



STRUCTURAL CALCULATIONS

Leung Residence 9102 SE 78th Place Mercer Island, WA 98040

Board & Vellum 115 15th Ave Suite 100 Seattle, WA 98112

July 26, 2022











Roof Framing, Joist A 1 piece(s) 2 x 12 HF No.2 @ 24" OC





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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	579 @ 2 1/2"	1367 (2.25")	Passed (42%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	478 @ 1' 2 3/4"	1941	Passed (25%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-Ibs)	1805 @ 6' 6 1/2"	2964	Passed (61%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.125 @ 6' 6 1/2"	0.422	Passed (L/999+)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.225 @ 6' 6 1/2"	0.633	Passed (L/675)		1.0 D + 1.0 S (All Spans)

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

• Deflection criteria: LL (L/360) and TL (L/240).

• Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Snow	Factored	Accessories
1 - Stud wall - HF	3.50"	2.25"	1.50"	262	327	589	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.50"	262	327	589	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments					
Top Edge (Lu)	6' 2" o/c						
Bottom Edge (Lu)	12' 11" o/c						
Maximum allowable burging internals based on anylind land							

Maximum allowable bracing intervals based on applied load.

			Dead	Snow	
Vertical Load	Location (Side)	Spacing	(0.90)	(1.15)	Comments
1 - Uniform (PSF)	0 to 13' 1"	24"	20.0	25.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	





Roof Framing, Beam 1 1 piece(s) 5 1/8" x 12" 24F-V8 DF Glulam

Overall Length: 22' 1 1/2"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3663 @ 3"	4997 (1.50")	Passed (73%)		1.0 D + 1.0 S (Alt Spans)
Shear (lbs)	3116 @ 1' 3"	12495	Passed (25%)	1.15	1.0 D + 1.0 S (Alt Spans)
Pos Moment (Ft-Ibs)	13515 @ 8' 2 3/8"	28290	Passed (48%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-Ibs)	-380 @ 18' 1 3/4"	27295	Passed (1%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.309 @ 8' 11 7/16"	0.597	Passed (L/694)		1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.578 @ 8' 11 3/8"	0.895	Passed (L/372)		1.0 D + 1.0 S (Alt Spans)

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

PASSED

Deflection criteria: LL (L/360) and TL (L/240).

Overhang deflection criteria: LL (2L/360) and TL (2L/240).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 17' 9 3/16".

• Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 4' 1 11/16''.

• The effects of positive or negative camber have not been accounted for when calculating deflection.

Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Snow	Factored	Accessories
1 - Hanger on 12" DF beam	3.00"	Hanger ¹	1.50"	1759	2043	3802	See note 1
2 - Stud wall - HF	5.50"	5.50"	1.50"	1279	1349	2629	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)	Continuous	
Bottom Edge (Lu)	All Bearing Points	

Connector: Simpson Strong-Tie									
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories			
1 - Face Mount Hanger	HU5.125/12	2.50"	N/A	22-16d	8-16d				

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

			Dead	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.15)	Comments
0 - Self Weight (PLF)	3" to 22' 1 1/2"	N/A	14.9		
1 - Tapered (PSF)	0 to 22' 1 1/2" (Front)	12' 3" to 0	20.0	25.0	Default Load

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

 ForteWEB Software Operator
 Job Notes

 Steven Nickolas
 Bykonen Carter Quinn

 (206) 264-7784
 ssn@bcq-se.com



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Roof Framing, Beam 2 1 piece(s) 5 1/8" x 10 1/2" 24F-V8 DF Glulam



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)	3096 @ 1 1/2"	6227 (3.00")	Passed (50%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	2635 @ 1' 1 1/2"	10933	Passed (24%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-Ibs)	11292 @ 7' 6 1/2"	21660	Passed (52%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.270 @ 7' 6 1/2"	0.494	Passed (L/659)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.503 @ 7' 6 1/2"	0.742	Passed (L/354)		1.0 D + 1.0 S (All Spans)

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

• Deflection criteria: LL (L/360) and TL (L/240).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 14' 10".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Snow	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	1431	1665	3096	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	1431	1665	3096	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)	Continuous	
Bottom Edge (Lu)	All Bearing Points	

			Dead	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 15' 1"	N/A	13.1		
1 - Uniform (PSF)	0 to 15' 1" (Front)	8' 10"	20.0	25.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	





3 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)	2184 @ 1 1/2"	9844 (3.00")	Passed (22%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	2087 @ 1' 1/4"	10611	Passed (20%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-Ibs)	12322 @ 6' 9"	19327	Passed (64%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.267 @ 6' 9"	0.442	Passed (L/595)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.498 @ 6' 9"	0.663	Passed (L/319)		1.0 D + 1.0 S (All Spans)

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

• Deflection criteria: LL (L/360) and TL (L/240).

	Bearing Length			Loads to Supports (lbs)				
Supports	Total	Available	Required	Dead	Snow	Factored	Accessories	
1 - Stud wall - DF	3.00"	3.00"	1.50"	1014	1170	2184	Blocking	
2 - Stud wall - DF	3.00"	3.00"	1.50"	1014	1170	2184	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)	Continuous	
Bottom Edge (Lu)	All Bearing Points	

			Dead	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 13' 6"	N/A	14.2		
1 - Uniform (PSF)	0 to 13' 6" (Front)	2'	15.0	25.0	Default Load
2 - Point (lb)	6' 9" (Front)	N/A	1431	1665	Linked from: Beam 2, Support 1

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

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Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

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Roof Framing, Beam 4 1 piece(s) 5 1/8" x 12" 24F-V4 DF Glulam

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)	3187 @ 1 1/2"	6227 (3.00")	Passed (51%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	2718 @ 1' 3"	12495	Passed (22%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-Ibs)	13150 @ 8' 6"	28290	Passed (46%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.267 @ 8' 6"	0.558	Passed (L/754)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.500 @ 8' 6"	0.837	Passed (L/402)		1.0 D + 1.0 S (All Spans)

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

• Deflection criteria: LL (L/360) and TL (L/240).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 16' 9".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

0

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

Applicable calculations are based on NDS.

	Bearing Length			Loads to Supports (lbs)			
Supports	Total	Available	Required	Dead	Snow	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.54"	1487	1700	3187	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.54"	1487	1700	3187	Blocking
- Blacking Danals are accumed to come no load	a applied dire	stly, shows the	mand that ful	Lood is popli	d to the more	ahar haina d	asianad

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)	Continuous	
Bottom Edge (Lu)	All Bearing Points	

			Dead	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 17'	N/A	14.9		
1 - Uniform (PSF)	0 to 17' (Front)	8'	20.0	25.0	Default Load

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Level 2 Framing, Joist A 1 piece(s) 2 x 12 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)	555 @ 2 1/2"	1367 (2.25")	Passed (41%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	472 @ 1' 2 3/4"	1688	Passed (28%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2040 @ 7' 8"	2577	Passed (79%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.257 @ 7' 8"	0.373	Passed (L/697)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.353 @ 7' 8"	0.746	Passed (L/507)		1.0 D + 1.0 L (All Spans)
TJ-Pro [™] Rating	N/A	N/A	N/A		N/A

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

• Deflection criteria: LL (L/480) and TL (L/240).

• Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

Applicable calculations are based on NDS.

· No composite action between deck and joist was considered in analysis.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.50"	2.25"	1.50"	153	409	562	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.50"	153	409	562	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments			
Top Edge (Lu)	5' o/c				
Bottom Edge (Lu)	15' 2" o/c				
Maximum allowable bracing intervals based on applied load					

Maximum allowable bracing intervals based on applied load.

			Dead	Floor Live	
Vertical Load	Location (Side)	Spacing	(0.90)	(1.00)	Comments
1 - Uniform (PSF)	0 to 15' 4"	16"	15.0	40.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas	
Bykonen Carter Quinn	
(206) 264-7784	
ssn@bcg-se.com	

Level 2 Framing, Joist B 1 piece(s) 2 x 10 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)	690 @ 2"	911 (1.50")	Passed (76%)		1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	662 @ 11 1/4"	1596	Passed (42%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	558 @ 1'	2204	Passed (25%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.010 @ 2' 5 15/16"	0.125	Passed (L/999+)		1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.018 @ 2' 5 9/16"	0.250	Passed (L/999+)		1.0 D + 0.75 L + 0.75 S (All Spans)
TJ-Pro™ Rating	N/A	N/A	N/A		N/A

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

• Deflection criteria: LL (L/480) and TL (L/240).

Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

Applicable calculations are based on NDS.

· No composite action between deck and joist was considered in analysis.

	Bearing Length				Loads to Su			
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Hanger on 9 1/4" HF beam	2.00"	Hanger ¹	1.50"	331	142	350	700	See note 1
2 - Hanger on 9 1/4" HF beam	2.00"	Hanger ¹	1.50"	109	142	70	268	See note 1

• At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger

• ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	5' o/c	
Bottom Edge (Lu)	5' o/c	

•Maximum allowable bracing intervals based on applied load.

Connector: Simpson Strong-Tie								
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories		
1 - Face Mount Hanger	LU28	1.50"	N/A	8-10dx1.5	6-10dx1.5			
2 - Face Mount Hanger	LU28	1.50"	N/A	8-10dx1.5	6-10dx1.5			

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

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Spacing	(0.90)	(1.00)	(1.15)	Comments
1 - Uniform (PSF)	0 to 5' 4"	16"	15.0	40.0	-	Default Load
2 - Point (PLF)	1'	16"	250.0	-	315.0	

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Level 2 Framing, Joist C 1 piece(s) 2 x 6 HF No.2 @ 16" OC

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	225 @ 2 1/2"	1367 (2.25")	Passed (16%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	194 @ 9"	949	Passed (20%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	517 @ 4' 11"	921	Passed (56%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.218 @ 4' 11"	0.314	Passed (L/518)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.305 @ 4' 11"	0.471	Passed (L/370)		1.0 D + 1.0 S (All Spans)

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

• Deflection criteria: LL (L/360) and TL (L/240).

• Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

• Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Snow	Factored	Accessories
1 - Stud wall - HF	3.50"	2.25"	1.50"	66	164	229	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.50"	66	164	229	1 1/4" Rim Board

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

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

•Maximum allowable bracing intervals based on applied load.

			Dead	Snow	
Vertical Load	Location (Side)	Spacing	(0.90)	(1.15)	Comments
1 - Uniform (PSF)	0 to 9' 10"	16"	10.0	25.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

Project Title: Engineer: Project ID: Project Descr:

Project File: Leung Residence - Framing.ec6 **Steel Beam** LIC# : KW-06015393, Build:20.22.3.16 (c) ENERCALC INC 1983-2022 BYKONEN CARTER QUINN **DESCRIPTION:** Level 2 Framing - Beam 1 **CODE REFERENCES** Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16 Load Combination Set : ASCE 7-16 **Material Properties** Analysis Method Allowable Strength Design Fy : Steel Yield : 46.0 ksi Beam Bracing : Completely Unbraced E: Modulus : 29,000.0 ksi Bending Axis : Major Axis Bending D(D(560)3) (Q(0.24)08) 35(0.5)918) D(0.03375) L(0.090) HSS16x4x1/2 Span = 24.250 ft Service loads entered. Load Factors will be applied for calculations. **Applied Loads**

Beam self weight calculated and added to loading Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 2.250 ft

Uniform Load : D = 0.2490, L = 0.1070, S = 0.2630 ksf, Tributary Width = 2.250 ft

Point Load : D = 3.0, L = 0.140, S = 3.370 k @ 12.0 ft

DESIGN SUMMARY

Maximum Bending Stress Ratio =	0.751 : 1	Maximum Shear Stress Ratio =	0.086 : 1
Section used for this span	HSS16x4x1/2	Section used for this span	HSS16x4x1/2
Ma : Applied	133.205 k-ft	Va : Applied	19.194 k
Mn / Omega : Allowable	177.435 k-ft	Vn/Omega : Allowable	224.480 k
Load Combination	+D+0.750L+0.750S	Load Combination Location of maximum on span	+D+0.750L+0.750S 0.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection Max Downward Transient Deflection Max Upward Transient Deflection Max Downward Total Deflection Max Upward Total Deflection	0.482 in Ratio = 0.000 in Ratio = 1.019 in Ratio = 0.000 in Ratio =	603 >=480. 0 <480.0 Span: 1 : S Only 286 >=240. Span: 1 : +D+0.750L+0.750S 0 <240.0	

Design OK

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stres	s Ratios		Su	mmary of Mo	ment Valu	es		Summar	y of Shear	r Values
Segment Length	Span #	М	V	Mmax +	Mmax -	Ma Max	Mnx Mn	x/Omega Cb	Rm	Va Max	VnxVnx/	Omega
D Only												
Dsgn. L = 24.25 ft	1	0.374	0.042	66.41		66.41	296.32	177.44 1.18	1.00	9.48	374.88	224.48
+D+L												
Dsgn. L = 24.25 ft	1	0.516	0.060	91.57		91.57	296.32	177.44 1.17	1.00	13.56	374.88	224.48
+D+S												
Dsgn. L = 24.25 ft	1	0.734	0.082	130.31		130.31	296.32	177.44 1.19	1.00	18.35	374.88	224.48
+D+0.750L												
Dsgn. L = 24.25 ft	1	0.481	0.056	85.28		85.28	296.32	177.44 1.17	1.00	12.54	374.88	224.48
+D+0.750L+0.750S												
Dsgn. L = 24.25 ft	1	0.751	0.086	133.20		133.20	296.32	177.44 1.18	1.00	19.19	374.88	224.48
+0.60D												
Dsgn. L = 24.25 ft	1	0.225	0.025	39.85		39.85	296.32	177.44 1.18	1.00	5.69	374.88	224.48
Overall Maximum I	Deflectio	ons										
Load Combination		Span M	ax. "-" De	fl Location	in Span	Load Con	nbination		Max	. "+" Defl L	ocation in	Span
+D+0.750L+0.750S		1	1.018	. 88	12.125					0.0000	0.	000

Project Title: Engineer: Project ID: Project Descr:

Steel Beam				Project File: Leung Residence - Framing.ec6
LIC# : KW-06015393, Build:2	0.22.3.16		BYKONEN CARTER QUINN	(c) ENERCALC INC 1983-2022
DESCRIPTION: Le	evel 2 Framing -	Beam 1		
Vertical Reactions			Support notation : Far left is #'	Values in KIPS
Load Combination	Support 1	Support 2		
Overall MAXimum	19.194	19.136		
Overall MINimum	4.081	4.080		
D Only	9.475	9.444		
+D+L	13.556	13.524		
+D+S	18.352	18.287		
+D+0.750L	12.536	12.504		
+D+0.750L+0.750S	19.194	19.136		
+0.60D	5.685	5.666		
L Only	4.081	4.080		
S Only	8.877	8.843		

Level 2 Framing, Beam 1a 3 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)	6357 @ 2"	7442 (3.50")	Passed (85%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	5704 @ 1' 3/4"	10611	Passed (54%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5281 @ 1'	19327	Passed (27%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.016 @ 2' 2 13/16"	0.119	Passed (L/999+)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.031 @ 2' 2 7/8"	0.237	Passed (L/999+)		1.0 D + 1.0 S (All Spans)

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

• Deflection criteria: LL (L/480) and TL (L/240).

	Bearing Length				Loads to Sup			
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	3.50"	3.50"	2.99"	2988	136	3369	6357	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	704	136	717	1421	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 5' 1"	N/A	14.2			
1 - Uniform (PSF)	0 to 5' 1" (Front)	1' 4"	15.0	40.0	-	Default Load
2 - Point (lb)	1' (Front)	N/A	1759	-	2043	Linked from: Beam 1, Support 1
3 - Point (lb)	1' (Front)	N/A	1759	-	2043	Linked from: Beam 1, Support 1

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784	
ssn@bcq-se.com	

1 piece(s) 6 3/4" x 19 1/2" 24F-V8 DF Glulam

Overall Length: 24' 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)	10745 @ 2"	15356 (3.50")	Passed (70%)		1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	9483 @ 1' 11"	26742	Passed (35%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-Ibs)	79760 @ 12'	90066	Passed (89%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.497 @ 12' 7/16"	0.594	Passed (L/573)		1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.988 @ 12' 7/16"	1.188	Passed (L/288)		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).

• A 8.5% decrease in the moment capacity has been added to account for lateral stability.

• Critical positive moment adjusted by a volume factor of 0.92 that was calculated using length L = 23' 9".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

Applicable calculations are based on NDS.

	Bearing Length				Loads to Sup			
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Column Cap - steel	3.50"	3.50"	2.45"	5280	2434	4851	10745	Blocking
2 - Column Cap - steel	3.50"	3.50"	2.44"	5270	2434	4840	10725	Blocking
Placking Danals are assumed to carry up loads applied directly above them and the full load is applied to the member being designed								

ing 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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 24' 1"	N/A	32.0			
1 - Uniform (PSF)	0 to 24' 1" (Front)	2' 3"	15.0	40.0	-	Default Load
2 - Uniform (PLF)	0 to 24' 1" (Front)	N/A	248.3	106.5	262.5	Linked from: Joist B, Support 1
3 - Point (lb)	12' (Front)	N/A	2988	136	3369	Linked from: Beam 1a, 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
Steven Nickolas
Bykonen Carter Quinn
(206) 264-7784
ssn@bcg-se.com

Job Notes

Level 2 Framing, Beam 2

1 piece(s) 5 1/8" x 18" 24F-V8 DF Glulam

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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)	4584 @ 2"	11659 (3.50")	Passed (39%)		1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	3849 @ 1' 9 1/2"	16298	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-Ibs)	28567 @ 12'	52501	Passed (54%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.367 @ 12' 1/2"	0.594	Passed (L/777)		1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.663 @ 12' 7/16"	1.188	Passed (L/430)		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).

• A 5.1% decrease in the moment capacity has been added to account for lateral stability.

• Critical positive moment adjusted by a volume factor of 0.95 that was calculated using length L = 23' 9".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

Applicable calculations are based on NDS.

	Bearing Length				Loads to Sup			
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Column Cap - steel	3.50"	3.50"	1.50"	2014	2434	992	4584	Blocking
2 - Beam - GLB	3.50"	3.50"	1.50"	2012	2434	989	4579	Blocking
Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 24' 1"	N/A	22.4			
1 - Uniform (PSF)	0 to 24' 1" (Front)	2' 3"	15.0	40.0	-	Default Load
2 - Uniform (PLF)	0 to 24' 1" (Front)	N/A	81.8	106.5	52.5	Linked from: Joist B, Support 2
3 - Point (lb)	12' (Front)	N/A	704	136	717	Linked from: Beam 1a, Support 2

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

ForteWEB Software Operator
Steven Nickolas
Bykonen Carter Quinn
(206) 264-7784
ssn@hca-se.com

Job Notes

7/26/2022 2:58:06 AM UTC ForteWEB v3.4, Engine: V8.2.2.122, Data: V8.1.2.2 File Name: Leung Residence Page 13 / 52

Level 2 Framing, Beam 3 1 piece(s) 3 1/8" x 18" 24F-V4 DF Glulam

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)	3145 @ 2"	4430 (3.50")	Passed (71%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	2677 @ 1' 9 1/2"	9938	Passed (27%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-Ibs)	18415 @ 12' 1/2"	33636	Passed (55%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.471 @ 12' 1/2"	0.594	Passed (L/605)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.684 @ 12' 1/2"	1,188	Passed (L/417)		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).

• A 0.3% decrease in the moment capacity has been added to account for lateral stability.

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 23' 9".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.50"	3.50"	2.48"	977	2168	3145	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.48"	977	2168	3145	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 24' 1"	N/A	13.7		
1 - Uniform (PSF)	0 to 24' 1" (Front)	4' 6"	15.0	40.0	Default Load

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ForteWEB Software Operator						
Steven Nickolas						
Bykonen Carter Quinn						
(206) 264-7784						
ssn@bca-se.com						

Level 2 Framing, Beam 4 (w/ overstrength) 1 piece(s) 3 1/8" x 18" 24F-V4 DF Glulam

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)	5275 @ 2"	5275 (2.60")	Passed (100%)		1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	3886 @ 1' 8"	11428	Passed (34%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-Ibs)	21543 @ 9' 5 9/16"	38813	Passed (56%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Neg Moment (Ft-Ibs)	-889 @ 7' 6"	41625	Passed (2%)	1.60	0.6 D - 0.7 E (All Spans)
Live Load Defl. (in)	0.337 @ 9' 1 1/2"	0.482	Passed (L/687)		1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.564 @ 9' 4 1/4"	0.965	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).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 19' 3 1/2".

• Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 2' 4 13/16".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

• Applicable calculations are based on NDS.

