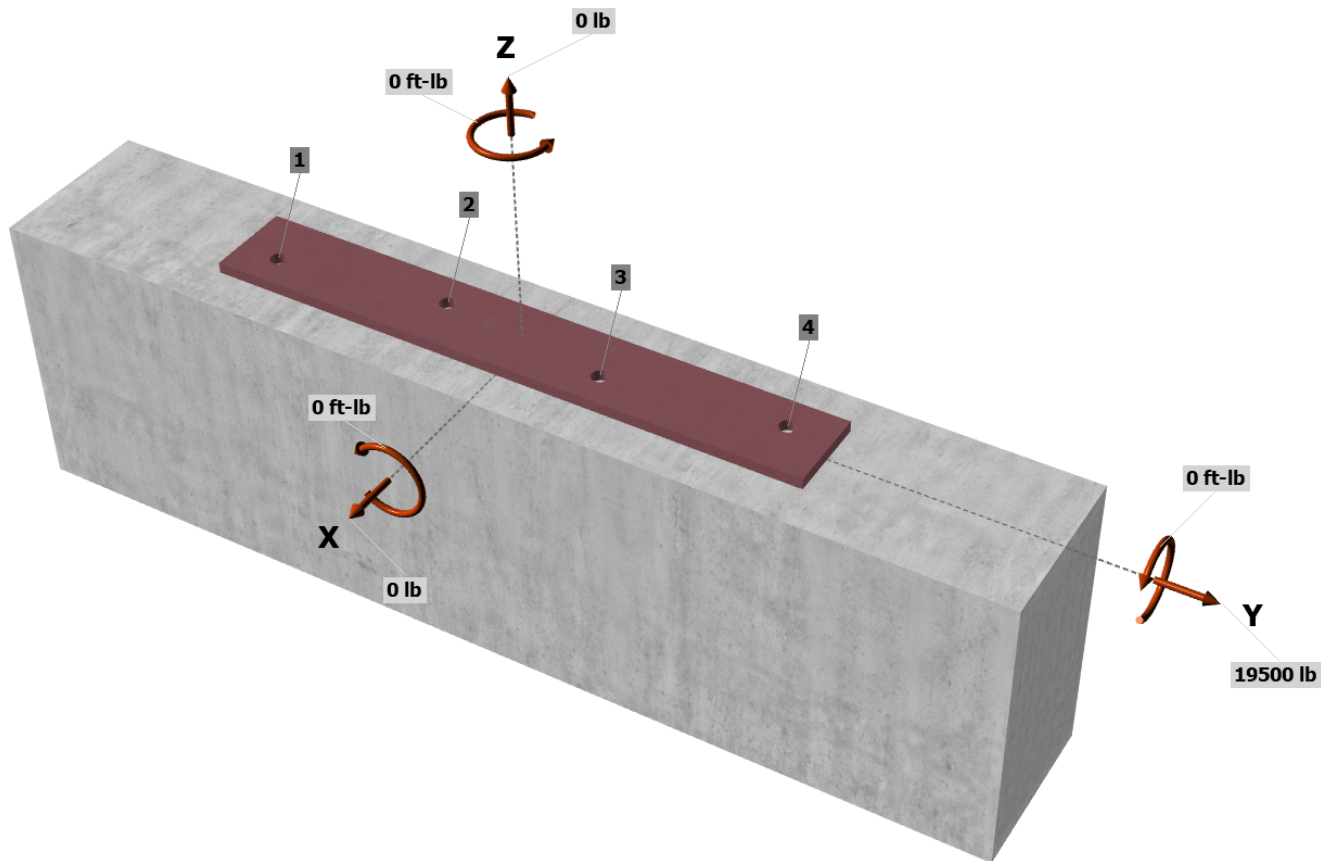
<Figure 1>

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.
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<Figure 2>

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.
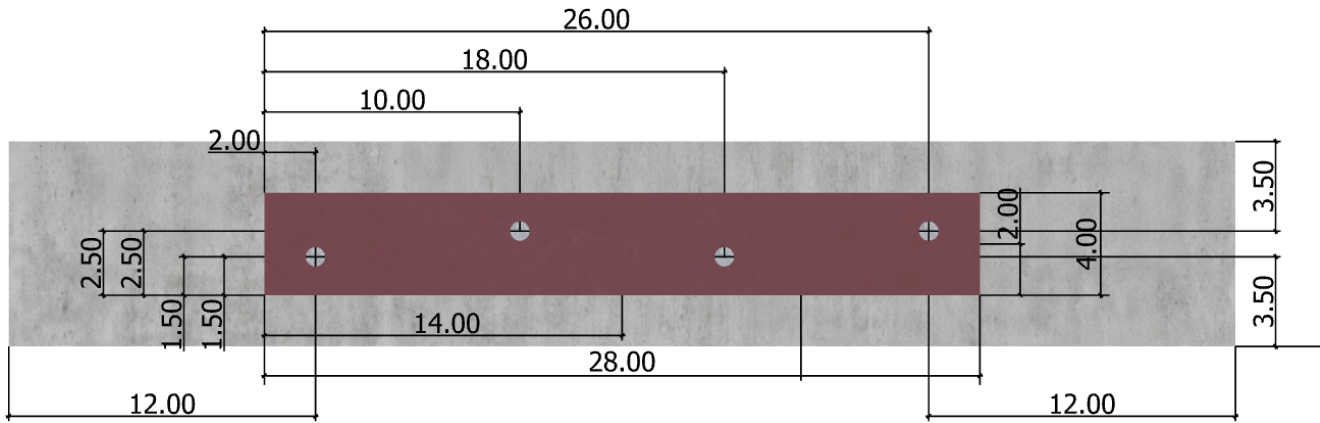
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3. Resulting Anchor Forces

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	4875.0	4875.0
2	0.0	0.0	4875.0	4875.0
3	0.0	0.0	4875.0	4875.0
4	0.0	0.0	4875.0	4875.0
Sum	0.0	0.0	19500.0	19500.0

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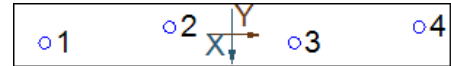Resultant compression force (lb): 0
Eccentricity of resultant tension forces in x-axis, e'_{Nx} (inch): 0.00
Eccentricity of resultant tension forces in y-axis, e'_{Ny} (inch): 0.00
Eccentricity of resultant shear forces in x-axis, e'_{Vx} (inch): 0.00
Eccentricity of resultant shear forces in y-axis,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

<Figure 3>

8. Steel Strength of Anchor in Shear (Sec. 17.7.1)

V_{sa} (lb)	ϕ_{grout}	ϕ	$\phi_{grout}\phi V_{sa}$ (lb)
11625	0.8	0.65	6045

10. Concrete Pryout Strength of Anchor in Shear (Sec. 17.7.3)

$\phi V_{cpg} = \phi k_{cp} N_{cbg} = \phi k_{cp}(A_{Nc} / A_{Nco}) \Psi_{ec,N} \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b$ (Sec. 17.5.1.2 & Eq. 17.7.3.1b)

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	384.00	576.00	1.000	0.788	1.000	1.000	27153	0.70	19957

11. Results

Interaction of Tensile and Shear Forces (Sec. 17.8)

Shear	Factored Load, V_{ua} (lb)	Design Strength, ϕV_n (lb)	Ratio	Status
Steel	4875	6045	0.81	Pass
Pryout	**19500**	**19957**	**0.98**	**Pass (Governs)**

3/4"Ø J- or L-Bolt, F1554 Gr. 36 with hef = 8.000 inch meets the selected design criteria.

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.
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		Phone:			
		E-mail:			

12. Warnings

- For irregular anchor patterns, the designer must consider sizing of base plate holes to ensure shear loads are distributed to anchors as designed.

- Minimum spacing and edge distance requirement of 6da per ACI 318 Table 17.9.2(a) for torqued cast-in-place anchor is waived per designer option.\n
- Concrete breakout strength in shear has not been evaluated against applied shear load(s) per designer option. Refer to ACI 318 Section 17.5.2.1 for conditions where calculations of the concrete breakout strength may not be required.

- Per designer input, the tensile component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor tensile force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.10.5.2 for tension need not be satisfied – designer to verify.

- Per designer input, ductility requirements for shear have been determined to be satisfied – designer to verify.

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

Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.

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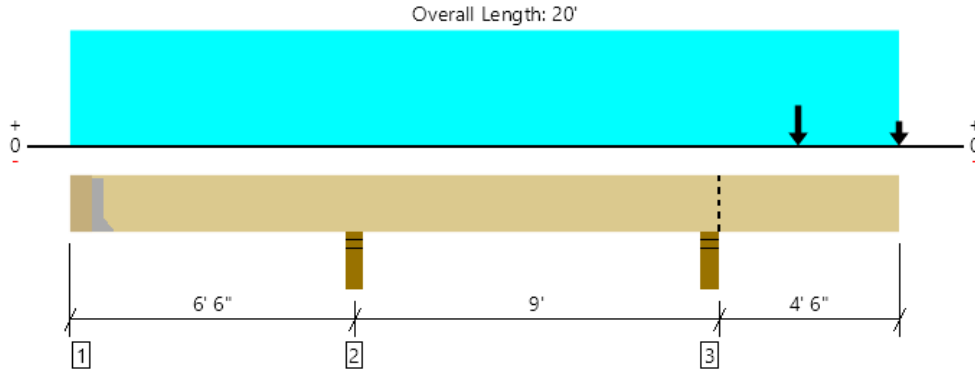
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UPPER FLOOR, Copy of B35 FOR OT
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 20'

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

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

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)

- 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"	Hanger¹	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

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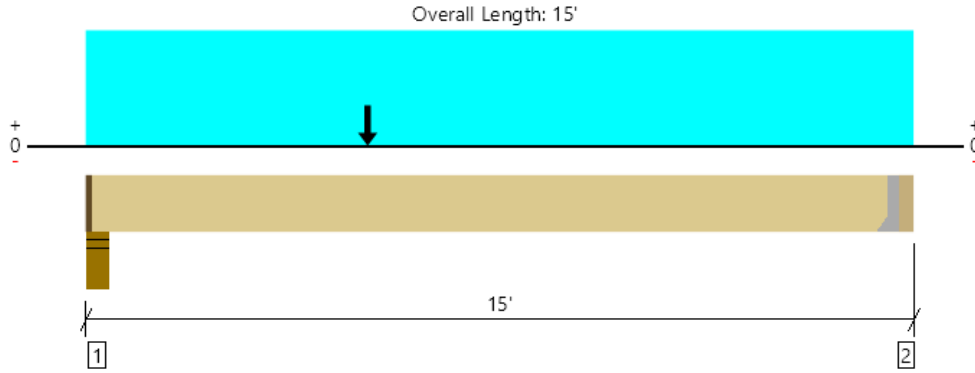(206) 356-9553
joshtwelch@gmail.com

Job Notes

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ForteWEB Software Operator	Job Notes
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FORTE WEB

UPPER FLOOR, Copy of B21 FOR OT
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL

Overall Length: 15'

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

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

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)

- 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"	Hanger¹	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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FORTE WEB

UPPER FLOOR, Copy of B22C for ot
1 piece(s) 1 3/4" x 11 7/8" 1.55E TimberStrand® LSL
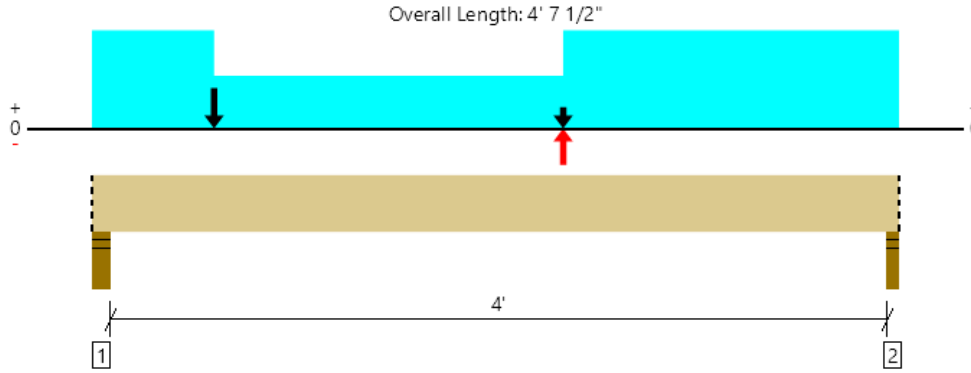
Overall Length: 4' 7 1/2"

