

Thomas Avant
PE, SE, PLS
CEO

Mike Downward, PE
VP Structural



Joshua Beazer, EIT
VP Civil

Chris Heaton
VP Development

THE ENCLAVES LOT 20
APN: 113-36-020
LAKE HAVASU, AZ 86406
August 9, 2022

PREPARED FOR:

Marvin Lunt
Home Designs by Marvin

PREPARED BY:

IRON ROCK GROUP, LLC
PO Box 55
Kanab, UT 84741
435-644-2031



TABLE OF CONTENTS

BASIS FOR DESIGN.....	1
DESIGN LOADS.....	2
GRAVITY DESIGN.....	G1
LATERAL DESIGN.....	L1
FOUNDATION DESIGN.....	F1



BASIS FOR DESIGN:

- (1) Building Code: 2018 IBC
- (2) Design Loads: Roof Live = 20 psf
Roof Snow Load = 0 psf
Wind Load = 115 mph (Vult.) Exp. C
Seismic Loading = Site Class D
SDC = C
S_s = 0.209
S₁ = 0.108
- (3) Lumber: All 2x6 and larger nominal solid sawn lumber #2 Douglas Fir – Larch. All 2x4 solid sawn lumber Douglas Fir – Larch stud grade.
- (4) Concrete: Compressive strength used for design $f'_c=2500$ psi, Type II/V concrete
- (5) Foundation: 1500 psf bearing pressure used for footing design (Foundation designed for non-expansive soil)



THE ENCLAVES LOT 20 LOADING

Typ. Flat Roof Loading

Foam roofing w/ Acrylic Coat	1.75 psf
Roof Solar Panels	4 psf
15/32" Roof Sheathing:	1.7 psf
Pre-Engineered Roof Trusses:	3.5 psf
R-38 Blown-in Insulation:	1 psf
1-Layer 5/8" Gypboard:	2.75 psf
Mechanical, Plumbing, Misc:	2.5 psf
	18 psf

Typ. Pitched Roof Loading

Metal Roofing:	1.5 psf
Roof Solar Panels	0 psf
15/32" Roof Sheathing:	1.7 psf
Pre-Engineered Roof Trusses:	3.5 psf
R-38 Blown-in Insulation:	1 psf
1-Layer 5/8" Gypboard:	2.75 psf
Mechanical, Plumbing, Misc:	3 psf
	14 psf

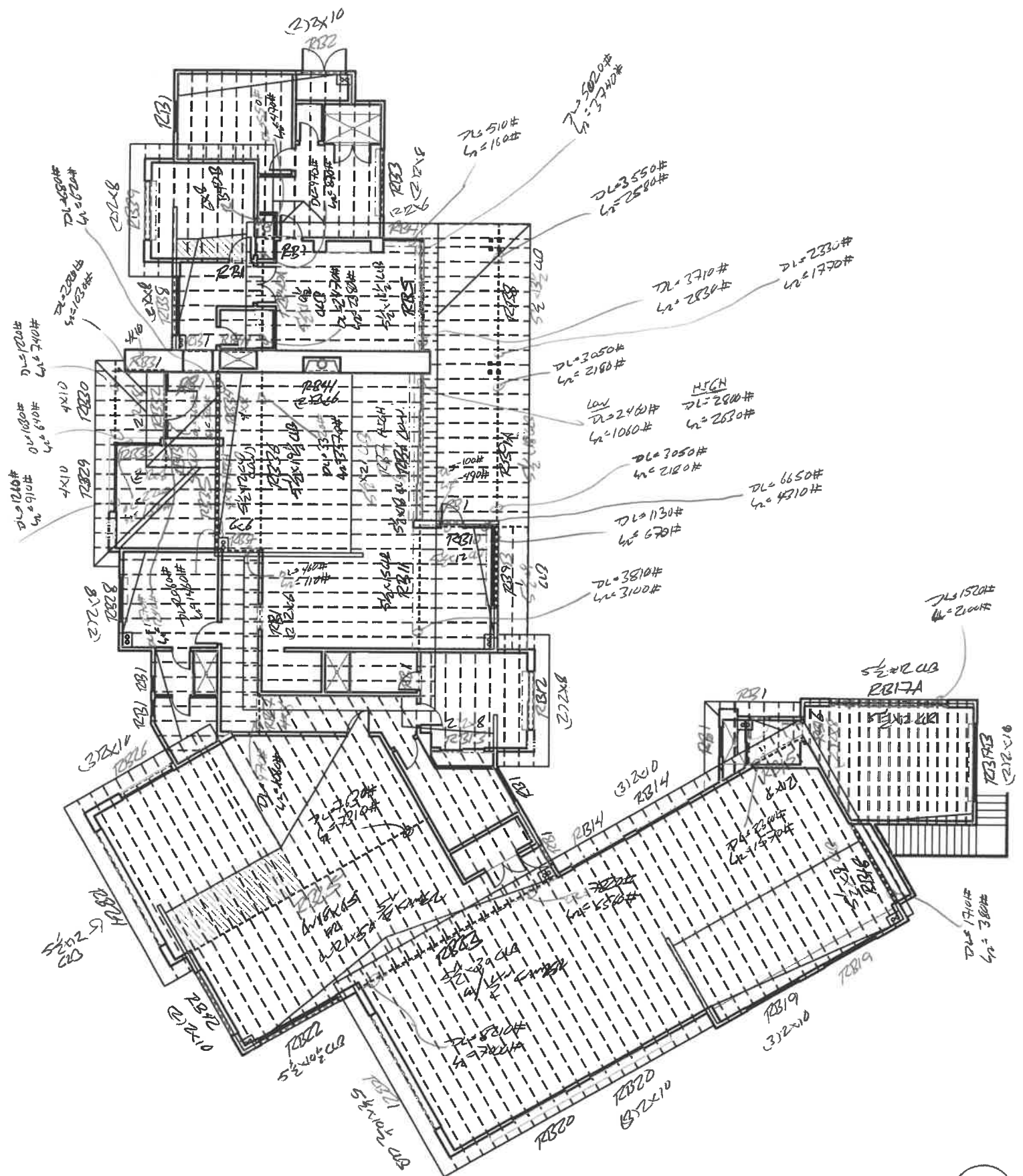
Typ. Exterior Wall w/ EIFS

2x6 Framing at 16" o.c.:	1.7 psf
1/2" Gypboard:	2.2 psf
1/2" Soundboard:	0 psf
R-23 Batt Insulation:	0.5 psf
7/16" Sheathing:	1.7 psf
Stucco:	9 psf
Mechanical, Plumbing, Misc:	1 psf
	17 psf

Typ. Exterior Wall w/ Cultured Stone

2x6 Framing at 16" o.c.:	1.7 psf
1/2" Gypboard:	2.2 psf
1/2" Soundboard:	0 psf
R-23 Batt Insulation:	0.5 psf
7/16" Sheathing:	1.7 psf
Stone Veneer:	18 psf
Mechanical, Plumbing, Misc:	1 psf
	26 psf

LH ENCLAVES LOT 20 ROOF FRAMING KEMPLAN



Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 11:36AM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.S.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Description : ROOF BEAMS 1

Wood Beam Design : BEAM RB1

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

BEAM Size : **2-2x6, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 13.0 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 9.50 ft

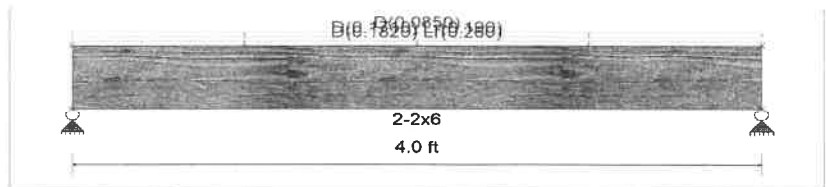
Unif Load: D = 0.0170 k/ft, Trib= 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.974 : 1**
 fb : Actual : 1,414.73 psi at 2.000 ft in Span # 1
 Fb : Allowable : 1,452.52 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.557 : 1**
 fv : Actual : 125.36 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.88		0.90				
Right Support	0.88		0.90				



Max Deflections

Transient Downward	0.039 in	Total Downward	0.078 in
Ratio	1225	Ratio	618
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB2

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

BEAM Size : **2-2x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 11.250 ft

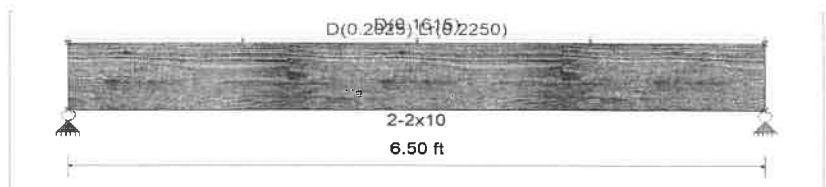
Unif Load: D = 0.0170 k/ft, Trib= 9.50 ft

Design Summary

Max fb/Fb Ratio = **0.726 : 1**
 fb : Actual : 881.44 psi at 3.250 ft in Span # 1
 Fb : Allowable : 1,214.16 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.356 : 1**
 fv : Actual : 80.14 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.20		0.73				
Right Support	1.20		0.73				



Max Deflections

Transient Downward	0.029 in	Total Downward	0.076 in
Ratio	2718	Ratio	1027
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

62

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 11:36AM

Multiple Simple Beam

File: LH ENCLAVES LOT 20_CALC.S.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. #: KW-06005427

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB3

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

BEAM Size : **2-2x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 1.0 ft

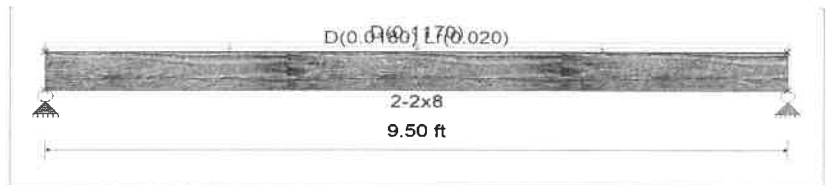
Unif Load: D = 0.0260 k/ft, Trib= 4.50 ft

Design Summary

Max fb/Fb Ratio = **0.752 : 1**
 fb : Actual : 719.67 psi at 4.750 ft in Span # 1
 Fb : Allowable : 957.50 psi
 Load Comb : +D+H

Max fv/FvRatio = **0.247 : 1**
 fv : Actual : 39.97 psi at 0.000 ft in Span # 1
 Fv : Allowable : 162.00 psi
 Load Comb : +D+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.66		0.10				
Right Support	0.66		0.10				



Max Deflections

Transient Downward	0.024 in	Total Downward	0.193 in
Ratio	4715	Ratio	590
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB4

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

BEAM Size : **2-2x6, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 7.250 ft

Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.504 : 1**
 fb : Actual : 527.08 psi at 2.625 ft in Span # 1
 Fb : Allowable : 1,046.56 psi
 Load Comb : +D+H

Max fv/FvRatio = **0.235 : 1**
 fv : Actual : 38.04 psi at 4.795 ft in Span # 1
 Fv : Allowable : 162.00 psi
 Load Comb : +D+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.51		0.16				
Right Support	0.51		0.16				



Max Deflections

Transient Downward	0.015 in	Total Downward	0.065 in
Ratio	4066	Ratio	965
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

63

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 11:36AM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB5

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

BEAM Size : **5.5x16.5, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 13.0 ft

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 5.250 ft

Unif Load: D = 0.0170 k/ft, Trib= 7.50 ft

Unif Load: D = 0.0120 k/ft, Trib= 7.250 ft

Design Summary

Max fb/Fb Ratio = **0.405 : 1**
 fb : Actual : 1,202.40 psi at 7.673 ft in Span # 1
 Fb : Allowable : 2,966.95 psi
 Load Comb : +D+Lr+H, LL Comb Run (L*)
 Max fv/FvRatio = **0.282 : 1**
 fv : Actual : 93.34 psi at 14.183 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H, LL Comb Run (LL)
 Max Reactions (k) D L Lr S W E H
 Left Support 3.71 2.83
 Right Support 5.02 3.74



Max Deflections

Transient Downward	0.129 in	Total Downward	0.293 in
Ratio	1442	Ratio	635
Lr Only, LL Comb Run (L*		+Lr+H, LL Comb Run (L*	
Transient Upward	-0.062 in	Total Upward	-0.136 in
Ratio	908	Ratio	410
Lr Only, LL Comb Run (L*		+Lr+H, LL Comb Run (L*	

Wood Beam Design : BEAM RB6

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

BEAM Size : **5.5x18, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

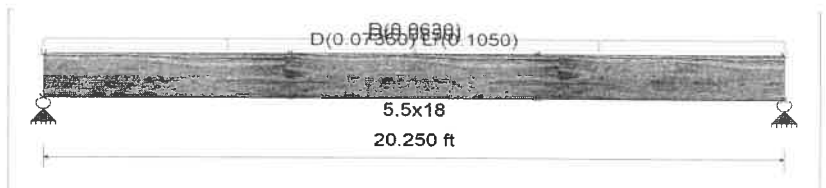
Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 5.250 ft

Unif Load: D = 0.0170 k/ft, Trib= 5.0 ft

Unif Load: D = 0.0120 k/ft, Trib= 5.250 ft

Design Summary

Max fb/Fb Ratio = **0.251 : 1**
 fb : Actual : 720.63 psi at 10.125 ft in Span # 1
 Fb : Allowable : 2,870.94 psi
 Load Comb : +D+Lr+H
 Max fv/FvRatio = **0.138 : 1**
 fv : Actual : 45.55 psi at 18.765 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H
 Max Reactions (k) D L Lr S W E H
 Left Support 2.46 1.06
 Right Support 2.46 1.06



Max Deflections

Transient Downward	0.083 in	Total Downward	0.275 in
Ratio	2927	Ratio	883
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	



Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 11:36AM

File: LH ENCLAVES LOT 20_CALC.ec6

Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31

IRON ROCK ENGINEERING

Multiple Simple Beam

LC: # : KW-06005427

Wood Beam Design : BEAM RB7

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

BEAM Size : **5.5x21, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2,400.0 psi	Fc - Prll	1,650.0 psi	Fv	265.0 psi	Ebend- xx	1,800.0 ksi	Density	31.210 pcf
Fb - Compr	1,850.0 psi	Fc - Perp	650.0 psi	Ft	1,100.0 psi	Eminbend - xx	950.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 13.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 2.670 ft

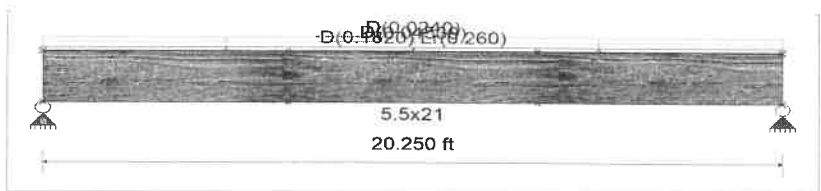
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.289 : 1**
 fb : Actual : 816.20 psi at 10.125 ft in Span # 1
 Fb : Allowable : 2,827.03 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.177 : 1**
 fv : Actual : 58.78 psi at 18.563 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	2.80		2.63				
Right Support	2.80		2.63				



Max Deflections

Transient Downward	0.129 in	Total Downward	0.267 in
Ratio	1877	Ratio	909
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB8

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

BEAM Size : **5.5x13.5, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 10.50 ft

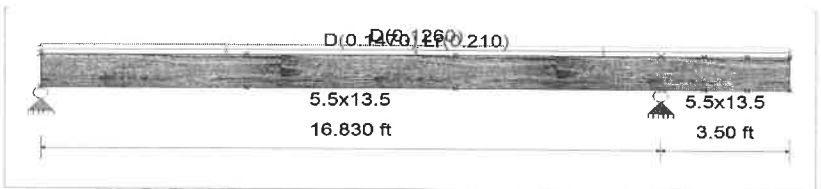
Unif Load: D = 0.0120 k/ft, Trib= 10.50 ft

Design Summary

Max fb/Fb Ratio = **0.406 : 1**
 fb : Actual : 1,206.46 psi at 8.163 ft in Span # 1
 Fb : Allowable : 2,971.26 psi
 Load Comb : +D+Lr+H, LL Comb Run (L*)

Max fv/FvRatio = **0.234 : 1**
 fv : Actual : 77.49 psi at 15.736 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H, LL Comb Run (LL)

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	2.33		1.77				
Right Support	3.55		2.58				



Max Deflections

Transient Downward	0.188 in	Total Downward	0.421 in
Ratio	1072	Ratio	480
Lr Only, LL Comb Run (L*)		+Lr+H, LL Comb Run (L*)	
Transient Upward	-0.124 in	Total Upward	-0.261 in
Ratio	674	Ratio	320
Lr Only, LL Comb Run (L*)		+Lr+H, LL Comb Run (L*)	

GS

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 11:36AM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31
 IRON/ROCK ENGINEERING

Wood Beam Design : BEAM RB9A

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

BEAM Size : **5.5x18, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend-xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend-xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib = 10.50 ft

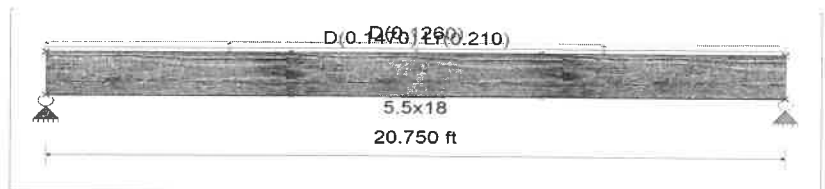
Unif Load: D = 0.0120 k/ft, Trib = 10.50 ft

Design Summary

Max fb/Fb Ratio = **0.383 : 1**
 fb : Actual : 1,096.97 psi at 10.375 ft in Span # 1
 Fb : Allowable : 2,863.95 psi
 Load Comb : +D+Lr+H

Max fv/Fv Ratio = **0.206 : 1**
 fv : Actual : 68.20 psi at 19.298 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	3.05		2.18				
Right Support	3.05		2.18				



Max Deflections

Transient Downward	0.183 in	Total Downward	0.440 in
Ratio	1360	Ratio	566
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB9B

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

BEAM Size : **5.5x9, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend-xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend-xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib = 6.250 ft

Unif Load: D = 0.0170 k/ft, Trib = 6.0 ft

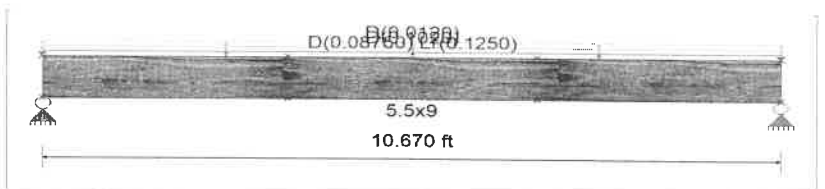
Unif Load: D = 0.0120 k/ft, Trib = 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.259 : 1**
 fb : Actual : 775.62 psi at 5.335 ft in Span # 1
 Fb : Allowable : 2,989.00 psi
 Load Comb : +D+Lr+H

Max fv/Fv Ratio = **0.142 : 1**
 fv : Actual : 46.89 psi at 9.923 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.13		0.67				
Right Support	1.13		0.67				



Max Deflections

Transient Downward	0.061 in	Total Downward	0.164 in
Ratio	2101	Ratio	778
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

66

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 11:36AM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB10

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

BEAM Size : **5.5x12, GLB, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, 0.0 ft to 8.250 ft, Trib= 2.0 ft

Unif Load: D = 0.0260, Lr = 0.020 k/ft, 8.250 to 12.50 ft, Trib= 9.250 ft

Unif Load: D = 0.0170 k/ft, 0.0 to 8.250 ft, Trib= 6.0 ft

Unif Load: D = 0.0120 k/ft, 0.0 to 8.250 ft, Trib= 1.0 ft

Point: D = 1.130, Lr = 0.670 k @ 8.250 ft

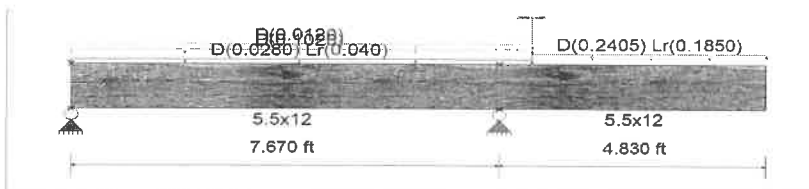
Point: D = 3.050, Lr = 2.180 k @ 8.250 ft

Design Summary

Max fb/Fb Ratio = **0.363 : 1**
 fb : Actual : 833.32 psi at 7.670 ft in Span # 1
 Fb : Allowable : 2,292.53 psi
 Load Comb : +D+Lr+H, LL Comb Run (*L)

Max fv/FvRatio = **0.120 : 1**
 fv : Actual : 39.82 psi at 6.673 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H, LL Comb Run (LL)

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	-0.10		-0.49				
Right Support	6.65		4.31				



Max Deflections

Transient Downward	0.075 in	Total Downward	0.163 in
Ratio	1554	Ratio	712
Lr Only, LL Comb Run (*L)		+Lr+H, LL Comb Run (*L)	
Transient Upward	-0.017 in	Total Upward	-0.034 in
Ratio	5279	Ratio	2714
Lr Only, LL Comb Run (*L)		+Lr+H, LL Comb Run (*L)	

Wood Beam Design : BEAM RB11

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

BEAM Size : **5.5x15, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 13.0 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 5.250 ft

