

STRUCTURAL CALCULATIONS

Steinborn Residence
8435 SE 47th PL,
Mercer Island, WA 98040

Ectypos Architecture
4212 W Mercer Way,
Mercer Island, WA 98040

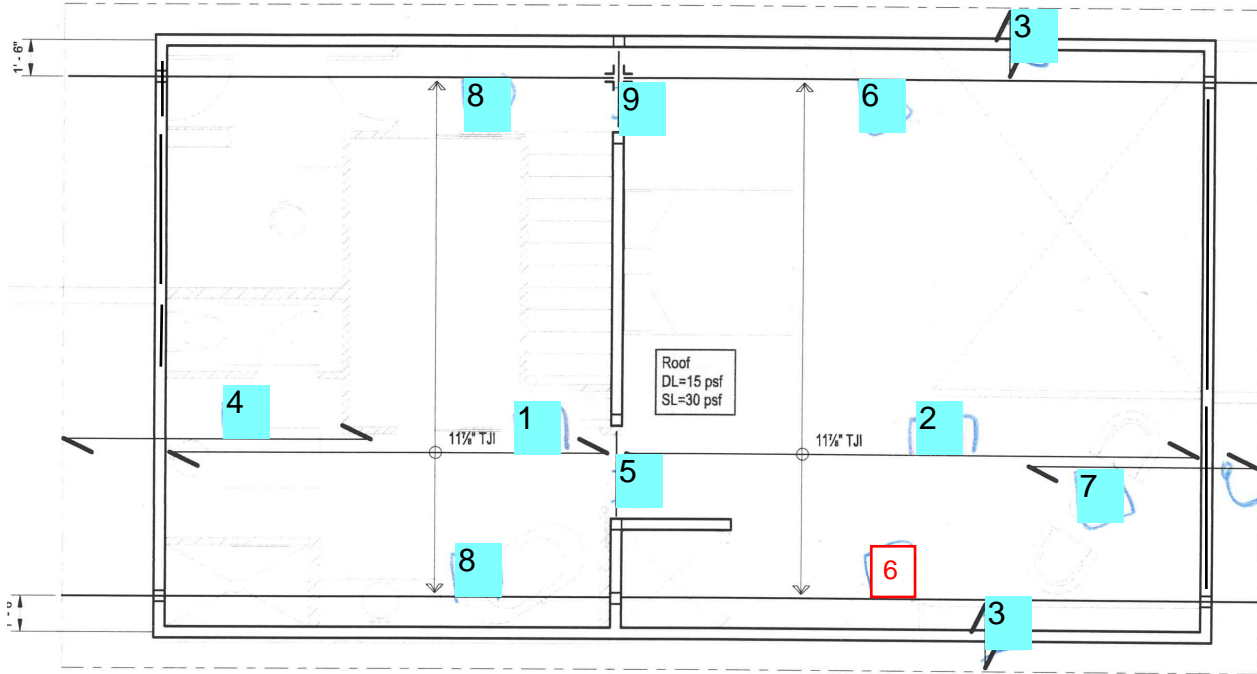
February 14, 2022

**Structural Permit
Calculations**

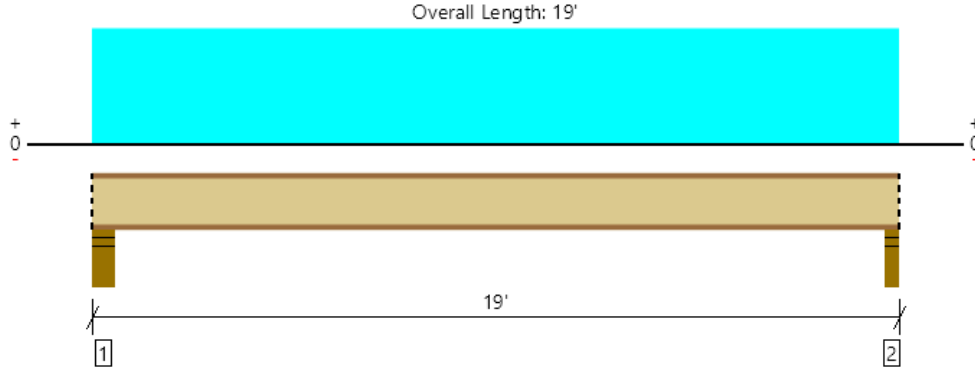


Roof Framing Key

Roof
DL=15 psf
SL=30 psf (includes rain surcharge)



Roof, J1
1 piece(s) 11 7/8" TJI ® 210 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	863 @ 4 1/2"	1679 (3.50")	Passed (51%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	821 @ 5 1/2"	1903	Passed (43%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3816 @ 9' 7"	4364	Passed (87%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.539 @ 9' 7"	0.921	Passed (L/410)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.808 @ 9' 7"	1.228	Passed (L/273)	--	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/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	5.50"	5.50"	1.75"	288	575	863	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.75"	283	565	848	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' 8" o/c	
Bottom Edge (Lu)	19' 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 19'	24"	15.0	30.0	Roof Load

Weyerhaeuser Notes

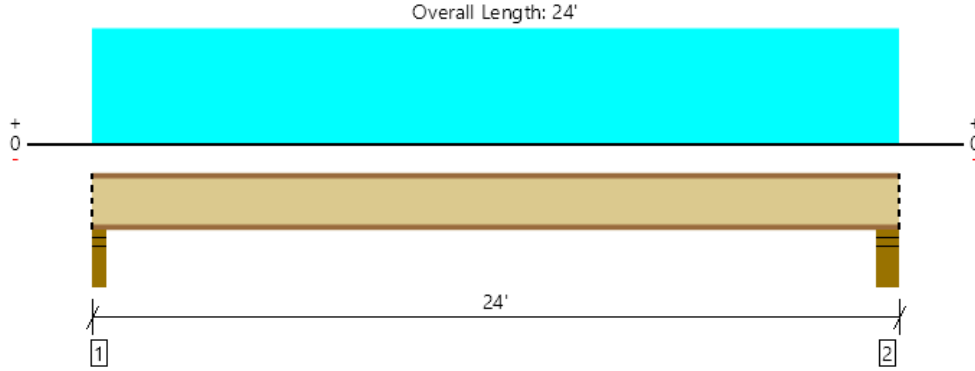
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, J2
1 piece(s) 11 7/8" TJI ® 360 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1088 @ 23' 7 1/2"	1731 (3.50")	Passed (63%)	1.15	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1046 @ 3 1/2"	1961	Passed (53%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	6169 @ 11' 11"	7107	Passed (87%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	1.043 @ 11' 11"	1.171	Passed (L/270)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	1.564 @ 11' 11"	1.561	Passed (L/180)	--	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/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	3.50"	3.50"	1.75"	358	715	1073	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	363	725	1088	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)	24' 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 24'	24"	15.0	30.0	Roof Load

Weyerhaeuser Notes

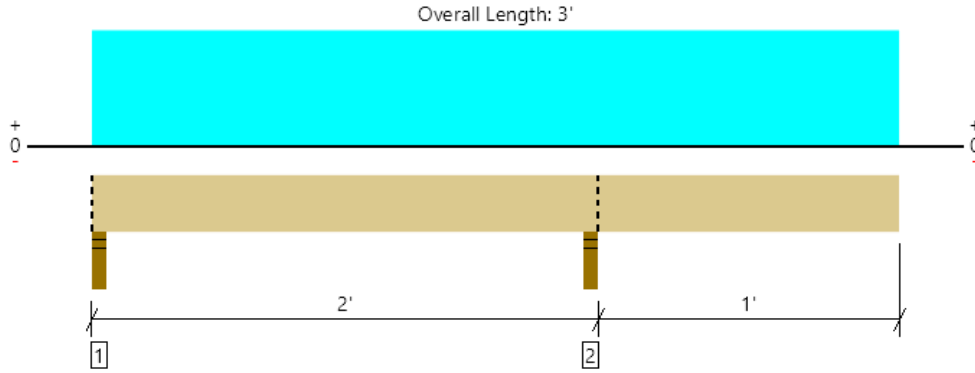
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jjaj@bcq-se.com	



Roof, J3
1 piece(s) 2 x 4 HF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	213 @ 1' 10 1/4"	2126 (3.50")	Passed (10%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	71 @ 1' 5"	604	Passed (12%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-59 @ 1' 10 1/4"	430	Passed (14%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.008 @ 3'	0.200	Passed (2L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.011 @ 3'	0.200	Passed (2L/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/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/0.2").
- 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.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.50"	3.50"	1.50"	19	50	69	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	71	142	213	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 Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 3'	24"	15.0	30.0	Roof Load

Weyerhaeuser Notes

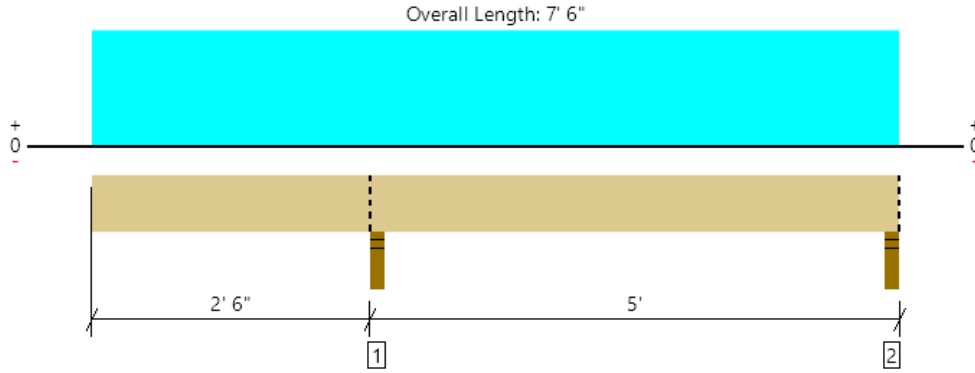
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, J4
2 piece(s) 2 x 4 HF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	515 @ 2' 7 3/4"	4253 (3.50")	Passed (12%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	237 @ 3' 1"	1208	Passed (20%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-315 @ 2' 7 3/4"	861	Passed (37%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.111 @ 0	0.265	Passed (2L/572)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.146 @ 0	0.353	Passed (2L/434)	--	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/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.50"	3.50"	1.50"	172	343	515	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	53	129	182	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 Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 7' 6"	24"	15.0	30.0	Roof Load

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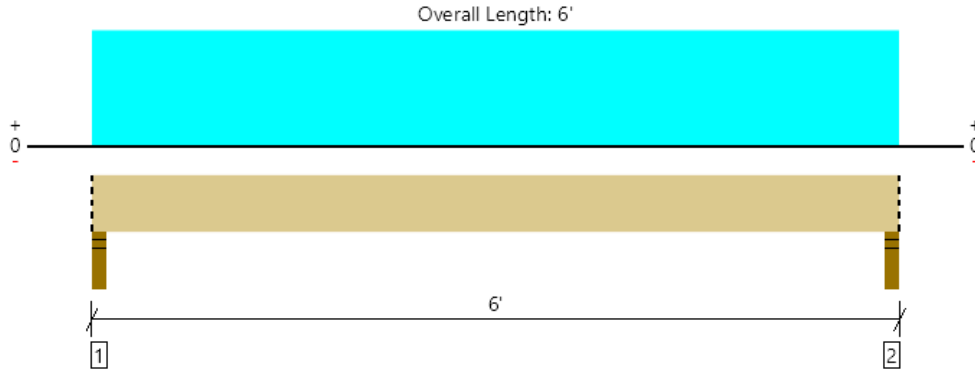
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, B5

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)	3009 @ 2"	4961 (3.50")	Passed (61%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1724 @ 1' 3 3/8"	9878	Passed (17%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4026 @ 3'	18346	Passed (22%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.030 @ 3'	0.283	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.045 @ 3'	0.378	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	3.50"	3.50"	2.12"	1029	1980	3009	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.12"	1029	1980	3009	Blocking

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

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

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 6' (Front)	22'	15.0	30.0	Roof Load

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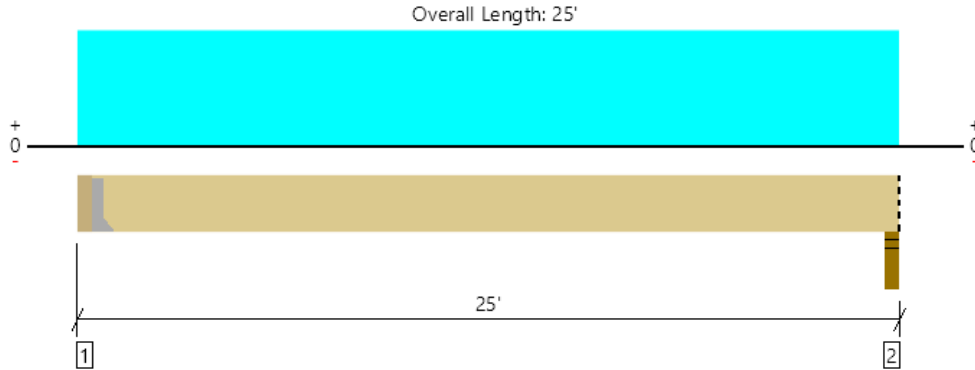
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, B6

1 piece(s) 3 1/2" x 11 7/8" 1.5E 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)	1264 @ 3 1/2"	4725 (1.50")	Passed (27%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1162 @ 1' 3 3/8"	9878	Passed (12%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	7754 @ 12' 6 3/4"	18346	Passed (42%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.663 @ 12' 6 3/4"	1.227	Passed (L/444)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	1.138 @ 12' 6 3/4"	1.636	Passed (L/259)	--	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 - Hanger on 11 7/8" HF beam	3.50"	Hanger ¹	1.50"	536	754	1290	See note ¹
2 - Stud wall - HF	3.50"	3.50"	1.50"	535	746	1281	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)	24' 9" o/c	
Bottom Edge (Lu)	24' 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	

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

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 25'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 25' (Front)	2'	15.0	30.0	

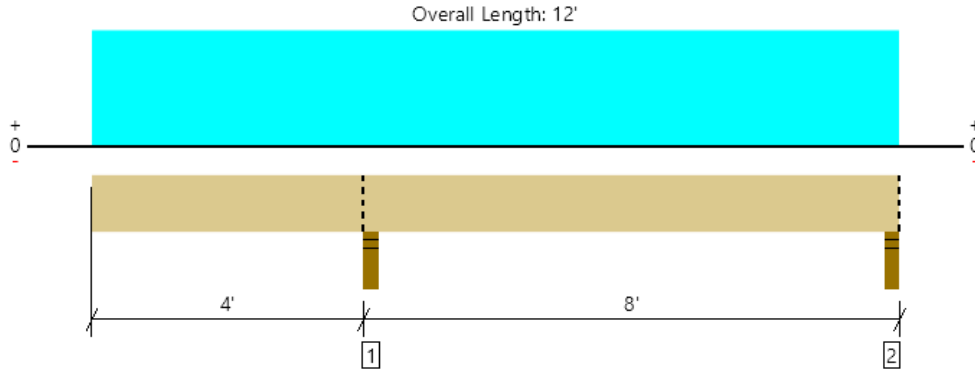
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Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, J7

2 piece(s) 1 3/4" x 3 1/2" 2.0E Microllam® LVL @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	818 @ 4' 1 3/4"	4961 (3.50")	Passed (16%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	406 @ 4' 7"	2677	Passed (15%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-773 @ 4' 1 3/4"	2190	Passed (35%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.374 @ 0	0.415	Passed (2L/266)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.481 @ 0	0.553	Passed (2L/206)	--	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/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 4% increase in the moment capacity has been added to account for repetitive member usage.
- Resawn products must maintain manufacturing stamps.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.50"	3.50"	1.50"	273	546	819	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	87	208	295	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' o/c	
Bottom Edge (Lu)	12' 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 12'	24"	15.0	30.0	Roof Load

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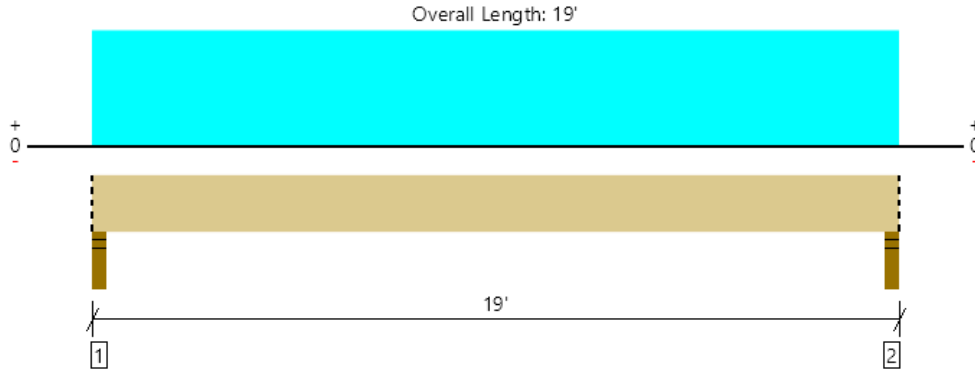
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, B8

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)	978 @ 2"	4961 (3.50")	Passed (20%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	846 @ 1' 3 3/8"	9878	Passed (9%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	4486 @ 9' 6"	18346	Passed (24%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.226 @ 9' 6"	0.933	Passed (L/992)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.388 @ 9' 6"	1.244	Passed (L/578)	--	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	3.50"	3.50"	1.50"	408	570	978	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	408	570	978	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)	19' o/c	
Bottom Edge (Lu)	19' 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 19'	N/A	13.0	--	
1 - Uniform (PSF)	0 to 19' (Front)	2'	15.0	30.0	

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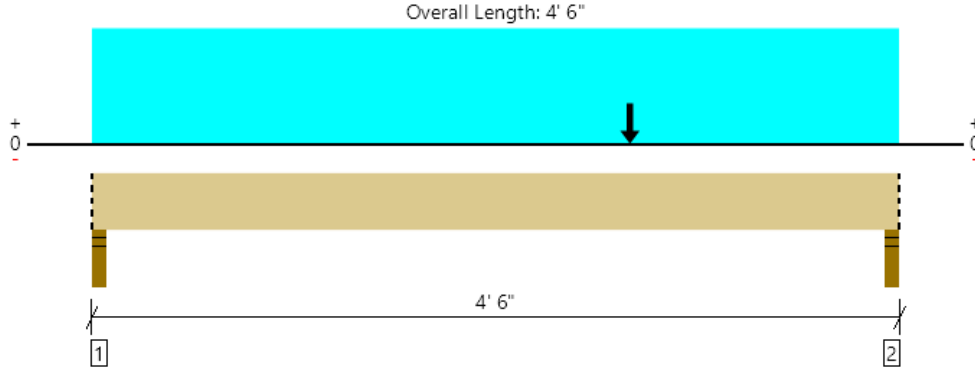
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, B9

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



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3799 @ 4' 4"	4961 (3.50")	Passed (77%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2514 @ 3' 2 5/8"	9878	Passed (25%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3951 @ 2' 11 11/16"	18346	Passed (22%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.018 @ 2' 3 7/16"	0.208	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.029 @ 2' 3 7/16"	0.278	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	3.50"	3.50"	2.10"	1074	1909	2983	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.68"	1414	2385	3799	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	13.0	--	
1 - Uniform (PSF)	0 to 4' 6" (Front)	22'	15.0	30.0	Roof Load
2 - Point (lb)	3' (Front)	N/A	536	754	Linked from: B6, Support 1
3 - Point (lb)	3' (Front)	N/A	408	570	Linked from: B8, Support 2

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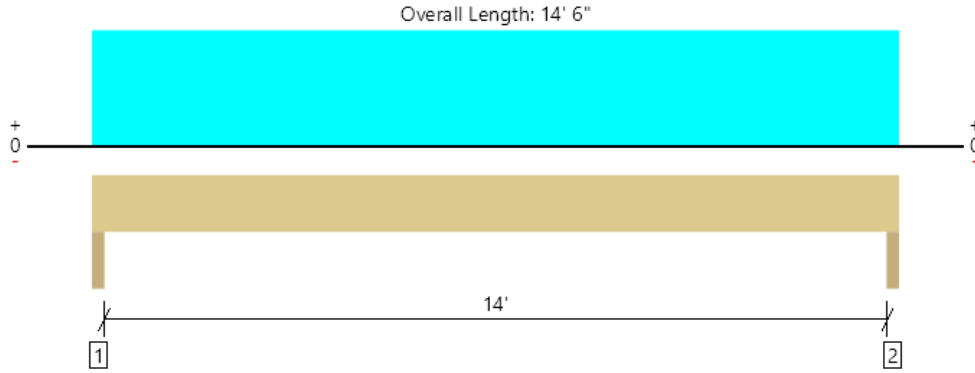
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, Roof header, 14' opening
 1 piece(s) 5 1/4" x 11 1/4" 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)	5028 @ 1' 1/2"	9844 (3.00")	Passed (51%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4204 @ 1' 2 1/4"	13132	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	17602 @ 7' 3"	30998	Passed (57%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.357 @ 7' 3"	0.475	Passed (L/478)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.551 @ 7' 3"	0.712	Passed (L/310)	--	1.0 D + 1.0 S (All Spans)

System : Wall
 Member Type : Header
 Building Use : Residential
 Building Code : IBC 2018
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - DF	3.00"	3.00"	1.53"	1765	3263	5028	None
2 - Trimmer - DF	3.00"	3.00"	1.53"	1765	3263	5028	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	14' 6" o/c	
Bottom Edge (Lu)	14' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 14' 6"	N/A	18.5	--	
1 - Uniform (PSF)	0 to 14' 6"	15'	15.0	30.0	Snow

Weyerhaeuser Notes

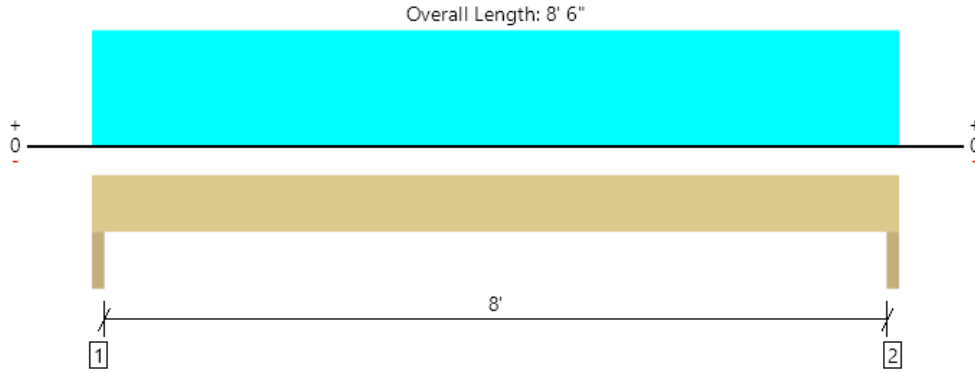
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, Roof header, 8' opening
3 piece(s) 2 x 10 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2914 @ 1' 1/2"	5468 (3.00")	Passed (53%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2214 @ 1' 1/4"	4787	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5832 @ 4' 3"	5750	Passed (101%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.122 @ 4' 3"	0.275	Passed (L/814)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.185 @ 4' 3"	0.412	Passed (L/535)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - DF	3.00"	3.00"	1.60"	1001	1913	2914	None
2 - Trimmer - DF	3.00"	3.00"	1.60"	1001	1913	2914	None

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 6"	N/A	10.6	--	
1 - Uniform (PSF)	0 to 8' 6"	15'	15.0	30.0	Snow

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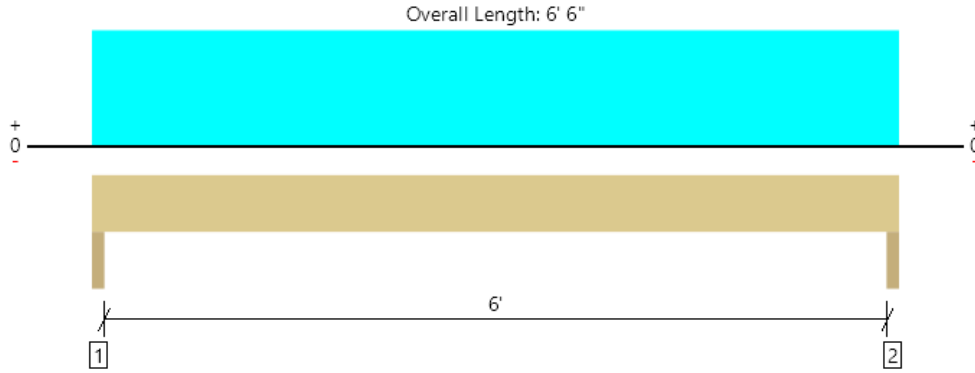
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, Roof header, 6' opening
2 piece(s) 2 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1700 @ 1 1/2"	3645 (3.00")	Passed (47%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	1253 @ 10 1/4"	2501	Passed (50%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2554 @ 3' 3"	2569	Passed (99%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.096 @ 3' 3"	0.208	Passed (L/784)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.145 @ 3' 3"	0.313	Passed (L/517)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - DF	3.00"	3.00"	1.50"	579	1121	1700	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	579	1121	1700	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	1' o/c	
Bottom Edge (Lu)	6' 6" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	5.5	--	
1 - Uniform (PSF)	0 to 6' 6"	11' 6"	15.0	30.0	Snow

Weyerhaeuser Notes

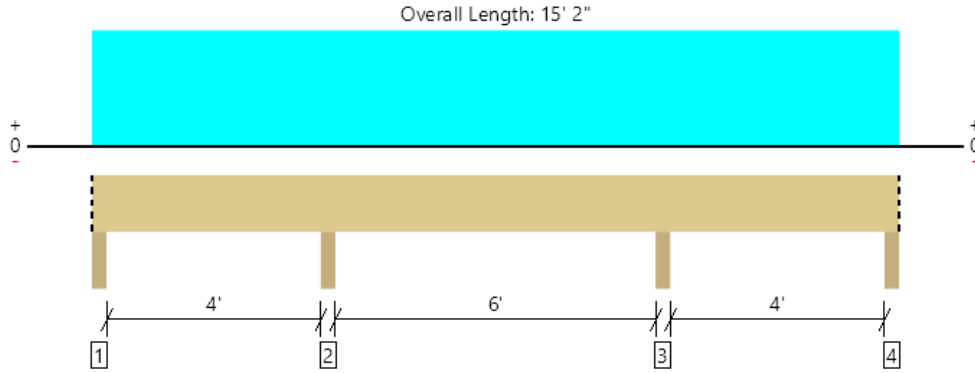
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Roof, Trellis joist, see Risa for steel framing
1 piece(s) 2 x 4 HF No.2 @ 24" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	545 @ 4' 5 1/4"	2126 (3.50")	Passed (26%)	--	1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	250 @ 4' 10 1/2"	604	Passed (41%)	1.15	1.0 D + 1.0 S (Adj Spans)
Moment (Ft-lbs)	-276 @ 4' 5 1/4"	430	Passed (64%)	1.15	1.0 D + 1.0 S (Adj Spans)
Live Load Defl. (in)	0.110 @ 7' 7"	0.315	Passed (L/684)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.153 @ 7' 7"	0.419	Passed (L/494)	--	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/240) and TL (L/180).
- 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Beam - DF	3.50"	3.50"	1.50"	49	113	162	Blocking
2 - Beam - DF	3.50"	3.50"	1.50"	179	366	545	None
3 - Beam - DF	3.50"	3.50"	1.50"	179	366	545	None
4 - Beam - DF	3.50"	3.50"	1.50"	49	113	162	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)	15' 2" o/c	
Bottom Edge (Lu)	13' 11" o/c	

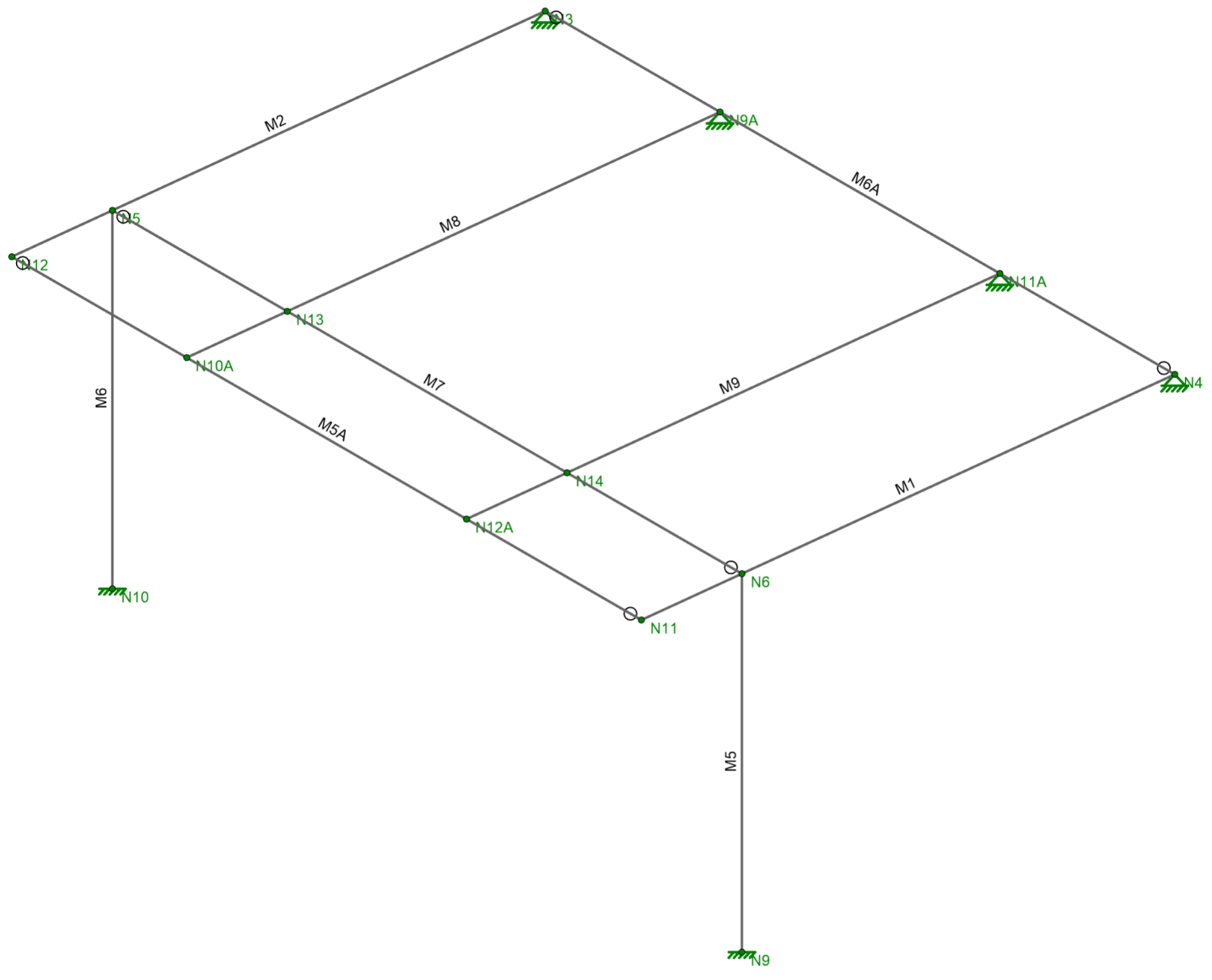
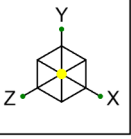
•Maximum allowable bracing intervals based on applied load.

Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 15' 2"	24"	15.0	30.0	Default Load

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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bccq-se.com	





BCQ	Steinborn Trellis Framing	SK-1
JAJ		Feb 04, 2022
		Trellis.r3d
Isometric - Labels		

Nodes

	Label	X [ft]	Y [ft]	Z [ft]	Temp [deg F]	Detach From Diap...
1	N3	0	6.5	2.3		
2	N4	14.4	6.5	2.3		
3	N5	0	7.5	12.2		
4	N6	14.4	7.5	12.2		
5	N9	14.4	0	12.2		
6	N10	0	0	12.2		
7	N11	14.4	7.732323	14.5		
8	N12	0	7.732323	14.5		
9	N9A	4	6.5	2.3		
10	N10A	4	7.732323	14.5		
11	N11A	10.4	6.5	2.3		
12	N12A	10.4	7.732323	14.5		
13	N13	4	7.5	12.2		
14	N14	10.4	7.5	12.2		

Boundary Conditions

	Node Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot [k-ft/rad]	Y Rot [k-ft/rad]	Z Rot [k-ft/rad]
1	N3	Reaction	Reaction	Reaction			
2	N4	Reaction	Reaction	Reaction			
3	N10	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
4	N9	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
5	N9A	Reaction	Reaction	Reaction			
6	N11A	Reaction	Reaction	Reaction			

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Co...	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.B...	29000	11154	0.3	0.65	0.527	42	1.4	58	1.3
5	A500 Gr.B...	29000	11154	0.3	0.65	0.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	0.3	0.65	0.49	35	1.6	60	1.2
7	A1085	29000	11154	0.3	0.65	0.49	50	1.4	65	1.3
8	A913 Gr.65	29000	11154	0.3	0.65	0.49	65	1.1	80	1.1

Primary Member Properties

	Label	I Node	J Node	K Node	Rotate(deg)	Section/Sh...	Type	Design List	Material	Design Rule
1	M1	N4	N11			W4X13	Beam	Wide Flange	A992	Typical
2	M2	N3	N12			W4X13	Beam	Wide Flange	A992	Typical
3	M5	N9	N6			PIPE 3.5X	Column	Tube	A992	Typical
4	M6	N10	N5			PIPE 3.5X	Column	Tube	A992	Typical
5	M5A	N12	N11			2X8	Beam	Rectangular	DF	Typical
6	M6A	N3	N4			2X8	Beam	Rectangular	DF	Typical
7	M7	N6	N5			W6X25	Beam	Wide Flange	A992	Typical
8	M8	N9A	N10A			W4X13	Beam	Wide Flange	A992	Typical
9	M9	N11A	N12A			W4X13	Beam	Wide Flange	A992	Typical

Advanced Member Properties

	Label	I Release	J Release	I Offset [in]	J Offset [in]	T/C Only	Physical	Deflection...	Analysis...	Activation	Seismic DR
1	M1						Yes				None
2	M2						Yes				None
3	M5						Yes	** NA **			None
4	M6						Yes	** NA **			None
5	M5A	BenPIN	BenPIN				Yes				None
6	M6A	BenPIN	BenPIN				Yes				None
7	M7	BenPIN	BenPIN				Yes				None
8	M8						Yes				None
9	M9						Yes				None

Hot Rolled Member Properties

	Label	Shape	Length [ft]	Lb y-y [ft]	Lb z-z [ft]	Lcomp t...	Lcomp b...	L-Torque...	K y-y	K z-z	Cb	Function
1	M1	W4X13	12.262			Lbyy						Lateral
2	M2	W4X13	12.262			Lbyy						Lateral
3	M5	PIPE 3.5X	7.5									Lateral
4	M6	PIPE 3.5X	7.5									Lateral
5	M7	W6X25	14.4			Lbyy						Lateral
6	M8	W4X13	12.262			Lbyy						Lateral
7	M9	W4X13	12.262			Lbyy						Lateral

Member Distributed Loads (BLC 4 : BLC 1 Transient Area Loads)

	Member Label	Direction	Start Magnitude...	End Magnitude...	Start Location [(...]	End Location [(f...]	Inactive [(k, k-ft)...
1	M1	Y	-0.029	-0.029	0	2.044	Active
2	M1	Y	-0.029	-0.029	2.044	4.087	Active
3	M1	Y	-0.029	-0.029	4.087	6.131	Active
4	M1	Y	-0.029	-0.029	6.131	8.175	Active
5	M1	Y	-0.029	-0.031	8.175	10.218	Active
6	M1	Y	-0.031	-0.036	10.218	12.262	Active
7	M2	Y	-0.029	-0.029	0	2.044	Active
8	M2	Y	-0.029	-0.029	2.044	4.087	Active
9	M2	Y	-0.029	-0.029	4.087	6.131	Active
10	M2	Y	-0.029	-0.029	6.131	8.175	Active
11	M2	Y	-0.029	-0.031	8.175	10.218	Active
12	M2	Y	-0.031	-0.036	10.218	12.262	Active
13	M8	Y	-0.075	-0.075	0	2.044	Active
14	M8	Y	-0.075	-0.075	2.044	4.087	Active
15	M8	Y	-0.075	-0.075	4.087	6.131	Active
16	M8	Y	-0.075	-0.075	6.131	8.175	Active
17	M8	Y	-0.075	-0.082	8.175	10.218	Active
18	M8	Y	-0.082	-0.094	10.218	12.262	Active
19	M9	Y	-0.075	-0.075	0	2.044	Active
20	M9	Y	-0.075	-0.075	2.044	4.087	Active
21	M9	Y	-0.075	-0.075	4.087	6.131	Active
22	M9	Y	-0.075	-0.075	6.131	8.175	Active
23	M9	Y	-0.075	-0.082	8.175	10.218	Active
24	M9	Y	-0.082	-0.094	10.218	12.262	Active

Member Distributed Loads (BLC 5 : BLC 2 Transient Area Loads)

	Member Label	Direction	Start Magnitude...	End Magnitude...	Start Location [(...]	End Location [(f...]	Inactive [(k, k-ft)...
1	M1	Y	-0.058	-0.058	0	2.044	Active
2	M1	Y	-0.058	-0.058	2.044	4.087	Active
3	M1	Y	-0.058	-0.058	4.087	6.131	Active
4	M1	Y	-0.058	-0.058	6.131	8.175	Active
5	M1	Y	-0.058	-0.063	8.175	10.218	Active
6	M1	Y	-0.063	-0.072	10.218	12.262	Active
7	M2	Y	-0.058	-0.058	0	2.044	Active
8	M2	Y	-0.058	-0.058	2.044	4.087	Active
9	M2	Y	-0.058	-0.058	4.087	6.131	Active
10	M2	Y	-0.058	-0.058	6.131	8.175	Active
11	M2	Y	-0.058	-0.063	8.175	10.218	Active
12	M2	Y	-0.063	-0.072	10.218	12.262	Active
13	M8	Y	-0.151	-0.151	0	2.044	Active
14	M8	Y	-0.151	-0.151	2.044	4.087	Active
15	M8	Y	-0.151	-0.151	4.087	6.131	Active
16	M8	Y	-0.151	-0.151	6.131	8.175	Active
17	M8	Y	-0.151	-0.163	8.175	10.218	Active
18	M8	Y	-0.163	-0.188	10.218	12.262	Active
19	M9	Y	-0.151	-0.151	0	2.044	Active
20	M9	Y	-0.151	-0.151	2.044	4.087	Active
21	M9	Y	-0.151	-0.151	4.087	6.131	Active
22	M9	Y	-0.151	-0.151	6.131	8.175	Active
23	M9	Y	-0.151	-0.163	8.175	10.218	Active
24	M9	Y	-0.163	-0.188	10.218	12.262	Active

Basic Load Cases

	BLC Descr...	Category	X Gravity	Y Gravity	Z Gravity	Nodal	Point	Distributed	Area(Mem...	Surface(Pl...
1	D	DL		-1					1	
2	S	SL							1	
3	E	EL								
4	BLC 1 Tra...	None						24		
5	BLC 2 Tra...	None						24		

Load Combinations

De...	SolvePD...	SR...	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...	BLC Fa...
1	D	Yes	Y	1	1							
2	S	Yes	Y	2	1							
3	D+S	Yes	Y	1	1	2	1					

Load Combination Design

Description	ASIF	Service	Hot Rolled	Cold For...	Wood	Concrete	Masonry	Aluminum	Stainless	Connecti...
1	D		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	S		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	D+S		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Member Section Forces

LC	Member Label	Sec	Axial [k]	y Shear [k]	z Shear [k]	Torque [k-ft]	y-y Moment...	z-z Moment...
1	1	M1	1	0.018	0.17	0	0	-0.015
2			2	0.005	0.042	0	0	-0.339
3			3	-0.008	-0.086	0	0	-0.271
4			4	-0.021	-0.215	0	0	0.191
5			5	0.005	0.047	0	0	-0.005
6	1	M2	1	0.018	0.17	0	0	-0.015
7			2	0.005	0.042	0	0	-0.339
8			3	-0.008	-0.086	0	0	-0.271
9			4	-0.021	-0.215	0	0	0.191
10			5	0.005	0.047	0	0	-0.005
11	1	M5	1	1.337	0	-0.028	0	0.071
12			2	1.315	0	-0.028	0	0.018
13			3	1.293	0	-0.028	0	-0.035
14			4	1.271	0	-0.028	0	-0.089
15			5	1.249	0	-0.028	0	-0.142
16	1	M6	1	1.337	0	-0.028	0	0.071
17			2	1.315	0	-0.028	0	0.018
18			3	1.293	0	-0.028	0	-0.035
19			4	1.271	0	-0.028	0	-0.089
20			5	1.249	0	-0.028	0	-0.142
21	1	M5A	1	0	0.047	0	0.005	0
22			2	0	0.037	0	0.005	-0.151
23			3	0	0	0	0	-0.181
24			4	0	-0.037	0	-0.005	-0.151
25			5	0	-0.047	0	-0.005	0
26	1	M6A	1	0	0.003	0	-0.015	0
27			2	0	-0.007	0	-0.015	0.006
28			3	0	0	0	0	-0.006
29			4	0	0.007	0	0.015	0.006
30			5	0	-0.003	0	0.015	0
31	1	M7	1	0	0.846	0.027	-0.005	0
32			2	0	0.756	0.027	-0.005	0.098
33			3	0	0	0	0	0.107
34			4	0	-0.756	-0.027	0.005	0.098
35			5	0	-0.846	-0.027	0.005	0
36	1	M8	1	0.07	0.418	0	0.002	0
37			2	0.042	0.148	0	0.002	-0.852
38			3	0.015	-0.122	0	0.002	-0.892
39			4	-0.012	-0.393	0	0.002	-0.104
40			5	-0.003	-0.028	0	-0.001	0

Member Section Forces (Continued)

	LC	Member Label	Sec	Axial [k]	y Shear [k]	z Shear [k]	Torque [k-ft]	y-y Moment...	z-z Moment...
41	1	M9	1	0.07	0.418	0	-0.002	0	0.015
42			2	0.042	0.148	0	-0.002	0	-0.852
43			3	0.015	-0.122	0	-0.002	0	-0.892
44			4	-0.012	-0.393	0	-0.002	0	-0.104
45			5	-0.003	-0.028	0	0.001	0	0.005
46	2	M1	1	0.027	0.235	0	0	0	-0.025
47			2	0.01	0.058	0	0	0	-0.475
48			3	-0.008	-0.119	0	0	0	-0.384
49			4	-0.026	-0.297	0	0	0	0.251
50			5	0.005	0.053	0	0	0	-0.01
51	2	M2	1	0.027	0.235	0	0	0	-0.025
52			2	0.01	0.058	0	0	0	-0.475
53			3	-0.008	-0.119	0	0	0	-0.384
54			4	-0.026	-0.297	0	0	0	0.251
55			5	0.005	0.053	0	0	0	-0.01
56	2	M5	1	1.692	0	-0.042	0	0.105	0
57			2	1.692	0	-0.042	0	0.026	0
58			3	1.692	0	-0.042	0	-0.052	0
59			4	1.692	0	-0.042	0	-0.131	0
60			5	1.692	0	-0.042	0	-0.209	0
61	2	M6	1	1.692	0	-0.042	0	0.105	0
62			2	1.692	0	-0.042	0	0.026	0
63			3	1.692	0	-0.042	0	-0.052	0
64			4	1.692	0	-0.042	0	-0.131	0
65			5	1.692	0	-0.042	0	-0.209	0
66	2	M5A	1	0	0.053	0	0.01	0	0
67			2	0	0.053	0	0.01	0	-0.191
68			3	0	0	0	0	0	-0.215
69			4	0	-0.053	0	-0.01	0	-0.191
70			5	0	-0.053	0	-0.01	0	0
71	2	M6A	1	0	0	0	-0.025	0	0
72			2	0	0	0	-0.025	0	0.002
73			3	0	0	0	0	0	0
74			4	0	0	0	0.025	0	0.002
75			5	0	0	0	0.025	0	0
76	2	M7	1	0	1.14	0.038	-0.011	0	0
77			2	0	1.14	0.038	-0.011	0.137	-4.104
78			3	0	0	0	0	0.149	-4.555
79			4	0	-1.14	-0.038	0.011	0.137	-4.104
80			5	0	-1.14	-0.038	0.011	0	0
81	2	M8	1	0.11	0.712	0	0.003	0	0.025
82			2	0.064	0.252	0	0.003	0	-1.453
83			3	0.017	-0.208	0	0.003	0	-1.521
84			4	-0.029	-0.671	0	0.003	0	-0.177
85			5	-0.005	-0.053	0	-0.003	0	0.01
86	2	M9	1	0.11	0.712	0	-0.003	0	0.025
87			2	0.064	0.252	0	-0.003	0	-1.453
88			3	0.017	-0.208	0	-0.003	0	-1.521
89			4	-0.029	-0.671	0	-0.003	0	-0.177
90			5	-0.005	-0.053	0	0.003	0	0.01
91	3	M1	1	0.046	0.406	0	0	0	-0.04
92			2	0.015	0.1	0	0	0	-0.815
93			3	-0.016	-0.205	0	0	0	-0.655
94			4	-0.047	-0.512	0	0	0	0.442
95			5	0.01	0.099	0	0	0	-0.015
96	3	M2	1	0.046	0.406	0	0	0	-0.04
97			2	0.015	0.1	0	0	0	-0.815
98			3	-0.016	-0.205	0	0	0	-0.655
99			4	-0.047	-0.512	0	0	0	0.442
100			5	0.01	0.099	0	0	0	-0.015
101	3	M5	1	3.028	0	-0.07	0	0.176	0
102			2	3.007	0	-0.07	0	0.044	0

Member Section Forces (Continued)