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)	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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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

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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
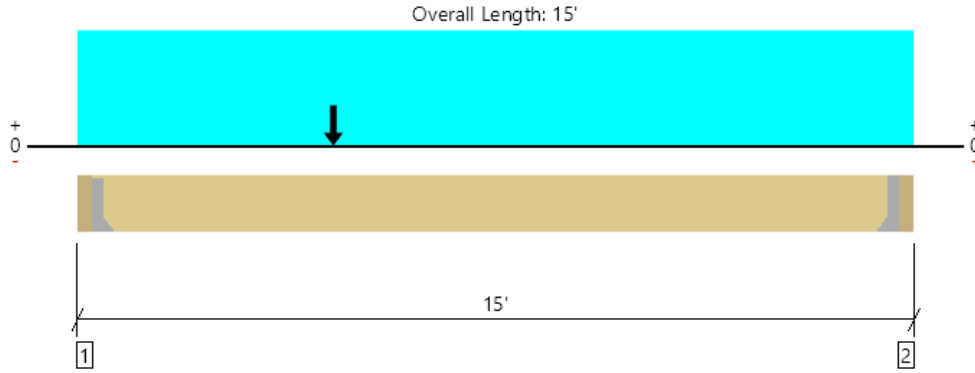
Overall Length: 15'

15'

1   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)	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"	Hanger¹	1.50"	1039	300	225	433	982/-982	2979/-982	See note ¹
2 - Hanger on 11 7/8" HF beam	3.50"	Hanger¹	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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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
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ForteWEB Software Operator	Job Notes
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MEMBER REPORT

UPPER FLOOR, Copy of B22B FOR OT
1 piece(s) 3 1/2" x 11 7/8" 1.55E TimberStrand® LSL
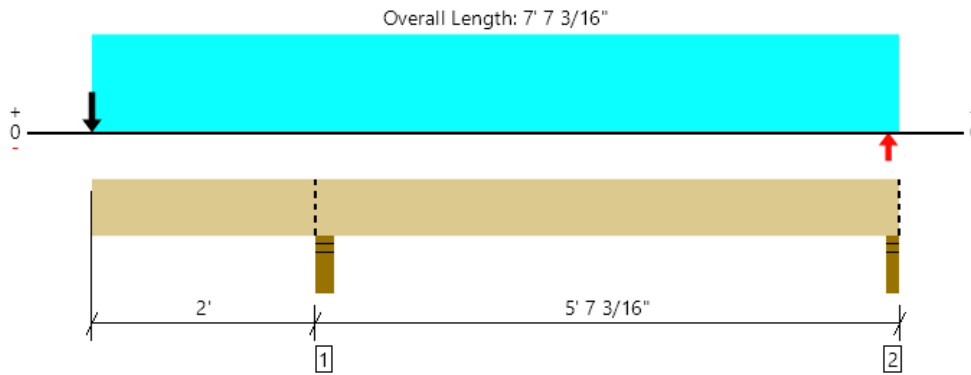
Overall Length: 7' 7 3/16"

2' | 5' 7 3/16"

|1| |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)	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

Weyerhaeuser Notes

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

ForteWEB Software Operator	Job Notes
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UPPER FLOOR, Copy of B30 FOR OT
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL
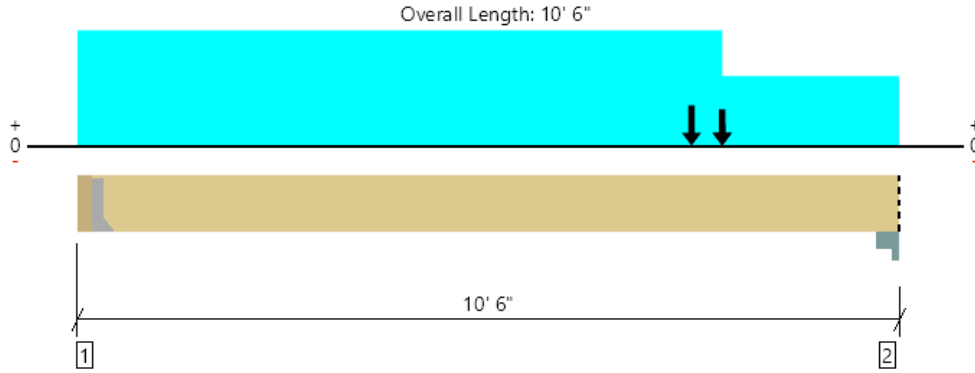
Overall Length: 10' 6"

10' 6"

1   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)	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"	Hanger¹	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

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ForteWEB v3.2, Engine: V8.2.0.17, Data: V8.1.0.16
File Name: mercer grove

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

Weyerhaeuser

MAIN FLOOR, Copy of B40 FOR OT
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL
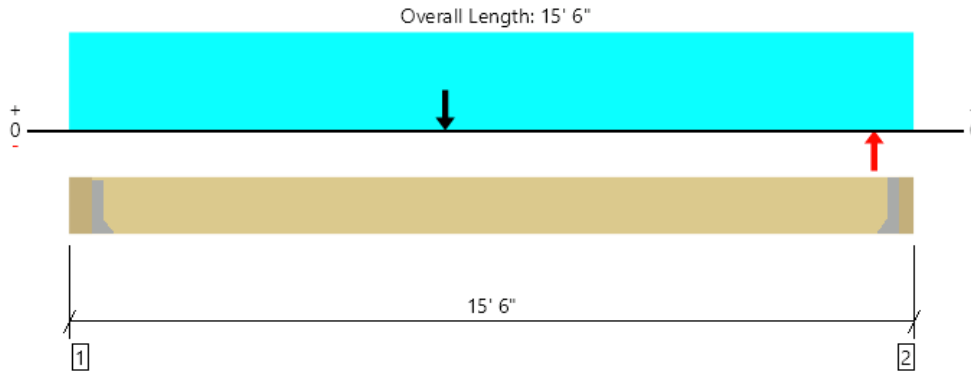
Overall Length: 15' 6"

15' 6"

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)

OKAY E INCLUDES OVERSTRENGTH FACTOR

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

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

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"	Hanger¹	2.10"	1436	313	235	7903/-7903	9887/-7903	See note ¹
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger¹	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

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ForteWEB Software Operator	Job Notes
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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
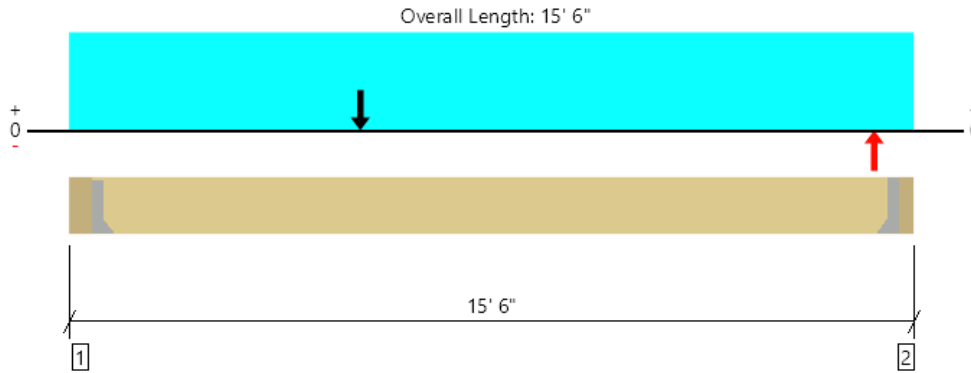
Overall Length: 15' 6"

15' 6"

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"	Hanger¹	2.79"	770	418	12022/-12022	13210/-12022	See note ¹
2 - Hanger on 11 7/8" DF beam	3.50"	Hanger¹	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

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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

MAIN FLOOR, Copy of B53 FOR OT
1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL
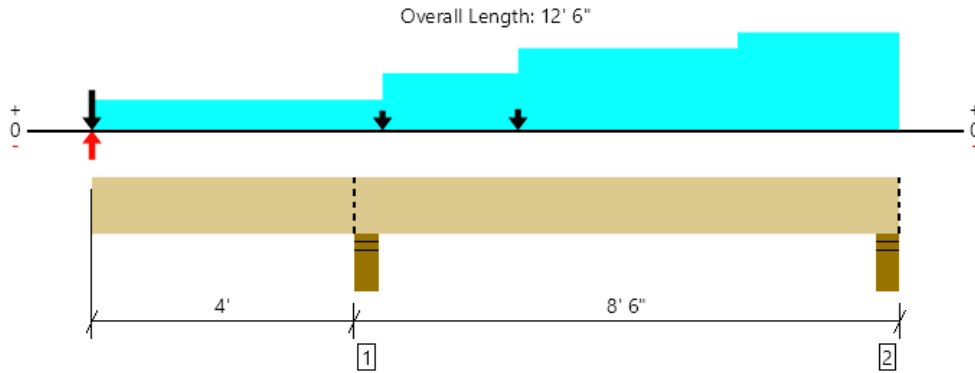
Overall Length: 12' 6"

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

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

MAIN FLOOR, COPY OF B56 FOR OT
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL
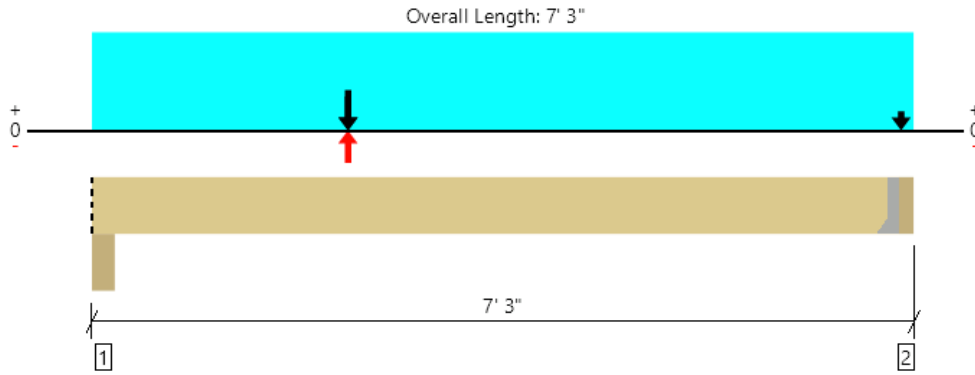
Overall Length: 7' 3"

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"	Hanger¹	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

FORTE WEB

MAIN FLOOR, Copy of B45 FOR OT
1 piece(s) 5 1/4" x 11 7/8" 2.0E Parallam® PSL
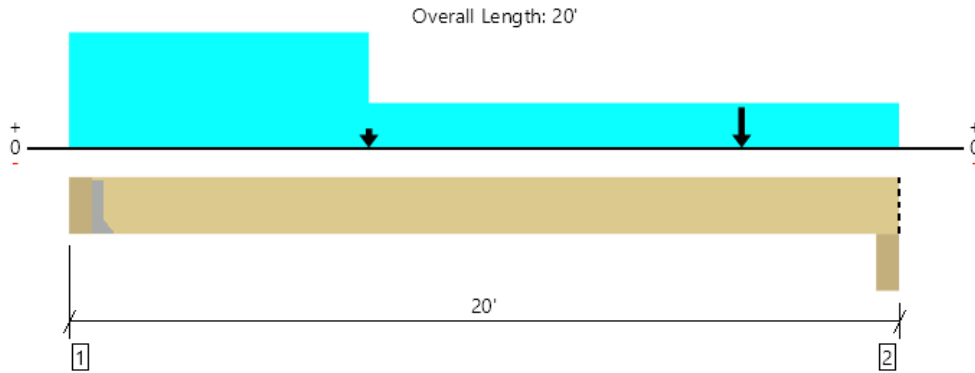
Overall Length: 20'