	Bearing Length		Loads to Supports (lbs)						
Supports	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Factored	Accessories
1 - Hanger on 18" HF beam	2.00"	Hanger ¹	2.60"	2054	916	2631	1221/-1221	5356	See note 1
2 - Stud wall - HF	5.50"	5.50"	3.71"	1763	931	2129	1221/-1221	4699	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)	Continuous	
Bottom Edge (Lu)	Continuous	

Connector: Simpson Strong-Tie

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

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

			Dead	Floor Live	Snow	Seismic	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	(1.60)	Comments
0 - Self Weight (PLF)	2" to 19' 9 1/2"	N/A	13.7				
1 - Uniform (PSF)	0 to 19' 9 1/2" (Front)	2' 4"	15.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 13' (Front)	4' 9"	15.0	-	25.0	-	Default Load
3 - Uniform (PSF)	0 to 19' 9 1/2" (Front)	6' 6"	15.0	-	25.0	-	Default Load
4 - Point (Ib)	7' 6" (Front)	N/A	-	-	-	3250	
5 - Point (lb)	14' 9" (Front)	N/A	-	-	-	-3250	

ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

7/26/2022 2:58:06 AM UTC ForteWEB v3.4, Engine: V8.2.2.122, Data: V8.1.2.2 File Name: Leung Residence Page 15 / 52

1 piece(s) 5 1/8" x 13 1/2" 24F-V4 DF Glulam

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern) [Group]
Member Reaction (lbs)	6292 @ 2"	7265 (3.50")	Passed (87%)		1.0 D + 1.0 S (All Spans) [1]
Shear (lbs)	5730 @ 1' 5"	14057	Passed (41%)	1.15	1.0 D + 1.0 S (All Spans) [1]
Pos Moment (Ft-Ibs)	25457 @ 5'	35805	Passed (71%)	1.15	1.0 D + 1.0 S (All Spans) [1]
Live Load Defl. (in)	0.300 @ 7' 5 7/16"	0.381	Passed (L/610)		1.0 D + 1.0 S (All Spans) [1]
Total Load Defl. (in)	0.517 @ 7' 5 5/16"	0.762	Passed (L/354)		1.0 D + 1.0 S (All Spans) [1]

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

• Deflection criteria: LL (L/480) and TL (L/240).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 15' 3".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

Applicable calculations are based on NDS.

	В	earing Leng	th		Loads	to Supports	; (lbs)		
Supports	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Factored	Accessories
1 - Beam - HF	3.50"	3.50"	3.03"	2644	626	3648	834/-834	6292	Blocking
2 - Stud wall - HF	3.50"	3.50"	2.20"	1892	290	2684	387/-387	4577	Blocking
2 - Stud wall - HF	3.50" c applied dire	3.50"	2.20"	1892 Lload is appli	290 od to the mon	2684	387/-387	4577	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	Seismic	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	(1.60)	Comments
0 - Self Weight (PLF)	0 to 15' 7"	N/A	16.8				
1 - Uniform (PSF)	0 to 15' 7" (Front)	9' 6"	15.0	-	25.0	-	Default Load
2 - Point (lb)	5' (Front)	N/A	2054	916	2631	1221/-1221	Linked from: Beam 4, 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
Steven Nickolas
Bykonen Carter Quinn
(206) 264-7784
ssn@hca-se.com

Job Notes

Overall Length: 11' 4"

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9571 @ 10' 11 1/2"	12454 (6.00")	Passed (77%)		1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	9113 @ 9' 7"	15618	Passed (58%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-Ibs)	34727 @ 4' 6"	44203	Passed (79%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.123 @ 5' 6 9/16"	0.265	Passed (L/999+)		1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.239 @ 5' 6 3/8"	0.529	Passed (L/532)		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).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 10' 7".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

Applicable calculations are based on NDS.

	Bearing Length				Loads to Su			
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	6.00"	6.00"	4.41"	4493	2087	4130	9156	Blocking
2 - Stud wall - HF	6.00"	6.00"	4.61"	4496	3083	3683	9571	Blocking
Placking Danals are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

ned 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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 11' 4"	N/A	18.7			
1 - Tapered (PSF)	0 to 5' 6" (Front)	6' to 8'	20.0	-	25.0	Default Load
2 - Tapered (PSF)	5' 6" to 11' 4" (Front)	8' to 6'	15.0	-	25.0	Default Load
3 - Uniform (PSF)	0 to 11' 4" (Front)	8"	15.0	40.0	-	Default Load
4 - Point (lb)	4' 6" (Front)	N/A	5270	2434	4840	Linked from: Beam 1, Support 2
5 - Point (lb)	9' (Front)	N/A	2012	2434	989	Linked from: Beam 2, Support 2

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

ForteWEB Software Operator Job Notes Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com

Weyerhaeuser

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Level 2 Framing, Beam 7 2 piece(s) 2 x 10 HF No.2

Overall Length: 6' 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)	1443 @ 1 1/2"	3645 (3.00")	Passed (40%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	959 @ 1' 1/4"	2775	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	2018 @ 3' 1/2"	3333	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.034 @ 3' 1/2"	0.146	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.048 @ 3' 1/2"	0.292	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).

• Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports			
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - HF	3.00"	3.00"	1.50"	409	1034	1443	Blocking	
2 - Stud wall - HF	3.00"	3.00"	1.50"	409	1034	1443	Blocking	
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 6' 1"	N/A	7.0		
1 - Uniform (PSF)	0 to 6' 1" (Front)	8' 6"	15.0	40.0	Default Load

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

ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

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Level 2 Framing, Beam 8

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)	4325 @ 8' 9"	6379 (4.50")	Passed (68%)		1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	3786 @ 7' 10 1/4"	7074	Passed (54%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	6306 @ 4' 11 5/16"	11204	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.122 @ 4' 7 5/8"	0.213	Passed (L/836)		1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.208 @ 4' 8 1/16"	0.425	Passed (L/491)		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).

	Bearing Length			Loads to Sup				
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	4.50"	4.50"	2.00"	987	1845	294	2832	Blocking
2 - Stud wall - HF	4.50"	4.50"	3.05"	1913	1845	1371	4325	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 9'	N/A	9.4			
1 - Uniform (PSF)	0 to 9' (Front)	10' 3"	15.0	40.0	-	Default Load
2 - Point (lb)	7' 3" (Front)	N/A	1431	-	1665	Linked from: Beam 2, Support 2

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

Level 2 Framing, Beam 9 3 piece(s) 2 x 8 HF No.2

Overall Length: 9'

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1162 @ 1 1/2"	5468 (3.00")	Passed (21%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	942 @ 10 1/4"	3263	Passed (29%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	2472 @ 4' 6"	3351	Passed (74%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.114 @ 4' 6"	0.219	Passed (L/924)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.183 @ 4' 6"	0.438	Passed (L/573)		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 NDS.

	Bearing Length			Loads to Su				
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	442	720	225	1162	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	442	720	225	1162	Blocking
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 9'	N/A	8.3			
1 - Uniform (PSF)	0 to 9' (Front)	4'	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 9' (Front)	2'	15.0	-	25.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

Level 2 Framing, Beam 10 3 piece(s) 2 x 8 HF No.2

Overall Length: 7' 10"

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1579 @ 1 1/2"	5468 (3.00")	Passed (29%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	1235 @ 10 1/4"	3752	Passed (33%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-Ibs)	2899 @ 3' 11"	3853	Passed (75%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.095 @ 3' 11"	0.190	Passed (L/957)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.162 @ 3' 11"	0.379	Passed (L/563)		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).

Applicable calculations are based on NDS.

	Bearing Length		Loads to Supports (lbs)					
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	649	157	930	1579	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	649	157	930	1579	Blocking
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 7' 10"	N/A	8.3			
1 - Uniform (PSF)	0 to 7' 10" (Front)	1'	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 7' 10" (Front)	9' 6"	15.0	-	25.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

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Level 2 Framing, Beam 11 3 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)	3708 @ 2"	7442 (3.50")	Passed (50%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	3007 @ 1' 3/4"	10611	Passed (28%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	9819 @ 5' 7 1/2"	19327	Passed (51%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.194 @ 5' 7 1/2"	0.273	Passed (L/675)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.327 @ 5' 7 1/2"	0.546	Passed (L/400)		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).

	Bearing Length			Loads to Sup				
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	3.50"	3.50"	1.74"	1511	300	2197	3708	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.74"	1511	300	2197	3708	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 11' 3"	N/A	14.2			
1 - Uniform (PSF)	0 to 11' 3" (Front)	1' 4"	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 11' 3" (Front)	15' 7 1/2"	15.0	-	25.0	Default Load

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I	ForteWEB Software Operator	Job Notes
	Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

Level 2 Framing, Beam 12 2 piece(s) 2 x 10 HF No.2

Overall Length: 5' 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)	1657 @ 2"	4253 (3.50")	Passed (39%)		1.0 D + 1.0 S (All Spans)
Shear (lbs)	964 @ 1' 3/4"	3191	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1839 @ 2' 6 1/2"	3833	Passed (48%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.017 @ 2' 6 1/2"	0.119	Passed (L/999+)		1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.029 @ 2' 6 1/2"	0.237	Passed (L/999+)		1.0 D + 1.0 S (All Spans)

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

• Deflection criteria: LL (L/480) and TL (L/240).

Applicable calculations are based on NDS.

	Bearing Length		Loads to Supports (lbs)					
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	3.50"	3.50"	1.50"	664	136	993	1657	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	664	136	993	1657	Blocking
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 5' 1"	N/A	7.0			
1 - Uniform (PSF)	0 to 5' 1" (Front)	1' 4"	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 5' 1" (Front)	15' 7 1/2"	15.0	-	25.0	Default Load

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Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

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Level 2 Framing, Beam 13 3 piece(s) 2 x 10 HF No.2

Overall Length: 9'

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1656 @ 1 1/2"	5468 (3.00")	Passed (30%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	1280 @ 1' 1/4"	4163	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3522 @ 4' 6"	5000	Passed (70%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.089 @ 4' 6"	0.219	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.126 @ 4' 6"	0.438	Passed (L/835)		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 NDS.

	Bearing Length			Loads	to Supports			
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - HF	3.00"	3.00"	1.50"	486	1170	1656	Blocking	
2 - Stud wall - HF	3.00"	3.00"	1.50"	486	1170	1656	Blocking	
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 9'	N/A	10.6		
1 - Uniform (PSF)	0 to 9' (Front)	6' 6"	15.0	40.0	Default Load

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

ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

7/26/2022 2:58:06 AM UTC ForteWEB v3.4, Engine: V8.2.2.122, Data: V8.1.2.2 File Name: Leung Residence Page 25 / 52

2 piece(s) 1 3/4" x 11 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)	2862 @ 1 1/2"	4253 (3.00")	Passed (67%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	2358 @ 1' 2 1/4"	7481	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	9304 @ 6' 9"	16137	Passed (58%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.270 @ 6' 9"	0.442	Passed (L/589)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.381 @ 6' 9"	0.663	Passed (L/417)		1.0 D + 1.0 L (All Spans)

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

• Deflection criteria: LL (L/360) and TL (L/240).

	Bearing Length			Loads to Supports (lbs)				
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - HF	3.00"	3.00"	2.02"	837	2025	2862	Blocking	
2 - Stud wall - HF	3.00"	3.00"	2.02"	837	2025	2862	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)	Continuous	
Bottom Edge (Lu)	All Bearing Points	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 13' 6"	N/A	11.5		
1 - Uniform (PSF)	0 to 13' 6" (Front)	7' 6"	15.0	40.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

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)	1015 @ 1 1/2"	4253 (3.00")	Passed (24%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	893 @ 1' 1/4"	6151	Passed (15%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	4189 @ 8' 6"	11204	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.317 @ 8' 6"	0.558	Passed (L/634)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.473 @ 8' 6"	0.837	Passed (L/425)		1.0 D + 1.0 L (All Spans)

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

• Deflection criteria: LL (L/360) and TL (L/240).

	Bearing Length			Loads to Supports (lbs)			
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	335	680	1015	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	335	680	1015	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)	Continuous	
Bottom Edge (Lu)	All Bearing Points	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 17'	N/A	9.4		
1 - Uniform (PSF)	0 to 17' (Front)	2'	15.0	40.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

Project Title: Engineer: Project ID: Project Descr:

Project File: Leung Residence - Framing.ec6 **Steel Beam** LIC# : KW-06015393, Build:20.22.7.14 BYKONEN CARTER QUINN (c) ENERCALC INC 1983-2022 **DESCRIPTION:** Level 2 Framing - Beam 16 **CODE REFERENCES** Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16 Load Combination Set : ASCE 7-16 **Material Properties** Analysis Method Allowable Strength Design Fy : Steel Yield : 46.0 ksi Beam Bracing : Completely Unbraced E: Modulus : 29,000.0 ksi Bending Axis : Major Axis Bending D(0.10) L(0.10) HSS8x4x1/4 Span = 16.50 ft **Applied Loads** Service loads entered. Load Factors will be applied for calculations. Beam self weight NOT internally calculated and added Uniform Load : D = 0.10, L = 0.10 k/ft, Tributary Width = 1.0 ft Design OK **DESIGN SUMMARY** Maximum Bending Stress Ratio = **0.223**:1 Maximum Shear Stress Ratio = 0.029:1 Section used for this span HSS8x4x1/4 Section used for this span HSS8x4x1/4 6 806 4.4 Ma · Applied 1/-. .

Ma : Applied	6.806 k-ft			Va : Applied	1.650 K
Mn / Omega : Allowable	30.529 k-f	t		Vn/Omega : Allowable	56.229 k
Load Combination	+D+L		Loac Loca	l Combination tion of maximum on span	+D+L 0.000 ft
Span # where maximum occurs	Span # 1		Spar	n # where maximum occurs	Span # 1
Maximum Deflection	0.126 in Ratio -	1 456	<u>>−360</u>		
Max Downward Transient Deflection	0.130 in Ratio -	1,400	~260	Span: 1 · L Only	
Max Opward Transient Deflection	0.000 III Kall0 =	0	<300	Span. T. L Only	
Max Downward Total Deflection	0.272 in Ratio =	728	>=180	Span: 1 : +D+L	
Max Upward Total Deflection	0.000 in Ratio =	0	<180		

Maximum Forces & Stresses for Load Combinations

Load Combination		Max Stre	ss Ratios		Su	mmary of Mo	ment Value	S		Summar	y of Shear	Values
Segment Length	Span #	Μ	V	Mmax +	Mmax -	Ma Max	Mnx Mnx/	Omega Cb	Rm	Va Max	VnxVnx/0	Omega
D Only											·	
Dsgn. L = 16.50 ft	1	0.111	0.015	3.40		3.40	50.98	30.53 1.14	1.00	0.83	93.90	56.23
+D+L												
Dsgn. L = 16.50 ft	1	0.223	0.029	6.81		6.81	50.98	30.53 1.14	1.00	1.65	93.90	56.23
+D+0.750L												
Dsgn. L = 16.50 ft	1	0.195	0.026	5.96		5.96	50.98	30.53 1.14	1.00	1.44	93.90	56.23
+0.60D												
Dsgn. L = 16.50 ft	1	0.067	0.009	2.04		2.04	50.98	30.53 1.14	1.00	0.50	93.90	56.23
Overall Maximum	Deflecti	ions										
Load Combination		Span M	Max. "-" De	fl Locatior	n in Span	Load Con	nbination		Max	. "+" Defl L	ocation in	Span
+D+L		1	0.271	9	8.297					0.0000	0.0	000
Vertical Reactions					Suppo	rt notation : F	ar left is #		Values	in KIPS		
Load Combination		Support 1	Support 2									
Overall MAXimum		1.650	1.650)								
Overall MINimum		0.495	0.495	5								
D Only		0.825	0.825	5								

1.650	1.650
1.444	1.444
0.495	0.495
0.825	0.825
	1.650 1.444 0.495 0.825

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

7' 1 2

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2020 @ 1 1/2"	4253 (3.00")	Passed (48%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	1898 @ 1' 1/4"	6151	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6485 @ 3' 9"	11204	Passed (58%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.091 @ 3' 9"	0.181	Passed (L/956)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.133 @ 3' 9"	0.363	Passed (L/656)		1.0 D + 1.0 L (All Spans)

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

0

· Deflection criteria: LL (L/480) and TL (L/240).

0

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	636	1384	2020	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	636	1384	2020	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 7' 6"	N/A	9.4		
1 - Uniform (PSF)	0 to 7' 6" (Front)	2'	15.0	40.0	Default Load
2 - Point (lb)	3' 9" (Front)	N/A	977	2168	Linked from: Beam 3, Support 1

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

Level 2 Framing, Beam 18 3 piece(s) 2 x 10 HF No.2

Overall Length: 5' 6"

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2252 @ 1 1/2"	5468 (3.00")	Passed (41%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	2167 @ 1' 1/4"	4163	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	4056 @ 2'	5000	Passed (81%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.029 @ 2' 7 5/16"	0.131	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.042 @ 2' 7 5/16"	0.262	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).

Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	712	1540	2252	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	433	921	1354	Blocking
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed							

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 5' 6"	N/A	10.6		
1 - Uniform (PSF)	0 to 5' 6" (Front)	1' 4"	15.0	40.0	Default Load
2 - Point (lb)	2' (Front)	N/A	977	2168	Linked from: Beam 3, Support 2

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

Level 2 Framing, Beam 19 1 piece(s) 4 x 10 HF No.2

Overall Length: 24' 11 1/2"

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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2175 @ 8' 8 3/4"	4961 (3.50")	Passed (44%)		1.0 D + 1.0 S (Adj Spans)
Shear (lbs)	1156 @ 9' 7 3/4"	3723	Passed (31%)	1.15	1.0 D + 1.0 S (Adj Spans)
Moment (Ft-lbs)	-3264 @ 8' 8 3/4"	4879	Passed (67%)	1.15	1.0 D + 1.0 S (Adj Spans)
Live Load Defl. (in)	0.258 @ 17' 6 5/16"	0.403	Passed (L/750)		1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.381 @ 17' 6 7/16"	0.805	Passed (L/507)		1.0 D + 1.0 S (Alt Spans)

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

• Deflection criteria: LL (L/480) and TL (L/240).

• Overhang deflection criteria: LL (2L/480) and TL (2L/240).

Applicable calculations are based on NDS.

	Bearing Length		Loads	to Supports			
Supports	Total	Available	Required	Dead	Snow	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	97	364	461	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.53"	708	1467	2175	None
3 - Stud wall - HF	3.00"	3.00"	1.50"	294	601	895	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 24' 11 1/2"	N/A	8.2		
1 - Uniform (PSF)	0 to 24' 11 1/2" (Front)	3' 7"	10.0	25.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	

Project Title: Engineer: Project ID: Project Descr:

Steel Beam								Project	File: Leung	Residence	- Framing.	ec6
LIC# : KW-06015393, B	Build:20.22.7.14			BYK	ONEN CAR	TER QUINN				(c) ENERCAI	_C INC 1983	3-2022
DESCRIPTION	Level 2 F	Framing - E	Beam 2	0								
CODE REFERE	INCES											
Calculations per A Load Combination	NSC 360-16 Set : ASCE	, IBC 2018, ∃ 7-16	CBC 20)19, ASCE	7-16							
Material Properti	ies											
Analysis Method Beam Bracing : Bending Axis :	Allowable Str Completely Major Axis Be	rength Desigr Unbraced ending	I				Fy : S E: Mo	Steel Yield odulus :	l : 29,	46.0 ksi 000.0 ksi		
	D(0).710) S(1.47	0)				D(0.7	10) S(1,4	70)			
×		````	·					<u> </u>				- ×
*												×
					HSS5x5	x1/4						\mathbf{X}
					Span = 1	2.0 ft						
												•
Applied Loads						Servic	e loads enter	red. Load	Factors wil	ll be applied	for calcula	ations.
Beam self weig	oht calculate	ed and adde	d to loa	dina								
Load(s) for Spa Point Load	an Number : D = 0.710	1 0, S = 1.470) k @ 3.	0 ft								
Point Load	: D = 0.710	0, S = 1.470) k @ 8	50 ft								
										Dec		
Maximum Bendi	I RY	Patio -		0 /32 · ·	1 Ma	vinum Sk	oor Stress	Patio -		Des		1
Section used fo	or this span		HSS	5x5x1/4		Section	on used for th	nis span		HSS	5x5x1/4	1
Ма	: Applied			7.543 k	-ft		Va : Applied			2.365 k		
Mn	/ Omega : All	lowable		17.468 k	-ft	Lood	Vn/Omega :	Allowable	9	33.124 k		
Load Combinat				+D+3		Locati	ion of maxim	um on spa	an	0.000 ft		
Span # where n	naximum occ	urs		Span # 1		Span	# where max	imum oco	curs	\$	Span # 1	
Maximum Defle	ction	0		in Datia	107	400						
Max Downward Max Upward Tr	ansient Defle	ction	0.289	in Ratio =	= 497 = 0	>=480. <480.0	Span: 1 : S	Only				
Max Downward	Total Deflect	tion	0.445	in Ratio =	= 323	323 >=240. Span: 1 : +D+S						
Max Upward To	otal Deflection	1	0.000	in Ratio =	= 0	<240.0						
Maximum Forces	s & Stress	es for Loa	d Com	bination	S							
Load Combination	Spop #	Max Stres	s Ratios	Mmox	Su	mmary of N	Noment Value	es v/Omogo	Ch Dm	Summar	y of Shear	Values
D Only	i Span #	IVI	v	IVIIIIAX T	IVIIIIdx -			voniega		va iviax		Jilleya
Dsgn. L = 12.00 +D+S	ft 1	0.150	0.025	2.62		2.62	29.17	17.47	1.06 1.00	0.83	55.32	33.12
Dsgn. L = 12.00	ft 1	0.432	0.071	7.54		7.54	29.17	17.47	1.06 1.00	2.36	55.32	33.12
Dsgn. L = 12.00 +0.60D	ft 1	0.361	0.060	6.31		6.31	29.17	17.47	1.06 1.00	1.98	55.32	33.12
Dsgn. L = 12.00	ft 1	0.090	0.015	1.57		1.57	29.17	17.47	1.06 1.00	0.50	55.32	33.12
Overall Maximur	n Deflectio	ons										
Load Combination		Span M	ax. "-" De	efl Location	n in Span	Load Co	ombination		Max	. "+" Defl L	ocation in	Span
+D+S		1	0.44	54	6.034					0.0000	0.0	000
Vertical Reaction	ns				Suppo	rt notation :	: Far left is #'		Values	s in KIPS		
Load Combination	ç	Support 1	Support 2	2								
Overall MAXimum	1	2.365	2.18 0.46	3 4								
D Only		0.833	0.40	4								
+D+S		2.365	2.18	3								

Project Title: Engineer: Project ID: Project Descr:

Steel Beam				Project File: Leung Residence - Framing.ec6
LIC# : KW-06015393, Build:	:20.22.7.14		BYKONEN CARTER QUINN	(c) ENERCALC INC 1983-2022
DESCRIPTION: L	evel 2 Framing -	Beam 20		
Vertical Reactions			Support notation : Far left is #	Values in KIPS
Load Combination	Support 1	Support 2		
+D+0.750S	1.982	1.831		
+0.60D	0.500	0.464		
S Only	1.531	1.409		

FOUNDATION PLAN NOTES

- 1. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND NOTIFY ENGINEER OF RECORD OF ANY DISCREPANCIES.
- 2. SLABS ON GRADE SHALL BE 4" THICK WITH 6x6 W1.4xW1.4 WWM CENTERED, U.N.O. PREPARED SOILS AND PROVIDE
- MINIMUM 6-MIL VISQUEEN VAPOR BARRIER UNDER ALL SLABS. 3. SLABS ON GRADE SHALL BE SUPPORTED ON 12" COMPACTED STRUCTURAL FILL OVER RE-COMPACTED NATIVE SOIL PER GEOTECHNICAL REPORT.
- 4. REFER TO ARCHITECTURAL PLANS FOR DIMENSIONS AND TOP OF SLAB ELEVATIONS.