LC	Member Label	Sec	Axial [k]	y Shear [k]	z Shear [k]	Torque [k-ft]	y-y Moment...	z-z Moment...	
103		3	2.985	0	-0.07	0	-0.088	0	
104		4	2.963	0	-0.07	0	-0.219	0	
105		5	2.941	0	-0.07	0	-0.351	0	
106	3	M6	1	3.028	0	-0.07	0	0.176	0
107		2	3.007	0	-0.07	0	0.044	0	
108		3	2.985	0	-0.07	0	-0.088	0	
109		4	2.963	0	-0.07	0	-0.219	0	
110		5	2.941	0	-0.07	0	-0.351	0	
111	3	M5A	1	0	0.1	0	0.015	0	0
112		2	0	0.09	0	0.015	-0.002	-0.342	
113		3	-0.001	0	0	0	-0.002	-0.396	
114		4	0	-0.09	0	-0.015	-0.002	-0.342	
115		5	0	-0.1	0	-0.015	0	0	
116	3	M6A	1	0	0.003	0	-0.04	0	0
117		2	0	-0.007	0	-0.04	0	0.008	
118		3	0	0	0	0	0	-0.007	
119		4	0	0.007	0	0.04	0	0.008	
120		5	0	-0.003	0	0.04	0	0	
121	3	M7	1	0	1.986	0.065	-0.016	0	0
122		2	0	1.896	0.065	-0.016	0.234	-6.987	
123		3	0.001	0	0	0	0.256	-7.863	
124		4	0	-1.896	-0.065	0.016	0.234	-6.987	
125		5	0	-1.986	-0.065	0.016	0	0	
126	3	M8	1	0.18	1.13	0	0.004	0	0.04
127		2	0.106	0.4	0	0.004	0	-2.306	
128		3	0.033	-0.33	0	0.004	0	-2.413	
129		4	-0.042	-1.065	0	0.004	0	-0.281	
130		5	-0.008	-0.08	0.001	-0.004	0	0.015	
131	3	M9	1	0.18	1.13	0	-0.004	0	0.04
132		2	0.106	0.4	0	-0.004	0	-2.306	
133		3	0.033	-0.33	0	-0.004	0	-2.413	
134		4	-0.042	-1.065	0	-0.004	0	-0.281	
135		5	-0.008	-0.08	-0.001	0.004	0	0.015	

Maximum Member Section Forces

LC	Memb...		Axial [k]	Loc [ft]	y She...	Loc [ft]	z She...	Loc [ft]	Torque...	Loc [ft]	y-y Mo...	Loc [ft]	z-z Mo...	Loc [ft]	
1	1	M1	max	0.018	0	0.17	0	12.262	0	12.262	0	12.262	0.337	9.835	
2			min	-0.023	9.835	-0.243	9.835	0	0	0	0	9.963	-0.36	4.087	
3	1	M2	max	0.018	0	0.17	0	9.835	0	12.262	0	9.963	0.337	9.835	
4			min	-0.023	9.835	-0.243	9.835	0	9.963	0	0	0	-0.36	4.087	
5	1	M5	max	1.337	0	0	7.5	-0.028	7.5	0	7.5	0.071	0	7.5	
6			min	1.249	7.5	0	0	-0.028	0	0	0	-0.142	7.5	0	
7	1	M6	max	1.337	0	0	7.5	-0.028	7.5	0	7.5	0.071	0	0	
8			min	1.249	7.5	0	0	-0.028	0	0	0	-0.142	7.5	7.5	
9	1	M5A	max	0	14.4	0.047	0	14.4	0.005	3.9	0	14.4	0	14.4	
10			min	0	4.05	-0.047	14.4	0	-0.005	10.5	0	4.05	-0.181	7.2	
11	1	M6A	max	0	14.4	0.008	4.05	0	3.9	0.015	14.4	0	3.9	0.008	10.5
12			min	0	0	-0.008	10.35	0	10.5	-0.015	0	0	4.05	-0.006	7.2
13	1	M7	max	0	10.35	0.846	0	0.027	3.9	0.005	14.4	0.107	10.35	0	14.4
14			min	0	0	-0.846	14.4	-0.027	10.5	-0.005	0	0	0	-3.308	7.2
15	1	M8	max	0.07	0	0.418	0	12.262	0.002	9.835	0	9.835	0.21	9.963	
16			min	-0.018	9.835	-0.452	9.835	0	0	-0.001	9.963	-0.001	9.963	-0.977	4.726
17	1	M9	max	0.07	0	0.418	0	9.835	0.001	12.262	0.001	9.963	0.21	9.963	
18			min	-0.018	9.835	-0.452	9.835	0	9.963	-0.002	0	0	9.835	-0.977	4.726
19	2	M1	max	0.027	0	0.235	0	12.262	0	12.262	0	12.262	0.453	9.835	
20			min	-0.03	9.835	-0.336	9.835	0	0	0	0	9.963	-0.505	4.087	
21	2	M2	max	0.027	0	0.235	0	9.835	0	12.262	0	9.963	0.453	9.835	
22			min	-0.03	9.835	-0.336	9.835	0	9.963	0	0	0	-0.505	4.087	
23	2	M5	max	1.692	7.5	0	7.5	-0.042	7.5	0	7.5	0.105	0	7.5	
24			min	1.692	0	0	0	-0.042	0	0	0	-0.209	7.5	0	
25	2	M6	max	1.692	7.5	0	7.5	-0.042	7.5	0	7.5	0.105	0	0	

Maximum Member Section Forces (Continued)

LC	Membr...		Axial [k]	Loc [ft]	y Shear...	Loc [ft]	z Shear...	Loc [ft]	Torque...	Loc [ft]	y-y Mo...	Loc [ft]	z-z Mo...	Loc [ft]	
26		min	1.692	0	0	0	-0.042	0	0	0	-0.209	7.5	0	7.5	
27	2	M5A	max	0	14.4	0.053	3.9	0	14.4	0.01	3.9	0	14.4	0	14.4
28		min	0	4.05	-0.053	10.5	0	0	-0.01	10.5	0	4.05	-0.215	4.05	
29	2	M6A	max	0	14.4	0	14.4	0	3.9	0.025	14.4	0	3.9	0.002	10.5
30		min	0	0	0	0	0	10.5	-0.025	0	0	4.05	0	10.05	
31	2	M7	max	0	10.35	1.14	3.9	0.038	3.9	0.011	14.4	0.149	10.35	0	14.4
32		min	0	0	-1.14	10.5	-0.038	10.5	-0.011	0	0	0	-4.555	4.05	
33	2	M8	max	0.11	0	0.712	0	0	12.262	0.003	9.835	0	9.835	0.358	9.963
34		min	-0.04	9.835	-0.772	9.835	0	0	-0.003	9.963	-0.002	9.963	-1.665	4.726	
35	2	M9	max	0.11	0	0.712	0	0	9.835	0.003	12.262	0.002	9.963	0.358	9.963
36		min	-0.04	9.835	-0.772	9.835	0	9.963	-0.003	0	0	9.835	-1.665	4.726	
37	3	M1	max	0.046	0	0.406	0	0	12.262	0	12.262	0	12.262	0.79	9.835
38		min	-0.054	9.835	-0.579	9.835	0	0	0	0	0	9.963	-0.865	4.087	
39	3	M2	max	0.046	0	0.406	0	0	9.835	0	12.262	0	9.963	0.79	9.835
40		min	-0.054	9.835	-0.579	9.835	0	9.963	0	0	0	0	-0.865	4.087	
41	3	M5	max	3.028	0	0	7.5	-0.07	7.5	0	7.5	0.176	0	0	7.5
42		min	2.941	7.5	0	0	0	-0.07	0	0	0	-0.351	7.5	0	0
43	3	M6	max	3.028	0	0	7.5	-0.07	7.5	0	7.5	0.176	0	0	0
44		min	2.941	7.5	0	0	0	-0.07	0	0	0	-0.351	7.5	0	7.5
45	3	M5A	max	0	14.4	0.1	0	0	14.4	0.015	3.9	0	14.4	0	14.4
46		min	-0.001	4.05	-0.1	14.4	0	0	-0.015	10.5	-0.002	4.05	-0.396	7.2	
47	3	M6A	max	0	14.4	0.008	4.05	0	3.9	0.04	14.4	0	3.9	0.01	10.5
48		min	0	0	-0.008	10.35	0	10.5	-0.04	0	0	4.05	-0.007	7.2	
49	3	M7	max	0.001	10.35	1.986	0	0.065	3.9	0.016	14.4	0.256	10.35	0	14.4
50		min	0	0	-1.986	14.4	-0.065	10.5	-0.016	0	0	0	-7.863	7.2	
51	3	M8	max	0.18	0	1.13	0	0.001	12.262	0.004	9.835	0	9.835	0.569	9.963
52		min	-0.058	9.835	-1.224	9.835	0	0	-0.004	9.963	-0.003	9.963	-2.642	4.726	
53	3	M9	max	0.18	0	1.13	0	0	9.835	0.004	12.262	0.003	9.963	0.569	9.963
54		min	-0.058	9.835	-1.224	9.835	-0.001	9.963	-0.004	0	0	9.835	-2.642	4.726	

Member End Reactions

	LC	Member Label	Member End	Axial [k]	y Shear [k]	z Shear [k]	Torque [k-ft]	y-y Moment...	z-z Moment...
1	1	M1	I	0.018	0.17	0	0	0	-0.015
2			J	0.005	0.047	0	0	0	-0.005
3	1	M2	I	0.018	0.17	0	0	0	-0.015
4			J	0.005	0.047	0	0	0	-0.005
5	1	M5	I	1.337	0	-0.028	0	0.071	0
6			J	1.249	0	-0.028	0	-0.142	0
7	1	M6	I	1.337	0	-0.028	0	0.071	0
8			J	1.249	0	-0.028	0	-0.142	0
9	1	M5A	I	0	0.047	0	0.005	0	0
10			J	0	-0.047	0	-0.005	0	0
11	1	M6A	I	0	0.003	0	-0.015	0	0
12			J	0	-0.003	0	0.015	0	0
13	1	M7	I	0	0.846	0.027	-0.005	0	0
14			J	0	-0.846	-0.027	0.005	0	0
15	1	M8	I	0.07	0.418	0	0.002	0	0.015
16			J	-0.003	-0.028	0	-0.001	0	0.005
17	1	M9	I	0.07	0.418	0	-0.002	0	0.015
18			J	-0.003	-0.028	0	0.001	0	0.005
19	2	M1	I	0.027	0.235	0	0	0	-0.025
20			J	0.005	0.053	0	0	0	-0.01
21	2	M2	I	0.027	0.235	0	0	0	-0.025
22			J	0.005	0.053	0	0	0	-0.01
23	2	M5	I	1.692	0	-0.042	0	0.105	0
24			J	1.692	0	-0.042	0	-0.209	0
25	2	M6	I	1.692	0	-0.042	0	0.105	0
26			J	1.692	0	-0.042	0	-0.209	0
27	2	M5A	I	0	0.053	0	0.01	0	0
28			J	0	-0.053	0	-0.01	0	0
29	2	M6A	I	0	0	0	-0.025	0	0

Member End Reactions (Continued)

	LC	Member Label	Member End	Axial [k]	y Shear [k]	z Shear [k]	Torque [k-ft]	y-y Moment...	z-z Moment...
30			J	0	0	0	0.025	0	0
31	2	M7	I	0	1.14	0.038	-0.011	0	0
32			J	0	-1.14	-0.038	0.011	0	0
33	2	M8	I	0.11	0.712	0	0.003	0	0.025
34			J	-0.005	-0.053	0	-0.003	0	0.01
35	2	M9	I	0.11	0.712	0	-0.003	0	0.025
36			J	-0.005	-0.053	0	0.003	0	0.01
37	3	M1	I	0.046	0.406	0	0	0	-0.04
38			J	0.01	0.099	0	0	0	-0.015
39	3	M2	I	0.046	0.406	0	0	0	-0.04
40			J	0.01	0.099	0	0	0	-0.015
41	3	M5	I	3.028	0	-0.07	0	0.176	0
42			J	2.941	0	-0.07	0	-0.351	0
43	3	M6	I	3.028	0	-0.07	0	0.176	0
44			J	2.941	0	-0.07	0	-0.351	0
45	3	M5A	I	0	0.1	0	0.015	0	0
46			J	0	-0.1	0	-0.015	0	0
47	3	M6A	I	0	0.003	0	-0.04	0	0
48			J	0	-0.003	0	0.04	0	0
49	3	M7	I	0	1.986	0.065	-0.016	0	0
50			J	0	-1.986	-0.065	0.016	0	0
51	3	M8	I	0.18	1.13	0	0.004	0	0.04
52			J	-0.008	-0.08	0.001	-0.004	0	0.015
53	3	M9	I	0.18	1.13	0	-0.004	0	0.04
54			J	-0.008	-0.08	-0.001	0.004	0	0.015

Torsion

	LC	Member Label	Sec	Torque [k-ft]	Shear [ksi]	y Warp She...	z Warp She...	z-Top Warp...	z-Bot Warp...
1	1	M1	1	0	0	0	0	0	0
2			2	0	0	0	0	0	0
3			3	0	0	0	0	0	0
4			4	0	0	0	0	0	0
5			5	0	0	0	0	0	0
6	1	M2	1	0	0	0	0	0	0
7			2	0	0	0	0	0	0
8			3	0	0	0	0	0	0
9			4	0	0	0	0	0	0
10			5	0	0	0	0	0	0
11	1	M5	1	0	0	NC	NC	NC	NC
12			2	0	0	NC	NC	NC	NC
13			3	0	0	NC	NC	NC	NC
14			4	0	0	NC	NC	NC	NC
15			5	0	0	NC	NC	NC	NC
16	1	M6	1	0	0	NC	NC	NC	NC
17			2	0	0	NC	NC	NC	NC
18			3	0	0	NC	NC	NC	NC
19			4	0	0	NC	NC	NC	NC
20			5	0	0	NC	NC	NC	NC
21	1	M5A	1	0.005	0.012	NC	NC	NC	NC
22			2	0.005	0.012	NC	NC	NC	NC
23			3	0	0	NC	NC	NC	NC
24			4	-0.005	-0.012	NC	NC	NC	NC
25			5	-0.005	-0.012	NC	NC	NC	NC
26	1	M6A	1	-0.015	-0.037	NC	NC	NC	NC
27			2	-0.015	-0.037	NC	NC	NC	NC
28			3	0	0	NC	NC	NC	NC
29			4	0.015	0.037	NC	NC	NC	NC
30			5	0.015	0.037	NC	NC	NC	NC
31	1	M7	1	-0.005	-0.061	NC	NC	NC	NC
32			2	-0.005	-0.061	NC	NC	NC	NC
33			3	0	0	NC	NC	NC	NC

Torsion (Continued)

	LC	Member Label	Sec	Torque [k-ft]	Shear [ksi]	y Warp She...	z Warp She...	z-Top Warp...	z-Bot Warp...
34			4	0.005	0.061	NC	NC	NC	NC
35			5	0.005	0.061	NC	NC	NC	NC
36	1	M8	1	0.002	0	0	0.006	0.093	0.093
37			2	0.002	0.045	0	0	0.009	0.009
38			3	0.002	0.049	0	0	0	0
39			4	0.002	0.045	0	0	-0.009	-0.009
40			5	-0.001	0	0	-0.005	0.07	0.07
41	1	M9	1	-0.002	0	0	-0.006	-0.093	-0.093
42			2	-0.002	-0.045	0	0	-0.009	-0.009
43			3	-0.002	-0.049	0	0	0	0
44			4	-0.002	-0.045	0	0	0.009	0.009
45			5	0.001	0	0	0.005	-0.07	-0.07
46	2	M1	1	0	0	0	0	0	0
47			2	0	0	0	0	0	0
48			3	0	0	0	0	0	0
49			4	0	0	0	0	0	0
50			5	0	0	0	0	0	0
51	2	M2	1	0	0	0	0	0	0
52			2	0	0	0	0	0	0
53			3	0	0	0	0	0	0
54			4	0	0	0	0	0	0
55			5	0	0	0	0	0	0
56	2	M5	1	0	0	NC	NC	NC	NC
57			2	0	0	NC	NC	NC	NC
58			3	0	0	NC	NC	NC	NC
59			4	0	0	NC	NC	NC	NC
60			5	0	0	NC	NC	NC	NC
61	2	M6	1	0	0	NC	NC	NC	NC
62			2	0	0	NC	NC	NC	NC
63			3	0	0	NC	NC	NC	NC
64			4	0	0	NC	NC	NC	NC
65			5	0	0	NC	NC	NC	NC
66	2	M5A	1	0.01	0.026	NC	NC	NC	NC
67			2	0.01	0.026	NC	NC	NC	NC
68			3	0	0	NC	NC	NC	NC
69			4	-0.01	-0.026	NC	NC	NC	NC
70			5	-0.01	-0.026	NC	NC	NC	NC
71	2	M6A	1	-0.025	-0.063	NC	NC	NC	NC
72			2	-0.025	-0.063	NC	NC	NC	NC
73			3	0	0	NC	NC	NC	NC
74			4	0.025	0.063	NC	NC	NC	NC
75			5	0.025	0.063	NC	NC	NC	NC
76	2	M7	1	-0.011	-0.134	NC	NC	NC	NC
77			2	-0.011	-0.134	NC	NC	NC	NC
78			3	0	0	NC	NC	NC	NC
79			4	0.011	0.134	NC	NC	NC	NC
80			5	0.011	0.134	NC	NC	NC	NC
81	2	M8	1	0.003	0	0	0.009	0.13	0.13
82			2	0.003	0.063	0	0	0.012	0.012
83			3	0.003	0.068	0	0	0	0
84			4	0.003	0.063	0	0	-0.012	-0.012
85			5	-0.003	0	0	-0.01	0.156	0.156
86	2	M9	1	-0.003	0	0	-0.009	-0.13	-0.13
87			2	-0.003	-0.063	0	0	-0.012	-0.012
88			3	-0.003	-0.068	0	0	0	0
89			4	-0.003	-0.063	0	0	0.012	0.012
90			5	0.003	0	0	0.01	-0.156	-0.156
91	3	M1	1	0	0	0	0	0	0
92			2	0	0	0	0	0	0
93			3	0	0	0	0	0	0
94			4	0	0	0	0	0	0
95			5	0	0	0	0	0	0

Torsion (Continued)

	LC	Member Label	Sec	Torque [k-ft]	Shear [ksi]	y Warp She...	z Warp She...	z-Top Warp...	z-Bot Warp...
96	3	M2	1	0	0	0	0	0	0
97			2	0	0	0	0	0	0
98			3	0	0	0	0	0	0
99			4	0	0	0	0	0	0
100			5	0	0	0	0	0	0
101	3	M5	1	0	0	NC	NC	NC	NC
102			2	0	0	NC	NC	NC	NC
103			3	0	0	NC	NC	NC	NC
104			4	0	0	NC	NC	NC	NC
105			5	0	0	NC	NC	NC	NC
106	3	M6	1	0	0	NC	NC	NC	NC
107			2	0	0	NC	NC	NC	NC
108			3	0	0	NC	NC	NC	NC
109			4	0	0	NC	NC	NC	NC
110			5	0	0	NC	NC	NC	NC
111	3	M5A	1	0.015	0.038	NC	NC	NC	NC
112			2	0.015	0.038	NC	NC	NC	NC
113			3	0	0	NC	NC	NC	NC
114			4	-0.015	-0.038	NC	NC	NC	NC
115			5	-0.015	-0.038	NC	NC	NC	NC
116	3	M6A	1	-0.04	-0.101	NC	NC	NC	NC
117			2	-0.04	-0.101	NC	NC	NC	NC
118			3	0	0	NC	NC	NC	NC
119			4	0.04	0.101	NC	NC	NC	NC
120			5	0.04	0.101	NC	NC	NC	NC
121	3	M7	1	-0.016	-0.195	NC	NC	NC	NC
122			2	-0.016	-0.195	NC	NC	NC	NC
123			3	0	0	NC	NC	NC	NC
124			4	0.016	0.195	NC	NC	NC	NC
125			5	0.016	0.195	NC	NC	NC	NC
126	3	M8	1	0.004	0	0	0.015	0.223	0.223
127			2	0.004	0.108	0	0.001	0.021	0.021
128			3	0.004	0.117	0	0	0	0
129			4	0.004	0.108	0	0.001	-0.021	-0.021
130			5	-0.004	0	0	-0.015	0.227	0.227
131	3	M9	1	-0.004	0	0	-0.015	-0.223	-0.223
132			2	-0.004	-0.108	0	-0.001	-0.021	-0.021
133			3	-0.004	-0.117	0	0	0	0
134			4	-0.004	-0.108	0	-0.001	0.021	0.021
135			5	0.004	0	0	0.015	-0.227	-0.227

Member Section Stresses

	LC	Member L...	Sec	Axial [ksi]	y Shear [ksi]	z Shear [ksi]	y top Bend...	y bot Bend...	z top Bend...	z bot Bend...
1	1	M1	1	0.005	0.146	0	0.033	-0.033	0	0
2			2	0.001	0.036	0	0.75	-0.75	0	0
3			3	-0.002	-0.074	0	0.599	-0.599	0	0
4			4	-0.005	-0.185	0	-0.421	0.421	0	0
5			5	0.001	0.04	0	0.011	-0.011	0	0
6	1	M2	1	0.005	0.146	0	0.033	-0.033	0	0
7			2	0.001	0.036	0	0.75	-0.75	0	0
8			3	-0.002	-0.074	0	0.599	-0.599	0	0
9			4	-0.005	-0.185	0	-0.421	0.421	0	0
10			5	0.001	0.04	0	0.011	-0.011	0	0
11	1	M5	1	0.39	0	-0.017	0	0	0.287	-0.287
12			2	0.383	0	-0.017	0	0	0.072	-0.072
13			3	0.377	0	-0.017	0	0	-0.143	0.143
14			4	0.371	0	-0.017	0	0	-0.358	0.358
15			5	0.364	0	-0.017	0	0	-0.573	0.573
16	1	M6	1	0.39	0	-0.017	0	0	0.287	-0.287
17			2	0.383	0	-0.017	0	0	0.072	-0.072
18			3	0.377	0	-0.017	0	0	-0.143	0.143

Member Section Stresses (Continued)

	LC	Member L...	Sec	Axial [ksi]	y Shear [ksi]	z Shear [ksi]	y top Bend...	y bot Bend...	z top Bend...	z bot Bend...
19			4	0.371	0	-0.017	0	0	-0.358	0.358
20			5	0.364	0	-0.017	0	0	-0.573	0.573
21	1	M5A	1	0	0.006	0	0	0	0	0
22			2	0	0.005	0	0.138	-0.138	-0.003	0.003
23			3	0	0	0	0.165	-0.165	-0.003	0.003
24			4	0	-0.005	0	0.138	-0.138	-0.003	0.003
25			5	0	-0.006	0	0	0	0	0
26	1	M6A	1	0	0	0	0	0	0	0
27			2	0	0	0	-0.006	0.006	0	0
28			3	0	0	0	0.006	-0.006	0	0
29			4	0	0	0	-0.006	0.006	0	0
30			5	0	0	0	0	0	0	0
31	1	M7	1	0	0.414	0.005	0	0	0	0
32			2	0	0.37	0.005	2.067	-2.067	0.208	-0.208
33			3	0	0	0	2.371	-2.371	0.228	-0.228
34			4	0	-0.37	-0.005	2.067	-2.067	0.208	-0.208
35			5	0	-0.414	-0.005	0	0	0	0
36	1	M8	1	0.018	0.359	0	-0.033	0.033	0	0
37			2	0.011	0.127	0	1.883	-1.883	0	0
38			3	0.004	-0.105	0	1.971	-1.971	0	0
39			4	-0.003	-0.338	0	0.23	-0.23	0.002	-0.002
40			5	0	-0.024	0	-0.011	0.011	0	0
41	1	M9	1	0.018	0.359	0	-0.033	0.033	0	0
42			2	0.011	0.127	0	1.883	-1.883	0	0
43			3	0.004	-0.105	0	1.971	-1.971	0	0
44			4	-0.003	-0.338	0	0.23	-0.23	-0.002	0.002
45			5	0	-0.024	0	-0.011	0.011	0	0
46	2	M1	1	0.007	0.202	0	0.055	-0.055	0	0
47			2	0.002	0.05	0	1.05	-1.05	0	0
48			3	-0.002	-0.102	0	0.847	-0.847	0	0
49			4	-0.007	-0.255	0	-0.556	0.556	0	0
50			5	0.001	0.045	0	0.023	-0.023	0	0
51	2	M2	1	0.007	0.202	0	0.055	-0.055	0	0
52			2	0.002	0.05	0	1.05	-1.05	0	0
53			3	-0.002	-0.102	0	0.847	-0.847	0	0
54			4	-0.007	-0.255	0	-0.556	0.556	0	0
55			5	0.001	0.045	0	0.023	-0.023	0	0
56	2	M5	1	0.493	0	-0.024	0	0	0.423	-0.423
57			2	0.493	0	-0.024	0	0	0.106	-0.106
58			3	0.493	0	-0.024	0	0	-0.211	0.211
59			4	0.493	0	-0.024	0	0	-0.529	0.529
60			5	0.493	0	-0.024	0	0	-0.846	0.846
61	2	M6	1	0.493	0	-0.024	0	0	0.423	-0.423
62			2	0.493	0	-0.024	0	0	0.106	-0.106
63			3	0.493	0	-0.024	0	0	-0.211	0.211
64			4	0.493	0	-0.024	0	0	-0.529	0.529
65			5	0.493	0	-0.024	0	0	-0.846	0.846
66	2	M5A	1	0	0.007	0	0	0	0	0
67			2	0	0.007	0	0.174	-0.174	-0.004	0.004
68			3	0	0	0	0.196	-0.196	-0.004	0.004
69			4	0	-0.007	0	0.174	-0.174	-0.004	0.004
70			5	0	-0.007	0	0	0	0	0
71	2	M6A	1	0	0	0	0	0	0	0
72			2	0	0	0	-0.001	0.001	0	0
73			3	0	0	0	0	0	0	0
74			4	0	0	0	-0.001	0.001	0	0
75			5	0	0	0	0	0	0	0
76	2	M7	1	0	0.558	0.007	0	0	0	0
77			2	0	0.558	0.007	2.942	-2.942	0.292	-0.292
78			3	0	0	0	3.265	-3.265	0.318	-0.318
79			4	0	-0.558	-0.007	2.942	-2.942	0.292	-0.292
80			5	0	-0.558	-0.007	0	0	0	0

Member Section Stresses (Continued)

	LC	Member L...	Sec	Axial [ksi]	y Shear [ksi]	z Shear [ksi]	y top Bend...	y bot Bend...	z top Bend...	z bot Bend...
81	2	M8	1	0.029	0.612	0	-0.055	0.055	-0.002	0.002
82			2	0.017	0.216	0	3.21	-3.21	0	0
83			3	0.005	-0.179	0	3.36	-3.36	0.001	-0.001
84			4	-0.008	-0.576	0	0.391	-0.391	0.003	-0.003
85			5	-0.001	-0.045	0	-0.023	0.023	0.002	-0.002
86	2	M9	1	0.029	0.612	0	-0.055	0.055	0.002	-0.002
87			2	0.017	0.216	0	3.21	-3.21	0	0
88			3	0.005	-0.179	0	3.36	-3.36	-0.001	0.001
89			4	-0.008	-0.576	0	0.391	-0.391	-0.003	0.003
90			5	-0.001	-0.045	0	-0.023	0.023	-0.002	0.002
91	3	M1	1	0.012	0.348	0	0.088	-0.088	0	0
92			2	0.004	0.086	0	1.8	-1.8	0	0
93			3	-0.004	-0.176	0	1.446	-1.446	0	0
94			4	-0.012	-0.44	0	-0.976	0.976	0	0
95			5	0.003	0.085	0	0.033	-0.033	0	0
96	3	M2	1	0.012	0.348	0	0.088	-0.088	0	0
97			2	0.004	0.086	0	1.8	-1.8	0	0
98			3	-0.004	-0.176	0	1.446	-1.446	0	0
99			4	-0.012	-0.44	0	-0.976	0.976	0	0
100			5	0.003	0.085	0	0.033	-0.033	0	0
101	3	M5	1	0.883	0	-0.041	0	0	0.71	-0.71
102			2	0.877	0	-0.041	0	0	0.178	-0.178
103			3	0.87	0	-0.041	0	0	-0.354	0.354
104			4	0.864	0	-0.041	0	0	-0.887	0.887
105			5	0.857	0	-0.041	0	0	-1.419	1.419
106	3	M6	1	0.883	0	-0.041	0	0	0.71	-0.71
107			2	0.877	0	-0.041	0	0	0.178	-0.178
108			3	0.87	0	-0.041	0	0	-0.354	0.354
109			4	0.864	0	-0.041	0	0	-0.887	0.887
110			5	0.857	0	-0.041	0	0	-1.419	1.419
111	3	M5A	1	0	0.014	0	0	0	0	0
112			2	0	0.012	0	0.312	-0.312	-0.007	0.007
113			3	0	0	0	0.361	-0.361	-0.007	0.007
114			4	0	-0.012	0	0.312	-0.312	-0.007	0.007
115			5	0	-0.014	0	0	0	0	0
116	3	M6A	1	0	0	0	0	0	0	0
117			2	0	0	0	-0.007	0.007	0	0
118			3	0	0	0	0.006	-0.006	0	0
119			4	0	0	0	-0.007	0.007	0	0
120			5	0	0	0	0	0	0	0
121	3	M7	1	0	0.973	0.012	0	0	0	0
122			2	0	0.929	0.012	5.009	-5.009	0.5	-0.5
123			3	0	0	0	5.637	-5.637	0.546	-0.546
124			4	0	-0.929	-0.012	5.009	-5.009	0.5	-0.5
125			5	0	-0.973	-0.012	0	0	0	0
126	3	M8	1	0.047	0.97	0	-0.088	0.088	-0.003	0.003
127			2	0.028	0.344	0	5.093	-5.093	0	0
128			3	0.008	-0.283	0	5.331	-5.331	0.002	-0.002
129			4	-0.011	-0.914	0	0.621	-0.621	0.005	-0.005
130			5	-0.002	-0.069	0	-0.033	0.033	0.003	-0.003
131	3	M9	1	0.047	0.97	0	-0.088	0.088	0.003	-0.003
132			2	0.028	0.344	0	5.093	-5.093	0	0
133			3	0.008	-0.283	0	5.331	-5.331	-0.002	0.002
134			4	-0.011	-0.914	0	0.621	-0.621	-0.005	0.005
135			5	-0.002	-0.069	0	-0.033	0.033	-0.003	0.003

Asd360

	LC	Member	Shape	UC Max	Loc [ft]	Shear...	Loc [ft]	Dir	Pnc/o...	Pnt/om...	Mnyy/o...	Mnzz/o...	Cb	Eqn
1	1	M1	W4X13	0.023	4.087	0.010	9.835	y	26.796	114.671	7.285	15.438	1.26	H1-1b
2	1	M2	W4X13	0.023	4.087	0.010	9.835	y	26.796	114.671	7.285	15.438	1.26	H1-1b
3	1	M5	PIPE ...	0.023	7.5	0.001	7.5		72.95	102.695	10.155	10.155	1	H1-1b

Asd360 (Continued)

	LC	Member	Shape	UC Max	Loc [ft]	Shear...	Loc [ft]	Dir	Pnc/o...	Pnt/om...	Mnyy/o...	Mnzz/o...	Cb	Eqn
4	1	M6	PIPE ...	0.023	7.5	0.001	7.5		72.95	102.695	10.155	10.155	1	H1-1b
5	1	M7	W6X25	0.086	7.2	0.024	14.4	y	86.09	219.76	21.357	40.868	1.066	H1-1b
6	1	M8	W4X13	0.063	4.726	0.022	9.835	y	26.796	114.671	7.285	15.669	1.375	H1-1b
7	1	M9	W4X13	0.063	4.726	0.022	9.835	y	26.796	114.671	7.285	15.669	1.375	H1-1b
8	2	M1	W4X13	0.033	4.087	0.014	9.835	y	26.796	114.671	7.285	15.543	1.268	H1-1b
9	2	M2	W4X13	0.033	4.087	0.014	9.835	y	26.796	114.671	7.285	15.543	1.268	H1-1b
10	2	M5	PIPE ...	0.032	7.5	0.001	7.5		72.95	102.695	10.155	10.155	1	H1-1b
11	2	M6	PIPE ...	0.032	7.5	0.001	7.5		72.95	102.695	10.155	10.155	1	H1-1b
12	2	M7	W6X25	0.120	10.35	0.035	14.4	y	86.09	219.76	21.357	40.259	1.05	H1-1b
13	2	M8	W4X13	0.107	4.726	0.036	9.835	y	26.796	114.671	7.285	15.669	1.375	H1-1b
14	2	M9	W4X13	0.107	4.726	0.036	9.835	y	26.796	114.671	7.285	15.669	1.375	H1-1b
15	3	M1	W4X13	0.056	4.087	0.025	9.835	y	26.796	114.671	7.285	15.499	1.265	H1-1b
16	3	M2	W4X13	0.056	4.087	0.025	9.835	y	26.796	114.671	7.285	15.499	1.265	H1-1b
17	3	M5	PIPE ...	0.055	7.5	0.002	7.5		72.95	102.695	10.155	10.155	1	H1-1b
18	3	M6	PIPE ...	0.055	7.5	0.002	7.5		72.95	102.695	10.155	10.155	1	H1-1b
19	3	M7	W6X25	0.206	7.2	0.058	14.4	y	86.09	219.76	21.357	40.513	1.056	H1-1b
20	3	M8	W4X13	0.170	4.726	0.058	9.835	y	26.796	114.671	7.285	15.669	1.375	H1-1b
21	3	M9	W4X13	0.170	4.726	0.058	9.835	y	26.796	114.671	7.285	15.669	1.375	H1-1b

Warning Log

No Data to Print...

Member Section Deflections Strength

	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate [rad]	(n) L/y' Ratio	(n) L/z' Ratio
1	1	M1	1	0	0	0	0	NC	NC
2			2	0	-0.019	0	0	7345	NC
3			3	0	-0.019	0	0	6985	NC
4			4	0	-0.005	0	0	NC	NC
5			5	0	0.004	0	0	NC	NC
6	1	M2	1	0	0	0	0	NC	NC
7			2	0	-0.019	0	0	7345	NC
8			3	0	-0.019	0	0	6985	NC
9			4	0	-0.005	0	0	NC	NC
10			5	0	0.004	0	0	NC	NC
11	1	M5	1	0	0	0	0	NC	NC
12			2	0	0	0.001	0	NC	NC
13			3	0	0	0.003	0	NC	NC
14			4	-0.001	0	0.004	0	NC	NC
15			5	-0.001	0	0	0	NC	NC
16	1	M6	1	0	0	0	0	NC	NC
17			2	0	0	0.001	0	NC	NC
18			3	0	0	0.003	0	NC	NC
19			4	-0.001	0	0.004	0	NC	NC
20			5	-0.001	0	0	0	NC	NC
21	1	M5A	1	0	0.004	0	-1.615e-04	NC	NC
22			2	0	-0.059	0.006	-7.106e-04	2751	NC
23			3	0	-0.084	0.008	-7.717e-04	1976	NC
24			4	0	-0.059	0.006	-7.106e-04	2751	NC
25			5	0	0.004	0	-1.615e-04	NC	NC
26	1	M6A	1	0	0	0	6.545e-04	NC	NC
27			2	0	0	0	2.303e-03	NC	NC
28			3	0	0	0	2.486e-03	NC	NC
29			4	0	0	0	2.303e-03	NC	NC
30			5	0	0	0	6.545e-04	NC	NC
31	1	M7	1	0	-0.001	0	2.773e-04	NC	NC
32			2	0	-0.079	-0.008	7.961e-04	2215	NC
33			3	0	-0.109	-0.011	8.538e-04	1602	NC
34			4	0	-0.079	-0.008	7.961e-04	2215	NC
35			5	0	-0.001	0	2.773e-04	NC	NC
36	1	M8	1	0	0	0	-9.447e-06	NC	NC
37			2	0	-0.081	0	-3.827e-04	2277	NC

Member Section Deflections Strength (Continued)

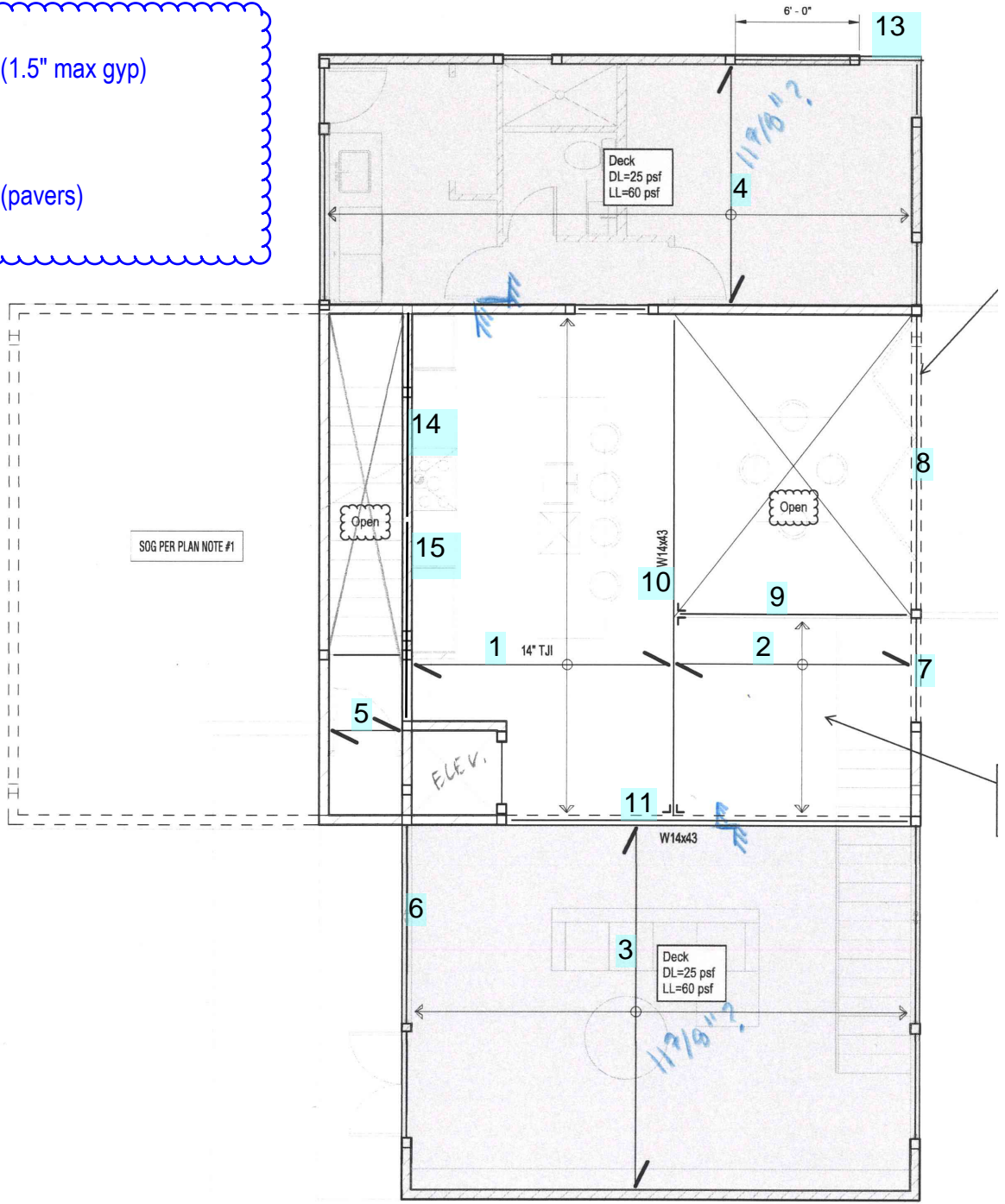
	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate [rad]	(n) L/y' Ratio	(n) L/z' Ratio
38			3	0	-0.113	0	-7.559e-04	1823	NC
39			4	0	-0.094	0	-1.129e-03	3214	NC
40			5	0	-0.065	0	-1.007e-03	2278	NC
41	1	M9	1	0	0	0	9.447e-06	NC	NC
42			2	0	-0.081	0	3.827e-04	2277	NC
43			3	0	-0.113	0	7.559e-04	1823	NC
44			4	0	-0.094	0	1.129e-03	3214	NC
45			5	0	-0.065	0	1.007e-03	2278	NC
46	2	M1	1	0	0	0	0	NC	NC
47			2	0	-0.027	0	0	5170	NC
48			3	0	-0.027	0	0	4862	NC
49			4	0	-0.006	0	0	NC	NC
50			5	0	0.006	0	0	NC	NC
51	2	M2	1	0	0	0	0	NC	NC
52			2	0	-0.027	0	0	5170	NC
53			3	0	-0.027	0	0	4862	NC
54			4	0	-0.006	0	0	NC	NC
55			5	0	0.006	0	0	NC	NC
56	2	M5	1	0	0	0	0	NC	NC
57			2	0	0	0.002	0	NC	NC
58			3	0	0	0.005	0	NC	NC
59			4	-0.001	0	0.005	4.029e-08	NC	NC
60			5	-0.002	0	0	5.372e-08	NC	NC
61	2	M6	1	0	0	0	0	NC	NC
62			2	0	0	0.002	0	NC	NC
63			3	0	0	0.005	0	NC	NC
64			4	-0.001	0	0.005	-4.029e-08	NC	NC
65			5	-0.002	0	0	-5.372e-08	NC	NC
66	2	M5A	1	0	0.006	0	-2.673e-04	NC	NC
67			2	0	-0.071	0.007	-1.41e-03	2242	NC
68			3	0	-0.101	0.01	-1.537e-03	1617	NC
69			4	0	-0.071	0.007	-1.41e-03	2242	NC
70			5	0	0.006	0	-2.673e-04	NC	NC
71	2	M6A	1	0	0	0	9.218e-04	NC	NC
72			2	0	0	0	3.708e-03	NC	NC
73			3	0	0	0	4.018e-03	NC	NC
74			4	0	0	0	3.708e-03	NC	NC
75			5	0	0	0	9.218e-04	NC	NC
76	2	M7	1	0	-0.002	0	4.1e-04	NC	NC
77			2	0	-0.111	-0.011	1.55e-03	1582	NC
78			3	0	-0.153	-0.015	1.676e-03	1147	NC
79			4	0	-0.111	-0.011	1.55e-03	1582	NC
80			5	0	-0.002	0	4.1e-04	NC	NC
81	2	M8	1	0	0	0	-4.32e-06	NC	NC
82			2	0	-0.13	0	-5.277e-04	1335	NC
83			3	0	-0.176	0	-1.051e-03	1069	NC
84			4	0	-0.136	0	-1.574e-03	1885	NC
85			5	0	-0.078	0	-1.23e-03	1898	NC
86	2	M9	1	0	0	0	4.32e-06	NC	NC
87			2	0	-0.13	0	5.277e-04	1335	NC
88			3	0	-0.176	0	1.051e-03	1069	NC
89			4	0	-0.136	0	1.574e-03	1885	NC
90			5	0	-0.078	0	1.23e-03	1898	NC
91	3	M1	1	0	0	0	0	NC	NC
92			2	0	-0.046	0	0	3034	NC
93			3	0	-0.046	0	0	2866	NC
94			4	0	-0.011	0	0	7975	NC
95			5	0	0.01	0	0	NC	NC
96	3	M2	1	0	0	0	0	NC	NC
97			2	0	-0.046	0	0	3034	NC
98			3	0	-0.046	0	0	2866	NC
99			4	0	-0.011	0	0	7975	NC

Member Section Deflections Strength (Continued)

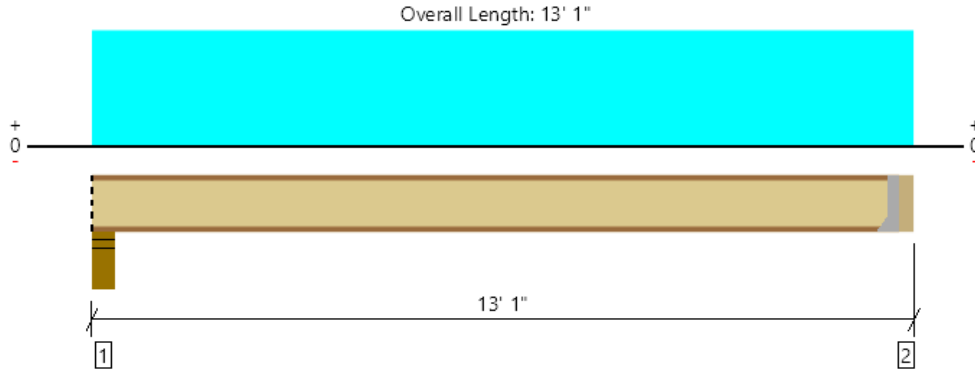
	LC	Member Label	Sec	x [in]	y [in]	z [in]	x Rotate [rad]	(n) L/y' Ratio	(n) L/z' Ratio
100			5	0	0.01	0	0	NC	NC
101	3	M5	1	0	0	0	0	NC	NC
102			2	0	0	0.003	0	NC	NC
103			3	-0.002	0	0.008	4.128e-08	NC	NC
104			4	-0.003	0	0.009	6.193e-08	NC	NC
105			5	-0.003	0	0	8.257e-08	NC	NC
106	3	M6	1	0	0	0	0	NC	NC
107			2	0	0	0.003	0	NC	NC
108			3	-0.002	0	0.008	-4.128e-08	NC	NC
109			4	-0.003	0	0.009	-6.193e-08	NC	NC
110			5	-0.003	0	0	-8.257e-08	NC	NC
111	3	M5A	1	0	0.01	0	-4.289e-04	NC	NC
112			2	0	-0.13	0.013	-2.121e-03	1235	NC
113			3	0	-0.184	0.018	-2.309e-03	889	8867
114			4	0	-0.13	0.013	-2.121e-03	1235	NC
115			5	0	0.01	0	-4.289e-04	NC	NC
116	3	M6A	1	0	0	0	1.576e-03	NC	NC
117			2	0	0	0	6.011e-03	NC	NC
118			3	0	0	0	6.504e-03	NC	NC
119			4	0	0	0	6.011e-03	NC	NC
120			5	0	0	0	1.576e-03	NC	NC
121	3	M7	1	0	-0.003	0	6.874e-04	NC	NC
122			2	0	-0.191	-0.019	2.346e-03	923	9167
123			3	0	-0.262	-0.026	2.53e-03	668	6626
124			4	0	-0.191	-0.019	2.346e-03	923	9167
125			5	0	-0.003	0	6.874e-04	NC	NC
126	3	M8	1	0	0	0	-1.377e-05	NC	NC
127			2	0	-0.21	0	-9.104e-04	842	NC
128			3	0	-0.289	0	-1.807e-03	674	NC
129			4	0	-0.23	0	-2.704e-03	1188	NC
130			5	0	-0.142	0	-2.238e-03	1035	NC
131	3	M9	1	0	0	0	1.377e-05	NC	NC
132			2	0	-0.21	0	9.104e-04	842	NC
133			3	0	-0.289	0	1.807e-03	674	NC
134			4	0	-0.23	0	2.704e-03	1188	NC
135			5	0	-0.142	0	2.238e-03	1035	NC