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

OKAY E INCLUDES OVERSTRENGTH FACTOR

• 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	Seismic	Total	
1 - Hanger on 11 7/8" DF beam	5.50"	Hanger¹	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

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MAIN FLOOR, Copy of B52 FOR OT
1 piece(s) 7" x 11 7/8" 2.0E Parallam® PSL
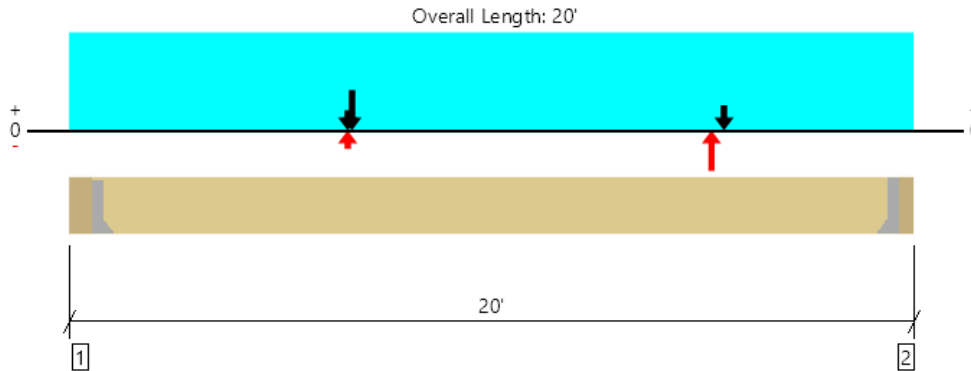
Overall Length: 20'

20'

1   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)	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"	Hanger¹	1.62"	2365	1575	-174	6800/-6800	10740/-6974	See note ¹
2 - Hanger on 11 7/8" PSL beam	3.50"	Hanger¹	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.

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| 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

ForteWEB Software Operator	Job Notes
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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

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SECTION 4: FOUNDATION

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Seattle, Washington 98118-9998
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6/2/2021
Page _____ of _____

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J Welch Engineering LLC

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)

MARK	POINT LOADS (LBS)				Max. Tributary Areas (Ft.)						Min. Footing Dimensions					Total Load (lbs)				BEARING (Ksf)					max.
	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	
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**
C25	3651	4496	4268	0	0	0	0	0	0	0	1.68438	11	3.5	42	3.5	5335	4496	4268	0	0.80	0.78	0.97	0.71	0.97	**0.97**
C26	6163	8444	7731	0	0	0	0	0	0	0	1.68438	11	3.5	42	3.5	7847	8444	7731	0	1.33	1.27	1.63	1.16	1.63	**1.63**
C27	1423	3798	1711	0	0	0	0	0	0	0	0.6	12	3	16	3	2023	3798	1711	0	1.46	0.93	1.54	1.22	1.54	**1.54**
C28	5066	5352	5815	0	0	8	0	0	0	0	1.5	12	5	24	5	10566	5352	5815	0	1.59	1.64	1.89	1.46	1.89	**1.89**
C29	3306	2396	5240	0	0	0	0	0	0	0	0.8	12	4	16	4	4106	2396	5240	0	1.22	1.75	1.84	1.11	1.84	**1.84**

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3/21/2023
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J Welch Engineering LLC

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.

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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9/13/2021
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Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : RETAINING WAL

Title   **4 ft wall**
Dsgnr: **jtw**
Description....

Page : 1
Date: 30 MAR 2021

This Wall in File: C:\Users\josh\Dropbox\New Projects\Whidbey Farmhouse\engineering\RETAINING WALLS

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		

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	=	1.66	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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Project Name/Number : RETAINING WAL
Title   **4 ft wall**
Dsgnr: **jtw**
Description....

Page : 2
Date: 30 MAR 2021

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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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Project Name/Number : RETAINING WAL
Title   **4 ft wall**
Dsgnr: **jtw**
Description....

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Date: 30 MAR 2021

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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-#		Item	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	451.3	1.58	714.5		Soil Over HL (ab. water tbl)	173.3	1.83	317.8
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		1.83	317.8
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				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	=		
Total	= 451.3	**O.T.M.** =	714.5		Footing Weight	= 225.0	1.00	225.0
					Key Weight	=		
Resisting/Overturning Ratio		= **1.66**			Vert. Component	=		
Vertical Loads used for Soil Pressure =	941.7 lbs				**Total =**	941.7 lbs	**R.M.=**	1,189.4

* 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.

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Project Name/Number : RETAINING WAL
Title   **4 ft wall**
Dsgnr: **jtw**
Description....

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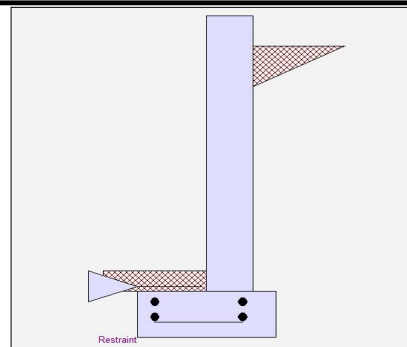**License To : J Welch Engineering LLC**

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

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

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title **4 ft wall**
Dsgnr: **jtw**
Description....

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Cantilevered Retaining Wall   Code: IBC 2018,ACI 318-14,TMS 402-16

8" w/ #4 @ 12"

6"

4'-0"

4'-6"

4"

#4@12.in
@ Toe

Restraint

9"

3"

1'-0"   1'-0"

2'-0"

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Project Name/Number : RETAINING WAL
Title **4 ft wall**
Dsgnr: **jtw**
Description....

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Cantilevered Retaining Wall   Code: IBC 2018,ACI 318-14,TMS 402-16

50.00psf

Restraint

451#

1244.63psf

■ Hydrostatic Force

■ Lateral earth pressure due to the soil BELOW water table

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Project Name/Number : RETAINING WAL
Title   **5 ft wall**   Page : 1
Dsgnr: **jtw**   Date: 19 JAN 2020
Description....

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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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Title   **5 ft wall**
Dsgnr: **jtw**
Description....

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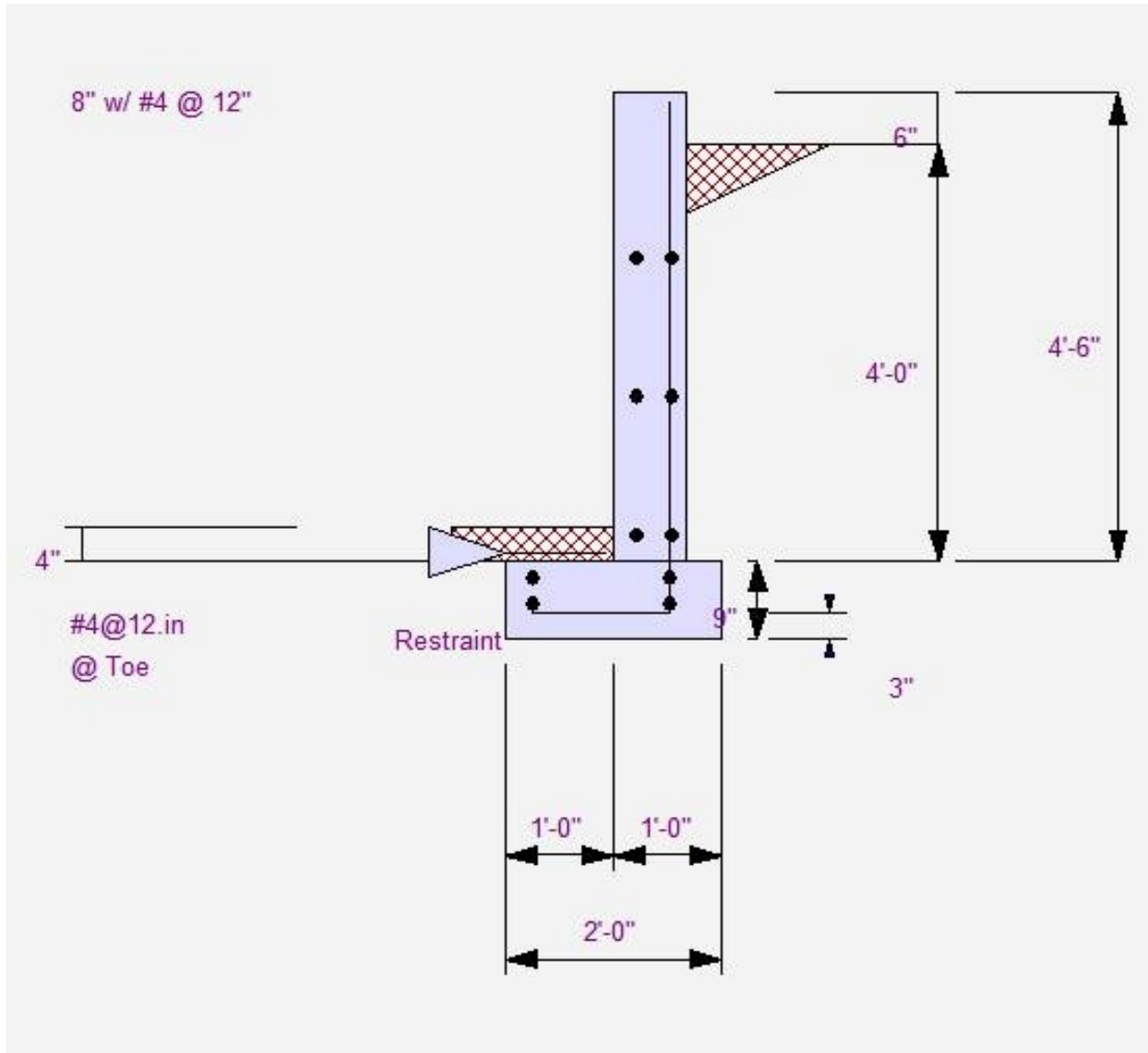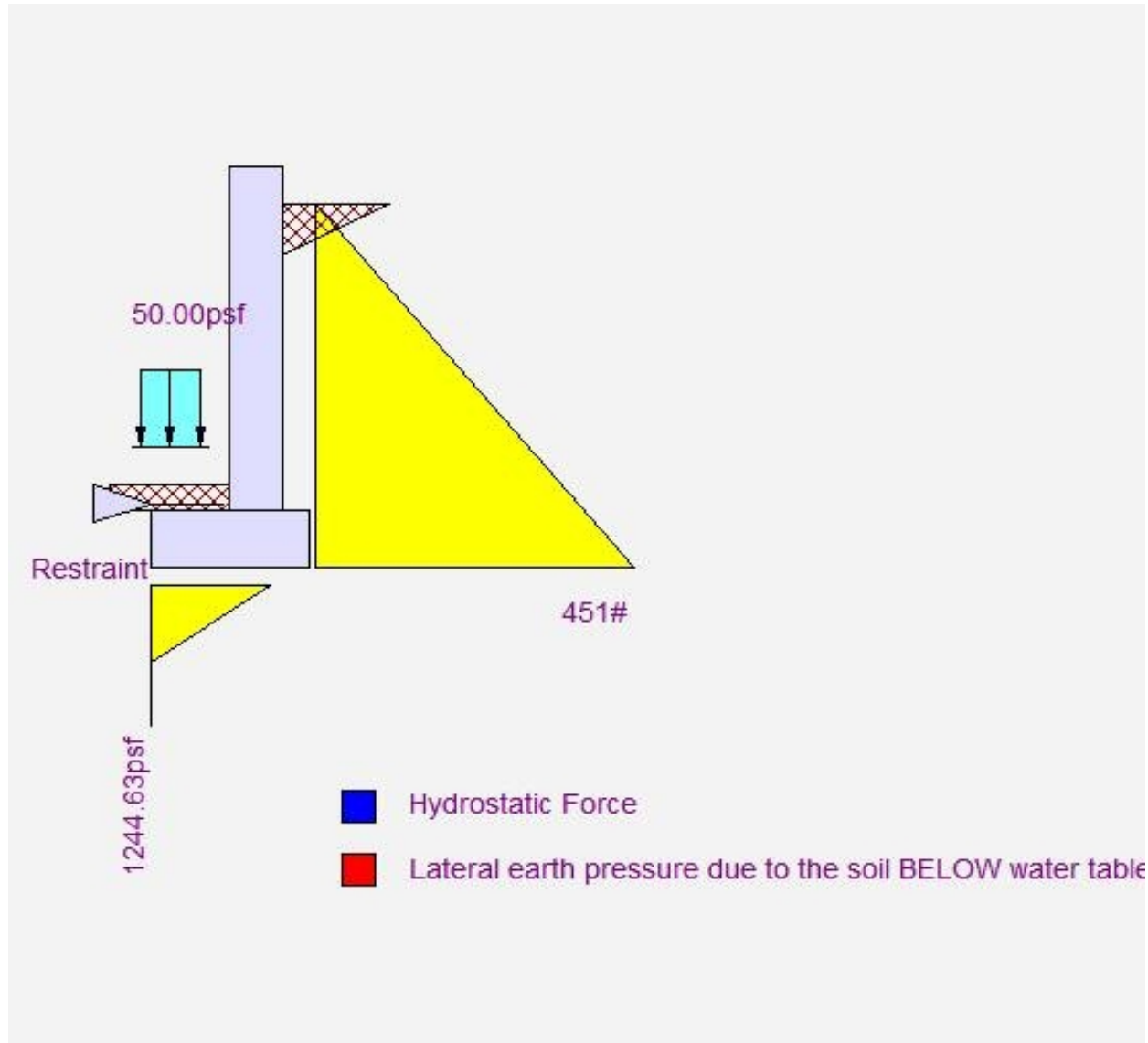
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Cantilevered Retaining Wall