FRAMING

3

4

B A 2'-0" SQUARE x 8" DEEP FTG w/ (2)#4 EA WAY BOT 6 (E) BEAM (E) SLAB ON GRADE **4** 2 P B 5

1 <u>LEVEL 1 FRAMING PLAN</u> 1/4" = 1'-0"

FRAMING PLAN NOTES

C

CONT. 4x12 FB

(E) BEAM

POS CA

(3)1³ 3 LVL FB

14

1000 CO



Level 1 Framing, Joist A 2 piece(s) 2 x 10 HF No.2 @ 16" OC

Overall Length: 16' 8"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	611 @ 2 1/2"	4253 (3.50")	Passed (14%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	533 @ 1' 3/4"	2775	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2421 @ 8' 4"	3833	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.325 @ 8' 4"	0.406	Passed (L/599)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.447 @ 8' 4"	0.813	Passed (L/436)		1.0 D + 1.0 L (All Spans)
TJ-Pro [™] Rating	N/A	N/A	N/A		N/A

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

PASSED

• Deflection criteria: LL (L/480) and TL (L/240).

• Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

• Applicable calculations are based on NDS.

· No composite action between deck and joist was considered in analysis.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.50"	3.50"	1.50"	167	444	611	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	167	444	611	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)	13' 5" o/c					
Bottom Edge (Lu)	16' 8" o/c					
-Maximum alloughte bracing intervals based on applied load						

Maximum allowable bracing intervals based on applied load.

			Dead	Floor Live	
Vertical Load	Location (Side)	Spacing	(0.90)	(1.00)	Comments
1 - Uniform (PSF)	0 to 16' 8"	16"	15.0	40.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas	
Bykonen Carter Quinn	
(206) 264-7784	
ssn@bcg-se.com	





Level 1 Framing, Joist B 1 piece(s) 2 x 8 HF No.2 @ 16" OC

Overall Length: 9' 4"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	498 @ 2 1/2"	2126 (3.50")	Passed (23%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	402 @ 10 3/4"	1088	Passed (37%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	1060 @ 4' 8"	1284	Passed (83%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.184 @ 4' 8"	0.223	Passed (L/582)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.245 @ 4' 8"	0.446	Passed (L/437)		1.0 D + 1.0 L (All Spans)
TJ-Pro [™] Rating	N/A	N/A	N/A		N/A

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

• Deflection criteria: LL (L/480) and TL (L/240).

Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

• Applicable calculations are based on NDS.

· No composite action between deck and joist was considered in analysis.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.50"	3.50"	1.50"	124	373	498	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	124	373	498	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' 4" o/c					
Bottom Edge (Lu)	9' 4" o/c					
-Maximum allowable brasing intervals based on applied land						

Maximum allowable bracing intervals based on applied load.

			Dead	Floor Live	
Vertical Load	Location (Side)	Spacing	(0.90)	(1.00)	Comments
1 - Uniform (PSF)	0 to 9' 4"	16"	20.0	60.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas	
Bykonen Carter Quinn	
(206) 264-7784	
ssn@bcg-se.com	



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Level 1 Framing, Joist C 1 piece(s) 2 x 8 HF No.2 @ 12" 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)	402 @ 2 1/2"	1367 (2.25")	Passed (29%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	338 @ 10 3/4"	1088	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	967 @ 5' 1 1/2"	1284	Passed (75%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.204 @ 5' 1 1/2"	0.246	Passed (L/579)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.272 @ 5' 1 1/2"	0.492	Passed (L/434)		1.0 D + 1.0 L (All Spans)
TJ-Pro [™] Rating	N/A	N/A	N/A		N/A

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

• Deflection criteria: LL (L/480) and TL (L/240).

Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

Applicable calculations are based on NDS.

· No composite action between deck and joist was considered in analysis.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - DF	3.50"	2.25"	1.50"	102	308	410	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	102	308	410	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments			
Top Edge (Lu)	7' 8" o/c				
Bottom Edge (Lu)	10' 1" o/c				
-Maximum allowable brasing intervale based on applied lead					

Maximum allowable bracing intervals based on applied load.

			Dead	Floor Live	
Vertical Load	Location (Side)	Spacing	(0.90)	(1.00)	Comments
1 - Uniform (PSF)	0 to 10' 3"	12"	20.0	60.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas	
Bykonen Carter Quinn	
(206) 264-7784	
ssn@bcg-se.com	





Level 1 Framing, Joist D 1 piece(s) 2 x 10 HF No.2 @ 12" OC

Overall Length: 12' 10"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	648 @ 9' 5 1/4"	2126 (3.50")	Passed (30%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	324 @ 8' 6 1/4"	1388	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	756 @ 4' 8 3/8"	1917	Passed (39%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.076 @ 4' 9 7/8"	0.231	Passed (L/999+)		1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.089 @ 4' 9 5/16"	0.461	Passed (L/999+)		1.0 D + 1.0 L (Alt Spans)
TJ-Pro [™] Rating	N/A	N/A	N/A		N/A

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

PASSED

Deflection criteria: LL (L/480) and TL (L/240).

• Overhang deflection criteria: LL (2L/480) and TL (2L/240).

• Allowed moment does not reflect the adjustment for the beam stability factor.

• 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.

	Bearing Length			Loads to Supports (lbs)			
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.50"	3.50"	1.50"	63	289/-37	352	Blocking
2 - Stud wall - HF	3.50"	3.50"	1.50"	130	518	648	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' 10" o/c	
Bottom Edge (Lu)	12' 10" o/c	

•Maximum allowable bracing intervals based on applied load.

			Dead	Floor Live	
Vertical Load	Location (Side)	Spacing	(0.90)	(1.00)	Comments
1 - Uniform (PSF)	0 to 12' 10"	12"	15.0	60.0	Default Load

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

ForteWEB Software Operator	Job
Steven Nickolas	
Bykonen Carter Quinn	
(206) 264-7784	
ssn@hca-se.com	

Job Notes



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Level 1 Framing, Joist E 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)	124 @ 2 1/2"	1367 (2.25")	Passed (9%)		1.0 D (All Spans)
Shear (lbs)	103 @ 10 3/4"	979	Passed (11%)	0.90	1.0 D (All Spans)
Moment (Ft-lbs)	275 @ 4' 9"	1156	Passed (24%)	0.90	1.0 D (All Spans)
Live Load Defl. (in)	0.000 @ 1 1/4"	0.227	Passed (L/999+)		1.0 D (All Spans)
Total Load Defl. (in)	0.066 @ 4' 9"	0.454	Passed (L/999+)		1.0 D (All Spans)
TJ-Pro [™] Rating	N/A	N/A	N/A		N/A

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

• Deflection criteria: LL (L/480) and TL (L/240).

Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

· Applicable calculations are based on NDS.

• No composite action between deck and joist was considered in analysis.

	Bearing Length		Loads to Supports (lbs)			
Supports	Total	Available	Required	Dead	Factored	Accessories
1 - Stud wall - HF	3.50"	2.25"	1.50"	127	127	1 1/4" Rim Board
2 - Stud wall - HF	3.50"	2.25"	1.50"	127	127	1 1/4" Rim Board
- Dim Deard is assumed to earny all leads applie	d directly abo	wo it hunned	ng the memb	or hoing doois	mod	

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

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

•Maximum allowable bracing intervals based on applied load.

			Dead	
Vertical Load	Location (Side)	Spacing	(0.90)	Comments
1 - Uniform (PSF)	0 to 9' 6"	16"	20.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas	
Bykonen Carter Quinn	1
(206) 264-7784	1
ssn@bcg-se.com	1





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)	3613 @ 1 1/2"	4253 (3.00")	Passed (85%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	2691 @ 1' 1/4"	6151	Passed (44%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	6781 @ 4'	11204	Passed (61%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.132 @ 4'	0.194	Passed (L/706)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.183 @ 4'	0.387	Passed (L/508)		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 Length			Loads	to Supports			
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - HF	3.00"	3.00"	2.55"	1013	2600	3613	Blocking	
2 - Stud wall - HF	3.00"	3.00"	2.55"	1013	2600	3613	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 8'	N/A	9.4		
1 - Uniform (PSF)	0 to 8' (Front)	16' 3"	15.0	40.0	Default Load

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

ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	



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Level 1 Framing, Beam 2

1 piece(s) 6 3/4" x 13 1/2" 24F-V4 DF Glulam



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)	7082 @ 1 1/2"	8201 (3.00")	Passed (86%)		1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	11428 @ 10' 10 1/2"	18514	Passed (62%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-Ibs)	41120 @ 7' 2"	47157	Passed (87%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.194 @ 6' 4 7/16"	0.300	Passed (L/744)		1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.364 @ 6' 4 5/8"	0.600	Passed (L/396)		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).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 12'.

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

Applicable calculations are based on NDS.

	Bearing Length			Loads to Supports (lbs)				
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	2.59"	3238	3027	2097	7082	Blocking
2 - Stud wall - DF	5.50"	5.50"	2.86"	5588	4878	3746	12055	Blocking
Placking Papals are accumed to carry no load	c applied dire	ctly above the	m and the ful	load ic appli	od to the mor	nhor hoing de	cianod	

• 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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 12' 5 1/2"	N/A	22.1			
1 - Uniform (PSF)	0 to 6' (Front)	5' 6"	15.0	40.0	-	Default Load
2 - Uniform (PSF)	6' to 12' 3" (Front)	1' 4"	15.0	40.0	-	Default Load
3 - Point (lb)	7' 2" (Front)	N/A	5280	2434	4851	Linked from: Beam 1, Support 1
4 - Point (lb)	11' (Front)	N/A	2014	2434	992	Linked from: Beam 2, Support 1
5 - Point (lb)	6' (Front)	N/A	636	1384	-	Linked from: Beam 20, Support 2

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 ForteWEB Software Operator
 Job Notes

 Steven Nickolas
 Bykonen Carter Quinn

 (206) 264-7784
 ssn@bcq-se.com



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Level 1 Framing, Beam 3

3 piece(s) 1 3/4" x 9 1/4" 2.0E Microllam® LVL

Overall Length: 9' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4932 @ 9' 4 1/2"	9844 (3.00")	Passed (50%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	4251 @ 8' 5 3/4"	9227	Passed (46%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	11184 @ 6' 6"	16806	Passed (67%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.140 @ 5' 5/8"	0.231	Passed (L/792)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.235 @ 5' 7/8"	0.463	Passed (L/472)		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 Length				Loads to Su			
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - DF	3.00"	3.00"	1.50"	978	1618	364	2596	Blocking
2 - Stud wall - DF	3.00"	3.00"	1.50"	1915	3017	806	4932	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 9' 6"	N/A	14.2			
1 - Uniform (PSF)	0 to 9' 6" (Front)	3'	20.0	60.0	-	Default Load
2 - Uniform (PSF)	6' 6" to 9' 6" (Front)	7' 6"	15.0	40.0	-	Default Load
3 - Point (lb)	6' 6" (Front)	N/A	1014	-	1170	Linked from: Beam 4, Support 2
4 - Point (lb)	6' 6" (Front)	N/A	837	2025	-	Linked from: Beam 18, Support 2

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ForteWEB Software Operator	Job No
Steven Nickolas	
Bykonen Carter Quinn	
(206) 264-7784	
ssn@bcg-se.com	







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)	4530 @ 1 1/2"	6563 (3.00")	Passed (69%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	4159 @ 1' 1/4"	6151	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	5823 @ 1' 6"	11204	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.041 @ 2' 5 7/16"	0.125	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.064 @ 2' 5 5/16"	0.250	Passed (L/936)		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 Length			Loads to Supports (lbs)				
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - DF	3.00"	3.00"	2.07"	1660	2870	584	4530	Blocking
2 - Stud wall - DF	3.00"	3.00"	1.50"	799	1512	222	2311	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 5' 3"	N/A	9.4			
1 - Uniform (PSF)	0 to 5' 3" (Front)	4' 6"	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 5' 3" (Front)	1' 4"	20.0	60.0	-	Default Load
3 - Point (lb)	1' 6" (Front)	N/A	1915	3017	806	Linked from: Beam 3, Support 2

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

ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	



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Level 1 Framing, Beam 5 1 piece(s) 4 x 8 HF No.2

Overall Length: 7' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1374 @ 1 1/2"	4253 (3.00")	Passed (32%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	1061 @ 10 1/4"	2538	Passed (42%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	2408 @ 3' 9"	2823	Passed (85%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.116 @ 3' 9"	0.181	Passed (L/749)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.158 @ 3' 9"	0.363	Passed (L/552)		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 NDS.

	Bearing Length		Loads	to Supports				
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - DF	3.00"	3.00"	1.50"	362	1013	1374	Blocking	
2 - Stud wall - DF	3.00"	3.00"	1.50"	362	1013	1374	Blocking	
Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 7' 6"	N/A	6.4		
1 - Uniform (PSF)	0 to 7' 6" (Front)	4' 6"	20.0	60.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	





Level 1 Framing, Beam 6 (w/ overstrength) 3 piece(s) 1 3/4" x 9 1/4" 2.0E Microllam® LVL

Support 2 failed reaction check due to insufficient bearing capacity. An excessive uplift of -1195 lbs at support located at 1 1/2" failed this product. An excessive uplift of -4025 lbs at support located at 11' 6 1/2" 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)	6866 @ 11' 6 1/2"	6379 (3.00")	Failed (108%)		1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	6289 @ 10' 7 3/4"	14763	Passed (43%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Moment (Ft-Ibs)	19306 @ 8' 3"	26889	Passed (72%)	1.60	1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.532 @ 6' 2 1/16"	0.285	Failed (L/258)		1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.655 @ 6' 1 5/16"	0.571	Failed (L/209)		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).

	B	earing Lengt	th		Loads				
Supports	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	2.23"	1220	2333	438	2753/-2753	4744/- 1195	Blocking
2 - Stud wall - HF	3.00"	3.00"	3.23"	1220	2333	438	6797/-6797	6866/- 4025	Blocking
 Blocking Panels are assumed to carry no load 	s applied dire	ctly above the	m and the ful	load is appli	ed to the men	nber beina de	esianed.		

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	Seismic	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	(1.60)	Comments
0 - Self Weight (PLF)	0 to 11' 8"	N/A	14.2				
1 - Uniform (PSF)	0 to 11' 8" (Front)	8'	15.0	40.0	-	-	Default Load
2 - Uniform (PSF)	0 to 11' 8" (Front)	2'	15.0	40.0	-	-	Default Load
3 - Uniform (PSF)	0 to 11' 8" (Front)	3'	15.0	-	25.0	-	Default Load
4 - Point (lb)	8' 3" (Front)	N/A	-	-	-	9550	3820 * 2.5

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	



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Level 1 Framing, Beam 7 1 piece(s) 4 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)	1327 @ 1 1/2"	4253 (3.00")	Passed (31%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	1115 @ 1' 1/4"	3238	Passed (34%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	4066 @ 6' 4 1/2"	4242	Passed (96%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.275 @ 6' 4 1/2"	0.313	Passed (L/546)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.381 @ 6' 4 1/2"	0.625	Passed (L/394)		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 NDS.

	Bearing Length		Loads	to Supports				
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - DF	3.00"	3.00"	1.50"	371	956	1327	Blocking	
2 - Stud wall - DF	3.00"	3.00"	1.50"	371	956	1327	Blocking	
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 12' 9"	N/A	8.2		
1 - Uniform (PSF)	0 to 12' 9" (Front)	2' 6"	20.0	60.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	





Level 1 Framing, Beam 8

1 piece(s) 5 1/8" x 12" 24F-V4 DF Glulam

PASSED





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)	3015 @ 4"	11416 (5.50")	Passed (26%)		1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2536 @ 1' 5 1/2"	12495	Passed (20%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Pos Moment (Ft-Ibs)	12840 @ 9' 2 1/16"	28290	Passed (45%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.239 @ 9' 8 13/16"	0.481	Passed (L/966)		1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.625 @ 9' 8 1/2"	0.962	Passed (L/369)		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).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 19' 3".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

Applicable calculations are based on NDS.

	Bearing Length				Loads to Su			
Supports	Total	Available	Required	Dead	Floor Live	Snow	Factored	Accessories
1 - Stud wall - HF	5.50"	5.50"	1.50"	1873	398	1125	3015	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.50"	1086	398	563	1807	Blocking
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Snow	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.15)	Comments
0 - Self Weight (PLF)	0 to 19' 11"	N/A	14.9			
1 - Uniform (PSF)	0 to 19' 11" (Front)	1'	15.0	40.0	-	Default Load
2 - Uniform (PSF)	0 to 13' 6" (Front)	5'	15.0	-	25.0	Default Load
3 - Uniform (PSF)	0 to 13' 6" (Front)	10'	10.0	-	-	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas	
Bykonen Carter Quinn	
(206) 264-7784	
ssn@hca-se.com	



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Level 1 Framing, Beam 9 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)	3715 @ 4"	10024 (5.50")	Passed (37%)		1.0 D + 0.7 E (All Spans)
Shear (lbs)	3567 @ 1' 2 3/4"	6660	Passed (54%)	1.60	1.0 D + 0.7 E (All Spans)
Moment (Ft-lbs)	4291 @ 4'	5000	Passed (86%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.105 @ 3' 10 3/16"	0.231	Passed (L/999+)		1.0 D + 0.525 E + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.174 @ 4' 2 5/8"	0.463	Passed (L/637)		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).

• Applicable calculations are based on NDS.

	Bearing Length				Loads to Su			
Supports	Total	Available	Required	Dead	Floor Live	Seismic	Factored	Accessories
1 - Stud wall - HF	5.50"	5.50"	2.04"	788	773	4181/-4181	3715/- 2454	Blocking
2 - Stud wall - HF	5.50"	5.50"	1.97"	660	423	4181/-4181	3587/- 2531	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	Seismic	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	(1.60)	Comments
0 - Self Weight (PLF)	0 to 9' 11"	N/A	10.6			
1 - Uniform (PSF)	0 to 9' 11" (Front)	9'	10.0	-	-	Default Load
2 - Uniform (PSF)	0 to 4' (Front)	1'	20.0	60.0	-	Default Load
3 - Point (Ib)	2' (Front)	N/A	-	-	5950	2380 * 2.5
4 - Point (Ib)	8' 6" (Front)	N/A	-	-	-5950	2380 * 2.5
5 - Point (lb)	4' (Front)	N/A	371	956	-	Linked from: Beam 7, Support 1

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	



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Level 1 Framing, Beam 10 1 piece(s) 4 x 10 DF No.2

Overall Length: 9' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1108 @ 1 1/2"	4253 (3.00")	Passed (26%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	870 @ 1' 1/4"	3885	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	2494 @ 4' 9"	4492	Passed (56%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.080 @ 4' 9"	0.231	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.104 @ 4' 9"	0.463	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).

Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	253	855	1108	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	253	855	1108	Blocking
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed							

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 9' 6"	N/A	8.2		
1 - Uniform (PSF)	0 to 9' 6" (Front)	3'	15.0	60.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	





Level 1 Framing, Beam 11 1 piece(s) 6 x 12 DF No.2

Overall Length: 10' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2840 @ 1 1/2"	6683 (3.00")	Passed (43%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	2187 @ 1' 2 1/2"	7168	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	7105 @ 5' 3"	8840	Passed (80%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.115 @ 5' 3"	0.256	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.148 @ 5' 3"	0.512	Passed (L/830)		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).