Upper Framing Key

- Floors
DL=28 psf (1.5" max gyp)
LL=40 psf
- Decks
DL=28 psf (pavers)
LL=60 psf



Upper Floor, J1
1 piece(s) 14" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	563 @ 12' 9 1/2"	910 (1.75")	Passed (62%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	563 @ 12' 9 1/2"	1860	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1747 @ 6' 7"	3740	Passed (47%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.074 @ 6' 7"	0.310	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.126 @ 6' 7"	0.621	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	65	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	5.50"	1.75"	246	351	597	Blocking
2 - Hanger on 14" HF beam	3.50"	Hanger ¹	1.75" / - ²	243	347	590	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.
- ² Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 9" o/c	
Bottom Edge (Lu)	12' 10" 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	IUS1.81/14	2.00"	N/A	12-10dx1.5	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 13' 1"	16"	28.0	40.0	Floor Load

Weyerhaeuser Notes

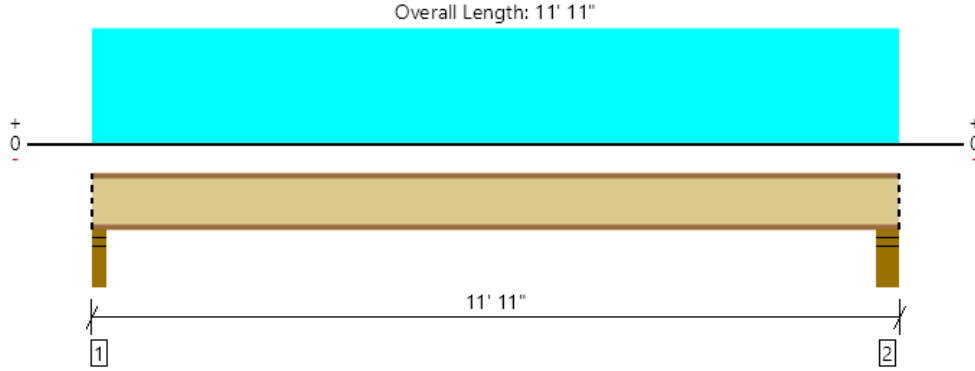
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, J2
1 piece(s) 14" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	548 @ 11' 6 1/2"	1375 (3.50")	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	506 @ 3 1/2"	1860	Passed (27%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1456 @ 5' 10 1/2"	3740	Passed (39%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.054 @ 5' 10 1/2"	0.283	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.091 @ 5' 10 1/2"	0.567	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	69	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	3.50"	3.50"	1.75"	219	313	532	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	226	322	548	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' 2" o/c	
Bottom Edge (Lu)	11' 11" o/c	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 11' 11"	16"	28.0	40.0	Floor Load

Weyerhaeuser Notes

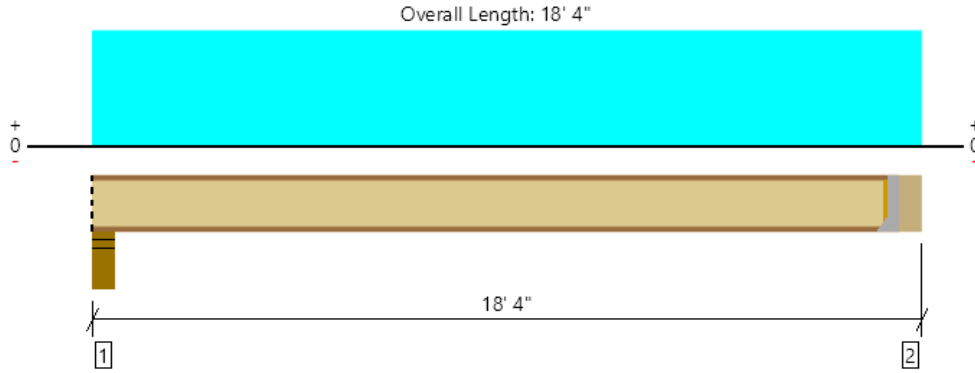
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, J3
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)	1027 @ 17' 10 1/2"	1080 (1.75")	Passed (95%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1027 @ 17' 10 1/2"	1705	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4492 @ 9' 1 1/2"	6180	Passed (73%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.395 @ 9' 1 1/2"	0.438	Passed (L/532)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.579 @ 9' 1 1/2"	0.875	Passed (L/363)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	51	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	5.50"	1.75"	341	730	1071	Blocking
2 - Hanger on 11 7/8" HF beam	5.50"	Hanger ¹	1.75" / - ²	344	737	1081	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.
- ² Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 3" o/c	
Bottom Edge (Lu)	17' 11" o/c	

- TJ1 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	U3516/20	2.00"	N/A	16-10dx1.5	6-10dx1.5	Web Stiffeners

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 18' 4"	16"	28.0	60.0	Deck Load

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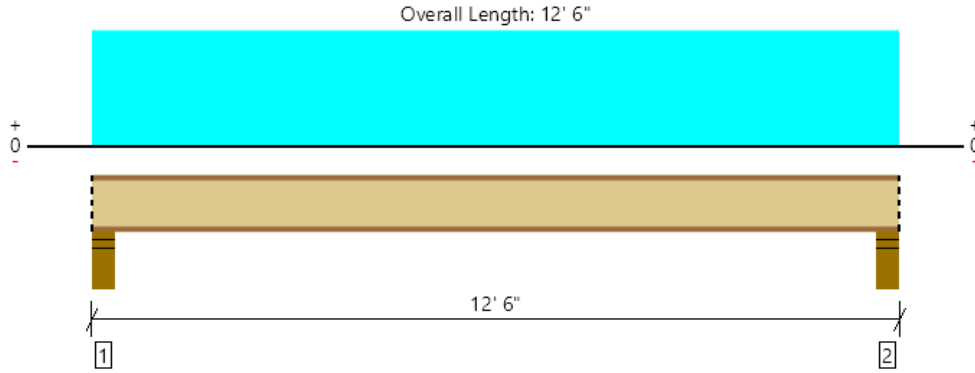
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, J4
1 piece(s) 11 7/8" TJI @ 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	733 @ 4 1/2"	1375 (3.50")	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	680 @ 5 1/2"	1560	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2025 @ 6' 3"	3160	Passed (64%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.127 @ 6' 3"	0.294	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.186 @ 6' 3"	0.587	Passed (L/757)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	66	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	5.50"	1.75"	233	500	733	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	233	500	733	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' 11" o/c	
Bottom Edge (Lu)	12' 6" 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 12' 6"	16"	28.0	60.0	Deck Load

Weyerhaeuser Notes

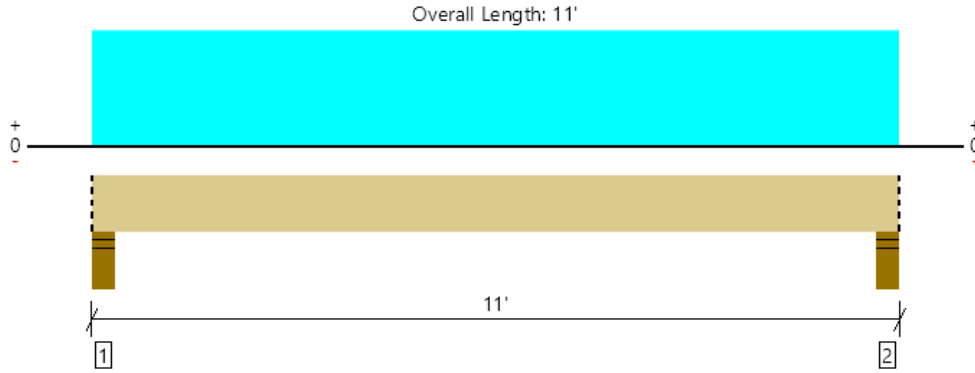
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B6
2 piece(s) 2 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	710 @ 4"	6683 (5.50")	Passed (11%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	573 @ 1' 3/4"	2501	Passed (23%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	1724 @ 5' 6"	2569	Passed (67%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.155 @ 5' 6"	0.258	Passed (L/798)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.268 @ 5' 6"	0.517	Passed (L/463)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

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

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

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	1.50"	298	220	330	848	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.50"	298	220	330	848	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' o/c	
Bottom Edge (Lu)	11' 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 11'	N/A	5.5	--	--	
1 - Uniform (PSF)	0 to 11' (Front)	8"	28.0	60.0	-	Deck Load
2 - Uniform (PSF)	0 to 11' (Front)	2'	15.0	-	30.0	Canopy

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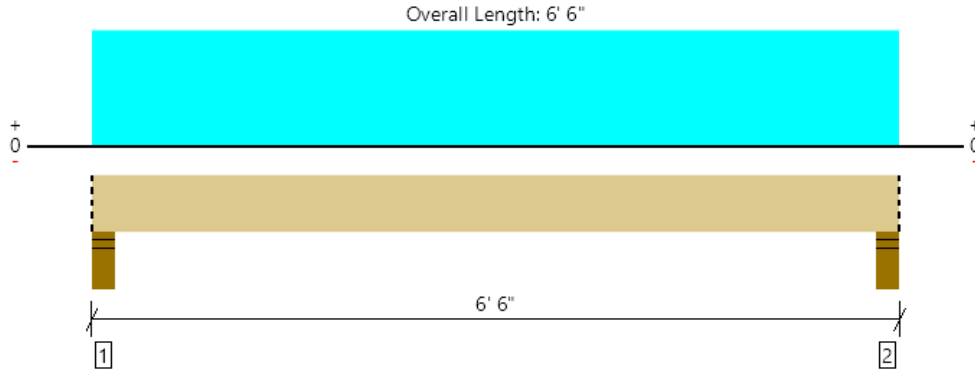
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B7
 1 piece(s) 3 1/2" x 11 7/8" 1.5E 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)	2882 @ 4"	7796 (5.50")	Passed (37%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1598 @ 1' 5 3/8"	9878	Passed (16%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	3772 @ 3' 3"	18346	Passed (21%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.025 @ 3' 3"	0.146	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.044 @ 3' 3"	0.292	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	5.50"	5.50"	2.03"	1260	775	1388	3423	Blocking
2 - Stud wall - HF	5.50"	5.50"	2.03"	1260	775	1388	3423	Blocking

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

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

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6' 6"	N/A	13.0	--	--	
1 - Uniform (PSF)	0 to 6' 6" (Front)	5' 11 1/2"	28.0	40.0	-	Deck Load
2 - Uniform (PLF)	0 to 6' 6" (Front)	N/A	181.5	-	362.5	Linked from: J2, Support 2
3 - Uniform (PLF)	0 to 6' 6" (Front)	N/A	26.5	-	64.5	Linked from: J4, Support 2

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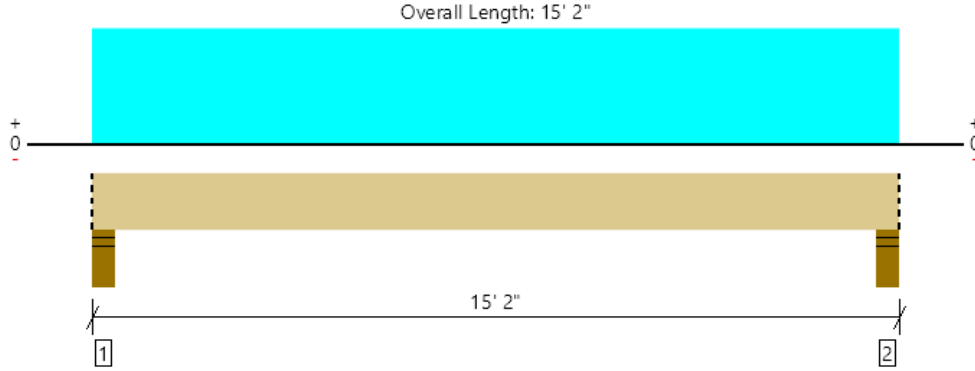
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bccq-se.com	



Upper Floor, B8
1 piece(s) 5 1/4" x 16" 2.2E 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)	5014 @ 4"	11694 (5.50")	Passed (43%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3830 @ 1' 9 1/2"	18676	Passed (21%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	17378 @ 7' 7"	60297	Passed (29%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.122 @ 7' 7"	0.290	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.188 @ 7' 7"	0.725	Passed (L/923)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/600) 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"	2.36"	1776	3238	5014	Blocking
2 - Stud wall - HF	5.50"	5.50"	2.36"	1776	3238	5014	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)	15' 2" o/c	
Bottom Edge (Lu)	15' 2" 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 15' 2"	N/A	26.3	--	
1 - Uniform (PLF)	0 to 15' 2" (Front)	N/A	181.5	362.5	Linked from: J2, Support 2
2 - Uniform (PLF)	0 to 15' 2" (Front)	N/A	26.5	64.5	Linked from: J4, Support 2

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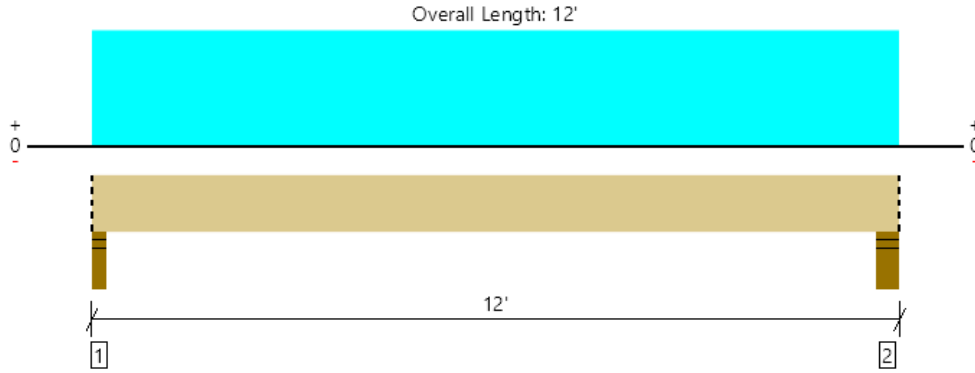
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B9
 1 piece(s) 3 1/2" x 14" 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)	627 @ 2"	4961 (3.50")	Passed (13%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	473 @ 1' 5 1/2"	10127	Passed (5%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1752 @ 5' 11"	21840	Passed (8%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.020 @ 5' 11"	0.287	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.039 @ 5' 11"	0.575	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 - Stud wall - HF	3.50"	3.50"	1.50"	312	316	628	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.50"	320	324	644	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' o/c	
Bottom Edge (Lu)	12' o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 12'	N/A	15.3	--	
1 - Uniform (PSF)	0 to 12' (Front)	1' 4"	28.0	40.0	Floor Load

Weyerhaeuser Notes

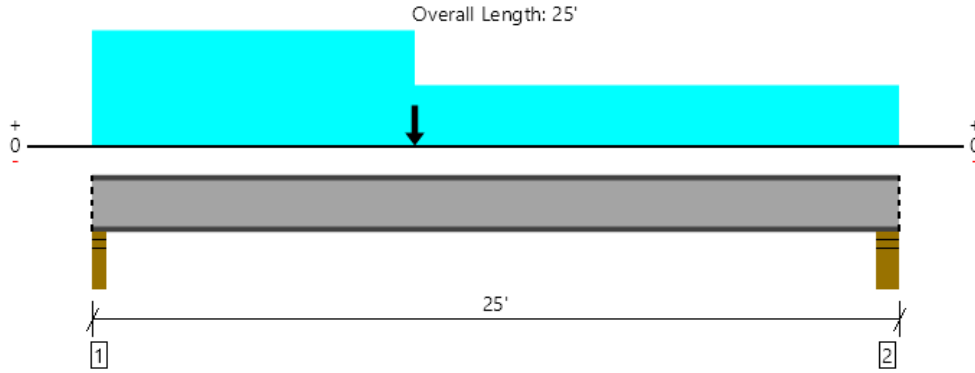
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B10
1 piece(s) W14X43 (A992) ASTM Steel



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)	9607 @ 2"	11340 (3.50")	Passed (85%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	9349 @ 3 1/2"	83570	Passed (11%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	50273 @ 10' 3 5/16"	82296	Passed (61%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.236 @ 12' 1 1/16"	0.613	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.433 @ 12' 1 1/4"	1.225	Passed (L/679)	--	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).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	3.50"	3.50"	3.50"	4302	5305	9607	Blocking
2 - Stud wall - HF	5.50"	5.50"	5.50"	3284	3865	7149	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)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 25'	N/A	43.0	--	
1 - Uniform (PLF)	0 to 10'	N/A	164.3	234.8	Linked from: J2, Support 1
2 - Uniform (PLF)	0 to 25'	N/A	182.3	260.3	Linked from: J1, Support 2
3 - Point (lb)	10'	N/A	312	316	Linked from: B9, Support 1

Weyerhaeuser Notes

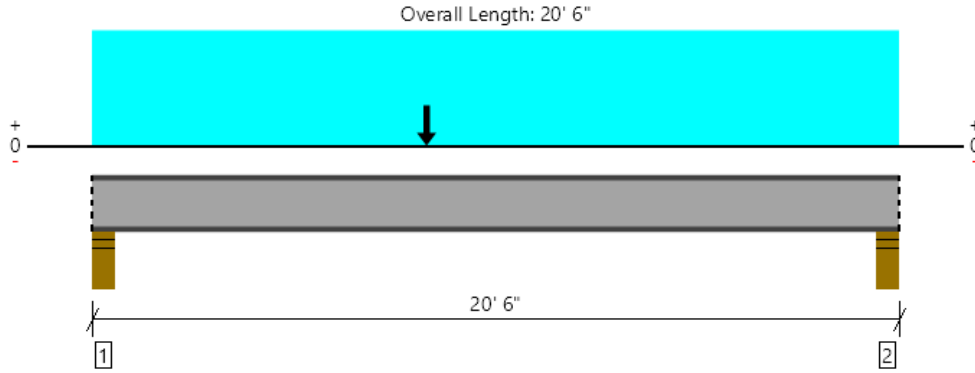
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B11
1 piece(s) W14X43 (A992) ASTM Steel



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)	16583 @ 4"	17820 (5.50")	Passed (93%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	16094 @ 5 1/2"	83570	Passed (19%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	96958 @ 8' 6"	110273	Passed (88%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.299 @ 10' 1/2"	0.496	Passed (L/796)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.507 @ 10' 5/16"	0.992	Passed (L/469)	--	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).
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	5.50"	6731	9851	728	17310	Blocking
2 - Stud wall - HF	5.50"	5.50"	5.50"	5972	8915	728	15615	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)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

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	43.0	--	--	
1 - Uniform (PSF)	0 to 20' 6"	2' 8"	28.0	40.0	-	Floor Load
2 - Uniform (PSF)	0 to 20' 6"	9' 2"	28.0	60.0	-	Deck Load
3 - Uniform (PLF)	0 to 20' 6"	N/A	35.5	-	71.0	Linked from: J3, Support 2
4 - Point (lb)	8' 6"	N/A	4302	5305	-	Linked from: B10, Support 1

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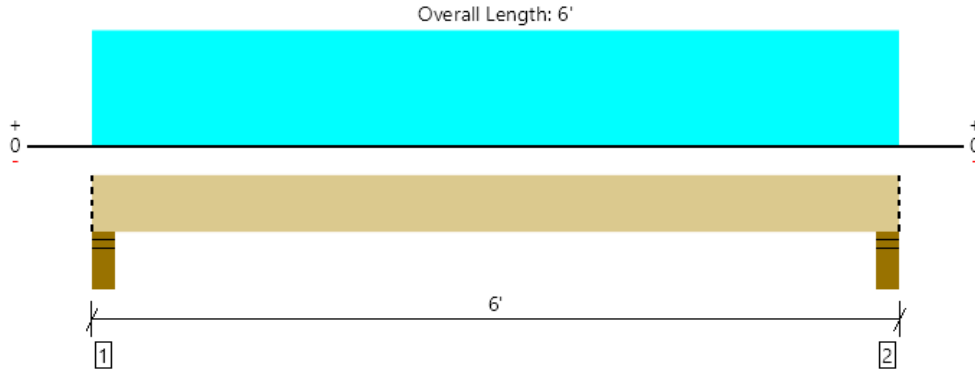
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B12
2 piece(s) 2 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	388 @ 4"	6683 (5.50")	Passed (6%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	250 @ 1' 3/4"	2501	Passed (10%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	459 @ 3'	2569	Passed (18%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.011 @ 3'	0.133	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.019 @ 3'	0.267	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.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	1.50"	163	120	180	463	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.50"	163	120	180	463	Blocking

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

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

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 6'	N/A	5.5	--	--	
1 - Uniform (PSF)	0 to 6' (Front)	8"	28.0	60.0	-	Deck Load
2 - Uniform (PSF)	0 to 6' (Front)	2'	15.0	-	30.0	

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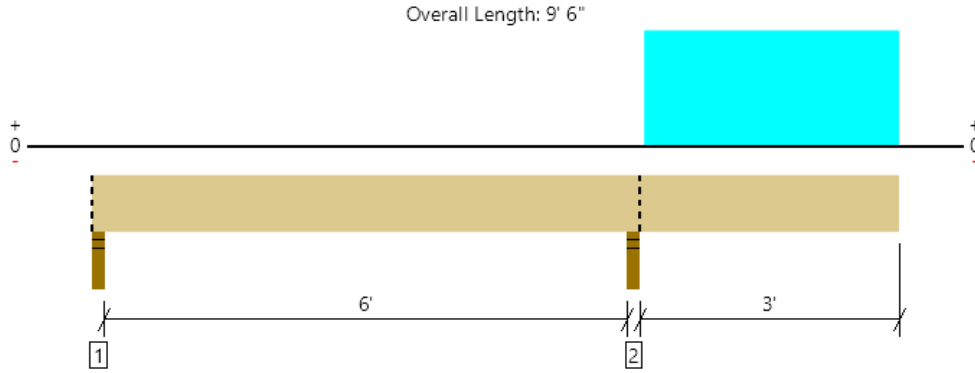
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B13 Corner Cantilever Rim Header
 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)	2087 @ 6' 4 1/2"	4253 (3.00")	Passed (49%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1088 @ 7' 5 7/8"	8590	Passed (13%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-2637 @ 6' 4 1/2"	15953	Passed (17%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.042 @ 9' 6"	0.200	Passed (2L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.062 @ 9' 6"	0.313	Passed (2L/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).
- Overhang deflection criteria: LL (2L/0.2") and TL (2L/240).
- Allowed moment does not reflect the adjustment for the beam stability factor.
- -380 lbs uplift at support located at 1 1/2". Strapping or other restraint may be required.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	3.00"	3.00"	1.50"	-99	-281	-380	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	726	1361	2087	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)	9' 6" o/c	
Bottom Edge (Lu)	9' 6" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 9' 6"	N/A	13.0	--	
1 - Uniform (PSF)	6' 6" to 9' 6" (Front)	6'	28.0	60.0	Deck

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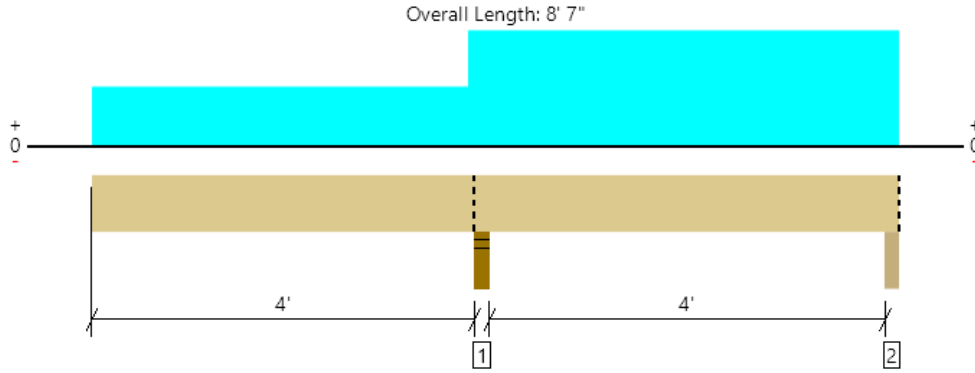
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jjaj@bccq-se.com	



Upper Floor, Canopy Joist
1 piece(s) 2 x 8 HF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	522 @ 4' 1 3/4"	2126 (3.50")	Passed (25%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	235 @ 4' 10 3/4"	1251	Passed (19%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	-515 @ 4' 1 3/4"	1477	Passed (35%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.097 @ 0	0.207	Passed (2L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.132 @ 0	0.415	Passed (2L/752)	--	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).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	3.50"	3.50"	1.50"	205	181	241	627	Blocking
2 - Beam - HF	3.50"	3.50"	1.50"	46	186	-81	232/-81	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)	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 4'	16"	15.0	-	30.0	Default Load
2 - Uniform (PSF)	4' to 8' 7"	16"	28.0	60.0	-	Deck

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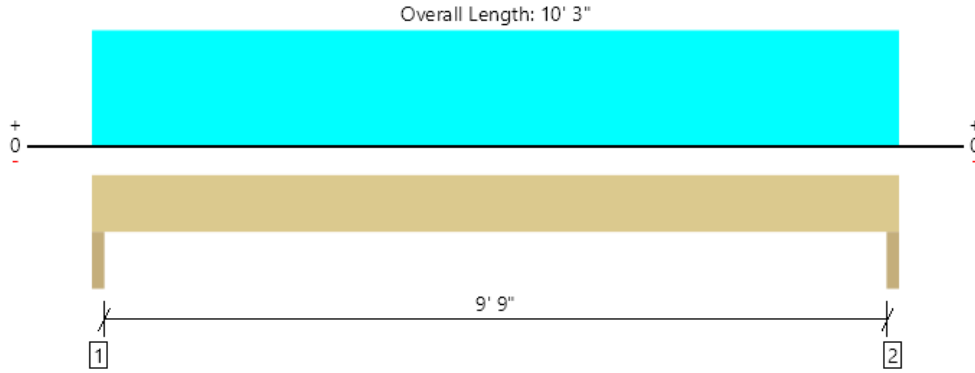
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, Canopy edge beam
2 piece(s) 2 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	489 @ 1 1/2"	3645 (3.00")	Passed (13%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	408 @ 10 1/4"	2501	Passed (16%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1194 @ 5' 1 1/2"	2569	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.109 @ 5' 1 1/2"	0.333	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.174 @ 5' 1 1/2"	0.313	Passed (L/692)	--	1.0 D + 1.0 S (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2018
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/5/16").
- Allowed moment does not reflect the adjustment for the beam stability factor.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Trimmer - DF	3.00"	3.00"	1.50"	182	308	490	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	182	308	490	None

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.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 10' 3"	N/A	5.5	--	
1 - Uniform (PSF)	0 to 10' 3"	2'	15.0	30.0	Snow

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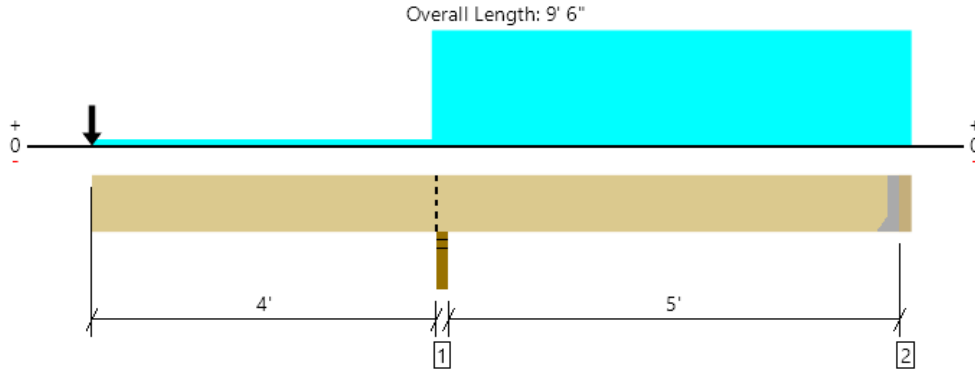
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, Canopy Cantilever
3 piece(s) 1 3/4" x 7 1/4" 2.0E Microllam® LVL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3290 @ 4' 1 1/2"	6379 (3.00")	Passed (52%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1734 @ 4' 10 1/4"	7232	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	-3820 @ 4' 1 1/2"	12273	Passed (31%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.169 @ 0	0.206	Passed (2L/584)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.228 @ 0	0.412	Passed (2L/434)	--	1.0 D + 1.0 S (All Spans)

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

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Left cantilever length exceeds 1/3 member length or 1/2 back span length. Additional bracing should be considered.
- Allowed moment does not reflect the adjustment for the beam stability factor.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	3.00"	3.00"	1.55"	1343	1452	1144	3939	Blocking
2 - Hanger on 7 1/4" HF beam	3.00"	Hanger ¹	1.50"	476	1519	-484	1995/-484	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)	9' 3" o/c	
Bottom Edge (Lu)	9' 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	HGUS5.50/8	4.00"	N/A	36-10d	12-10d	

- 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 9' 3"	N/A	11.1	--	--	
1 - Uniform (PSF)	0 to 4' (Front)	1'	15.0	-	30.0	Canopy
2 - Point (lb)	0 (Front)	N/A	270	-	540	Canopy beam reactions
3 - Uniform (PSF)	4' to 9' 6" (Front)	9'	28.0	60.0	-	Deck

Forteweb Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



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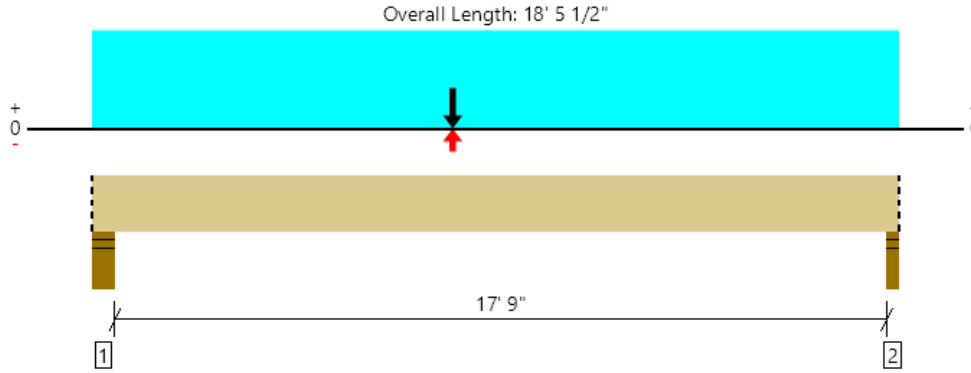
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File Name: Steinborn Residence_Imported

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Upper Floor, Floor beam at canopy cantilever
 1 piece(s) 5 1/4" x 11 7/8" 2.2E 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)	2126 @ 18' 4"	6379 (3.00")	Passed (33%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2196 @ 1' 5 3/8"	12053	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	14308 @ 8' 3"	29854	Passed (48%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.327 @ 9' 1 11/16"	0.450	Passed (L/661)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.478 @ 9' 1 7/8"	0.900	Passed (L/452)	--	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 - Stud wall - HF	5.50"	5.50"	1.50"	797	1598	-271	2395/-271	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	728	1398	-213	2126/-213	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)	18' 6" o/c	
Bottom Edge (Lu)	18' 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 18' 5 1/2"	N/A	19.5	--	--	
1 - Uniform (PSF)	0 to 18' 5 1/2" (Front)	1' 4"	28.0	60.0	-	Deck
2 - Point (lb)	8' 3" (Front)	N/A	476	1519	-484	Linked from: Canopy Cantilever, Support 2

Weyerhaeuser Notes

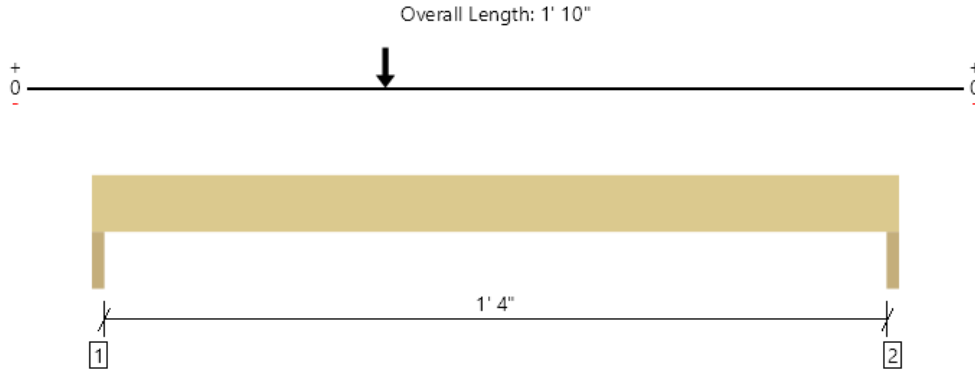
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jjaj@bccq-se.com	



Upper Floor, Elevator Rim - out of plane
 1 piece(s) 1 3/4" x 14" 1.55E TimberStrand® LSL (Plank)



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)	172 @ 1 1/2"	32550 (3.00")	Passed (1%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	169 @ 4 3/4"	2450	Passed (7%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	92 @ 8"	1557	Passed (6%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.004 @ 10 11/16"	0.053	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.004 @ 10 11/16"	0.079	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Wall
 Member Type : Header
 Building Use : Residential
 Building Code : IBC 2018
 Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Member has been designed in flat (plank) orientation with vertical (gravity) loads applied to wide strand face.
- 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 - Trimmer - DF	3.00"	3.00"	1.50"	7	165	172	None
2 - Trimmer - DF	3.00"	3.00"	1.50"	7	86	93	None

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	1' 10" o/c	
Bottom Edge (Lu)	1' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 1' 10"	N/A	7.7	--	
1 - Point (lb)	8"	N/A	-	251	

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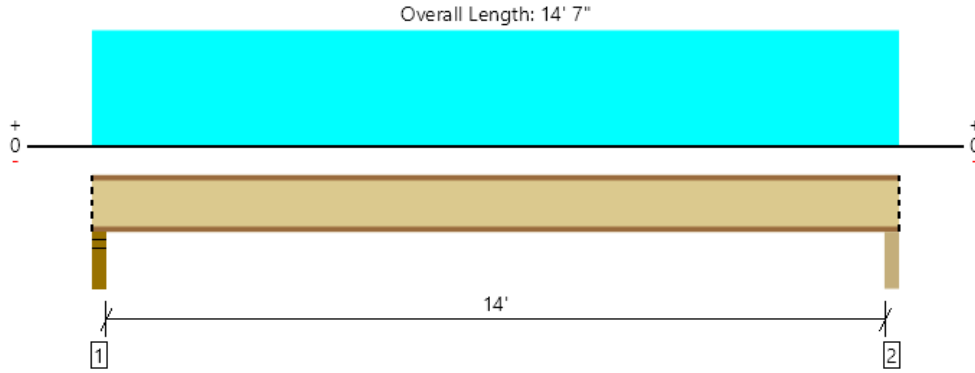
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, Floor: Joist 14' span, typ.
1 piece(s) 11 7/8" TJI @ 210 @ 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)	661 @ 2 1/2"	1460 (3.50")	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	635 @ 3 1/2"	1655	Passed (38%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2275 @ 7' 3 1/2"	3795	Passed (60%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.149 @ 7' 3 1/2"	0.354	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.253 @ 7' 3 1/2"	0.708	Passed (L/672)	--	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	3.50"	3.50"	1.75"	272	389	661	Blocking
2 - Beam - HF	3.50"	3.50"	1.75"	272	389	661	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' 10" o/c	
Bottom Edge (Lu)	14' 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)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 14' 7"	16"	28.0	40.0	Default Load

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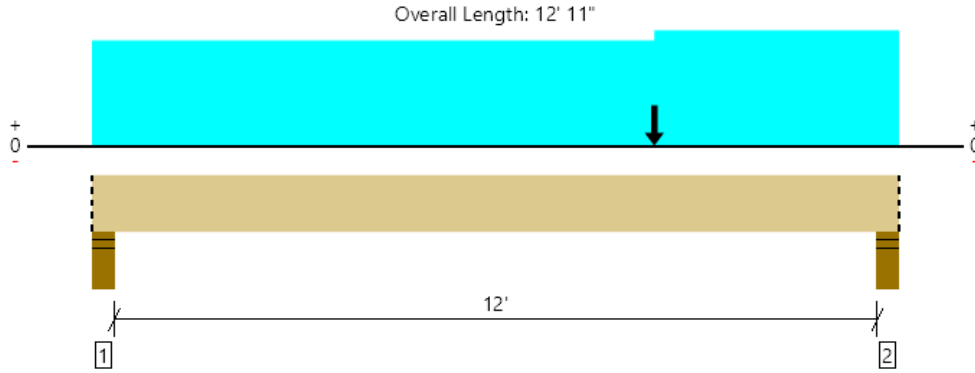
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B14 FB at stair
1 piece(s) 5 1/4" x 14" 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)	10019 @ 12' 7"	11694 (5.50")	Passed (86%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	6545 @ 11' 3 1/2"	16342	Passed (40%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	24319 @ 6' 8 3/16"	46854	Passed (52%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.223 @ 6' 7 7/16"	0.306	Passed (L/658)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.358 @ 6' 6 7/8"	0.613	Passed (L/410)	--	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	Seismic	Total	
1 - Stud wall - HF	5.50"	5.50"	4.05"	3506	1908	4166	1044/-1044	10624/-1044	Blocking
2 - Stud wall - HF	5.50"	5.50"	4.71"	3766	2403	4166	2526/-2526	12861/-2526	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' 11" o/c	
Bottom Edge (Lu)	12' 11" 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' 11"	N/A	23.0	--	--	--	
1 - Uniform (PSF)	0 to 12' 11" (Front)	6' 6"	28.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 12' 11" (Top)	21' 6"	15.0	-	30.0	-	
3 - Uniform (PSF)	9' to 12' 11" (Back)	2'	28.0	40.0	-	-	Default Load
4 - Point (lb)	9' (Top)	N/A	240	640	-	-	Stair beam
5 - Point (lb)	9' (Front)	N/A	-	-	-	3570	Hold-down

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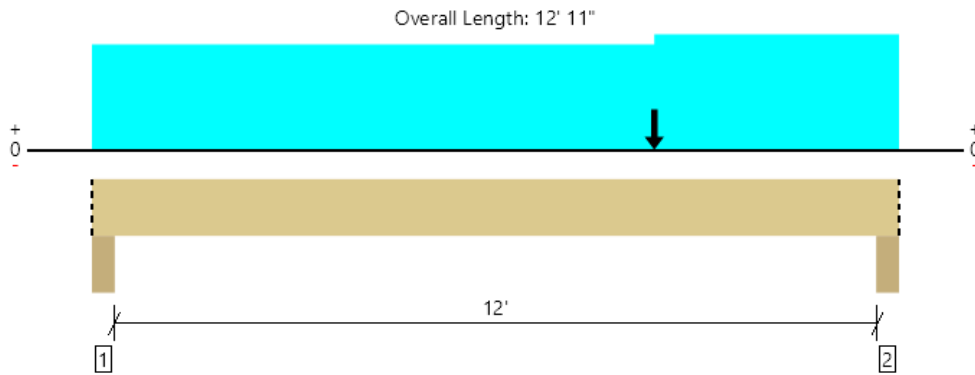
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B14 FB at stair, omega
1 piece(s) 5 1/4" x 14" 2.0E Parallam® PSL

An excessive uplift of -2160 lbs at support located at 12' 7" failed this product.



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)	12008 @ 12' 7"	18047 (5.50")	Passed (67%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	9860 @ 11' 3 1/2"	22736	Passed (43%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	24319 @ 6' 8 3/16"	46854	Passed (52%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.292 @ 6' 8 11/16"	0.306	Passed (L/503)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.427 @ 6' 7 13/16"	0.613	Passed (L/344)	--	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	Seismic	Total	
1 - Column - HF	5.50"	5.50"	2.87"	3506	1908	4166	2611/-2611	12191/-2611	Blocking
2 - Column - HF	5.50"	5.50"	3.66"	3766	2403	4166	6314/-6314	16649/-6314	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' 11" o/c	
Bottom Edge (Lu)	12' 11" 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' 11"	N/A	23.0	--	--	--	
1 - Uniform (PSF)	0 to 12' 11" (Front)	6' 6"	28.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 12' 11" (Top)	21' 6"	15.0	-	30.0	-	
3 - Uniform (PSF)	9' to 12' 11" (Back)	2'	28.0	40.0	-	-	Default Load
4 - Point (lb)	9' (Top)	N/A	240	640	-	-	Stair beam
5 - Point (lb)	9' (Front)	N/A	-	-	-	8925	Hold-down, overstrength = 2.5

Weyerhaeuser Notes

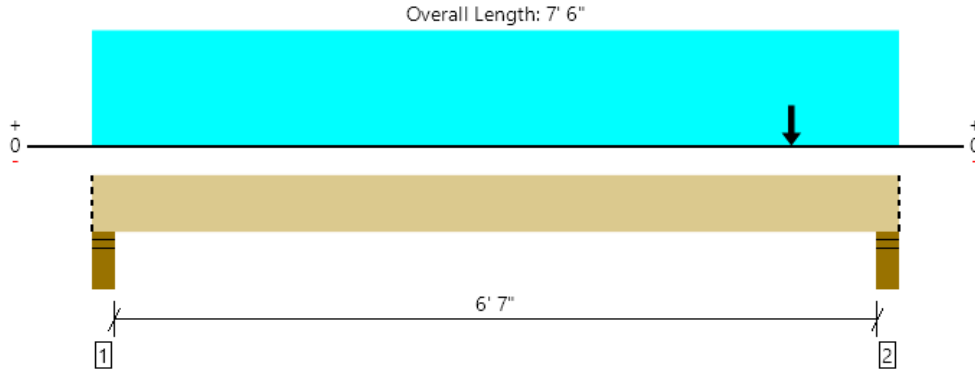
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Upper Floor, B14 FB at stair
 1 piece(s) 3 1/2" x 14" 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)	7271 @ 7' 2"	7796 (5.50")	Passed (93%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	3057 @ 5' 10 1/2"	11646	Passed (26%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	7915 @ 3' 9 5/8"	25116	Passed (32%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.051 @ 3' 10"	0.171	Passed (L/999+)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.085 @ 3' 9 11/16"	0.342	Passed (L/966)	--	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.
- -830 lbs uplift at support located at 7' 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 - Stud wall - HF	5.50"	5.50"	3.66"	2183	1337	2419	348/-348	6287/-348	Blocking
2 - Stud wall - HF	5.50"	5.50"	5.13"	2376	1853	2419	3222/-3222	9870/-3222	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)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 7' 6"	N/A	15.3	--	--	--	
1 - Uniform (PSF)	0 to 7' 6" (Front)	6' 6"	28.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 7' 6" (Top)	21' 6"	15.0	-	30.0	-	
3 - Uniform (PSF)	0 to 7' 6" (Back)	2'	28.0	40.0	-	-	Default Load
4 - Point (lb)	6' 6" (Top)	N/A	240	640	-	-	Stair beam
5 - Point (lb)	6' 6" (Front)	N/A	-	-	-	3570	Hold-down

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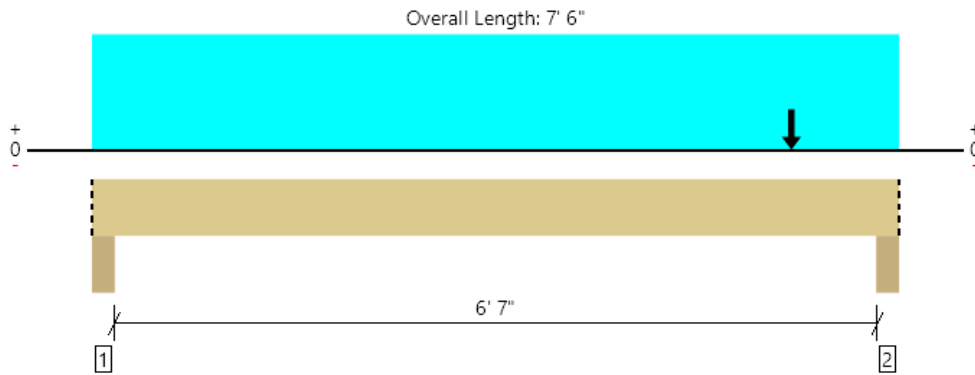
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bccq-se.com	



Upper Floor, B14 FB at stair, omega
 1 piece(s) 3 1/2" x 14" 1.55E TimberStrand® LSL

An excessive uplift of -4212 lbs at support located at 7' 2" failed this product.