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

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL

Title **5 ft wall**
Dsgnr: **jtw**
Description....

Page : 3
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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	Soil Over HL (ab. water tbl)	216.7	2.33	505.6
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.33	505.6
Hydrostatic Force				Watre Table			
Buoyant Force	=			Sloped Soil Over Heel =			
Surcharge over Heel	=			Surcharge Over Heel =			
Surcharge Over Toe	=			Adjacent Footing Load =			
Adjacent Footing Load	=			Axial Dead Load on Stem =			
Added Lateral Load	=			* Axial Live Load on Stem =			
Load @ Stem Above Soil	=			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 =			
Total	= 661.3	**O.T.M.** =	1,267.4	Footing Weight =	281.3	1.25	351.6
				Key Weight =			
				Vert. Component =			

Resisting/Overturning Ratio = **1.55**
Vertical Loads used for Soil Pressure = 1,187.9 lbs

Total = 1,187.9 lbs **R.M.=** 1,970.5

* 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.

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **5 ft wall**
Dsgnr: **jtw**
Description....

Page : 4
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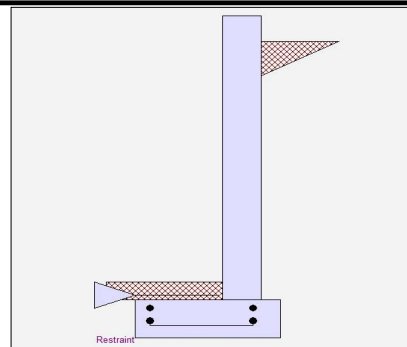**License To : J Welch Engineering LLC**

Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

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

Use menu item **Settings > Printing & Title Block**
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Project Name/Number : **RETAINING WAL**
Title   **5 ft wall**   Page : 5
Dsgnr: **jtw**   Date: 19 JAN 2020
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Cantilevered Retaining Wall   Code: IBC 2018,ACI 318-14,TMS 402-16

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Project Name/Number : RETAINING WAL
Title   **5 ft wall**   Page : 6
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Project Name/Number : RETAINING WAL
Title   **6 ft wall**
Dsgnr: **jtw**
Description....

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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		

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	=	1.79 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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Project Name/Number : RETAINING WAL

Title   **6 ft wall**
Dsgnr: **jtw**
Description....

Page : 2
Date: 19 JAN 2020

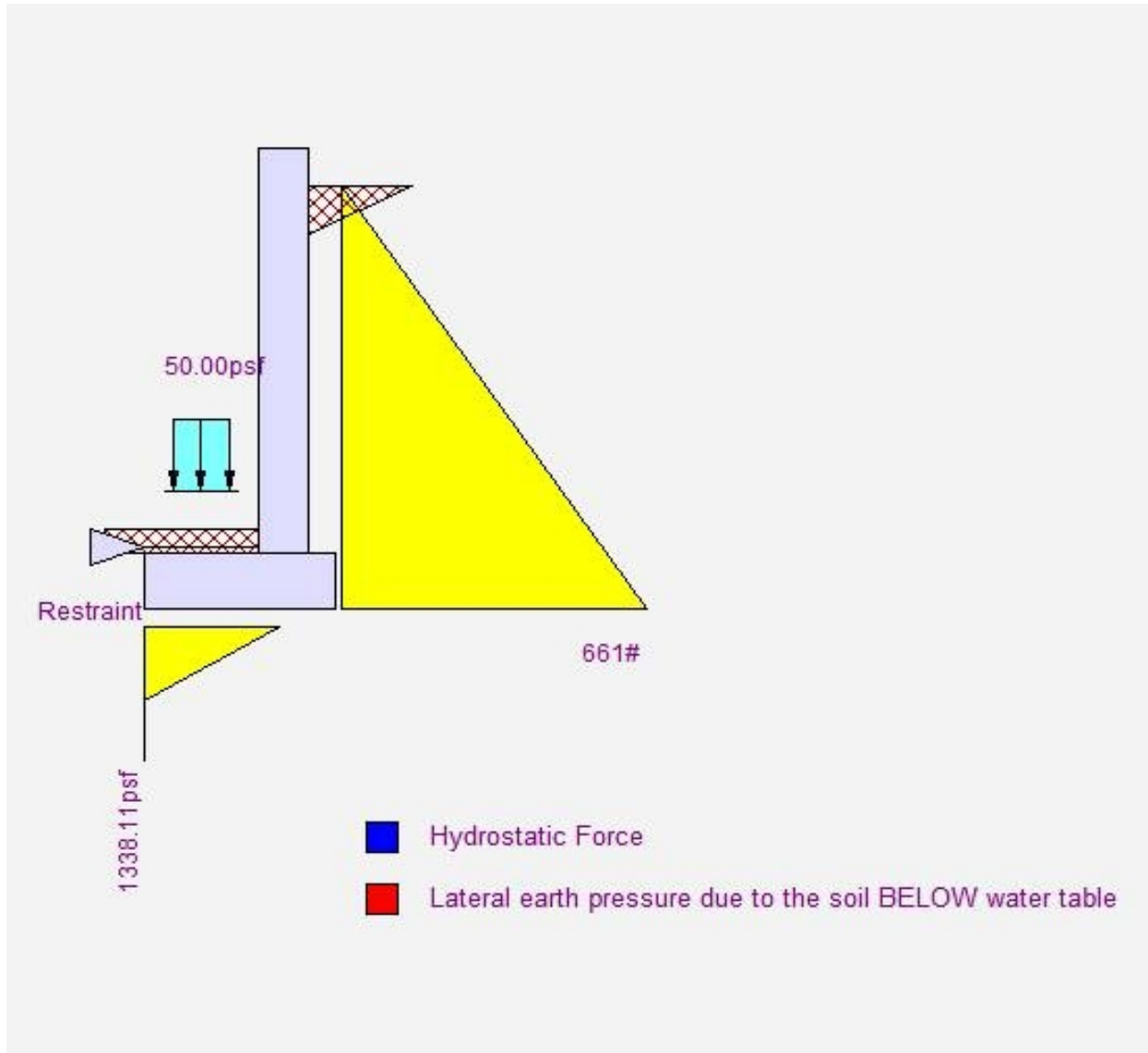This Wall in File: C:\Users\josh\Dropbox\New Projects\Whidbey Farmhouse\engineering\RETAINING WALLS

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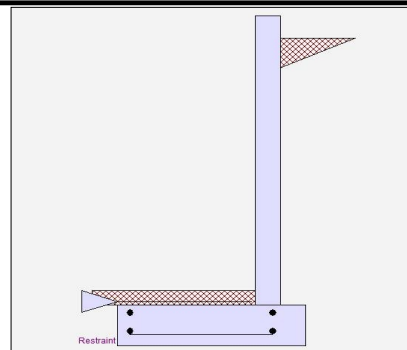
Cantilevered Retaining Wall

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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Project Name/Number : RETAINING WAL
Title   **6 ft wall**
Dsgnr: **jtw**
Description....

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....				.....RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	956.8	2.31	2,206.0	Soil Over HL (ab. water tbl)	390.0	3.50	1,365.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.50	1,365.0
Hydrostatic Force				Watre Table			
Buoyant Force	=			Sloped Soil Over Heel	=		
Surcharge over Heel	=			Surcharge Over Heel	=		
Surcharge Over Toe	=			Adjacent Footing Load	=		
Adjacent Footing Load	=			Axial Dead Load on Stem	=		
Added Lateral Load	=			* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=			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	=		
Total	=	956.8	**O.T.M.** =	2,206.0	Footing Weight	=	515.6	1.88	966.8
				Key Weight	=		
				Vert. Component	=		

Resisting/Overturning Ratio = **1.79**
Vertical Loads used for Soil Pressure = 1,512.3 lbs

Total = 1,512.3 lbs **R.M.=**   3,958.2

* 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.

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **6 ft wall**
Dsgnr: **jtw**
Description....

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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

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **6 ft wall**
Dsgnr: **jtw**
Description....

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Code: IBC 2018,ACI 318-14,TMS 402-16

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Project Name/Number : RETAINING WAL
Title   **6 ft wall**
Dsgnr: **jtw**
Description....

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

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Project Name/Number : RETAINING WAL
Title   **6 ft wall (SEISMIC)**
Dsgnr: **jtw**
Description....

Page : 1
Date: 19 JAN 2020

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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