• Lumber grading provisions must be extended over the length of the member per NDS 4.2.5.5.

Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports			
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - HF	3.00"	3.00"	1.50"	635	2205	2840	Blocking	
2 - Stud wall - HF	3.00"	3.00"	1.50"	635	2205	2840	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)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 10' 6"	N/A	16.0		
1 - Uniform (PSF)	0 to 10' 6" (Front)	7'	15.0	60.0	Default Load

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

ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	



7/26/2022 2:58:06 AM UTC ForteWEB v3.4, Engine: V8.2.2.122, Data: V8.1.2.2 File Name: Leung Residence Page 47 / 52



Level 1 Framing, Beam 12 1 piece(s) 5 1/8" x 12" 24F-V4 DF Glulam



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)	5703 @ 2"	5703 (1.71")	Passed (100%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	4315 @ 1' 2"	9779	Passed (44%)	0.90	1.0 D (All Spans)
Pos Moment (Ft-Ibs)	12649 @ 4' 9"	22140	Passed (57%)	0.90	1.0 D (All Spans)
Live Load Defl. (in)	0.005 @ 4' 9"	0.229	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.149 @ 4' 9"	0.458	Passed (L/739)		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).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 9' 2".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Hanger on 12" HF beam	2.00"	Hanger ¹	1.71"	5718	190	5908	See note 1
2 - Hanger on 12" HF beam	2.00"	Hanger ¹	1.71"	5718	190	5908	See note 1

At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger

• ¹ See Connector grid below for additional information and/or requirements.

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

Connector: Simpson Strong-Lie									
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories			
1 - Face Mount Hanger	HGUS5.25/10	4.00"	N/A	46-10d	16-10d				
2 - Face Mount Hanger	HGUS5.25/10	4.00"	N/A	46-10d	16-10d				

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

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	2" to 9' 4"	N/A	14.9		
1 - Uniform (PSF)	0 to 9' 6" (Front)	8"	20.0	60.0	Default Load
2 - Uniform (PSF)	0 to 9' 6" (Front)	24' 6"	48.0	-	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	



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Level 1 Framing, Beam 13 1 piece(s) 5 1/8" x 12" 24F-V4 DF Glulam



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)	8182 @ 1 1/2"	9609 (3.00")	Passed (85%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	6293 @ 1' 3"	10865	Passed (58%)	1.00	1.0 D + 1.0 L (All Spans)
Pos Moment (Ft-Ibs)	20510 @ 4' 6"	24600	Passed (83%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.026 @ 4' 2 5/16"	0.198	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.157 @ 4' 15/16"	0.396	Passed (L/606)		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).

• Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 7' 11".

• The effects of positive or negative camber have not been accounted for when calculating deflection.

• The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.

Applicable calculations are based on NDS.

	Bearing Length			Loads	to Supports			
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - DF	3.00"	3.00"	2.55"	6891	1291	8182	Blocking	
2 - Stud wall - DF	3.00"	3.00"	2.23"	5242	1904	7147	Blocking	
- Blacking Danals are assumed to save up lands applied directly above them and the full land is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 8' 2"	N/A	14.9		
1 - Uniform (PSF)	0 to 8' 2" (Front)	4'	20.0	60.0	Default Load
2 - Uniform (PSF)	0 to 4' 6" (Front)	24' 6"	48.0	-	Default Load
3 - Uniform (PSF)	4' 6" to 8' 2" (Front)	4' 9"	20.0	60.0	Default Load
4 - Point (lb)	4' 6" (Front)	N/A	5718	190	Linked from: Beam 12, Support 1

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ForteWEB Software Operator Job Notes
Steven Nickolas
Bykonen Carter Quinn
(206) 264-7784
ssn@bcq-se.com





Level 1 Framing, Beam 14 1 piece(s) 4 x 10 HF No.2

Overall Length: 10' 5 1/2"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1298 @ 1 1/2"	4253 (3.00")	Passed (31%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	1045 @ 1' 1/4"	3238	Passed (32%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	3233 @ 5' 2 3/4"	4242	Passed (76%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.147 @ 5' 2 3/4"	0.255	Passed (L/836)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.202 @ 5' 2 3/4"	0.510	Passed (L/606)		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 NDS.

	Bearing Length			Loads	to Supports			
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories	
1 - Stud wall - DF	3.00"	3.00"	1.50"	357	941	1298	Blocking	
2 - Stud wall - DF	3.00"	3.00"	1.50"	357	941	1298	Blocking	
Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed								

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 10' 5 1/2"	N/A	8.2		
1 - Uniform (PSF)	0 to 10' 5 1/2" (Front)	3'	20.0	60.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	





Foundation Plan, Joists @ Hot Tub 1 piece(s) 2 x 8 HF No.2 @ 12" 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)	352 @ 2 1/2"	1367 (2.25")	Passed (26%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	253 @ 10 3/4"	1088	Passed (23%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	458 @ 2' 11"	1284	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.034 @ 2' 11"	0.135	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.039 @ 2' 11"	0.271	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
TJ-Pro [™] Rating	N/A	N/A	N/A		N/A

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

• Deflection criteria: LL (L/480) and TL (L/240).

Allowed moment does not reflect the adjustment for the beam stability factor.

• A 15% increase in the moment capacity has been added to account for repetitive member usage.

• Applicable calculations are based on NDS.

· No composite action between deck and joist was considered in analysis.

	Bearing Length			Loads	to Supports		
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - DF	3.50"	2.25"	1.50"	44	321	365	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	44	321	365	1 1/4" Rim Board

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

Lateral Bracing	Bracing Intervals	Comments	
Top Edge (Lu)	5' 8" o/c		
Bottom Edge (Lu)	5' 8" o/c		
-Maximum alloughle bracing intervals based on parallel lead			

Maximum allowable bracing intervals based on applied load.

			Dead	Floor Live	
Vertical Load	Location (Side)	Spacing	(0.90)	(1.00)	Comments
1 - Uniform (PSF)	0 to 5' 10"	12"	15.0	110.0	Default Load

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ForteWEB Software Operator				
Steven Nickolas				
Bykonen Carter Quinn				
(206) 264-7784				
ssn@bcg-se.com				





Foundation Plan, Center Beam @ Hot Tub 1 piece(s) 4 x 8 HF No.2

Overall Length: 4' 6"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1479 @ 1 1/2"	4253 (3.00")	Passed (35%)		1.0 D + 1.0 L (All Spans)
Shear (lbs)	918 @ 10 1/4"	2538	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-Ibs)	1484 @ 2' 3"	2823	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.029 @ 2' 3"	0.106	Passed (L/999+)		1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.033 @ 2' 3"	0.213	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).

Applicable calculations are based on NDS.

	Bearing Length		Loads to Supports (lbs)				
Supports	Total	Available	Required	Dead	Floor Live	Factored	Accessories
1 - Stud wall - HF	3.00"	3.00"	1.50"	190	1289	1479	Blocking
2 - Stud wall - HF	3.00"	3.00"	1.50"	190	1289	1479	Blocking
Blocking Papels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed							

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

Lateral Bracing	Bracing Intervals	Comments
Top Edge (Lu)	Continuous	
Bottom Edge (Lu)	Continuous	

			Dead	Floor Live	
Vertical Loads	Location (Side)	Tributary Width	(0.90)	(1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 6"	N/A	6.4		
1 - Uniform (PSF)	0 to 4' 6" (Front)	5' 2 1/2"	15.0	110.0	Default Load

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ForteWEB Software Operator	Job Notes
Steven Nickolas Bykonen Carter Quinn (206) 264-7784 ssn@bcq-se.com	



7/26/2022 2:58:06 AM UTC ForteWEB v3.4, Engine: V8.2.2.122, Data: V8.1.2.2 File Name: Leung Residence Page 52 / 52



Search Information

Address:	9102 SE 78th Pl, Mercer Island, WA 98040, USA
Coordinates:	47.5331438, -122.2185708
Elevation:	177 ft
Timestamp:	2022-02-03T22:37:24.087Z
Hazard Type:	Seismic
Reference Document:	ASCE7-16
Risk Category:	Ш
Site Class:	D



Basic Parameters

Name	Value	Description
S _S	1.458	MCE _R ground motion (period=0.2s)
S ₁	0.503	MCE _R ground motion (period=1.0s)
S _{MS}	1.458	Site-modified spectral acceleration value
S _{M1}	* null	Site-modified spectral acceleration value
S _{DS}	0.972	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
Fa	1	Site amplification factor at 0.2s
Fv	* 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	0.623	MCE _G peak ground acceleration
F _{PGA}	1.1	Site amplification factor at PGA
PGA _M	0.686	Site modified peak ground acceleration

https://hazards.atcouncil.org/#/seismic?lat=47.5331438&Ing=-122.2185708&address=9102 SE 78th PI%2C Mercer Island%2C WA 98040%2C USA 1/2

ΤL	6	Long-period transition period (s)
SsRT	1.458	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.616	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	4.314	Factored deterministic acceleration value (0.2s)
S1RT	0.503	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.56	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.637	Factored deterministic acceleration value (1.0s)
PGAd	1.424	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

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

Disclaimer

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

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ATC Hazards by Location

ATC Hazards by Location

Search Information

Address:	9102 SE 78th Pl, Mercer Island, WA 98040, USA
Coordinates:	47.5331438, -122.2185708
Elevation:	177 ft
Timestamp:	2021-11-18T17:18:10.742Z
Hazard Type:	Wind



ASCE 7-16

ASCE 7-10

ASCE 7-05

MRI 10-Year	nph	MRI 10-Year	72 mph	ASCE 7-05 Wind Speed	 85 mph
MRI 25-Year	ıph	MRI 25-Year	79 mph		
MRI 50-Year 78 m	nph	MRI 50-Year	85 mph		
MRI 100-Year	nph	MRI 100-Year	91 mph		
Risk Category I	nph	Risk Category I	100 mph		
Risk Category II	nph	Risk Category II	110 mph		
Risk Category III 104 m	nph	Risk Category III-IV	115 mph		
Risk Category IV 108 m	nph				

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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ATC Hazards by Location

building site described by latitude/longitude location in the report.

<u>Seismic</u>

Project: Leung Residence

Seismic Design Para		
Site Class	D	
Risk Category	П	Table 1.5-1
Importance Factor	1	Table 1.5-2
Ss	1.458	From LISCS
S1	0.503	FI0111 03G3
Fa	1.000	Table 11.4-1
Fv	1.800	Table 11.4-2
Sms	1.458	Eq. 11.4-1
Sm1	0.905	Eq. 11.4-2
Sds	0.972	Eq. 11.4-3
Sd1	0.604	Eq. 11.4-4
R	6.5	Table 12.2-1
Cs	0.150	Eq. 12.8-2
k	1	12.8.3
ρ	1	
Seismic Design Category	D	Table 11.6-1

Seismic Weight

Areas (ft ²)					
Roof	2215				
Upper Floor	2760				
Main Floor	1315				

Loads	
DL-Floor (psf)	25
DL-Roof (psf)	20
DL-Solar (psf)	5

Seismic Base Shea		
V _{ultimate} (k)	23.5	Eq. 12.8-1
V _{allowable} (k)	16.5	

Level	Weight (k)	Height (ft)	w _x f _x ^k	C _{vx}	F _x (ult.)	F _x (allow.)
Roof	55.375	35.25	1952.0	0.53	12.4	8.7
Upper Floor	69	20.5	1414.5	0.38	9.0	6.3
Main Floor	32.875	10.5	345.2	0.09	2.2	1.5
TOTAL	157.3	-	3711.7	1	23.5	16.5

All references are from ASCE 7-16: Minimum Design Loads and Associated Criteria for Buildings and Other Structures

Project: Leung Residence

Wind Load Parameters		Chapter 28 - Envelope Procedure
Exposure	С	Sec. 26.7
Risk Category	11	Table 1.5-1
Mean Roof Height (ft)	35.25	
Roof Slope (X/12)	4	
Angle	18.4	
a (ft)	3.4	Figure 28.3-1 Note "a"
K _d	0.85	Table 26.6-1
K _{zt}	1.6	
V (mph)	97	
Kz	1.01	Table 26.10-1
q _h (psf)	33.14	Eq. 26.10-1
Minimum Wind Pressure on	46	
Walls (psf)	16	6 20.2.4
Minimum Wind Pressure on	0	Sec. 28.3.4
Roof (nsf)	8	

Building Geometry

Loval	Hoight (ft)	Unight (ft) Trib Unight (ft)		Load Case B Direction (ft)
Level			Plan North/South	Plan East/West
Above Roof	6	6	42.75	44.5
Roof	9	4.5	42.75	44.5
Upper Floor	10	9.5	81.25	42.25
Main Floor	10.5	10.25	34	42.25
	Height below Level		"Long" Dimension	"Short" Dimension

GC pf Values Summary (28.3-1)

Building Surface	Load Case A	Load Case B
Roof	0.22	-
Roof Corners	0.40	-
Wall	0.93	0.69
Wall Corners	1.40	1.04

Load Case A - Plan North/South

Level	A (ft ²)		$F = q_h^* GC_{pf}^* A(k)$	Total Wind Load (Ultimate, k)	Minimum Load (Ultimate, k)	Total (allowable, k)
Roof - roof	216		1.50	2.01	2.05	1.23
Corners		41	0.51			
Roof - walls	162		5.00	6.41	3.08	3.85
Corners		31	1.42			
Upper Floor	707		21.84	24.83	12.35	14.90
Corners		65	2.99			
Main Floor	279		8.61	11.84	5.58	7.10
Corners		70	3.23			

Load Case B - Plan East/West

Level	A (ft ²)	F = q _h *GC _{pf} *A (k)	Total Wind Load (Ultimate, k)	Minimum Load (Ultimate, k)	Total (allowable, k)
Roof - roof	247	5.64	6.34	2.14	3.80
Corners	2	0 0.70			
Roof - walls	185	4.23	4.76	3.20	2.85
Corners	1	.5 0.53			
Upper Floor	369	8.44	9.55	6.42	5.73
Corners		2 1.11			
Main Floor	398	9.10	10.31	6.93	6.18
Corners	3	5 1.20			

Wind Loads Summary

Level	Plan Nor	th/South	Plan East/West		
Level	Wind Load (Ultimate, k)	Wind Load (Allowable, k)	Wind Load (Ultimate, k)	Wind Load (Allowable, k)	
Roof	8.46	5.08	11.10	6.66	
Upper Floor	24.83	14.90	9.55	5.73	
Main Floor	11.84	7.10	10.31	6.18	
Base Shear	45.13	27.08	30.95	18.57	

FOUNDATION PLAN NOTES

- 1. CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS AND NOTIFY ENGINEER OF RECORD OF ANY DISCREPANCIES.
- 2. SLABS ON GRADE SHALL BE 4" THICK WITH 6x6 W1.4xW1.4 WWM CENTERED, U.N.O. PREPARED SOILS AND PROVIDE
- MINIMUM 6-MIL VISQUEEN VAPOR BARRIER UNDER ALL SLABS. SLABS ON GRADE SHALL BE SUPPORTED ON 12" COMPACTED 3. STRUCTURAL FILL OVER RE-COMPACTED NATIVE SOIL PER GEOTECHNICAL REPORT.
- 4. REFER TO ARCHITECTURAL PLANS FOR DIMENSIONS AND TOP OF SLAB ELEVATIONS.

FRAMING REQUIREMENTS.

3

4

В Α 2'-0" SQUARE x 8" DEEP FTG w/ (2)#4 EA WAY BOT 6 E) BEAM (E) SLAB ON GRADE <u> (Ē) BĒĀM</u> **4** 2 PT.ANPOST P.T. 4x8 FB

1 <u>LEVEL 1 FRAMING PLAN</u> 1/4" = 1'-0"

FRAMING PLAN NOTES









W	L-C1
-	

Level	Total Wall Line Lengths (ft)	Seismic Forces (k)	Wind Forces (k)	Story Heights (ft)
Roof	7.25	1.22	0.96	9
Upper Floor	13	1.87	1.65	9
Main Floor	17.25	2.25	3.2	9

Max H/W Ratio²

3.5

ROOF

Longth (ft) H/W/ P	H/W Patio	In energy 1	Force in Wall Elements		Dead Loads		Solomic Overturning (k)	Wind Overturning (k)
Length (ft) H/ W Ratio Increa		Increase	Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seisinic Overturning (k)	wind Overturning (k)
7.25	1.24	1.00	168	132	653	73	1.30	0.97
		Shear Wall	SW-1			Strap Tie	MSTO	240

UPPER FLOOR

Longth (ft) H/M/ Dot		In an an a 1	Force in Wall Elements		Dead Loads		Solomia Quarturning (k)	Wind Overturning (k)
Length (ft) H/ W Ratio Increase		Increase	Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seismic Overturning (k)	wind Overturning (k)
13	0.69	1.00	144	127	1170	130	0.90	0.75
		Shear Wall	SW-1			Strap Tie	Strap Tie/Holdow	n Not Required

MAIN FLOOR

Longth (ft) U/M/ Do		1	1 Force in Wall Elements		Dead Loads		Solomia Quarturning (k)	Wind Quarturning (k)
Length (ft) H/W Ratio Increase		Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seismic Overturning (K)	wind Overturning (k)	
17.25	0.52	1.00	130	186	1553	173	0.66	1.15
		Shear Wall	SW-1			Holdown	HDU2 w,	/ (2) 2x

¹ Increase per 4.3.4.2 ANSI/AWC SDPWS-2015

<u>WL-C2</u>

Level	Total Wall Line Lengths (ft)	Seismic Forces (k)	Wind Forces (k)	Story Heights (ft)	
Roof	7.5	1.22	0.96	9	
Upper Floor	7.5	2.48	2.1	12	
Main Floor	15.75	3.61	6.75	9	

Max H/W Ratio²

3.5

ROOF

Longth (ft)	H/W/ Patio	In average 1	Force in Wall Elements		Dead Loads		Soismis Quarturning (k)	Wind Overturning (k)
Length (It)	Length (it) H/ W Ratio Increase	Increase	Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seisinic Overturning (k)	wind Overturning (K)
3.75	2.40	1.05	171	128	338	38	1.35	1.04
3.75	2.40	1.05	171	128	338	38	1.35	1.04
		Shear Wall	SW	-1		Strap Tie	MSTO	240

UPPER FLOOR

Longth (ft)	H/W Patio	Increase 1	Force in Wall Elements		Dead Loads		Soismis Overturning (k)	Wind Overturning (k)
Length (It)	n/w Ratio Increase		Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seisinic Overturning (k)	wind Overturning (K)
3.75	3.20	1.18	389	280	450	38	3.82	3.21
3.75	3.20	1.18	389	280	450	38	3.82	3.21
		Shear Wall	SW	-3		Strap Tie	MSTO	266

MAIN FLOOR

Longth (ft) H/M/ Do		Increase 1	Force in Wall Elements		De	ad Loads	Solomic Quarturning (k)	Wind Overturning (k)
Length (ft) H/W Ratio Increase		Increase	Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seismic Overturning (k)	wind Overturning (k)
15.75	0.57	1.00	229	429	1418	158	1.59	3.38
		Shear Wall	SW-2			Holdown	HDU5 w	′ (2) 2x

¹ Increase per 4.3.4.2 ANSI/AWC SDPWS-2015

<u>WL-4</u>

Level	Total Wall Line Lengths (ft)	Seismic Forces (k)	Wind Forces (k)	Story Heights (ft)
Roof	37	2.8	1.67	9
Upper Floor	17.5	4.69	6.14	9

Max H/W Ratio²

3.5

ROOF

Length (ft) H/W Ratio	H/W Patio	Increase ¹	Force in Wall Elements		Dead Loads		Saismic Overturning (k)	Wind Overturning (k)
	increase	Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seisinic Overturning (K)		
14.5	0.62	1.00	76	45	1305	145	0.25	-0.03
12	0.75	1.00	76	45	1080	120	0.32	0.05
10.5	0.86	1.00	76	45	945	105	0.37	0.09
-		Shear Wall	SW-1			Strap Tie	Strap Tie/Holdow	n Not Required

UPPER FLOOR

Longth (ft)	H/W Patio	In an an a 1	Force in Wall Elements		Dead Loads		Saismis Quarturning (k)	Wind Overturning (k)
Length (It)	n/w Ratio Increase		Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seisinic Overturning (k)	wind Overturning (K)
4	2.25	1.03	277	351	360	40	2.29	3.04
7.5	1.20	1.00	268	351	675	75	2.19	2.93
6	1.50	1.00	268	351	540	60	2.23	2.98
		Shear Wall	SW	-2		Strap Tie	MSTO	52

¹ Increase per 4.3.4.2 ANSI/AWC SDPWS-2015

W	L-5

Level	Total Wall Line Lengths (ft)	Seismic Forces (k)	Wind Forces (k)	Story Heights (ft)
Roof	14.5	1.22	0.73	9
Upper Floor	7.5	2.17	2.97	9
Main Floor	21	3.57	6.52	9

Max H/W Ratio²

3.5

ROOF

Longth (ft)	H/W Patio	In average 1	Force in Wall Elements		Dead Loads		Soismis Overturning (k)	Wind Overturning (k)
Length (It)		Increase	Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seisinic Overturning (k)	wind Overturning (k)
14.5	0.62	1.00	84	50	1305	145	0.32	0.02
		Shear Wall	SW-	-1		Strap Tie	Strap Tie/Holdow	n Not Required