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)	9808 @ 7' 2"	13956 (5.50")	Passed (70%)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	4776 @ 5' 10 1/2"	16203	Passed (29%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	7915 @ 3' 9 5/8"	25116	Passed (32%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.062 @ 3' 10 3/4"	0.171	Passed (L/999+)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.095 @ 3' 10 3/16"	0.342	Passed (L/859)	--	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	Seismic	Total	
1 - Column - HF	5.50"	5.50"	2.15"	2183	1337	2419	871/-871	6810/-871	Blocking
2 - Column - HF	5.50"	5.50"	3.87"	2376	1853	2419	8054/-8054	14702/-8054	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)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
0 - Self Weight (PLF)	0 to 7' 6"	N/A	15.3	--	--	--	
1 - Uniform (PSF)	0 to 7' 6" (Front)	6' 6"	28.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 7' 6" (Top)	21' 6"	15.0	-	30.0	-	
3 - Uniform (PSF)	0 to 7' 6" (Back)	2'	28.0	40.0	-	-	Default Load
4 - Point (lb)	6' 6" (Top)	N/A	240	640	-	-	Stair beam
5 - Point (lb)	6' 6" (Front)	N/A	-	-	-	8925	Hold-down, overstrength = 2.5

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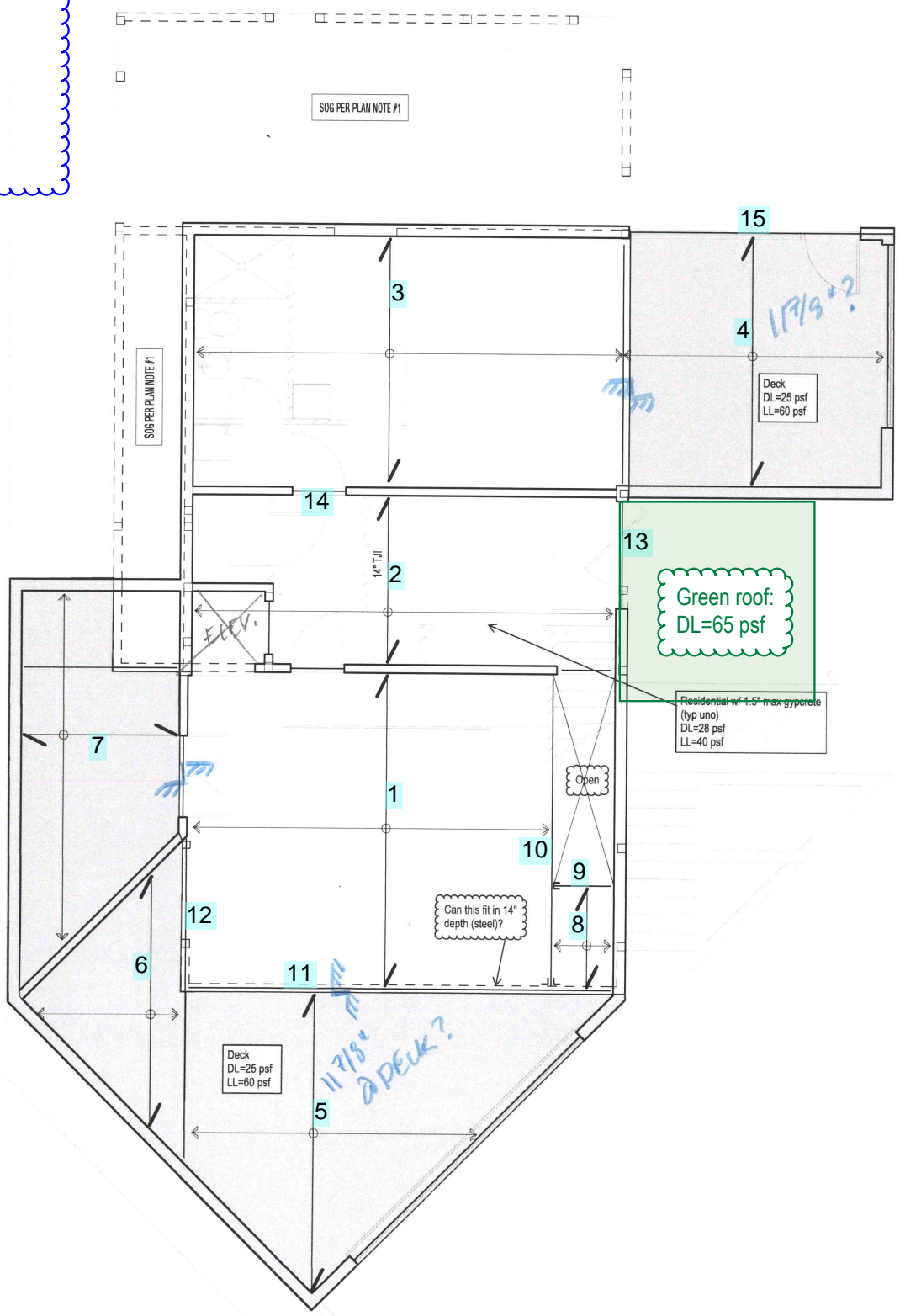
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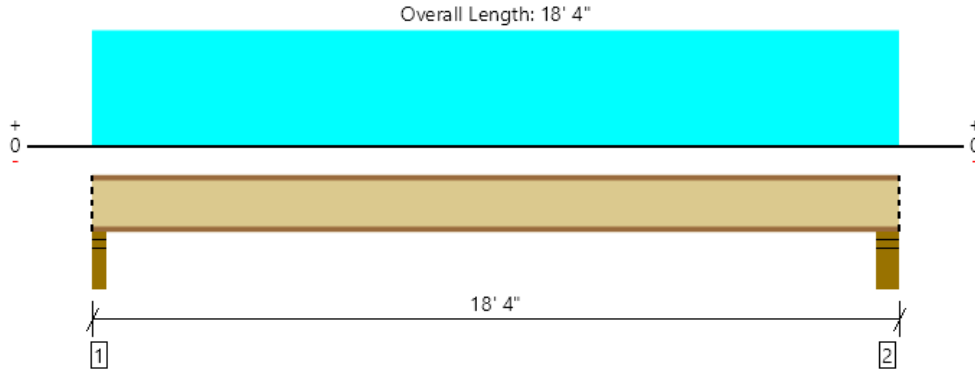


Main Framing Key

- Floors
 - DL=28 psf (1.5" max gyp)
 - LL=40 psf
- Decks
 - DL=28 psf (pavers)
 - LL=60 psf



Main Floor, J1
1 piece(s) 14" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	839 @ 17' 11 1/2"	1375 (3.50")	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	797 @ 3 1/2"	1860	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3571 @ 9' 1"	3740	Passed (95%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.276 @ 9' 1"	0.444	Passed (L/771)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.470 @ 9' 1"	0.887	Passed (L/454)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	53	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	3.50"	3.50"	1.75"	339	484	823	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	345	493	838	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' 2" o/c	
Bottom Edge (Lu)	18' 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 18' 4"	16"	28.0	40.0	Floor Load

Weyerhaeuser Notes

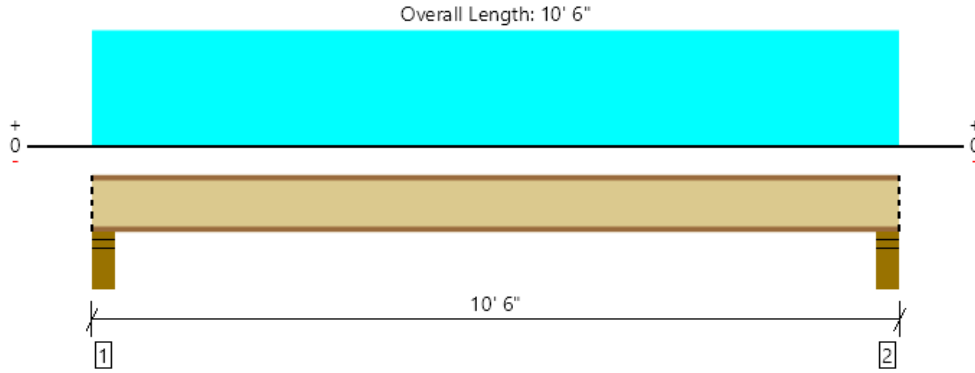
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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, J2
1 piece(s) 14" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	476 @ 4 1/2"	1375 (3.50")	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	434 @ 5 1/2"	1860	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1077 @ 5' 3"	3740	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.032 @ 5' 3"	0.244	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.054 @ 5' 3"	0.488	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	72	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	5.50"	1.75"	196	280	476	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	196	280	476	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 1" o/c	
Bottom Edge (Lu)	10' 6" o/c	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 10' 6"	16"	28.0	40.0	Floor Load

Weyerhaeuser Notes

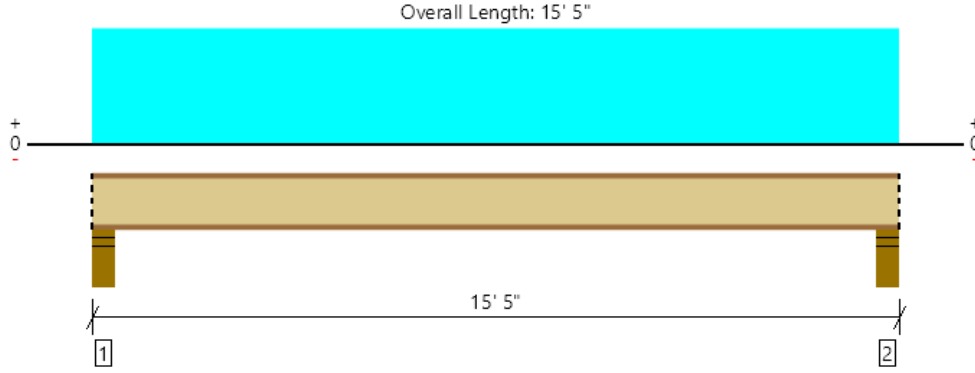
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, J3
1 piece(s) 14" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	699 @ 4 1/2"	1375 (3.50")	Passed (51%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	657 @ 5 1/2"	1860	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2438 @ 7' 8 1/2"	3740	Passed (65%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.136 @ 7' 8 1/2"	0.367	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.231 @ 7' 8 1/2"	0.733	Passed (L/763)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	62	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	5.50"	1.75"	288	411	699	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	288	411	699	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' 11" o/c	
Bottom Edge (Lu)	15' 5" 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' 5"	16"	28.0	40.0	Floor Load

Weyerhaeuser Notes

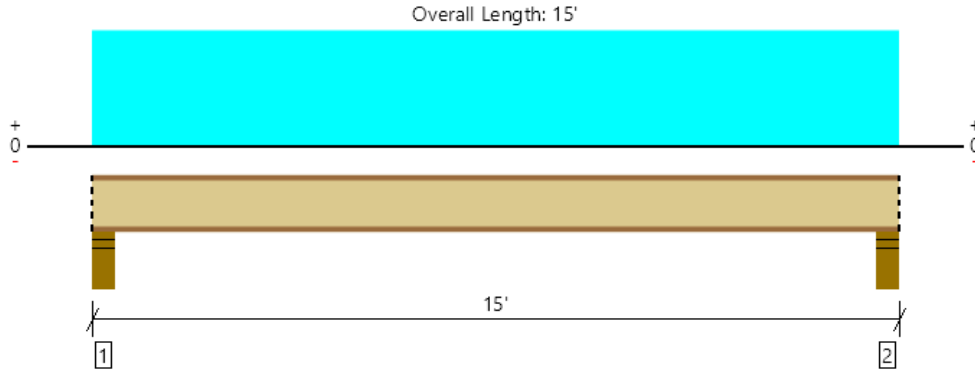
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, J4
1 piece(s) 11 7/8" TJI @ 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	880 @ 4 1/2"	1375 (3.50")	Passed (64%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	826 @ 5 1/2"	1560	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2978 @ 7' 6"	3160	Passed (94%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.257 @ 7' 6"	0.356	Passed (L/664)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.378 @ 7' 6"	0.712	Passed (L/453)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	59	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	5.50"	1.75"	280	600	880	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	280	600	880	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' 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'	16"	28.0	60.0	Deck Load

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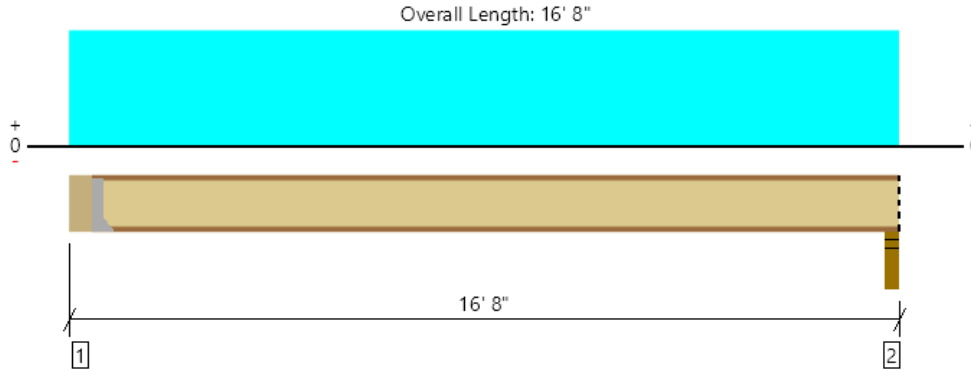
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Main Floor, J5
1 piece(s) 11 7/8" TJI @ 360 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	939 @ 5 1/2"	1080 (1.75")	Passed (87%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	939 @ 5 1/2"	1705	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3755 @ 8' 5 1/2"	6180	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.283 @ 8' 5 1/2"	0.400	Passed (L/677)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.416 @ 8' 5 1/2"	0.800	Passed (L/462)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	56	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Hanger on 11 7/8" HF beam	5.50"	Hanger ¹	1.75" / - ²	316	677	993	See note 1
2 - Stud wall - HF	3.50"	3.50"	1.75"	306	657	963	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.
- ² Required Bearing Length / Required Bearing Length with Web Stiffeners

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	4' 9" o/c	
Bottom Edge (Lu)	16' 3" 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	10-10d	2-Strong-Grip	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 16' 8"	16"	28.0	60.0	Deck Load

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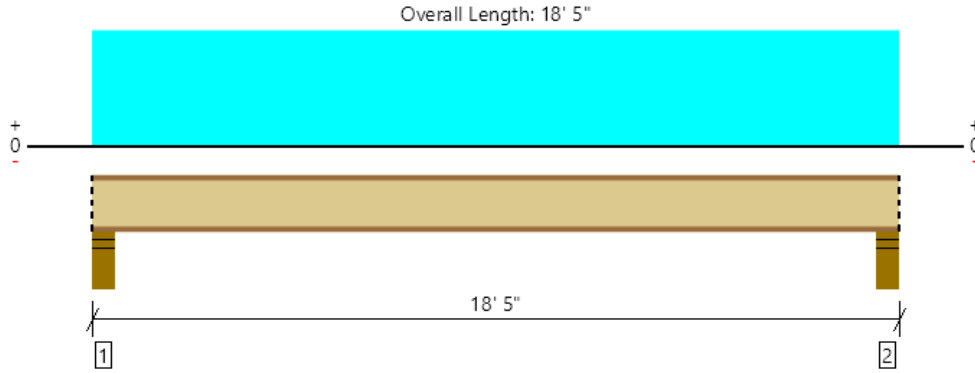
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Main Floor, J6
2 piece(s) 11 7/8" TJI @ 360 @ 16" OC



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)	1080 @ 4 1/2"	3010 (3.50")	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1027 @ 5 1/2"	3410	Passed (30%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4578 @ 9' 2 1/2"	12360	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.217 @ 9' 2 1/2"	0.442	Passed (L/977)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.318 @ 9' 2 1/2"	0.883	Passed (L/666)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	61	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	5.50"	1.75"	344	737	1081	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	344	737	1081	Blocking

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	6' 3" o/c	
Bottom Edge (Lu)	18' 5" 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 18' 5"	16"	28.0	60.0	Deck Load

Weyerhaeuser Notes

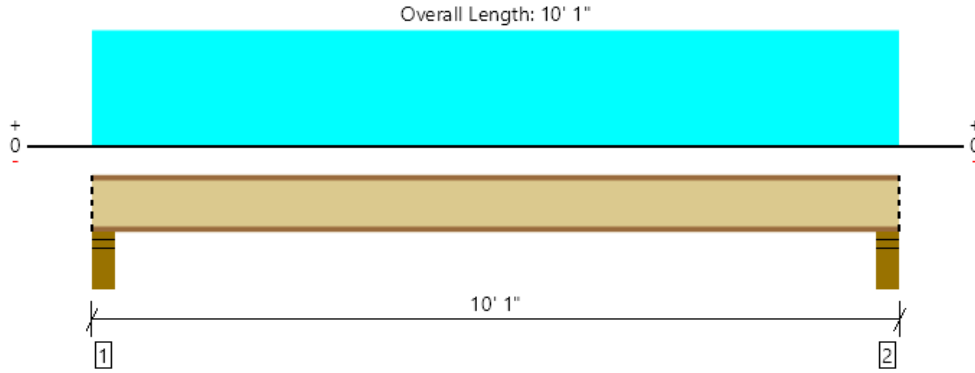
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ForteWEB Software Operator	Job Notes
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Main Floor, J7
1 piece(s) 11 7/8" TJI @ 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	592 @ 4 1/2"	1375 (3.50")	Passed (43%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	538 @ 5 1/2"	1560	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1278 @ 5' 1/2"	3160	Passed (40%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.056 @ 5' 1/2"	0.233	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.083 @ 5' 1/2"	0.467	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	5.50"	5.50"	1.75"	188	403	591	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.75"	188	403	591	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' 1" o/c	
Bottom Edge (Lu)	10' 1" o/c	

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

Vertical Load	Location	Spacing	Dead (0.90)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 10' 1"	16"	28.0	60.0	Deck Load

Weyerhaeuser Notes

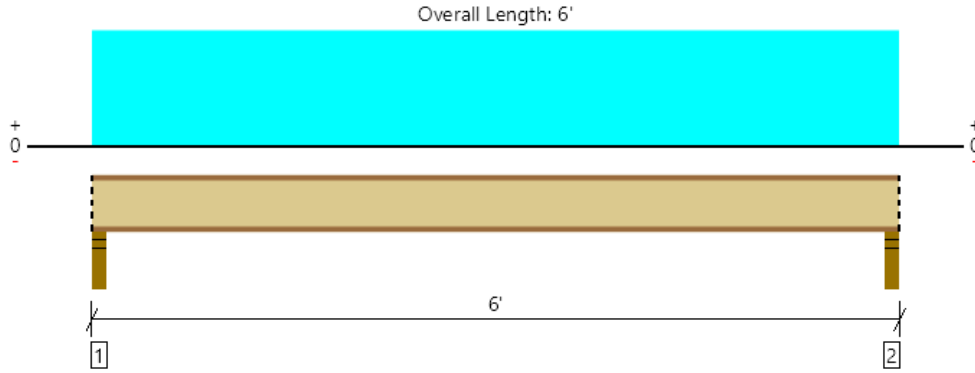
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, J8
1 piece(s) 14" TJI® 110 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	272 @ 2 1/2"	1375 (3.50")	Passed (20%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	246 @ 3 1/2"	1860	Passed (13%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	353 @ 3'	3740	Passed (9%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.006 @ 3'	0.140	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.009 @ 3'	0.279	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	78	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" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: 5/8" Gypsum ceiling, bridging or blocking at max. 8' o.c., Perpendicular Partitions, Pour Flooring Overlay.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - HF	3.50"	3.50"	1.75"	112	160	272	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.75"	112	160	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)	6' o/c	
Bottom Edge (Lu)	6' 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'	16"	28.0	40.0	Floor Load

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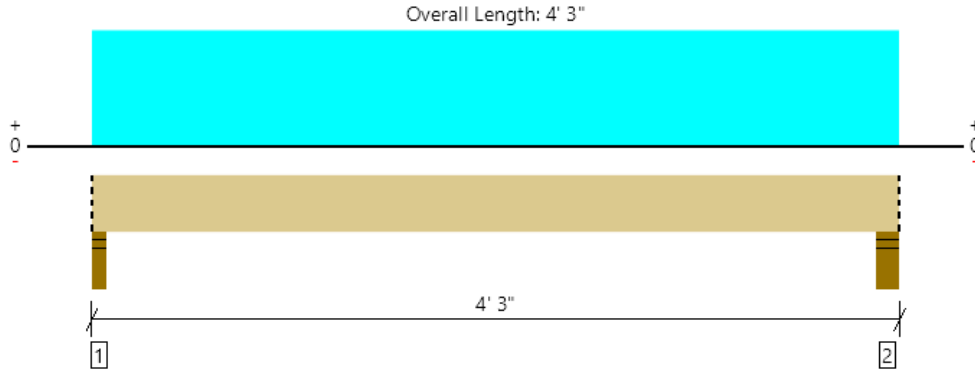
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, B9

1 piece(s) 3 1/2" x 14" 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)	448 @ 2"	4961 (3.50")	Passed (9%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	128 @ 1' 5 1/2"	10127	Passed (1%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	386 @ 2' 1/2"	21840	Passed (2%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.001 @ 2' 1/2"	0.094	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.002 @ 2' 1/2"	0.188	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 - Stud wall - HF	3.50"	3.50"	1.50"	203	245	448	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.50"	219	265	484	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' 3" o/c	
Bottom Edge (Lu)	4' 3" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 3"	N/A	15.3	--	
1 - Uniform (PSF)	0 to 4' 3" (Front)	3'	28.0	40.0	Floor Load

Weyerhaeuser Notes

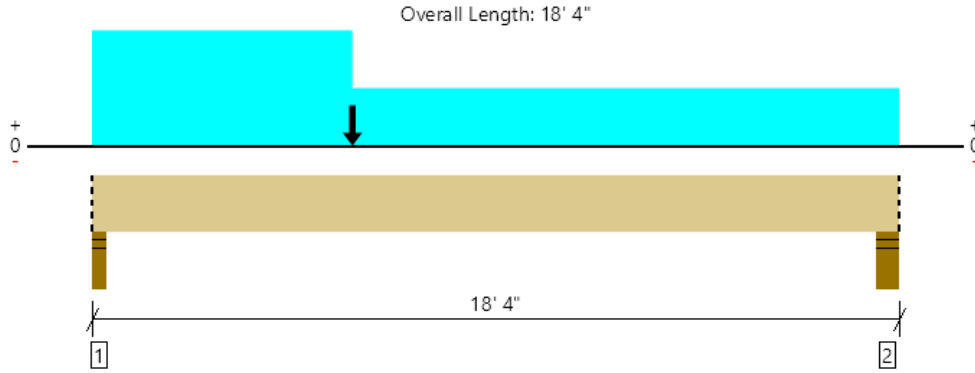
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, B10
2 piece(s) 1 3/4" x 9 1/4" 2.0E Microllam® LVL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1665 @ 2"	4961 (3.50")	Passed (34%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1463 @ 1' 3/4"	6151	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6278 @ 6' 9 5/8"	11204	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.427 @ 8' 9"	0.446	Passed (L/502)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.785 @ 8' 9 1/8"	0.892	Passed (L/273)	--	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 - Stud wall - HF	3.50"	3.50"	1.50"	749	917	1666	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.50"	533	622	1155	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)	18' 1" o/c	
Bottom Edge (Lu)	18' 4" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 18' 4"	N/A	9.4	--	
1 - Uniform (PSF)	0 to 5' 11" (Front)	2' 8"	28.0	40.0	Floor Load
2 - Uniform (PSF)	5' 11" to 18' 4" (Front)	1' 4"	28.0	40.0	Floor Load
3 - Point (lb)	5' 11" (Front)	N/A	203	245	Linked from: B9, Support 1

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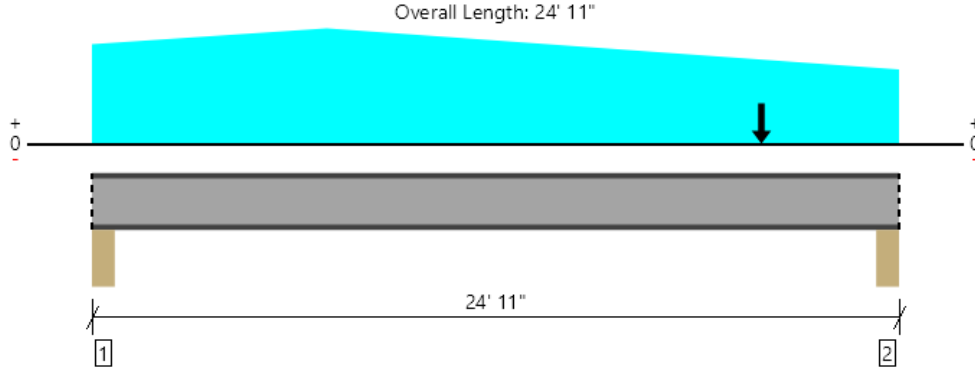
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bccq-se.com	



Main Floor, B11
1 piece(s) W14X61 (A992) ASTM Steel



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)	26087 @ 4"	39875 (5.50")	Passed (65%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	25177 @ 5 1/2"	104250	Passed (24%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	151607 @ 12' 1 13/16"	177019	Passed (86%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.545 @ 12' 4 11/16"	0.606	Passed (L/534)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.865 @ 12' 4 13/16"	1.212	Passed (L/336)	--	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).
- Bearing reinforcement may be required for support located at 4".
- Bearing reinforcement may be required for support located at 24' 7".
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - HF	5.50"	5.50"	5.50"	9581	16506	26087	Blocking
2 - Column - HF	5.50"	5.50"	5.50"	9177	15175	24352	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)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 24' 11"	N/A	61.0	--	
1 - Uniform (PSF)	0 to 24' 11"	9' 2"	28.0	40.0	Floor Load
2 - Tapered (PSF)	0 to 7' 3"	5' 6" to 9'	28.0	60.0	Deck Load
3 - Tapered (PSF)	7' 3" to 24' 11"	9' to 0	28.0	60.0	Deck Load
4 - Uniform (PSF)	0 to 24' 11"	9' 2"	28.0	60.0	Upper Floor Deck Load
5 - Point (lb)	20' 8"	N/A	749	917	Linked from: B10, Support 1

Weyerhaeuser Notes

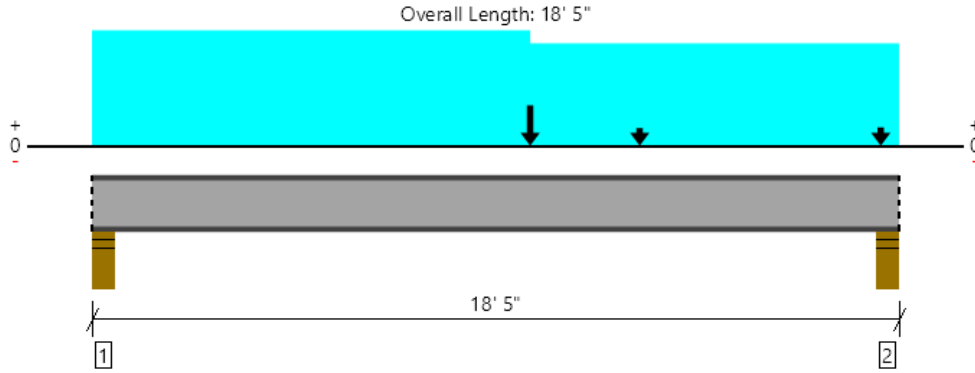
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, B12
1 piece(s) W12X53 (A992) ASTM Steel



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)	17179 @ 18' 1"	22275 (5.50")	Passed (77%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	16282 @ 17' 11 1/2"	83490	Passed (20%)	--	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	124292 @ 10'	161513	Passed (77%)	--	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.289 @ 9' 4 15/16"	0.444	Passed (L/738)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.465 @ 9' 4 15/16"	0.887	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).
- Bearing reinforcement may be required for point load located at 10'.
- Applicable calculations are based on ANSI/AISC 360-16.
- A lateral-torsional buckling factor (C_b) of 1.0 has been assumed.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	5.50"	5418	8623	57	14098	Blocking
2 - Stud wall - HF	5.50"	5.50"	5.50"	6794	10385	633	17812	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)	End Bearing Points	
Bottom Edge (Lu)	End Bearing Points	

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 18' 5"	N/A	53.0	--	--	
1 - Uniform (PSF)	0 to 10'	2'	28.0	60.0	-	Deck Load
2 - Uniform (PSF)	10' to 18' 5"	1'	28.0	40.0	-	Floor Load
3 - Uniform (PSF)	10' to 18' 5"	1'	28.0	60.0	-	Deck Load
4 - Point (lb)	18'	N/A	298	220	330	Linked from: B6, Support 1
5 - Point (lb)	12' 6"	N/A	163	120	180	Linked from: B12, Support 1
6 - Point (lb)	18'	N/A	163	120	180	Linked from: B12, Support 2
7 - Point (lb)	10'	N/A	9581	16506	-	Linked from: B11, Support 1

Weyerhaeuser Notes

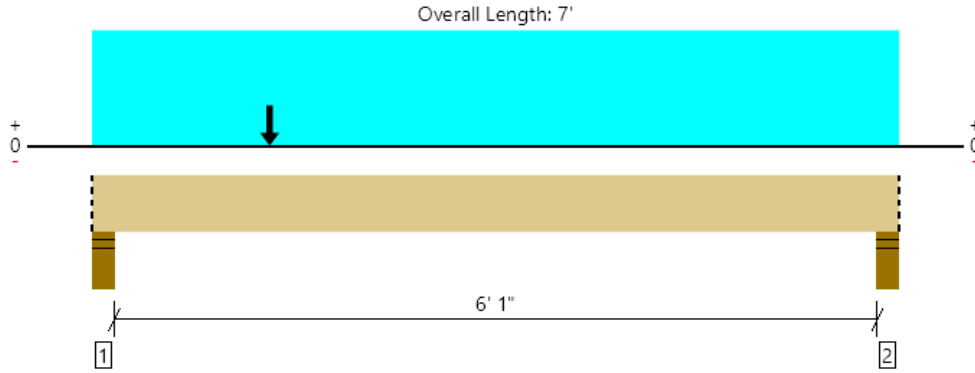
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, B13
2 piece(s) 2 x 10 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2628 @ 4"	6683 (5.50")	Passed (39%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2524 @ 1' 2 3/4"	3191	Passed (79%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	3079 @ 1' 6 1/2"	3833	Passed (80%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.038 @ 3' 2 3/16"	0.158	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.069 @ 3' 2 5/16"	0.317	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.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - HF	5.50"	5.50"	2.16"	1175	814	1123	3112	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.50"	396	335	265	996	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' o/c	
Bottom Edge (Lu)	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'	N/A	7.0	--	--	
1 - Uniform (PSF)	0 to 7' (Front)	1' 4"	28.0	40.0	-	Floor Load
2 - Point (lb)	1' 6 1/2" (Front)	N/A	1260	775	1388	Linked from: B7, Support 1

Weyerhaeuser Notes

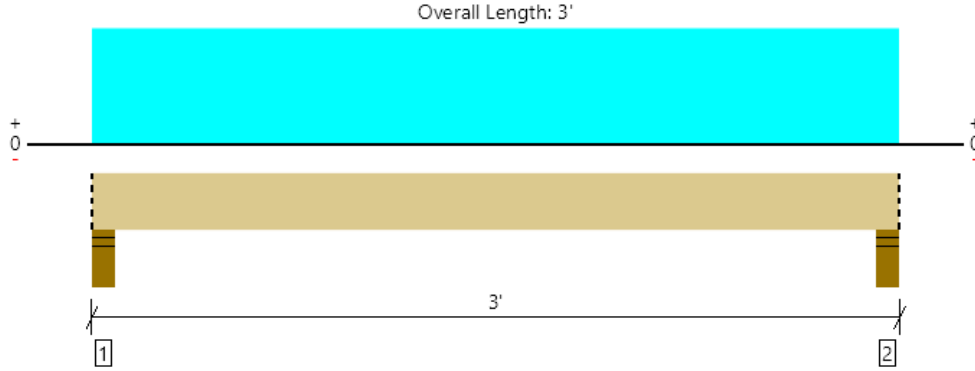
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, B14
2 piece(s) 2 x 8 HF No.2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1330 @ 4"	6683 (5.50")	Passed (20%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	388 @ 1' 3/4"	2175	Passed (18%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	603 @ 1' 6"	2234	Passed (27%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.003 @ 1' 6"	0.058	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.005 @ 1' 6"	0.117	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 - Stud wall - HF	5.50"	5.50"	1.50"	553	777	1330	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.50"	553	777	1330	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)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 3'	N/A	5.5	--	
1 - Uniform (PLF)	0 to 3' (Front)	N/A	147.0	210.0	Linked from: J2, Support 2
2 - Uniform (PLF)	0 to 3' (Front)	N/A	216.0	308.3	Linked from: J3, Support 1

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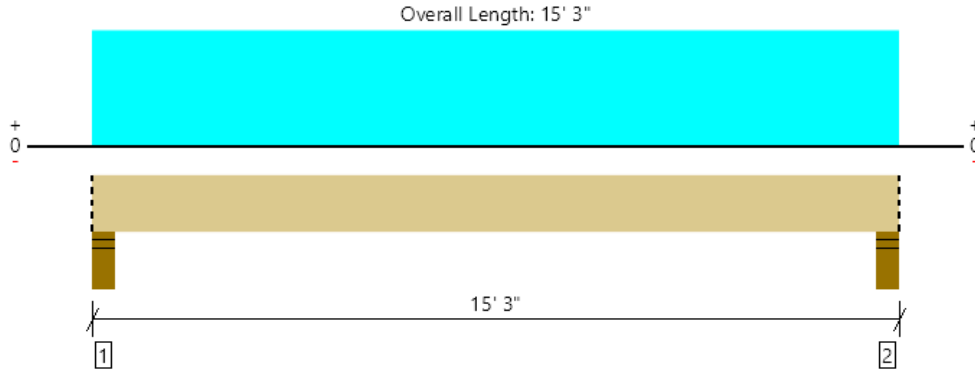
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, B15

1 piece(s) 5 1/4" x 11 7/8" 2.2E 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)	5181 @ 4"	11694 (5.50")	Passed (44%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	4197 @ 1' 5 3/8"	12053	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	18063 @ 7' 7 1/2"	29854	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.304 @ 7' 7 1/2"	0.365	Passed (L/575)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.459 @ 7' 7 1/2"	0.729	Passed (L/381)	--	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 - Stud wall - HF	5.50"	5.50"	2.44"	1750	3431	5181	Blocking
2 - Stud wall - HF	5.50"	5.50"	2.44"	1750	3431	5181	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)	15' 3" o/c	
Bottom Edge (Lu)	15' 3" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 15' 3"	N/A	19.5	--	
1 - Uniform (PSF)	0 to 15' 3" (Front)	7' 6"	28.0	60.0	Deck Load

Weyerhaeuser Notes

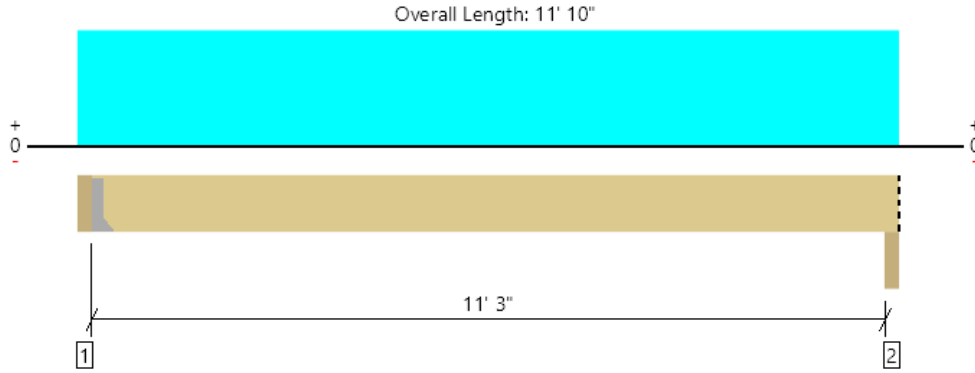
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, Entry canopy - Green roof, 65 psf
 1 piece(s) 2 x 10 DF No.2 @ 16" OC



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	831 @ 3 1/2"	1406 (1.50")	Passed (59%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	718 @ 1' 3/4"	1915	Passed (38%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	2355 @ 5' 11 1/2"	2334	Passed (101%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.094 @ 5' 11 1/2"	0.567	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.344 @ 5' 11 1/2"	0.756	Passed (L/395)	--	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 : 0.25/12

- Deflection criteria: LL (L/240) and TL (L/180).
- 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.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Hanger on 9 1/4" HF beam	3.50"	Hanger ¹	1.50"	636	238	874	See note ¹
2 - Beam - HF	3.50"	3.50"	1.50"	627	235	862	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)	6" o/c	
Bottom Edge (Lu)	11' 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	LRU28Z	1.94"	N/A	6-10d	5-10d		

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

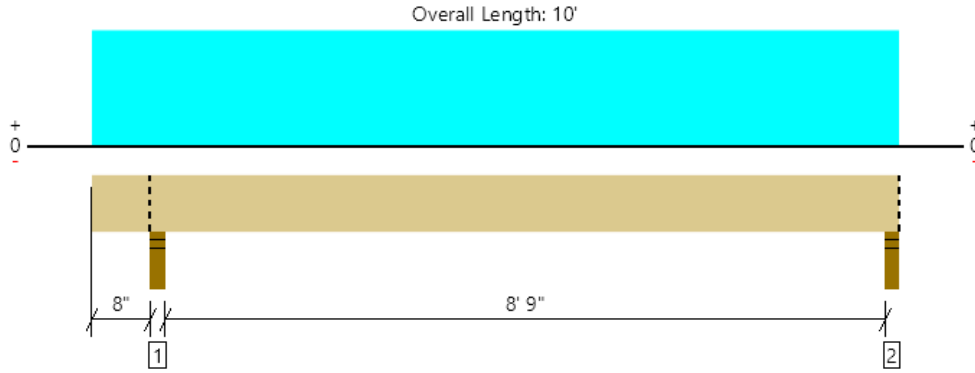
Vertical Load	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 11' 10"	16"	80.0	30.0	Green roof 50 psf

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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, DB Green roof 65 psf
1 piece(s) 6 x 10 DF No.1



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)	4050 @ 9 3/4"	7796 (3.50")	Passed (52%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2728 @ 1' 9"	6810	Passed (40%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	7580 @ 5' 4 1/4"	10703	Passed (71%)	1.15	1.0 D + 1.0 S (Alt Spans)
Live Load Defl. (in)	0.048 @ 5' 3 15/16"	0.451	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.176 @ 5' 4"	0.601	Passed (L/615)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Drop 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.
- Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - HF	3.50"	3.50"	1.82"	2965	1085	4050	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.58"	2567	943	3510	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' o/c	
Bottom Edge (Lu)	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 10'	N/A	13.2	--	
1 - Uniform (PSF)	0 to 10' (Front)	6' 9"	80.0	30.0	Default Load

Weyerhaeuser Notes

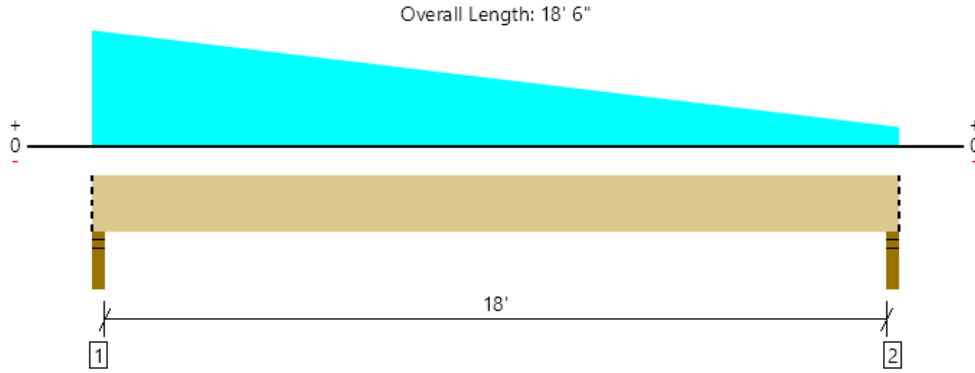
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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Main Floor, Garage Flush Header
 1 piece(s) 5 1/4" x 11 7/8" 2.2E 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)	4737 @ 1' 1/2"	6379 (3.00")	Passed (74%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3891 @ 1' 2 7/8"	12053	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	17513 @ 8' 3 1/16"	29854	Passed (59%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.437 @ 9'	0.456	Passed (L/501)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.673 @ 9' 1/8"	0.913	Passed (L/325)	--	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 - Stud wall - HF	3.00"	3.00"	2.23"	1630	3107	4737	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	1061	1888	2949	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)	18' 6" o/c	
Bottom Edge (Lu)	18' 6" o/c	

- Maximum allowable bracing intervals based on applied load.