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Title   **6 ft wall (SEISMIC)**
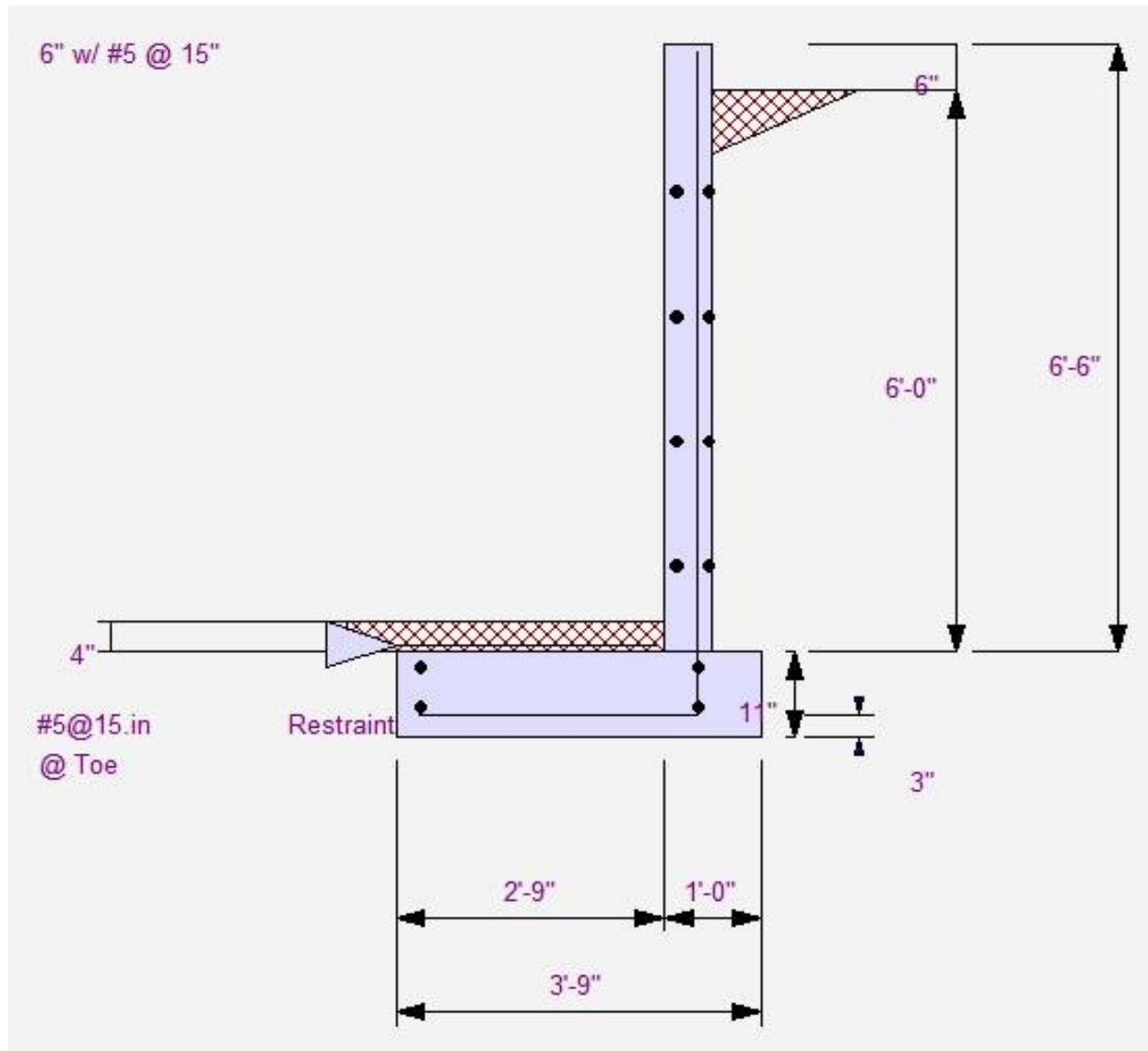Dsgnr: **jtw**
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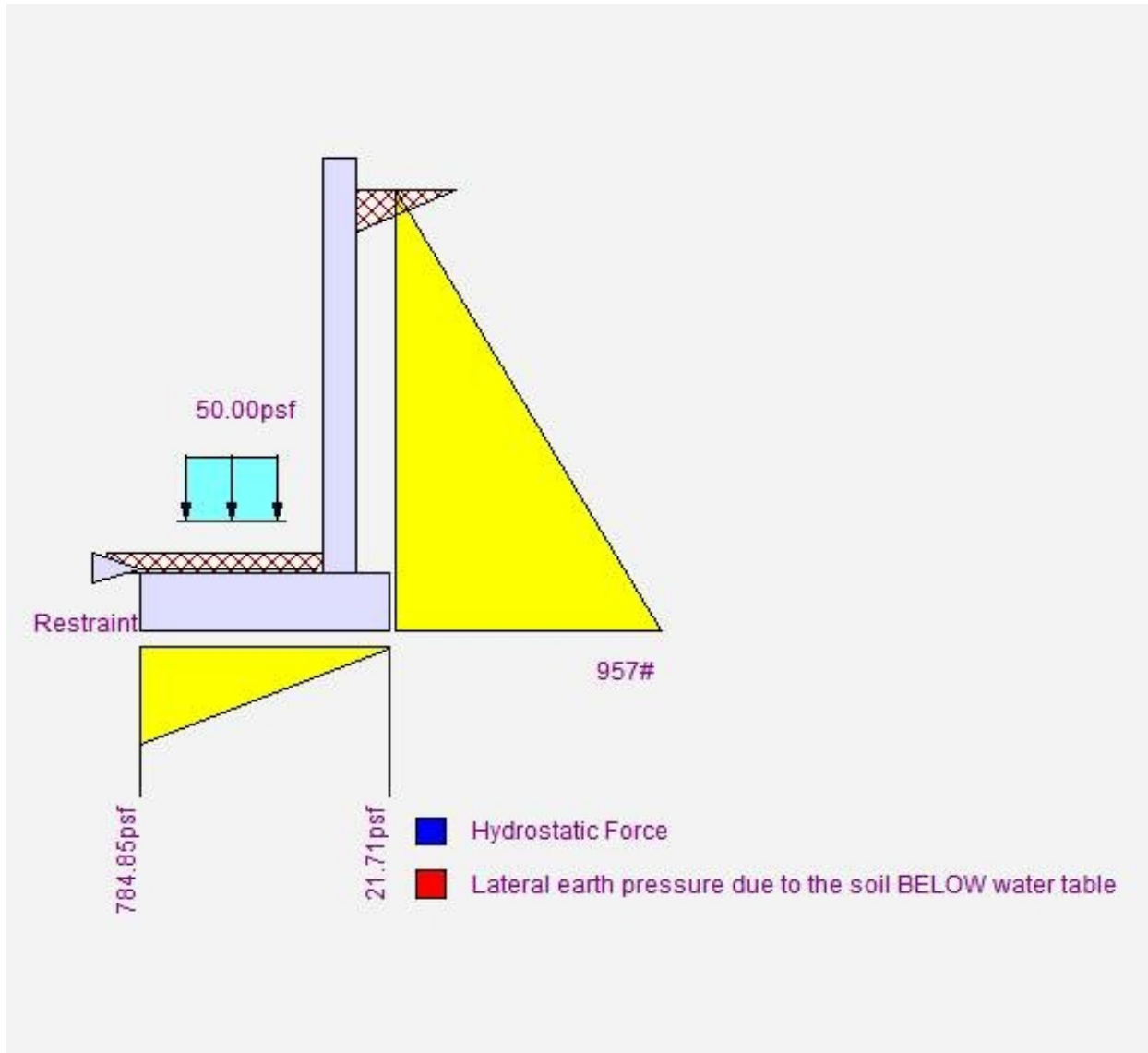This Wall in File: C:\Users\josh\Dropbox\New Projects\Whidbey Farmhouse\engineering\RETAINING WALLS

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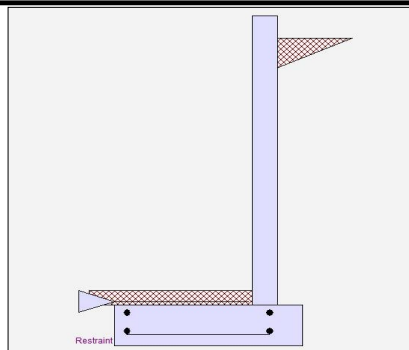
Cantilevered Retaining Wall

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) :	0.1896 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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Title   **6 ft wall (SEISMIC)**
Dsgnr: **jtw**
Description....

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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-#		Item	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	956.8	2.31	2,206.0		Soil Over HL (ab. water tbl)	390.0	3.50	1,365.0
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		3.50	1,365.0
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	119.2	1.38	163.9
Seismic Earth Load	=	267.9	3.46	926.5		Surcharge Over Toe	=		
	=				Stem Weight(s)	=	487.5	3.00	1,462.5
					Earth @ Stem Transitions	=		
Total	=	1,224.7	**O.T.M.** =	3,132.5		Footing Weight	=	515.6	1.88	966.8
					Key Weight	=		
					Vert. Component	=		

Resisting/Overturning Ratio   =   **1.26**
  Vertical Loads used for Soil Pressure =   1,512.3 lbs

Total =   1,512.3 lbs **R.M.=**   3,958.2

* 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.

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **6 ft wall (SEISMIC)**
Dsgnr: **jtw**
Description....

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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

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **6 ft wall (SEISMIC)**
Dsgnr: **jtw**
Description....

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Title   **6 ft wall (SEISMIC)**
Dsgnr: **jtw**
Description....

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Project Name/Number : RETAINING WAL
Title   **7 ft wall**
Dsgnr: **jtw**
Description....

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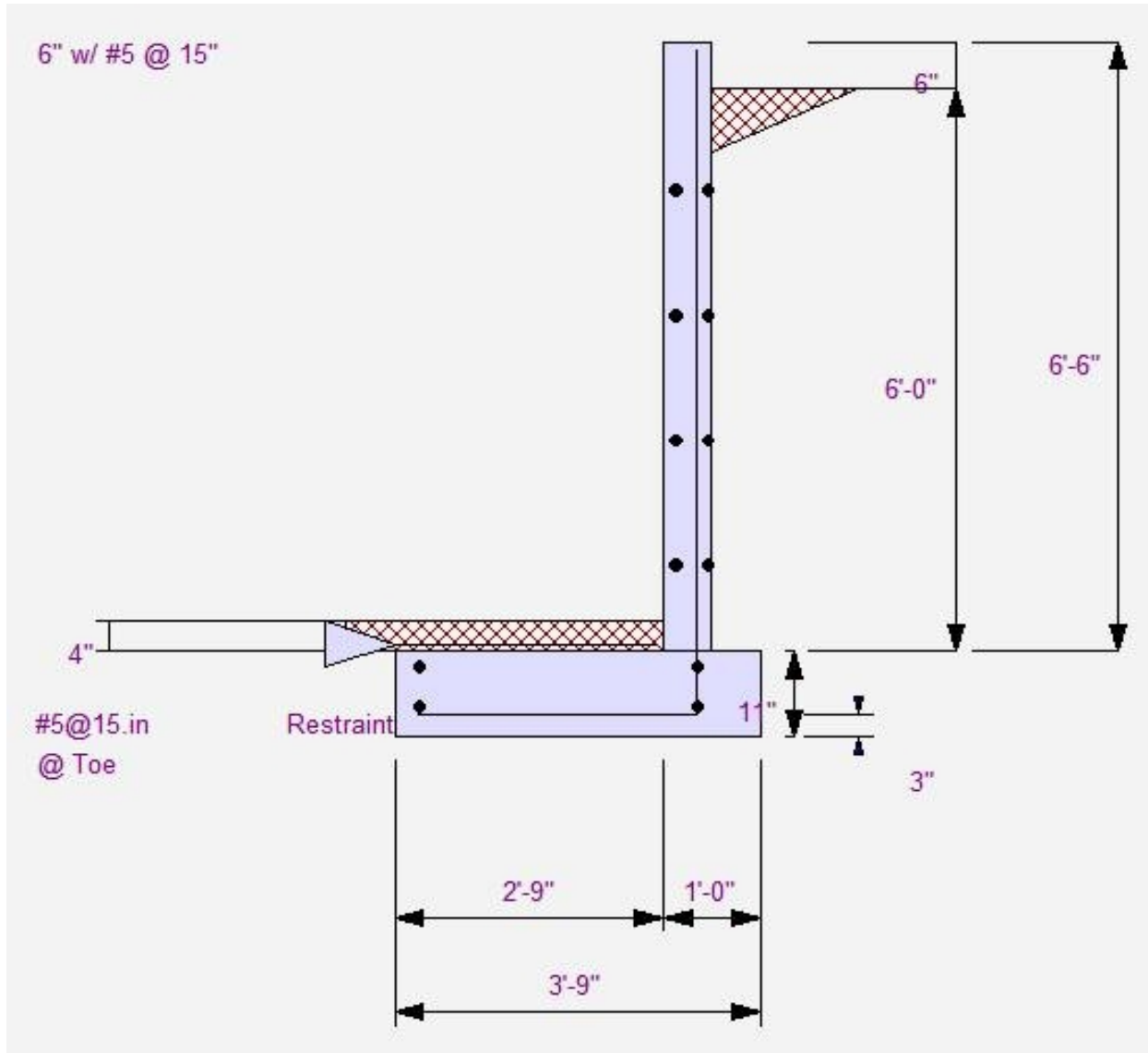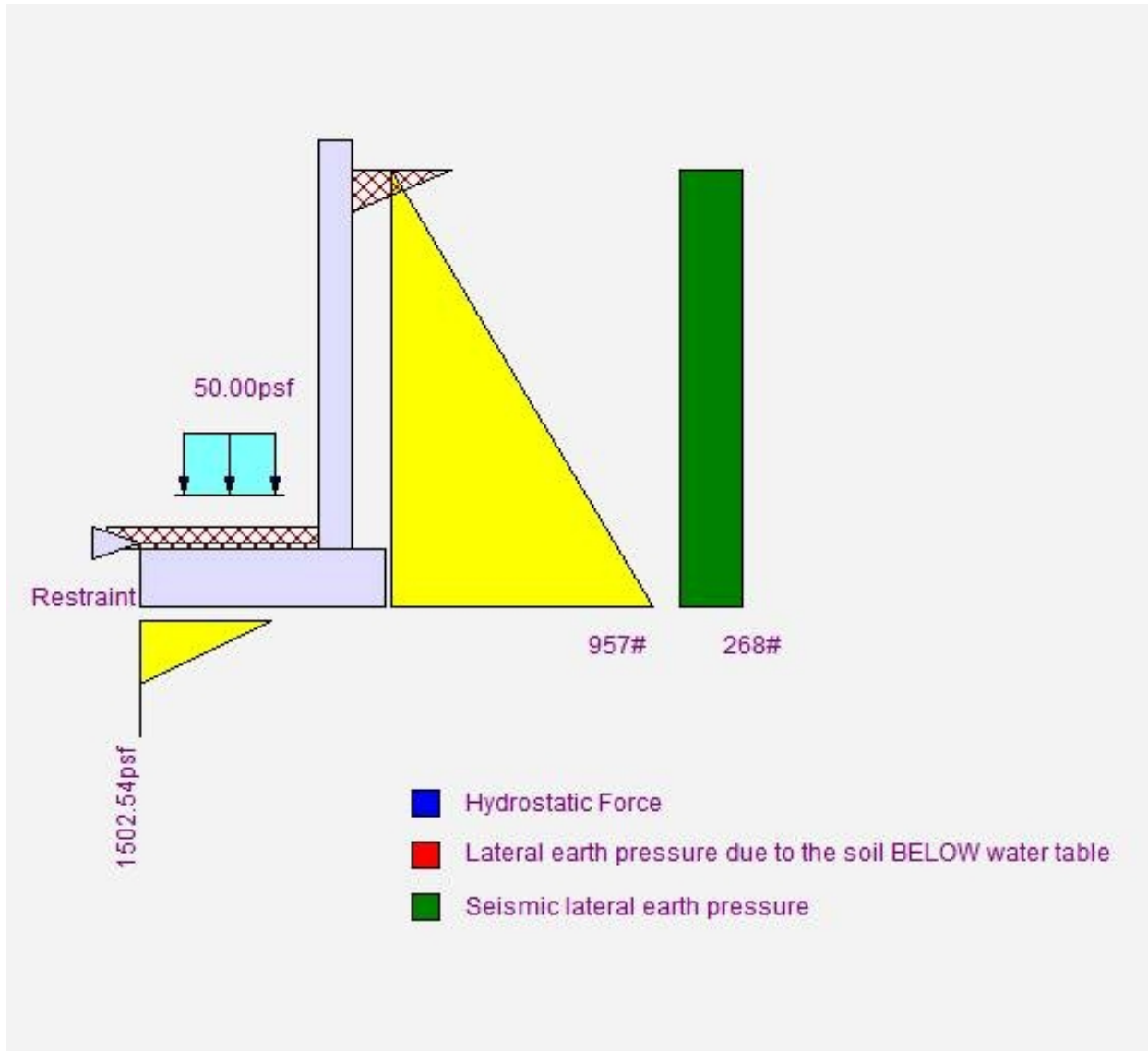
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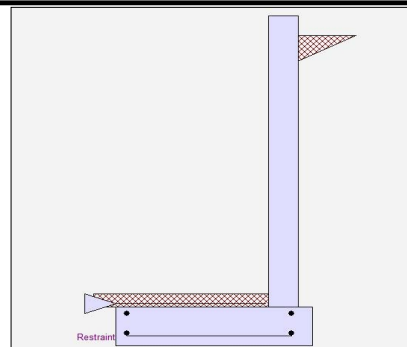# Cantilevered Retaining Wall