Unif Load: D = 0.0170 k/ft, Trib= 7.670 ft

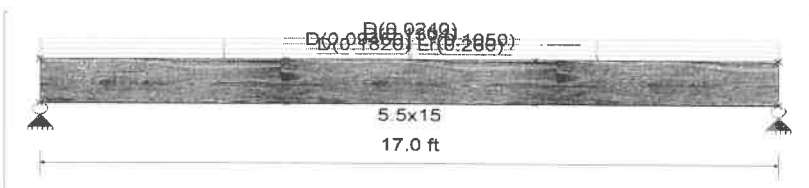
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.576 : 1**
 fb : Actual : 1,710.40 psi at 8.500 ft in Span # 1
 Fb : Allowable : 2,967.26 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.324 : 1**
 fv : Actual : 107.32 psi at 15.753 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	3.81		3.10				
Right Support	3.81		3.10				



Max Deflections

Transient Downward	0.248 in	Total Downward	0.552 in
Ratio	823	Ratio	369
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

67

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 12:32PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Description : ROOF BEAMS 2

Wood Beam Design : BEAM RB12

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

BEAM Size : **2-2x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0260 k/ft, Trib= 3.50 ft

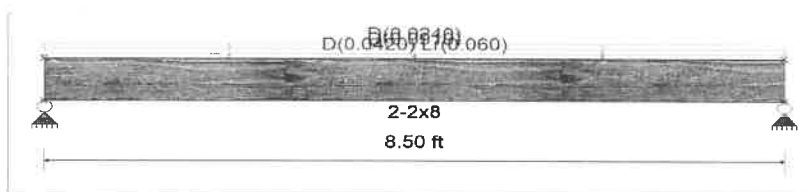
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.695 : 1**
 fb : Actual : 666.85 psi at 4.250 ft in Span # 1
 Fb : Allowable : 959.34 psi
 Load Comb : +D+H

Max fv/Fv Ratio = **0.252 : 1**
 fv : Actual : 40.76 psi at 7.905 ft in Span # 1
 Fv : Allowable : 162.00 psi
 Load Comb : +D+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.69		0.26				
Right Support	0.69		0.26				



Max Deflections

Transient Downward	0.046 in	Total Downward	0.172 in
Ratio	2194	Ratio	593
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB13

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

BEAM Size : **2-2x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 7.0 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 6.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 2.50 ft

Design Summary

Max fb/Fb Ratio = **0.930 : 1**
 fb : Actual : 1,237.57 psi at 3.250 ft in Span # 1
 Fb : Allowable : 1,330.22 psi
 Load Comb : +D+Lr+H

Max fv/Fv Ratio = **0.419 : 1**
 fv : Actual : 94.33 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.82		0.85				
Right Support	0.82		0.85				



Max Deflections

Transient Downward	0.069 in	Total Downward	0.136 in
Ratio	1132	Ratio	573
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

GG

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 12:32PM

Multiple Simple Beam

File: LH ENCLAVES LOT 20_CALC.S.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
 IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB14

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

BEAM Size : **3-2x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 16.50 ft

Unif Load: D = 0.0170 k/ft, Trib= 5.50 ft

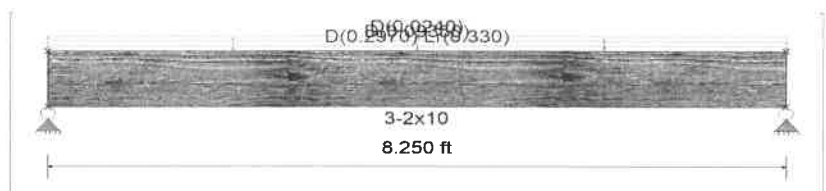
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.977** : 1
 fb : Actual : 1,198.81 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,226.49 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.405** : 1
 fv : Actual : 91.10 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.75		1.36				
Right Support	1.75		1.36				



Max Deflections

Transient Downward	0.073 in	Total Downward	0.166 in
Ratio	1359	Ratio	595
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB15

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

BEAM Size : **6x12, Sawn, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 16.50 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 2.50 ft

Unif Load: D = 0.0170 k/ft, Trib= 10.50 ft

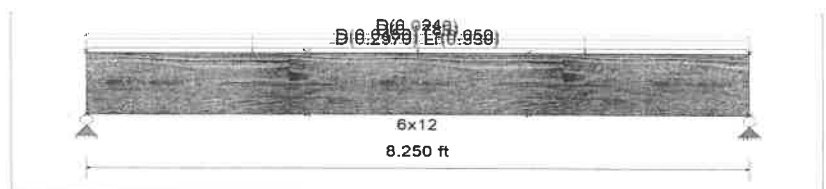
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.704** : 1
 fb : Actual : 790.12 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,122.56 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.315** : 1
 fv : Actual : 70.98 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	2.30		1.57				
Right Support	2.30		1.57				



Max Deflections

Transient Downward	0.036 in	Total Downward	0.088 in
Ratio	2772	Ratio	1123
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

69

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 12:32PM

Multiple Simple Beam

File #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
 IRON ROCK ENGINEERING

Description : ROOF BEAMS 2

Wood Beam Design : BEAM RB12

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

BEAM Size : 2-2x8, Sawn, Fully Unbraced

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension 900.0 psi Fc - Prll 1,350.0 psi Fv 180.0 psi Ebend- xx 1,600.0 ksi Density 31.210 pcf
 Fb - Compr 900.0 psi Fc - Perp 625.0 psi Ft 575.0 psi Eminbend - xx 580.0 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0260 k/ft, Trib= 3.50 ft

Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = 0.695 : 1
 fb : Actual : 666.85 psi at 4.250 ft in Span # 1
 Fb : Allowable : 959.34 psi
 Load Comb : +D+H

Max fv/FvRatio = 0.252 : 1
 fv : Actual : 40.76 psi at 7.905 ft in Span # 1
 Fv : Allowable : 162.00 psi
 Load Comb : +D+H

Max Reactions (k) D L Lr S W E H
 Left Support 0.69 0.26
 Right Support 0.69 0.26



Max Deflections

Transient Downward 0.046 in Total Downward 0.172 in
 Ratio 2194 Ratio 593
 LC: Lr Only LC: +D+Lr+H
 Transient Upward 0.000 in Total Upward 0.000 in
 Ratio 9999 Ratio 9999
 LC: LC:

Wood Beam Design : BEAM RB13

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

BEAM Size : 2-2x8, Sawn, Fully Unbraced

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension 900 psi Fc - Prll 1350 psi Fv 180 psi Ebend- xx 1600 ksi Density 31.21 pcf
 Fb - Compr 900 psi Fc - Perp 625 psi Ft 575 psi Eminbend - xx 580 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 7.0 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 6.0 ft

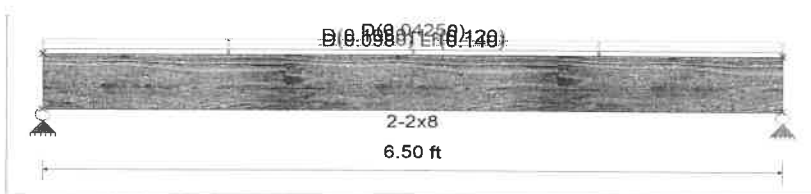
Unif Load: D = 0.0170 k/ft, Trib= 2.50 ft

Design Summary

Max fb/Fb Ratio = 0.930 : 1
 fb : Actual : 1,237.57 psi at 3.250 ft in Span # 1
 Fb : Allowable : 1,330.22 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = 0.419 : 1
 fv : Actual : 94.33 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k) D L Lr S W E H
 Left Support 0.82 0.85
 Right Support 0.82 0.85



Max Deflections

Transient Downward 0.069 in Total Downward 0.136 in
 Ratio 1132 Ratio 573
 LC: Lr Only LC: +D+Lr+H
 Transient Upward 0.000 in Total Upward 0.000 in
 Ratio 9999 Ratio 9999
 LC: LC:

G10

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 12:32PM

Multiple Simple Beam

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
 IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB14

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

BEAM Size : **3-2x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 16.50 ft

Unif Load: D = 0.0170 k/ft, Trib= 5.50 ft

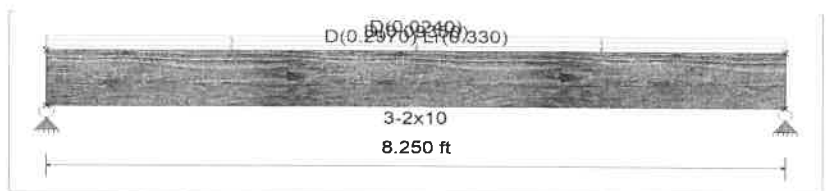
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.977 : 1**
 fb : Actual : 1,198.81 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,226.49 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.405 : 1**
 fv : Actual : 91.10 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.75		1.36				
Right Support	1.75		1.36				



Max Deflections

Transient Downward	0.073 in	Total Downward	0.166 in
Ratio	1359	Ratio	595
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB15

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

BEAM Size : **6x12, Sawn, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 16.50 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 2.50 ft

Unif Load: D = 0.0170 k/ft, Trib= 10.50 ft

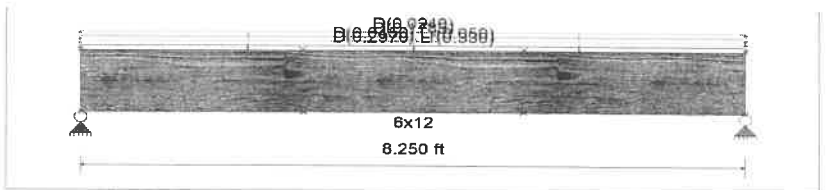
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.704 : 1**
 fb : Actual : 790.12 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,122.56 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.315 : 1**
 fv : Actual : 70.98 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	2.30		1.57				
Right Support	2.30		1.57				



Max Deflections

Transient Downward	0.036 in	Total Downward	0.088 in
Ratio	2772	Ratio	1123
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

G11

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 12:32PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB16

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

BEAM Size : **2-2x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

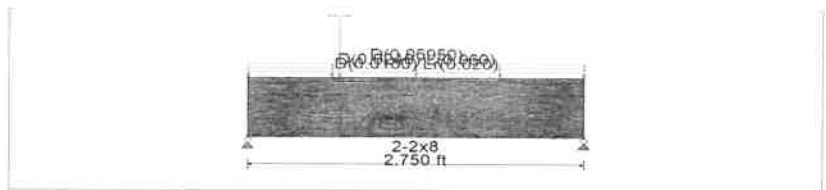
Beam self weight calculated and added to loads
 Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 1.0 ft
 Unif Load: D = 0.0240, L = 0.060 k/ft, Trib= 1.0 ft
 Unif Load: D = 0.0170 k/ft, Trib= 3.50 ft
 Point: D = 2.30, Lr = 1.570 k @ 0.750 ft

Design Summary

Max fb/Fb Ratio = **0.750 : 1**
 fb : Actual : 1,006.32 psi at 0.752 ft in Span # 1
 Fb : Allowable : 1,342.08 psi
 Load Comb : +D+Lr+H

Max fv/Fv Ratio = **0.893 : 1**
 fv : Actual : 200.89 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.82	0.08	1.17				
Right Support	0.77	0.08	0.46				



Max Deflections

Transient Downward	0.006 in	Total Downward	0.015 in
Ratio	5528	Ratio	2148
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB17A

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

BEAM Size : **5.5x12, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

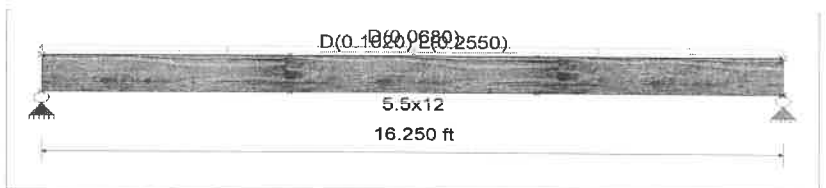
Beam self weight calculated and added to loads
 Unif Load: D = 0.0240, L = 0.060 k/ft, Trib= 4.250 ft
 Unif Load: D = 0.0170 k/ft, Trib= 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.553 : 1**
 fb : Actual : 1,318.23 psi at 8.125 ft in Span # 1
 Fb : Allowable : 2,385.09 psi
 Load Comb : +D+L+H

Max fv/Fv Ratio = **0.269 : 1**
 fv : Actual : 71.39 psi at 15.275 ft in Span # 1
 Fv : Allowable : 265.00 psi
 Load Comb : +D+L+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.50	2.07					
Right Support	1.50	2.07					



Max Deflections

Transient Downward	0.282 in	Total Downward	0.486 in
Ratio	691	Ratio	401
LC: L Only		LC: +D+L+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

GR

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 12:32PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB17B

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

BEAM Size : **2-2x10, Sawn, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0240, L = 0.060 k/ft, Trib= 1.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.651 : 1**
 fb : Actual : 640.25 psi at 5.375 ft in Span # 1
 Fb : Allowable : 982.75 psi
 Load Comb : +D+L+H

Max fv/FvRatio = **0.219 : 1**
 fv : Actual : 39.48 psi at 9.998 ft in Span # 1
 Fv : Allowable : 180.00 psi
 Load Comb : +D+L+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.53	0.32					
Right Support	0.53	0.32					



Max Deflections

Transient Downward	0.057 in	Total Downward	0.151 in
Ratio	2253	Ratio	855
LC: L Only		LC: +D+L+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB18

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

BEAM Size : **5.5x9, GLB, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 3.0 ft

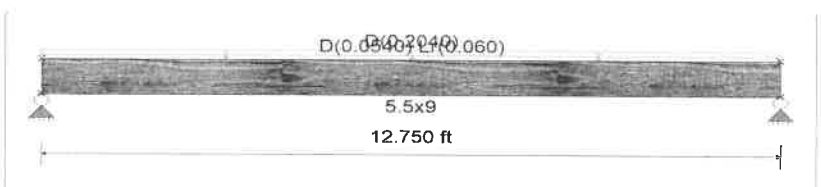
Unif Load: D = 0.0170 k/ft, Trib= 12.0 ft

Design Summary

Max fb/Fb Ratio = **0.412 : 1**
 fb : Actual : 882.53 psi at 6.375 ft in Span # 1
 Fb : Allowable : 2,140.04 psi
 Load Comb : +D+H

Max fv/FvRatio = **0.193 : 1**
 fv : Actual : 46.03 psi at 12.028 ft in Span # 1
 Fv : Allowable : 238.50 psi
 Load Comb : +D+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.71		0.38				
Right Support	1.71		0.38				



Max Deflections

Transient Downward	0.060 in	Total Downward	0.327 in
Ratio	2565	Ratio	468
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

G13

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 12:32PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB19

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

BEAM Size : **3-2x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 14.50 ft

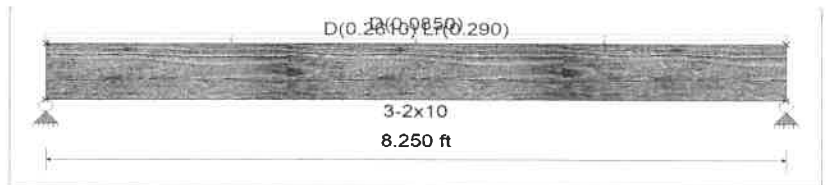
Unif Load: D = 0.0170 k/ft, Trib= 5.0 ft

Design Summary

Max fb/Fb Ratio = **0.837 : 1**
 fb : Actual : 1,026.19 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,226.49 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.347 : 1**
 fv : Actual : 77.98 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.46		1.20				
Right Support	1.46		1.20				



Max Deflections

Transient Downward	0.064 in	Total Downward	0.142 in
Ratio	1547	Ratio	695
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB20

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

BEAM Size : **3-2x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 15.250 ft

Unif Load: D = 0.0170 k/ft, Trib= 1.250 ft

Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.743 : 1**
 fb : Actual : 911.25 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,226.49 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.308 : 1**
 fv : Actual : 69.25 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.10		1.26				
Right Support	1.10		1.26				



Max Deflections

Transient Downward	0.067 in	Total Downward	0.126 in
Ratio	1470	Ratio	783
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

GH

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 12:32PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
 IRON/ROCK ENGINEERING

Wood Beam Design : BEAM RB21

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

BEAM Size : **5.5x10.5, GLB, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 3.0 ft

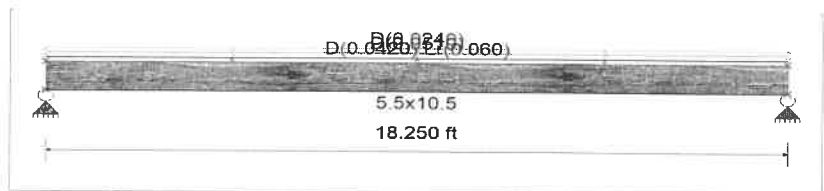
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.321 : 1**
 fb : Actual : 936.86 psi at 9.125 ft in Span # 1
 Fb : Allowable : 2,918.59 psi
 Load Comb : +D+Lr+H

Max fv/Fv Ratio = **0.123 : 1**
 fv : Actual : 40.73 psi at 0.000 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.18		0.55				
Right Support	1.18		0.55				



Max Deflections

Transient Downward	0.158 in	Total Downward	0.498 in
Ratio	1389	Ratio	439
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB22

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

BEAM Size : **5.5x10.5, GLB, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 8.0 ft

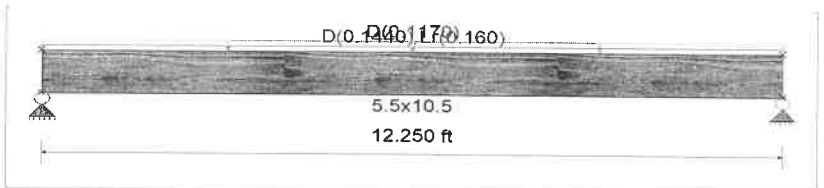
Unif Load: D = 0.0260 k/ft, Trib= 4.50 ft

Design Summary

Max fb/Fb Ratio = **0.327 : 1**
 fb : Actual : 965.56 psi at 6.125 ft in Span # 1
 Fb : Allowable : 2,952.43 psi
 Load Comb : +D+Lr+H

Max fv/Fv Ratio = **0.179 : 1**
 fv : Actual : 59.31 psi at 0.000 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.68		0.98				
Right Support	1.68		0.98				



Max Deflections

Transient Downward	0.085 in	Total Downward	0.231 in
Ratio	1722	Ratio	635
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

GS

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:17PM

File: LH ENCLAVES LOT 20_CALCS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20 5.31

IRON ROCK ENGINEERING

Multiple Simple Beam

Lic. #: KW-06005427

Description : ROOF BEAMS 3

Wood Beam Design : BEAM RB23

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

BEAM Size : **5.5x30, GLB, Braced @ 1/4 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 15.250 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, 0.0 to 19.330 ft, Trib= 7.750 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, 19.330 to 31.0 ft, Trib= 4.750 ft

Unif Load: D = 0.0170 k/ft, Trib= 7.330 ft

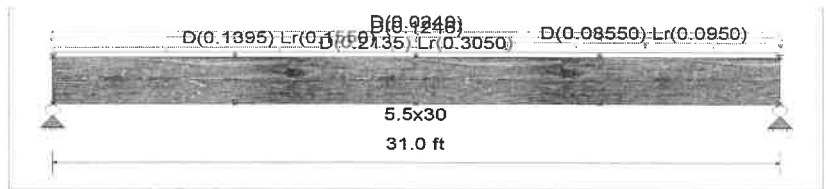
Unif Load: D = 0.0240 k/ft, 0.0 to 31.0 ft

Design Summary

Max fb/Fb Ratio = **0.645 : 1**
 fb : Actual : 1,686.67 psi at 15.293 ft in Span # 1
 Fb : Allowable : 2,614.24 psi
 Load Comb : +D+Lr+H

Max fv/Fv Ratio = **0.350 : 1**
 fv : Actual : 115.78 psi at 0.000 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	Lr	S	W	E	H
Left Support	8.21	7.00				
Right Support	7.82	6.56				



Max Deflections

Transient Downward	0.414 in	Total Downward	0.902 in
Ratio	898	Ratio	412
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB24

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

BEAM Size : **5.5x12, GLB, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 4.0 ft

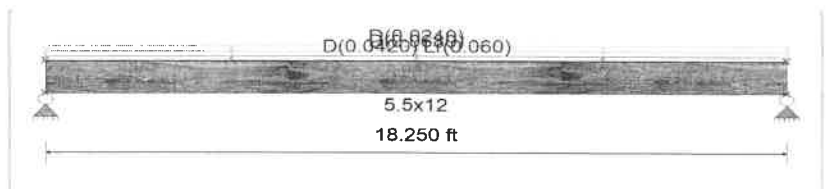
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.272 : 1**
 fb : Actual : 788.39 psi at 9.125 ft in Span # 1
 Fb : Allowable : 2,900.58 psi
 Load Comb : +D+Lr+H

Max fv/Fv Ratio = **0.117 : 1**
 fv : Actual : 38.59 psi at 0.000 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	Lr	S	W	E	H
Left Support	1.35	0.55				
Right Support	1.35	0.55				



Max Deflections

Transient Downward	0.106 in	Total Downward	0.367 in
Ratio	2073	Ratio	597
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

GLB

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:17PM

Multiple Simple Beam

LIC. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.S.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
 IRON ROCK ENGINEERING

Steel Beam Design : BEAM RB25

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16

STEEL Section : W21x57, Braced @ 1/4 Points

Using Load Resistance Factor Design with IBC 2018 Load Combinations, Major Axis Bending