Vertical Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 18' 6"	N/A	19.5	--	
1 - Tapered (PSF)	0 to 18' 6" (Front)	7' 9" to 1' 3"	28.0	60.0	Deck

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ForteWEB Software Operator	Job Notes
Jane Johnson Bykonen Carter Quinn (206) 264-7784 jaj@bcq-se.com	



Search Information

Address: 7221 78th Ave SE, Mercer Island, WA 98040, USA
Coordinates: 47.560961, -122.225477
Elevation: 268 ft
Timestamp: 2021-12-28T00:19:49.647Z
Hazard Type: Seismic
Reference Document: ASCE7-16
Risk Category: II
Site Class: D



Basic Parameters

Name	Value	Description
S _S	1.439	MCE _R ground motion (period=0.2s)
S ₁	0.5	MCE _R ground motion (period=1.0s)
S _{MS}	1.439	Site-modified spectral acceleration value
S _{M1}	* null	Site-modified spectral acceleration value
S _{DS}	0.959	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	0.898	Coefficient of risk (1.0s)
PGA	0.616	MCE _G peak ground acceleration
F _{PGA}	1.1	Site amplification factor at PGA
PGA _M	0.678	Site modified peak ground acceleration
T _L	6	Long-period transition period (s)
SsRT	1.439	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.595	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.957	Factored deterministic acceleration value (0.2s)
S1RT	0.5	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.557	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.551	Factored deterministic acceleration value (1.0s)
PGAd	1.333	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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Search Information

Address: 7221 78th Ave SE, Mercer Island, WA 98040, USA
Coordinates: 47.560961, -122.225477
Elevation: 268 ft
Timestamp: 2021-12-28T00:22:17.892Z
Hazard Type: Wind



ASCE 7-16

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

ASCE 7-10

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

ASCE 7-05

ASCE 7-05 Wind Speed 85 mph

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

Disclaimer

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

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

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MASSING		Uniform Loads (PSF)			Area (SF)	Σw (k)			
ROOF	<i>Misc</i>	<i>Partitions</i>		1100		23.7			
	15	6.5							
FLOORS		Uniform Loads (PSF)			Area (SF)	Green Roof (k)	Σw (k)	Green Roof	
		<i>Misc</i>	<i>Partitions</i>	<i>Gyp top</i>				Area (sf)	Unit weight (psf)
UPPER		15	13	13	1522	9.1	71.5	140.7	65.0
MAIN		15	13	13	1804		74.0		

SEISMIC DESIGN PARAMETERS

Site Class = D $S_s = 1.439$
Risk Cat. = II $S_1 = 0.500$
 $S_{DS} = 0.959$ $f_a = 1.00$
R = 6.50 $f_v = 1.80$
Cs = 0.148 k = 1.0

ASCE 7-16 Equivalent Lateral Force Procedure, 12.8

Level	Area (SF)	Unit DL (PSF)	w (k)	h^k (ft)	$(w)(h^k)$	C_{ux}	F_x (k)	0.7E (k)	ASD
ROOF	1100	21.5	23.7	30.0	710	26%	6.4	4.5	
UPPER	1522	41.0	71.5	19.2	1371	50%	12.4	8.7	
MAIN	1522	41.0	74.0	9.2	678	25%	6.1	4.3	
Σ			169.2	25.0	2759	100%			
Base Shear								25.0	

WIND DESIGN PARAMETERS

V (mph) = 97 G = 0.85 L/B = 0.57 L/B = 1.76
Exposure Cat. = C Gcpi = 0.18 Cp = Windward Wall 0.80 Cp = Windward Wall 0.80
 $K_{zt} = 1.60$ $K_e = 0.98$ Leeward Wall -0.50 Leeward Wall -0.35
 $K_d = 0.85$ $q_s = 32.1$ Side Wall -0.70 Side Wall -0.70
Roof Slope (in/ft) = 1:12 h/L = 1.23 Roof -1.30 -0.18 h/L = 0.70 Roof -0.90 -0.18

ASCE 7-16 MWFRS Directional Procedure 27.3.1

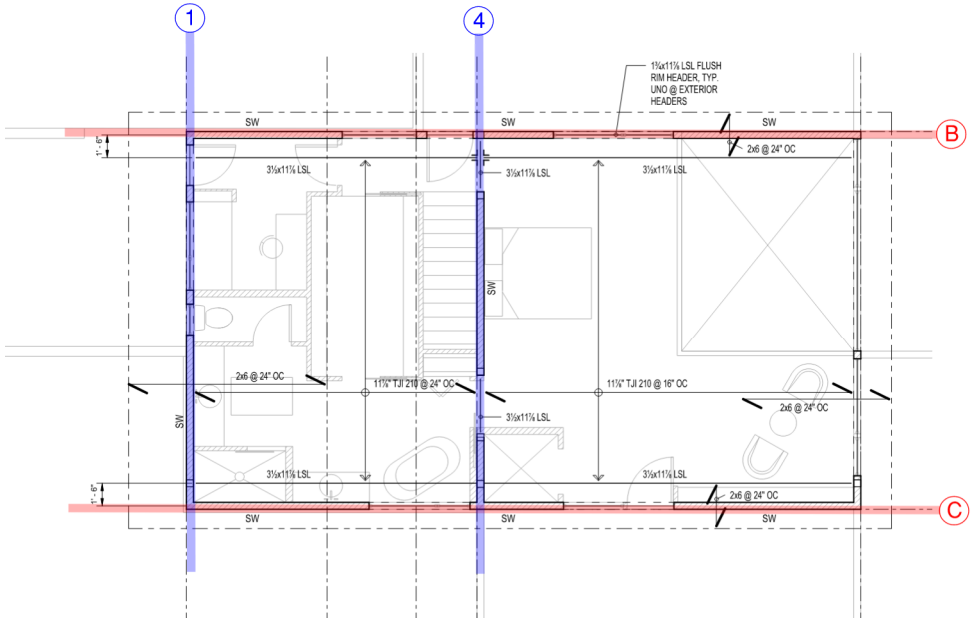
Level	h (ft)	Direction	Wall Area	K_h	q_h	Wall (PSF)	Roof (PSF)	Roof (k)	F_x (k)	06W (k)
ROOF	30.0	PARALLEL TO WL-A	135	0.98	32.1	35.5	30.6	1.3	4.8	2.9
		PARALLEL TO WL-1	238	0.98	32.1	31.3	19.6	1.4	7.5	4.5
UPPER	19.2	PARALLEL TO WL-A	573	0.90	29.5	34.4			19.7	11.8
		PARALLEL TO WL-1	458	0.90	29.5	30.6			14.0	8.4
MAIN	9.2	PARALLEL TO WL-A	688	0.85	27.8	33.7			23.2	13.9
		PARALLEL TO WL-1	278	0.85	27.8	30.1			8.4	5.0
Base Shear - Parallel to Wall Line A									47.7	
Base Shear - Parallel to Wall Line 1									29.8	

LATERAL KEY - ROOF

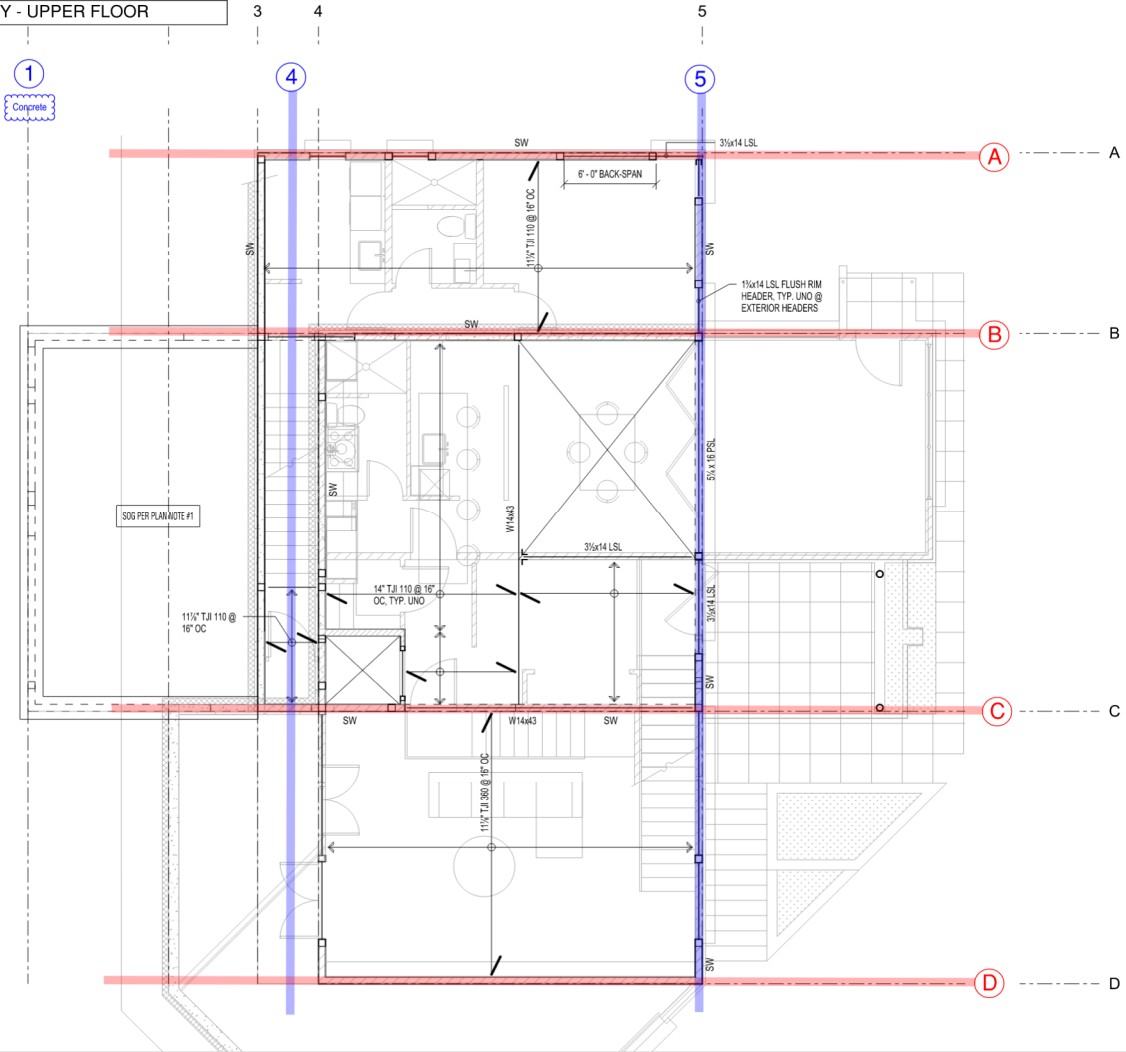
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4

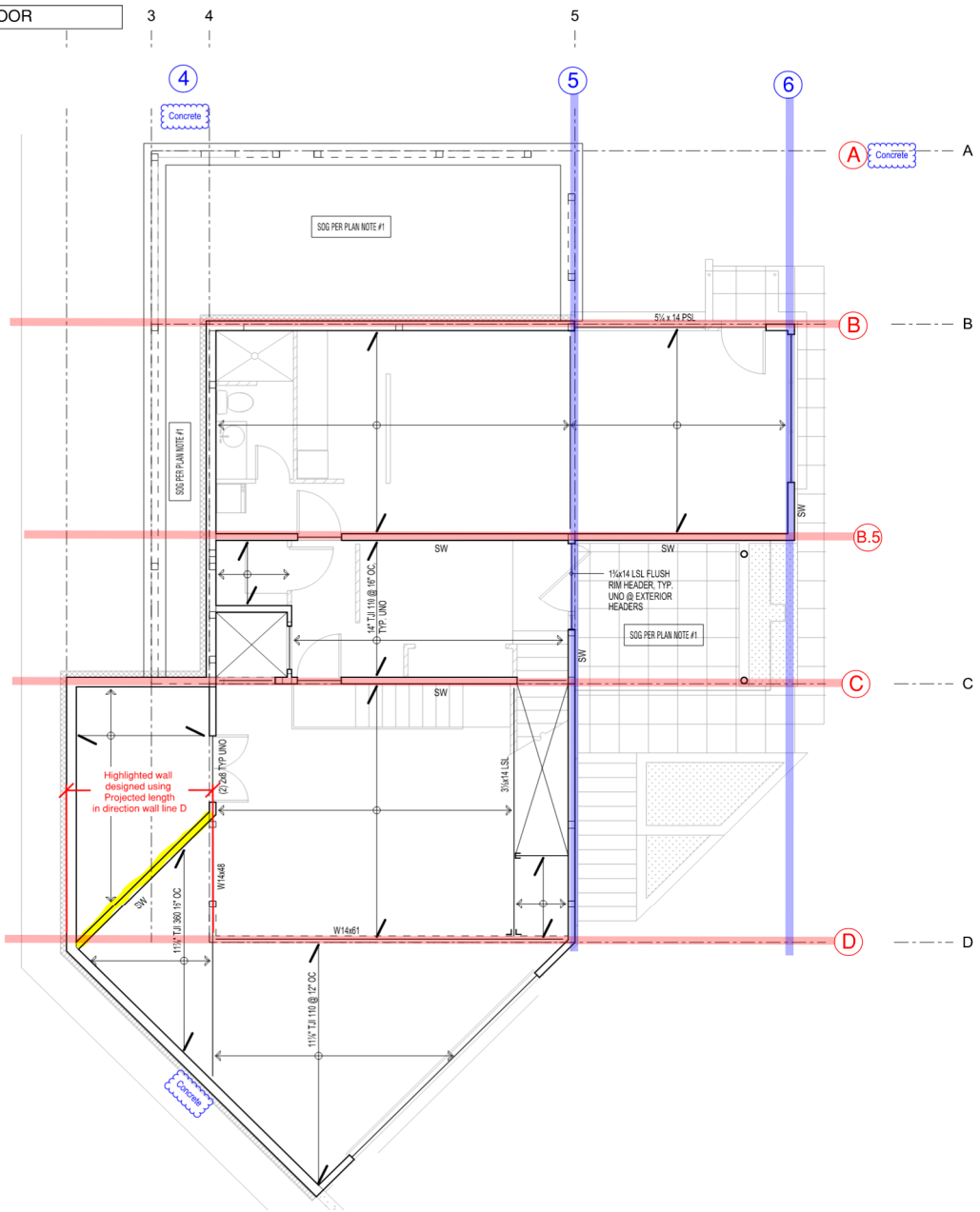
5



LATERAL KEY - UPPER FLOOR



LATERAL KEY - MAIN FLOOR



1. Shear wall demands have been increased where seismic controls design and h/L is greater than 2:1 per SDPWS Table 4.3.4. Where wind controls design, shearwall demands have been decreased 40% per IBC 2306.3.

WALL LINE A

UPPER												
		WIND TRIB = 11%		ZL = 14.25								
		0.6W (k) = 1.30										
		SEISMIC TRIB = 11%										
		0.7E (k) = 0.96				<i>Wall weight</i>						
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)
1	9.4	14.3	0.66	1.00	65	67	SW 1	240	0.6	0.47	0.6	0.3
Concrete												

WALL LINE B

ROOF													OPEN FRONT	W (ft)	Mmax (k-ft)	V (k)	v (plf)
		WIND TRIB = 50%		OPEN FRONT 1.75		ZL = 27.00											
		0.6W (k) = 1.45															
		SEISMIC TRIB = 50%															
		0.7E (k) = 2.25		1.75		<i>Wall weight</i>											
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)					
1	10.2	10.0	1.02	1.00	46	83	SW 1	240	0.8	0.47	0.5	0.6					
1	10.2	5.0	2.04	0.98	46	85	SW 1	240	0.8	0.47	0.2	0.7					
1	10.2	12.0	0.85	1.00	46	83	SW 1	240	0.8	0.47	0.6	0.6					
UPPER																	
		WIND TRIB = 33%		ZL = 18.00													
		0.6W (k) = 5.65															
		SEISMIC TRIB = 33%															
		0.7E (k) = 5.11				<i>Wall weight</i>											
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)					
1	9.4	5.5	1.70	1.00	224	284	SW 2	355	2.7	0.47	0.2	2.5					
1	9.4	12.5	0.75	1.00	224	284	SW 2	355	2.7	0.47	0.5	2.4					
Concrete																	

WALL LINE B.5

MAIN												
		WIND TRIB = 21%										
		0.6W (k) = 2.92										
		SEISMIC TRIB = 23%										
		0.7E (k) = 0.99				<i>Wall weight</i>						
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)
1	9.4	15.0	0.63	1.00	72	34	SW 1	240	0.7	0.47	0.7	0.3
1	9.4	14.0	0.67	1.00	72	34	SW 1	240	0.7	0.47	0.6	0.4
Concrete												

WALL LINE C

ROOF													OPEN FRONT	W (ft)	Mmax (k-ft)	V (k)	v (plf)
		WIND TRIB = 50%		OPEN FRONT 1.75		ZL = 27.75											
		0.6W (k) = 1.45															
		SEISMIC TRIB = 50%															
		0.7E (k) = 2.25		1.75		<i>Wall weight</i>											
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)					
2	10.2	11.0	0.93	1.00	45	81	SW 1	240	0.8	0.47	0.5	0.6					
1	10.2	5.8	1.77	1.00	45	81	SW 1	240	0.8	0.47	0.3	0.7					
UPPER																	
		WIND TRIB = 39%		ZL = 9.25													
		0.6W (k) = 6.06															
		SEISMIC TRIB = 39%															
		0.7E (k) = 5.63				<i>Wall weight</i>											
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)					
1	9.4	9.3	1.01	1.00	468	609	SW 3	595	5.7	0.47	0.4	5.5					
MAIN																	
		WIND TRIB = 23%		ZL = 11.75													
		0.6W (k) = 9.25															
		SEISMIC TRIB = 26%															
		0.7E (k) = 6.75				<i>Wall weight</i>											
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)					
1	9.4	11.8	0.80	1.00	562	575	SW 3	595	5.4	0.47	0.5	5.1					
Concrete																	

WALL LINE D

UPPER		WIND TRIB = 17%	IL = 24.00									
		0.6W (k) = 2.01										
		SEISMIC TRIB = 17%										
		0.7E (k) = 1.48										
<i>Wall weight</i>												
Segment Count	HT (ft)	LENGTH (ft)	h/L	$2/(h/L)^3$	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	$[0.6-0.14Sds]D$ (k)	Net T (k)
1	9.4	24.0	0.39	1.00	60	62	SW 1	240	0.6	0.47	1.0	0.1
MAIN		WIND TRIB = 43%	IL = 9.00									
		0.6W (k) = 7.98										
		SEISMIC TRIB = 35%										
		0.7E (k) = 2.98										
<i>Wall weight</i>												
Segment Count	HT (ft)	LENGTH (ft)	h/L	$2/(h/L)^3$	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	$[0.6-0.14Sds]D$ (k)	Net T (k)
1	9.4	9.0	1.04	1.00	633	331	SW 4	705	5.9	0.47	0.4	5.7

1. Shear wall demands have been increased where seismic controls design and h/L is greater than 2:1 per SDPWS Table 4.3.4. Where wind controls design, shearwall demands have been decreased 40% per IBC 2306.3.

WALL LINE 1

ROOF		WIND TRIB = 22%		ΣL = 11.30								
		0.6W (k) = 0.99										
		SEISMIC TRIB = 22%										
		0.7E (k) = 0.99										
<i>Wall weight</i>												
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)
1	10.2	11.3	0.90	1.00	63	87	SW 1	240	0.9	0.47	0.5	0.6
Concrete												

WALL LINE 4

ROOF		WIND TRIB = 78%		ΣL = 14.30								
		0.6W (k) = 3.51										
		SEISMIC TRIB = 78%										
		0.7E (k) = 3.51										
<i>Wall weight</i>												
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)
1	10.2	9.5	1.07	1.00	175	245	SW 2	355	2.5	0.47	0.5	2.3
1	10.2	4.8	2.13	0.94	175	261	SW 2	355	2.5	0.47	0.2	2.4
UPPER		WIND TRIB = 50%		ΣL = 36.50								
		0.6W (k) = 7.71										
		SEISMIC TRIB = 50%										
		0.7E (k) = 7.85										
<i>Wall weight</i>												
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)
1	9.4	24.5	0.38	1.00	151	215	SW 1	240	2.0	0.47	1.1	1.5
1	9.4	12.0	0.78	1.00	151	215	SW 1	240	2.0	0.47	0.5	1.8
Concrete												

OPEN FRONT
 D/2 (ft) Mmax (k-ft)
 0.6W (k) = 12.25 42.95
 0.7E (k) = 12.25 42.94

WALL LINE 5

UPPER		WIND TRIB = 50%		ΣL = 12.70								
		0.6W (k) = 4.20										
		SEISMIC TRIB = 50%										
		0.7E (k) = 4.34										
<i>Wall weight</i>												
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)
1	9.4	6.0	1.56	1.00	236	342	SW 3	595	3.2	0.47	0.3	3.1
1	9.4	3.8	2.47	0.81	236	422	SW 3	595	3.2	0.47	0.2	3.1
1	9.4	2.9	3.23	0.62	236	553	SW 3	595	3.2	0.47	0.1	3.1
MAIN		WIND TRIB = 50%		ΣL = 21.00								
		0.6W (k) = 6.71										
		SEISMIC TRIB = 47%										
		0.7E (k) = 6.36										
<i>Wall weight</i>												
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)
1	8.5	21.0	0.41	1.00	228	303	SW 3	595	2.6	0.47	0.8	2.2
Concrete												

WALL LINE 6

MAIN		WIND TRIB = 18%		ΣL = 3.80								
		0.6W (k) = 0.90										
		SEISMIC TRIB = 6%										
		0.7E (k) = 0.26										
<i>Wall weight</i>												
Segment Count	HT (ft)	LENGTH (ft)	h/L	2/(h/L) ¹	0.6W (plf)	0.7E (plf)	SW	SW Cap (plf)	Tension (k)	0.6-0.14Sds	[0.6-0.14Sds]D (k)	Net T (k)
1	8.5	3.8	2.25	0.89	170	76	SW 1	240	1.4	0.47	0.2	1.4
Concrete												

Mark	Sheathing	Blck'g	Panel Nailing ¹	Attachment to top plate ³	Bottom Plate Attachment			Capacity (plf) (Seismic)
					Rim Joist Req'd	Nailing to ⁴ wood below	A. Bolts to ⁵ concrete below	
SW 1	15/32" APA Sheathing	Yes	8d @ 6"oc	CLIP @ 24"oc	2x or 1¾" LSL	16d @ 6"oc	5/8" @ 48"oc	240
SW 2	15/32" APA Sheathing	Yes	8d @ 4"oc ²	CLIP @ 20"oc	2x or 1¾" LSL	16d @ 4¾"oc	5/8" @ 48"oc	355
SW x	15/32" APA Sheathing	Yes	8d @ 3"oc ²	CLIP @ 16"oc	2x or 1¾" LSL	16d @ 3¾"oc	5/8" @ 36"oc	455
SW 3	15/32" APA Sheathing	Yes	8d @ 2"oc ²	CLIP @ 12"oc	4x or 3½" LSL	(2) Rows ⁶ 16d @ 5¾"oc	5/8" @ 24"oc	595
SW 4	15/32" APA Sheathing Each Side	Yes	8d @ 4"oc ²	CLIP @ 9"oc	4x or 3½" LSL	(2) Rows ⁶ 16d @ 4¾"oc	5/8" @ 24"oc ⁷	705

¹ Nails shall be 8d box. Nailing applies to all panel edges (block all unsupported panel edges), top & bottom plates and blocking. Nail to intermediate framing members w/ 8d @ 12"oc.

(Note: where stud spacing is 24"oc, nail to intermediate framing members with 8d@6"oc.)

² Framing at adjoining panel edges shall be 3-inch nominal or wider and nails shall be staggered.

³ Clip shall be either A35, LTP4.

⁴ Nails shall be 16d box (0.135Øx3½") or 10d common (0.148Øx3½")

Screws shall be Simpson SDS25412 (1/4"Øx4½"min).

⁵ Provide 3"x3"x0.229" plate washer at all anchor bolts. Anchor bolts shall be positioned such that plate edge of plate washer is with 1/2" of the edge of the bottom plate.

(Plate washers may be diagonally slotted with a width of up to 13/16" and a length not to exceed 1¾")

⁶ Rows must be offset at least 1/2" and staggered.

⁷ Alternate plate washers to provide 1/2" dimension on each side fo the shearwall.



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Phone:			
E-mail:			

1. Project information

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

Project description:
Location:
Fastening description:

2. Input Data & Anchor Parameters

General

Design method: ACI 318-14
Units: Imperial units

Anchor Information:

Anchor type: Cast-in-place
Material: AB
Diameter (inch): 0.875
Effective Embedment depth, h_{ef} (inch): 9.000
Anchor category: -
Anchor ductility: Yes
 h_{min} (inch): 11.38
 C_{min} (inch): 1.75
 S_{min} (inch): 3.50

Base Material

Concrete: Normal-weight
Concrete thickness, h (inch): 12.00
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: Yes
Build-up grout pad: No

Recommended Anchor

Anchor Name: PAB Pre-Assembled Anchor Bolt - PAB7 (7/8"Ø)





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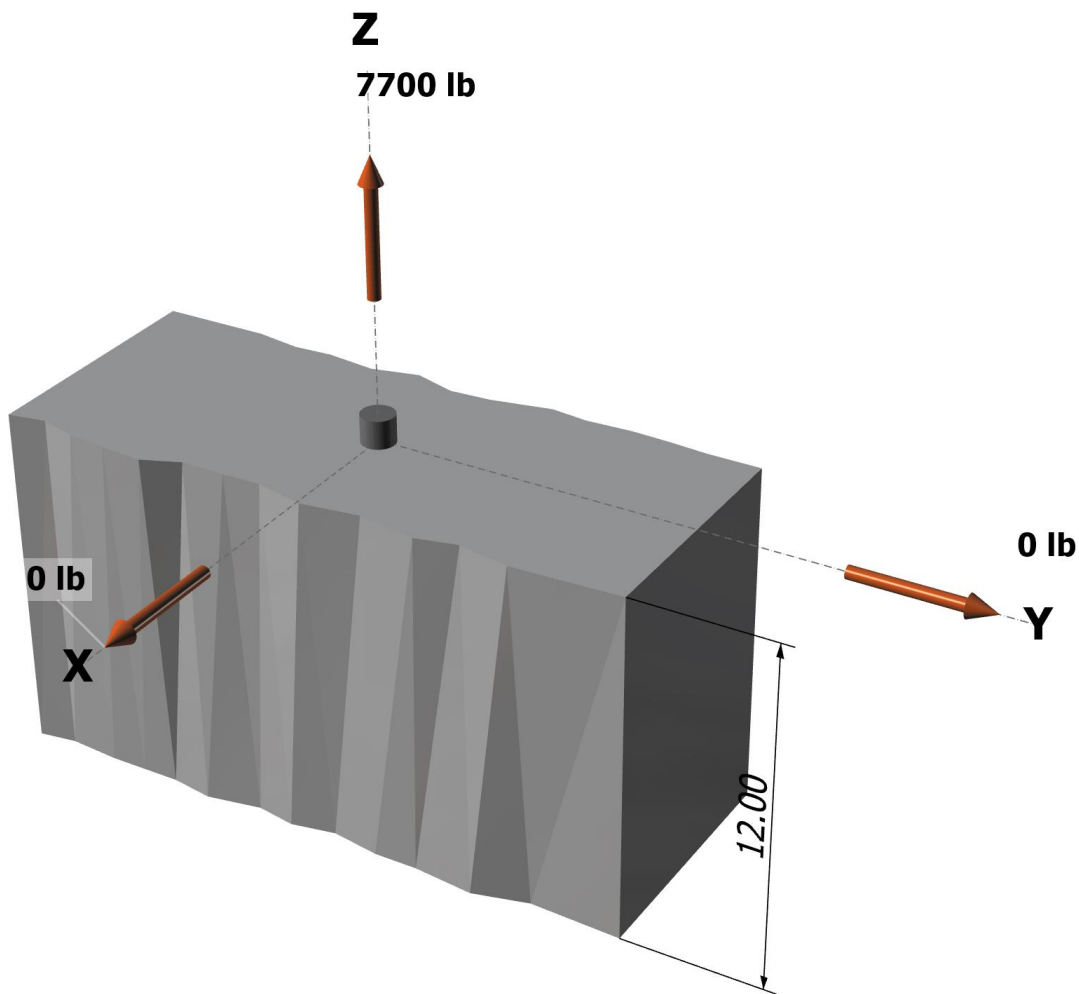
Load and Geometry

Load factor source: ACI 318 Section 5.3
Load combination: $U = 0.9D + 1.0E$
Seismic design: Yes
Anchors subjected to sustained tension: Not applicable
Ductility section for tension: 17.2.3.4.3 (c) is satisfied
Ductility section for shear: 17.2.3.5.2 not applicable
 Ω_0 factor: not set
Apply entire shear load at front row: No
Anchors only resisting wind and/or seismic loads: Yes

Service level loads:

	D	E	Strength level loads
N_a [lb]:	0	7700	7700
V_{ax} [lb]:	0	0	0
V_{ay} [lb]:	0	0	0

<Figure 1>

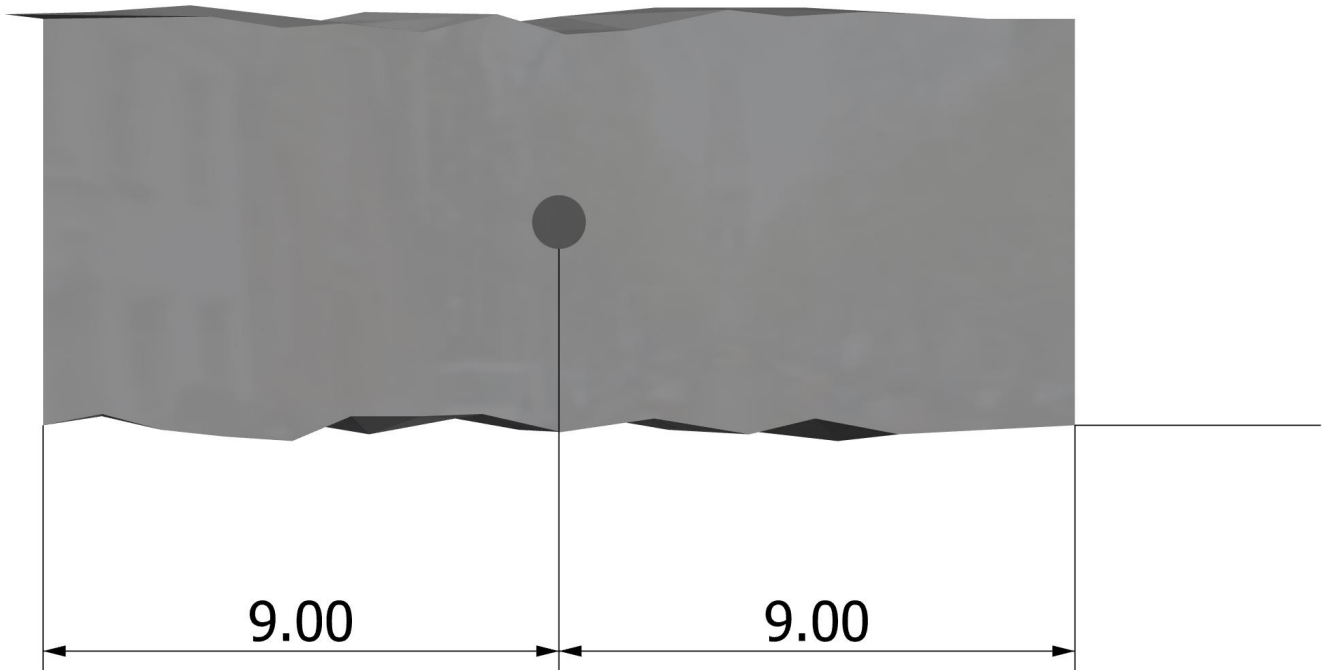


Input data and results must be checked for agreement with the existing circumstances, the standards and guidelines must be checked for plausibility.



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<Figure 2>





Anchor Designer™
Software
Version 2.8.7094.0

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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	7700.0	0.0	0.0	0.0
Sum	7700.0	0.0	0.0	0.0

Maximum concrete compression strain (%): 0.00
 Maximum concrete compression stress (psi): 0
 Resultant tension force (lb): 7700
 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

4. Steel Strength of Anchor in Tension (Sec. 17.4.1)

N _{sa} (lb)	φ	φN _{sa} (lb)
26795	0.75	20096

5. Concrete Breakout Strength of Anchor in Tension (Sec. 17.4.2)

$$N_b = k_c \lambda_a \sqrt{f_c} h_{ef}^{1.5} \text{ (Eq. 17.4.2.2a)}$$

k _c	λ _a	f _c (psi)	h _{ef} (in)	N _b (lb)
24.0	1.00	2500	9.000	32400

$$0.75 \phi N_{cb} = 0.75 \phi (A_{Nc} / A_{Nco}) \Psi_{ed,N} \Psi_{c,N} \Psi_{cp,N} N_b \text{ (Sec. 17.3.1 \& Eq. 17.4.2.1a)}$$

A _{Nc} (in ²)	A _{Nco} (in ²)	c _{a,min} (in)	Ψ _{ed,N}	Ψ _{c,N}	Ψ _{cp,N}	N _b (lb)	φ	0.75 φN _{cb} (lb)
529.88	729.00	9.00	0.900	1.00	1.000	32400	0.75	11922

6. Pullout Strength of Anchor in Tension (Sec. 17.4.3)

$$0.75 \phi N_{pn} = 0.75 \phi \Psi_{c,P} N_p = 0.75 \phi \Psi_{c,P} 8 A_{brg} f_c \text{ (Sec. 17.3.1, Eq. 17.4.3.1 \& 17.4.3.4)}$$

Ψ _{c,P}	A _{brg} (in ²)	f _c (psi)	φ	0.75 φN _{pn} (lb)
1.0	4.07	2500	0.70	42683

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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11. Results

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

Tension	Factored Load, N_{ua} (lb)	Design Strength, ϕN_n (lb)	Ratio	Status
Steel	7700	20096	0.38	Pass
Concrete breakout	7700	11922	0.65	Pass (Governs)
Pullout	7700	42683	0.18	Pass

PAB7 (7/8"Ø) with hef = 9.000 inch meets the selected design criteria.

12. Warnings

- Minimum spacing and edge distance requirement of $6d_a$ per ACI 318 Sections 17.7.1 and 17.7.2 for torqued cast-in-place anchor is waived per designer option.
- Per designer input, ductility requirements for tension have been determined to be satisfied – designer to verify.
- Per designer input, the shear component of the strength-level earthquake force applied to anchors does not exceed 20 percent of the total factored anchor shear force associated with the same load combination. Therefore the ductility requirements of ACI 318 17.2.3.5.2 for shear need not be satisfied – designer to verify.
- Designer must exercise own judgement to determine if this design is suitable.

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage/ADU Step (12/S3.2)

Code Reference

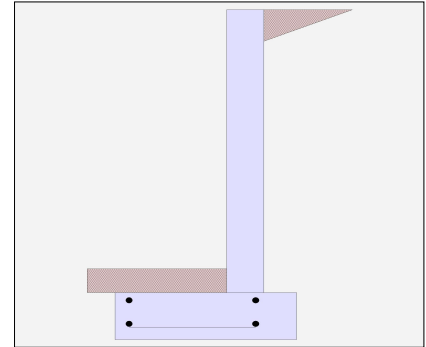
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.675
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	40.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	210.0 lbs
Axial Live Load	=	560.0 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	=	0.0 psf (Strength Level)

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage/ADU Step (12/S3.2)

Design Summary

Wall Stability Ratios

Overtuning	=	1.63	OK
Sliding	=	1.51	OK
Global Stability	=	0.00	
Total Bearing Load	=	2,466 lbs	
...resultant ecc.	=	5.16 in	
Soil Pressure @ Toe	=	1,362 psf	OK
Soil Pressure @ Heel	=	156 psf	OK
Allowable	=	4,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,906 psf	
ACI Factored @ Heel	=	218 psf	
Footing Shear @ Toe	=	16.3 psi	OK
Footing Shear @ Heel	=	3.9 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	1,066.2 lbs	
less 100% Passive Force	-	328.1 lbs	
less 100% Friction Force	= -	1,286.4 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Design Height Above Ftg

ft =	Stem OK	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	SD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa = 0.491

Total Force @ Section

Service Level	lbs =	1,270.2
Strength Level	lbs =	1,270.2

Moment....Actual

Service Level	ft-# =	2,658.5
Strength Level	ft-# =	2,658.5

Moment.....Allowable = 5,412.6

Shear.....Actual

Service Level	psi =	16.9
Strength Level	psi =	16.9

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	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Bottom

SD SD

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage/ADU Step (12/S3.2)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0996 in2/ft		
(4/3) * As :	0.1328 in2/ft	Min Stem T&S Reinf Area 1.152 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	1.25
Total Footing Width	=	3.25
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 %	=	0.0000
Cover @ Top	2.00	@ Btm= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,906	218 psf
Mu' : Upward	=	3,120	54 ft-#
Mu' : Downward	=	516	201 ft-#
Mu: Design	=	2,604	146 ft-#
phiMin	=	7,663	2,500 ft-#
Actual 1-Way Shear	=	16.29	3.94 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:
 Heel:
 Key:

Min footing T&S reinf Area	0.84	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

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage/ADU Step (12/S3.2)

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)	980.0	2.33	2,286.7	Soil Over HL (ab. water tbl)	455.0	2.96	1,346.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.96	1,346.0
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =	86.2	3.50	301.5	Surcharge Over Heel =	23.3	2.96	69.0
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	210.0	2.33	490.0
Added Lateral Load =				* Axial Live Load on Stem =	560.0	2.33	1,306.7
Load @ Stem Above Soil =				Soil Over Toe =	130.0	1.00	130.0
=				Surcharge Over Toe =			
				Stem Weight(s) =	600.0	2.33	1,400.0
				Earth @ Stem Transitions =			
Total	= 1,066.2	O.T.M.	= 2,588.2	Footing Weight =	487.5	1.63	792.2
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	1.63	Total =	1,905.8 lbs	R.M.=	4,227.3
Vertical Loads used for Soil Pressure =		2,465.8	lbs	* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.070 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

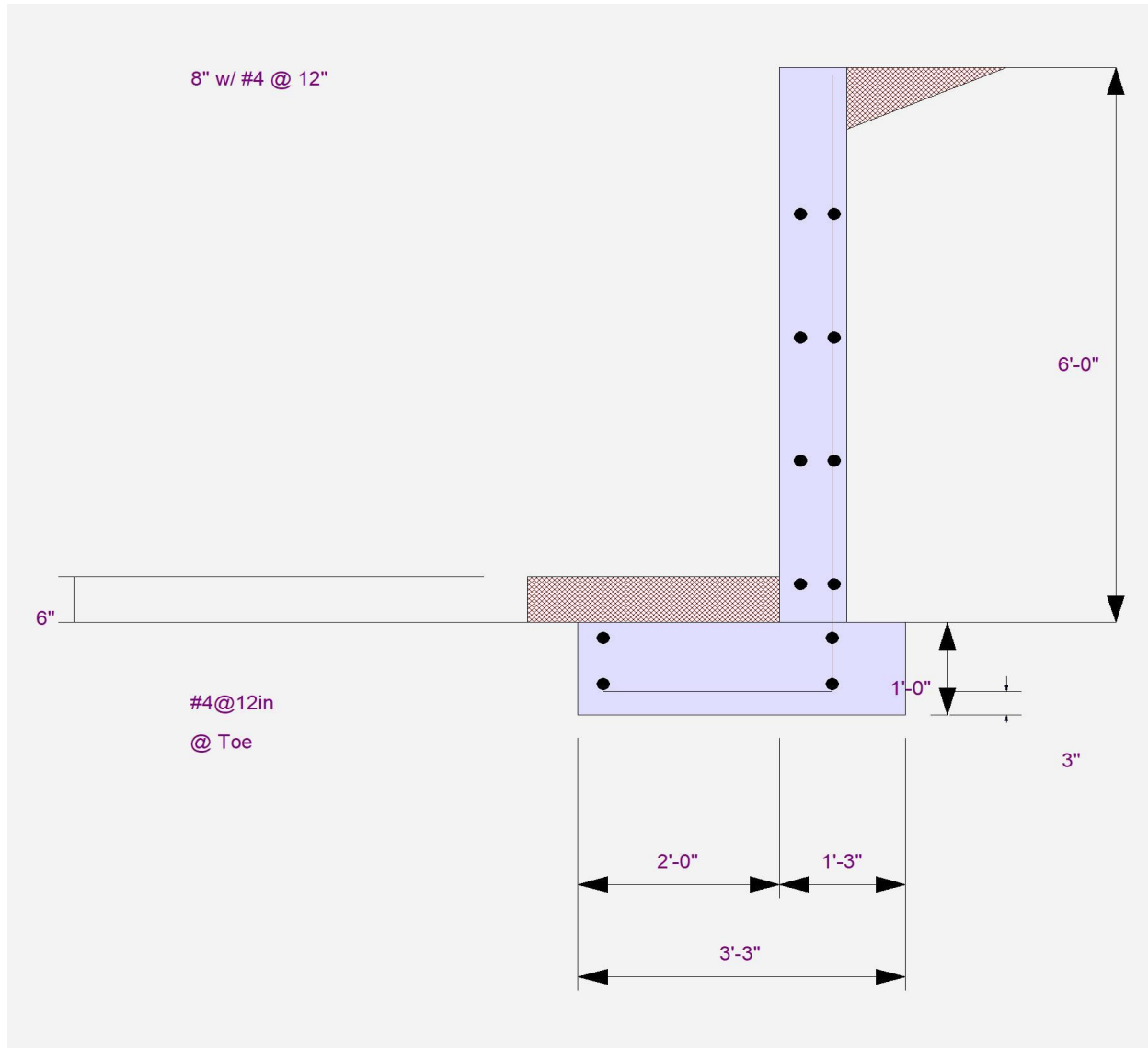
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage/ADU Step (12/S3.2)



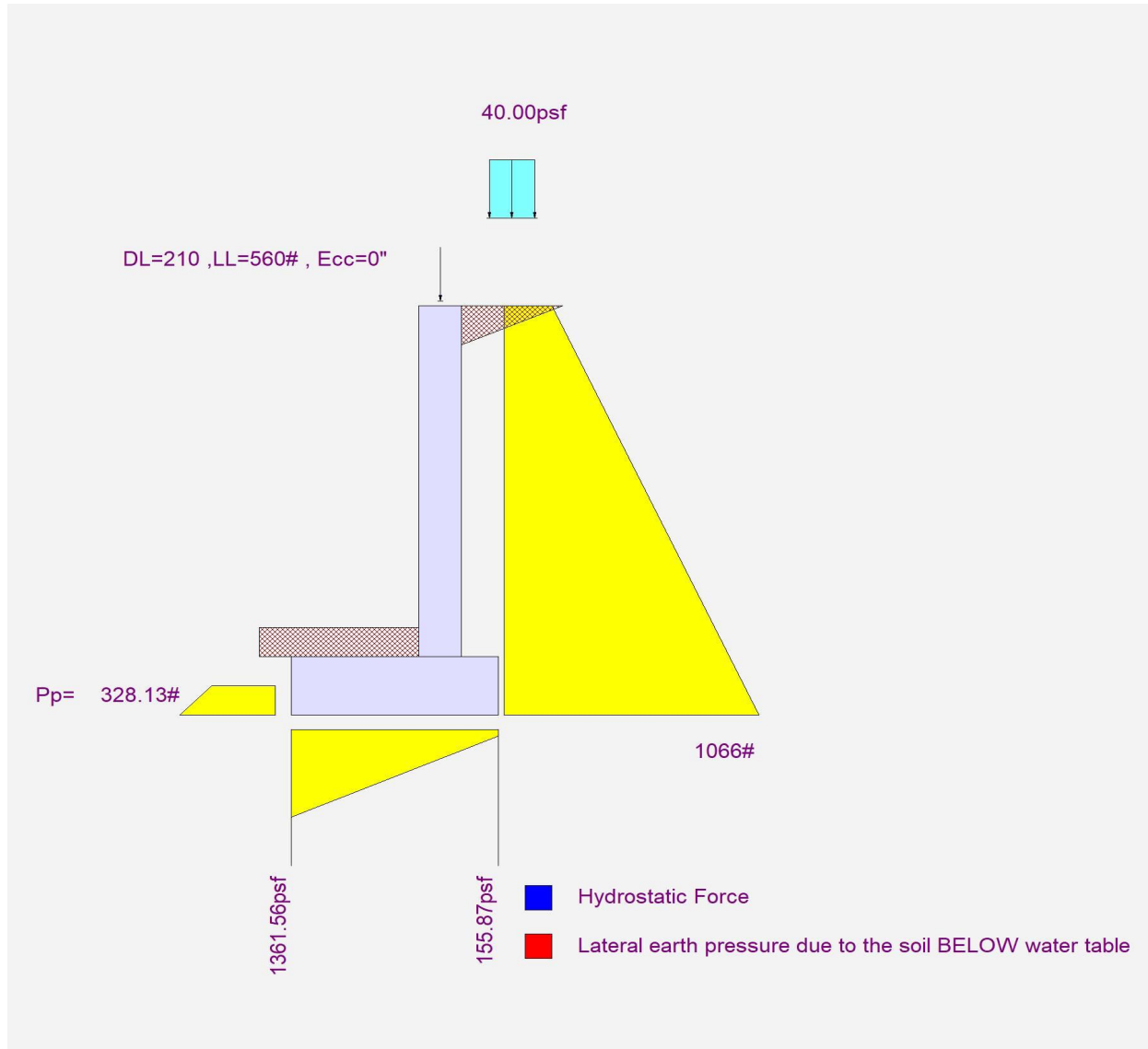
Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage/ADU Step (12/S3.2)



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE Den/Guest Rm (9/S3.2)

Code Reference

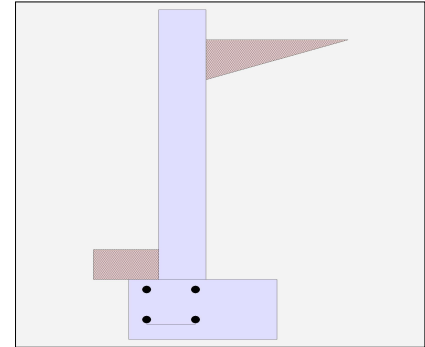
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.675
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	40.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	120.0 lbs
Axial Live Load	=	40.0 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	=	0.0 psf (Strength Level)

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE Den/Guest Rm (9/S3.2)

Design Summary

Wall Stability Ratios

Overturing	=	1.67	OK
Sliding	=	2.35	OK
Global Stability	=	0.00	
Total Bearing Load	=	1,511 lbs	
...resultant ecc.	=	7.01 in	
Soil Pressure @ Toe	=	2,193 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	4,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	3,070 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	0.8 psi	OK
Footing Shear @ Heel	=	6.4 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	561.5 lbs	
less 100% Passive Force	=	328.1 lbs	
less 100% Friction Force	=	992.6 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Design Height Above Ftg

ft =	Stem OK	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	SD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.155
---------------	---	-------

Total Force @ Section

Service Level	lbs =	590.8
Strength Level	lbs =	590.8

Moment....Actual

Service Level	ft-# =	840.2
Strength Level	ft-# =	840.2

Moment.....Allowable	=	5,412.6
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Shear.....Actual

Service Level	psi =	7.9
Strength Level	psi =	7.9

Shear.....Allowable	psi =	75.0
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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	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Bottom

SD SD

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE Den/Guest Rm (9/S3.2)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0315 in ² /ft		
(4/3) * As :	0.042 in ² /ft	Min Stem T&S Reinf Area 0.864 in ²	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in ² /ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in ² /ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.1728 in ² /ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in ² /ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in ² /ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	1.67
Total Footing Width	=	2.09
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 % =		0.0000
Cover @ Top 2.00	@ Btm=	3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 3,070	0 psf
Mu' : Upward	= 243	9 ft-#
Mu' : Downward	= 23	434 ft-#
Mu: Design	= 221	425 ft-#
phiMin	= 7,663	2,500 ft-#
Actual 1-Way Shear	= 0.80	6.45 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:
 Heel:
 Key:

Min footing T&S reinf Area	0.54 in ²
Min footing T&S reinf Area per foot	0.26 in ² /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

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE Den/Guest Rm (9/S3.2)

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)	500.0	1.67	833.3	Soil Over HL (ab. water tbl)	520.2	1.59	825.4		
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.59	825.4		
Hydrostatic Force				Watre Table					
Buoyant Force	=			Sloped Soil Over Heel	=				
Surcharge over Heel	=	61.5	2.50	153.8	Surcharge Over Heel	=	40.0	1.59	63.5
Surcharge Over Toe	=			Adjacent Footing Load	=				
Adjacent Footing Load	=			Axial Dead Load on Stem	=	120.0	0.75	90.4	
Added Lateral Load	=			* Axial Live Load on Stem	=	40.0	0.75	30.1	
Load @ Stem Above Soil	=			Soil Over Toe	=	27.3	0.21	5.7	
	=			Surcharge Over Toe	=				
				Stem Weight(s)	=	450.0	0.75	339.0	
				Earth @ Stem Transitions	=				
Total	=	561.5	O.T.M. =	987.2	Footing Weight	=	313.1	1.04	326.7
				Key Weight	=				
				Vert. Component	=				
Resisting/Overturning Ratio			=	1.67	Total =	1,470.5 lbs	R.M.=	1,650.7	
Vertical Loads used for Soil Pressure =		1,510.5	lbs						

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

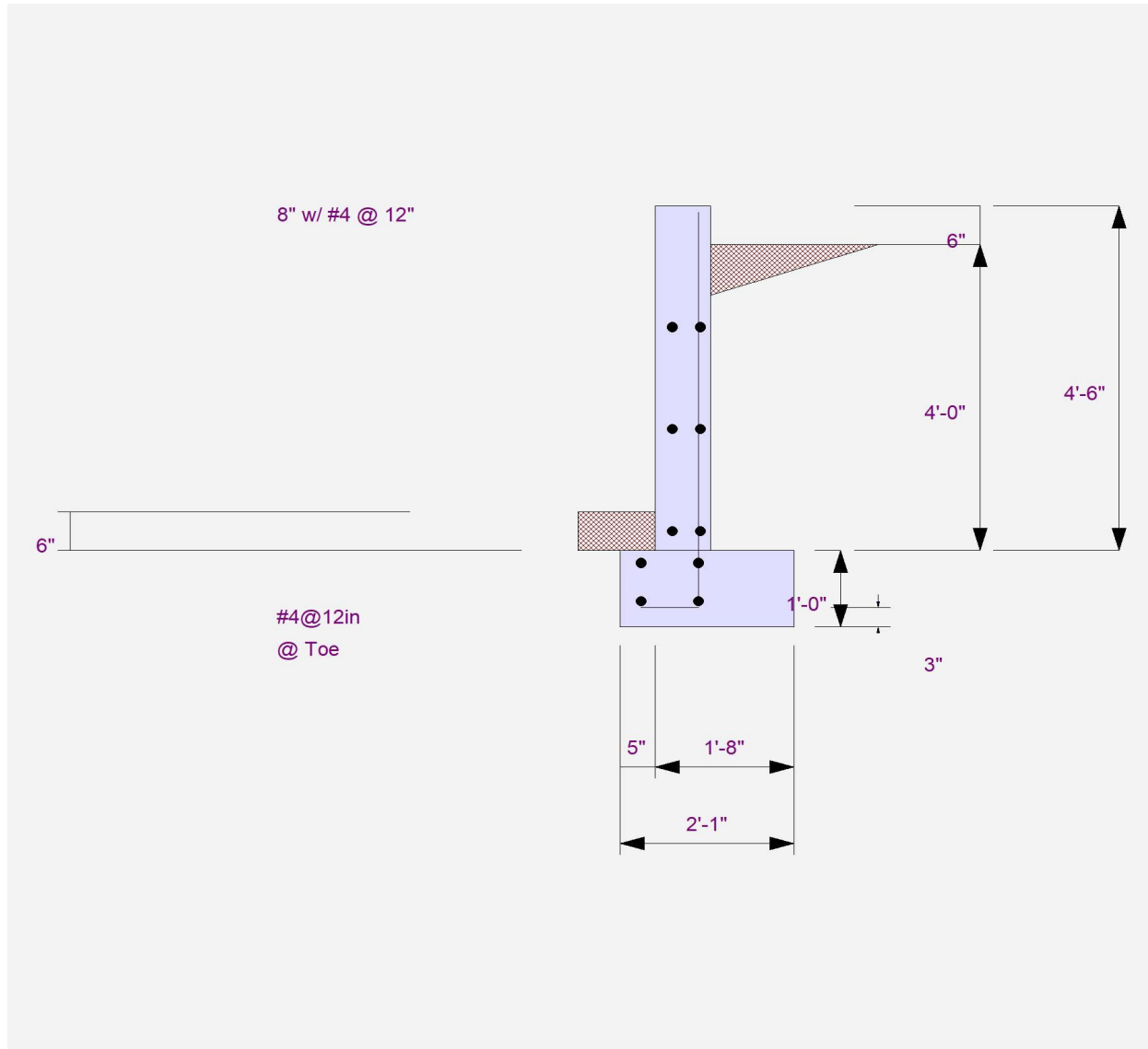
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