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		

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	=	1.75	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

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

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

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Project Name/Number : RETAINING WAL

Title   **7 ft wall**
Dsgnr: **jtw**
Description....

Page : 2
Date: 19 JAN 2020

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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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Project Name/Number : RETAINING WAL

Title **7 ft wall**
Dsgnr: **jtw**
Description....

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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-#		Force lbs	.....RESISTING..... Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,280.0	2.67	3,413.3	Soil Over HL (ab. water tbl)	303.3	4.33	1,314.4
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		4.33	1,314.4
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =				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 =			
Total =	1,280.0	O.T.M. =	3,413.3	Footing Weight =	675.0	2.25	1,518.8
				Key Weight =			
				Vert. Component =			

Resisting/Overturning Ratio   =   **1.75**
Vertical Loads used for Soil Pressure =   1,880.0 lbs

Total =   1,880.0 lbs **R.M.=**   5,973.6

* 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.

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **7 ft wall**
Dsgnr: **jtw**
Description....

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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

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **7 ft wall**
Dsgnr: **jtw**
Description....

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Code: IBC 2018,ACI 318-14,TMS 402-16

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Project Name/Number : RETAINING WAL
Title   **7 ft wall**   Page : 6
Dsgnr: **jtw**   Date: 19 JAN 2020
Description....

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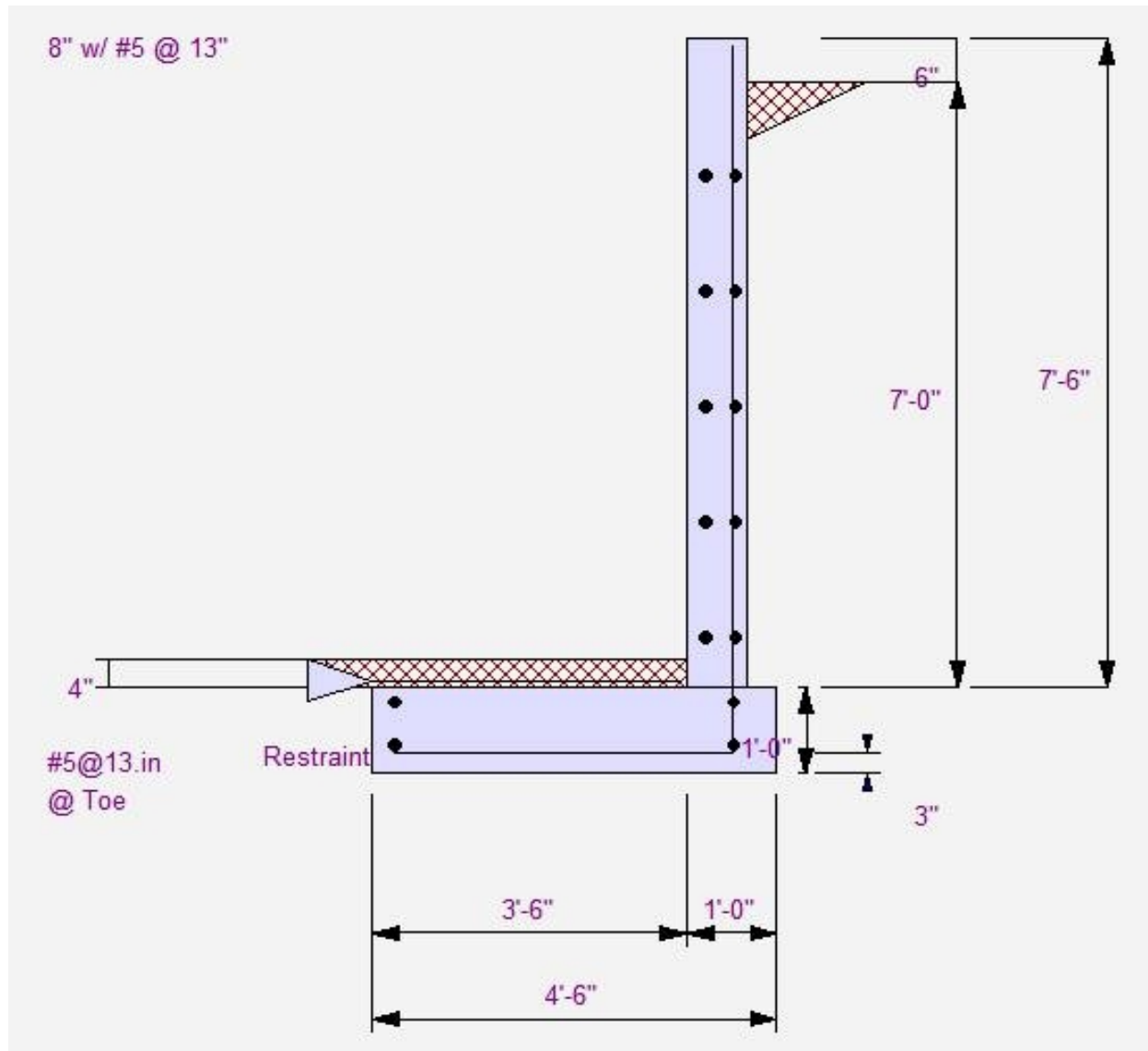
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Project Name/Number : RETAINING WAL
Title **7 ft wall (seismic)**
Dsgnr: **jtw**
Description....

Page : 1
Date: 19 JAN 2020

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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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Title   **7 ft wall (seismic)**
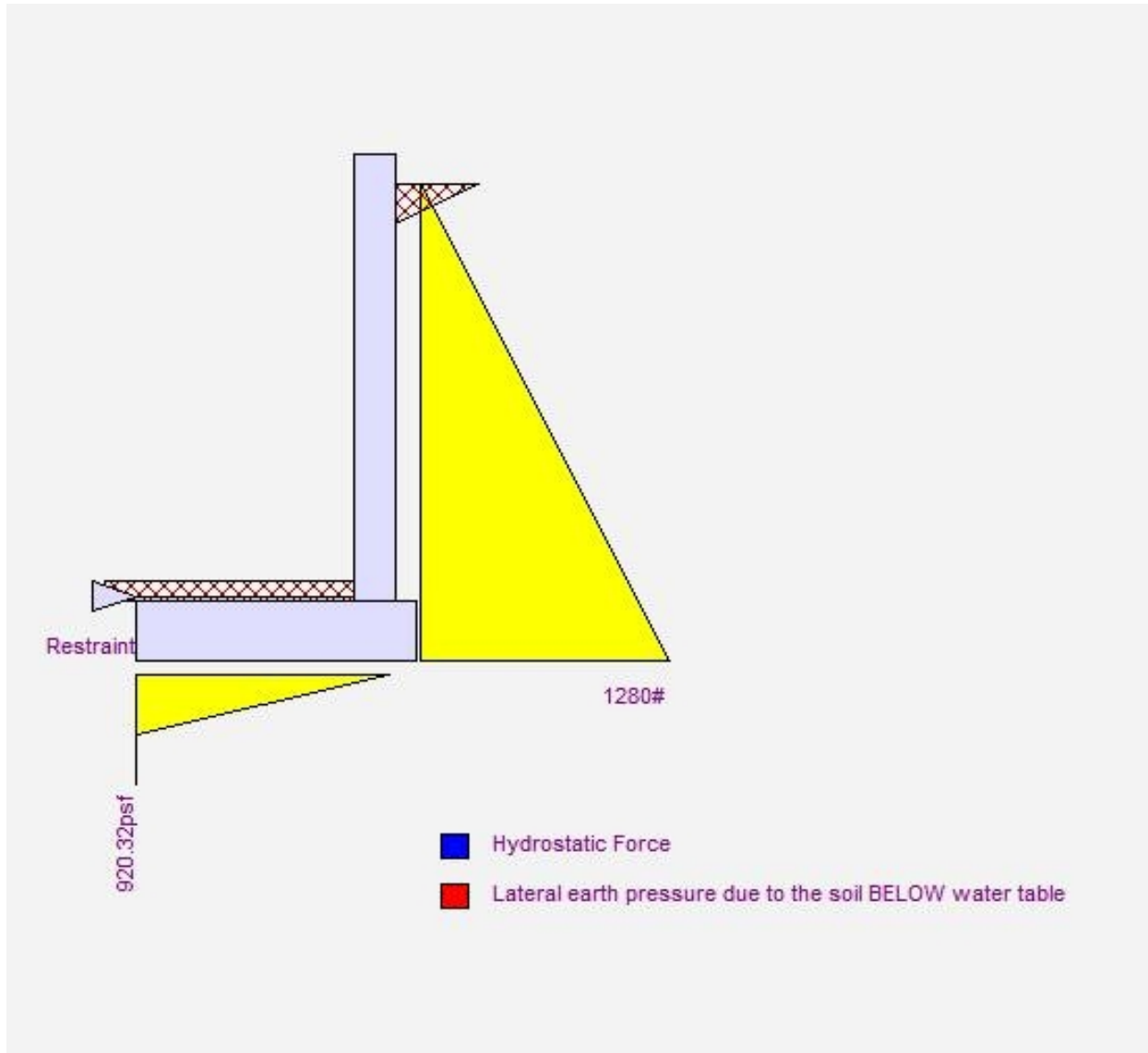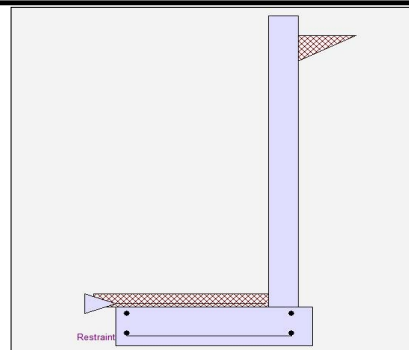Dsgnr: **jtw**
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Cantilevered Retaining Wall