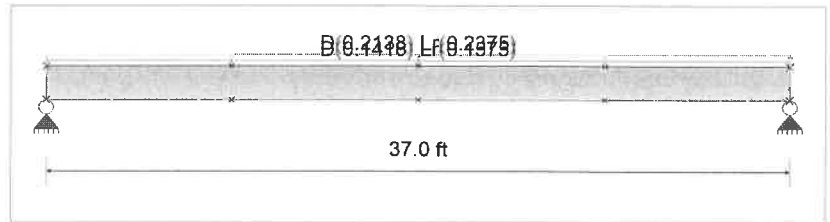
Fy = 50.0 ksi E = 29,000.0 ksi

Applied Loads

Beam self weight calculated and added to loads
 Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 7.875 ft
 Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 11.875 ft

Design Summary

Max fb/Fb Ratio = 0.462 : 1
 Mu : Applied 192.826 k-ft at 18.500 ft in Span # 1
 Mn * Phi : Allow 416.998 k-ft
 Load Comb : +1.20D+1.60Lr+0.50L+1.60H
 Max fv/FvRatio = 0.081 : 1
 Vu : Applied 20.846 k at 37.000 ft in Span # 1
 Vn * Phi : Allow 256.365 k
 Load Comb : +1.20D+1.60Lr+0.50L+1.60H



Max Reactions (k)	D	L	Lr	S	W	E	H	Max Deflections			
Left Support	7.63		7.31					Transient Downward	0.494 in	Total Downward	1.009 in
Right Support	7.63		7.31					Ratio	899		440
								LC: Lr Only		LC: +D+Lr+H	
								Transient Upward	0.000 in	Total Upward	0.000 in
								Ratio	9999	Ratio	9999
								LC:		LC:	

G7

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:17PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
 IRON/ROCK ENGINEERING

Wood Beam Design : BEAM RB26

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

BEAM Size : **3-2x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 13.875 ft

Unif Load: D = 0.0170 k/ft, Trib= 5.0 ft

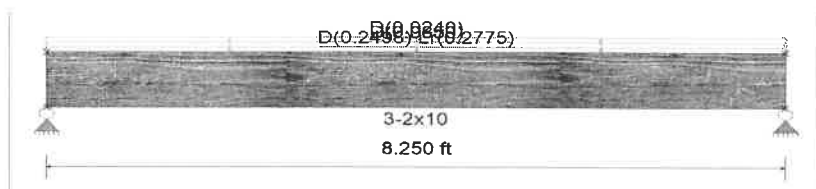
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.837 : 1**
 fb : Actual : 1,026.59 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,226.49 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.347 : 1**
 fv : Actual : 78.01 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.52		1.14				
Right Support	1.52		1.14				



Max Deflections

Transient Downward	0.061 in	Total Downward	0.142 in
Ratio	1616	Ratio	695
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB27

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

BEAM Size : **4x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 7.375 ft

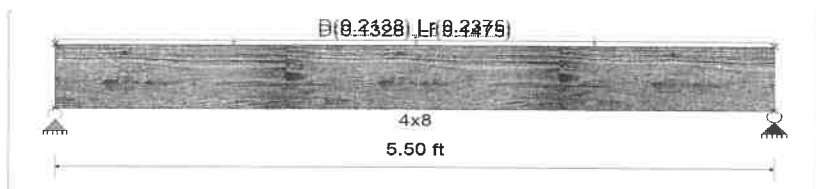
Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 11.875 ft

Design Summary

Max fb/Fb Ratio = **0.753 : 1**
 fb : Actual : 1,090.66 psi at 2.750 ft in Span # 1
 Fb : Allowable : 1,448.77 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.419 : 1**
 fv : Actual : 94.25 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.97		1.06				
Right Support	0.97		1.06				



Max Deflections

Transient Downward	0.045 in	Total Downward	0.086 in
Ratio	1472	Ratio	769
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

618

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:17PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.S66
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB28

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

BEAM Size : **2-2x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 9.50 ft

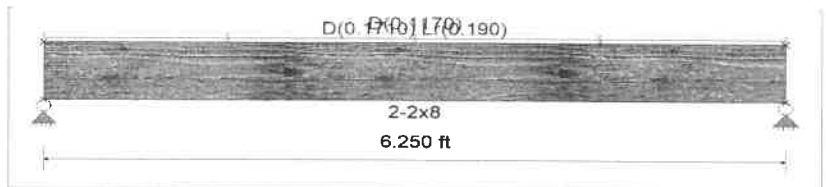
Unif Load: D = 0.0260 k/ft, Trib= 4.50 ft

Design Summary

Max fb/Fb Ratio = **0.809 : 1**
 fb : Actual : 1,076.21 psi at 3.125 ft in Span # 1
 Fb : Allowable : 1,331.03 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.376 : 1**
 fv : Actual : 84.61 psi at 5.667 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.91		0.59				
Right Support	0.91		0.59				



Max Deflections

Transient Downward	0.043 in	Total Downward	0.109 in
Ratio	1743	Ratio	686
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB29

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

BEAM Size : **4x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 9.625 ft

Unif Load: D = 0.0170 k/ft, Trib= 3.0 ft

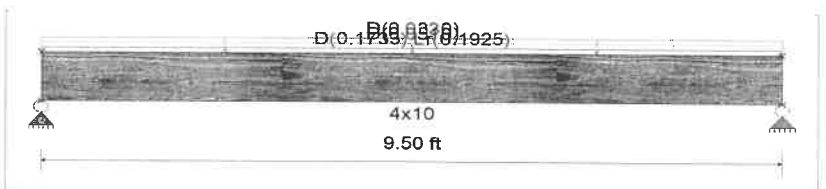
Unif Load: D = 0.0120 k/ft, Trib= 2.750 ft

Design Summary

Max fb/Fb Ratio = **0.938 : 1**
 fb : Actual : 1,238.89 psi at 4.750 ft in Span # 1
 Fb : Allowable : 1,320.87 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.375 : 1**
 fv : Actual : 84.44 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.26		0.91				
Right Support	1.26		0.91				



Max Deflections

Transient Downward	0.096 in	Total Downward	0.228 in
Ratio	1187	Ratio	500
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

G19

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:17PM

Multiple Simple Beam

Lic #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.CS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB30

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

BEAM Size : **4x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0260, Lr = 0.020 k/ft, 0.0 ft to 10.180 ft, Trib= 6.250 ft

Unif Load: D = 0.0170 k/ft, Trib= 2.0 ft

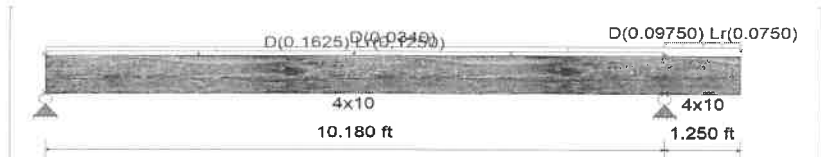
Unif Load: D = 0.0260, Lr = 0.020 k/ft, 10.180 to 11.430 ft, Trib= 3.750 ft

Design Summary

Max fb/Fb Ratio = **0.766 : 1**
 fb : Actual : 1,010.18 psi at 5.039 ft in Span # 1
 Fb : Allowable : 1,318.34 psi
 Load Comb : +D+Lr+H, LL Comb Run (L*)

Max fv/FvRatio = **0.296 : 1**
 fv : Actual : 66.61 psi at 9.417 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H, LL Comb Run (LL)

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	1.03		0.64				
Right Support	1.22		0.74				



Max Deflections

Transient Downward	0.082 in	Total Downward	0.213 in
Ratio	1481	Ratio	572
Lr Only, LL Comb Run (L*		+Lr+H, LL Comb Run (L*	
Transient Upward	-0.032 in	Total Upward	-0.082 in
Ratio	932	Ratio	364
Lr Only, LL Comb Run (L*		+Lr+H, LL Comb Run (L*	

Wood Beam Design : BEAM RB31

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

BEAM Size : **4x10, Sawn, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0260, Lr = 0.020 k/ft, Trib= 1.0 ft

Unif Load: D = 0.0170 k/ft, 0.0 to 5.50 ft, Trib= 8.330 ft

Unif Load: D = 0.0140, Lr = 0.020 k/ft, 0.0 to 5.50 ft, Trib= 1.50 ft

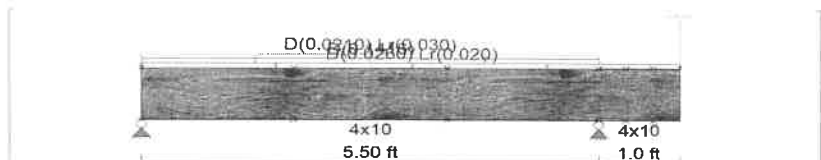
Point: D = 1.220, Lr = 0.740 k @ 6.50 ft

Design Summary

Max fb/Fb Ratio = **0.355 : 1**
 fb : Actual : 477.57 psi at 5.500 ft in Span # 1
 Fb : Allowable : 1,345.21 psi
 Load Comb : +D+Lr+H, LL Comb Run (*L)

Max fv/FvRatio = **0.406 : 1**
 fv : Actual : 91.38 psi at 5.500 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H, LL Comb Run (*L)

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.31		0.14				
Right Support	2.02		1.03				



Max Deflections

Transient Downward	0.008 in	Total Downward	0.014 in
Ratio	3160	Ratio	1742
Lr Only, LL Comb Run (*L		+Lr+H, LL Comb Run (*L	
Transient Upward	-0.007 in	Total Upward	-0.008 in
Ratio	9630	Ratio	8341
Lr Only, LL Comb Run (*L		+Lr+H, LL Comb Run (*L	

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:17PM

File: LH ENCLAVES LOT 20_CALC.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Multiple Simple Beam

Lic. #: KW-06005427

Wood Beam Design : BEAM RB32

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

BEAM Size : **2-2x8, Sawn, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0260, Lr = 0.020 k/ft, Trib= 3.50 ft

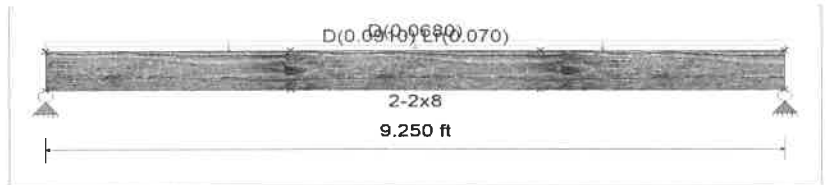
Unif Load: D = 0.0170 k/ft, Trib= 4.0 ft

Design Summary

Max fb/Fb Ratio = **0.851 : 1**
 fb : Actual : 1,141.34 psi at 4.625 ft in Span # 1
 Fb : Allowable : 1,341.00 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.289 : 1**
 fv : Actual : 65.10 psi at 8.664 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.76		0.32				
Right Support	0.76		0.32				



Max Deflections

Transient Downward	0.076 in	Total Downward	0.254 in
Ratio	1459	Ratio	437
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB33

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

BEAM Size : **2-2x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 2.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 1.50 ft

Unif Load: D = 0.0120 k/ft, Trib= 1.0 ft

Design Summary

Max fb/Fb Ratio = **0.185 : 1**
 fb : Actual : 245.72 psi at 3.125 ft in Span # 1
 Fb : Allowable : 1,331.03 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.086 : 1**
 fv : Actual : 19.32 psi at 5.667 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.22		0.13				
Right Support	0.22		0.13				



Max Deflections

Transient Downward	0.009 in	Total Downward	0.025 in
Ratio	8280	Ratio	3005
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

GA

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.

Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:17PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCOS.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB34

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

BEAM Size : **4x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900.0 psi	Fc - Prll	1,350.0 psi	Fv	180.0 psi	Ebend- xx	1,600.0 ksi	Density	31.210 pcf
Fb - Compr	900.0 psi	Fc - Perp	625.0 psi	Ft	575.0 psi	Eminbend - xx	580.0 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 3.50 ft

Unif Load: D = 0.0170 k/ft, Trib= 2.0 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 3.0 ft

Design Summary

Max fb/Fb Ratio = **0.837 : 1**
 fb : Actual : 1,203.13 psi at 4.750 ft in Span # 1
 Fb : Allowable : 1,437.71 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.297 : 1**
 fv : Actual : 66.82 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.68		0.62				
Right Support	0.68		0.62				



Max Deflections

Transient Downward	0.135 in	Total Downward	0.282 in
Ratio	846	Ratio	403
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

CR

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.

Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 6 AUG 2022, 4:45PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.CALCS.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Description : ROOF BEAMS 4

Wood Beam Design : BEAM RB35 (HIGH)

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

BEAM Size : **4x10, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 3.50 ft

Design Summary

Max fb/Fb Ratio = **0.622 : 1**
fb : Actual : 814.11 psi at 6.125 ft in Span # 1
Fb : Allowable : 1,309.17 psi
Load Comb : +D+Lr+H

Max fv/FvRatio = **0.200 : 1**
fv : Actual : 45.08 psi at 0.000 ft in Span # 1
Fv : Allowable : 225.00 psi
Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.74		0.37				
Right Support	0.74		0.37				



Max Deflections

Transient Downward	0.083 in	Total Downward	0.249 in
Ratio	1776	Ratio	590
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB35 (LOW)

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

BEAM Size : **5.5x12, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 7.0 ft

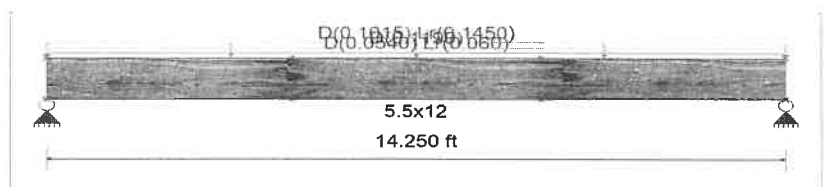
Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 7.250 ft

Design Summary

Max fb/Fb Ratio = **0.382 : 1**
fb : Actual : 1,139.47 psi at 7.125 ft in Span # 1
Fb : Allowable : 2,979.35 psi
Load Comb : +D+Lr+H

Max fv/FvRatio = **0.208 : 1**
fv : Actual : 68.77 psi at 0.000 ft in Span # 1
Fv : Allowable : 331.25 psi
Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	2.06		1.46				
Right Support	2.06		1.46				



Max Deflections

Transient Downward	0.134 in	Total Downward	0.323 in
Ratio	1274	Ratio	529
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

IR

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:45PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB36

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

BEAM Size : **5.5x19.5, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

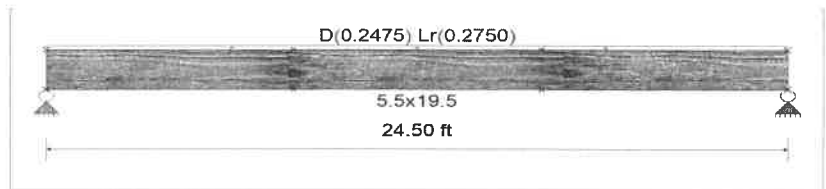
Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 13.750 ft

Design Summary

Max fb/Fb Ratio = **0.504 : 1**
 fb : Actual : 1,409.72 psi at 12.250 ft in Span # 1
 Fb : Allowable : 2,794.31 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.247 : 1**
 fv : Actual : 81.66 psi at 0.000 ft in Span # 1
 Fv : Allowable : 331.25 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	3.32		3.37				
Right Support	3.32		3.37				



Max Deflections

Transient Downward	0.366 in	Total Downward	0.727 in
Ratio	802	Ratio	404
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB37

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

BEAM Size : **6x6, Sawn, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 2.0 ft

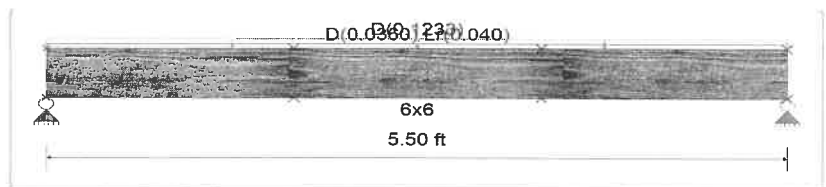
Unif Load: D = 0.0170 k/ft, Trib= 7.250 ft

Design Summary

Max fb/Fb Ratio = **0.335 : 1**
 fb : Actual : 271.32 psi at 2.750 ft in Span # 1
 Fb : Allowable : 810.00 psi
 Load Comb : +D+H

Max fv/FvRatio = **0.117 : 1**
 fv : Actual : 18.99 psi at 5.060 ft in Span # 1
 Fv : Allowable : 162.00 psi
 Load Comb : +D+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.46		0.11				
Right Support	0.46		0.11				



Max Deflections

Transient Downward	0.007 in	Total Downward	0.035 in
Ratio	9725	Ratio	1890
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

624

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:45PM

Multiple Simple Beam

Lic. #: KW06005427

File: LH ENCLAVES LOT 20_CALC.S.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
 IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB38

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

BEAM Size : **2-2x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 6.180 ft

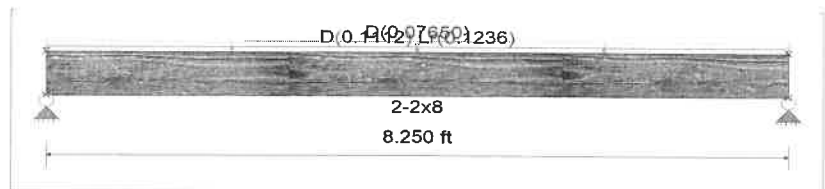
Unif Load: D = 0.0170 k/ft, Trib= 4.50 ft

Design Summary

Max fb/Fb Ratio = **0.927 : 1**
 fb : Actual : 1,227.76 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,324.17 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.344 : 1**
 fv : Actual : 77.32 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.79		0.51				
Right Support	0.79		0.51				



Max Deflections

Transient Downward	0.085 in	Total Downward	0.217 in
Ratio	1165	Ratio	455
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB39

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

BEAM Size : **2-2x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 3.0 ft

Unif Load: D = 0.0260 k/ft, Trib= 2.50 ft

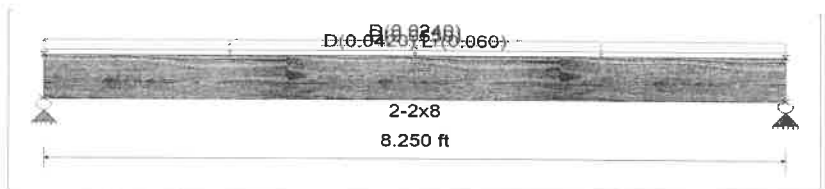
Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Design Summary

Max fb/Fb Ratio = **0.574 : 1**
 fb : Actual : 760.28 psi at 4.125 ft in Span # 1
 Fb : Allowable : 1,324.17 psi
 Load Comb : +D+Lr+H

Max fv/FvRatio = **0.213 : 1**
 fv : Actual : 47.88 psi at 0.000 ft in Span # 1
 Fv : Allowable : 225.00 psi
 Load Comb : +D+Lr+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.56		0.25				
Right Support	0.56		0.25				



Max Deflections

Transient Downward	0.041 in	Total Downward	0.135 in
Ratio	2400	Ratio	735
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

G25

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.

Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 6 AUG 2022, 4:45PM

Multiple Simple Beam

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALCS.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB40A

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

BEAM Size : **5.5x10.5, GLB, Braced @ 1/3 Points**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : DF/DF

Wood Grade : 24F - V4

Fb - Tension	2400 psi	Fc - Prll	1650 psi	Fv	265 psi	Ebend- xx	1800 ksi	Density	31.21 pcf
Fb - Compr	1850 psi	Fc - Perp	650 psi	Ft	1100 psi	Eminbend - xx	950 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 13.0 ft

Unif Load: D = 0.0170 k/ft, Trib= 4.0 ft

Unif Load: D = 0.0120 k/ft, Trib= 2.0 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, Trib= 6.0 ft

Design Summary

Max fb/Fb Ratio = **0.602 : 1**
fb : Actual : 1,796.19 psi at 6.250 ft in Span # 1
fb : Allowable : 2,984.59 psi
Load Comb : +D+Lr+H

Max fv/FvRatio = **0.329 : 1**
fv : Actual : 108.97 psi at 11.667 ft in Span # 1
Fv : Allowable : 331.25 psi
Load Comb : +D+Lr+H

Max Reactions (k)	<u>D</u>	<u>L</u>	<u>Lr</u>	<u>S</u>	<u>W</u>	<u>E</u>	<u>H</u>
Left Support	2.47		2.38				
Right Support	2.47		2.38				



Max Deflections

Transient Downward	0.220 in	Total Downward	0.448 in
Ratio	682	Ratio	334
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM RB40B

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

BEAM Size : **6x8, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, 0.0 ft to 3.250 ft, Trib= 14.0 ft

Unif Load: D = 0.0170 k/ft, 0.0 to 3.250 ft, Trib= 4.0 ft

Unif Load: D = 0.0120 k/ft, 0.0 to 3.250 ft, Trib= 2.0 ft

Unif Load: D = 0.0180, Lr = 0.020 k/ft, 3.250 to 6.580 ft, Trib= 2.0 ft

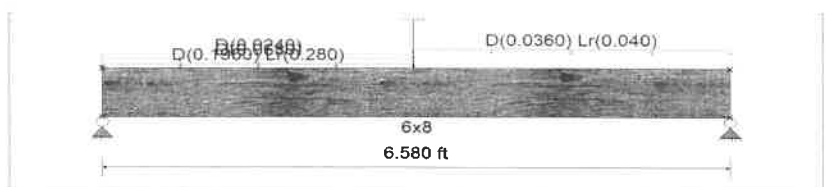
Point: D = 0.40, Lr = 0.30 k @ 3.250 ft

Design Summary

Max fb/Fb Ratio = **0.607 : 1**
fb : Actual : 681.23 psi at 3.180 ft in Span # 1
fb : Allowable : 1,121.40 psi
Load Comb : +D+Lr+H

Max fv/FvRatio = **0.240 : 1**
fv : Actual : 53.95 psi at 0.000 ft in Span # 1
Fv : Allowable : 225.00 psi
Load Comb : +D+Lr+H

Max Reactions (k)	<u>D</u>	<u>L</u>	<u>Lr</u>	<u>S</u>	<u>W</u>	<u>E</u>	<u>H</u>
Left Support	0.97		0.87				
Right Support	0.55		0.47				



Max Deflections

Transient Downward	0.032 in	Total Downward	0.068 in
Ratio	2492	Ratio	1158
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

626

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 6 AUG 2022, 4:45PM

Multiple Simple Beam

File: # KW-06005427

File: LH ENCLAVES LOT 20_CALC.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31
 IRON ROCK ENGINEERING

Wood Beam Design : BEAM RB41

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

BEAM Size : **2-2x6, Sawn, Fully Unbraced**

Using Allowable Stress Design with IBC 2018 Load Combinations, Major Axis Bending

Wood Species : Douglas Fir - Larch

Wood Grade : No.2

Fb - Tension	900 psi	Fc - Prll	1350 psi	Fv	180 psi	Ebend- xx	1600 ksi	Density	31.21 pcf
Fb - Compr	900 psi	Fc - Perp	625 psi	Ft	575 psi	Eminbend - xx	580 ksi		

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.0140, Lr = 0.020 k/ft, Trib= 2.50 ft

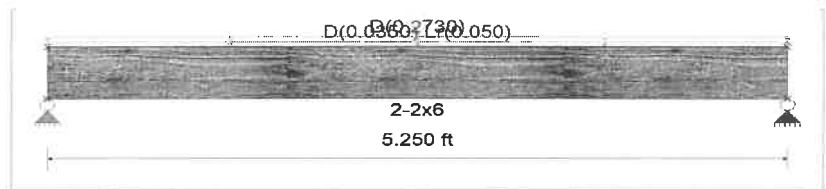
Unif Load: D = 0.0260 k/ft, Trib= 10.50 ft

Design Summary

Max fb/Fb Ratio = **0.814 : 1**
 fb : Actual : 851.68 psi at 2.625 ft in Span # 1
 Fb : Allowable : 1,046.56 psi
 Load Comb : +D+H

Max fv/FvRatio = **0.379 : 1**
 fv : Actual : 61.47 psi at 4.795 ft in Span # 1
 Fv : Allowable : 162.00 psi
 Load Comb : +D+H

Max Reactions (k)	D	L	Lr	S	W	E	H
Left Support	0.82		0.13				
Right Support	0.82		0.13				



Max Deflections

Transient Downward	0.013 in	Total Downward	0.093 in
Ratio	4879	Ratio	674
LC: Lr Only		LC: +D+Lr+H	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	



Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 1:54AM

File: LH ENCLAVES LOT 20_CALCS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Wood Column

Lic. #: KW-06005427

DESCRIPTION: TYP. STUD AT 16' TALL WALL

Code References

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

Load Combinations Used : IBC 2018

General Information

Analysis Method :	Allowable Stress Design			Wood Section Name	2x6	
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber	
Overall Column Height	16 ft			Wood Member Type	Sawn	
(Used for non-slender calculations)						
Wood Species	Douglas Fir - Larch			Exact Width	1.50 in	Allow Stress Modification Factors
Wood Grade	No.2			Exact Depth	5.50 in	
Fb +	900 psi	Fv	180 psi	Area	8.250 in^2	Cf or Cv for Bending 1.30
Fb -	900 psi	Ft	575 psi	Ix	20.797 in^4	Cf or Cv for Compression 1.10
Fc - Prll	1350 psi	Density	31.21 pcf	Iy	1.547 in^4	Cf or Cv for Tension 1.30
Fc - Perp	625 psi					Cm : Wet Use Factor 1.0
						Ct : Temperature Factor 1.0
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial			Cfu : Flat Use Factor 1.0
	Basic	1600	1600	1600 ksi		Kf : Built-up columns 1.0 NDS 15.3.2
	Minimum	580	580			Use Cr : Repetitive ? No
Brace condition for deflection (buckling) along columns :						
X-X (width) axis :					Fully braced against buckling ABOUT Y-Y Axis	
Y-Y (depth) axis :					Unbraced Length for buckling ABOUT X-X Axis = 16 ft, K = 1.0	

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 28.609 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 16.0 ft, D = 0.2830, Lr = 0.4050 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, W = 0.01380 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2586 : 1**
 Load Combination +D+0.60W+H
 Governing NDS Formula 1Comp + Mxx, NDS Eq. 3.9-3
 Location of max.above base 7.946 ft
 At maximum location values are . . .
 Applied Axial 0.3116 k
 Applied Mx 0.2649 k-ft
 Applied My 0.0 k-ft
 Fc : Allowable 377.001 psi

Maximum SERVICE Lateral Load Reactions . .
 Top along Y-Y 0.1104 k Bottom along Y-Y 0.1104 k
 Top along X-X 0.0 k Bottom along X-X 0.0 k

Maximum SERVICE Load Lateral Deflections . . .
 Along Y-Y 0.6181 in at 8.054 ft above base
 for load combination : W Only
 Along X-X 0.0 in at 0.0 ft above base
 for load combination : n/a

Other Factors used to calculate allowable stresses . . .
 Bending Compression Tension

PASS Maximum Shear Stress Ratio = **0.04182 : 1**
 Load Combination +D+0.60W+H
 Location of max.above base 0.0 ft
 Applied Design Shear 12.044 psi
 Allowable Shear 288.0 psi

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+H	0.900	0.272	0.1038	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+L+H	1.000	0.247	0.1029	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+Lr+H	1.250	0.201	0.2332	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+S+H	1.150	0.217	0.1019	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+0.750Lr+0.750L+H	1.250	0.201	0.2002	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+0.750L+0.750S+H	1.150	0.217	0.1019	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+0.60W+H	1.600	0.159	0.2586	PASS	7.946 ft	0.04182	PASS	0.0 ft
+D+0.70E+H	1.600	0.159	0.1002	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.159	0.2473	PASS	7.946 ft	0.03136	PASS	0.0 ft

628

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 10 AUG 2022, 1:54AM

File: LH ENCLAVES LOT 20_CALC5.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Wood Column

Lic. #: KW-06005427

IRON ROCK ENGINEERING

DESCRIPTION: TYP. STUD AT 16' TALL WALL

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+0.750L+0.750S+0.450W+H	1.600	0.159	0.1965	PASS	7.946 ft	0.03136	PASS	0.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.159	0.1002	PASS	0.0 ft	0.0	PASS	16.0 ft
+0.60D+0.60W+0.60H	1.600	0.159	0.2420	PASS	7.946 ft	0.04182	PASS	0.0 ft
+0.60D+0.70E+0.60H	1.600	0.159	0.06011	PASS	0.0 ft	0.0	PASS	16.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
+D+H						0.312					
+D+L+H						0.312					
+D+Lr+H						0.717					
+D+S+H						0.312					
+D+0.750Lr+0.750L+H						0.615					
+D+0.750L+0.750S+H						0.312					
+D+0.60W+H				0.066	0.066	0.312					
+D+0.70E+H						0.312					
+D+0.750Lr+0.750L+0.450W+H				0.050	0.050	0.615					
+D+0.750L+0.750S+0.450W+H				0.050	0.050	0.312					
+D+0.750L+0.750S+0.5250E+H						0.312					
+0.60D+0.60W+0.60H				0.066	0.066	0.187					
+0.60D+0.70E+0.60H						0.187					
D Only						0.312					
Lr Only						0.405					
L Only											
S Only											
W Only				0.110	0.110						
E Only											
H Only											

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance	Max. Y-Y Deflection		Distance
+D+H	0.0000	in	0.000	0.0000	in	0.000
+D+L+H	0.0000	in	0.000	0.0000	in	0.000
+D+Lr+H	0.0000	in	0.000	0.0000	in	0.000
+D+S+H	0.0000	in	0.000	0.0000	in	0.000
+D+0.750Lr+0.750L+H	0.0000	in	0.000	0.0000	in	0.000
+D+0.750L+0.750S+H	0.0000	in	0.000	0.0000	in	0.000
+D+0.60W+H	0.0000	in	0.000	0.3709	in	8.054
+D+0.70E+H	0.0000	in	0.000	0.0000	in	0.000
+D+0.750Lr+0.750L+0.450W+H	0.0000	in	0.000	0.2782	in	8.054
+D+0.750L+0.750S+0.450W+H	0.0000	in	0.000	0.2782	in	8.054
+D+0.750L+0.750S+0.5250E+H	0.0000	in	0.000	0.0000	in	0.000
+0.60D+0.60W+0.60H	0.0000	in	0.000	0.3709	in	8.054
+0.60D+0.70E+0.60H	0.0000	in	0.000	0.0000	in	0.000
D Only	0.0000	in	0.000	0.0000	in	0.000
Lr Only	0.0000	in	0.000	0.0000	in	0.000
L Only	0.0000	in	0.000	0.0000	in	0.000
S Only	0.0000	in	0.000	0.0000	in	0.000
W Only	0.0000	in	0.000	0.6181	in	8.054
E Only	0.0000	in	0.000	0.0000	in	0.000
H Only	0.0000	in	0.000	0.0000	in	0.000

629

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 1:54AM

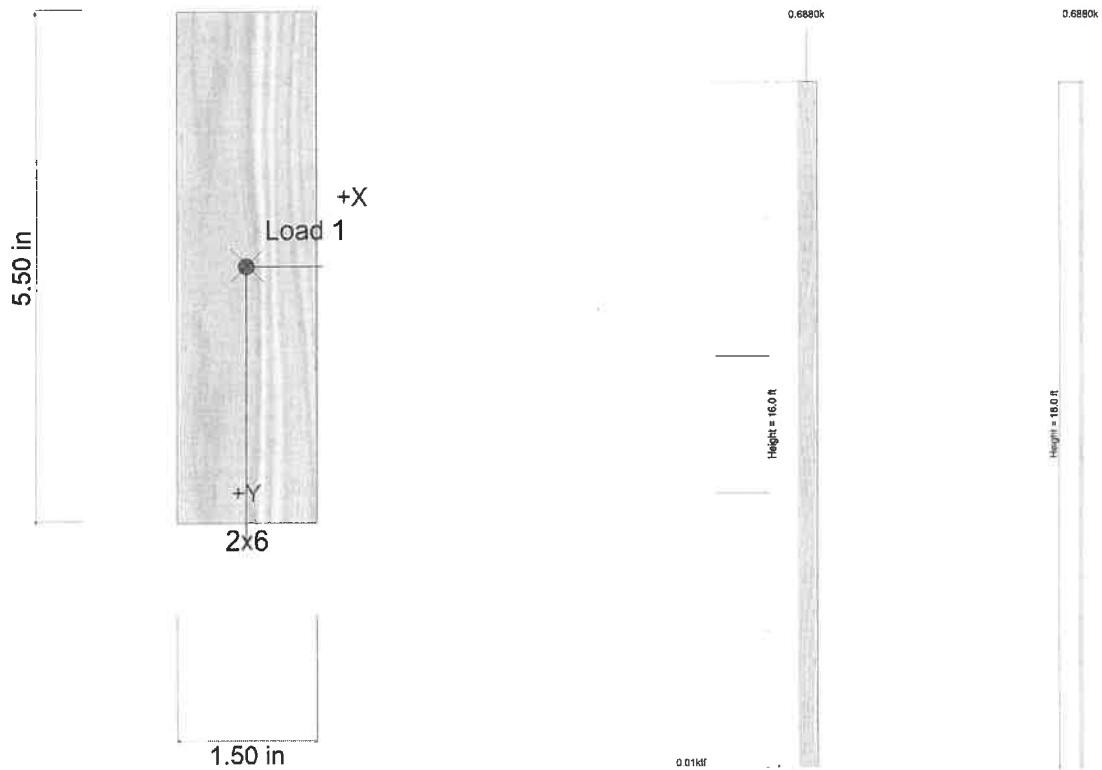
Wood Column

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
IRON ROCK ENGINEERING

DESCRIPTION: TYP. STUD AT 16' TALL WALL

Sketches



530

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 1:56AM

Wood Column

File: LH ENCLAVES LOT 20_CALC.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
IRON ROCK ENGINEERING

Lic. #: KW-06005427

DESCRIPTION: KING STUDS AT 8' OPENING - 16' TALL WALL

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Analysis Method :		Allowable Stress Design		Wood Section Name		5-2x6	
End Fixities		Top & Bottom Pinned		Wood Grading/Manuf.		Graded Lumber	
Overall Column Height		16 ft		Wood Member Type		Sawn	
(Used for non-slender calculations)				Exact Width		7.50 in	
Wood Species		Douglas Fir - Larch		Exact Depth		5.50 in	
Wood Grade		No.2		Area		41.250 in^2	
Fb +	900.0 psi	Fv	180.0 psi	Ix		103.984 in^4	
Fb -	900.0 psi	Ft	575.0 psi	Iy		193.359 in^4	
Fc - Prll	1,350.0 psi	Density	31.210 pcf	Allow Stress Modification Factors			
Fc - Perp	625.0 psi			Cf or Cv for Bending 1.30			
E : Modulus of Elasticity . . .		x-x Bending	y-y Bending	Axial		Cf or Cv for Compression 1.10	
Basic		1,600.0	1,600.0	1,600.0 ksi		Cf or Cv for Tension 1.30	
Minimum		580.0	580.0			Cm : Wet Use Factor 1.0	
						Ct : Temperature Factor 1.0	
						Cfu : Flat Use Factor 1.0	
						Kf : Built-up columns 1.0 NDS 15.3.2	
						Use Cr : Repetitive ? No	
Brace condition for deflection (buckling) along columns :							
				X-X (width) axis :		Fully braced against buckling ABOUT Y-Y Axis	
				Y-Y (depth) axis :		Unbraced Length for buckling ABOUT X-X Axis = 16 ft, K = 1.0	

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 143.046 lbs * Dead Load Factor

AXIAL LOADS ...

Axial Load at 16.0 ft, D = 0.2830, Lr = 0.4050 k

BENDING LOADS ...

Lat. Uniform Load creating Mx-x, W = 0.0650 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.2180 : 1**
Load Combination +D+0.60W+H
Governing NDS Formula 1Comp + Mxx, NDS Eq. 3.9-3
Location of max.above base 7.946 ft
At maximum location values are ...
Applied Axial 0.4260 k
Applied Mx 1.248 k-ft
Applied My 0.0 k-ft
Fc : Allowable 377.001 psi

Maximum SERVICE Lateral Load Reactions ...

Top along Y-Y	0.520 k	Bottom along Y-Y	0.520 k
Top along X-X	0.0 k	Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections ...

Along Y-Y	0.5823 in	at	8.054 ft	above base
for load combination : W Only				
Along X-X	0.0 in	at	0.0 ft	above base
for load combination : n/a				

Other Factors used to calculate allowable stresses ...

<u>Bending</u>	<u>Compression</u>	<u>Tension</u>
----------------	--------------------	----------------

PASS Maximum Shear Stress Ratio = **0.03939 : 1**
Load Combination +D+0.60W+H
Location of max.above base 0.0 ft
Applied Design Shear 11.345 psi
Allowable Shear 288.0 psi

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+H	0.900	0.272	0.02838	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+L+H	1.000	0.247	0.02813	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+Lr+H	1.250	0.201	0.05408	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+S+H	1.150	0.217	0.02786	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+0.750Lr+0.750L+H	1.250	0.201	0.04749	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+0.750L+0.750S+H	1.150	0.217	0.02786	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+0.60W+H	1.600	0.159	0.2180	PASS	7.946 ft	0.03939	PASS	0.0 ft
+D+0.70E+H	1.600	0.159	0.02740	PASS	0.0 ft	0.0	PASS	16.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.159	0.1684	PASS	7.946 ft	0.02955	PASS	0.0 ft

31

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 10 AUG 2022, 1:56AM

Wood Column

File: LH ENCLAVES LOT 20_CALC.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. #: KW-06005427

IRON ROCK ENGINEERING

DESCRIPTION: KING STUDS AT 8' OPENING - 16' TALL WALL

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+0.750L+0.750S+0.450W+H	1.600	0.159	0.1637	PASS	7.946 ft	0.02955	PASS	0.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.159	0.02740	PASS	0.0 ft	0.0	PASS	16.0 ft
+0.60D+0.60W+0.60H	1.600	0.159	0.2152	PASS	7.946 ft	0.03939	PASS	0.0 ft
+0.60D+0.70E+0.60H	1.600	0.159	0.01644	PASS	0.0 ft	0.0	PASS	16.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
+D+H						0.426					
+D+L+H						0.426					
+D+Lr+H						0.831					
+D+S+H						0.426					
+D+0.750Lr+0.750L+H						0.730					
+D+0.750L+0.750S+H						0.426					
+D+0.60W+H				0.312	0.312	0.426					
+D+0.70E+H						0.426					
+D+0.750Lr+0.750L+0.450W+H				0.234	0.234	0.730					
+D+0.750L+0.750S+0.450W+H				0.234	0.234	0.426					
+D+0.750L+0.750S+0.5250E+H						0.426					
+0.60D+0.60W+0.60H				0.312	0.312	0.256					
+0.60D+0.70E+0.60H						0.256					
D Only						0.426					
Lr Only						0.405					
L Only											
S Only											
W Only				0.520	0.520						
E Only											
H Only											

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance	Max. Y-Y Deflection		Distance
+D+H	0.0000	in	0.000	0.0000	in	0.000
+D+L+H	0.0000	in	0.000	0.0000	in	0.000
+D+Lr+H	0.0000	in	0.000	0.0000	in	0.000
+D+S+H	0.0000	in	0.000	0.0000	in	0.000
+D+0.750Lr+0.750L+H	0.0000	in	0.000	0.0000	in	0.000
+D+0.750L+0.750S+H	0.0000	in	0.000	0.0000	in	0.000
+D+0.60W+H	0.0000	in	0.000	0.3494	in	8.054
+D+0.70E+H	0.0000	in	0.000	0.0000	in	0.000
+D+0.750Lr+0.750L+0.450W+H	0.0000	in	0.000	0.2620	in	8.054
+D+0.750L+0.750S+0.450W+H	0.0000	in	0.000	0.2620	in	8.054
+D+0.750L+0.750S+0.5250E+H	0.0000	in	0.000	0.0000	in	0.000
+0.60D+0.60W+0.60H	0.0000	in	0.000	0.3494	in	8.054
+0.60D+0.70E+0.60H	0.0000	in	0.000	0.0000	in	0.000
D Only	0.0000	in	0.000	0.0000	in	0.000
Lr Only	0.0000	in	0.000	0.0000	in	0.000
L Only	0.0000	in	0.000	0.0000	in	0.000
S Only	0.0000	in	0.000	0.0000	in	0.000
W Only	0.0000	in	0.000	0.5823	in	8.054
E Only	0.0000	in	0.000	0.0000	in	0.000
H Only	0.0000	in	0.000	0.0000	in	0.000

32

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 1:56AM

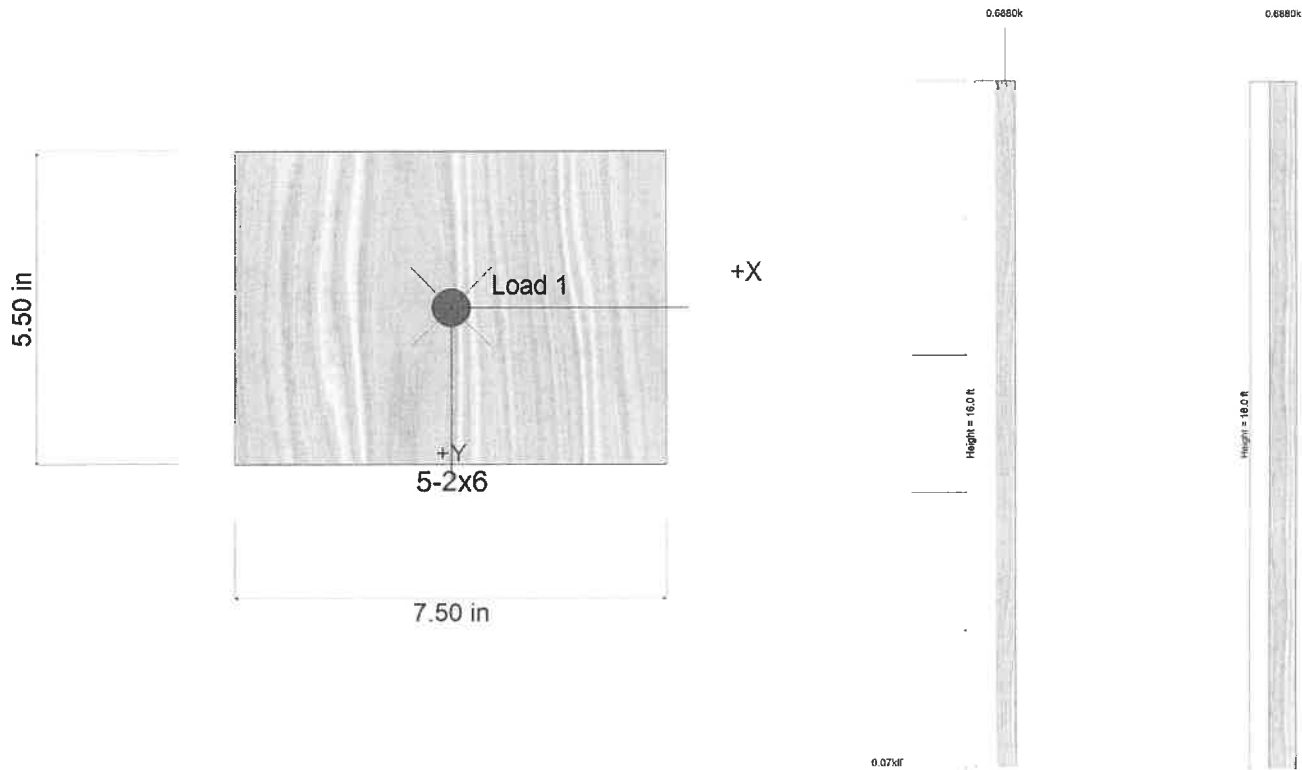
Wood Column

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.S.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
IRON ROCK ENGINEERING

DESCRIPTION: KING STUDS AT 8' OPENING - 16' TALL WALL

Sketches



633

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 2:00AM

File: LH ENCLAVES LOT 20_CALC.CS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Wood Column

Lic. #: KW-06005427

DESCRIPTION: KING STUDS AT 18' OPENING - 10' TALL WALL

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Analysis Method :		Allowable Stress Design		Wood Section Name	3-2x6	
End Fixities		Top & Bottom Pinned		Wood Grading/Manuf.	Graded Lumber	
Overall Column Height		10 ft		Wood Member Type	Sawn	
(Used for non-slender calculations)						
Wood Species	Douglas Fir - Larch			Exact Width	4.50 in	Allow Stress Modification Factors
Wood Grade	No.2			Exact Depth	5.50 in	Cf or Cv for Bending 1.30
Fb +	900.0 psi	Fv	180.0 psi	Area	24.750 in^2	Cf or Cv for Compression 1.10
Fb -	900.0 psi	Ft	575.0 psi	Ix	62.391 in^4	Cf or Cv for Tension 1.30
Fc - Prll	1,350.0 psi	Density	31.210 pcf	Iy	41.766 in^4	Cm : Wet Use Factor 1.0
Fc - Perp	625.0 psi					Ct : Temperature Factor 1.0
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial			Cfu : Flat Use Factor 1.0
Basic	1,600.0	1,600.0	1,600.0 ksi			Kf : Built-up columns 1.0 NDS 15.3.2
Minimum	580.0	580.0				Use Cr : Repetitive ? No
Brace condition for deflection (buckling) along columns :						
X-X (width) axis :					Fully braced against buckling ABOUT Y-Y Axis	
Y-Y (depth) axis :					Unbraced Length for buckling ABOUT X-X Axis = 10 ft, K = 1.0	

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 53.642 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 10.0 ft, D = 0.0560, Lr = 0.080 k

BENDING LOADS . . .