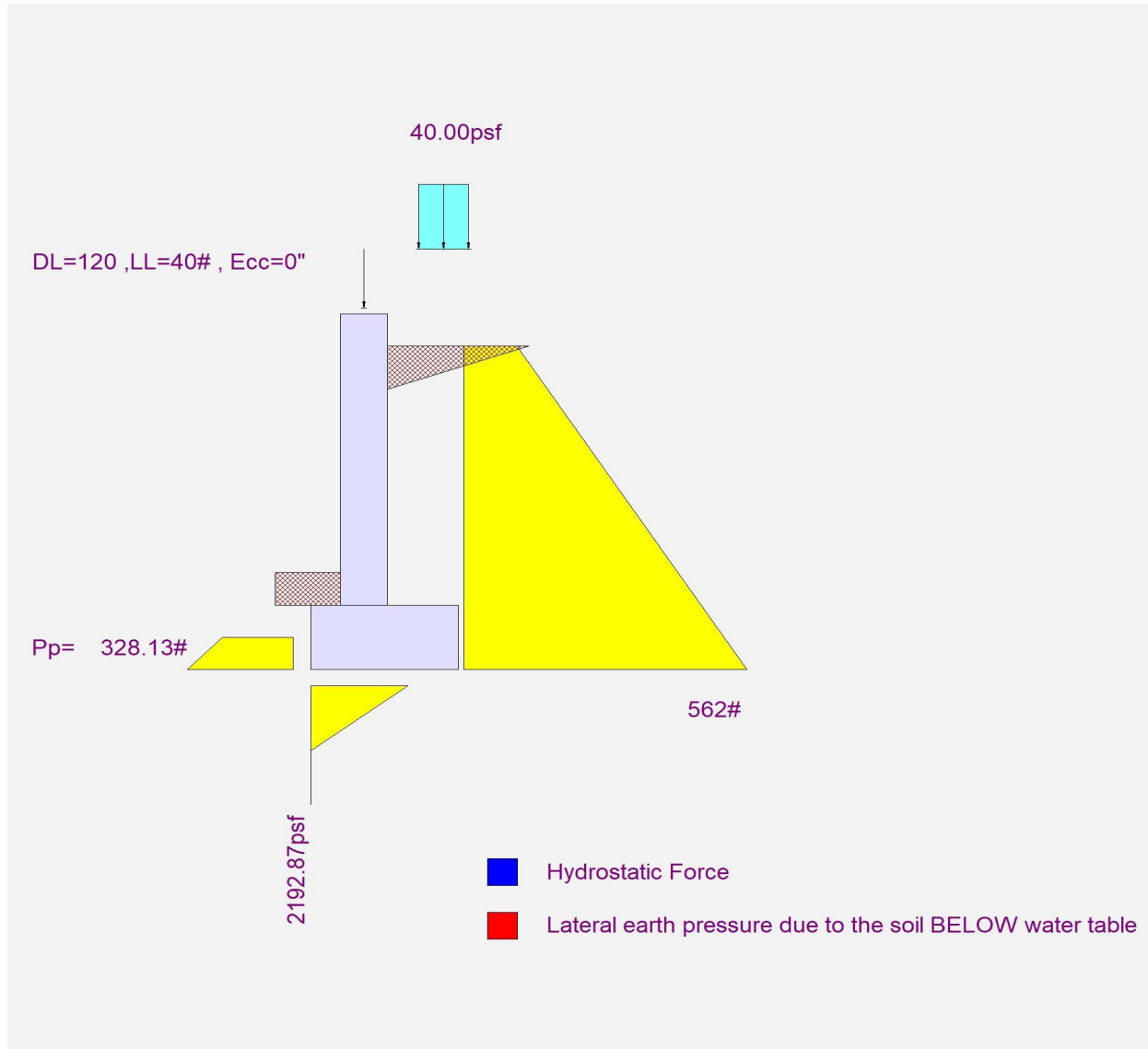
(c) ENERCALC INC 1983-2021

DESCRIPTION: SE Den/Guest Rm (9/S3.2)



Cantilevered Retaining Wall

DESCRIPTION: SE Den/Guest Rm (9/S3.2)



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage Wall (12/S3.3)

Code Reference

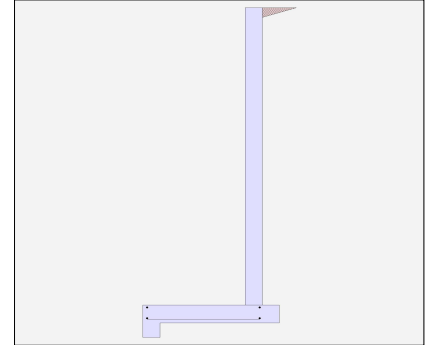
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	20.67 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	10.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	10.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.525
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	=	0.0
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	=	0.0 psf (Strength Level)

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage Wall (12/S3.3)

Design Summary

Wall Stability Ratios

Overtuning	=	1.58	OK
Sliding	=	1.64	OK
Global Stability	=	0.00	
Total Bearing Load	=	4,957 lbs	
...resultant ecc.	=	23.24 in	
Soil Pressure @ Toe	=	1,601 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	4,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,242 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	40.3 psi	OK
Footing Shear @ Heel	=	3.0 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	2,401.8 lbs	
less 100% Passive Force	=	- 1,328.9 lbs	
less 100% Friction Force	=	- 2,602.3 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Design Height Above Ftg

ft =	0.00
Wall Material Above "Ht"	= Concrete
Design Method	= SD
Thickness	= 12.00
Rebar Size	= # 5
Rebar Spacing	= 6.00
Rebar Placed at	= Edge

Design Data

fb/FB + fa/Fa = 0.892

Total Force @ Section

Service Level	lbs =	3,417.0
Strength Level	lbs =	3,417.0

Moment....Actual

Service Level	ft-# =	23,539.7
Strength Level	ft-# =	23,539.7

Moment.....Allowable = 26,382.0

Shear.....Actual

Service Level	psi =	28.0
Strength Level	psi =	28.0

Shear.....Allowable psi = 75.0

Anet (Masonry) in2 =

Rebar Depth 'd' in = 10.19

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	150.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Bottom

Stem OK

ft = 0.00

= Concrete

= SD

= 12.00

= # 5

= 6.00

= Edge

= 0.892

lbs = 3,417.0

lbs = 3,417.0

ft-# = 23,539.7

ft-# = 23,539.7

= 26,382.0

psi = 28.0

psi = 28.0

psi = 75.0

in2 =

in = 10.19

psi =

psi =

=

=

psf = 150.0

=

=

=

psf = 150.0

=

=

=

= ASD

psi = 2,500.0

psi = 60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage Wall (12/S3.3)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.5301 in2/ft		
(4/3) * As :	0.7067 in2/ft	Min Stem T&S Reinf Area 5.952 in2	
200bd/fy : 200(12)(10.1875)/60000 :	0.4075 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.288 in2/ft	
0.0018bh : 0.0018(12)(12) :	0.2592 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.5301 in2/ft	#4@ 8.33 in	#4@ 16.67 in
Provided Area :	0.62 in2/ft	#5@ 12.92 in	#5@ 25.83 in
Maximum Area :	1.3801 in2/ft	#6@ 18.33 in	#6@ 36.67 in

Footing Data

Toe Width	=	6.00 ft
Heel Width	=	2.00
Total Footing Width	=	8.00
Footing Thickness	=	15.00 in
Key Width	=	12.00 in
Key Depth	=	12.00 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 % =		0.0000
Cover @ Top 2.00	@ Btm=	3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,242	0 psf
Mu' : Upward	= 27,317	0 ft-#
Mu' : Downward	= 4,050	237 ft-#
Mu: Design	= 23,267	237 ft-#
phiMin	= 30,573	4,225 ft-#
Actual 1-Way Shear	= 40.33	3.03 psi
Allow 1-Way Shear	= 75.00	40.00 psi
Toe Reinforcing	= # 5 @ 6.00 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:
 Heel:
 Key:

Min footing T&S reinf Area	2.59 in2
Min footing T&S reinf Area per foot	0.32 in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 7.41 in	#4@ 14.81 in
#5@ 11.48 in	#5@ 22.96 in
#6@ 16.30 in	#6@ 32.59 in

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage Wall (12/S3.3)

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)	2,401.8	7.31	17,546.6	Soil Over HL (ab. water tbl)	206.7	7.50	1,550.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		7.50	1,550.0
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 =			
				Surcharge Over Toe =			
				Stem Weight(s) =	3,100.1	6.50	20,150.3
				Earth @ Stem Transitions =			
Total	= 2,401.8	O.T.M.	= 17,546.6	Footing Weight =	1,500.0	4.00	6,000.0
				Key Weight =	150.0	0.50	75.0
				Vert. Component =			
Resisting/Overturning Ratio		=	1.58	Total =	4,956.7 lbs	R.M.=	27,775.4
Vertical Loads used for Soil Pressure =		4,956.7 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.115 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

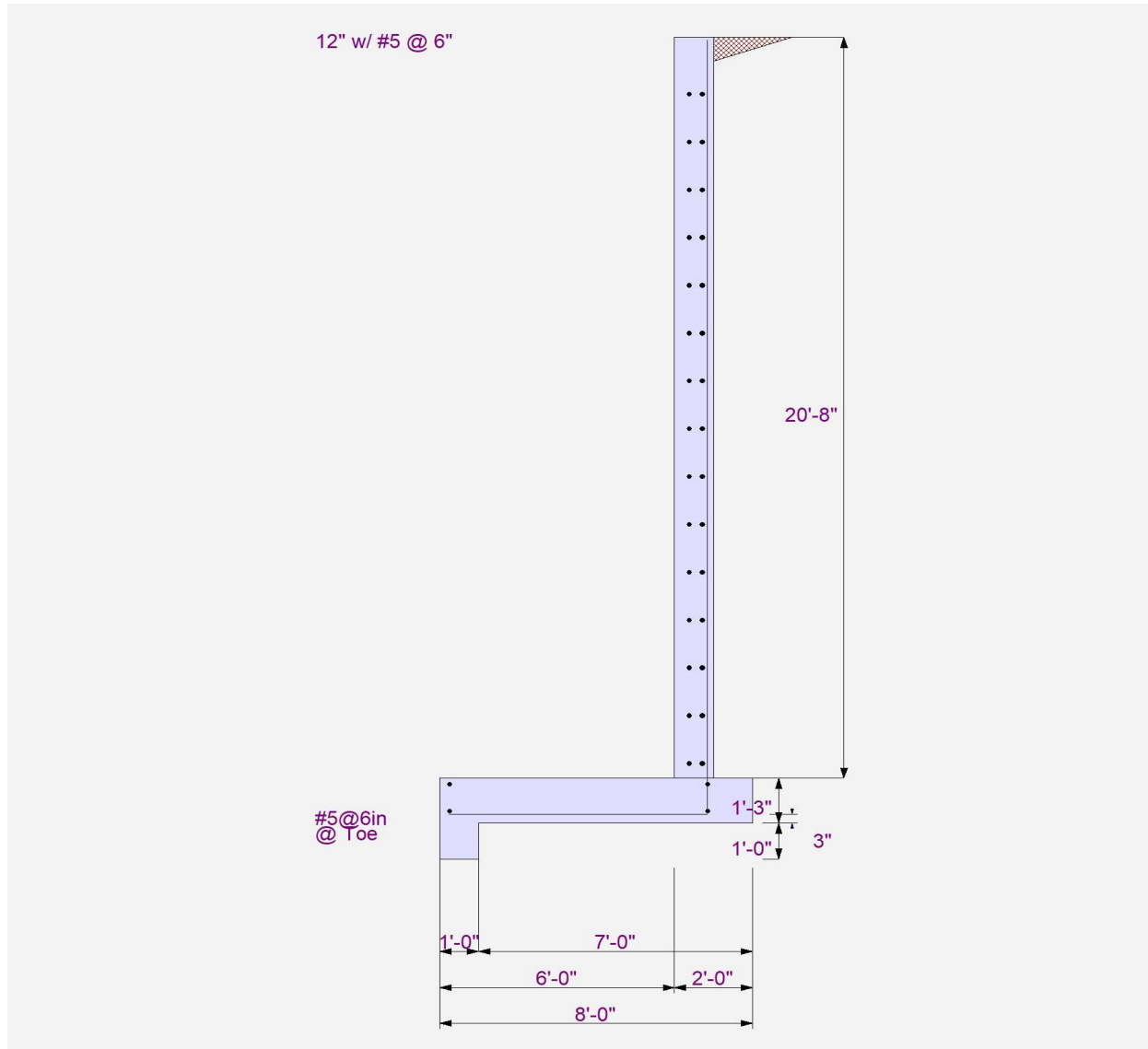
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage Wall (12/S3.3)



Cantilevered Retaining Wall

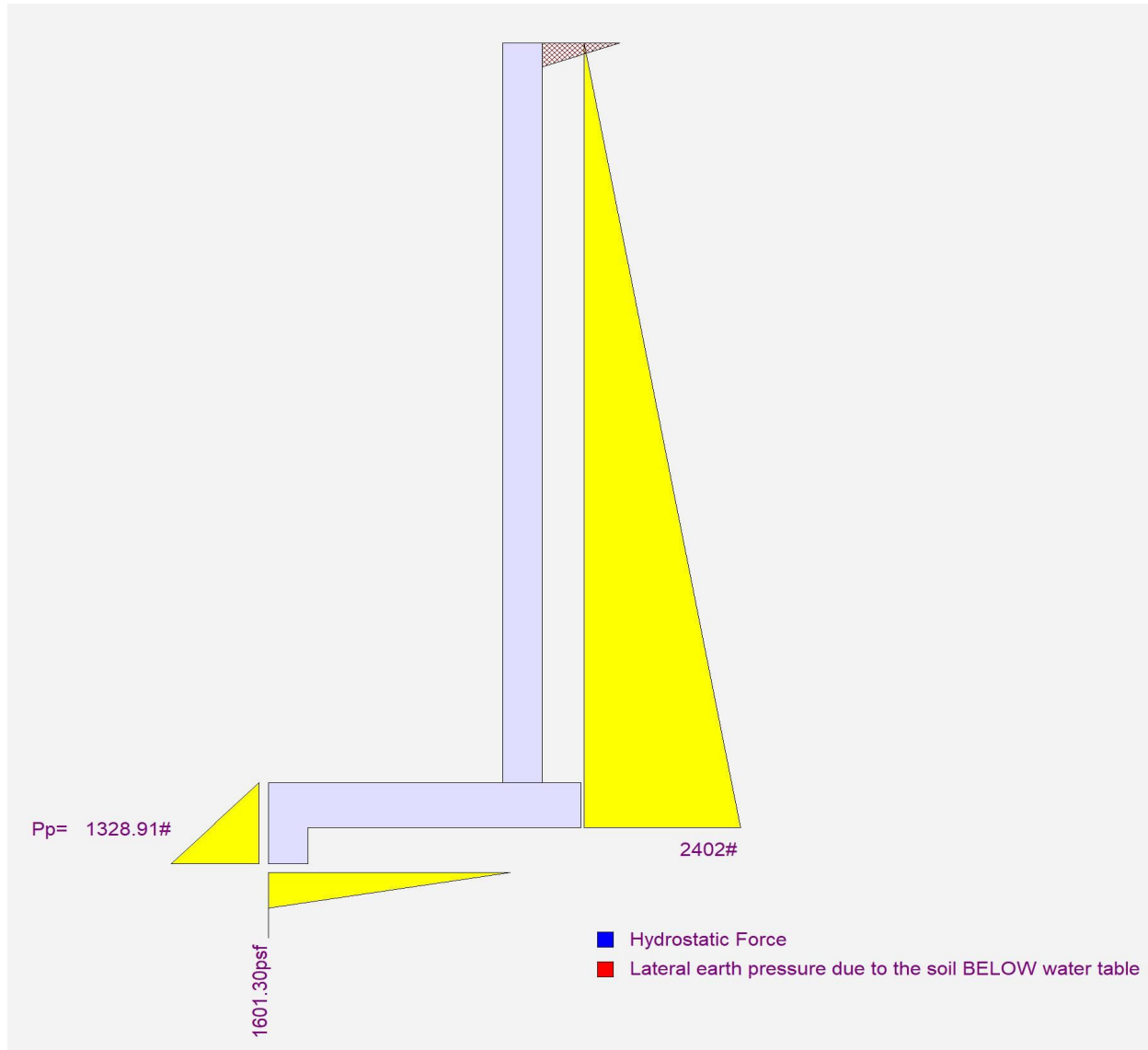
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Garage Wall (12/S3.3)



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Stair Wall (10/S3.1)

Code Reference

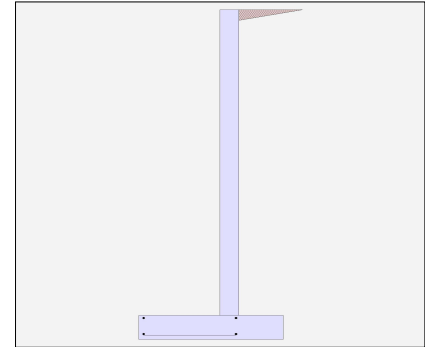
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	19.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	10.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	5.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.525
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	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	120.0 lbs
Axial Live Load	=	300.0 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	=	0.0 psf (Strength Level)

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Stair Wall (10/S3.1)

Design Summary

Wall Stability Ratios

Overtuning	=	1.53	OK
Sliding	=	1.50	OK
Global Stability	=	0.00	
Total Bearing Load	=	5,197 lbs	
...resultant ecc.	=	24.56 in	
Soil Pressure @ Toe	=	1,988 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	4,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,783 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	29.8 psi	OK
Footing Shear @ Heel	=	4.7 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	2,101.3 lbs	
less 100% Passive Force	=	- 590.6 lbs	
less 100% Friction Force	=	- 2,570.8 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Design Height Above Ftg

ft =	0.00
Wall Material Above "Ht"	= Concrete
Design Method	= SD
Thickness	= 12.00
Rebar Size	= # 5
Rebar Spacing	= 8.00
Rebar Placed at	= Edge

Design Data

fb/FB + fa/Fa = 0.906

Total Force @ Section

Service Level	lbs =	2,888.0
Strength Level	lbs =	2,888.0

Moment....Actual

Service Level	ft-# =	18,290.7
Strength Level	ft-# =	18,290.7

Moment.....Allowable = 20,169.2

Shear.....Actual

Service Level	psi =	23.6
Strength Level	psi =	23.6

Shear.....Allowable psi = 75.0

Anet (Masonry)

Rebar Depth 'd' in = 10.19

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	150.0
Short Term Factor	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Bottom

Stem OK

ft = 0.00

= Concrete

= SD

SD

SD

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Stair Wall (10/S3.1)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.4119 in2/ft		
(4/3) * As :	0.5492 in2/ft	Min Stem T&S Reinf Area 5.472 in2	
200bd/fy : 200(12)(10.1875)/60000 :	0.4075 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.288 in2/ft	
0.0018bh : 0.0018(12)(12) :	0.2592 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.4119 in2/ft	#4@ 8.33 in	#4@ 16.67 in
Provided Area :	0.465 in2/ft	#5@ 12.92 in	#5@ 25.83 in
Maximum Area :	1.3801 in2/ft	#6@ 18.33 in	#6@ 36.67 in

Footing Data

Toe Width	=	4.25 ft
Heel Width	=	3.33
Total Footing Width	=	7.58
Footing Thickness	=	18.00 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 % = 0.0000		
Cover @ Top 2.00	@ Btm= 3.00 in	

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	2,783	0 psf
Mu' : Upward	=	18,324	0 ft-#
Mu' : Downward	=	2,438	1,042 ft-#
Mu: Design	=	15,885	1,042 ft-#
phiMin	=	29,589	6,400 ft-#
Actual 1-Way Shear	=	29.78	4.66 psi
Allow 1-Way Shear	=	75.00	40.00 psi
Toe Reinforcing	=	# 5 @ 8.00 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:
 Heel:
 Key:

Min footing T&S reinf Area	2.95	in2
Min footing T&S reinf Area per foot	0.39	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 6.17 in		#4@ 12.35 in
#5@ 9.57 in		#5@ 19.14 in
#6@ 13.58 in		#6@ 27.16 in

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Stair Wall (10/S3.1)

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)	2,101.3	6.83	14,358.5	Soil Over HL (ab. water tbl)	221.4	6.42	1,420.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		6.42	1,420.0
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 =	120.0	4.75	570.0
Added Lateral Load =				* Axial Live Load on Stem =	300.0	4.75	1,425.0
Load @ Stem Above Soil =				Soil Over Toe =			
=				Surcharge Over Toe =			
				Stem Weight(s) =	2,850.0	4.75	13,537.5
				Earth @ Stem Transitions =			
Total	= 2,101.3	O.T.M.	= 14,358.5	Footing Weight =	1,705.5	3.79	6,463.8
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	1.53	Total =	4,896.9 lbs	R.M.=	21,991.3
Vertical Loads used for Soil Pressure =		5,196.9 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
 Horizontal Defl @ Top of Wall (approximate only) 0.138 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

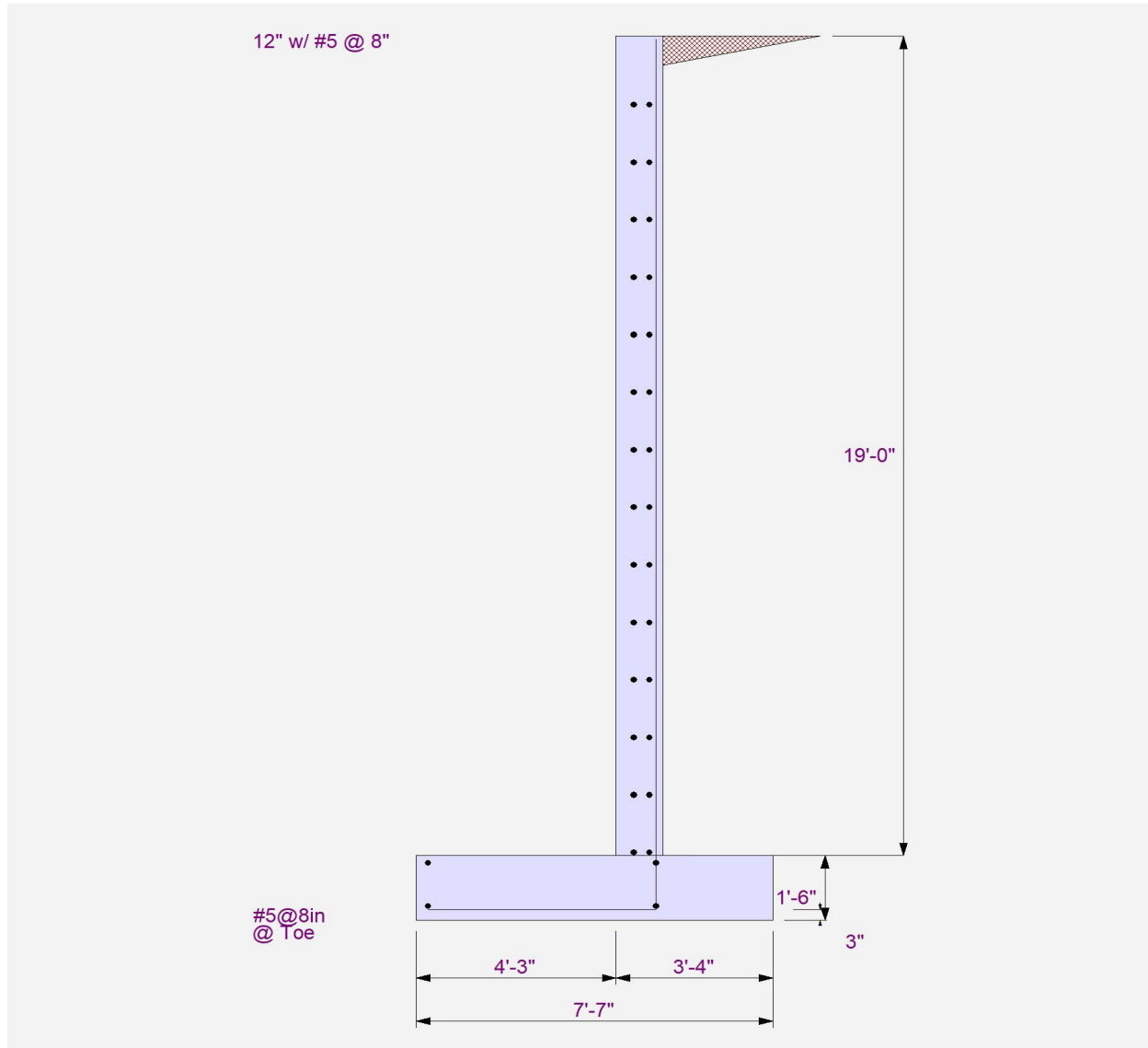
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Stair Wall (10/S3.1)



Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

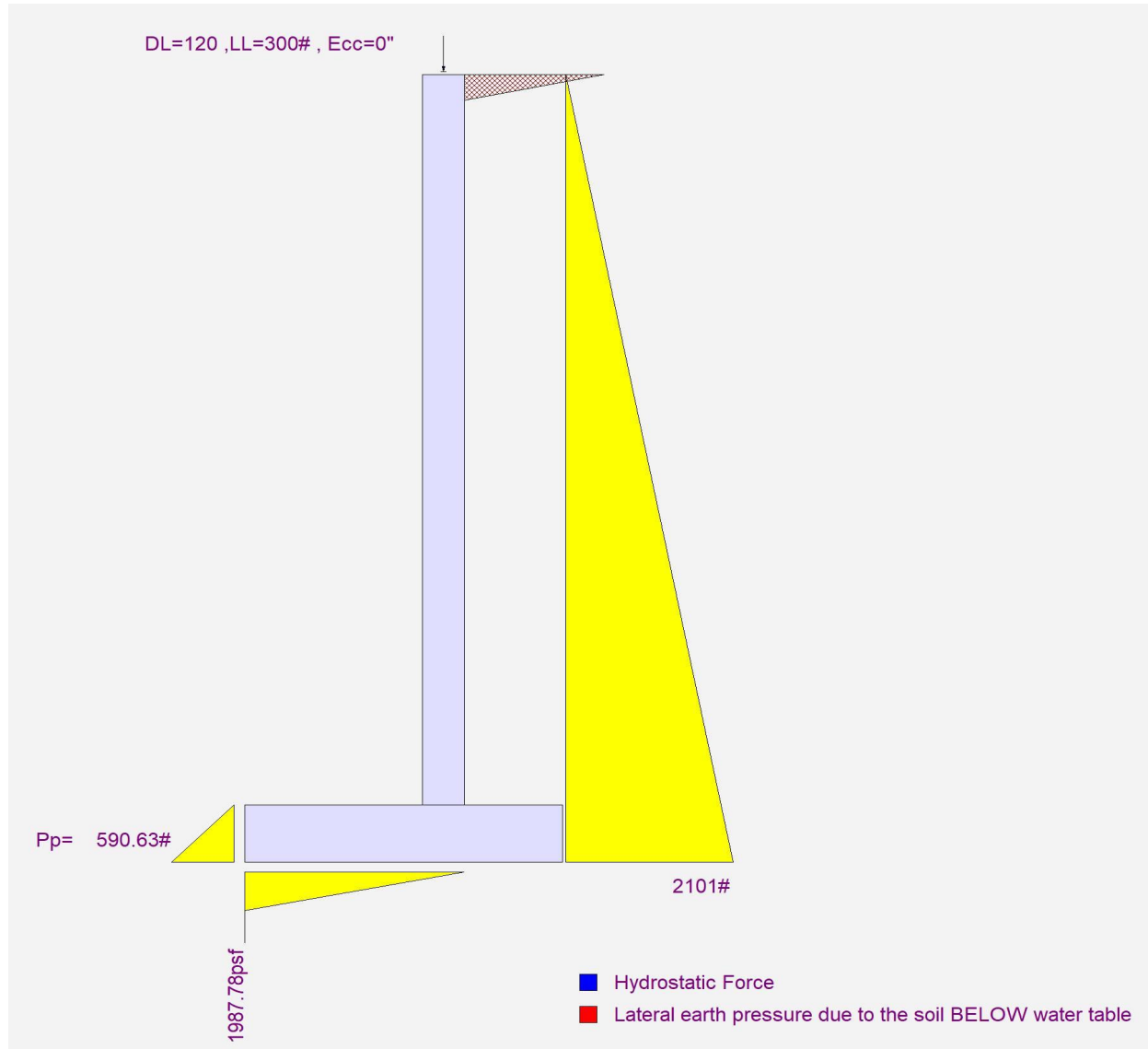
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: Stair Wall (10/S3.1)



Restrained Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE & NW Den/Guest Rm (11/S3.2)

Code Reference

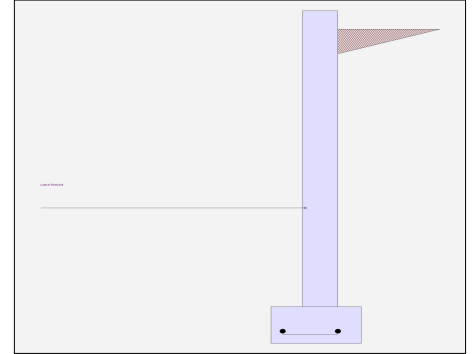
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	7.50 ft
Wall height above soil	=	0.50 ft
Total Wall Height	=	8.0 ft
Top Support Height	=	2.667 ft
Slope Behind Wall	=	0
Height of Soil over Toe	=	in

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
At-Rest Heel Pressure	=	55.0 psf/ft
	=	0.0 psf/ft
Passive Pressure	=	525.0 psf/ft
Soil Density	=	130.0 pcf
Footing||Soil Frictior	=	0.5250 psf
Soil height to ignore for passive pressure	=	in



Surcharge Loads

Surcharge Over Heel	=	psf
>>>Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	40.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	120.0 lbs
Axial Live Load	=	40.0 lbs
Axial Load Eccentricity	=	in

Earth Pressure Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	#/ft
...Height to Top	=	ft
...Height to Bottom	=	ft
Load Type	=	Wind (W)
		(Service Level)
Wind on Exposed Stem	=	0.00 psf
		(Strength Level)
Wind acts left-to-right toward retention side.		

K_h Soil Density Multiplier = 0.2 g Added seismic per unit area = 0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	lbs
Footing Width	=	ft
Eccentricity	=	in
Wall to Ftg CL Dist	=	ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	ft
Poisson's Ratio	=	0.3

Design Summary

Total Bearing Load	=	1,757.50 lbs
...resultant ecc.	=	-0.9165 in
Soil Pressure @ Toe	=	699.39 psf OK
Soil Pressure @ Heel	=	1,140.93 psf OK
Allowable	=	psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	845.63 psf
ACI Factored @ Heel	=	1,379.50 psf
Footing Shear @ Toe	=	0.2481 psi OK
Footing Shear @ Heel	=	-0.1707 psi OK
Allowable	=	75.0 psi
Reaction at Top	=	1,446.16 lbs
Reaction at Bottom	=	536.86 lbs

Sliding Calcs

Lateral Sliding Force	=	536.86 lbs
-----------------------	---	------------

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Concrete Stem Construction

Thickness	=	8.00 in
Wall Weight	=	100.0 psf
Stem is FREE to rotate at top of footing		

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
Design Height Above Ftg	Stem OK = 2.667 ft	Stem OK = 0.2463 ft	Stem OK = 0.00 ft
Rebar Size	# 4	# 4	# 4
Rebar Spacing	12.00 in	12.00 in	12.00 in
Rebar Placed at	Edge	Edge	Edge
Rebar Depth 'd'	5.50 in	6.0 in	5.50 in

Design Data

fb/FB + fa/Fa	=		
Moment.....Actual	=	1,655.70 ft-#	18.387 ft-#
Moment.....Allowable	=	4,737.60 ft-#	5,187.60 ft-#
Shear Force @ this height	=	1,292.28 lbs	154.978 lbs
Shear.....Actual	=	19.580 psi	2.348 psi
Shear.....Allowable	=	75.0 psi	75.0 psi

Load Factors

Building Code	
Dead Load	0.000
Live Load	0.000
Earth, H	0.000
Wind, W	0.000
Seismic, E	0.000

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Restrained Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE & NW Den/Guest Rm (11/S3.2)

Footing Strengths & Dimensions

Toe Width	=	0.750	ft
Heel Width	=	1.160	
Total Footing Width	=	1.910	
Footing Thickness	=	12.0	in
Key Width	=		in
Key Depth	=		in
Key Distance from Toe	=		ft
f'c =	2,500.0	psi	Fy = 60000
Footing Concrete Density	=	150	pcf
Min. As %	=	0.0018	
Cover @ Top	=	2	in @ Btm.= 3

Footing Design Results

	Toe	Heel
Factored Pressure	= 845.63	1,379.50 psf
Mu' : Upward	= 257.488	ft-#
Mu' : Downward	= 68.625	ft-#
Mu: Design	= 189	-4 ft-#
Actual 1-Way Shear	= 0.2481	psi
Allow 1-Way Shear	= 75.0	75.0 psi

Other Acceptable Sizes & Spacings:

Toe: # 7 @ 18.00 in	-or-	phiMn = phi * 5 * lambda * sqrt(fc) * Sm
Heel: None Spec'd	-or-	phiMn = phi * 5 * lambda * sqrt(fc) * Sm
Key: # 0 @ 0.00 in	-or-	No key defined
Min footing T&S reinf Area		0.50 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

Summary of Forces on Footing : Slab is NOT resisting sliding, stem is PINNED at footing

Forces acting on footing for overturning, sliding, & soil pressure

Overturning Moments...	Lateral lbs	Distance ft	Moment ft-#
Stem Shear @ Top of Footing	= 96.861	1.0	-96.861
Heel Active Pressure	= 440.0	0.4896	-215.417
Sliding Force	= 536.86		
		Overturning Moment =	-312.278

Footing Overturning Stability Ratio **6.805**

Net Moment Used For Soil Pressure Calculations **-134.231 ft-#**

Resisting Moments...	Vertical lbs	Lateral lbs	Distance ft	Moment ft-#
Surcharge Over Heel	=	0.0	0.0	0.0
Adjacent Footing Load	=	0.0	0.0	0.0
Axial Dead Load on Stem	=	160.0	1.083	173.333
Soil Over Toe	=	0.0	0.0	0.0
Stem Weight	=	800.0	0.3750	11.250
Surcharge Over Toe	=	30.0	1.083	866.67
Soil Over Heel	=	481.0	1.663	800.06
Footing Weight	=	286.50	0.9550	273.608
Total Vertical Force	=	1,757.50 lbs		
		Resisting Moment =		2,124.92

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Project Title:
Engineer:
Project ID:
Project Descr:

Restrained Retaining Wall

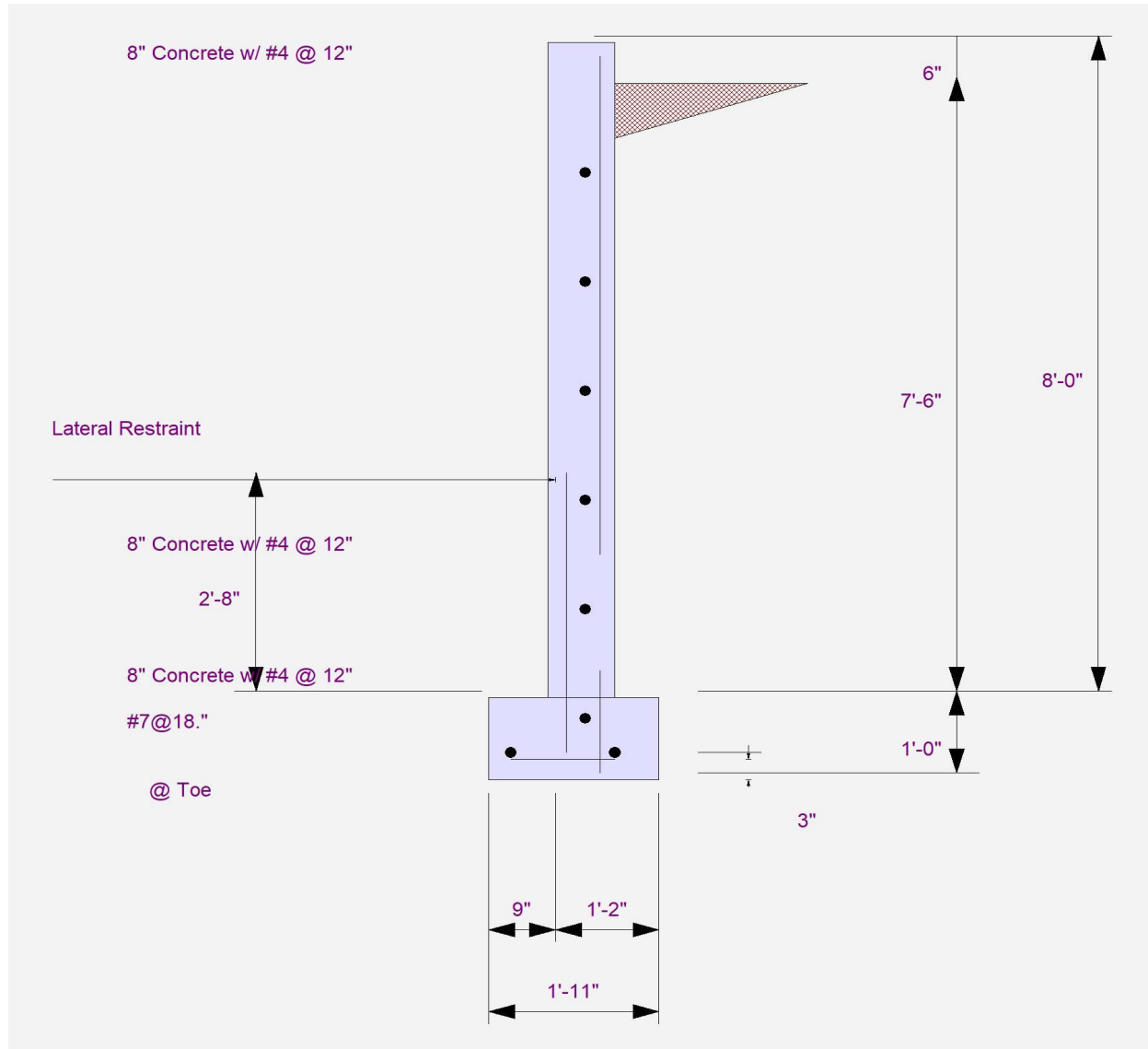
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE & NW Den/Guest Rm (11/S3.2)



Project Title:
Engineer:
Project ID:
Project Descr:

Restrained Retaining Wall

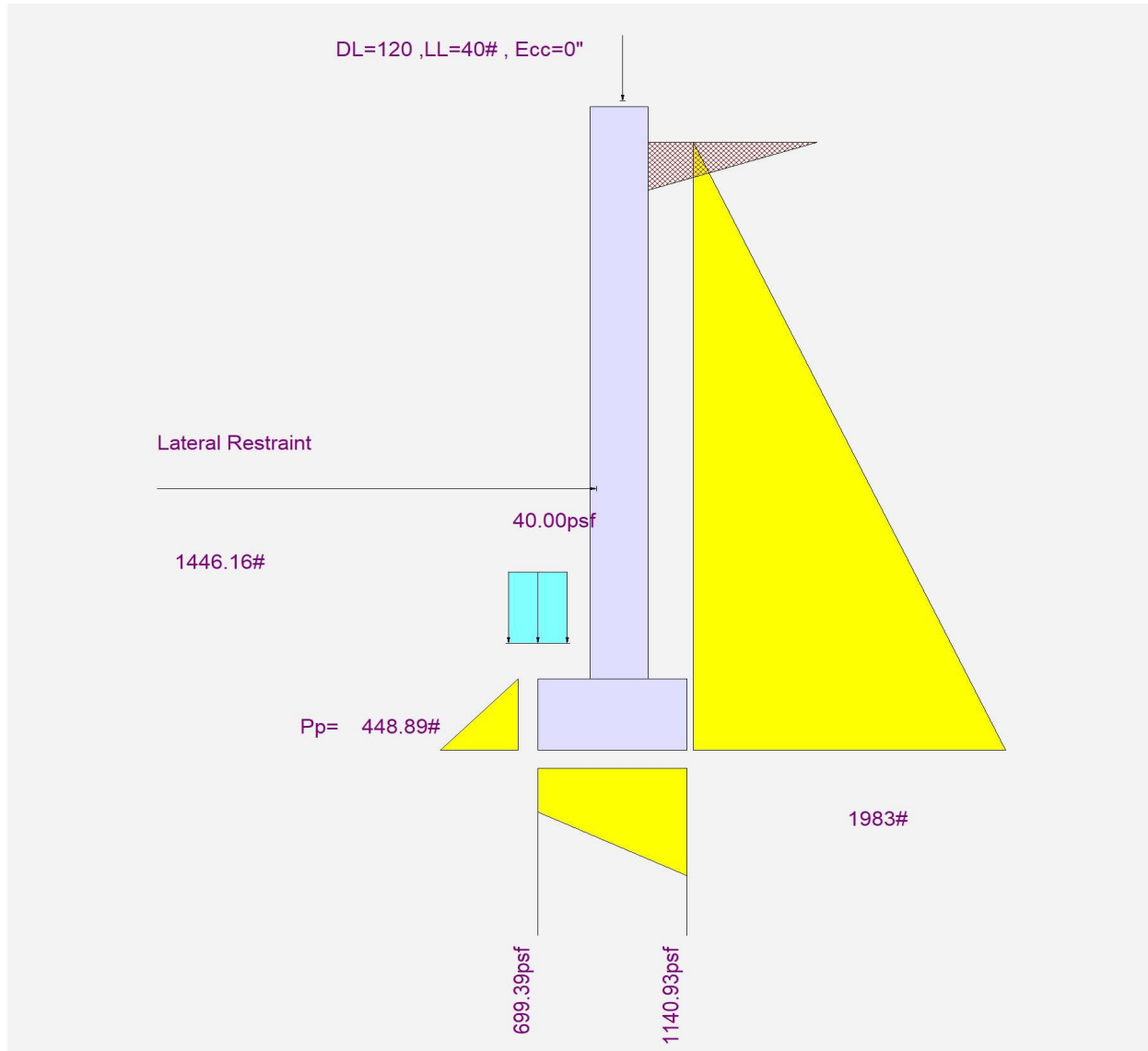
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE & NW Den/Guest Rm (11/S3.2)



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SW Den/Guest Rm (10/S3.2)

Code Reference

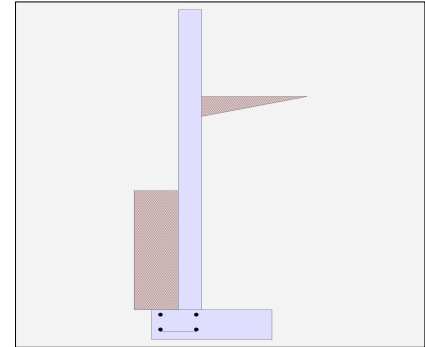
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	7.17 ft
Wall height above soil	=	2.92 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	48.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.675
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	40.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	120.0 lbs
Axial Live Load	=	40.0 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	=	0.0 psf (Strength Level)

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SW Den/Guest Rm (10/S3.2)

Design Summary

Wall Stability Ratios

Overturing	=	1.72	OK
Sliding	=	6.26	OK
Global Stability	=	0.00	
Total Bearing Load	=	4,016 lbs	
...resultant ecc.	=	11.71 in	
Soil Pressure @ Toe	=	3,655 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	4,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	5,117 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	1.7 psi	OK
Footing Shear @ Heel	=	16.8 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	1,435.5 lbs	
less 100% Passive Force	=	6,300.0 lbs	
less 100% Friction Force	=	2,683.8 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Design Height Above Ftg

ft =	0.00
Wall Material Above "Ht"	= Concrete
Design Method	= SD
Thickness	= 8.00
Rebar Size	= # 4
Rebar Spacing	= 10.00
Rebar Placed at	= Edge

Design Data

fb/FB + fa/Fa = 0.688

Total Force @ Section

Service Level	lbs =	1,786.3
Strength Level	lbs =	1,786.3

Moment....Actual

Service Level	ft-# =	4,437.9
Strength Level	ft-# =	4,437.9

Moment.....Allowable = 6,444.1

Shear.....Actual

Service Level	psi =	23.8
Strength Level	psi =	23.8

Shear.....Allowable psi = 75.0

Anet (Masonry)

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	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Bottom

Stem OK

ft = 0.00

= Concrete

= SD

= 8.00

= # 4

= 10.00

= Edge

= 0.688

lbs = 1,786.3

lbs = 1,786.3

ft-# = 4,437.9

ft-# = 4,437.9

= 6,444.1

psi = 23.8

psi = 23.8

psi = 75.0

in2 =

in = 6.25

psi =

psi =

=

=

psf = 100.0

=

=

=

psf = 100.0

=

=

=

= ASD

psi = 2,500.0

psi = 60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SW Den/Guest Rm (10/S3.2)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1663 in2/ft		
(4/3) * As :	0.2217 in2/ft	Min Stem T&S Reinf Area 1.937 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.2217 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.24 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.75 ft
Heel Width	=	2.67
Total Footing Width	=	3.42
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 %	=	0.0000
Cover @ Top 2.00	@ Btm=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	5,117	0 psf
Mu' : Upward	=	1,276	185 ft-#
Mu' : Downward	=	226	2,726 ft-#
Mu: Design	=	1,049	2,541 ft-#
phiMin	=	7,663	2,500 ft-#
Actual 1-Way Shear	=	1.66	16.80 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:
 Heel:
 Key:

Min footing T&S reinf Area	0.89	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

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SW Den/Guest Rm (10/S3.2)

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)	1,335.0	2.72	3,635.6	Soil Over HL (ab. water tbl)	1,864.5	2.42	4,506.2		
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.42	4,506.2		
Hydrostatic Force				Watre Table					
Buoyant Force	=			Sloped Soil Over Heel	=				
Surcharge over Heel	=	100.6	4.09	410.8	Surcharge Over Heel	=	80.0	2.42	193.4
Surcharge Over Toe	=			Adjacent Footing Load	=				
Adjacent Footing Load	=			Axial Dead Load on Stem	=	120.0	1.08	130.0	
Added Lateral Load	=			* Axial Live Load on Stem	=	40.0	1.08	43.3	
Load @ Stem Above Soil	=			Soil Over Toe	=	390.0	0.38	146.3	
	=			Surcharge Over Toe	=				
				Stem Weight(s)	=	1,009.0	1.08	1,093.1	
				Earth @ Stem Transitions	=				
Total	=	1,435.5	O.T.M. =	4,046.4	Footing Weight	=	512.6	1.71	875.7
					Key Weight	=			
Resisting/Overturning Ratio			=	1.72	Vert. Component	=			
Vertical Loads used for Soil Pressure	=	4,016.1	lbs		Total =	3,976.1	lbs	R.M.=	6,944.6

* 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 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.300 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

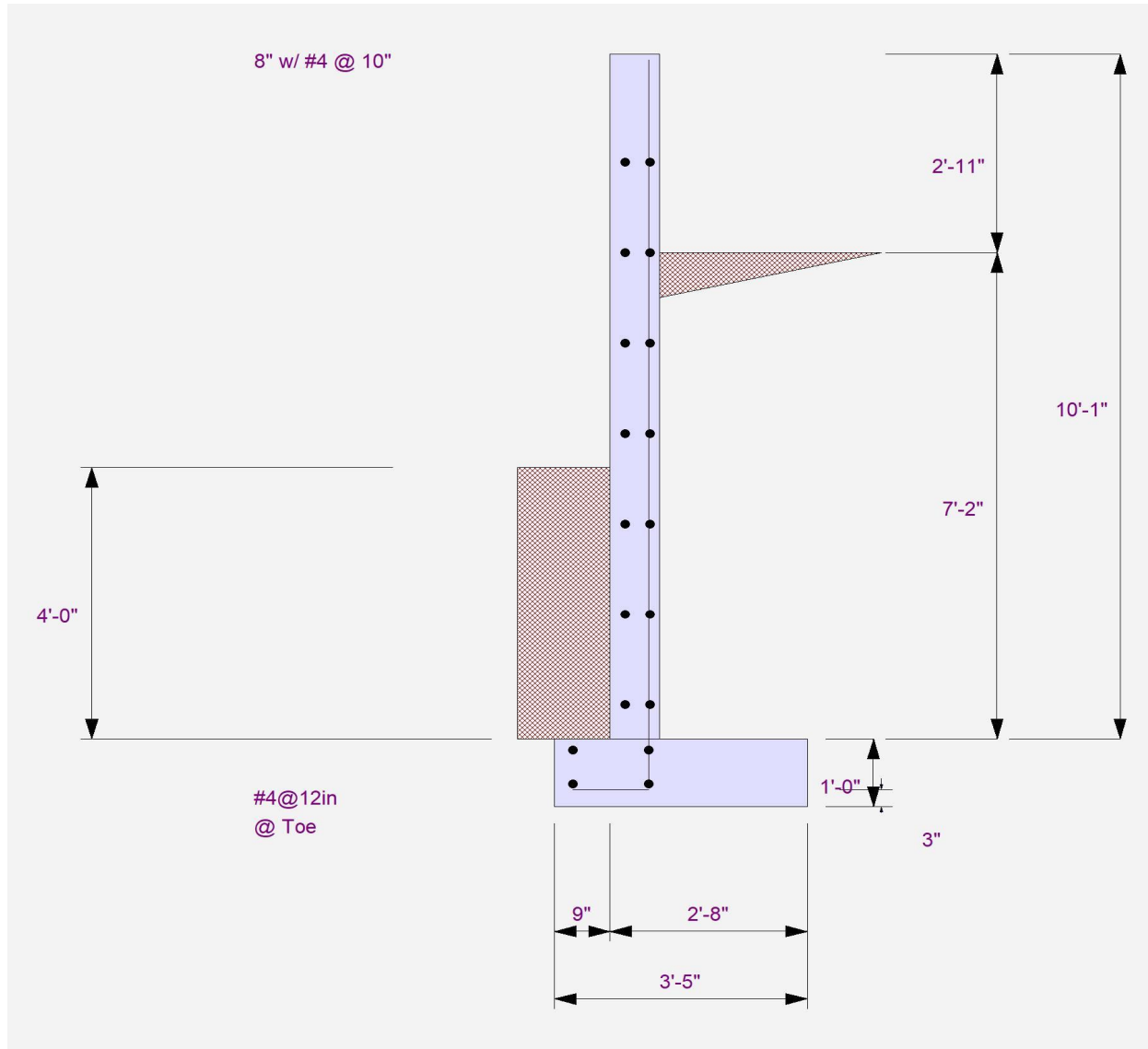
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

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DESCRIPTION: SW Den/Guest Rm (10/S3.2)



Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

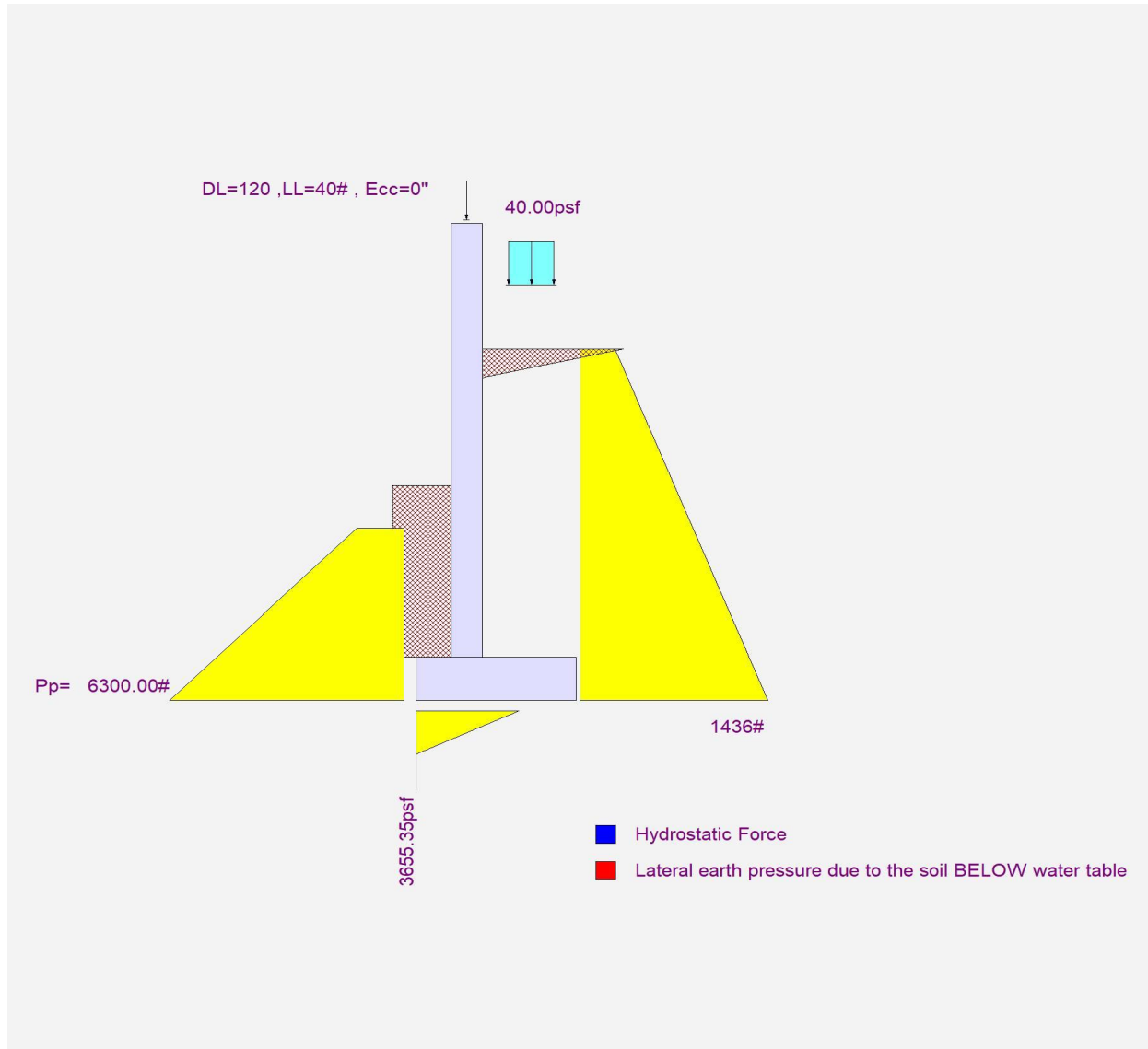
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

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DESCRIPTION: SW Den/Guest Rm (10/S3.2)



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry W/ 9H (12/S3.1)

Code Reference

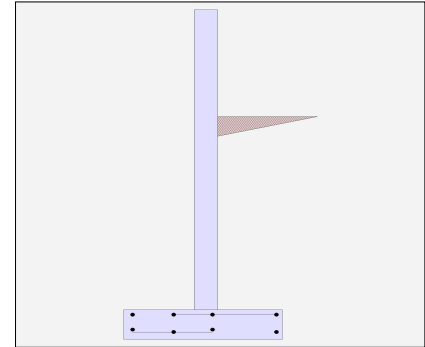
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	6.50 ft
Wall height above soil	=	3.59 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.675
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	40.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	290.0 lbs
Axial Live Load	=	435.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	9.000
(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	=	0.0 psf (Strength Level)

Uniform Seismic Force	=	67.500
Total Seismic Force	=	506.250

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry W/ 9H (12/S3.1)

Design Summary		Stem Construction		Bottom	
Wall Stability Ratios		Design Height Above Ftg	ft =	Stem OK	
Overtuning	= 1.83 OK	Wall Material Above "Ht"	=	Concrete	
Sliding	= 1.33 Ratio < 1.5!	Design Method	=	SD	SD
Global Stability	= 0.00	Thickness	=	8.00	
		Rebar Size	=	# 4	
		Rebar Spacing	=	10.00	
		Rebar Placed at	=	Edge	
Total Bearing Load	= 4,031 lbs	Design Data			
...resultant ecc.	= 10.01 in	fb/FB + fa/Fa	=	0.935	
Soil Pressure @ Toe	= 1,899 psf OK	Total Force @ Section			
Soil Pressure @ Heel	= 0 psf OK	Service Level	lbs =	2,473.8	
Allowable	= 4,000 psf	Strength Level	lbs =	2,473.8	
Soil Pressure Less Than Allowable		Moment....Actual			
ACI Factored @ Toe	= 2,658 psf	Service Level	ft-# =	6,025.8	
ACI Factored @ Heel	= 0 psf	Strength Level	ft-# =	6,025.8	
Footing Shear @ Toe	= 26.3 psi OK	Moment.....Allowable	=	6,444.1	
Footing Shear @ Heel	= 13.4 psi OK	Shear.....Actual			
Allowable	= 75.0 psi	Service Level	psi =	33.0	
		Strength Level	psi =	33.0	
Sliding Calcs		Shear.....Allowable	psi =	75.0	
Lateral Sliding Force	= 2,028.2 lbs	Anet (Masonry)	in2 =		
less 100% Passive Force	= - 262.5 lbs	Rebar Depth 'd'	in =	6.25	
less 100% Friction Force	= - 2,427.4 lbs	Masonry Data			
Added Force Req'd	= 0.0 lbs OK	f'm	psi =		
....for 1.5 Stability	= 352.3 lbs NG	Fs	psi =		
		Solid Grouting	=		
		Modular Ratio 'n'	=		
		Wall Weight	psf =	100.0	
		Short Term Factor	=		
		Equiv. Solid Thick.	=		
		Masonry Block Type	=		
		Masonry Design Method	=	ASD	
		Concrete Data			
		f'c	psi =	2,500.0	
		Fy	psi =	60,000.0	
Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing					
Load Factors					
Building Code					
Dead Load	1.200				
Live Load	1.600				
Earth, H	1.600				
Wind, W	1.600				
Seismic, E	1.000				

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry W/ 9H (12/S3.1)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.2258 in2/ft		
(4/3) * As :	0.301 in2/ft	Min Stem T&S Reinf Area 1.937 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.25 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.24 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	2.50
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 % =		0.0000
Cover @ Top 2.00	@ Btm=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,658	0 psf
Mu' : Upward	=	4,482	411 ft-#
Mu' : Downward	=	360	2,114 ft-#
Mu: Design	=	4,122	1,703 ft-#
phiMin	=	9,145	10,225 ft-#
Actual 1-Way Shear	=	26.26	13.38 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 10.00 in	
Heel Reinforcing	=	# 4 @ 10.00 in	
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:
 Heel:
 Key:

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

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry W/ 9H (12/S3.1)

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)	1,546.9	2.50	3,867.2	Soil Over HL (ab. water tbl)	1,549.2	3.58	5,551.2		
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.58	5,551.2		
Hydrostatic Force				Watre Table					
Buoyant Force	=			Sloped Soil Over Heel	=				
Surcharge over Heel	=	126.9	3.75	476.0	Surcharge Over Heel	=	73.3	3.58	262.8
Surcharge Over Toe	=			Adjacent Footing Load	=				
Adjacent Footing Load	=			Axial Dead Load on Stem	=	290.0	2.33	676.7	
Added Lateral Load	=			* Axial Live Load on Stem	=	435.0	2.33	1,015.0	
Load @ Stem Above Soil	=			Soil Over Toe	=				
Seismic Earth Load	=	354.4	3.75	1,328.9	Surcharge Over Toe	=			
	=			Stem Weight(s)	=	1,008.7	2.33	2,353.6	
Total	=	2,028.2	O.T.M.	=	5,672.1	Earth @ Stem Transitions	=		
				Footing Weight	=	675.0	2.25	1,518.8	
				Key Weight	=				
				Vert. Component	=				
Resisting/Overturning Ratio			=	1.83					
Vertical Loads used for Soil Pressure	=	4,031.2	lbs						
				Total =	3,596.2	lbs	R.M.=	10,363.0	

* 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 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.118 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

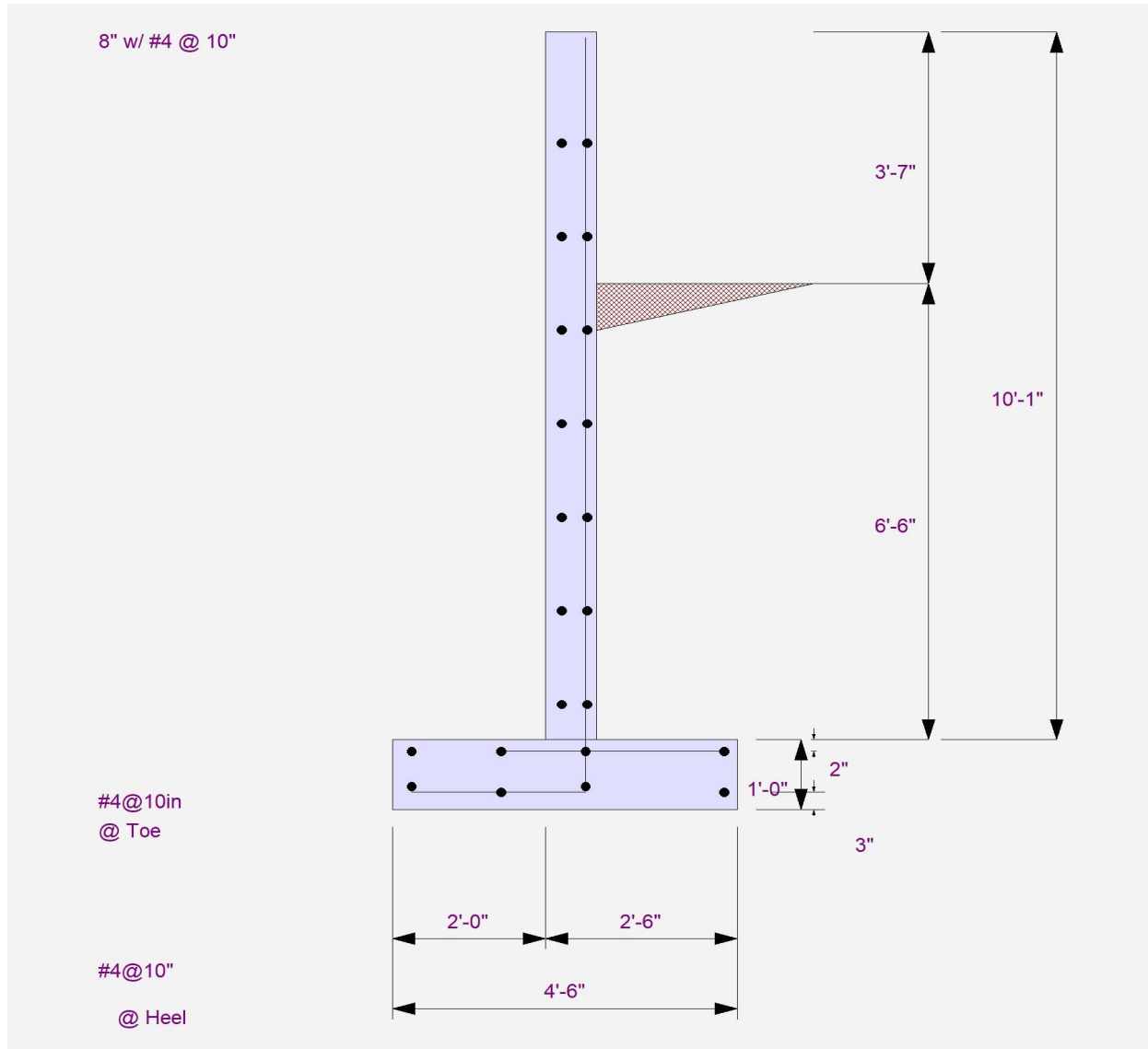
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry W/ 9H (12/S3.1)



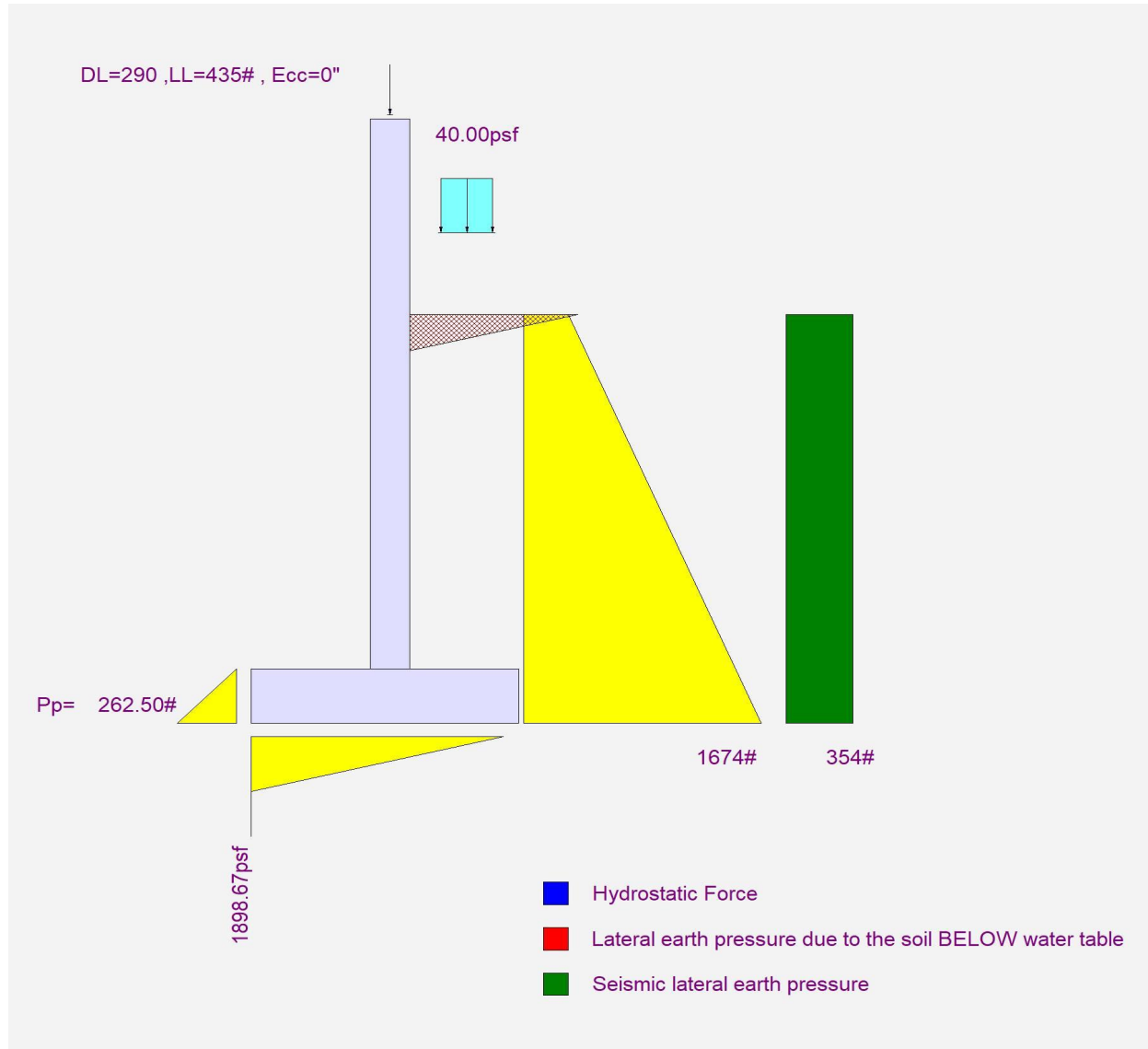
Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry W/ 9H (12/S3.1)



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry (12/S3.1)

Code Reference

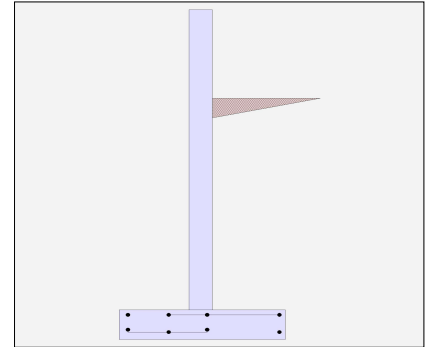
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	7.17 ft
Wall height above soil	=	3.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	0.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	55.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.675
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

Surcharge Over Heel	=	40.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	290.0 lbs
Axial Live Load	=	435.0 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	=	0.0 psf (Strength Level)

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry (12/S3.1)

Design Summary

Wall Stability Ratios

Overtuning = 2.20 OK
 Sliding = 1.52 OK
 Global Stability = 0.00

Total Bearing Load = 4,479 lbs
 ...resultant ecc. = 7.85 in

Soil Pressure @ Toe = 1,722 psf OK
 Soil Pressure @ Heel = 163 psf OK
 Allowable = 4,000 psf
 Soil Pressure Less Than Allowable

ACI Factored @ Toe = 2,411 psf
 ACI Factored @ Heel = 229 psf
 Footing Shear @ Toe = 24.5 psi OK
 Footing Shear @ Heel = 12.0 psi OK
 Allowable = 75.0 psi

Sliding Calcs

Lateral Sliding Force = 1,972.5 lbs
 less 100% Passive Force - 262.5 lbs
 less 100% Friction Force = - 2,729.4 lbs
 Added Force Req'd = 0.0 lbs OK
for 1.5 Stability = 0.0 lbs OK

Vertical component of active lateral soil pressure IS
 NOT considered in the calculation of soil bearing

Load Factors

Building Code
 Dead Load 1.200
 Live Load 1.600
 Earth, H 1.600
 Wind, W 1.600
 Seismic, E 1.000

Stem Construction

Design Height Above Ftg ft = 0.00
 Wall Material Above "Ht" = Concrete
 Design Method = SD SD SD
 Thickness = 8.00
 Rebar Size = # 4
 Rebar Spacing = 10.00
 Rebar Placed at = Edge

Design Data

fb/FB + fa/Fa = 0.945

Total Force @ Section

Service Level lbs = 2,454.2
 Strength Level lbs = 2,454.2

Moment....Actual

Service Level ft-# = 6,094.8
 Strength Level ft-# = 6,094.8

Moment.....Allowable = 6,444.1

Shear.....Actual

Service Level psi = 32.7
 Strength Level psi = 32.7

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 =
 Masonry Design Method = ASD

Concrete Data

f'c psi = 2,500.0
 Fy psi = 60,000.0

Bottom

Stem OK

ft = 0.00

= Concrete

= SD SD SD

= 8.00

= # 4

= 10.00

= Edge

= 0.945

lbs = 2,454.2

lbs = 2,454.2

ft-# = 6,094.8

ft-# = 6,094.8

= 6,444.1

psi = 32.7

psi = 32.7

psi = 75.0

in2 =

in = 6.25

psi =

psi =

=

=

psf = 100.0

=

=

=

psf = 100.0

=

=

=

= ASD

psi = 2,500.0

psi = 60,000.0

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry (12/S3.1)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.2283 in2/ft		
(4/3) * As :	0.3045 in2/ft	Min Stem T&S Reinf Area 1.952 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.25 in2/ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.24 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	2.75
Total Footing Width	=	4.75
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 % =		0.0000
Cover @ Top 2.00	@ Btm=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,411	229 psf
Mu' : Upward	=	4,210	1,189 ft-#
Mu' : Downward	=	360	2,956 ft-#
Mu: Design	=	3,850	1,767 ft-#
phiMin	=	9,145	10,225 ft-#
Actual 1-Way Shear	=	24.50	11.96 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 10.00 in	
Heel Reinforcing	=	# 4 @ 10.00 in	
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:
 Heel:
 Key:

Min footing T&S reinf Area	1.23	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

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry (12/S3.1)

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)	1,834.2	2.72	4,993.4	Soil Over HL (ab. water tbl)	1,941.1	3.71	7,198.1		
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.71	7,198.1		
Hydrostatic Force				Watre Table					
Buoyant Force	=			Sloped Soil Over Heel	=				
Surcharge over Heel	=	138.2	4.08	564.4	Surcharge Over Heel	=	83.3	3.71	309.0
Surcharge Over Toe	=			Adjacent Footing Load	=				
Adjacent Footing Load	=			Axial Dead Load on Stem	=	290.0	2.33	676.7	
Added Lateral Load	=			* Axial Live Load on Stem	=	435.0	2.33	1,015.0	
Load @ Stem Above Soil	=			Soil Over Toe	=				
	=			Surcharge Over Toe	=				
				Stem Weight(s)	=	1,016.7	2.33	2,372.3	
				Earth @ Stem Transitions	=				
Total	=	1,972.5	O.T.M. =	5,557.8	Footing Weight	=	712.5	2.38	1,692.2
					Key Weight	=			
Resisting/Overturning Ratio			=	2.20	Vert. Component	=			
Vertical Loads used for Soil Pressure	=	4,478.6	lbs		Total =	4,043.6	lbs	R.M.=	12,248.3

* 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 250.0 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

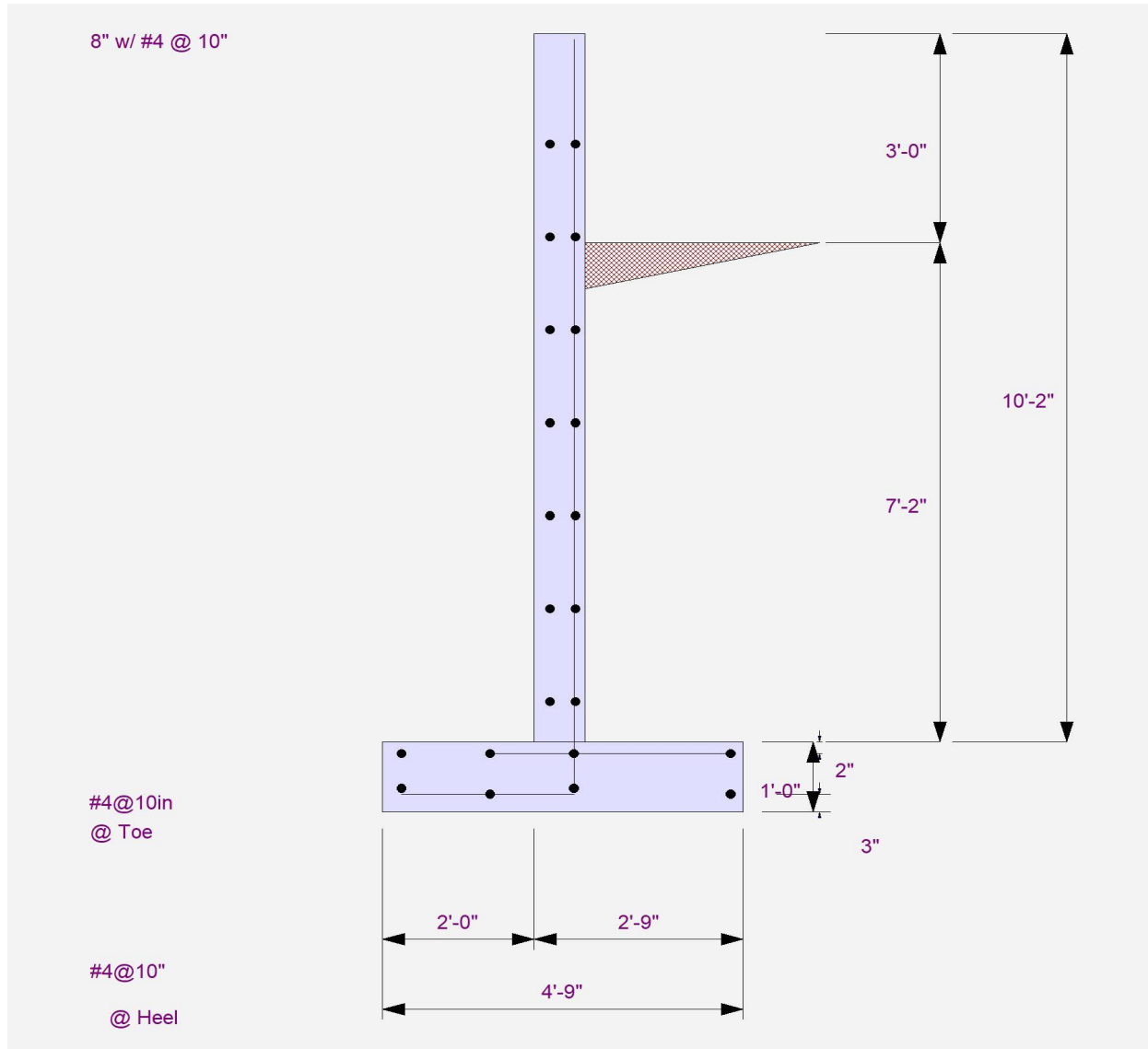
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry (12/S3.1)



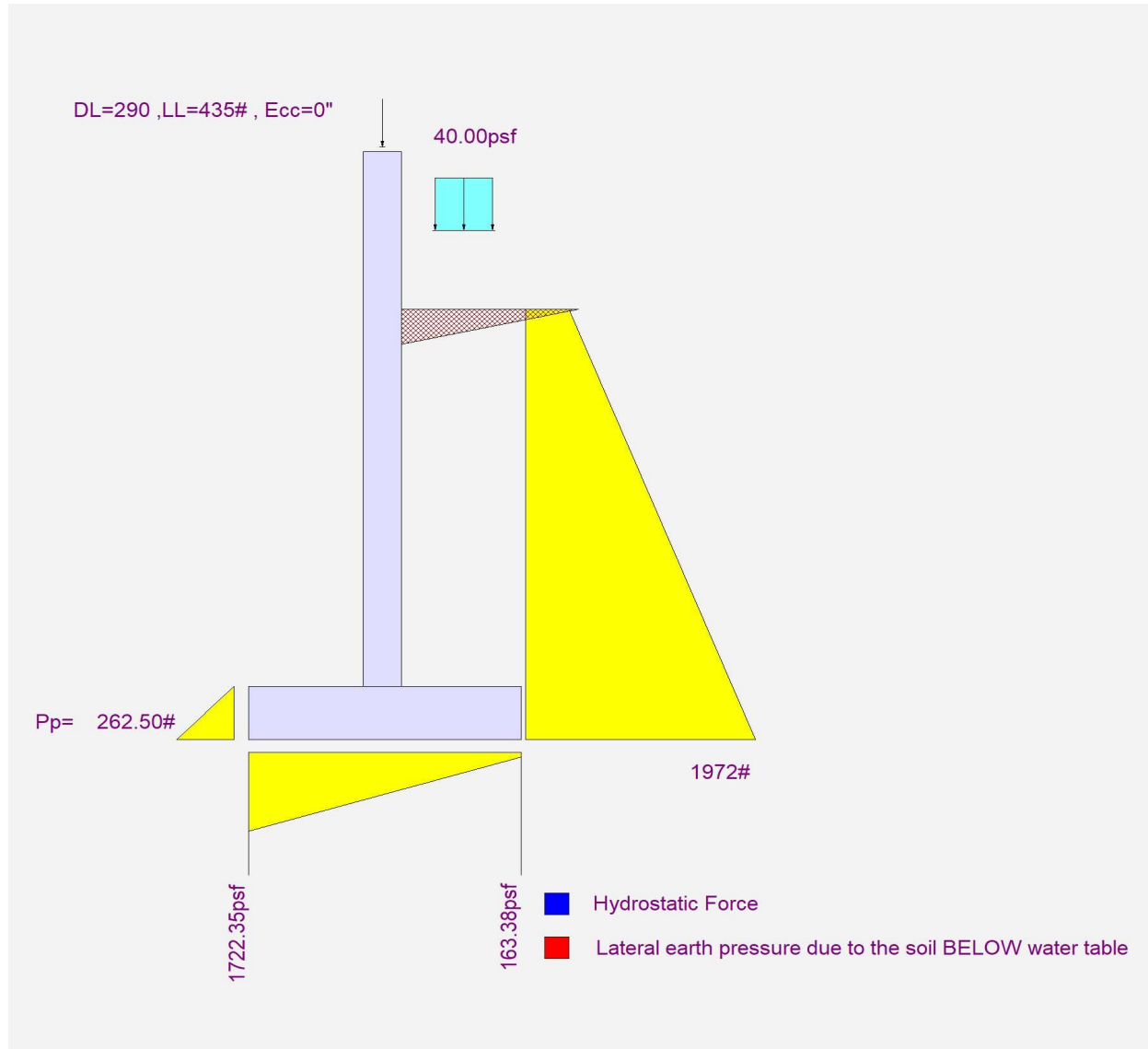
Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU/Laundry (12/S3.1)



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU (4/S3.1)

Code Reference

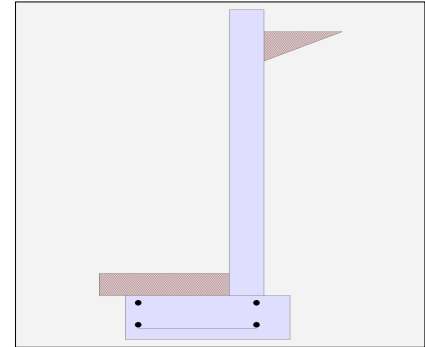
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.675
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	290.0 lbs
Axial Live Load	=	435.0 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	=	0.0 psf (Strength Level)

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU (4/S3.1)

Design Summary

Wall Stability Ratios

Overtuning	=	1.84	OK
Sliding	=	1.67	OK
Global Stability	=	0.00	
Total Bearing Load	=	2,370 lbs	
...resultant ecc.	=	4.11 in	
Soil Pressure @ Toe	=	1,234 psf	OK
Soil Pressure @ Heel	=	263 psf	OK
Allowable	=	4,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,727 psf	
ACI Factored @ Heel	=	368 psf	
Footing Shear @ Toe	=	14.8 psi	OK
Footing Shear @ Heel	=	2.7 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs

Lateral Sliding Force	=	980.0 lbs	
less 100% Passive Force	=	- 328.1 lbs	
less 100% Friction Force	=	- 1,306.3 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Design Height Above Ftg

ft =	0.00
Wall Material Above "Ht"	= Concrete
Design Method	= SD
Thickness	= 8.00
Rebar Size	= # 4
Rebar Spacing	= 12.00
Rebar Placed at	= Edge

Design Data

fb/FB + fa/Fa = 0.425

Total Force @ Section

Service Level	lbs =	1,152.0
Strength Level	lbs =	1,152.0

Moment....Actual

Service Level	ft-# =	2,304.0
Strength Level	ft-# =	2,304.0

Moment.....Allowable = 5,412.6

Shear.....Actual

Service Level	psi =	15.4
Strength Level	psi =	15.4

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	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Bottom

Stem OK

ft = 0.00

= Concrete

= SD

SD

SD

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU (4/S3.1)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0863 in2/ft		
(4/3) * As :	0.1151 in2/ft	Min Stem T&S Reinf Area 1.248 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	1.17
Total Footing Width	=	3.17
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 % =		0.0000
Cover @ Top 2.00	@ Btm=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,727	368 psf
Mu' : Upward	=	2,882	55 ft-#
Mu' : Downward	=	516	140 ft-#
Mu: Design	=	2,366	85 ft-#
phiMin	=	7,663	2,500 ft-#
Actual 1-Way Shear	=	14.77	2.67 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:
 Heel:
 Key:

Min footing T&S reinf Area	0.82 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

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU (4/S3.1)

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)	980.0	2.33	2,286.7	Soil Over HL (ab. water tbl)	390.3	2.92	1,138.3
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.92	1,138.3
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 =	290.0	2.33	676.7
Added Lateral Load =				* Axial Live Load on Stem =	435.0	2.33	1,015.0
Load @ Stem Above Soil =				Soil Over Toe =	130.0	1.00	130.0
				Surcharge Over Toe =			
				Stem Weight(s) =	650.0	2.33	1,516.7
				Earth @ Stem Transitions =			
Total	= 980.0	O.T.M.	= 2,286.7	Footing Weight =	475.1	1.58	752.2
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	1.84	Total =	1,935.3 lbs	R.M.=	4,213.9
Vertical Loads used for Soil Pressure =		2,370.3	lbs	* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.070 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

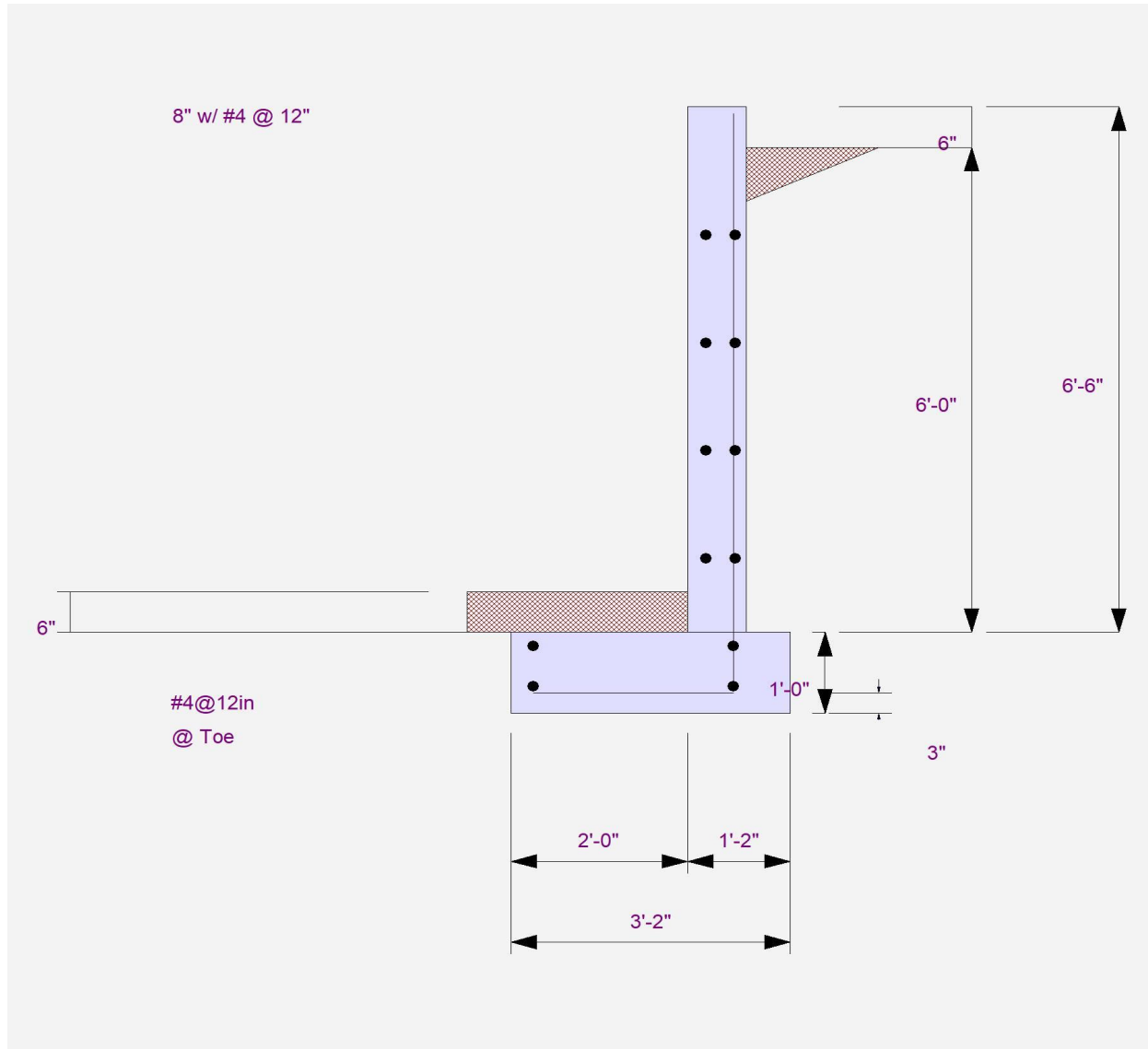
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU (4/S3.1)



Cantilevered Retaining Wall

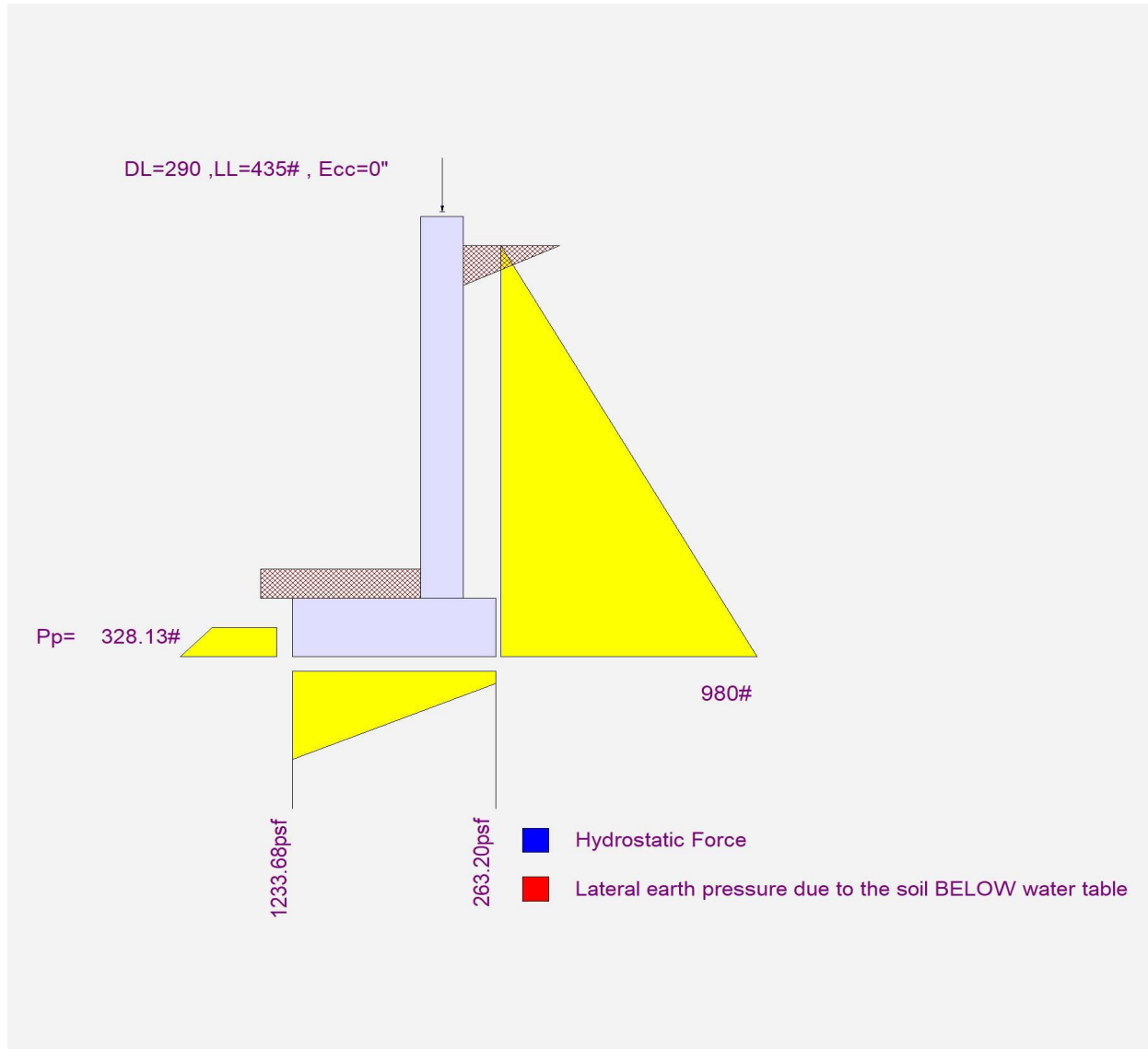
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU (4/S3.1)



Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU w/ 9H (4/S3.1)

Code Reference

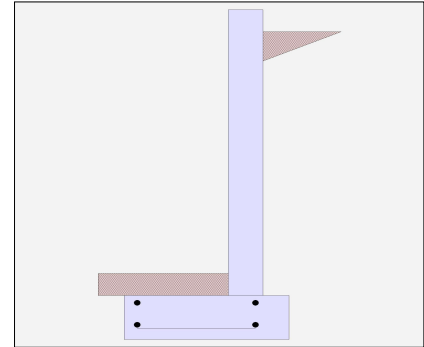
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	525.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	130.00 pcf
Footing||Soil Friction	=	0.675
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	290.0 lbs
Axial Live Load	=	435.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	9.000
(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	=	0.0 psf (Strength Level)

Uniform Seismic Force	=	63.000
Total Seismic Force	=	441.000

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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU w/ 9H (4/S3.1)

Design Summary

Wall Stability Ratios

Overtuning	=	1.25	Ratio < 1.5!
Sliding	=	1.27	Ratio < 1.5!
Global Stability	=	0.00	
Total Bearing Load	=	2,370	lbs
...resultant ecc.	=	9.58	in
Soil Pressure @ Toe	=	2,012	psf OK
Soil Pressure @ Heel	=	0	psf OK
Allowable	=	4,000	psf
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	2,817	psf
ACI Factored @ Heel	=	0	psf
Footing Shear @ Toe	=	22.3	psi OK
Footing Shear @ Heel	=	4.7	psi OK
Allowable	=	75.0	psi

Sliding Calcs

Lateral Sliding Force	=	1,288.7	lbs
less 100% Passive Force	=	- 328.1	lbs
less 100% Friction Force	=	- 1,306.3	lbs
Added Force Req'd	=	0.0	lbs OK
....for 1.5 Stability	=	298.6	lbs NG

Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors

Building Code	
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

Stem Construction

Design Height Above Ftg

ft =	Stem OK	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	SD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa = 0.635

Total Force @ Section

Service Level	lbs =	1,530.0
Strength Level	lbs =	1,530.0

Moment....Actual

Service Level	ft-# =	3,438.0
Strength Level	ft-# =	3,438.0

Moment.....Allowable = 5,412.6

Shear.....Actual

Service Level	psi =	20.4
Strength Level	psi =	20.4

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	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	2,500.0
Fy	psi =	60,000.0

Bottom

SD SD

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2021

DESCRIPTION: SE @ ADU w/ 9H (4/S3.1)

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1288 in2/ft		
(4/3) * As :	0.1717 in2/ft	Min Stem T&S Reinf Area 1.248 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	1.17
Total Footing Width	=	3.17
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 % = 0.0000		
Cover @ Top 2.00	@ Btm= 3.00 in	

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,817	0 psf
Mu' : Upward	=	4,039	0 ft-#
Mu' : Downward	=	516	140 ft-#
Mu: Design	=	3,523	140 ft-#
phiMin	=	7,663	2,500 ft-#
Actual 1-Way Shear	=	22.30	4.65 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:
 Heel:
 Key:

Min footing T&S reinf Area	0.82 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

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Cantilevered Retaining Wall

Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

BYKONEN CARTER QUINN

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DESCRIPTION: SE @ ADU w/ 9H (4/S3.1)

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)	980.0	2.33	2,286.7	Soil Over HL (ab. water tbl)	390.3	2.92	1,138.3
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.92	1,138.3
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 =	290.0	2.33	676.7
Added Lateral Load =				* Axial Live Load on Stem =	435.0	2.33	1,015.0
Load @ Stem Above Soil =				Soil Over Toe =	130.0	1.00	130.0
Seismic Earth Load =	308.7	3.50	1,080.5	Surcharge Over Toe =			
=				Stem Weight(s) =	650.0	2.33	1,516.7
Total =	1,288.7	O.T.M.	3,367.1	Earth @ Stem Transitions =			
				Footing Weight =	475.1	1.58	752.2
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	1.25	Total =	1,935.3 lbs	R.M.=	4,213.9
Vertical Loads used for Soil Pressure =		2,370.3 lbs					

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
 Horizontal Defl @ Top of Wall (approximate only) 0.115 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.