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-#		Item	.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,280.0	2.67	3,413.3		Soil Over HL (ab. water tbl)	303.3	4.33	1,314.4
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		4.33	1,314.4
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	151.7	1.75	265.4
Seismic Earth Load	=	358.4	4.00	1,433.6		Surcharge Over Toe	=		
	=				Stem Weight(s)	=	750.0	3.83	2,875.0
					Earth @ Stem Transitions	=		
Total	=	1,638.4	**O.T.M.** =	4,846.9		Footing Weight	=	675.0	2.25	1,518.8
					Key Weight	=		
					Vert. Component	=		

Resisting/Overturning Ratio   =   **1.23**
  Vertical Loads used for Soil Pressure =   1,880.0 lbs

Total =   1,880.0 lbs **R.M.=**   5,973.6

* 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.

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **7 ft wall (seismic)**
Dsgnr: **jtw**
Description....

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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

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **7 ft wall (seismic)**
Dsgnr: **jtw**
Description....

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Project Name/Number : RETAINING WAL
Title   **7 ft wall (seismic)**
Dsgnr: **jtw**
Description....

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Cantilevered Retaining Wall   Code: IBC 2018,ACI 318-14,TMS 402-16

Restraint

2091.34psf

1280#   358#

■ Hydrostatic Force

■ Lateral earth pressure due to the soil BELOW water table

■ Seismic lateral earth pressure

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL

Title **8 ft wall**
Dsgnr: **jtw**
Description....

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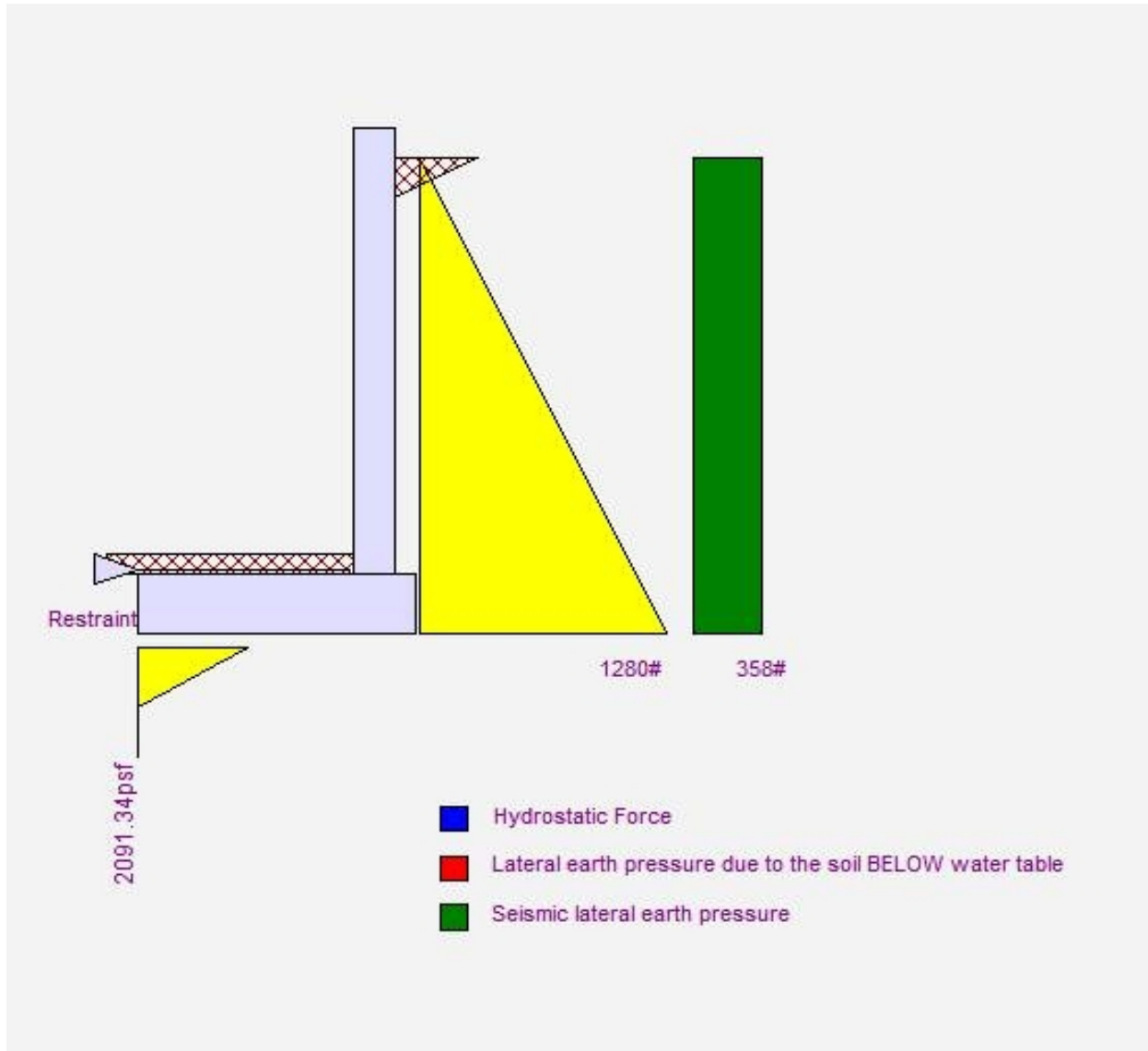This Wall in File: C:\Users\josh\Dropbox\New Projects\Whidbey Farmhouse\engineering\RETAINING WALLS

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		

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	=	1.72	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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Project Name/Number : RETAINING WAL

Title **8 ft wall**
Dsgnr: **jtw**
Description....

Page : 2
Date: 19 JAN 2020

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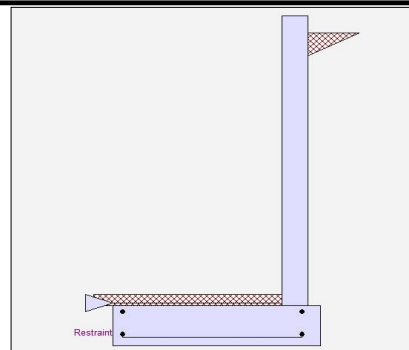
Cantilevered Retaining Wall

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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Project Name/Number : RETAINING WAL

Title **8 ft wall**
Dsgnr: **jtw**
Description....

Page : 3
Date: 19 JAN 2020

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RetainPro (c) 1987-2019, Build 11.20.03.31 License : KW-06061184 License To : J Welch Engineering LLC	**Cantilevered Retaining Wall**	Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....					.....RESISTING.....		
	Force lbs	Distance ft	Moment ft-#			Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,680.6	3.06	5,135.0		Soil Over HL (ab. water tbl)	346.7	5.23	1,814.2
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		5.23	1,814.2
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	190.7	419.5
	=						2.20	
					Surcharge Over Toe	=		
					Stem Weight(s)	=	850.0	4.73	4,023.3
Total	=	1,680.6	**O.T.M.** =	5,135.0		Earth @ Stem Transitions	=		
					Footing Weight	=	945.0	2.70	2,551.5
					Key Weight	=		
Resisting/Overturning Ratio		=	**1.72**		Vert. Component	=		
Vertical Loads used for Soil Pressure =		2,332.3	lbs		**Total =**	2,332.3 lbs	**R.M.=**	8,808.5

* 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.

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **8 ft wall**
Dsgnr: **jtw**
Description....

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Date: 19 JAN 2020

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

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

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **8 ft wall**
Dsgnr: **jtw**
Description....

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Cantilevered Retaining Wall   Code: IBC 2018,ACI 318-14,TMS 402-16

8" w/ #5 @ 12"

6"

8'-0"   8'-6"

4"

Restraint

#5@12.in
@ Toe

1'-2"

3"

4'-5"   1'-0"

5'-5"

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Project Name/Number : RETAINING WAL