Lat. Uniform Load creating Mx-x, W = 0.1340 k/ft

DESIGN SUMMARY

Bending & Shear Check Results

PASS	Max. Axial+Bending Stress Ratio =	0.2852 : 1	Maximum SERVICE Lateral Load Reactions . .		
	Load Combination	+D+0.60W+H	Top along Y-Y	0.670 k	Bottom along Y-Y 0.670 k
	Governing NDS Formula	1Comp + Mxx, NDS Eq. 3.9-3	Top along X-X	0.0 k	Bottom along X-X 0.0 k
	Location of max.above base	4.966 ft	Maximum SERVICE Load Lateral Deflections . . .		
	At maximum location values are . . .		Along Y-Y	0.3053 in at 5.034 ft above base	
	Applied Axial	0.1096 k	for load combination : W Only		
	Applied Mx	1.005 k-ft	Along X-X	0.0 in at 0.0 ft above base	
	Applied My	0.0 k-ft	for load combination : n/a		
	Fc : Allowable	893.75 psi	Other Factors used to calculate allowable stresses . . .		
PASS	Maximum Shear Stress Ratio =	0.08460 : 1	Bending	Compression	Tension
	Load Combination	+D+0.60W+H			
	Location of max.above base	10.0 ft			
	Applied Design Shear	24.364 psi			
	Allowable Shear	288.0 psi			

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+H	0.900	0.585	0.005669	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+L+H	1.000	0.544	0.005480	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+Lr+H	1.250	0.461	0.008958	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+S+H	1.150	0.491	0.005278	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750Lr+0.750L+H	1.250	0.461	0.008013	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L+0.750S+H	1.150	0.491	0.005278	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.60W+H	1.600	0.376	0.2852	PASS	4.966 ft	0.08460	PASS	10.0 ft
+D+0.70E+H	1.600	0.376	0.004957	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.376	0.2145	PASS	5.034 ft	0.06345	PASS	10.0 ft

0341

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.

Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 2:00AM

Wood Column

File: LH ENCLAVES LOT 20_CALCS.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. #: KW-06005427

IRON ROCK ENGINEERING

DESCRIPTION: KING STUDS AT 18' OPENING - 10' TALL WALL

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+0.750L+0.750S+0.450W+H	1.600	0.376	0.2139	PASS	5.034 ft	0.06345	PASS	10.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.376	0.004957	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.60D+0.60W+0.60H	1.600	0.376	0.2847	PASS	4.966 ft	0.08460	PASS	10.0 ft
+0.60D+0.70E+0.60H	1.600	0.376	0.002974	PASS	0.0 ft	0.0	PASS	10.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
+D+H						0.110					
+D+L+H						0.110					
+D+Lr+H						0.190					
+D+S+H						0.110					
+D+0.750Lr+0.750L+H						0.170					
+D+0.750L+0.750S+H						0.110					
+D+0.60W+H				0.402	0.402	0.110					
+D+0.70E+H						0.110					
+D+0.750Lr+0.750L+0.450W+H				0.302	0.302	0.170					
+D+0.750L+0.750S+0.450W+H				0.302	0.302	0.110					
+D+0.750L+0.750S+0.5250E+H						0.110					
+0.60D+0.60W+0.60H				0.402	0.402	0.066					
+0.60D+0.70E+0.60H						0.066					
D Only						0.110					
Lr Only						0.080					
L Only											
S Only											
W Only				0.670	0.670						
E Only											
H Only											

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
+D+H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
+D+L+H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
+D+Lr+H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
+D+S+H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
+D+0.750Lr+0.750L+H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
+D+0.750L+0.750S+H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
+D+0.60W+H	0.0000	in	0.000	ft	0.1832	in	5.034	ft
+D+0.70E+H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
+D+0.750Lr+0.750L+0.450W+H	0.0000	in	0.000	ft	0.1374	in	5.034	ft
+D+0.750L+0.750S+0.450W+H	0.0000	in	0.000	ft	0.1374	in	5.034	ft
+D+0.750L+0.750S+0.5250E+H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
+0.60D+0.60W+0.60H	0.0000	in	0.000	ft	0.1832	in	5.034	ft
+0.60D+0.70E+0.60H	0.0000	in	0.000	ft	0.0000	in	0.000	ft
D Only	0.0000	in	0.000	ft	0.0000	in	0.000	ft
Lr Only	0.0000	in	0.000	ft	0.0000	in	0.000	ft
L Only	0.0000	in	0.000	ft	0.0000	in	0.000	ft
S Only	0.0000	in	0.000	ft	0.0000	in	0.000	ft
W Only	0.0000	in	0.000	ft	0.3053	in	5.034	ft
E Only	0.0000	in	0.000	ft	0.0000	in	0.000	ft
H Only	0.0000	in	0.000	ft	0.0000	in	0.000	ft

GS

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 2:00AM

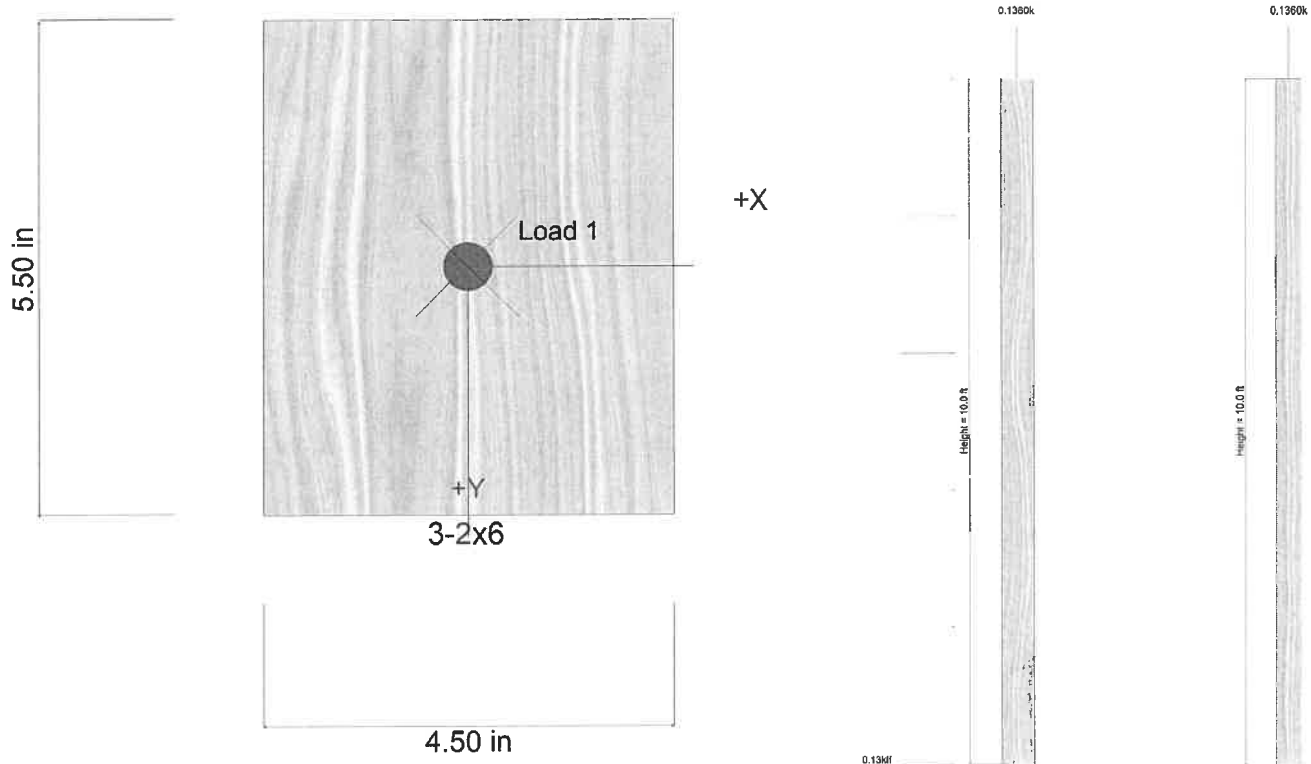
Wood Column

File: LH ENCLAVES LOT 20_CALC.S.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31
IRON ROCK ENGINEERING

Lic. #: KW-06005427

DESCRIPTION: KING STUDS AT 18' OPENING - 10' TALL WALL

Sketches



G36

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 2:02AM

Wood Column

File: LH ENCLAVES LOT 20_CALCS.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Lic. #: KW-06005427

DESCRIPTION: 6x6 POST AT BEAM RB23

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Analysis Method :		Allowable Stress Design		Wood Section Name		6x6	
End Fixities		Top & Bottom Pinned		Wood Grading/Manuf.		Graded Lumber	
Overall Column Height		12 ft		Wood Member Type		Sawn	
(Used for non-slender calculations)							
Wood Species		Douglas Fir - Larch		Exact Width		5.50 in	
Wood Grade		No.2		Exact Depth		5.50 in	
Fb +		900.0 psi	Fv	180.0 psi	Area		30.250 in^2
Fb -		900.0 psi	Ft	575.0 psi	Ix		76.255 in^4
Fc - Prll		1,350.0 psi	Density	31.210 pcf	Iy		76.255 in^4
Fc - Perp		625.0 psi					
E : Modulus of Elasticity . . .		x-x Bending	y-y Bending	Axial			
		Basic	1,600.0	1,600.0	1,600.0 ksi		
		Minimum	580.0	580.0			
Brace condition for deflection (buckling) along columns :							
				X-X (width) axis :		Unbraced Length for buckling ABOUT Y-Y Axis = 12 ft, K = 1.0	
				Y-Y (depth) axis :		Unbraced Length for buckling ABOUT X-X Axis = 12 ft, K = 1.0	

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 78.675 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 12.0 ft, D = 8.210, Lr = 7.0 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS	Max. Axial+Bending Stress Ratio =	0.8117 : 1	Maximum SERVICE Lateral Load Reactions . .			
	Load Combination	+D+Lr+H	Top along Y-Y	0.0 k	Bottom along Y-Y	0.0 k
	Governing NDS Formula	Comp Only, f_c/F_c'	Top along X-X	0.0 k	Bottom along X-X	0.0 k
	Location of max.above base	0.0 ft	Maximum SERVICE Load Lateral Deflections . . .			
	At maximum location values are . . .		Along Y-Y	0.0 in	at	0.0 ft above base
	Applied Axial	15.289 k	for load combination : n/a			
	Applied Mx	0.0 k-ft	Along X-X	0.0 in	at	0.0 ft above base
	Applied My	0.0 k-ft	for load combination : n/a			
	Fc : Allowable	622.68 psi	Other Factors used to calculate allowable stresses . . .			
				<u>Bending</u>	<u>Compression</u>	<u>Tension</u>
PASS	Maximum Shear Stress Ratio =	0.0 : 1				
	Load Combination	+0.60D+0.70E+0.60H				
	Location of max.above base	12.0 ft				
	Applied Design Shear	0.0 psi				
	Allowable Shear	288.0 psi				

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+D+H	0.900	0.482	0.4674	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+L+H	1.000	0.444	0.4569	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+Lr+H	1.250	0.369	0.8117	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+S+H	1.150	0.396	0.4456	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+H	1.250	0.369	0.7188	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+H	1.150	0.396	0.4456	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.60W+H	1.600	0.297	0.4272	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.70E+H	1.600	0.297	0.4272	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750Lr+0.750L+0.450W+H	1.600	0.297	0.6979	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.450W+H	1.600	0.297	0.4272	PASS	0.0 ft	0.0	PASS	12.0 ft
+D+0.750L+0.750S+0.5250E+H	1.600	0.297	0.4272	PASS	0.0 ft	0.0	PASS	12.0 ft
+0.60D+0.60W+0.60H	1.600	0.297	0.2563	PASS	0.0 ft	0.0	PASS	12.0 ft

637

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 10 AUG 2022, 2:02AM

Wood Column

File: LH ENCLAVES LOT 20_CALC.S.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. #: KW-06005427

IRON ROCK ENGINEERING

DESCRIPTION: 6x6 POST AT BEAM RB23

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+0.60D+0.70E+0.60H	1.600	0.297	0.2563	PASS	0.0 ft	0.0	PASS	12.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
+D+H						8.289					
+D+L+H						8.289					
+D+Lr+H						15.289					
+D+S+H						8.289					
+D+0.750Lr+0.750L+H						13.539					
+D+0.750L+0.750S+H						8.289					
+D+0.60W+H						8.289					
+D+0.70E+H						8.289					
+D+0.750Lr+0.750L+0.450W+H						13.539					
+D+0.750L+0.750S+0.450W+H						8.289					
+D+0.750L+0.750S+0.5250E+H						8.289					
+0.60D+0.60W+0.60H						4.973					
+0.60D+0.70E+0.60H						4.973					
D Only						8.289					
Lr Only						7.000					
L Only											
S Only											
W Only											
E Only											
H Only											

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance	Max. Y-Y Deflection		Distance
+D+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+L+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+Lr+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+S+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750Lr+0.750L+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.60W+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.70E+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750Lr+0.750L+0.450W+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+0.450W+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+D+0.750L+0.750S+0.5250E+H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+0.60D+0.60W+0.60H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
+0.60D+0.70E+0.60H	0.0000	in	0.000 ft	0.0000	in	0.000 ft
D Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
Lr Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
L Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
S Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
W Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
E Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft
H Only	0.0000	in	0.000 ft	0.0000	in	0.000 ft



Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 2:02AM

Wood Column

Lic. # : KW-06005427

File: LH ENCLAVES LOT 20_CALC.S.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

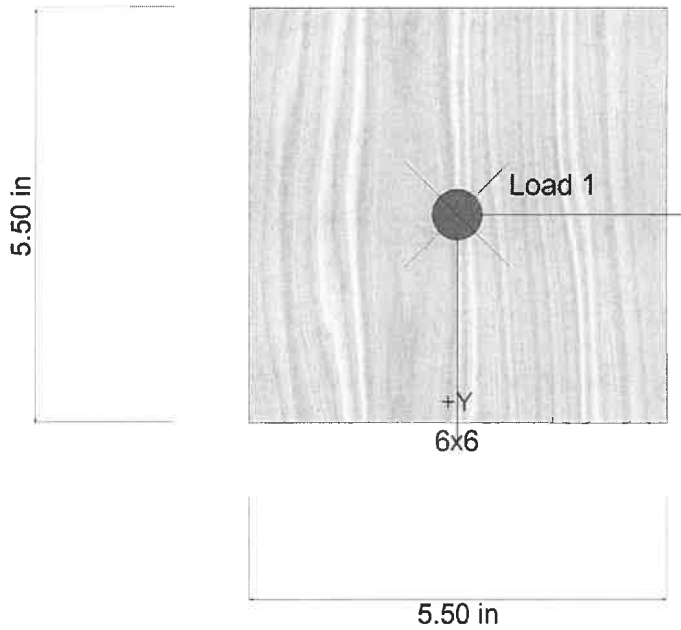
IRON ROCK ENGINEERING

DESCRIPTION: 6x6 POST AT BEAM RB23

Sketches

15.210k

16.210k



Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 2:04AM

Steel Column

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

DESCRIPTION: STEEL POST AT BEAM RB25

Code References

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : IBC 2018

General Information

Steel Section Name : **HSS4x4x3/16**
Analysis Method : Load Resistance Factor
Steel Stress Grade
Fy : Steel Yield 46 ksi
E : Elastic Bending Modulus 29000 ksi

Overall Column Height 11.67 ft
Top & Bottom Fixity Top & Bottom Pinned
Brace condition for deflection (buckling) along columns :
X-X (width) axis :
Unbraced Length for buckling ABOUT Y-Y Axis = 11.67 ft, K = 1.0
Y-Y (depth) axis :
Unbraced Length for buckling ABOUT X-X Axis = 11.67 ft, K = 1.0

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 109.734 lbs * Dead Load Factor

AXIAL LOADS ...

Axial Load at 11.670 ft, Xecc = 4.250 in, D = 7.630, LR = 7.310 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = 0.8552 : 1
Load Combination +1.20D+1.60Lr+0.50L+1.60H
Location of max. above base 11.592 ft
At maximum location values are ...
Pu 20.984 k
0.9 * Pn 61.681 k
Mu-x 0.0 k-ft
0.9 * Mn-x : 12.662 k-ft
Mu-y -7.336 k-ft
0.9 * Mn-y : 12.662 k-ft

Maximum Load Reactions ..
Top along X-X 0.4534 k
Bottom along X-X 0.4534 k
Top along Y-Y 0.0 k
Bottom along Y-Y 0.0 k

Maximum Load Deflections ...
Along Y-Y 0.0 in at 0.0 ft above base
for load combination :
Along X-X -0.4474 in at 6.814 ft above base
for load combination : +D+Lr+H

PASS Maximum Shear Stress Ratio = 0.02526 : 1
Load Combination +1.20D+1.60Lr+0.50L+1.60H
Location of max. above base 0.0 ft
At maximum location values are ...
Vu : Applied 0.6328 k
Vn * Phi : Allowable 25.054 k

Load Combination Results

Load Combination	Maximum Axial + Bending Stress Ratios							Maximum Shear Ratios		
	Stress Ratio	Status	Location	Cbx	Cby	KxLx/Rx	KyLy/Ry	Stress Ratio	Status	Location
+1.40D+1.60H	0.385	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.013	PASS	0.00 ft
+1.20D+0.50Lr+1.60L+1.60H	0.526	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.016	PASS	0.00 ft
+1.20D+1.60L+0.50S+1.60H	0.330	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.011	PASS	0.00 ft
+1.20D+1.60Lr+0.50L+1.60H	0.855	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.025	PASS	0.00 ft
+1.20D+1.60Lr+0.50W+1.60H	0.855	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.025	PASS	0.00 ft
+1.20D+0.50L+1.60S+1.60H	0.330	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.011	PASS	0.00 ft
+1.20D+1.60S+0.50W+1.60H	0.330	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.011	PASS	0.00 ft
+1.20D+0.50Lr+0.50L+W+1.60H	0.526	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.016	PASS	0.00 ft
+1.20D+0.50L+0.50S+W+1.60H	0.330	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.011	PASS	0.00 ft
+1.20D+0.50L+0.70S+E+1.60H	0.330	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.011	PASS	0.00 ft
+0.90D+W+0.90H	0.247	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.008	PASS	0.00 ft
+0.90D+E+0.90H	0.247	PASS	11.59 ft	1.00	1.66	90.35	90.35	0.008	PASS	0.00 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top	@ Base	@ Top
+D+H	7.740		0.232	0.232							
+D+L+H	7.740		0.232	0.232							
+D+Lr+H	15.050		0.453	0.453							

640

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 10 AUG 2022, 2:04AM

File: LH ENCLAVES LOT 20_CALCS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Steel Column

Lic. #: KW-06005427

DESCRIPTION: STEEL POST AT BEAM RB25

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
	@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
+D+S+H	7.740		0.232	0.232								
+D+0.750Lr+0.750L+H	13.222		0.398	0.398								
+D+0.750L+0.750S+H	7.740		0.232	0.232								
+D+0.60W+H	7.740		0.232	0.232								
+D+0.70E+H	7.740		0.232	0.232								
+D+0.750Lr+0.750L+0.450W+H	13.222		0.398	0.398								
+D+0.750L+0.750S+0.450W+H	7.740		0.232	0.232								
+D+0.750L+0.750S+0.5250E+H	7.740		0.232	0.232								
+0.60D+0.60W+0.60H	4.644		0.139	0.139								
+0.60D+0.70E+0.60H	4.644		0.139	0.139								
D Only	7.740		0.232	0.232								
Lr Only	7.310		0.222	0.222								
L Only												
S Only												
W Only												
E Only												
H Only												