UPPER FLOOR

Longth (ft)		1	Force in Wall Elements		Dead Loads		Solomia Quarturning (k)	Wind Overturning (k)
Length (IL)		Increase	Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seismic Overturning (K)	wind Overturning (k)
7.5	1.20	1.00	289	396	675	75	2.38	3.34
		Shear Wall	SW	-2		Strap Tie	MSTO	252

MAIN FLOOR

Longth (ft)			Force in Wall Elements		Dead Loads		Solomia Quarturning (k)	Wind Quarturning (k)
Length (It)		Increase	Seismic Shear (plf)	Wind Shear (plf)	Wall (lb)	Floor (lb)	Seismic Overturning (K)	wind Overturning (k)
21	0.43	1.00	170	310	1890	210	0.90	2.16
		Shear Wall	SW	-1		Holdown	HDU2 w,	/ (2) 2x

¹ Increase per 4.3.4.2 ANSI/AWC SDPWS-2015

Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.3.31

DESCRIPTION: Site Retaining Wall 6'-0"

Code Reference:

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

Criteria

Soil Data

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

Surcharge Loads

Surcharge Over Heel Used To Resist Slidir Surcharge Over Toe Used for Sliding & Ov	ng & O\ = verturnii	0.0 psf verturning 0.0 ng		
Axial Load Applied to Stem				
Axial Dead Load	=	0.0 lbs		

Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	1,500.0 od	psf
Active Heel Pressure	=	35.0	psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	110.00	pcf
Soil Density, Toe	=	110.00	pcf
Footing Soil Friction	=	0.525	
Soil height to ignore for passive pressure	=	0.00	in

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Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Sten (Strength Level)	י =	0.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project File: Leung Residence - Retaining Walls.ec6

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Project Title: Engineer: Project ID: Project Descr:

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Project File: Leung Residence - Retaining Walls.ec6

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Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.3.31

DESCRIPTION: Site Retaining Wall 6'-0"

Design Summary			Stem Construction		Bottom			
			Design Height Above Ftg	ft =	Stem OK 0.00			
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete			
Overturning	=	5.29 OK	Design Method	=	SD	SD	SD	
Sliding	=	2.79 OK	Thickness	=	8.00			
Global Stability	=	2.12	Rebar Size	=	# 4			
			Rebar Spacing	=	10.00			
Total Bearing Load	=	3,834 lbs	Rebar Placed at	=	Edge			
resultant ecc.	=	1.98 in	Design Data		0.040			
		4.000		=	0.312			
Soil Pressure @ Hool	=	1,039 psr OK	I otal Force @ Section					
	-	1 500 m of	Service Level	lbs =				
Allowable Soil Pressure Less	= Than	Allowable	Strength Level	lbs =	1,008.0			
ACI Factored @ Toe	_	1 455 nef	MomentActual					
ACI Factored @ Heel	_	930 psf	Service Level	ft-# =				
Easting Shear @ Too	_	17.8 pci OK	Strength Level	ft-# =	2,016.0			
Footing Shear @ Heel	_	2.5 psi OK	MomentAllowable	=	6,444.1			
Allowable	_	2.5 psi OK	ShearActual					
Allowable	-	75.0 psi	Service Level	psi =				
Sliding Calcs			Strength Level	psi =	13.4			
Lateral Sliding Force	_	817.2 lbs	ShearAllowable	psi =	75.0			
less 100% Passive Force		266 7 lbs	Anet (Masonry)	in2 =				
less 100% Friction Force = $-2.012.7$ lbs			Wall Weight	nsf =	300.0			
Added Force Regid	_	0.0 lbs OK	Robar Dopth 'd'	in -	6 25			
for 1 5 Stability	_		Rebai Deptit u	=	0.25			
	-	0.0 100 010	Masonry Data					
Vertical component of active lateral soil pressure IS			f'm	nsi =				
NOT considered in the calculation of soil bearing			Fs	nsi =				
		Ũ	Solid Grouting	=				
Load Factors			Modular Ratio 'n'	=				
Building Code			Equiv. Solid Thick.	=				
Dead Load		1.200	Masonry Block Type	=				
Live Load		1.600	Masonry Design Method	=	ASD			
Earth, H		1.600	Concrete Data					
Wind, W		1.600	f'c	psi =	2,500.0			
Seismic, E		1.000	Fy	psi =	60,000.0			
Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.3.31

DESCRIPTION: Site Retaining Wall 6'-0"

Concrete Stem Rebar Area Details

Bottom Stem As (based on applied moment) : (4/3) * As : 200bd/fy : 200(12)(6.25)/60000 : 0.0018bh : 0.0018(12)(8) :

Required Area : Provided Area : Maximum Area :

Footing Data

Toe Width	=	1.75 ft
Heel Width	=	2.75
Total Footing Widt	h =	4.50
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 p Footing Concrete I	si Fy = Density =	60,000 psi 150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00 @	Btm.= 3.00 in

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Project File: Leung Residence - Retaining Walls.ec6

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Horizontal Reinforcing

 Min Stem T&S Reinf Area 1.152 in2

 Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft

 Horizontal Reinforcing Options :

 One layer of :
 Two layers of :

 #4@ 12.50 in
 #4@ 25.00 in

 #5@ 19.38 in
 #5@ 38.75 in

 #6@ 27.50 in
 #6@ 55.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>	
Factored Pressure	=	1,455	930 psf	
Mu' : Upward	=	2,124	2,195 ft-#	
Mu' : Downward	=	331	2,044 ft-#	
Mu: Design	=	1,793	-151 ft-#	
phiMn	=	6,985	8,065 ft-#	
Actual 1-Way Shear	=	17.76	2.54 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	n, p	hiTu =	0.00 ft-lbs	
If to voto a successful				

If torsion exceeds allowable, provide

supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: Heel:

Vertical Reinforcing

0.0755 in2/ft

0.1007 in2/ft

0.1728 in2/ft

0.1728 in2/ft

0.8467 in2/ft

0.24 in2/ft

0.25 in2/ft

Key:

Min footing T&S reinf Area	0.97	in2
Min footing T&S reinf Area per foot	0.22	in2 <i>/</i> ft
If one layer of horizontal bars:	If two lay	ers of horizontal bars:
#4@ 11.11 in	#4@ 2	2.22 in
#5@ 17.22 in	#5@3	4.44 in
#6@ 24.44 in	#6@4	8.89 in

Project File: Leung Residence - Retaining Walls.ec6

LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

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DESCRIPTION: Site Retaining Wall 6'-0"

Summary of Overturning & Resisting Forces & Moments

		ov	ERTURNING			RE	SISTING	
Item	F	lbs	Distance ft	Moment ft-#		Force Ibs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl	I)	817.2	2.28	1,861.3	Soil Over HL (ab. water tbl)	1,375.0	3.46	4,755.2
HL Act Pres (be water tbl Hydrostatic Force	l)				Watre Table		5.40	4,755.2
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 Soi	=				Soil Over Toe =	96.3	0.88	84.2
	=				Surcharge Over Toe =			
					Stem Weight(s) =	1,800.0	2.08	3,750.0
					Earth @ Stem Transitions =			
Total	=	817.2	O.T.M. =	1,861.3	Footing Weight =	562.5	2.25	1,265.6
					Key Weight =			
Resisting/Overturning	g Ratio		=	5.29	Vert. Component =			
Vertical Loads used for	or Soil P	ressure	= 3,833.	B lbs	Total =	3,833.8 II	os R.M.=	9,855.1
					* Axial live load NOT included	in total displaye	ed, or used fo	r overturnina

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 Modulus250.0pciHorizontal Defl @ Top of Wall (approximate only)0.038in

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.

Cantilevered	Retaining Wall		Project File: Leung Residence - Retaining Walls.ec6
LIC# : KW-06015393, Bu	ild:20.22.3.31	BYKONEN CARTER QUINN	(c) ENERCALC INC 1983-2022
DESCRIPTION:	Site Retaining Wall 6'-0"		
Rebar Lap & Emb	pedment Lengths Informat	ion	
Stem Design Segmer	nt: Bottom		
Stem Design Height:	0.00 ft above top of footing		
Lap Splice length for	#4 bar specified in this stem desig	n segment =	18.72 in
Development length f	or #4 bar specified in this stem des	sign segment =	14.40 in
Hooked embedment	length into footing for #4 bar specif	ied in this stem design segment =	6.05 in
As Provided =			0.2400 in2/ft
As Required =			0.1728 in2/ft



DESCRIPTION: Site Retaining Wall 6'-0"





DESCRIPTION: Site Retaining Wall 6'-0"



LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

Project File: Leung Residence - Retaining Walls.ec6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 6'-0" (with Seismic)

Code Reference:

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

Criteria

Soil	Data

=	6.00 ft
=	0.00 ft
=	0.00
=	6.00 in
=	0.0 ft
	= = =

Surcharge	
Surcharge	Loaus

Surcharge Over Heel Used To Resist Sliding Surcharge Over Toe Used for Sliding & Ove	e Wer Wer Wer Wer Wer Wer	0.0 psf turning 0.0
Axial Load Applied	d to St	em
Axial Dead Load Axial Live Load Axial Load Eccentricity	= = =	0.0 lbs 0.0 lbs 0.0 in
Farth Pressure Se	aismic	Load

Earth Pressure Seismic Load

Method : Uniform Multiplier Used = 12.000 (Multiplier used on soil density)

Allow Soil Bearing	=	1,500.0	psf
Equivalent Fluid Pressure	Meth	od	
Active Heel Pressure	=	35.0	psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	110.00	pcf
Soil Density, Toe	=	110.00	pcf
Footing Soil Friction	=	0.525	
Soil height to ignore			
for passive pressure	=	0.00	in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf



Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Easting Tupo		Sprood Easting
rooung rype		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft

Uniform Seismic Force	=	82.000
Total Seismic Force	=	560.333

Cantilevered Retaining Wall LIC# : KW-06015393, Build:20.22.3.31

Project File: Leung Residence - Retaining Walls.ec6

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DESCRIPTION: Site Retaining Wall 6'-0" (with Seismic)

Design Summary			Stem Construction	_	Bottom			
Wall Stability Ratios			Design Height Above Ftg	ft =	Stem OK 0.00			
Overturning	=	3.08 OK		=	Concrete	80	6 D	
Sliding	=	1.88 OK	Thicknoss	=	8 00	30	30	
Global Stability	_	2 1 2	Rebar Size	_	# 4			
Global Stability	=	2.12	Rebar Spacing	_	10.00			
Total Bearing Load	=	3,834 lbs	Rebar Placed at	=	Edge			
resultant ecc.	=	6.17 in	fb/FB + fa/Fa	_	0.541			
Soil Pressure @ Toe	=	1.436 psf OK	Total Force @ Section	_				
Soil Pressure @ Heel	=	268 psf OK	Service Level	lbs =				
Allowable Soil Processo Loss	= Thon	1,500 psf	Strength Level	lbs =	1,500.0			
ACI Eactored @ Toe	- _	2 011 pef	MomentActual					
ACI Factored @ Heel	_	375 psf	Service Level	ft-# =				
Footing Shoar @ Too	_	24.1 pci OK	Strength Level	ft-# =	3,492.0			
Footing Shear @ Heel	_	24.1 psi OK	MomentAllowable	=	6,444.1			
Allowable	_	75.0 psi	ShearActual					
Allowable	-	70.0 psi	Service Level	psi =				
Sliding Calcs			Strength Level	psi =	20.0			
Lateral Sliding Force	=	1.209.4 lbs	ShearAllowable	psi =	75.0			
less 100% Passive Force	-	266.7 lbs	Anet (Masonry)	in2 =				
less 100% Friction Force	≡ -	2,012.7 lbs	Wall Weight	psf =	300.0			
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.25			
for 1.5 Stability	=	0.0 lbs OK	·					
			Masonry Data					
Vertical component of active	later	al soil pressure IS	f'm	psi =				
NOT considered in the calcu	latior	of soil bearing	Fs	psi =				
			Solid Grouting	=				
Load Factors			Modular Ratio 'n'	=				
Dood Lood		1 200	Equiv. Solid Thick.	=				
		1.200	Masonry Block Type	=				
Eve Load Farth H		1.000	Masonry Design Method	=	ASD			
		1.000	Concrete Data		2 500 0			
Solomia E		1.000		psi =	2,500.0			
		1.000	гу	psi=	00,000.0			

BYKONEN CARTER QUINN

LIC# : KW-06015393, Build:20.22.3.31

As (based on applied moment) :

200bd/fy:200(12)(6.25)/60000:

0.0018bh : 0.0018(12)(8) :

BYKONEN CARTER QUINN

Project File: Leung Residence - Retaining Walls.ec6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 6'-0" (with Seismic)

Vertical Reinforcing

0.1308 in2/ft

0.1744 in2/ft

0.1728 in2/ft

0.1744 in2/ft

0.8467 in2/ft

0.24 in2/ft

0.25 in2/ft

Concrete Stem Rebar Area Details

Horizontal Reinforcing

 Min Stem T&S Reinf Area 1.152 in2

 Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft

 Horizontal Reinforcing Options :

 One layer of :
 Two layers of :

 #4@ 12.50 in
 #4@ 25.00 in

 #5@ 19.38 in
 #5@ 38.75 in

 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Required Area :

Provided Area :

Maximum Area :

Bottom Stem

(4/3) * As :

Toe Width		=	1.	75 ft
Total Footing Widt	th	=	4.	.75
Footing Thickness		=	10.	00 in
Key Width		=	0.	00 in
Key Depth Key Distance from	Toe	=	0. 0	00 in 00 ft
$f'_{c} = 2500 r$	ni E	- 	60 0	00 nci
Footing Concrete	Density	y = =	150.	.00 psi
Min. As %	0.00	=	0.00	18
Cover @ Top	2.00	W	Btm.=	3.00 In

Footing Design Results

Eastarad Prossura	_	<u>Toe</u>	Heel			
Mu': Upword	_	2,011	1 261 ff #			
Mu' : Downword	_	2,754	2 044 ft #			
Mu Desim	-	0.404	2,044 11-#			
Mu: Design	=	2,424	683 II-#			
phiMn	=	6,985	8,065 ft-#			
Actual 1-Way Shear	=	24.06	4.37 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. Torsio	n, p	ohi Tu =	0.00 ft-lbs			
If torsion exceeds allowable, provide						

supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

- Toe:
- Heel: Kev:

су	•		

Min footing T&S reinf Area	0.97	in2
Min footing T&S reinf Area per foot	0.22	in2 <i>/</i> ft
If one layer of horizontal bars:	If two lay	ers of horizontal bars:
#4@ 11.11 in	#4@ 2	2.22 in
#5@ 17.22 in	#5@3	4.44 in
#6@ 24.44 in	#6@4	8.89 in

Project File: Leung Residence - Retaining Walls.ec6

LIC# : KW-06015393, Build:20.22.3.31

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DESCRIPTION: Site Retaining Wall 6'-0" (with Seismic)

Summary of Overturning & Resisting Forces & Moments

		OV	ERTURNING			RE	SISTING	
Item		Force lbs	Distance ft	Moment ft-#		Force Ibs	Distance ft	Moment ft-#
HL Act Pres (ab water tb	l)	817.2	2.28	1,861.3	Soil Over HL (ab. water tbl)	1,375.0	3.46	4,755.2
HL Act Pres (be water tb Hvdrostatic Force	l)				Soil Over HL (bel. water tbl) Watre Table		3.46	4,755.2
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 So	il =				Soil Over Toe =	96.3	0.88	84.2
Seismic Earth Load	=	392.2	3.42	1,340.1	Surcharge Over Toe =			
	=				Stem Weight(s) =	1,800.0	2.08	3,750.0
					Earth @ Stem Transitions =			
Total	=	1,209.4	O.T.M. =	3,201.4	Footing Weight =	562.5	2.25	1,265.6
					Key Weight =			
Resisting/Overturnin	g Rat	io	=	3.08	Vert. Component =			
Vertical Loads used f	or So	il Pressure :	= 3,833.8	B lbs	Total =	3,833.8	os R.M.=	9,855.1
If seismic is included, th	e OT	M and slidin	a ratios		* Axial live load NOT included i resistance, but is included for	n total displaye soil pressure o	ed, or used fo calculation.	r overturning

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) 0.053 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe,

because the wall would then tend to rotate into the retained soil.

Cantilevered	Retaining Wall		Project File: Leung Residence - Retaining Walls.ec6			
LIC# : KW-06015393, Bu	ild:20.22.3.31	BYKONEN CARTER QUINN	(c) ENERCALC INC 1983-2022			
DESCRIPTION:	Site Retaining Wall	6'-0" (with Seismic)				
Rebar Lap & Emb	pedment Lengths Ir	offrmation				
Stem Design Segmer	nt: Bottom					
Stem Design Height:	0.00 ft above top of fe	ooting				
Lap Splice length for	#4 bar specified in this st	em design segment =	18.72 in			
Development length f	or #4 bar specified in this	stem design segment =	14.40 in			
Hooked embedment	length into footing for #4 I	bar specified in this stem design segment =	6.11 in			
As Provided =			0.2400 in2/ft			
As Required =			0.1744 in2/ft			



DESCRIPTION: Site Retaining Wall 6'-0" (with Seismic)





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Project File: Leung Residence - Retaining Walls.ec6

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Code Reference:

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

Criteria

Soil Data

Retained Height	=	5.00 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

Surcharge Loads

-		
Surcharge Over Heel Used To Resist Slidi Surcharge Over Toe	ng & Ov =	0.0 psf verturning 0.0
Axial Load Appli	ed to	Stem
Axial Dead Load	=	0.0 lbs

Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Allow Soil Bearing	= Meth	1,500.0 od	psf
Active Heel Pressure	=	35.0	psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	110.00	pcf
Soil Density, Toe	=	110.00	pcf
Footing Soil Friction	=	0.525	
Soil height to ignore for passive pressure	=	0.00	in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Sten (Strength Level)	n _	0.0 psf



Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

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Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.3.31

DESCRIPTION: Site Retaining Wall 5'-0"