Title   **8 ft wall**
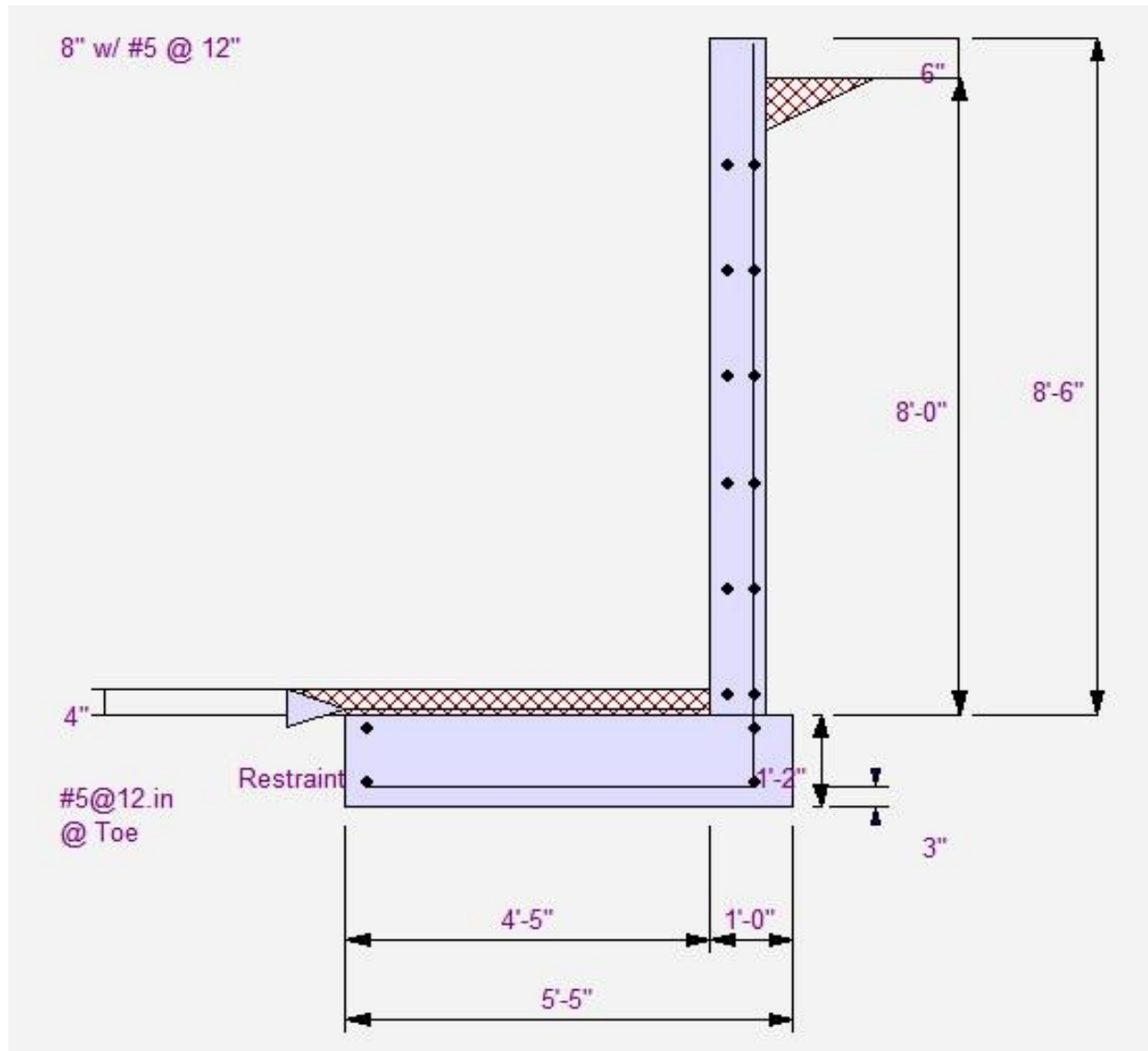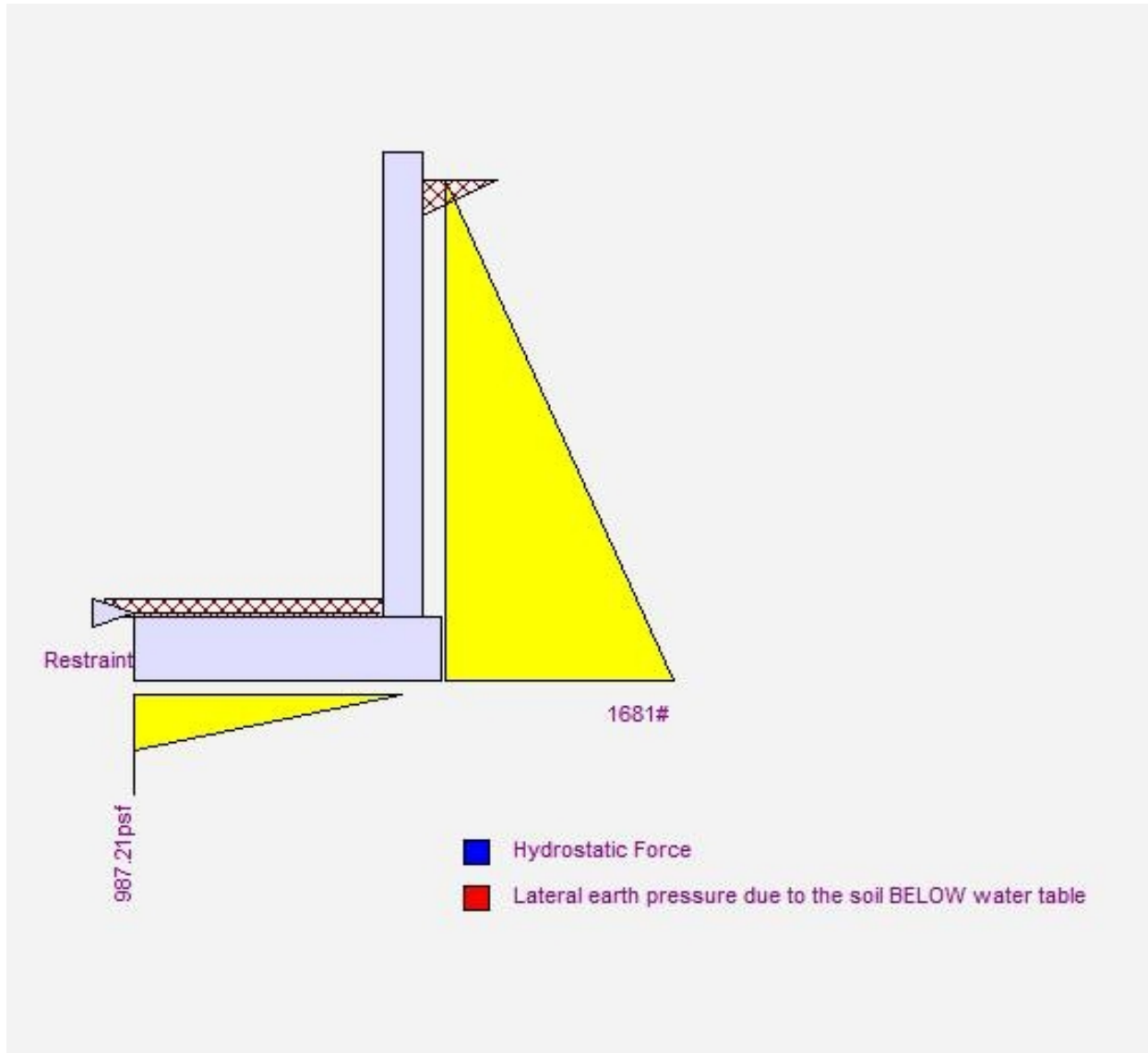Dsgnr: **jtw**
Description....

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

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Project Name/Number : RETAINING WAL
Title   8 ft wall (seismic)   Page : 1
Dsgnr: jtw   Date: 19 JAN 2020
Description....

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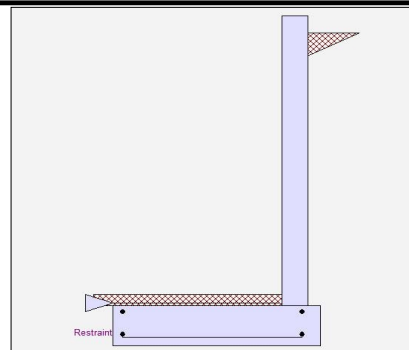
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Cantilevered Retaining Wall

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		

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)		

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

Uniform Seismic Force	=	73.333
Total Seismic Force	=	672.222

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	=	1.21 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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Project Name/Number : RETAINING WAL
Title   **8 ft wall (seismic)**
Dsgnr: **jtw**
Description....

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Date: 19 JAN 2020

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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

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   **8 ft wall (seismic)**
Dsgnr: **jtw**
Description....

Page : 3
Date: 19 JAN 2020

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Cantilevered Retaining Wall   Code: IBC 2018,ACI 318-14,TMS 402-16

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....				Item	.....RESISTING.....		
	Force lbs	Distance ft	Moment ft-#			Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	1,680.6	3.06	5,135.0		Soil Over HL (ab. water tbl)	346.7	5.23	1,814.2
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		5.23	1,814.2
Hydrostatic Force					Watre Table			
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	=	190.7	2.20	419.5
Seismic Earth Load	=	470.6	4.58	2,156.7		Surcharge Over Toe	=		
	=				Stem Weight(s)	=	850.0	4.73	4,023.3
					Earth @ Stem Transitions	=		
Total	=	2,151.1	O.T.M. =	7,291.7		Footing Weight	=	945.0	2.70	2,551.5
					Key Weight	=		
					Vert. Component	=		

Resisting/Overturning Ratio   =   **1.21**
   Vertical Loads used for Soil Pressure =   2,332.3 lbs

Total =   2,332.3 lbs   **R.M.=**   8,808.5

* 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.

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : RETAINING WAL
Title   **8 ft wall (seismic)**
Dsgnr: **jtw**
Description....

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Date: 19 JAN 2020

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

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

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : RETAINING WAL
Title   8 ft wall (seismic)
Dsgnr: jtw
Description....

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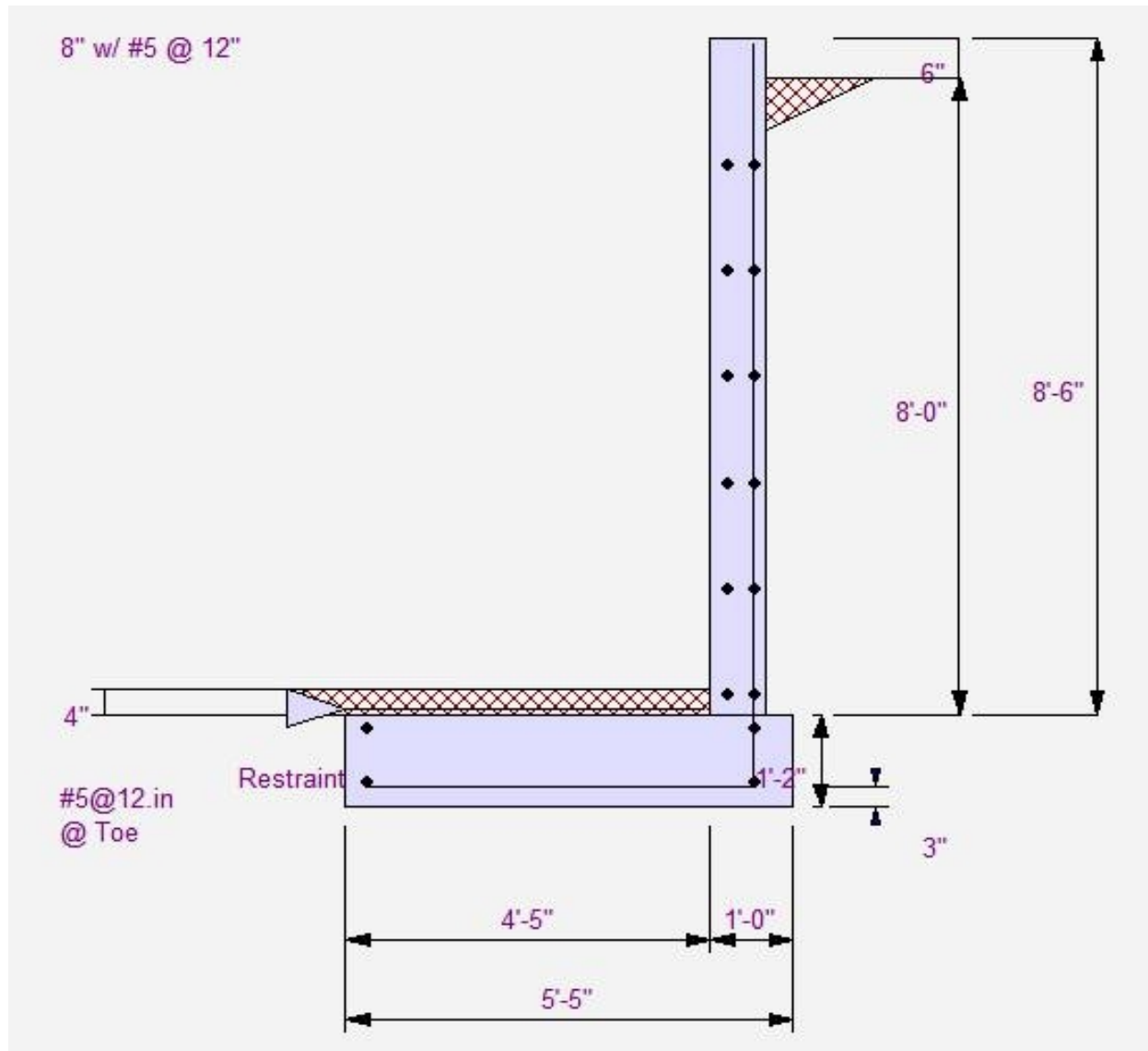
Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Use menu item Settings > Printing & Title Block
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Project Name/Number : RETAINING WAL
Title   8 ft wall (seismic)
Dsgnr: jtw
Description....

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Cantilevered Retaining Wall

Code: IBC 2018,ACI 318-14,TMS 402-16

Restraint

1681#   471#

2390.94psf

■ Hydrostatic Force
■ Lateral earth pressure due to the soil BELOW water table
■ Seismic lateral earth pressure