Extreme Reactions

Item	Extreme Value	Axial Reaction		X-X Axis Reaction		k	Y-Y Axis Reaction		Mx - End Moments		k-ft	My - End Moments	
		@ Base		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		@ Base	@ Top
Axial @ Base	Maximum	15.050		0.453	0.453								
"	Minimum												
Reaction, X-X Axis Base	Maximum	15.050		0.453	0.453								
"	Minimum												
Reaction, Y-Y Axis Base	Maximum	7.740		0.232	0.232								
"	Minimum	7.740		0.232	0.232								
Reaction, X-X Axis Top	Maximum	15.050		0.453	0.453								
"	Minimum												
Reaction, Y-Y Axis Top	Maximum	7.310		0.222	0.222								
"	Minimum	7.740		0.232	0.232								
Moment, X-X Axis Base	Maximum	7.740			0.232								
"	Minimum	7.740			0.232								
Moment, Y-Y Axis Base	Maximum	7.740		0.232	0.232								
"	Minimum	7.740		0.232	0.232								
Moment, X-X Axis Top	Maximum	7.740		0.232	0.232								
"	Minimum	7.740		0.232	0.232								
Moment, Y-Y Axis Top	Maximum	7.740		0.232	0.232								
"	Minimum	7.740		0.232	0.232								

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance		Max. Y-Y Deflection		Distance	
+D+H	-0.2285	in	6.814	ft	0.000	in	0.000	ft
+D+L+H	-0.2285	in	6.814	ft	0.000	in	0.000	ft
+D+Lr+H	-0.4474	in	6.814	ft	0.000	in	0.000	ft
+D+S+H	-0.2285	in	6.814	ft	0.000	in	0.000	ft
+D+0.750Lr+0.750L+H	-0.3927	in	6.814	ft	0.000	in	0.000	ft
+D+0.750L+0.750S+H	-0.2285	in	6.814	ft	0.000	in	0.000	ft
+D+0.60W+H	-0.2285	in	6.814	ft	0.000	in	0.000	ft
+D+0.70E+H	-0.2285	in	6.814	ft	0.000	in	0.000	ft
+D+0.750Lr+0.750L+0.450W+H	-0.3927	in	6.814	ft	0.000	in	0.000	ft
+D+0.750L+0.750S+0.450W+H	-0.2285	in	6.814	ft	0.000	in	0.000	ft
+D+0.750L+0.750S+0.5250E+H	-0.2285	in	6.814	ft	0.000	in	0.000	ft
+0.60D+0.60W+0.60H	-0.1371	in	6.814	ft	0.000	in	0.000	ft
+0.60D+0.70E+0.60H	-0.1371	in	6.814	ft	0.000	in	0.000	ft
D Only	-0.2285	in	6.814	ft	0.000	in	0.000	ft
Lr Only	-0.2189	in	6.814	ft	0.000	in	0.000	ft
L Only	0.0000	in	0.000	ft	0.000	in	0.000	ft
S Only	0.0000	in	0.000	ft	0.000	in	0.000	ft

GAI

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 10 AUG 2022, 2:04AM

File: LH ENCLAVES LOT 20_CALCS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

Steel Column

Lic. #: KW-08005427

DESCRIPTION: STEEL POST AT BEAM RB25

Maximum Deflections for Load Combinations

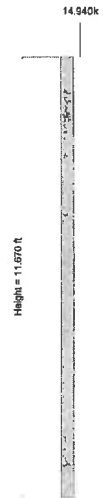
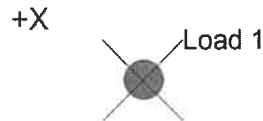
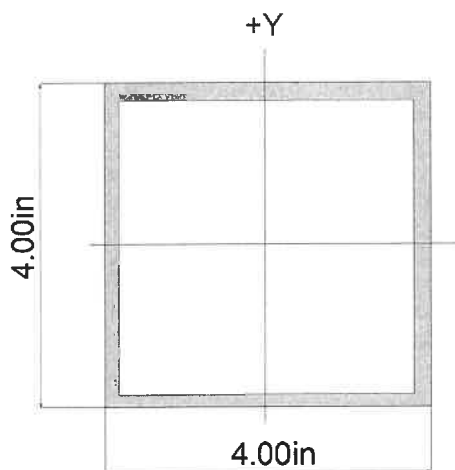
Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
W Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
E Only	0.0000 in	0.000 ft	0.000 in	0.000 ft
H Only	0.0000 in	0.000 ft	0.000 in	0.000 ft

Steel Section Properties : HSS4x4x3/16

Depth	=	4.000 in	I xx	=	6.21 in^4	J	=	10.000 in^4
Design Thick	=	0.174 in	S xx	=	3.10 in^3			
Width	=	4.000 in	R xx	=	1.550 in			
Wall Thick	=	0.187 in	Zx	=	3.670 in^3			
Area	=	2.580 in^2	I yy	=	6.210 in^4	C	=	5.070 in^3
Weight	=	9.403 plf	S yy	=	3.100 in^3			
			R yy	=	1.550 in			

Ycg = 0.000 in

Sketches



GAR

Wind Loads - ENCLAVES LOT 20 - 2:12

Gust Effect Factor

Rigid Structures
 $G = 0.85$
or
 0.865801

Horizontal Dimensions:
Least (L): 121 (ft)
Greatest (B): 148 (ft)
 $L/B = 0.82$

Flexible or Dynamically sensitive structures

$G_f =$

Velocity Pressure

$q_h = 25.9$ (psf)
 $K_h = 0.9$
 $C_{p(\text{leeward})} = -0.5$
 $C_{p(\text{windward})} = 0.8$
 $GC_{pi} (+/-) = 0.18$

Leeward wall (psf) = -11.01
Side wall (psf) = -15.41
Windward roof (psf) = 3.96
Leeward roof (psf) = 0
Net roof (psf) = 3.96
Internal roof (psf) = 4.66

$C_{p(\text{sidewall})} = -0.7$
 $C_{p(\text{leeward roof})} = 0$
 $C_{p(\text{windward roof})} = -0.9$
 $C_{p(\text{windward roof})} = -0.18$

Height (ft)	K_z	q_z (psf)	Windward wall (psf)	Net wall P (psf)
0-15	0.85	24.46	16.63	27.64
20	0.9	25.9	17.61	28.62
25	0.94	27.05	18.39	29.4
30	0.98	28.2	19.18	30.19
40	1.04	29.93	20.35	31.36
50	1.09	31.37	21.33	32.34
60	1.13	32.52	22.11	33.12
70	1.17	33.67	22.9	33.91

Vertical Design Pressures

Wind normal to ridge

$C_p = -0.9$
 $P_{\text{uplift}} \text{ (psf)} = 24.48$

Flat roof or wind parallel to ridge

$C_p = -0.9$
 $P_{\text{uplift}} \text{ (psf)} = 24.48$

41

MWFRS Parapet pressures

$$P_p = q_p G C_{pn} \text{ (psf)}$$

Top of Parapet = 20 ft "Standard Parapet"
 K_z at top of parapet = 0.9
 q_p = 25.9 psf

	Windward Parapet	Leeward Parapet	Σ Parapet pressures
Net $G C_{pn}$:	1.5	1	
Net P (psf):	38.85	25.9	64.75

Topographic Factors:

$$K_1 = 1$$

$$K_2 = 1$$

$$K_3 = 1$$

Gust Effect Factor Coefficients:

$$g_Q = 3.4$$

$$g_v = 3.4$$

$$I_z = 0.304804$$

$$Q = 0.899674$$

$$c = 0.3$$

$$z = 30 \text{ ft}$$

$$B = 50 \text{ ft}$$

$$h = 15 \text{ ft}$$

$$L_z = 309.9934$$

$$I = 320 \text{ ft}$$

$$e = 0.333333$$

$$z_{\min} = 30 \text{ ft}$$

Velocity pressure coefficients:

$$K_z = 0.57$$

$$K_{zt} = 1$$

$$K_d = 0.85$$

$$V = 115$$

$$\text{Exposure} = C$$

$$\text{Mean roof height (h)} = 19.83 \text{ (ft)}$$

$$\text{Roof Pitch} = 2 : 12$$

$$\text{Roof Slope } (\odot) = 9.46^\circ$$

$$h/L = 0.163884$$

ASCE SEISMIC ANALYSIS

ENCLAVES LOT 20

Ground Motion Parameters (Ground Acceleration Values)

S_S :	0.209
S_1 :	0.108

Site Coefficients

F_a :	1.6
F_v :	2.368

Adjusted Response Accelerations

S_{MS} :	0.334
S_{M1} :	0.256

Design Spectral Response Acceleration Parameters

S_{DS} :	0.223
S_{D1} :	0.171

Structural System: All Other Structural Systems

Site Class:	D
Occupancy Category:	II
I:	1
SDC:	C

Structural System:	13
R:	6.5
Ω_0 :	3
C_d :	4

Structure Height, h_n :	18.5 ft
Structure Period, T_a :	0.178

C_s :	0.034
W:	180.16 k
V:	6.125 k

Vertical Distribution of Seismic Forces

# Stories:	1
k:	1

Level	w_x (kips)	h_x (ft)	$w_x h_x^k$ (ft-kips)	F_x (kips)	C_{sx}
1	180.16	18.5	3332.96	6.13	0.034
--			0	0	#DIV/0!
--			0	0	#DIV/0!
--			0	0	#DIV/0!
--			0	0	#DIV/0!
--			0	0	#DIV/0!
--			0	0	#DIV/0!
--			0	0	#DIV/0!
	180.16		3332.96	6.125	

64

ENCLAVES LOT 20 LATERAL LINE LOADS

WIND

ROOF FRAMING

	WALL-WW		WALL-LW		WALL-WW		WALL-LW		ROOF (2:12)		ROOF (2:12)		PARAPET		PARAPET		TOTAL	
	(0-15)	(0-15)	(0-15)	(0-15)	(15-20)	(15-20)	(15-20)	(15-20)	WW	LW	WW	LW	WW	LW	WW	LW		
W ₁ :	10	16.6	7.5	11	17.6	11	11	3.96	0	38.9	25.9	38.9	25.9	38.9	25.9	38.9	25.9	W ₁ :
W ₂ :	8	16.6		11	17.6	11	11	3.96	0	2	38.9	2	25.9	38.9	25.9	38.9	25.9	W ₂ :
W ₃ :	8.25	16.6	4.5	11	4.25	17.6	4.25	11	3.96	0	38.9		25.9	38.9	25.9	38.9	25.9	W ₃ :
W ₄ :	10	16.6	3	11	5.5	17.6	5.5	11	3.96	0	1.5	38.9	25.9	38.9	25.9	38.9	25.9	W ₄ :
W ₅ :	10	16.6	10	11	5.5	17.6	5.5	11	3.96	0	38.9	1.5	25.9	38.9	25.9	38.9	25.9	W ₅ :
W ₆ :	2	16.6	2	11	17.6	11	11	3.96	0	38.9	25.9	38.9	25.9	38.9	25.9	38.9	25.9	W ₆ :
W ₇ :	7	16.6	7	11	17.6	11	11	3.96	0	1.5	38.9	1.5	25.9	38.9	25.9	38.9	25.9	W ₇ :
W ₈ :	8	16.6	7.75	11	17.6	11	11	3.96	0	1.5	38.9		25.9	38.9	25.9	38.9	25.9	W ₈ :
W ₉ :	9	16.6	10	11	4.25	17.6	11	3.96	0	38.9	1.5	25.9	38.9	25.9	38.9	25.9	38.9	W ₉ :
W ₁₀ :	10	16.6	7.5	11	2	17.6	4.25	11	3.96	0	1.5	38.9	0	25.9	38.9	25.9	38.9	W ₁₀ :
W ₁₁ :	9	16.6	10	11	4.25	17.6	11	3.96	0	2	38.9	1.5	25.9	38.9	25.9	38.9	25.9	W ₁₁ :
W ₁₂ :	8.67	16.6	1.67	11	17.6	11	11	3.96	0	38.9	25.9	38.9	25.9	38.9	25.9	38.9	25.9	W ₁₂ :
W ₁₃ :	7	16.6	7	11	17.6	11	11	3.96	0	1.5	38.9	1.5	25.9	38.9	25.9	38.9	25.9	W ₁₃ :
W ₁₄ :	8	16.6	3	11	5	17.6	5	11	3.96	0	38.9		25.9	38.9	25.9	38.9	25.9	W ₁₄ :
W ₁₅ :	8	16.6	8	11	3.25	17.6	3.25	11	3.96	0	1	38.9	1	25.9	38.9	25.9	38.9	W ₁₅ :
W ₁₆ :	7	16.6	10.5	11	17.6	11	11	3.67	3.96	0	1.5	38.9	25.9	38.9	25.9	38.9	25.9	W ₁₆ :
W ₁₇ :	8	16.6	8	11	1.18	17.6	6	11	5	3.96	0	38.9	25.9	38.9	25.9	38.9	25.9	W ₁₇ :
W ₁₈ :	8	16.6	8	11	3	17.6	6	11	3	3.96	0	1	38.9	38.9	25.9	38.9	25.9	W ₁₈ :
W ₁₉ :	8	16.6		11	17.6	11	11	3.96	0	38.9	25.9	38.9	25.9	38.9	25.9	38.9	25.9	W ₁₉ :
W ₂₀ :	8	16.6	8	11	17.6	11	11	3.96	0	38.9	3.5	25.9	38.9	25.9	38.9	25.9	38.9	W ₂₀ :
W ₂₁ :	8	16.6	8	11	17.6	11	11	3.96	0	38.9	25.9	38.9	25.9	38.9	25.9	38.9	25.9	W ₂₁ :
W ₂₂ :	8	16.6		11	17.6	11	11	3.96	0	38.9	25.9	38.9	25.9	38.9	25.9	38.9	25.9	W ₂₂ :
W ₂₃ :	8	16.6	4	11	1.18	17.6	6	11	5	3.96	0	38.9	25.9	38.9	25.9	38.9	25.9	W ₂₃ :

LS

ENCLAVES LOT 20 LATERAL LINE LOADS
SEISMIC

ROOF FRAMING

	C _s	W (psf)	L (ft)			
S ₁ :	0.034	20	74	51	plf	S ₁ :
S ₂ :	0.034	20	90.5	62	plf	S ₂ :
S ₃ :	0.034	20	59	41	plf	S ₃ :
S ₄ :	0.034	20	28	20	plf	S ₄ :
S ₅ :	0.034	20	28.5	20	plf	S ₅ :
S ₆ :	0.034	20	34.5	24	plf	S ₆ :
S ₇ :	0.034	20	48.5	33	plf	S ₇ :
S ₈ :	0.034	20	59	41	plf	S ₈ :
S ₉ :	0.034	20	58.5	40	plf	S ₉ :
S ₁₀ :	0.034	20	44.75	31	plf	S ₁₀ :
S ₁₁ :	0.034	20	49.5	34	plf	S ₁₁ :
S ₁₂ :	0.034	20	73	50	plf	S ₁₂ :
S ₁₃ :	0.034	20	74.5	51	plf	S ₁₃ :
S ₁₄ :	0.034	20	41.5	29	plf	S ₁₄ :
S ₁₅ :	0.034	20	30.5	21	plf	S ₁₅ :
S ₁₆ :	0.034	20	31	22	plf	S ₁₆ :
S ₁₇ :	0.034	20	20.5	14	plf	S ₁₇ :
S ₁₈ :	0.034	20	37	26	plf	S ₁₈ :
S ₁₉ :	0.034	20	17	12	plf	S ₁₉ :
S ₂₀ :	0.034	20	11.5	8	plf	S ₂₀ :
S ₂₁ :	0.034	20	63.75	44	plf	S ₂₁ :

LH ENCLAVES LOT 20 LATERAL DESIGN

WIND DESIGN

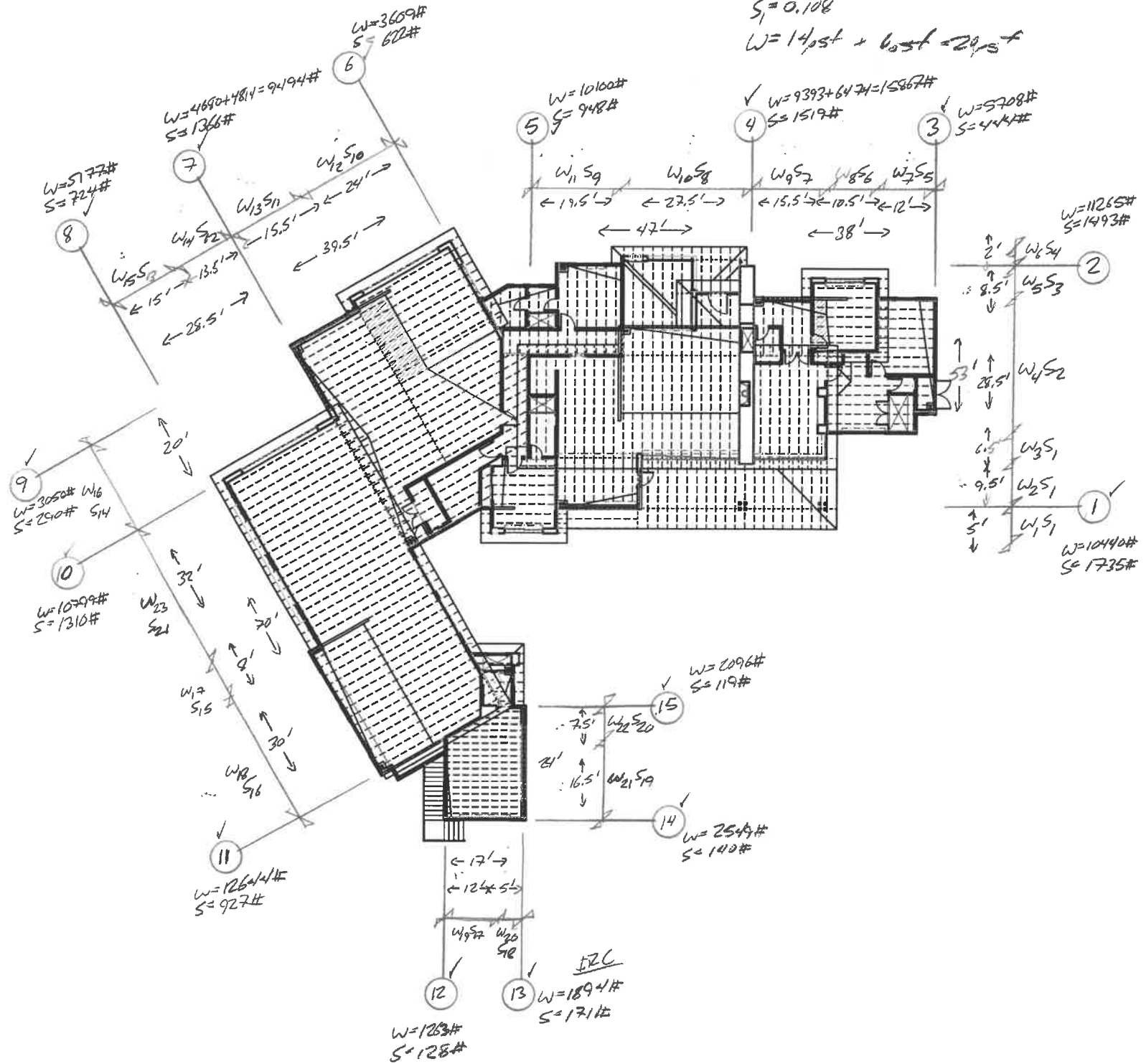
Exp. C 10.5 mph (V_{LT})

SEISMIC DESIGN

$$\xi_5 = 0.209 \quad \zeta_5 = 0.1034 \quad \rho = 1.0$$

$$S_1 = 0.108$$

$$W = 14,5t + 6,5t = 21,0t$$



SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: **Line 1 - Individual pier** Pier Label: **Pier 1**

Wall Length:	6 ft	Shear Wall Capacity:	602 plf
Wall Height:	12 ft	Shear Wall Load:	502 plf
Wall Weight:	17 psf		O.K.
Aspect Ratio:	2		
Aspect Ratio Factor:	1	AR adjusted: Shear Wall Capacity:	602 plf
Sheathing Thickness:	(2)-3/8"		
Stud Spacing:	16 "		
Stud Size:	5.5 "	Max. Uplift:	5636.784 #
Nail Size:	8d	Max. Downward Load:	6816.816 #
Nail Spacing:	4 "		

Unfactored Loads:

Strut Force Wind:	10440 #
Strut Force Seismic:	1735 #

Factored Loads:

Strut Force Wind:	3007 #
Strut Force Seismic:	584 #
Control Strut Force:	3007 #
Controlling W/S:	W
Wind Load Factor:	0.6
Seismic Load Factor:	0.7
p:	1

Vertical Loading

Wall Dead Load:	152 plf
Wall Live Load:	0 plf
Wall Snow Load:	120 plf
Wall Wind Load:	146.88 plf

Overturning

	Uplift	Downward
LC1:	5209.584	6816.816
LC2:	98.2	2234.2
LC3:	3370.188	5649.612
LC4:	-463.35	2212.65
LC5:	5636.784	6389.616
LC6:	525.4	1807

SW Line Pier: Pier 1

Pier Strut Force-Wind:	5011
Pier Strut Force-Seismic:	833

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	6	W:	10440	5011	833
Pier 2	6.5	S:	1735	5429	902
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	12.5		0	0

18

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 1 - Individual pier

Pier Label: Pier 2

Wall Length: 6.5 ft
 Wall Height: 10 ft
 Wall Weight: 26 psf
 Aspect Ratio: 1.54
 Aspect Ratio Factor: 1.06
 Sheathing Thickness: (2)-3/8"
 Stud Spacing: 16 "
 Stud Size: 5.5 "
 Nail Size: 8d
 Nail Spacing: 4 "

Shear Wall Capacity: 602 plf
 Shear Wall Load: 502 plf
 O.K.