Wail Stability Ratios OverturningDesign Height Above Fig ftft ftft 0.00 0.00 Wall Material Above Wittft ft ftWail Stability=2.49 OK Sliding=2.84 OK Rebar Size= 4 ftGlobal Stability=2.17 Rebar Spacing=0.00 Wall Material Above Fig ft=Concrete Design Method=SD SDSDSDTotal Bearing Load=2.706 lbs Rebar Spacing=10.00 Rebar Placed at=EdgeSoil Pressure @ Toe=1.166 psf OK Soil Pressure Bear Than Allowable ACI Factored @ Heel=1.500 psf Strength LevelIbs =-ACI Factored @ Toe=1.633 psf ACI Factored @ Toe=11.7 psi OK MomentActualService Levellbs =Sliding Calcs Lateral Sliding Force=595.5 lbs Addeed Force ReqidShearActual Service LevelShearActual Service LevelShearActual Service LevelSiding Calcs Lateral Sliding Force=1.00 bs OK MaddetShearAllowable Masonry DataShearAllowable Fig300.0Added Force Reqid=0.0 lbs OK Masonry DataMasonry DataTim Figpsi =Vertical component of active lateral soil pressure IS Dive Load1.200 Live Load1.600 Kasonry Block Typepsi =2,500.0 FyLoad Factors Building Code Dead Load1.200 Live Load1.600 Km, W1.600 KmFigpsi =2,500.0 FyLoad Load <th>Design Summary</th> <th></th> <th></th> <th>Stem Construction</th> <th></th> <th>Bottom</th> <th></th> <th></th> <th></th>	Design Summary			Stem Construction		Bottom			
Wall Stability Ratios OverturningWall Material Above "H"Concrete ConcreteWall Material Above "H"Concrete SolidingSDOverturning= 4.28 OK Global Stability= 2.17Wall Material Above "H"= Concrete SolidingSDGlobal Stability= 2.17Rebar Size= 8.00Total Bearing Load resultant ecc.= 2.708 lbs 2.60 in= 1.66 psf OK Soli Pressure @ Toe = 1.600 psf OK Soli Pressure @ Toe Soli Pressure @ Toe = 1.630 psfRebar Size = 4.26 on psf= 0.181Soli Pressure @ Toe Soli Pressure @ Toe Soli Pressure @ Toe Soli Pressure @ Toe = 1.633 psfTotal Force @ Section Service LevelIbs = Strength Level1bs = Strength LevelACI Factored @ Toe Allowable allowable= 75.0 psf Soli Pressure lessStrength LevelIt #= strength Level1,166.7MomentActual Service LevelShearActual Service LevelShearActual Service LevelShearActual Service LevelShearActual Service LevelSilding Cacs Lateral Siding Force Iess 100% Pressive Lessel Si Method is oil bearingShearAllowable= 0.33Vertical component of active lateral soil pressure IS Dor considered in the calculation of soil bearingfm Fs psi = Solid Groutingpsi = Solid GroutingVertical component of active lateral soil pressure IS Dudding Code Dead Load1.200 1.600Fs Fs Fs Psi = Solid Groutingfm Fs Fs Fs Solid Trick.= Masonry Design MethodLoad Factors Building Code Live Load				Design Height Above Ftg		Stem OK			
Overturning'=4.29 OK SlidingDesign Method=SDSDSDSliding=2.84 OKDesign Method=SDSDSDGlobal Stability=2.17Rebar Spacing=10.00Total Bearing Load=2,708 lbsRebar Spacing=10.00Total Bearing Load=2,708 lbsRebar Spacing=10.00Total Fressure @ Toe=1,166 psf OKSoil Pressure @ Heel=500 psfSoil Pressure @ Heel=1,00 psfService LevelIbs =-ACI Factored @ Toe=1,270 psfService LevelIf $+# =$ Footing Shear @ Toe=11.7 psi OKShearActualService LevelIf $+# =$ Siding Cates=595.5 lbsShearActualShearActualService Levelpsi =Siding Cates=0.0 lbs OKNew (Masonry)in2 =Wall Weightpsi =50.0Less 100% Pressive Force =-2.67 lbsAnet (Masonry)in2 =Masonry DataNorticot 7.5 Stability=0.0 lbs OKNew Psi =50.0Fsot 1.5 Stability=0.0 lbs OKpsi =Soil Grouting=Building Code Dead Load1.200Live Load1.600Equiv. Soild Thick.=Building Code Dead Load1.600Equiv. Soild Thick.=Masonry Design Method=Concrete Data Concrete Datafcpsi =2,500.0Fy<	Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete			
Sliding=2.84 OK Global StabilityThickness=8.00 Rebar SizeGlobal Stability=2.17Rebar Size=#4Rebar Size=#4Rebar Size=#4Rebar Size=#4Rebar Size=#4Rebar Size=#4Rebar Size=#4Soil Pressure @ Toe=1,166 psf OKSign Data=CosSoil Pressure Less Than Allowable=1,500 psfStrength LevelIbs =ACI Factored @ Toe=1.633 psfStrength LevelIbs =ACI Factored @ Toe=1.7 psi OKMomentActualService LevelIft#=Footing Shear @ Toe=1.2 psi OKMomentActualService Levelfs#=Striding CalcsStrength Levelpsi =\$1.00ShearAllowable=Less 100% Friction Force=0.0 lbs OKShearAllowablepsi =\$1.00Added Force Reqd=0.0 lbs OKRebar Depth 'd'in =6.25Vertical component of active lateral soil pressure ISFspsi =Soil Grouting=Not Considered in the calculation of soil bearingSoil Grouting=Equiv. Soil Thick=Building Code Dead Load1.6001.600Fspsi =2.500.0FcRebar Stability1.000Fypsi =60,000.0Fypsi =60,000.0	Overturning	=	4.29 OK	Design Method	=	SD	SD	SD	
Global Stability=2.17Rebar Size=#4Rebar Spacing=1.00Total Bearing Load=2.708 lbsresultant ecc.=2.60 inSoil Pressure @ Toe=1.66 pst OKSoil Pressure @ Toe=1.500 psfSoil Pressure Less Than Allowable=1.500 psfACI Factored @ Toe=1.633 psfACI Factored @ Toe=1.7 psi OKFooting Shear @ Toe=1.7 psi OKAllowable=75.0 psiStiding CatcsStrength Levelft#=Lateral Sliding Force=595.5 lbsless 100% Friction Force =-1.421.9 lbsAdded Force Reqid=0.0 lbs OKfort 1.5 Stability=0.0 lbs OKWartical component of active lateral soil pressure ISNoNOT considered in the calculation of soil bearingservice LevelDead Load1.200Live Load1.600Earth, H1.600Kinth, W1.600Kinth, W1.600Kinth, W1.600Kinth, W1.600Kinth, W1.600Kinth, W1.600Forpsi =Concrete DataNind, W1.600Kinth, H1.600Kinth, H1.600Kinth, H1.600Kinth, H1.600Kinth, H1.600Kinth, H1.600Kinth, H1.600Kinth, H1.600 <td>Sliding</td> <td>=</td> <td>2.84 OK</td> <td>Thickness</td> <td>=</td> <td>8.00</td> <td>02</td> <td>02</td> <td></td>	Sliding	=	2.84 OK	Thickness	=	8.00	02	02	
Total Bearing Load=2,708 lbs 2.60 inRebar Spacing=10.00Total Bearing Load=2,708 lbs 2.60 inRebar Placed at=EdgeSoil Pressure @ Toe=1,166 psf OK Soil Pressure Less Than Allowable= $500 psf$ OK AllowableTotal Force @ Section Strength Level $10s =$ ACI Factored @ Toe=1,633 psf ACI Factored @ Heel=700 psfStrength Level $1bs =$ Footing Shear @ Toe=11.7 psi <ok </ok Allowable=75.0 psiStrength Level $tt # =$ Stiding CalcsStrength Level $tt # =$ 1,166.7Lateral Sliding Force=266.7 lbs Less 100% Fraction Force =>9.3Added Force Req'd=0.0 lbs OK out lateral soil pressure IS NOT considered in the calculation of soil bearingShearAllowablepsi =Load FactorsEquiv. Soil Thick.=Masonry DataBuilding Code Dead Load1.200 Live Load1.600frpsi =Wind, W1.600 Seismic, E1.600frpsi =Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearingfmpsi =Load Factors Building Code Dead Load1.600 fcpsi =2.500.0 fcpsi =Wind, W1.600 Seismic, E1.600frpsi =Fight Dead Load Live Load1.600 fcfrpsi =Set Seismic, E1.000Fypsi =Set Seismic, E1.000	Global Stability	=	2.17	Rebar Size	=	# 4			
Total Bearing Load=2,708 lbs 2,60 inRehar Placed at=EdgeSoil Pressure @ Toe=1,166 psf OK Soil Pressure @ Heel=500 psf OK 500 psf OKTotal Force @ Section Service Level0.181ACI Factored @ Toe=1,500 psf Soil Pressure Less Than Allowable a CI Factored @ Toe=1,63 psf ACI Factored @ Toe=1,63 psf ACI Factored @ Toe=1,63 psf ACI Factored @ Toe=1,63 psf ACI Factored @ Toe=1,7 psi OK AllowableStrength LevelIbs =700.0Footing Shear @ Toe=1,2 psi OK Allowable=595.5 lbsShearAllowable=6,444.1Strength Levelpsi =9.3Stiding Cates Lateral Sliding Force=595.5 lbsShearAllowablepsi =75.0I des force Reqid=0.0 lbs OKMaesoryin 2Wall Weightpsi =Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearingModular Ratio 'n'=Masonry DataLoad Factors Building Code Load1.600 Live Load1.600 Hown Placemogsi =2,500.0forpsi =Wind, W1.600 Seismic, E1.000Fypsi =2,500.0forpsi =For psi =0.000.0Fypsi =6,000.0forpsi =				Rebar Spacing	=	10.00			
resultant cc.= 2.60 inDesign Data fb/FB + fa/Fa= 0.181 Soil Pressure @ Toe= $1,166$ psf OKSoil Pressure @ Heel= 500 psf OKSoil Pressure $105 =$ 500 psf OKAllowable= 1.500 psfStrength Level $105 =$ $Strength Level$ $105 =$ ACI Factored @ Toe= 1.633 psfStrength Level $105 =$ $Strength Level$ $105 =$ ACI Factored @ Heel= 700 psfStrength Level ft ## $1.66.7$ Footing Shear @ Toe= 11.7 psi OKMomentAllowable= $6.444.1$ Allowable= 75.0 psiStrength Level $psi =$ Sliding CalcsStrength Levelpsi = 75.0 Anet (Masonry) $in2 =$ Lateral Sliding Force= 266.7 bsAnet (Masonry) $in2 =$ Wall Weightpsf = 300.0 Added Force Reyd= 0.0 bs OKRebar Depth 'd'in = 6.25 for 1.5 Stability= 0.0 bs OKMasonry DataFspsi =Vertical component of active lateral soil pressure ISFspsi = $psi =$ Soild Grouting=Load FactorsEquiv. Soil Thick.=Masonry Block Type=Masonry Block Type=Building Code1.600Kasonry Design Method=ASDConcrete Data $psi = 2,500.0$ Wind, W1.600Fypsi = $6,0000.0$ Fypsi = $6,0000.0$	Total Bearing Load	=	2.708 lbs	Rebar Placed at	=	Edge			
bild Pressure @ Toe = 1,166 psf OK Soil Pressure @ Heel = 500 psf OKcolspan="2">olisibild Fressure & Heel = 1,500 psf Soil Pressure Less Than Allowable ACI Factored @ Toe = 1,633 psf ACI Factored @ Heel = 700 psfString Level $bs = 700.0$ MomentActual Service Level $bs = 700.0$ MomentActual String Shear @ Heel = 1.2 psi OK Allowable = 75.0 psiString Level $ft # = $ Strength Level $ft # = $ Strength Level $psi = $ Strength Level $psi = $ Strength Level $psi = 9.3$ Sliding Calcs Lateral Sliding Force = 595.5 lbs Added Force Req'd = 0.0 lbs OK for 1.5 Stability = 0.0 lbs OK for 1.5 Stability = 0.0 lbs OK Dead Load 1.600 Earth, HModular Ratio 'n' = Equiv. Soid Thick. = Dead Load 1.600 Earth, HSoid Grouting frict for Fig mConcrete DataLoad1.600 Mind, W1.600 frict for Fig mpsi = 2,500.0 Fig mWind, W1.600 Fig mpsi = 2,500.0 Fig mpsi = 2,500.0 Fig m	resultant ecc.	=	2.60 in	Design Data					
Soil Pressure @ Toe = 1,166 pst OKSoil Pressure @ Heel =1,500 psfService LevelIbs =Allowable=1,633 psfService LevelIbs =ACI Factored @ Toe =1,633 psfService LevelIbs =ACI Factored @ Heel =700 psfService LevelIbs =Footing Shear @ Toe =11.7 psi OKMomentActualService Levelft.# =Allowable =75.0 psiStrength Levelpsi =9.3Sliding CalcsStreigh Levelpsi =9.3Lateral Sliding Forc =295.5 lbsAnet (Masonry)in2 =less 100% Passive Force -266.7 lbsAnet (Masonry)in2 =less 100% Friction Force = -1,421.9 lbsMall Weightpsf =300.0Added Force Req'd =0.0 lbs OKMasonry Datafmpsi =Load FactorsSoild Grouting =Modular Ratio 'n' =Equiv. Soild Thick. =Building CodeDead Load1.200Masonry Datamasonry Design Method =ASDUve Load1.600Fcpsi =50.0Fypsi =60,000.0				fb/FB + fa/Fa	=	0.181			
Soli Pressure Wretel=500 psf OKService LevelIbs =Allowable=1,500 psfStrength LevelIbs =700.0ACI Factored @ Toe=1.633 psfStrength LevelIbs =700.0ACI Factored @ Heel=700 psfStrength LevelIf.# =Footing Shear @ Toe=11.7 psi OKMomentActualService LevelIf.# =Allowable=75.0 psiStrength Levelpsi =Sliding CatcsStrength Levelpsi =9.3Strength Levelpsi =Sliding Force=266.7 lbsShearAllowablepsi =75.0Added Force Reqid=0.0 lbs OKNet (Masonry)in2 =Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearingfmpsi =Suiding Code1.200Moasonry DataFspsi =Building Code1.600Masonry Design Method=ASDLoad Factors1.600Fcpsi =2,500.0Wind, W1.600Fypsi =6,0,000.0	Soil Pressure @ Toe	=	1,166 psf OK	Total Force @ Section					
Allowable=1,500 psfStrength LevelIbs =700.0ACI Factored @ Toe=1,633 psfService Levelft-# =ACI Factored @ Hele=700 psfService Levelft-# =Footing Shear @ Toe=1.17 psi OKMomentActualAllowable=75.0 psiStrength Levelfsi =Sliding CalcsStricton Force=595.5 lbsShearAllowable=Lateral Sliding Force=595.5 lbsShearAllowablepsi =less 100% Passive Force-266.7 lbsAnet (Masonry)in2 =less 100% Priction Force =-1,421.9 lbsWall Weightpsf =Added Force Reqid=0.0 lbs OKRebar Depth 'd'in =Vertical component of active lateral soil pressure ISfmpsi =NOT considered in the calculation of soil bearingfmpsi =Load Factors=1.200Masonry DataDead Load1.200Masonry Design Method=Live Load1.600fcpsi =Load, Wind, W1.600fcpsi =Seismic, E1.000Fypsi =Seismic, E1.000Fypsi =	Soli Pressure @ Heel	=	500 psr OK	Service Level	lbs =				
Solid Pressure Less than AntowableMomentActualACI Factored @ Toe = 1633 psffor the service Levelft-# = 1,166.7Footing Shear @ Toe = 11.7 psi OKStrength Levelft-# = 6,444.1Allowable = 75.0 psiStrength Levelpsi = 6,444.1Sliding CalcsStrength Levelpsi = 9.3Lateral Sliding Force = 595.5 lbsShearAllowablepsi = 75.0less 100% Priction Force = 1,421.9 lbsAnet (Masonry)in 2 =Added Force Req'd = 0.0 lbs OKWall Weightpsf = 300.0for 1.5 Stability = 0.0 lbs OKMasonry DatafmVertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearingfmLoad FactorsSolid Grouting=Building CodeDead Load1.600Dead Load1.600Equiv. Solid Thick.Load FactorsMasonry Design Method= ASDWind, W1.600Fypsi = 2,500.0Fypsi = 60,000.0fc	Allowable	= Then	1,500 psf	Strength Level	lbs =	700.0			
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Allowable=7.5.0 psiSliding CalcsService Levelpsi =Lateral Sliding Force=595.5 lbsLess 100% Passive Force-266.7 lbsless 100% Passive Force-266.7 lbsless 100% Friction Force=1,421.9 lbsAdded Force Req'd=0.0 lbs OKfor 1.5 Stability=0.0 lbs OKWertical component of active lateral soil pressure ISRebar Depth 'd'NOT considered in the calculation of soil bearingf'mDead Load1.200Live Load1.600Earth, H1.600Wind, W1.600Wind, W1.600Seismic, E1.000Fypsi =2,500.0Fypsi =60,000.0		=	1.2 psi OK	ShearActual					
Sliding CalcsStrength Levelpsi =9.3Lateral Sliding Force=595.5 lbsShearAllowablepsi =75.0less 100% Passive Force-266.7 lbsAnet (Masonry)in2 =less 100% Friction Force =-1,421.9 lbsWall Weightpsf =300.0Added Force Req'd=0.0 lbs OKRebar Depth 'd'in =6.25for 1.5 Stability=0.0 lbs OKRebar Depth 'd'in =6.25Vertical component of active lateral soil pressure ISf'mpsi =NOT considered in the calculation of soil bearingFspsi =Solid Grouting=Solid Grouting=Building CodeEquiv. Solid Thick.=Dead Load1.200Masonry Block Type=Live Load1.600Masonry Design Method=Wind, W1.600f'cpsi =Wind, W1.600Fypsi =Seismic, E1.000Fypsi =	Allowable	=	75.0 psi	Service Level	psi =				
Intervention of the second sec	Sliding Calcs			Strength Level	psi =	9.3			
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less 100% Friction Force = - 1,421.9 lbsWall Weightpsf = 300.0Added Force Req'd = 0.0 lbs OKfor 1.5 Stability = 0.0 lbs OKRebar Depth 'd'in = 6.25Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearingMasonry DataLoad FactorsFspsi = Solid GroutingBuilding Codefor Dead Load1.200Live Load1.600Masonry Block TypeLive Load1.600Wind, W1.600Seismic, E1.000Fypsi = 2,500.0Fypsi = 60,000.0	loss 100% Passivo Force	=	266 7 lbs	Anet (Masonry)	in2 =	1010			
Added Force Req'd=0.0 lbs OKRebar Depth 'd'in =6.25Added Force Req'd=0.0 lbs OKMasonry Datafor 1.5 Stability=0.0 lbs OKVertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearingf'mpsi =Load FactorsFspsi =Building CodeFspsi =Dead Load1.200Masonry Block Type=Live Load1.600Masonry Design Method=Wind, W1.600f'cpsi =2,500.0Wind, W1.600Fypsi =60,000.0	less 100% Friction Force		1 421 9 lbs	Wall Weight	nef –	300.0			
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Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearingf'mpsi =Load FactorsFspsi =Building CodeSolid Grouting=Dead Load1.200Masonry Block Type=Live Load1.600Masonry Design Method= ASDEarth, H1.600f'cpsi = 2,500.0Wind, W1.600f'cpsi = 60,000.0Seismic, E1.000Fypsi = 60,000.0	ior 1.5 Otability	-	0.0 103 010	Masonry Data					
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Load FactorsModular Ratio 'n'=Building CodeEquiv. Solid Thick.=Dead Load1.200Masonry Block Type=Live Load1.600Masonry Design Method= ASDEarth, H1.600f'cpsi =2,500.0Wind, W1.600Fypsi =60,000.0			-	Solid Grouting	=				
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Dead Load 1.200 Masonry Block Type = Live Load 1.600 Masonry Design Method = ASD Earth, H 1.600 Concrete Data Wind, W 1.600 f'c psi = 2,500.0 Seismic, E 1.000 Fy psi = 60,000.0	Building Code			Equiv. Solid Thick.	=				
Live Load 1.600 Masonry Design Method = ASD Earth, H 1.600 Concrete Data	Dead Load		1.200	Masonry Block Type	=				
Earth, H 1.600 Concrete Data Wind, W 1.600 f'c psi = 2,500.0 Seismic, E 1.000 Fy psi = 60,000.0	Live Load		1.600	Masonry Design Method	=	ASD			
Wind, W1.600f'cpsi =2,500.0Seismic, E1.000Fypsi =60,000.0	Earth, H		1.600	Concrete Data					
Seismic, E 1.000 Fy psi = 60,000.0	Wind, W		1.600	f'c	psi =	2,500.0			
	Seismic, E		1.000	Fy	psi =	60,000.0			

Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.3.31

DESCRIPTION: Site Retaining Wall 5'-0"

Concrete Stem Rebar Area Details

Bottom Stem As (based on applied moment) : (4/3) * As : 200bd/fy : 200(12)(6.25)/60000 : 0.0018bh : 0.0018(12)(8) :

Required Area : Provided Area : Maximum Area :

Footing Data

=	1	.25 ft
=	2	.00
th =	3	.25
s =	10.	.00 in
=	0.	.00 in
=	0.	.00 in
n Toe 🛛 =	0.	.00 ft
osi Fy =	60,0	00 psi
Density -	1.00	.00 pci
=	0.00	018
2.00 @	Btm.=	3.00 in
	= th = s = n Toe = Density = = 2.00 @	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$

BYKONEN CARTER QUINN

Project File: Leung Residence - Retaining Walls.ec6

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Horizontal Reinforcing

 Min Stem T&S Reinf Area 0.960 in2

 Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft

 Horizontal Reinforcing Options :

 One layer of :
 Two layers of :

 #4@ 12.50 in
 #4@ 25.00 in

 #5@ 19.38 in
 #5@ 38.75 in

 #6@ 27.50 in
 #6@ 55.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>				
Factored Pressure	=	1,633	700 psf				
Mu' : Upward	=	1,182	736 ft-#				
Mu' : Downward	=	169	720 ft-#				
Mu: Design	=	1,014	-16 ft-#				
phiMn	=	6,985	8,065 ft-#				
Actual 1-Way Shear	=	11.75	1.21 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	n, p	hi Tu =	0.00 ft-lbs				
If torsion exceeds allowable, provide							

supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe:

Vertical Reinforcing

0.0437 in2/ft

0.0583 in2/ft

0.1728 in2/ft

0.1728 in2/ft

0.8467 in2/ft

0.24 in2/ft

0.25 in2/ft

Heel: Key:

ey.

Min footing T&S reinf Area	0.70	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:	If two lay	ers of horizontal bars:
#4@ 11.11 in	#4@ 2	2.22 in
#5@ 17.22 in	#5@3	4.44 in
#6@ 24.44 in	#6@4	8.89 in

Project File: Leung Residence - Retaining Walls.ec6

LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

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DESCRIPTION: Site Retaining Wall 5'-0"

Summary of Overturning & Resisting Forces & Moments

		OVERTURN	ING		RE	ESISTING	
Item	Force lbs	Distanc	e Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl HL Act Pres (be water tbl) 59:)	5.5 1.94	1,157.9	Soil Over HL (ab. water tbl) Soil Over HL (bel. water tbl)	733.3	2.58 2.58	1,894.4 1,894.4
Hydrostatic Force Buoyant Force	=			Sloped Soil Over Heel =			
Surcharge over Heel Surcharge Over Toe	=			Surcharge Over Heel = Adjacent Footing Load =			
Adjacent Footing Load	=			Axial Dead Load on Stem = * Axial Live Load on Stem =			
Load @ Stem Above Soil	=			Soil Over Toe =	68.8	0.63	43.0
	=			Stem Weight(s) =	1,500.0	1.58	2,375.0
Total	= 59	5.5 O.T.M.	= 1,157.9	Footing Weight =	406.3	1.63	660.2
Resisting/Overturning	g Ratio	=	4.29	Key Weight = Vert. Component =			
Vertical Loads used fo	or Soil Press	ure = 2,7	708.3 lbs	Total = * Axial live load NOT included i	2,708.3 I n total display	bs R.M.=	4,972.6 r 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 Modulus250.0pciHorizontal Defl @ Top of Wall (approximate only)0.050in

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.