Project Title:
Engineer:
Project ID:
Project Descr:

Cantilevered Retaining Wall

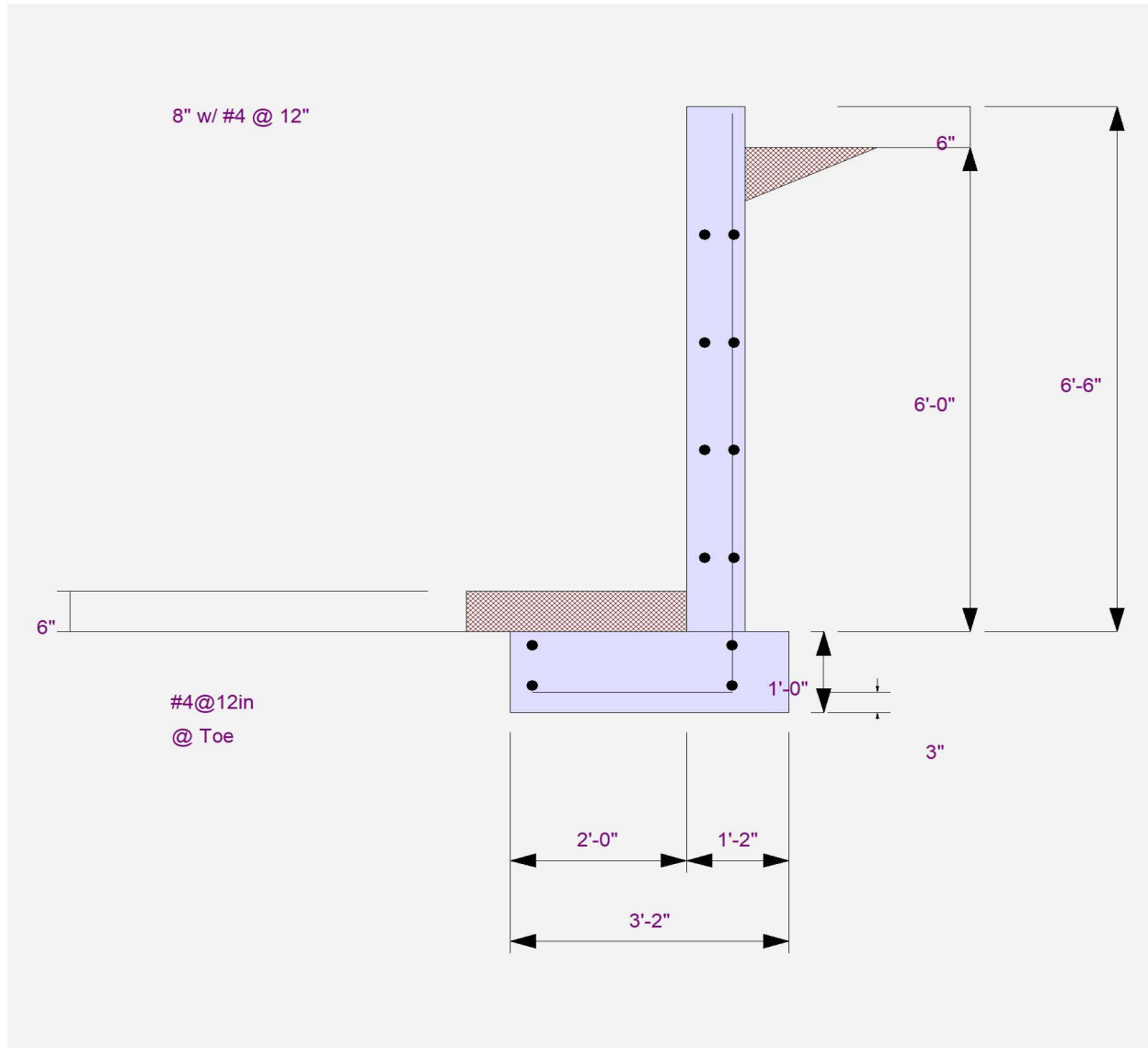
Project File: Foundations.ec6

LIC# : KW-06015393, Build:20.22.1.19

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DESCRIPTION: SE @ ADU w/ 9H (4/S3.1)



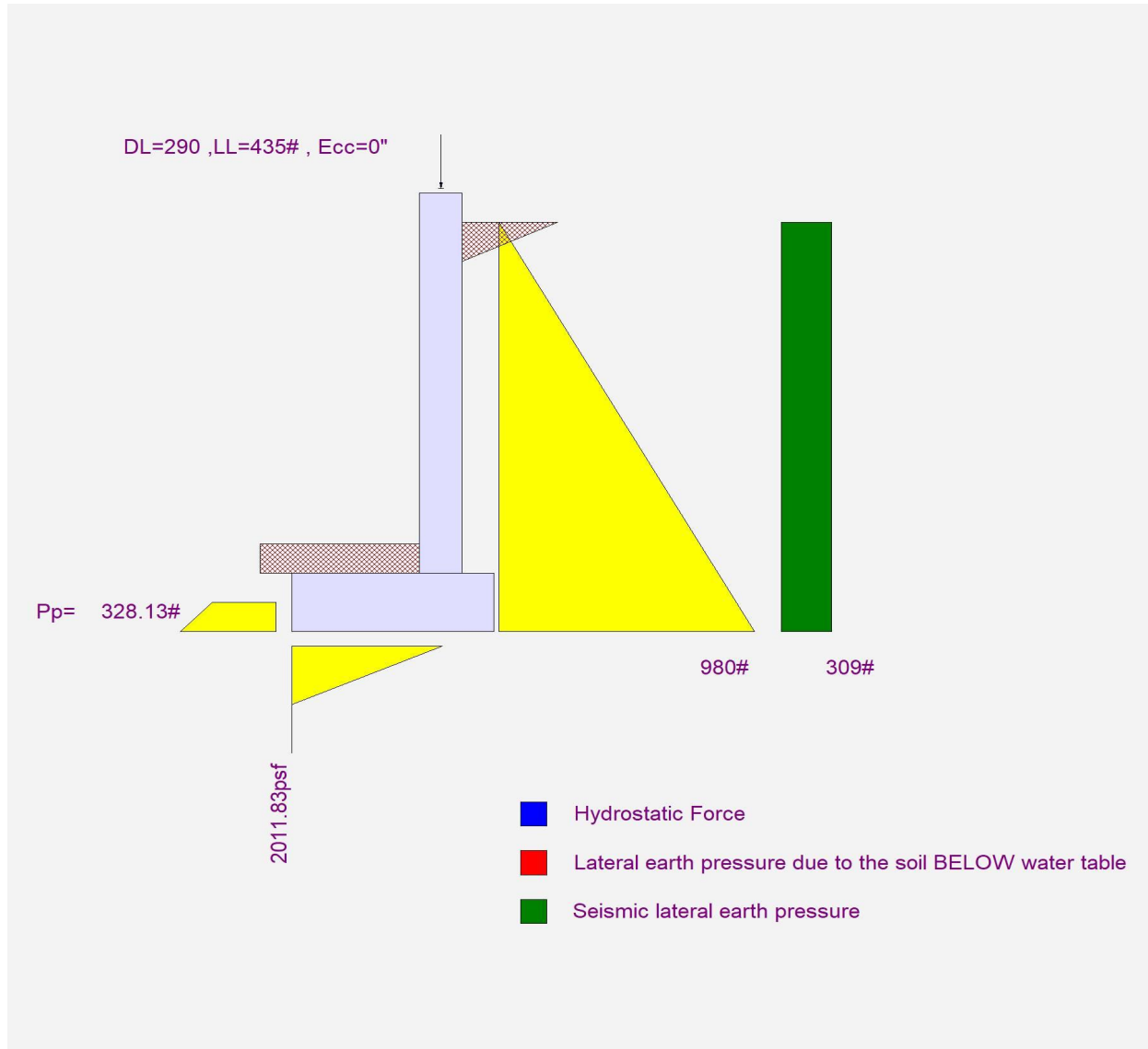
Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.1.19

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DESCRIPTION: SE @ ADU w/ 9H (4/S3.1)



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Project Name/Number : retain schedu

Title H=7' :
Dsgnr: JAJ
Description....

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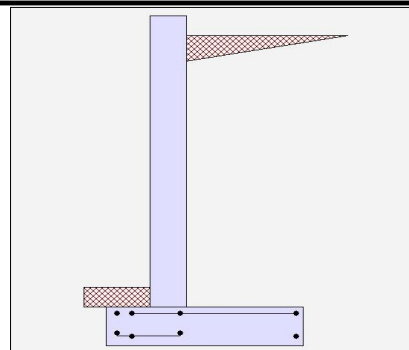
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	7.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
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	=	0.0 psf (Service Level)

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	=	3.09 OK
Sliding	=	1.60 OK
Total Bearing Load	=	4,039 lbs
...resultant ecc.	=	5.85 in
Soil Pressure @ Toe	=	1,481 psf OK
Soil Pressure @ Heel	=	314 psf OK
Allowable	=	4,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,074 psf
ACI Factored @ Heel	=	439 psf
Footing Shear @ Toe	=	5.0 psi OK
Footing Shear @ Heel	=	8.1 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	1,280.0 lbs
less 100% Passive Force	= -	187.5 lbs
less 100% Friction Force	= -	1,860.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	10.00
Rebar Size	=	# 5
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.335
---------------	---	-------

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	=	10,911.3

Shear....Actual

Service Level	psi =	
Strength Level	psi =	16.0
Shear....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	8.19

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Wall Weight	psf =	125.0
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 H=7' :
Dsgnr: JAJ
Description....

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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) :	0.1033 in2/ft		
(4/3) * As :	0.1378 in2/ft	Min Stem T&S Reinf Area 1.800 in2	
200bd/fy : 200(12)(8.1875)/60000 :	0.3275 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.240 in2/ft	
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.216 in2/ft	#4@ 10.00 in	#4@ 20.00 in
Provided Area :	0.31 in2/ft	#5@ 15.50 in	#5@ 31.00 in
Maximum Area :	1.1092 in2/ft	#6@ 22.00 in	#6@ 44.00 in

Footing Data

Toe Width	=	1.00 ft
Heel Width	=	3.50
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

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	2,074	439 psf
Mu' : Upward	=	11,717	2,710 ft-#
Mu' : Downward	=	1,548	4,523 ft-#
Mu: Design	=	847	1,812 ft-#
Actual 1-Way Shear	=	4.97	8.15 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 11.48 in	
Heel Reinforcing	=	# 5 @ 11.48 in	
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: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
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 : retain schedu

Title H=7' :
Dsgnr: JAJ
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.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	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)	2,426.7	3.17	7,684.4
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.17	7,684.4
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 =		0.50	
=				Surcharge Over Toe =			
Total	= 1,280.0	O.T.M. =	3,413.3	Stem Weight(s) =	937.5	1.42	1,328.1
				Earth @ Stem Transitions =			
				Footing Weight =	675.0	2.25	1,518.8
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 3.09		Total =	4,039.2 lbs	R.M.=	10,531.3
Vertical Loads used for Soil Pressure =		4,039.2 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

Vertical component of active lateral soil pressure IS 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 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.069 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 : retain schedu

Title H=7' seismic
Dsgnr: JAJ
Description....

Page : 1
Date: 25 JAN 2022

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Cantilevered Retaining Wall

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

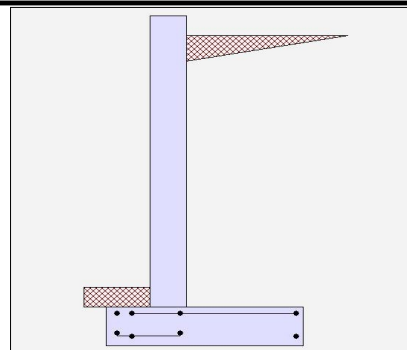
Criteria

Retained Height = 7.00 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 6.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 5,320.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 40.0 psf/ft

Passive Pressure = 300.0 psf/ft
Soil Density, Heel = 130.00 pcf
Soil Density, Toe = 0.00 pcf
Footing||Soil Friction = 0.400
Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
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 = 0.0 psf
(Service Level)

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 = 9.000
(Multiplier used on soil density)
Uniform Seismic Force = 72.000
Total Seismic Force = 576.000

Design Summary

Wall Stability Ratios >1.2 for seismic
Overturning = 2.10 OK
Sliding = 1.22 Ratio < 1.5!

Total Bearing Load = 4,039 lbs
...resultant ecc. = 10.64 in

Soil Pressure @ Toe = 1,976 psf OK
Soil Pressure @ Heel = 0 psf OK
Allowable = 5,320 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 2,766 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 6.8 psi OK
Footing Shear @ Heel = 14.7 psi OK
Allowable = 75.0 psi

Sliding Calcs
Lateral Sliding Force = 1,683.2 lbs
less 100% Passive Force = - 187.5 lbs
less 100% Friction Force = - 1,860.8 lbs
Added Force Req'd = 0.0 lbs OK
....for 1.5 Stability = 476.5 lbs NG

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 10.00
Rebar Size = # 5
Rebar Spacing = 12.00
Rebar Placed at = Edge

Design Data
fb/FB + fa/Fa = 0.496

Total Force @ Section
Service Level lbs =
Strength Level lbs = 2,072.0

Moment....Actual
Service Level ft-# =
Strength Level ft-# = 5,422.7
Moment.....Allowable = 10,911.3

Shear.....Actual
Service Level psi =
Strength Level psi = 21.1
Shear.....Allowable psi = 75.0
Anet (Masonry) in2 =
Rebar Depth 'd' in = 8.19

Masonry Data
f'm psi =
Fs psi =
Solid Grouting =
Modular Ratio 'n' =
Wall Weight psf = 125.0

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

Bottom

Stem OK

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

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Title H=7' seismic

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Description....

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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) :	0.1531 in2/ft	
(4/3) * As :	0.2042 in2/ft	Min Stem T&S Reinf Area 1.800 in2
200bd/fy : 200(12)(8.1875)/60000 :	0.3275 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.240 in2/ft
0.0018bh : 0.0018(12)(10) :	0.216 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.216 in2/ft	#4@ 10.00 in #4@ 20.00 in
Provided Area :	0.31 in2/ft	#5@ 15.50 in #5@ 31.00 in
Maximum Area :	1.1092 in2/ft	#6@ 22.00 in #6@ 44.00 in

Footing Data

Toe Width	=	1.00 ft
Heel Width	=	3.50
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	= 2,766	0 psf
Mu' : Upward	= 15,243	1,294 ft-#
Mu' : Downward	= 1,548	4,523 ft-#
Mu: Design	= 1,141	3,229 ft-#
Actual 1-Way Shear	= 6.82	14.66 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 5 @ 11.48 in	
Heel Reinforcing	= # 5 @ 11.48 in	
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: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
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 : retain schedu

Title H=7' seismic
Dsgnr: JAJ
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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)	1,280.0	2.67	3,413.3	Soil Over HL (ab. water tbl)	2,426.7	3.17	7,684.4
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.17	7,684.4
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 =		0.50	
Seismic Earth Load =	403.2	4.00	1,612.8	Surcharge Over Toe =			
=				Stem Weight(s) =	937.5	1.42	1,328.1
Total =	1,683.2	O.T.M.	= 5,026.1	Earth @ Stem Transitions =			
				Footing Weight =	675.0	2.25	1,518.8
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio =			2.10	Total =	4,039.2 lbs	R.M.=	10,531.3
Vertical Loads used for Soil Pressure =		4,039.2 lbs					

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS 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 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.091 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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Cantilevered Retaining Wall

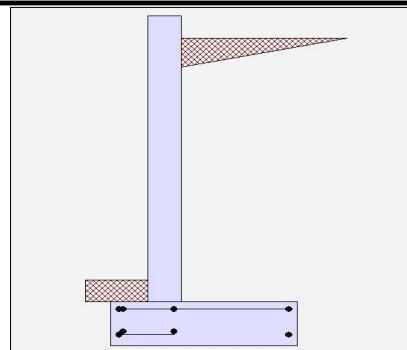
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
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	=	0.0 psf (Service Level)

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	=	2.83 OK
Sliding	=	1.62 OK
Total Bearing Load	=	3,033 lbs
...resultant ecc.	=	5.98 in
Soil Pressure @ Toe	=	1,454 psf OK
Soil Pressure @ Heel	=	164 psf OK
Allowable	=	4,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,035 psf
ACI Factored @ Heel	=	229 psf
Footing Shear @ Toe	=	0.7 psi OK
Footing Shear @ Heel	=	6.7 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	980.0 lbs
less 100% Passive Force	=	- 187.5 lbs
less 100% Friction Force	=	- 1,400.7 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.425
---------------	---	-------

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	=	5,412.6

Shear....Actual

Service Level	psi =	
Strength Level	psi =	15.4
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 =	60,000.0

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Project Name/Number : retain schedu

Title H=6' :
Dsgnr: JAJ
Description....

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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) :	0.0863 in2/ft		
(4/3) * As :	0.1151 in2/ft	Min Stem T&S Reinf Area 1.248 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.75 ft
Heel Width	=	3.00
Total Footing Width	=	3.75
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

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	2,035	229 psf
Mu' : Upward	=	6,463	1,643 ft-#
Mu' : Downward	=	871	3,038 ft-#
Mu: Design	=	466	1,395 ft-#
Actual 1-Way Shear	=	0.71	6.65 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 5 @ 12.00 in	
Heel Reinforcing	=	# 5 @ 12.00 in	
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: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area	0.97	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 : retain schedu

Title H=6' :
Dsgnr: JAJ
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)	980.0	2.33	2,286.7	Soil Over HL (ab. water tbl)	1,820.0	2.58	4,701.7
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.58	4,701.7
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 =		0.38	
				Surcharge Over Toe =			
				Stem Weight(s) =	650.0	1.08	704.2
				Earth @ Stem Transitions =			
Total	= 980.0	O.T.M.	= 2,286.7	Footing Weight =	562.5	1.88	1,054.7
				Key Weight =			
				Vert. Component =			
				Total =	3,032.5 lbs	R.M.=	6,460.5

Resisting/Overturning Ratio = **2.83**

Vertical Loads used for Soil Pressure = 3,032.5 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS 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 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.070 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 : retain schedu

Title H=6' seismic
Dsgnr: JAJ
Description....

Page : 1
Date: 25 JAN 2022

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

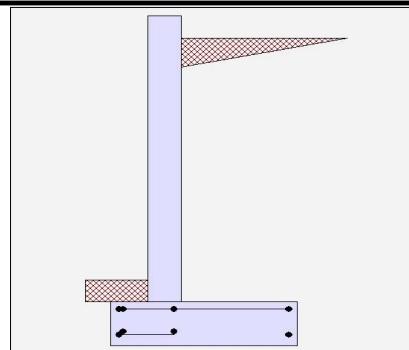
Criteria

Retained Height = 6.00 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 6.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 5,320.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 40.0 psf/ft

Passive Pressure = 300.0 psf/ft
Soil Density, Heel = 130.00 pcf
Soil Density, Toe = 0.00 pcf
Footing||Soil Friction = 0.400
Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
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 = 0.0 psf
(Service Level)

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 = 9.000
(Multiplier used on soil density)
Uniform Seismic Force = 63.000
Total Seismic Force = 441.000

Design Summary

Wall Stability Ratios >1.2 for seismic
Overturning = 1.92 OK
Sliding = 1.23 Ratio < 1.5!

Total Bearing Load = 3,033 lbs
...resultant ecc. = 10.26 in

Soil Pressure @ Toe = 1,982 psf OK
Soil Pressure @ Heel = 0 psf OK
Allowable = 5,320 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 2,775 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 1.0 psi OK
Footing Shear @ Heel = 12.1 psi OK
Allowable = 75.0 psi

Sliding Calcs

Lateral Sliding Force = 1,288.7 lbs
less 100% Passive Force = - 187.5 lbs
less 100% Friction Force = - 1,400.7 lbs
Added Force Req'd = 0.0 lbs OK
....for 1.5 Stability = 344.9 lbs NG

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 4
Rebar Spacing = 12.00
Rebar Placed at = Edge

Design Data

fb/FB + fa/Fa = 0.635

Total Force @ Section

Service Level lbs =
Strength Level lbs = 1,530.0

Moment....Actual

Service Level ft-# =
Strength Level ft-# = 3,438.0

Moment.....Allowable = 5,412.6

Shear.....Actual

Service Level psi =
Strength Level psi = 20.4

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 = 60,000.0

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

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Project Name/Number : retain schedu

Title H=6' seismic

Dsgnr: JAJ

Description....

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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) :	0.1288 in2/ft		
(4/3) * As :	0.1717 in2/ft	Min Stem T&S Reinf Area 1.248 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.75 ft
Heel Width	=	3.00
Total Footing Width	=	3.75
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	= 2,775	0 psf
Mu' : Upward	= 8,599	671 ft-#
Mu' : Downward	= 871	3,038 ft-#
Mu: Design	= 644	2,367 ft-#
Actual 1-Way Shear	= 1.01	12.10 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 5 @ 12.00 in	
Heel Reinforcing	= # 5 @ 12.00 in	
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: #4@ 9.25 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.77 in, #8@ 36.57 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area	0.97 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 : retain schedu

Title H=6' seismic
Dsgnr: JAJ
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)	980.0	2.33	2,286.7	Soil Over HL (ab. water tbl)	1,820.0	2.58	4,701.7
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.58	4,701.7
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 =		0.38	
Seismic Earth Load =	308.7	3.50	1,080.5	Surcharge Over Toe =			
=				Stem Weight(s) =	650.0	1.08	704.2
Total =	1,288.7	O.T.M.	= 3,367.1	Earth @ Stem Transitions =			
				Footing Weight =	562.5	1.88	1,054.7
				Key Weight =			
				Vert. Component =			
				Total =	3,032.5 lbs	R.M.=	6,460.5

Resisting/Overturning Ratio

= **1.92**
Vertical Loads used for Soil Pressure = 3,032.5 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS 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 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.095 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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Cantilevered Retaining Wall

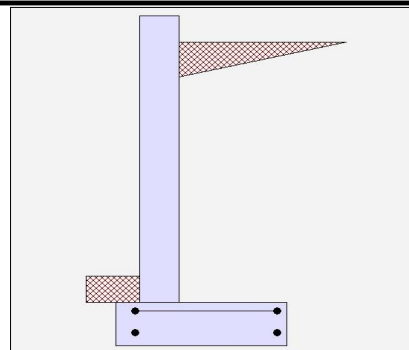
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	5.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	0.00 pcf
Footings||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
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	=	0.0 psf (Service Level)

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	=	2.51 OK
Sliding	=	1.60 OK
Total Bearing Load	=	2,106 lbs
...resultant ecc.	=	6.08 in
Soil Pressure @ Toe	=	1,477 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	4,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,067 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	0.4 psi OK
Footing Shear @ Heel	=	6.3 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	680.6 lbs
less 100% Passive Force	= -	116.7 lbs
less 100% Friction Force	= -	972.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.246
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	800.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	1,333.3
Moment....Allowable	=	5,412.6

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 =	60,000.0

Use menu item Settings > Printing & Title Block
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Project Name/Number : retain schedu

Title H=5' :
Dsgnr: JAJ
Description....

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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) :	0.05 in2/ft		
(4/3) * As :	0.0666 in2/ft	Min Stem T&S Reinf Area 1.056 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	2.50
Total Footing Width	=	2.92
Footing Thickness	=	10.00 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

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	2,067	0 psf
Mu' : Upward	=	2,042	670 ft-#
Mu' : Downward	=	237	1,563 ft-#
Mu: Design	=	150	893 ft-#
Actual 1-Way Shear	=	0.41	6.33 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 11.11 in	
Heel Reinforcing	=	# 4 @ 11.11 in	
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@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Heel: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Key: No key defined

Min footing T&S reinf Area	0.63	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 11.11 in		#4@ 22.22 in
#5@ 17.22 in		#5@ 34.44 in
#6@ 24.44 in		#6@ 48.89 in

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Project Name/Number : retain schedu

Title H=5' :
Dsgnr: JAJ
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)	680.6	1.94	1,323.3	Soil Over HL (ab. water tbl)	1,191.7	2.00	2,382.5
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.00	2,382.5
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 =		0.21	
				Surcharge Over Toe =			
				Stem Weight(s) =	550.0	0.75	412.1
				Earth @ Stem Transitions =			
Total	= 680.6	O.T.M. =	1,323.3	Footing Weight =	364.5	1.46	531.4
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 2.51		Total =	2,106.2 lbs	R.M.=	3,326.1
Vertical Loads used for Soil Pressure =		2,106.2 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

Vertical component of active lateral soil pressure IS 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 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.077 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 : retain schedu

Title H=5' seismic
Dsgnr: JAJ
Description....

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

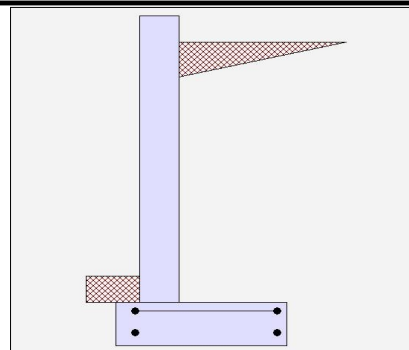
Criteria

Retained Height = 5.00 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 6.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 5,320.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 40.0 psf/ft

Passive Pressure = 300.0 psf/ft
Soil Density, Heel = 130.00 pcf
Soil Density, Toe = 0.00 pcf
Footings||Soil Friction = 0.400
Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
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 = 0.0 psf
(Service Level)

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 = 9.000
(Multiplier used on soil density)
Uniform Seismic Force = 52.500
Total Seismic Force = 306.250

Design Summary

Wall Stability Ratios >1.2 for seismic
Overturning = 1.71 OK
Sliding = 1.22 Ratio < 1.5!

Total Bearing Load = 2,106 lbs
...resultant ecc. = 9.65 in

Soil Pressure @ Toe = 2,147 psf OK
Soil Pressure @ Heel = 0 psf OK
Allowable = 5,320 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 3,005 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 0.4 psi OK
Footing Shear @ Heel = 12.4 psi OK
Allowable = 75.0 psi

Sliding Calcs
Lateral Sliding Force = 894.9 lbs
less 100% Passive Force = - 116.7 lbs
less 100% Friction Force = - 972.8 lbs
Added Force Req'd = 0.0 lbs OK
....for 1.5 Stability = 252.9 lbs NG

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 4
Rebar Spacing = 12.00
Rebar Placed at = Edge

Design Data
fb/FB + fa/Fa = 0.367

Total Force @ Section
Service Level lbs =
Strength Level lbs = 1,062.5

Moment....Actual
Service Level ft-# =
Strength Level ft-# = 1,989.6
Moment.....Allowable = 5,412.6

Shear.....Actual
Service Level psi =
Strength Level psi = 14.2
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 = 60,000.0

Bottom

Stem OK

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

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Title H=5' seismic

Dsgnr: JAJ

Description....

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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) :	0.0745 in2/ft		
(4/3) * As :	0.0994 in2/ft	Min Stem T&S Reinf Area 1.056 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	2.50
Total Footing Width	=	2.92
Footing Thickness	=	10.00 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

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	3,005	0 psf
Mu' : Upward	=	2,900	174 ft-#
Mu' : Downward	=	237	1,563 ft-#
Mu: Design	=	222	1,389 ft-#
Actual 1-Way Shear	=	0.41	12.36 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 11.11 in	
Heel Reinforcing	=	# 4 @ 11.11 in	
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@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Heel: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Key: No key defined

Min footing T&S reinf Area	0.63	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 11.11 in		#4@ 22.22 in
#5@ 17.22 in		#5@ 34.44 in
#6@ 24.44 in		#6@ 48.89 in

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Project Name/Number : retain schedu

Title H=5' seismic

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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)	680.6	1.94	1,323.3	Soil Over HL (ab. water tbl)	1,191.7	2.00	2,382.5
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.00	2,382.5
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 =		0.21	
Seismic Earth Load =	214.4	2.92	625.3	Surcharge Over Toe =			
=				Stem Weight(s) =	550.0	0.75	412.1
Total =	894.9	O.T.M.	= 1,948.6	Earth @ Stem Transitions =			
				Footing Weight =	364.5	1.46	531.4
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio =			1.71	Total =	2,106.2 lbs	R.M.=	3,326.1
Vertical Loads used for Soil Pressure =		2,106.2 lbs					

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS 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 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.112 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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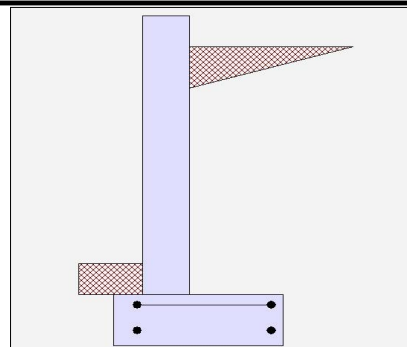
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
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	=	0.0 psf (Service Level)

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	=	2.54 OK
Sliding	=	1.68 OK
Total Bearing Load	=	1,445 lbs
...resultant ecc.	=	4.85 in
Soil Pressure @ Toe	=	1,198 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	4,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,678 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	0.4 psi OK
Footing Shear @ Heel	=	4.6 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	467.2 lbs
less 100% Passive Force	= -	116.7 lbs
less 100% Friction Force	= -	667.6 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.126
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	512.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	682.7
Moment....Allowable	=	5,412.6

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 =	60,000.0

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Cantilevered Retaining Wall

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

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0256 in2/ft		
(4/3) * As :	0.0341 in2/ft	Min Stem T&S Reinf Area 0.864 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	2.00
Total Footing Width	=	2.42
Footing Thickness	=	10.00 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	=	1,678	0 psf
Mu' : Upward	=	1,642	272 ft-#
Mu' : Downward	=	237	688 ft-#
Mu: Design	=	117	416 ft-#
Actual 1-Way Shear	=	0.41	4.64 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 11.11 in	
Heel Reinforcing	=	# 4 @ 11.11 in	
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@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Heel: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Key: No key defined

Min footing T&S reinf Area	0.52	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:		
#4@ 11.11 in		
#5@ 17.22 in		
#6@ 24.44 in		
If two layers of horizontal bars:		
#4@ 22.22 in		
#5@ 34.44 in		
#6@ 48.89 in		

Use menu item Settings > Printing & Title Block
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Project Name/Number : retain schedu

Title H=4' :
Dsgnr: JAJ
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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)	467.2	1.61	752.7	Soil Over HL (ab. water tbl)	693.3	1.75	1,212.9
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.75	1,212.9
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 =		0.21	
				Surcharge Over Toe =			
				Stem Weight(s) =	450.0	0.75	337.2
				Earth @ Stem Transitions =			
Total =	467.2	O.T.M.	752.7	Footing Weight =	302.0	1.21	364.8
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	2.54	Total =	1,445.3 lbs	R.M.=	1,914.9
Vertical Loads used for Soil Pressure =		1,445.3 lbs					

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

Vertical component of active lateral soil pressure IS 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 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.062 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 : retain schedu

Title H=4' seismic
Dsgnr: JAJ
Description....

Page : 1
Date: 25 JAN 2022

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

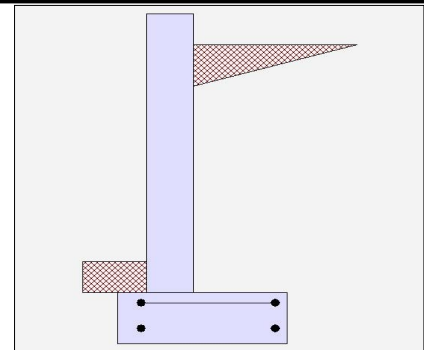
Criteria

Retained Height = 4.00 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 6.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 5,320.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 40.0 psf/ft

Passive Pressure = 300.0 psf/ft
Soil Density, Heel = 130.00 pcf
Soil Density, Toe = 0.00 pcf
Footings||Soil Friction = 0.400
Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
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 = 0.0 psf
(Service Level)

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 = 9.000
(Multiplier used on soil density)
Uniform Seismic Force = 43.500
Total Seismic Force = 210.250

Design Summary

Wall Stability Ratios >1.2 for seismic
Overturning = 1.73 OK
Sliding = 1.28 Ratio < 1.5!

Total Bearing Load = 1,445 lbs
...resultant ecc. = 7.80 in

Soil Pressure @ Toe = 1,727 psf OK
Soil Pressure @ Heel = 0 psf OK
Allowable = 5,320 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 2,418 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 0.4 psi OK
Footing Shear @ Heel = 8.7 psi OK
Allowable = 75.0 psi

Sliding Calcs
Lateral Sliding Force = 614.4 lbs
less 100% Passive Force = - 116.7 lbs
less 100% Friction Force = - 667.6 lbs
Added Force Req'd = 0.0 lbs OK
....for 1.5 Stability = 137.3 lbs NG

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 4
Rebar Spacing = 12.00
Rebar Placed at = Edge

Design Data
fb/FB + fa/Fa = 0.190

Total Force @ Section
Service Level lbs =
Strength Level lbs = 686.0

Moment....Actual
Service Level ft-# =
Strength Level ft-# = 1,030.7
Moment.....Allowable = 5,412.6

Shear.....Actual
Service Level psi =
Strength Level psi = 9.1
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 = 60,000.0

Bottom

Stem OK
ft = 0.00

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

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Project Name/Number : retain schedu

Title H=4' seismic

Dsgnr: JAJ

Description....

Page : 2
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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) :	0.0386 in2/ft		
(4/3) * As :	0.0515 in2/ft	Min Stem T&S Reinf Area 0.864 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	2.00
Total Footing Width	=	2.42
Footing Thickness	=	10.00 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

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	2,418	0 psf
Mu' : Upward	=	2,302	50 ft-#
Mu' : Downward	=	237	688 ft-#
Mu: Design	=	172	638 ft-#
Actual 1-Way Shear	=	0.41	8.66 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 11.11 in	
Heel Reinforcing	=	# 4 @ 11.11 in	
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@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Heel: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Key: No key defined

Min footing T&S reinf Area	0.52	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 11.11 in		#4@ 22.22 in
#5@ 17.22 in		#5@ 34.44 in
#6@ 24.44 in		#6@ 48.89 in

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Project Name/Number : retain schedu

Title H=4' seismic

Dsgnr: JAJ

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)	467.2	1.61	752.7	Soil Over HL (ab. water tbl)	693.3	1.75	1,212.9
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.75	1,212.9
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 =		0.21	
Seismic Earth Load =	147.2	2.42	355.7	Surcharge Over Toe =			
=				Stem Weight(s) =	450.0	0.75	337.2
Total =	614.4	O.T.M.	= 1,108.4	Earth @ Stem Transitions =			
				Footing Weight =	302.0	1.21	364.8
				Key Weight =			
				Vert. Component =			
				Total =	1,445.3 lbs	R.M.=	1,914.9

Resisting/Overturning Ratio

= **1.73**

Vertical Loads used for Soil Pressure = 1,445.3 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS 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 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.089 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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Cantilevered Retaining Wall

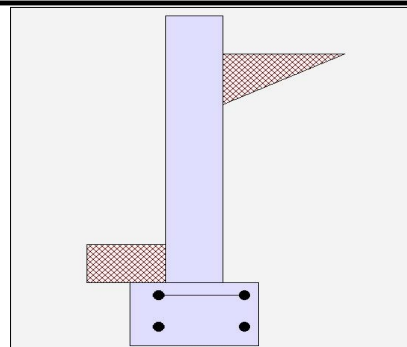
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	3.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	40.0 psf/ft
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	130.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

Surcharge Over Heel	=	0.0 psf
Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0
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	=	0.0 psf (Service Level)

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	=	2.19 OK
Sliding	=	1.54 OK
Total Bearing Load	=	700 lbs
...resultant ecc.	=	4.93 in
Soil Pressure @ Toe	=	1,379 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	4,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,930 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	0.4 psi OK
Footing Shear @ Heel	=	5.4 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	293.9 lbs
less 100% Passive Force	= -	116.7 lbs
less 100% Friction Force	= -	336.2 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.053
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	288.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	288.0
Moment....Allowable	=	5,412.6

Shear....Actual

Service Level	psi =	
Strength Level	psi =	3.8
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 =	60,000.0

Bottom

Stem OK

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Project Name/Number : retain schedu

Title H=3':
Dsgnr: JAJ
Description....

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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) :	0.0108 in2/ft		
(4/3) * As :	0.0144 in2/ft	Min Stem T&S Reinf Area 0.672 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	1.08
Total Footing Width	=	1.50
Footing Thickness	=	10.00 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	=	1,930	0 psf
Mu' : Upward	=	1,730	0 ft-#
Mu' : Downward	=	237	147 ft-#
Mu: Design	=	124	147 ft-#
Actual 1-Way Shear	=	0.41	5.36 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 11.11 in	
Heel Reinforcing	=	# 4 @ 11.11 in	
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@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Heel: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Key: No key defined

Min footing T&S reinf Area	0.32	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 11.11 in		#4@ 22.22 in
#5@ 17.22 in		#5@ 34.44 in
#6@ 24.44 in		#6@ 48.89 in

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Project Name/Number : retain schedu

Title H=3' :
Dsgnr: JAJ
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)	293.9	1.28	375.5	Soil Over HL (ab. water tbl)	162.4	1.29	209.6
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.29	209.6
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 =		0.21	
				Surcharge Over Toe =			
				Stem Weight(s) =	350.0	0.75	262.3
				Earth @ Stem Transitions =			
Total =	293.9	O.T.M.	375.5	Footing Weight =	187.4	0.75	140.4
				Key Weight =			
				Vert. Component =	140.7	1.50	210.9
				Total =	840.5 lbs	R.M.=	823.2
Resisting/Overturning Ratio =			2.19	* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			
Vertical Loads used for Soil Pressure =		699.7 lbs					

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS 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 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.089 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 : retain schedu

Title H=3' seismic
Dsgnr: JAJ
Description....

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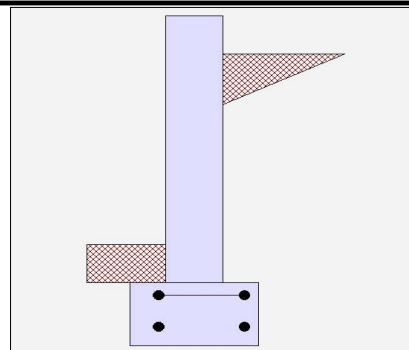
Criteria

Retained Height = 3.00 ft
Wall height above soil = 0.50 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 6.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 5,320.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 40.0 psf/ft

Passive Pressure = 350.0 psf/ft
Soil Density, Heel = 130.00 pcf
Soil Density, Toe = 0.00 pcf
Footings/Soil Friction = 0.400
Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0
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 = 0.0 psf
(Service Level)

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 = 9.000
(Multiplier used on soil density)
Uniform Seismic Force = 34.500
Total Seismic Force = 132.250

Design Summary

Wall Stability Ratios >1.2 for seismic
Overturning = 1.49 Ratio < 1.5!
Sliding = 1.22 Ratio < 1.5!

Total Bearing Load = 840 lbs
...resultant ecc. = 4.36 in

Soil Pressure @ Toe = 1,208 psf OK
Soil Pressure @ Heel = 0 psf OK
Allowable = 5,320 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,691 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 0.4 psi OK
Footing Shear @ Heel = 5.3 psi OK
Allowable = 75.0 psi

Sliding Calcs
Lateral Sliding Force = 386.5 lbs
less 100% Passive Force = - 136.1 lbs
less 100% Friction Force = - 336.2 lbs
Added Force Req'd = 0.0 lbs OK
....for 1.5 Stability = 107.4 lbs NG

Stem Construction

Bottom
Stem OK
Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 4
Rebar Spacing = 12.00
Rebar Placed at = Edge

Design Data
fb/FB + fa/Fa = 0.081

Total Force @ Section
Service Level lbs =
Strength Level lbs = 391.5

Moment....Actual
Service Level ft-# =
Strength Level ft-# = 443.3
Moment.....Allowable = 5,412.6

Shear.....Actual
Service Level psi =
Strength Level psi = 5.2
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 = 60,000.0

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

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 : retain schedu

Title H=3' seismic

Dsgnr: JAJ

Description....

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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) :	0.0166 in2/ft		
(4/3) * As :	0.0221 in2/ft	Min Stem T&S Reinf Area 0.672 in2	
200bd/fy : 200(12)(6.25)/60000 :	0.25 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 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@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in2/ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.8467 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	1.08
Total Footing Width	=	1.50
Footing Thickness	=	10.00 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

	<u>Toe</u>	<u>Heel</u>
Factored Pressure	= 1,691	0 psf
Mu' : Upward	= 1,546	0 ft-#
Mu' : Downward	= 237	147 ft-#
Mu: Design	= 109	147 ft-#
Actual 1-Way Shear	= 0.41	5.31 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 4 @ 11.11 in	
Heel Reinforcing	= # 4 @ 11.11 in	
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@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Heel: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.88 in, #9@ 5
Key: No key defined

Min footing T&S reinf Area	0.32	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 11.11 in		#4@ 22.22 in
#5@ 17.22 in		#5@ 34.44 in
#6@ 24.44 in		#6@ 48.89 in

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Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	293.9	1.28	375.5	Soil Over HL (ab. water tbl)	162.4	1.29	209.6
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		1.29	209.6
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 =		0.21	
Seismic Earth Load =	92.6	1.92	177.4	Surcharge Over Toe =			
=				Stem Weight(s) =	350.0	0.75	262.3
Total =	386.5	O.T.M.	= 553.0	Earth @ Stem Transitions =			
				Footing Weight =	187.4	0.75	140.4
				Key Weight =			
				Vert. Component =	140.7	1.50	210.9
				Total =	840.5 lbs	R.M.=	823.2

Resisting/Overturning Ratio

= **1.49**
Vertical Loads used for Soil Pressure = 840.5 lbs

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS 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 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.078 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.