AR adjusted: Shear Wall Capacity: 602 plf

Max. Uplift: 4347.371 #
 Max. Downward Load: 6149.899 #

Unfactored Loads:

Strut Force Wind: 10440 #
 Strut Force Seismic: 1735 #

Factored Loads:

Strut Force Wind: 3258 #
 Strut Force Seismic: 632 #
 Control Strut Force: 3258 #
 Controlling W/S: W
 Wind Load Factor: 0.6
 Seismic Load Factor: 0.7
 ρ: 1

Vertical Loading

Wall Dead Load: 105 plf
 Wall Live Load: 0 plf
 Wall Snow Load: 20 plf
 Wall Wind Load: 24.48 plf

Overturning

	Uplift	Downward
LC1:	3872.8706	6149.8986
LC2:	-214.8654	2157.6346
LC3:	2559.3405	4957.7365
LC4:	-506.4615	1963.5385
LC5:	4347.3706	5675.3986
LC6:	259.63462	1683.1346

SW Line Pier: Pier 2

Pier Strut Force-Wind: 5429
 Pier Strut Force-Seismic: 902

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	6	W:	10440	5011	833
Pier 2	6.5	S:	1735	5429	902
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	12.5		0	0

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 2 - Individual pier

Pier Label: Pier 1

Wall Length: 4 ft
 Wall Height: 10 ft
 Wall Weight: 26 psf
 Aspect Ratio: 2.5
 Aspect Ratio Factor: 0.94
 Sheathing Thickness: (2)-3/8"
 Stud Spacing: 16 "
 Stud Size: 5.5 "
 Nail Size: 8d
 Nail Spacing: 4 "

Shear Wall Capacity: 602 plf
 Shear Wall Load: 387 plf
 O.K.

AR adjusted: Shear Wall Capacity: 565.88 plf

Max. Uplift: 3560.772 #
 Max. Downward Load: 4551.428 #

Unfactored Loads:

Strut Force Wind: 11265 #
 Strut Force Seismic: 1493 #

Factored Loads:

Strut Force Wind: 1545 #
 Strut Force Seismic: 239 #
 Control Strut Force: 1545 #
 Controlling W/S: W
 Wind Load Factor: 0.6
 Seismic Load Factor: 0.7
 p: 1

Vertical Loading

Wall Dead Load: 224 plf
 Wall Live Load: 0 plf
 Wall Snow Load: 190 plf
 Wall Wind Load: 232.56 plf

Overturning

	Uplift	Downward
LC1:	3173.572	4551.428
LC2:	-371.25	1564.75
LC3:	1853.179	3940.571
LC4:	-805.4375	1700.5625
LC5:	3560.772	4164.228
LC6:	15.95	1177.55

SW Line Pier: Pier 1

Pier Strut Force-Wind: 2575
 Pier Strut Force-Seismic: 341

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	4	W:	11265	2575	341
Pier 2	5.5	S:	1493	3540	469
Pier 3	4.25			2736	363
Pier 4	3.75			2414	320
Pier 5	0			0	0
Pier 6	0	17.5		0	0

L10

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 2 - Individual pier

Pier Label: Pier 4

Wall Length:	4.25	ft
Wall Height:	10	ft
Wall Weight:	17	psf
Aspect Ratio:	2.36	
Aspect Ratio Factor:	0.96	
Sheathing Thickness:	(2)-3/8"	
Stud Spacing:	16	"
Stud Size:	5.5	"
Nail Size:	8d	
Nail Spacing:	4	"

Shear Wall Capacity:	602	plf
Shear Wall Load:	387	plf
	O.K.	

AR adjusted: Shear Wall Capacity: 577.92 plf

Max. Uplift:	3583.338	#
Max. Downward Load:	4348.814	#

Unfactored Loads:

Strut Force Wind:	11265	#
Strut Force Seismic:	1493	#

Factored Loads:

Strut Force Wind:	1642	#
Strut Force Seismic:	255	#
Control Strut Force:	1642	#
Controlling W/S:	W	
Wind Load Factor:	0.6	
Seismic Load Factor:	0.7	
p:	1	

Vertical Loading

Wall Dead Load:	73.5	plf
Wall Live Load:	0	plf
Wall Snow Load:	20	plf
Wall Wind Load:	24.48	plf

Overturning

	Uplift	Downward
LC1:	3376.3627	4348.8137
LC2:	80.444853	1115.3199
LC3:	2371.0377	3422.8447
LC4:	-100.9007	997.72426
LC5:	3583.3377	4141.8387
LC6:	287.41985	908.34485

SW Line Pier: Pier 4

Pier Strut Force-Wind:	2736
Pier Strut Force-Seismic:	363

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	4	W:	11265	2575	341
Pier 2	5.5	S:	1493	3540	469
Pier 3	3.75			2414	320
Pier 4	4.25			2736	363
Pier 5	0			0	0
Pier 6	0	17.5		0	0

11

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: **Line 2 - PERFORATED**

Pier Label: **Pier 3**

Wall Length: **12** ft
 Wall Height: **10** ft
 Wall Weight: **17** psf
 Aspect Ratio: **0.84**
 Aspect Ratio Factor: **1.15**
 Sheathing Thickness: **(2)-3/8"**
 Stud Spacing: **16** "
 Stud Size: **5.5** "
 Nail Size: **8d**
 Nail Spacing: **4** "

Shear Wall Capacity: **602** plf
 Shear Wall Load: **315** plf
 O.K.

AR adjusted: Shear Wall Capacity: **602** plf

Max. Uplift: **2355.028** #
 Max. Downward Load: **4516.372** #

Unfactored Loads:

Strut Force Wind: **11265** #
 Strut Force Seismic: **1493** #

Factored Loads:

Strut Force Wind: **3773** #
 Strut Force Seismic: **584** #
 Control Strut Force: **3773** #
 Controlling W/S: **W**
 Wind Load Factor: **0.6**
 Seismic Load Factor: **0.7**
 ρ: **1**

Vertical Loading

Wall Dead Load: **73.5** plf
 Wall Live Load: **0** plf
 Wall Snow Load: **20** plf
 Wall Wind Load: **24.48** plf

Overturning

	Uplift	Downward
LC1:	1770.628	4516.372
LC2:	-975.0833	1946.9167
LC3:	872.721	3842.529
LC4:	-1186.563	1915.4375
LC5:	2355.028	3931.972
LC6:	-390.6833	1362.5167

SW Line Pier: **Pier 3**

Pier Strut Force-Wind: **6287**
 Pier Strut Force-Seismic: **833**

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	4	W:	11265	2096	278
Pier 2	5.5	S:	1493	2882	382
Pier 3	12			6287	833
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	21.5		0	0

LR2

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 3 - Individual pier

Pier Label: Pier 1

Wall Length:	16	ft
Wall Height:	10	ft
Wall Weight:	17	psf
Aspect Ratio:	0.63	
Aspect Ratio Factor:	1.18	
Sheathing Thickness:	(2)-3/8"	
Stud Spacing:	16	"
Stud Size:	5.5	"
Nail Size:	8d	
Nail Spacing:	6	"

Shear Wall Capacity:	392	plf
Shear Wall Load:	215	plf

O.K.

AR adjusted: Shear Wall Capacity: 392 plf

Max. Uplift:	1340.724	#
Max. Downward Load:	4304.607	#

Unfactored Loads:

Strut Force Wind:	5708	#
Strut Force Seismic:	444	#

Factored Loads:

Strut Force Wind:	3425	#
Strut Force Seismic:	311	#
Control Strut Force:	3425	#
Controlling W/S:	W	
Wind Load Factor:	0.6	
Seismic Load Factor:	0.7	
p:	1	

Vertical Loading

Wall Dead Load:	143.5	plf
Wall Live Load:	0	plf
Wall Snow Load:	120	plf
Wall Wind Load:	146.88	plf

Overturning

	Uplift	Downward
LC1:	337.524	3943.476
LC2:	-2313.75	2702.25
LC3:	-1093.857	4304.607
LC4:	-3082.313	3373.6875
LC5:	1340.724	2940.276
LC6:	-1310.55	1699.05

SW Line Pier: Pier 1

Pier Strut Force-Wind:	5708
Pier Strut Force-Seismic:	444

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	16	W:	5708	5708	444
Pier 2	0	S:	444	0	0
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	16		0	0

L13

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 4 - Individual pier

Pier Label: Pier 1

Wall Length: 19.5 ft
 Wall Height: 12 ft
 Wall Weight: 12 psf
 Aspect Ratio: 0.62
 Aspect Ratio Factor: 1.18
 Sheathing Thickness: (2)-3/8"
 Stud Spacing: 16 "
 Stud Size: 5.5 "
 Nail Size: 8d
 Nail Spacing: 4 "

Shear Wall Capacity: 602 plf
 Shear Wall Load: 489 plf
 O.K.

AR adjusted: Shear Wall Capacity: 602 plf

Max. Uplift: 4256.855 #
 Max. Downward Load: 8766.815 #

Unfactored Loads:

Strut Force Wind: 15867 #
 Strut Force Seismic: 1519 #

Factored Loads:

Strut Force Wind: 9521 #
 Strut Force Seismic: 1064 #
 Control Strut Force: 9521 #
 Controlling W/S: W
 Wind Load Factor: 0.6
 Seismic Load Factor: 0.7
 p: 1

Vertical Loading

Wall Dead Load: 191 plf
 Wall Live Load: 0 plf
 Wall Snow Load: 50 plf
 Wall Wind Load: 61.2 plf

Overturning

	Uplift	Downward
LC1:	2950.3546	8766.8146
LC2:	-2611.912	3920.5885
LC3:	1030.5785	7757.2985
LC4:	-3141.121	4122.6288
LC5:	4256.8546	7460.3146
LC6:	-1305.412	2614.0885

SW Line Pier: Pier 1

Pier Strut Force-Wind: 15867
 Pier Strut Force-Seismic: 1519

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	19.5	W:	15867	15867	1519
Pier 2	0	S:	1519	0	0
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	19.5		0	0

14

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 5 - Individual pier

Pier Label: Pier 1

Wall Length:	20	ft
Wall Height:	15	ft
Wall Weight:	17	psf
Aspect Ratio:	0.75	
Aspect Ratio Factor:	1.16	
Sheathing Thickness:	(2)-3/8"	
Stud Spacing:	16	"
Stud Size:	5.5	"
Nail Size:	8d	
Nail Spacing:	6	"

Shear Wall Capacity:	392	plf
Shear Wall Load:	303	plf
O.K.		

AR adjusted: Shear Wall Capacity: 392 plf

Max. Uplift:	3608.88	#
Max. Downward Load:	8811.59	#

Unfactored Loads:

Strut Force Wind:	10100	#
Strut Force Seismic:	948	#

Factored Loads:

Strut Force Wind:	6060	#
Strut Force Seismic:	664	#
Control Strut Force:	6060	#
Controlling W/S:	W	
Wind Load Factor:	0.6	
Seismic Load Factor:	0.7	
p:	1	

Vertical Loading

Wall Dead Load:	231.5	plf
Wall Live Load:	0	plf
Wall Snow Load:	270	plf
Wall Wind Load:	330.48	plf

Overturning

	Uplift	Downward
LC1:	1662.88	7427.12
LC2:	-4367.3	5362.7
LC3:	-1994.09	8811.59
LC4:	-6516.725	7263.275
LC5:	3608.88	5481.12
LC6:	-2421.3	3416.7

SW Line Pier: Pier 1

Pier Strut Force-Wind:	10100
Pier Strut Force-Seismic:	948

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	20	W:	10100	10100	948
Pier 2	0	S:	948	0	0
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	20		0	0

115

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 6 - Individual pier

Pier Label: Pier 1

Wall Length: 5.5 ft
 Wall Height: 10 ft
 Wall Weight: 17 psf
 Aspect Ratio: 1.82
 Aspect Ratio Factor: 1.03
 Sheathing Thickness: (2)-3/8"
 Stud Spacing: 16 "
 Stud Size: 5.5 "
 Nail Size: 8d
 Nail Spacing: 4 "

Shear Wall Capacity: 602 plf
 Shear Wall Load: 394 plf
 O.K.

AR adjusted: Shear Wall Capacity: 602 plf

Max. Uplift: 3786.479 #
 Max. Downward Load: 4565.103 #

Unfactored Loads:

Strut Force Wind: 3609 #
 Strut Force Seismic: 622 #

Factored Loads:

Strut Force Wind: 2166 #
 Strut Force Seismic: 436 #
 Control Strut Force: 2166 #
 Controlling W/S: W
 Wind Load Factor: 0.6
 Seismic Load Factor: 0.7
 p: 1

Vertical Loading

Wall Dead Load: 264 plf
 Wall Live Load: 0 plf
 Wall Snow Load: 280 plf
 Wall Wind Load: 342.72 plf

Overturning

	Uplift	Downward
LC1:	3309.0789	4565.1029
LC2:	-401.8636	1985.1364
LC3:	1605.9342	4299.7022
LC4:	-1177.273	2364.7273
LC5:	3786.4789	4087.7029
LC6:	75.536364	1507.7364

SW Line Pier: Pier 1

Pier Strut Force-Wind: 3609
 Pier Strut Force-Seismic: 622

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	5.5	W:	3609	3609	622
Pier 2	0	S:	622	0	0
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	5.5		0	0

46

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 7 - Individual pier

Pier Label: Pier 1

Wall Length: 3 ft
 Wall Height: 10 ft
 Wall Weight: 26 psf
 Aspect Ratio: 3.34
 Aspect Ratio Factor: 0.84
 Sheathing Thickness: (2)-3/8"
 Stud Spacing: 16"
 Stud Size: 5.5"
 Nail Size: 8d
 Nail Spacing: 3"

Shear Wall Capacity: 770 plf
 Shear Wall Load: 575 plf
 O.K.

AR adjusted: Shear Wall Capacity: 646.8 plf

Max. Uplift: 5507.556 #
 Max. Downward Load: 6266.244 #

Unfactored Loads:

Strut Force Wind: 9494 #
 Strut Force Seismic: 1366 #

Factored Loads:

Strut Force Wind: 1725 #
 Strut Force Seismic: 290 #
 Control Strut Force: 1725 #
 Controlling W/S: W
 Wind Load Factor: 0.6
 Seismic Load Factor: 0.7
 p: 1

Vertical Loading

Wall Dead Load: 203 plf
 Wall Live Load: 0 plf
 Wall Snow Load: 160 plf
 Wall Wind Load: 195.84 plf

Overturning

	Uplift	Downward
LC1:	5229.756	6266.244
LC2:	271.5	1660.5
LC3:	3568.692	5053.308
LC4:	-150	1599
LC5:	5507.556	5988.444
LC6:	549.3	1382.7

SW Line Pier: Pier 1

Pier Strut Force-Wind: 2874
 Pier Strut Force-Seismic: 414

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	3	W:	9494	2874	414
Pier 2	4.91	S:	1366	4704	677
Pier 3	2			1916	276
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	9.91		0	0

117

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 7 - Individual pier

Pier Label: Pier 2

Wall Length:	4.91	ft
Wall Height:	16	ft
Wall Weight:	17	psf
Aspect Ratio:	3.26	
Aspect Ratio Factor:	0.85	
Sheathing Thickness:	(2)-3/8"	
Stud Spacing:	16	"
Stud Size:	5.5	"
Nail Size:	8d	
Nail Spacing:	3	"

Shear Wall Capacity:	770	plf
Shear Wall Load:	575	plf
	O.K.	

AR adjusted: Shear Wall Capacity: 654.5 plf

Max. Uplift:	8938.601	#
Max. Downward Load:	10024.93	#

Unfactored Loads:

Strut Force Wind:	9494	#
Strut Force Seismic:	1366	#

Factored Loads:

Strut Force Wind:	2823	#
Strut Force Seismic:	474	#
Control Strut Force:	2823	#
Controlling W/S:	W	
Wind Load Factor:	0.6	
Seismic Load Factor:	0.7	
p:	1	

Vertical Loading

Wall Dead Load:	307.5	plf
Wall Live Load:	0	plf
Wall Snow Load:	330	plf
Wall Wind Load:	403.92	plf

Overturning

	Uplift	Downward
LC1:	8369.5318	10024.928
LC2:	121.60449	2966.9495
LC3:	5313.8682	8481.977
LC4:	-872.0773	3188.4927
LC5:	8938.6008	9455.8595
LC6:	690.67349	2397.8805

SW Line Pier: Pier 2

Pier Strut Force-Wind:	4704
Pier Strut Force-Seismic:	677

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	3	W:	9494	2874	414
Pier 2	4.91	S:	1366	4704	677
Pier 3	2			1916	276
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	9.91		0	0

L18

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: **Line 7 - PERFORATED**

Pier Label: **Pier 2**

Wall Length: **14.91** ft
 Wall Height: **16** ft
 Wall Weight: **17** psf
 Aspect Ratio: **1.08**
 Aspect Ratio Factor: **1.12**
 Sheathing Thickness: **(2)-3/8"**
 Stud Spacing: **16** "
 Stud Size: **5.5** "
 Nail Size: **8d**
 Nail Spacing: **3** "

Shear Wall Capacity: **770** plf
 Shear Wall Load: **319** plf
 O.K.

AR adjusted: Shear Wall Capacity: **770** plf

Max. Uplift: **4303.725** #
 Max. Downward Load: **8627.055** #

Unfactored Loads:

Strut Force Wind: **9494** #
 Strut Force Seismic: **1366** #

Factored Loads:

Strut Force Wind: **4743** #
 Strut Force Seismic: **796** #
 Control Strut Force: **4743** #
 Controlling W/S: **W**
 Wind Load Factor: **0.6**
 Seismic Load Factor: **0.7**
 p: **1**

Vertical Loading

Wall Dead Load: **307.5** plf
 Wall Live Load: **0** plf
 Wall Snow Load: **330** plf
 Wall Wind Load: **403.92** plf

Overturning

	Uplift	Downward
LC1:	2575.6562	7602.5329
LC2:	-3466.088	5174.257
LC3:	-993.4135	8627.0553
LC4:	-5524.722	6805.8484
LC5:	4303.7252	5874.4639
LC6:	-1738.019	3446.188

SW Line Pier: **Pier 2**

Pier Strut Force-Wind: **7904**
 Pier Strut Force-Seismic: **1137**

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	3	W:	9494	1590	229
Pier 2	14.91	S:	1366	7904	1137
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	17.91		0	0

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 8 - Individual pier

Pier Label: Pier 1

Wall Length: 10 ft
 Wall Height: 16 ft
 Wall Weight: 17 psf
 Aspect Ratio: 1.6
 Aspect Ratio Factor: 1.05
 Sheathing Thickness: (2)-3/8"
 Stud Spacing: 16 "
 Stud Size: 5.5 "
 Nail Size: 8d
 Nail Spacing: 6 "

Shear Wall Capacity: 392 plf
 Shear Wall Load: 208 plf
 O.K.

AR adjusted: Shear Wall Capacity: 392 plf

Max. Uplift: 2976.42 #
 Max. Downward Load: 5216 #

Unfactored Loads:

Strut Force Wind: 5177 #
 Strut Force Seismic: 724 #

Factored Loads:

Strut Force Wind: 2071 #
 Strut Force Seismic: 339 #
 Control Strut Force: 2071 #
 Controlling W/S: W
 Wind Load Factor: 0.6
 Seismic Load Factor: 0.7
 p: 1

Vertical Loading

Wall Dead Load: 213.5 plf
 Wall Live Load: 0 plf
 Wall Snow Load: 305 plf
 Wall Wind Load: 373.32 plf

Overturning

	Uplift	Downward
LC1:	2005.42	4620.5
LC2:	-1886.54	2968.46
LC3:	-246.56	5216
LC4:	-3165.53	3976.97
LC5:	2976.42	3649.5
LC6:	-915.54	1997.46

SW Line Pier: Pier 1

Pier Strut Force-Wind: 3451
 Pier Strut Force-Seismic: 483

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	10	W:	5177	3451	483
Pier 2	5	S:	724	1726	241
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	15		0	0

120

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 9 - Individual pier

Pier Label: Pier 1

Wall Length: 3 ft
 Wall Height: 10 ft
 Wall Weight: 26 psf
 Aspect Ratio: 3.34
 Aspect Ratio Factor: 0.84
 Sheathing Thickness: (2)-3/8"
 Stud Spacing: 16 "
 Stud Size: 5.5 "
 Nail Size: 8d
 Nail Spacing: 6 "

Shear Wall Capacity: 392 plf
 Shear Wall Load: 305 plf
 O.K.