Cantilevered I	Retaining Wall		Project File: Leung Residence - Retaining Walls.ec6
LIC# : KW-06015393, Bu	ild:20.22.3.31	BYKONEN CARTER QUINN	(c) ENERCALC INC 1983-2022
DESCRIPTION:	Site Retaining Wall 5'-0"		
Rebar Lap & Emb	edment Lengths Information	tion	
Stem Design Segmer	nt: Bottom		
Stem Design Height:	0.00 ft above top of footing		
Lap Splice length for	#4 bar specified in this stem desig	n segment =	18.72 in
Development length f	or #4 bar specified in this stem de	sign segment =	14.40 in
Hooked embedment l	ength into footing for #4 bar speci	fied in this stem design segment =	6.05 in
As Provided =			0.2400 in2/ft
As Required =			0.1728 in2/ft



DESCRIPTION: Site Retaining Wall 5'-0"





DESCRIPTION: Site Retaining Wall 5'-0"



LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

Project File: Leung Residence - Retaining Walls.ec6 (c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 5'-0" (with Seismic)

Code Reference:

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

Criteria

Soil	Data

Retained Height	=	5.00 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

_		
Surcl	narge	Loads

Surcharge Over Heel Used To Resist Sliding Surcharge Over Toe Used for Sliding & Ove	= & Over = rturning	0.0 psf turning 0.0		
Axial Load Applied to Stem				
Axial Dead Load	=	0.0 lbs		
Axial Live Load Axial Load Eccentricity	=	0.0 lbs 0.0 in		
Earth Pressure Seismic Load				

Method : Uniform Multiplier Used = 12.000 (Multiplier used on soil density)

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	1,500.0 od	psf
Active Heel Pressure	=	35.0	psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	110.00	pcf
Soil Density, Toe	=	110.00	pcf
Footing Soil Friction	=	0.525	
Soil height to ignore for passive pressure	=	0.00	in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf



Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Spread Footing
		oproud r ooung
Base Above/Below Soil at Back of Wall	=	0.0 ft

Uniform Seismic Force	=	70.000
Total Seismic Force	=	408.333

Cantilevered Retaining Wall LIC# : KW-06015393, Build:20.22.3.31

Project File: Leung Residence - Retaining Walls.ec6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 5'-0" (with Seismic)

Design Summary			Stem Construction		Bottom			
			Design Height Above Ftg		Stem OK			
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete			
Overturning	=	2.50 OK	Design Method	=	SD	SD	SD	
Sliding	=	1.92 OK	Thickness	=	8.00		•	
Global Stability	=	2.17	Rebar Size	=	# 4			
2			Rebar Spacing	=	10.00			
Total Bearing Load	=	2,708 lbs	Rebar Placed at	=	Edge			
resultant ecc.	=	6.29 in	Design Data					
		1 C 10 m of NO		=	0.316			
Soll Pressure @ Loe	=	1,640 pst NG	Total Force @ Section					
	-	1 500 por	Service Level	lbs =				
Soil Pressure Exce	= eds A	Allowable!	Strength Level	lbs =	1,050.0			
ACI Factored @ Toe	=	2.296 psf	MomentActual	6 11				
ACI Factored @ Heel	=	37 psf	Service Level	π-# =	0.044 7			
Footing Shear @ Toe	=	16.5 psi OK	Strength Level	π-# =	2,041.7			
Footing Shear @ Heel	=	4.6 psi OK	MomentAllowable	=	6,444.1			
Allowable	=	75.0 psi	ShearActual					
		1010 pc.	Service Level	psi =				
Sliding Calcs			Strength Level	psi =	14.0			
Lateral Sliding Force	=	881.3 lbs	ShearAllowable	psi =	75.0			
less 100% Passive Force	-	266.7 lbs	Anet (Masonry)	in2 =				
less 100% Friction Force	≡ -	1,421.9 lbs	Wall Weight	psf =	300.0			
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.25			
for 1.5 Stability	=	0.0 lbs OK	·					
			Masonry Data					
Vertical component of active	later	al soil pressure IS	f'm	psi =				
NOT considered in the calcu	lation	of soil bearing	Fs	psi =				
			Solid Grouting	=				
Load Factors			Modular Ratio 'n'	=				
Dead Load		1 200	Equiv. Solid Thick.	=				
Live Load		1.200	Masonry Block Type	=				
Farth H		1 600	Masonry Design Method	=	ASD			
Wind W		1 600	Concrete Data	nei –	2 500 0			
Seismic F		1 000	Fv	psi=	2,300.0			
		1.000	' y	p31 =	00,000.0			

BYKONEN CARTER QUINN

LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

Project File: Leung Residence - Retaining Walls.ec6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 5'-0" (with Seismic)

Vertical Reinforcing

0.0765 in2/ft

0.102 in2/ft

0.1728 in2/ft

0.1728 in2/ft

0.8467 in2/ft

0.24 in2/ft

0.25 in2/ft

Concrete Stem Rebar Area Details

As (based on applied moment) :

200bd/fy:200(12)(6.25)/60000:

0.0018bh : 0.0018(12)(8) :

Horizontal Reinforcing

 Min Stem T&S Reinf Area 0.960 in2

 Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft

 Horizontal Reinforcing Options :

 One layer of :
 Two layers of :

 #4@ 12.50 in
 #4@ 25.00 in

 #5@ 19.38 in
 #5@ 38.75 in

 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Required Area :

Provided Area :

Maximum Area :

Bottom Stem

(4/3) * As :

Toe Width Heel Width Total Footing Wid	th	= =	1. 3	.25 ft .00
Footing Thickness	5	=	10.	00 in
Key Width Key Depth Key Distance from	n Toe	= = =	0. 0. 0.	00 in 00 in 00 ft
f'c = 2,500 p Footing Concrete Min. As % Cover @ Top	osi F Density 2.00	y = = @	60,0 150. 0.00 Btm. =	00 psi 00 pcf 18 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>			
Factored Pressure	=	2,296	37 psf			
Mu' : Upward	=	1,568	308 ft-#			
Mu' : Downward	=	169	720 ft-#			
Mu: Design	=	1,399	412 ft-#			
phiMn	=	6,985	8,065 ft-#			
Actual 1-Way Shear	=	16.45	4.58 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. Torsio	n, p	hiTu =	0.00 ft-lbs			
If torsion exceeds allowable, provide						

supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe:

h	leel:	
ł	Key:	

Min footing T&S reinf Area	0.70	in2	
Min footing T&S roinf Area par foot	0.70	in2 ft	
Will looling 1&3 telli Alea per lool	0.22	1112 /IL	
If one layer of horizontal bars:	If two lay	ers of hori	zontal bars:
#4@ 11.11 in	#4@ 2	2.22 in	
#5@ 17.22 in	#5@3	4.44 in	
#6@ 24.44 in	#6@4	8.89 in	

Project File: Leung Residence - Retaining Walls.ec6

LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 5'-0" (with Seismic)

Summary of Overturning & Resisting Forces & Moments

		OV	ERTURNING			RE	SISTING	
Item		Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tb)	595.5	1.94	1.157.9	Soil Over HL (ab. water tbl)	733.3	2.58	1,894.4
HL Act Pres (be water tb) Hydrostatic Force)			,	Soil Over HL (bel. water tbl) Watre Table		2.58	1,894.4
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 Soi	=				Soil Over Toe =	68.8	0.63	43.0
Seismic Earth Load	=	285.8	2.92	833.7	Surcharge Over Toe =			
	=				Stem Weight(s) =	1,500.0	1.58	2,375.0
					Earth @ Stem Transitions =			
Total	=	881.3	O.T.M. =	1,991.6	Footing Weight =	406.3	1.63	660.2
					Key Weight =			
Resisting/Overturning	g Rati	io	=	2.50	Vert. Component =			
Vertical Loads used for	or Soi	I Pressure	= 2,708.3	3 lbs	Total =	2,708.3 lb	os R.M.=	4,972.6
If seismic is included, the	e OTI	A and slidin	g ratios		* Axial live load NOT included i resistance, but is included for	n total displaye soil pressure o	ed, or used fo calculation.	r overturning

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) 0.070 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.

Cantilevered	Retaining Wall	Project File: Leung Residence - Retaining Walls.ec6		
LIC# : KW-06015393, Bu	ild:20.22.3.31	BYKONEN CARTER QUINN	(c) ENERCALC INC 1983-2022	
DESCRIPTION:	Site Retaining Wall	5'-0" (with Seismic)		
Rebar Lap & Emb	pedment Lengths Ir	offrmation		
Stem Design Segmer	nt: Bottom			
Stem Design Height:	0.00 ft above top of fe	ooting		
Lap Splice length for	#4 bar specified in this st	em design segment =	18.72 in	
Development length f	or #4 bar specified in this	stem design segment =	14.40 in	
Hooked embedment	length into footing for #4 I	bar specified in this stem design segment =	6.05 in	
As Provided =			0.2400 in2/ft	
As Required =			0.1728 in2/ft	







DESCRIPTION: Site Retaining Wall 5'-0" (with Seismic)



LIC# : KW-06015393, Build:20.22.3.31

DESCRIPTION: Site Retaining Wall 4'-0"

Code Reference

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

Criteria

Soil Data

=	4.00 ft
=	0.00 ft
=	0.00
=	6.00 in
=	0.0 ft
	= = = =

Surcharge Loads

Surcharge Over Heel Used To Resist Slidi	ng & O\	0.0 psf /erturning					
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

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	1,500.0 od	psf
Active Heel Pressure	=	35.0	psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	110.00	pcf
Soil Density, Toe	=	110.00	pcf
Footing Soil Friction	=	0.525	
Soil height to ignore for passive pressure	=	0.00	in

BYKONEN CARTER QUINN

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem (Strength Level)	י ₌	0.0 psf



Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project File: Leung Residence - Retaining Walls.ec6

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Project File: Leung Residence - Retaining Walls.ec6

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Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.3.31

DESCRIPTION: Site Retaining Wall 4'-0"

Design Summary			Stem Construction		Bottom			
Wall Stability Paties			Design Height Above Ftg	ft =	Stem OK 0.00			
	=		Wall Material Above "Ht"	=	Concrete	0.5	0.5	
Sliding	_	4.56 OK 3.07 OK	Design Method	=	SD	SD	SD	
	-	0.01 011	I NICKNESS Rober Size	=	8.00			
Global Stability	=	2.28	Rebai Size	=	# 4 10.00			
		4 000 "	Robar Blacod at	_	Edgo			
I otal Bearing Load	=	1,883 IDS 0.46 in	Design Data		Luge			
esultant ecc.	-	0.40 11	fb/FB + fa/Fa	=	0.092			
Soil Pressure @ Toe	=	795 psf OK	Total Force @ Section					
Soil Pressure @ Heel	=	664 psf OK	Service Level	lbs =				
Allowable	=	1,500 psf	Strength Level	lbs =	448.0			
Soil Pressure Less	Than Al	lowable	MomentActual					
ACI Factored @ Toe	=	1,114 pst	Service Level	ft-# =				
ACI Factored @ Heel	=	930 psr	Strength Level	ft-# =	597.3			
Footing Shear @ Toe	=	7.7 psi OK	MomentAllowable	=	6,444.1			
Footing Shear @ Heel	=	2.0 psi OK	ShearActual					
Allowable	=	75.0 psi	Service Level	psi =				
Sliding Cales			Strength Level	nei –	6.0			
Lotoral Sliding Force		100 0 lb a	Shear Allowable	poi -	75.0			
	=	408.8 IDS	Anot (Masonny)	por -	75.0			
less 100% Passive Force		266.7 IDS	Anet (Masonry)	IIIZ =	200.0			
Added Fares Decid	= -			psi =	300.0			
Added Force Req d	=		Rebar Depth "d"	in =	6.25			
IOF 1.5 Stability	=	0.0 IDS OK	Masonry Data					
Vertical component of active	lateral	soil pressure IS	f'm	nci –				
NOT considered in the calcul	ation of	soil bearing	Fs	psi =				
		5	Solid Grouting	p3i =				
Load Factors			Modular Ratio 'n'	=				
Building Code			Equiv. Solid Thick.	=				
Dead Load		1.200	Masonry Block Type	=				
Live Load		1.600	Masonry Design Method	=	ASD			
Earth, H		1.600	Concrete Data		-			
Wind, W		1.600	f'c	psi =	2,500.0			
Seismic, E		1.000	Fy	psi =	60,000.0			

BYKONEN CARTER QUINN

Cantilevered Retaining Wall

LIC# : KW-06015393, Build:20.22.3.31

DESCRIPTION: Site Retaining Wall 4'-0"

Concrete Stem Rebar Area Details

Bottom Stem As (based on applied moment) : (4/3) * As : 200bd/fy : 200(12)(6.25)/60000 : 0.0018bh : 0.0018(12)(8) :

Required Area : Provided Area : Maximum Area :

Footing Data

=	
Toe Width	= 1.25 ft
Heel Width	= 1.33
Total Footing Width	= 2.58
Footing Thickness	= 10.00 in
Key Width	= 0.00 in
Key Depth	= 0.00 in
Key Distance from Toe	e = 0.00 ft
f'c = 2,500 psi	Fy = 60,000 psi
Footing Concrete Dens	sity = 150.00 pcf
Min. As %	= 0.0018
Cover @ Top 2.00	0 @ Btm.= 3.00 in

BYKONEN CARTER QUINN

Project File: Leung Residence - Retaining Walls.ec6

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Horizontal Reinforcing

 Min Stem T&S Reinf Area 0.768 in2

 Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft

 Horizontal Reinforcing Options :

 One layer of :
 Two layers of :

 #4@ 12.50 in
 #4@ 25.00 in

 #5@ 19.38 in
 #5@ 38.75 in

 #6@ 27.50 in
 #6@ 55.00 in

Footing Design Results

		Toe	Heel			
Factored Pressure	=	1,114	930 psf			
Mu' : Upward	=	847	208 ft-#			
Mu': Downward	=	169	149 ft-#			
Mu: Design	=	678	-59 ft-#			
phiMn	=	6,985	8,065 ft-#			
Actual 1-Way Shear	=	7.72	2.03 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:

Vertical Reinforcing

0.0224 in2/ft

0.0298 in2/ft

0.1728 in2/ft

0.1728 in2/ft

0.8467 in2/ft

0.24 in2/ft

0.25 in2/ft

Heel: Key:

Min footing T&S reinf Area	0.56	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:	If two lay	ers of horizontal bars:
#4@ 11.11 in	#4@ 2	2.22 in
#5@ 17.22 in	#5@3	4.44 in
#6@ 24.44 in	#6@4	8.89 in

Project File: Leung Residence - Retaining Walls.ec6

LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 4'-0"

Summary of Overturning & Resisting Forces & Moments

		OV	ERTURNING	i		F	RESISTING	
Item		Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tb	I)	408.8	1.61	658.7	Soil Over HL (ab. water tbl)	291.9	2.25	656.2
HL Act Pres (be water tb) Hydrostatic Force)				Soil Over HL (bel. water tbl) Watre Table		2.25	656.2
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 Soi	=				Soil Over Toe =	68.8	0.63	43.0
	=				Surcharge Over Toe =			
					Stem Weight(s) =	1,200.0	1.58	1,900.0
					Earth @ Stem Transitions =			
Total	=	408.8	O.T.M. =	658.7	Footing Weight =	322.5	1.29	416.0
					Key Weight =			
Resisting/Overturning	g Ratio	D	=	4.58	Vert. Component =			
Vertical Loads used for	or Soil	Pressure	= 1,883.	1 lbs	Total =	1,883.1	lbs R.M.=	3,015.2
					* Axial live load NOT included	in total displa	ayed, or used fo	r 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 Modulus250.0pciHorizontal Defl @ Top of Wall (approximate only)0.034in

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.

Cantilevered I	Retaining Wall	Project File: Leung Residence - Retaining Walls.ec6	
LIC# : KW-06015393, Bu	ild:20.22.3.31	BYKONEN CARTER QUINN	(c) ENERCALC INC 1983-2022
DESCRIPTION:	Site Retaining Wall 4'-0"		
Rebar Lap & Emb	pedment Lengths Informat	ion	
Stem Design Segmer	nt: Bottom		
Stem Design Height:	0.00 ft above top of footing		
Lap Splice length for	#4 bar specified in this stem desig	n segment =	18.72 in
Development length f	or #4 bar specified in this stem des	sign segment =	14.40 in
Hooked embedment l	length into footing for #4 bar specif	6.05 in	
As Provided =		0.2400 in2/ft	
As Required =			0.1728 in2/ft



DESCRIPTION: Site Retaining Wall 4'-0"





DESCRIPTION: Site Retaining Wall 4'-0"



LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

Project File: Leung Residence - Retaining Walls.ec6 (c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 4'-0" (with Seismic)

Code Reference:

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

Criteria

Soil	Data

Retained Height	=	4.00 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

Surc	hard	ah

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			
Earth Pressure Seismic Load					

Method : Uniform Multiplier Used = 12.000 (Multiplier used on soil density)

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	1,500.0 od	psf
Active Heel Pressure	=	35.0	psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	110.00	pcf
Soil Density, Toe	=	110.00	pcf
Footing Soil Friction	=	0.525	
Soil height to ignore for passive pressure	=	0.00	in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Strength Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf



Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Spread Footing
Base Above/Below Soil		
at Back of Wall	=	0.0 ft

Uniform Seismic Force = 58.000 Total Seismic Force = 280.333

Cantilevered Retaining Wall LIC# : KW-06015393, Build:20.22.3.31

Project File: Leung Residence - Retaining Walls.ec6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 4'-0" (with Seismic)

Design Summary			Stem Construction		Bottom			
Wall Stability Ratios			Design Height Above Ftg Wall Material Above "Ht"	ft = 	Stem OK 0.00 Concrete			
Overturning	=	2.66 OK	Design Method	_	SD	SD	SD	
Sliding	=	2.07 OK	Thickness	=	8.00	00	00	
Global Stability	=	2.28	Rebar Size	=	# 4			
,			Rebar Spacing	=	10.00			
Total Bearing Load	=	1,883 lbs	Rebar Placed at	=	Edge			
resultant ecc.	=	3.49 in	fb/FB + fa/Fa	=	0.164			
Soil Pressure @ Toe	=	1,223 psf OK	Total Force @ Section					
Soil Pressure @ Heel	=	237 psf OK	Service Level	lbs =				
Allowable	= Then Al	1,500 psf	Strength Level	lbs =	680.0			
ACI Expertored @ Too	man A	1 712 pof	MomentActual					
ACI Factored @ Heel	=	1,712 psi 332 psf	Service Level	ft-# =				
	-		Strength Level	ft-# =	1,061.3			
Footing Shear @ Hool	=	11.7 psi OK	MomentAllowable	=	6,444.1			
	=	1.2 psi OK	ShearActual					
Allowable	=	75.0 psi	Service Level	psi =				
Sliding Calcs			Strength Level	psi =	9.1			
Lateral Sliding Force	=	605.1 lbs	ShearAllowable	psi =	75.0			
less 100% Passive Force	-	266.7 lbs	Anet (Masonry)	in2 =				
less 100% Friction Force	≡ -	988.6 lbs	Wall Weight	psf =	300.0			
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.25			
for 1.5 Stability	=	0.0 lbs OK						
			Masonry Data					
Vertical component of active	lateral	soil pressure IS	f'm	psi =				
NOT considered in the calcu	lation of	r soll bearing	FS Solid Crouting	psi =				
Load Easters				=				
Building Code			Modular Ratio 'n'	=				
Dead Load		1 200	Equiv. Solid Thick.	=				
Live Load		1.600	Masonny Dasign Mathad	=				
Earth. H		1.600	Concercto Deta	=	ASD			
Wind, W		1.600		nsi –	2 500 0			
Seismic. E		1.000	Fv	psi =	60,000,0			
			. y	P01 -	00,000.0			

BYKONEN CARTER QUINN

LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

Project File: Leung Residence - Retaining Walls.ec6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 4'-0" (with Seismic)

Vertical Reinforcing

0.0398 in2/ft

0.053 in2/ft

0.25 in2/ft

0.1728 in2/ft

0.1728 in2/ft

0.8467 in2/ft

0.24 in2/ft

Concrete Stem Rebar Area Details

As (based on applied moment) :

200bd/fy:200(12)(6.25)/60000:

0.0018bh : 0.0018(12)(8) :

Horizontal Reinforcing

 Min Stem T&S Reinf Area 0.768 in2

 Min Stem T&S Reinf Area per ft of stem Height : 0.192 in2/ft

 Horizontal Reinforcing Options :

 One layer of :
 Two layers of :

 #4@ 12.50 in
 #4@ 25.00 in

 #5@ 19.38 in
 #5@ 38.75 in

 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Required Area :

Provided Area :

Maximum Area :

Bottom Stem

(4/3) * As :

Toe Width Heel Width Total Footing Wid	dth	=	1. 1. 2.	.25 ft . <u>33</u> .58
Footing Thicknes	S	=	10.	00 in
Key Width Key Depth Key Distance from	m Toe	= = =	0. 0. 0.	00 in 00 in 00 ft
f'c = 2,500 Footing Concrete Min. As % Cover @ Top	psi F Density 2.00	y = = @	60,0 150. 0.00 Btm. =	00 psi 00 pcf 18 3.00 in

Footing Design Results

Eastarad Brazoura	_	<u>Toe</u>	Heel		
Mu': Upword	_	1,712	00 fr #		
Mu': Dowoword	_	1,103	99 II-# 140 ft #		
Mu: Dosign	_	109	50 ft #		
wu. Design	=	995	50 II-#		
phiMn	=	6,985	8,065 ft-#		
Actual 1-Way Shear	=	11.66	1.24 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. Torsio	n, p	ohi Tu =	0.00 ft-lbs		
If torsion exceeds allowable, provide					

supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

- Toe:
- Heel: Kev:

су	•	

Min footing T&S reinf Area	0.56	in2
Min footing T&S reinf Area per foot	0.22	in2 /ft
If one layer of horizontal bars:	If two lay	ers of horizontal bars:
#4@ 11.11 in	#4@ 2	2.22 in
#5@ 17.22 in	#5@3	4.44 in
#6@ 24.44 in	#6@4	8.89 in
Cantilevered Retaining Wall

Project File: Leung Residence - Retaining Walls.ec6

LIC# : KW-06015393, Build:20.22.3.31

BYKONEN CARTER QUINN

(c) ENERCALC INC 1983-2022

DESCRIPTION: Site Retaining Wall 4'-0" (with Seismic)

Summary of Overturning & Resisting Forces & Moments

		OV	ERTURNING			RI	ESISTING	
Item		Force lbs	Distance ft	Moment ft-#		Force Ibs	Distance ft	Moment ft-#
HL Act Pres (ab water tb	l)	408.8	1.61	658.7	Soil Over HL (ab. water tbl)	291.9	2.25	656.2
HL Act Pres (be water tb	í)				Soil Over HL (bel. water tbl)		2.25	656.2
Hydrostatic Force	,				Watre Table			
Buoyant Force	=				Sloped Soil Over Heel =			
Surcharge over Heel	=				Surcharge Over Heel =			
Surcharge Over Toe	=				Adjacent Footing Load =			
Adjacent Footing Load	=				Axial Dead Load on Stem =			
Added Lateral Load	=				* Axial Live Load on Stem =			
Load @ Stem Above Sol	il =				Soil Over Toe =	68.8	0.63	43.0
Seismic Earth Load	=	196.2	2.42	474.2	Surcharge Over Toe =			
	=				Stem Weight(s) =	1,200.0	1.58	1,900.0
T = 4 = 1		005.4		1 100 0	Earth @ Stem Transitions =			
Iotal	=	605.1	0.1.M. =	1,132.9	Footing Weight =	322.5	1.29	416.0
					Key Weight =			
Resisting/Overturnin	g Rat	io	=	2.66	Vert. Component =			
Vertical Loads used f	or So	il Pressure	= 1,883.7	1 lbs	Total =	1,883.1	bs R.M.=	3,015.2
If seismic is included, th	e OT	M and slidin	g ratios		* Axial live load NOT included resistance, but is included for	in total display soil pressure	ed, or used fo calculation.	r overturning

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) 0.053 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe,

because the wall would then tend to rotate into the retained soil.

Cantilevered	Retaining Wall	Project File: Leung Residence - Retaining Walls.ec6					
LIC# : KW-06015393, Bu	ild:20.22.3.31	BYKONEN CARTER QUINN	(c) ENERCALC INC 1983-2022				
DESCRIPTION:	Site Retaining Wall	4'-0" (with Seismic)					
Rebar Lap & Emb	pedment Lengths In	formation					
Stem Design Segmer	nt: Bottom						
Stem Design Height:	0.00 ft above top of fo	poting					
Lap Splice length for	#4 bar specified in this ste	em design segment =	18.72 in				
Development length f	or #4 bar specified in this	stem design segment =	14.40 in				
Hooked embedment	length into footing for #4 b	par specified in this stem design segment =	6.05 in				
As Provided =			0.2400 in2/ft				
As Required =			0.1728 in2/ft				



DESCRIPTION: Site Retaining Wall 4'-0" (with Seismic)





DESCRIPTION: Site Retaining Wall 4'-0" (with Seismic)



Concrete Beam

LIC# : KW-06015393, Build:20.22.4.16

BYKONEN CARTER QUINN

Project File: leung hot tub slab.ec6

(c) ENERCALC INC 1983-2022

Design OK

DESCRIPTION: Hot tub slab

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16 Load Combination Set : ASCE 7-16

Material Properties



12.0 ft <mark>12" w x 8" h</mark>

Cross Section & Reinforcing Details

Rectangular Section, Width = 12.0 in, Height = 8.0 in Span #1 Reinforcing.... 1-#6 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span

1.360

0.708

1.360

0.708

Beam self weight calculated and added to loads

Loads on all spans... D = 0.10, L = 0.040

Uniform Load on ALL spans : D = 0.10, L = 0.040 k/ft

DESIGN SUMMARY

+D+0.750L

+0.60D

					Doolgii olk
Maximum Bending Stress Ratio =		0.583 : 1			
Section used for this span	Typical Se	ction			
Mu : Applied		5.40 k-ft			
Mn * Phi : Allowable		9.259 k-ft			
Location of maximum on span		6.011 ft			
Span # where maximum occurs	Sp	an # 1			
Maximum Deflection					
Max Downward Transient Deflection	0.010 in	Ratio =	14246 >=360.0	L Only	
Max Upward Transient Deflection	0.000 in	Ratio =	<mark>0</mark> <360.0	L Only	
Max Downward Total Deflection	0.060 in	Ratio =	2407 >=180.0	Span: 1 : +D+L	
Max Upward Total Deflection	0.000 in	Ratio =	<mark>0</mark> <180.0	Span: 1 : +D+L	
Vertical Reactions			Support notation	n : Far left is #1	
Load Combination	Support 1	Support 2			
Overall MAXimum	1.420	1.420			
Overall MINimum	0.240	0.240			
D Only	1.180	1.180			
+D+L	1.420	1.420			

Concrete Beam

LIC# : KW-06015393, Build:20.22.4.16

BYKONEN CARTER QUINN

Project File: leung hot tub slab.ec6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Hot tub slab

Vertical Reactions			Support notation : Far left is #1
Load Combination	Support 1	Support 2	
L Only	0.240	0.240	

Detailed Shear Information

	Span D	Distance	'd'	Vu	(k)	Mu	d*Vu/Mu	Phi*Vc	Comment	Phi*Vs	Phi*Vn	Spacing	(in)
Load Combination	Number	(ft)	(in)	Actual	Design	(k-ft)		(k)		(k)	(k)	Req'Su	ggest
+1.20D+1.60L	1	0.00	5.00	1.80	1.80	0.00	1.00	6.23	Vu < PhiVc/2	t Regd 9.6	6.2	0.0	0.0
+1.20D+1.60L	1	0.13	5.00	1.76	1.76	0.23	1.00	6.23	Vu < PhiVc/2	ot Regd 9.6	6.2	0.0	0.0
+1.20D+1.60L	1	0.26	5.00	1.72	1.72	0.46	1.00	6.23	$V_{\rm U}$ < PhiVc/2	t Regd 9.6	6.2	0.0	0.0
+1.20D+1.60L	1	0.39	5.00	1.68	1.68	0.68	1.00	6.23	$V_{\rm H} < PhiVc/2$	t Read 9.6	6.2	0.0	0.0
+1.20D+1.60L	1	0.52	5.00	1.64	1.64	0.90	0.76	6.03	$V_{\rm H} < PhiVc/2$	t Read 9.6	6.0	0.0	0.0
+1.20D+1.60L	1	0.66	5.00	1.60	1.60	1.12	0.60	5.90	Vu < PhiVc/2	ot Read 9.6	5.9	0.0	0.0
+1 20D+1 60	1	0.79	5.00	1 56	1 56	1 32	0.49	5.81	Vu < PhiVo/2	t Read 9.6	5.8	0.0	0.0
+1 20D+1 60	1	0.70	5.00	1.50	1.50	1.02	0.40	5 75	Vu < PIIIVC/2	t Read 9.6	5.8	0.0	0.0
+1 20D+1 60	1	1.05	5.00	1.02	1 49	1.00	0.72	5 70	Vu < PhiVc/2	t Read 9.6	5.0	0.0	0.0
+1 20D+1 60	1	1.00	5.00	1.45	1.45	1.72	0.30	5.70	Vu < PniVc/2	vt Read 9.6	5.7	0.0	0.0
+1.20D+1.60L	1	1.10	5.00	1.40	1.40	2 10	0.01	5.07	vu < Pnivc/2	x Requise	5.7	0.0	0.0
+1.20D+1.60L	1	1.31	5.00	1.41	1.41	2.10	0.20	5.04	vu < Pnivc/2	t Regu 9.0	5.0	0.0	0.0
+1.20D+1.60L	1	1.44	5.00	1.37	1.37	2.20	0.25	5.01	Vu < PhiVc/2	JI Requies.	5.0	0.0	0.0
+1.20D+1.60L	1	1.57	5.00	1.33	1.33	2.40	0.22	5.59	Vu < PhiVc/2	JI Requise	5.0	0.0	0.0
+1.20D+1.60L	1	1.70	5.00	1.29	1.29	2.63	0.20	5.58	Vu < PhiVc/2	x Reqd 9.6	5.6	0.0	0.0
+1.20D+1.60L	1	1.84	5.00	1.25	1.25	2.80	0.19	5.56	Vu < PhiVc/2	ot Redd 9.6	5.6	0.0	0.0
+1.20D+1.60L	1	1.97	5.00	1.21	1.21	2.96	0.17	5.55	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	2.10	5.00	1.17	1.17	3.12	0.16	5.54	Vu < PhiVc/2	of Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	2.23	5.00	1.13	1.13	3.27	0.14	5.53	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	2.36	5.00	1.09	1.09	3.41	0.13	5.52	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	2.49	5.00	1.05	1.05	3.55	0.12	5.51	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	2.62	5.00	1.01	1.01	3.69	0.11	5.50	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	2.75	5.00	0.97	0.97	3.82	0.11	5.50	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	2.89	5.00	0.93	0.93	3.94	0.10	5.49	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	3.02	5.00	0.90	0.90	4.06	0.09	5.48	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	3.15	5.00	0.86	0.86	4.18	0.09	5.48	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	3.28	5.00	0.82	0.82	4.29	0.08	5.47	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	3.41	5.00	0.78	0.78	4.39	0.07	5.47	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	3.54	5.00	0.74	0.74	4.49	0.07	5.46	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	3.67	5.00	0.70	0.70	4.59	0.06	5.46	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	3.80	5.00	0.66	0.66	4.68	0.06	5.46	Vu < PhiVc/2	ot Regd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	3.93	5.00	0.62	0.62	4.76	0.05	5.45	Vu < PhiVc/2	t Regd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	4.07	5.00	0.58	0.58	4.84	0.05	5.45	$V_{\rm U}$ < PhiVc/2	t Regd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	4.20	5.00	0.54	0.54	4.91	0.05	5.45	$V_{\rm U}$ < PhiVc/2	t Regd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	4.33	5.00	0.50	0.50	4.98	0.04	5.44	Vu < PhiVc/2	t Regd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	4.46	5.00	0.46	0.46	5.04	0.04	5.44	$V_{\rm H} < PhiVc/2$	t Read 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	4.59	5.00	0.42	0.42	5.10	0.03	5.44	$V_{\rm H} < PhiVc/2$	t Read 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	4.72	5.00	0.38	0.38	5.15	0.03	5.43	Vu < PhiVc/2	ot Read 9.6	5.4	0.0	0.0
+1.20D+1.60I	1	4.85	5.00	0.34	0.34	5.20	0.03	5.43	Vu < PhiVc/2	ot Read 9.6	5.4	0.0	0.0
+1.20D+1.60I	1	4.98	5.00	0.30	0.30	5.25	0.02	5.43	Vu < PhiVc/2	ot Read 9.6	5.4	0.0	0.0
+1.20D+1.60	1	5.11	5.00	0.27	0.27	5.28	0.02	5.42	Vu < PhiVc/2	of Read 9.6	5.4	0.0	0.0
+1 20D+1 60	1	5.25	5.00	0.23	0.23	5.31	0.02	5 42	Vu < PhiVc/2	t Read 9.6	5.4	0.0	0.0
+1 20D+1 60	1	5 38	5.00	0.20	0.20	5 34	0.02	5.42	Vu < PhiVo/2	t Read 9.6	5.4	0.0	0.0
+1 20D+1 60	1	5 51	5.00	0.15	0.15	5 36	0.01	5.42	Vu < PIIIVC/2	t Read 9.6	5.4	0.0	0.0
+1 20D+1 60	1	5.64	5.00	0.10	0.10	5 38	0.01	5.41	VU < PHVC/2	vt Read 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	5.04	5.00	0.11	0.11	5.30	0.01	5.41	vu < Pnivc/2	x Requise	5.4	0.0	0.0
+1.20D+1.60L	1	5.00	5.00	0.07	0.07	5.39	0.01	5.41	VU < PNIVC/2	t Requise	5.4	0.0	0.0
+1.20D+1.60L	1	5.90	5.00	0.03	0.03	5.40	0.00	5.41	Vu < PhiVc/2	st Regul 9.0	5.4	0.0	0.0
+1.20D+1.60L	1	0.03	5.00	-0.01	0.01	5.40	0.00	5.41	Vu < PhiVc/2	st Regul 9.0	5.4	0.0	0.0
+1.20D+1.60L	1	0.10	5.00	-0.05	0.05	5.40	0.00	5.41	Vu < PhiVc/2	JI Requise	5.4	0.0	0.0
+1.20D+1.00L	1	0.30	5.00	-0.09	0.09	5.39	0.01	5.41	Vu < PhiVc/2	JI Reqa 9.6	5.4	0.0	0.0
+1.20D+1.00L	1	0.43	5.00	-0.13	0.13	5.37	0.01	5.42	Vu < PhiVc/2	JI Reqa 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	6.56	5.00	-0.17	0.17	5.35	0.01	5.42	Vu < PhiVc/2	ot Redd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	6.69	5.00	-0.21	0.21	5.33	0.02	5.42	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	6.82	5.00	-0.25	0.25	5.30	0.02	5.42	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	6.95	5.00	-0.29	0.29	5.26	0.02	5.43	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0

Concrete Beam

LIC# : KW-06015393, Build:20.22.4.16

BYKONEN CARTER QUINN

Project File: leung hot tub slab.ec6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Hot tub slab

Detailed Shear Information

	Span	Distance	ə 'd'	Vu	(k)	Mu	d*Vu/Mu	Phi*Vc	Comment	Phi*Vs	Phi*Vn	Spacing	(in)
Load Combination	Number	(ft)	(in)	Actual	Design	(k-ft)		(k)		(k)	(k)	Req' \$u	ggest
+1.20D+1.60L	1	7.08	5.00	-0.32	0.32	5.22	0.03	5.43	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	7.21	5.00	-0.36	0.36	5.18	0.03	5.43	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	7.34	5.00	-0.40	0.40	5.13	0.03	5.43	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	7.48	5.00	-0.44	0.44	5.07	0.04	5.44	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	7.61	5.00	-0.48	0.48	5.01	0.04	5.44	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	7.74	5.00	-0.52	0.52	4.95	0.04	5.44	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	7.87	5.00	-0.56	0.56	4.88	0.05	5.45	Vu < PhiVc/2	ot Reqd 9.6	5.4	0.0	0.0
+1.20D+1.60L	1	8.00	5.00	-0.60	0.60	4.80	0.05	5.45	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	8.13	5.00	-0.64	0.64	4.72	0.06	5.45	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	8.26	5.00	-0.68	0.68	4.63	0.06	5.46	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	8.39	5.00	-0.72	0.72	4.54	0.07	5.46	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	8.52	5.00	-0.76	0.76	4.44	0.07	5.47	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	8.66	5.00	-0.80	0.80	4.34	0.08	5.47	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	8.79	5.00	-0.84	0.84	4.23	0.08	5.48	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	8.92	5.00	-0.88	0.88	4.12	0.09	5.48	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	9.05	5.00	-0.91	0.91	4.01	0.10	5.49	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	9.18	5.00	-0.95	0.95	3.88	0.10	5.49	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	9.31	5.00	-0.99	0.99	3.76	0.11	5.50	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	9.44	5.00	-1.03	1.03	3.62	0.12	5.51	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	9.57	5.00	-1.07	1.07	3.48	0.13	5.51	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	9.70	5.00	-1.11	1.11	3.34	0.14	5.52	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	9.84	5.00	-1.15	1.15	3.19	0.15	5.53	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	9.97	5.00	-1.19	1.19	3.04	0.16	5.54	Vu < PhiVc/2	ot Reqd 9.6	5.5	0.0	0.0
+1.20D+1.60L	1	10.10	5.00	-1.23	1.23	2.88	0.18	5.55	Vu < PhiVc/2	ot Reqd 9.6	5.6	0.0	0.0
+1.20D+1.60L	1	10.23	5.00	-1.27	1.27	2.72	0.19	5.57	Vu < PhiVc/2	ot Reqd 9.6	5.6	0.0	0.0
+1.20D+1.60L	1	10.36	5.00	-1.31	1.31	2.55	0.21	5.58	Vu < PhiVc/2	ot Reqd 9.6	5.6	0.0	0.0
+1.20D+1.60L	1	10.49	5.00	-1.35	1.35	2.37	0.24	5.60	Vu < PhiVc/2	ot Reqd 9.6	5.6	0.0	0.0
+1.20D+1.60L	1	10.62	5.00	-1.39	1.39	2.19	0.26	5.62	Vu < PhiVc/2	ot Reqd 9.6	5.6	0.0	0.0
+1.20D+1.60L	1	10.75	5.00	-1.43	1.43	2.01	0.30	5.65	Vu < PhiVc/2	ot Reqd 9.6	5.7	0.0	0.0
+1.20D+1.60L	1	10.89	5.00	-1.47	1.47	1.82	0.34	5.68	Vu < PhiVc/2	ot Reqd 9.6	5.7	0.0	0.0
+1.20D+1.60L	1	11.02	5.00	-1.50	1.50	1.63	0.39	5.73	Vu < PhiVc/2	ot Reqd 9.6	5.7	0.0	0.0
+1.20D+1.60L	1	11.15	5.00	-1.54	1.54	1.43	0.45	5.78	Vu < PhiVc/2	ot Reqd 9.6	5.8	0.0	0.0
+1.20D+1.60L	1	11.28	5.00	-1.58	1.58	1.22	0.54	5.85	Vu < PhiVc/2	ot Reqd 9.6	5.9	0.0	0.0
+1.20D+1.60L	1	11.41	5.00	-1.62	1.62	1.01	0.67	5.96	Vu < PhiVc/2	ot Reqd 9.6	6.0	0.0	0.0
+1.20D+1.60L	1	11.54	5.00	-1.66	1.66	0.79	0.87	6.13	Vu < PhiVc/2	ot Reqd 9.6	6.1	0.0	0.0
+1.20D+1.60L	1	11.67	5.00	-1.70	1.70	0.57	1.00	6.23	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60L	1	11.80	5.00	-1.74	1.74	0.35	1.00	6.23	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0
+1.20D+1.60L	1	11.93	5.00	-1.78	1.78	0.12	1.00	6.23	Vu < PhiVc/2	ot Reqd 9.6	6.2	0.0	0.0

Maximum Forces & Stresses for Load Combinations

	Location (ft)	Bending S	tress Results	(k-ft)	
Span #	along Beam	Mu : Max	Phi*Mnx	Stress Ratio	
1	12.000	5.40	9.26	0.58	
1	12.000	4.96	9.26	0.54	
1	12.000	5.40	9.26	0.58	
1	12.000	4.97	9.26	0.54	
1	12.000	4.25	9.26	0.46	
1	12.000	3.19	9.26	0.34	
Max. "-" Defl (in) .ocation	on in Span (ft Loa	ad Combination	Max	. "+" Defl (injocatio	on in Span (ft
0.0598	6.000			0.0000	0.000
	Span # 1 1 1 1 1 1 1 1 1 1 1 1 1 0.0598	Location (ft) Location (ft) Span # along Beam 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000 1 12.000	Location (ft) Bending S Span # along Beam Mu : Max 1 12.000 5.40 1 12.000 4.96 1 12.000 5.40 1 12.000 4.97 1 12.000 4.97 1 12.000 4.25 1 12.000 3.19 Max. "-" Defl (in) .ocation in Span (ft Load Combination 0.0598 6.000 6.000	Location (ft) Bending Stress Results Span # along Beam Mu : Max Phi*Mnx 1 12.000 5.40 9.26 1 12.000 4.96 9.26 1 12.000 5.40 9.26 1 12.000 4.96 9.26 1 12.000 5.40 9.26 1 12.000 4.97 9.26 1 12.000 4.97 9.26 1 12.000 4.25 9.26 1 12.000 3.19 9.26 Max. "-" Defl (in) .ocation in Span (ft Load Combination Vax 0.0598 6.000 5.000 5.000	Location (ft) Bending Stress Results (k-ft) Span # along Beam Mu : Max Phi*Mnx Stress Ratio 1 12.000 5.40 9.26 0.58 1 12.000 4.96 9.26 0.58 1 12.000 5.40 9.26 0.58 1 12.000 5.40 9.26 0.58 1 12.000 4.97 9.26 0.54 1 12.000 4.97 9.26 0.54 1 12.000 4.25 9.26 0.46 1 12.000 3.19 9.26 0.34 Max. "-" Defl (in) .ocation in Span (ft Load Combination Vax. "+" Defl (in.ocation in Contine in Contin Contin Contin Contine in Contine in Contin Contine in Contine