AR adjusted: Shear Wall Capacity: 329.28 plf

Max. Uplift: 2749.382 #
 Max. Downward Load: 3565.718 #

Unfactored Loads:

Strut Force Wind: 3050 #
 Strut Force Seismic: 290 #

Factored Loads:

Strut Force Wind: 915 #
 Strut Force Seismic: 102 #
 Control Strut Force: 915 #
 Controlling W/S: W
 Wind Load Factor: 0.6
 Seismic Load Factor: 0.7
 p: 1

Vertical Loading

Wall Dead Load: 98.5 plf
 Wall Live Load: 0 plf
 Wall Snow Load: 20 plf
 Wall Wind Load: 24.48 plf

Overturning

	Uplift	Downward
LC1:	2534.282	3565.718
LC2:	-199.4167	876.08333
LC3:	1743.774	2831.226
LC4:	-306.5	814
LC5:	2749.382	3350.618
LC6:	15.683333	660.98333

SW Line Pier: Pier 1
 Pier Strut Force-Wind: 1525
 Pier Strut Force-Seismic: 145

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	3	W:	3050	1525	145
Pier 2	3	S:	290	1525	145
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	6		0	0

24

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 10 - Individual pier

Pier Label: Pier 1

Wall Length:	4.25	ft
Wall Height:	15.67	ft
Wall Weight:	17	psf
Aspect Ratio:	3.69	
Aspect Ratio Factor:	0.79	
Sheathing Thickness:	(5)-15/32"	
Stud Spacing:	16	"
Stud Size:	5.5	"
Nail Size:	8d	
Nail Spacing:	2	"

Shear Wall Capacity:	1218	plf
Shear Wall Load:	811	plf
	O.K.	

AR adjusted: Shear Wall Capacity: 962.22 plf

Max. Uplift:	12370.36	#
Max. Downward Load:	13289.41	#

Unfactored Loads:

Strut Force Wind:	10799	#
Strut Force Seismic:	1310	#

Factored Loads:

Strut Force Wind:	3443	#
Strut Force Seismic:	488	#
Control Strut Force:	3443	#
Controlling W/S:	W	
Wind Load Factor:	0.6	
Seismic Load Factor:	0.7	
p:	1	

Vertical Loading

Wall Dead Load:	59	plf
Wall Live Load:	0	plf
Wall Snow Load:	60	plf
Wall Wind Load:	73.44	plf

Overturning

	Uplift	Downward
LC1:	12093.776	13289.412
LC2:	1104.8813	2487.7888
LC3:	8801.8437	10235.547
LC4:	560.17254	2134.33
LC5:	12370.358	13012.83
LC6:	1381.4628	2211.2073

SW Line Pier: Pier 1

Pier Strut Force-Wind:	5737
Pier Strut Force-Seismic:	696

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	4.25	W:	10799	5737	696
Pier 2	3.75	S:	1310	5062	614
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	8		0	0

122

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: **Line 11 - Individual pier** Pier Label: **Pier 1**

Wall Length:	11.91 ft	Shear Wall Capacity:	770 plf
Wall Height:	16 ft	Shear Wall Load:	638 plf
Wall Weight:	17 psf		O.K.
Aspect Ratio:	1.35		
Aspect Ratio Factor:	1.09	AR adjusted: Shear Wall Capacity:	770 plf
Sheathing Thickness:	(2)-3/8"		
Stud Spacing:	16"		
Stud Size:	5.5"	Max. Uplift:	9264.515 #
Nail Size:	8d	Max. Downward Load:	12042.98 #
Nail Spacing:	3"		

Unfactored Loads:

Strut Force Wind:	12644 #
Strut Force Seismic:	927 #

Factored Loads:

Strut Force Wind:	7587 #
Strut Force Seismic:	649 #
Control Strut Force:	7587 #
Controlling W/S:	W
Wind Load Factor:	0.6
Seismic Load Factor:	0.7
p:	1

Vertical Loading

Wall Dead Load:	116 plf
Wall Live Load:	0 plf
Wall Snow Load:	105 plf
Wall Wind Load:	128.52 plf

Overturning

	Uplift	Downward
LC1:	8340.2992	12042.975
LC2:	-1438.802	3182.278
LC3:	5208.6332	10078.823
LC4:	-2125.693	3433.2998
LC5:	9264.5152	11118.759
LC6:	-514.586	2258.062

SW Line Pier: **Pier 1**

Pier Strut Force-Wind:	12644
Pier Strut Force-Seismic:	927

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	11.91	W:	12644	12644	927
Pier 2	0	S:	927	0	0
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	11.91		0	0

123

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 12 - Individual pier

Pier Label: Pier 1

Wall Length:	12	ft
Wall Height:	10	ft
Wall Weight:	17	psf
Aspect Ratio:	0.84	
Aspect Ratio Factor:	1.15	
Sheathing Thickness:	(2)-3/8"	
Stud Spacing:	16	"
Stud Size:	5.5	"
Nail Size:	8d	
Nail Spacing:	6	"

Shear Wall Capacity:	392	plf
Shear Wall Load:	64	plf

O.K.

AR adjusted: Shear Wall Capacity: 392 plf

Max. Uplift:	-41.7	#
Max. Downward Load:	2809.425	#

Unfactored Loads:

Strut Force Wind:	1263	#
Strut Force Seismic:	128	#

Factored Loads:

Strut Force Wind:	758	#
Strut Force Seismic:	90	#
Control Strut Force:	758	#
Controlling W/S:	W	
Wind Load Factor:	0.6	
Seismic Load Factor:	0.7	
ρ :	1	

Vertical Loading

Wall Dead Load:	153	plf
Wall Live Load:	0	plf
Wall Snow Load:	170	plf
Wall Wind Load:	136	plf

Overturning

	Uplift	Downward
LC1:	-816.9	2079.9
LC2:	-1863.333	2012.6667
LC3:	-1862.175	2809.425
LC4:	-2647	2759
LC5:	-41.7	1304.7
LC6:	-1088.133	1237.4667

SW Line Pier: Pier 1

Pier Strut Force-Wind:	1263
Pier Strut Force-Seismic:	128

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	12	W:	1263	1263	128
Pier 2	0	S:	128	0	0
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	12		0	0

124

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: **Line 13 - Individual pier** Pier Label: **Pier 1**

Wall Length:	4 ft	Shear Wall Capacity:	392 plf
Wall Height:	10 ft	Shear Wall Load:	143 plf
Wall Weight:	17 psf		O.K.
Aspect Ratio:	2.5		
Aspect Ratio Factor:	0.94	AR adjusted: Shear Wall Capacity:	368.48 plf
Sheathing Thickness:	(2)-3/8"		
Stud Spacing:	16 "		
Stud Size:	5.5 "	Max. Uplift:	1196.1 #
Nail Size:	8d	Max. Downward Load:	1903.3 #
Nail Spacing:	6 "		

Unfactored Loads:

Strut Force Wind:	1894 #
Strut Force Seismic:	171 #

Factored Loads:

Strut Force Wind:	569 #
Strut Force Seismic:	61 #
Control Strut Force:	569 #
Controlling W/S:	W
Wind Load Factor:	0.6
Seismic Load Factor:	0.7
p:	1

Vertical Loading

Wall Dead Load:	153 plf
Wall Live Load:	0 plf
Wall Snow Load:	170 plf
Wall Wind Load:	136 plf

Overturning

	Uplift	Downward
LC1:	937.7	1903.3
LC2:	-495.5	796.5
LC3:	286.775	1843.975
LC4:	-788.125	1013.875
LC5:	1196.1	1644.9
LC6:	-237.1	538.1

SW Line Pier: Pier 1

Pier Strut Force-Wind:	947
Pier Strut Force-Seismic:	86

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	4	W:	1894	947	86
Pier 2	4	S:	171	947	86
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	8		0	0

125

SHEAR WALL DESIGN - 2018 IBC

ENCLAVES LOT 20

Shear Wall Label: Line 14 - Individual pier

Pier Label: Pier 1

Wall Length: 3.25 ft
 Wall Height: 10 ft
 Wall Weight: 17 psf
 Aspect Ratio: 3.08
 Aspect Ratio Factor: 0.87
 Sheathing Thickness: (2)-3/8"
 Stud Spacing: 16 "
 Stud Size: 5.5 "
 Nail Size: 8d
 Nail Spacing: 6 "

Shear Wall Capacity: 392 plf
 Shear Wall Load: 236 plf
 O.K.

AR adjusted: Shear Wall Capacity: 341.04 plf

Max. Uplift: 2156.896 #
 Max. Downward Load: 2692.496 #

Unfactored Loads:

Strut Force Wind: 2549 #
 Strut Force Seismic: 140 #

Factored Loads:

Strut Force Wind: 765 #
 Strut Force Seismic: 49 #
 Control Strut Force: 765 #
 Controlling W/S: W
 Wind Load Factor: 0.6
 Seismic Load Factor: 0.7
 p: 1

Vertical Loading

Wall Dead Load: 48 plf
 Wall Live Load: 0 plf
 Wall Snow Load: 20 plf
 Wall Wind Load: 16 plf

Overturning

	Uplift	Downward
LC1:	2015.1962	2692.4962
LC2:	-203.4808	505.01923
LC3:	1398.4596	2132.3096
LC4:	-265.5481	491.70192
LC5:	2156.8962	2550.7962
LC6:	-61.78077	363.31923

SW Line Pier: Pier 1

Pier Strut Force-Wind: 1275
 Pier Strut Force-Seismic: 70

Multiple Shear Wall Piers

	Length (ft)	Total Wall	Load (#)	Load/pier (Wind-#)	Load/pier (Seis-#)
Pier 1	3.25	W:	2549	1275	70
Pier 2	3.25	S:	140	1275	70
Pier 3	0			0	0
Pier 4	0			0	0
Pier 5	0			0	0
Pier 6	0	6.5		0	0

176

Beam Label: F1

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	1	24	60		84
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13	221			221
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				462	60	0	522

Beam Label: F2

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	8.5	204	510		714
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13	221			221
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				642	510	0	1152

Beam Label: F3

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	10.75	258	645		903
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13	221			221
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				696	645	0	1341

Beam Label: F4

	DL (psf)	LL/SL (psf)	Tributary Area		LL (plf)	SL (plf)	TL (plf)
			Area	DL (plf)			
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	5.75	103.5		115	218.5
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	15	255			255
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				599.5	0	115	714.5

Beam Label: F5

	DL (psf)	LL/SL (psf)	Tributary Area		LL (plf)	SL (plf)	TL (plf)
			Area	DL (plf)			
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	16.5	297		330	627
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	20.5	348.5			348.5
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				886.5	0	330	1216.5

Beam Label: F6

	DL (psf)	LL/SL (psf)	Tributary Area		LL (plf)	SL (plf)	TL (plf)
			Area	DL (plf)			
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	2	36		40	76
Floor Load	24	60	6.5	156	390		546
Stucco Soffit	12	0	1	12	0		12
Exterior Walls	17	--	20	340			340
Foundation Walls 8"	100		2	200			200
Stone Veneer	26	---	0	0			0
				744	390	40	1134

Beam Label: F7

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	14.5	261		290	551
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	20	340			340
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				818	0	290	1108

Beam Label: F8

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	15	210		300	510
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	6	102			102
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	10	260			260
				813	0	300	1113

Beam Label: F9

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	3	42		60	102
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	19	323			323
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				606	0	60	666

F7

Beam Label: F10

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	8	144		160	304
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	13.5	351			351
				712	0	160	872

Beam Label: F11

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	1	18		20	38
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	13.5	351			351
				586	0	20	606

Beam Label: F12

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	3	42		60	102
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	12.5	212.5			212.5
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				495.5	0	60	555.5

FS

Beam Label: F13

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	14	196		280	476
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	14	238			238
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				675	0	280	955

Beam Label: F14

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	14	196		280	476
Flat Roof	18	20	4	72		80	152
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	14	238			238
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				747	0	360	1107

Beam Label: F15

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	12	216		240	456
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	10	120	0		120
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		1.5	150			150
Stone Veneer	26	---	0	0			0
				486	0	240	726

Beam Label: F16

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	3	42		60	102
Flat Roof	18	20	12	216		240	456
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	16.5	280.5			280.5
Foundation Walls 8"	100		1.5	150			150
Stone Veneer	26	---	0	0			0
				712.5	0	300	1012.5

Beam Label: F17

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	20.5	369		410	779
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	10	120	0		120
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		1.5	150			150
Stone Veneer	26	---	0	0			0
				639	0	410	1049

Beam Label: F18

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	7	98		140	238
Flat Roof	18	20	6.25	112.5		125	237.5
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	12	204			204
Foundation Walls 8"	100		1.5	150			150
Stone Veneer	26	---	0	0			0
				564.5	0	265	829.5



Beam Label: F19

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	1	18		20	38
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13.5	229.5			229.5
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				464.5	0	20	484.5

Beam Label: F20

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	3	42		60	102
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	13	338			338
				621	0	60	681

Beam Label: F21

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	7.25	130.5		145	275.5
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13.5	229.5			229.5
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				577	0	145	722



Beam Label: F22

	DL (psf)	LL/SL (psf)	Tributary Area		LL (plf)	SL (plf)	TL (plf)
			Area	DL (plf)			
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	9.5	171		190	361
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	13.5	351			351
				739	0	190	929

Beam Label: F23

	DL (psf)	LL/SL (psf)	Tributary Area		LL (plf)	SL (plf)	TL (plf)
			Area	DL (plf)			
Pitched Roof	14	20	9.25	129.5		185	314.5
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	10	170			170
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				540.5	0	185	725.5

Beam Label: F24

	DL (psf)	LL/SL (psf)	Tributary Area		LL (plf)	SL (plf)	TL (plf)
			Area	DL (plf)			
Pitched Roof	14	20	13	182		260	442
Flat Roof	18	20	9.5	171		190	361
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	14	238			238
Foundation Walls 8"	100		1.5	150			150
Stone Veneer	26	---	0	0			0
				765	0	450	1215

Beam Label: F25

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	1	14		20	34
Flat Roof	18	20	5.25	94.5		105	199.5
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	1	12	0		12
Exterior Walls	17	--	16	272			272
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				609.5	0	125	734.5

Beam Label: F26

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	5	70		100	170
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		5	500			500
Stone Veneer	26	----	40	1040			1040
				1610	0	100	1710

Beam Label: F27

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	6.25	112.5		125	237.5
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13.5	229.5			229.5
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				559	0	125	684

Beam Label: F28

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	3	42		60	102
Flat Roof	18	20	0	0		0	0
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	12	312			312
				595	0	60	655

Beam Label: F29

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	1	18		20	38
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13.5	229.5			229.5
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				464.5	0	20	484.5

Beam Label: F30

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	6	108		120	228
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13.5	229.5			229.5
Foundation Walls 8"	100		5.17	517			517
Stone Veneer	26	---	0	0			0
				854.5	0	120	974.5

Beam Label: F31

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	9	126		180	306
Flat Roof	18	20	6	108		120	228
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	12.5	212.5			212.5
Foundation Walls 8"	100		1.5	150			150
Stone Veneer	26	---	0	0			0
				596.5	0	300	896.5

Beam Label: F32

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	11.25	202.5		225	427.5
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	13.5	229.5			229.5
Foundation Walls 8"	100		7	700			700
Stone Veneer	26	---	0	0			0
				1132	0	225	1357

Beam Label: F33

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	0	0		0	0
Flat Roof	18	20	1	18		20	38
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	0	0			0
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	13.5	351			351
				586	0	20	606

Beam Label: F34

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	3	42		60	102
Flat Roof	18	20	11.25	202.5		225	427.5
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	2	24	0		24
Exterior Walls	17	--	16	272			272
Foundation Walls 8"	100		1.5	150			150
Stone Veneer	26	---	0	0			0
				690.5	0	285	975.5

Beam Label: F35

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	7	98		140	238
Flat Roof	18	20	1	18		20	38
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	0	0	0		0
Exterior Walls	17	--	10	170			170
Foundation Walls 8"	100		1.5	150			150
Stone Veneer	26	---	0	0			0
				436	0	160	596

Beam Label: F36

	Tributary Area						
	DL (psf)	LL/SL (psf)	Area	DL (plf)	LL (plf)	SL (plf)	TL (plf)
Pitched Roof	14	20	13	182		260	442
Flat Roof	14	20	5.25	73.5		105	178.5
Floor Load	24	60	0	0	0		0
Stucco Soffit	12	0	5.25	63	0		63
Exterior Walls	17	--	17.75	301.75			301.75
Foundation Walls 8"	100		2.17	217			217
Stone Veneer	26	---	0	0			0
				837.25	0	365	1202.25

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 AUG 2022, 4:53PM

File: LH ENCLAVES LOT 20_CALCS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

General Footing

Lic. #: KW-06005427

DESCRIPTION: FOOTING SF1

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : IBC 2018

General Information

Material Properties

f'_c : Concrete 28 day strength	=	2.50 ksi
f_y : Rebar Yield	=	60.0 ksi
E_c : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
ϕ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Sliding Safety Factor	=	1.50 : 1
Add Ftg Wt for Soil Pressure	=	Yes
Use ftg wt for stability, moments & shears	=	Yes
Add Pedestal Wt for Soil Pressure	=	Yes
Use Pedestal wt for stability, mom & shear	=	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	200.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Footing base depth below soil surface	=	1.50 ft
Allow press. increase per foot of depth when footing base is below	=	ksf
	=	ft

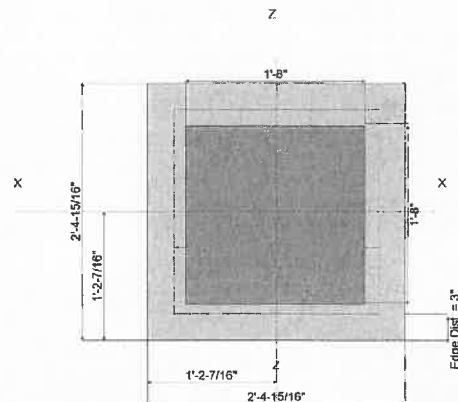
Increases based on footing plan dimension

Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
	=	ft

Dimensions

Width parallel to X-X Axis	=	2.410 ft
Length parallel to Z-Z Axis	=	2.410 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...		
px : parallel to X-X Axis	=	20 in
pz : parallel to Z-Z Axis	=	20.0 in
Height	=	14.0 in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



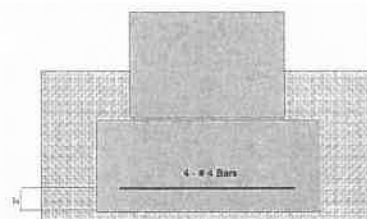
Reinforcing

Bars parallel to X-X Axis	=	4.0
Number of Bars	=	# 4
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis	=	4
Number of Bars	=	# 4
Reinforcing Bar Size	=	# 4

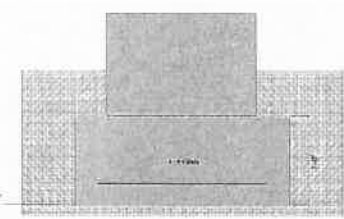
Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

# Bars required within zone	n/a
# Bars required on each side of zone	n/a



X-X Section Looking to +Z



Z-Z Section Looking to +X

Applied Loads

	D	Lr	L	S	W	E	H	
P : Column Load	=	3.81	3.10					k
OB : Overburden	=							ksf
M-xx	=							k-ft
M-zz	=							k-ft
V-x	=							k
V-z	=							k

FM

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 AUG 2022, 4:53PM

General Footing

File: LH ENCLAVES LOT 20_CALC.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. # KW-06005427

IRON ROCK ENGINEERING

DESCRIPTION: FOOTING SF1

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9627	Soil Bearing	1.444 ksf	1.50 ksf	+D+Lr+H about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.009159	Z Flexure (+X)	0.1178 k-ft/ft	12.861 k-ft/ft	+1.20D+1.60Lr+0.50W+1.60H
PASS	0.009159	Z Flexure (-X)	0.1178 k-ft/ft	12.861 k-ft/ft	+1.20D+1.60Lr+0.50W+1.60H
PASS	0.009159	X Flexure (+Z)	0.1178 k-ft/ft	12.861 k-ft/ft	+1.20D+1.60Lr+0.50W+1.60H
PASS	0.009159	X Flexure (-Z)	0.1178 k-ft/ft	12.861 k-ft/ft	+1.20D+1.60Lr+0.50W+1.60H
PASS	n/a	1-way Shear (+X)	0.0 psi	75.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	n/a	1-way Shear (+Z)	0.0 psi	75.0 psi	n/a
PASS	n/a	1-way Shear (-Z)	0.0 psi	75.0 psi	n/a
PASS	n/a	2-way Punching	4.470 psi	75.0 psi	+1.40D+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, +D+H	1.50	n/a	0.0	0.9106	0.9106	n/a	n/a	0.607
X-X, +D+L+H	1.50	n/a	0.0	0.9106	0.9106	n/a	n/a	0.607
X-X, +D+Lr+H	1.50	n/a	0.0	1.444	1.444	n/a	n/a	0.963
X-X, +D+S+H	1.50	n/a	0.0	0.9106	0.9106	n/a	n/a	0.607
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.311	1.311	n/a	n/a	0.874
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	0.9106	0.9106	n/a	n/a	0.607
X-X, +D+0.60W+H	1.50	n/a	0.0	0.9106	0.9106	n/a	n/a	0.607
X-X, +D+0.70E+H	1.50	n/a	0.0	0.9106	0.9106	n/a	n/a	0.607
X-X, +D+0.750Lr+0.750L+0.450W+H	1.50	n/a	0.0	1.311	1.311	n/a	n/a	0.874
X-X, +D+0.750L+0.750S+0.450W+H	1.50	n/a	0.0	0.9106	0.9106	n/a	n/a	0.607
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	0.9106	0.9106	n/a	n/a	0.607
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.5463	0.5463	n/a	n/a	0.364
X-X, +0.60D+0.70E+0.60H	1.50	n/a	0.0	0.5463	0.5463	n/a	n/a	0.364
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.9106	0.9106	0.607
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	0.9106	0.9106	0.607
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	1.444	1.444	0.963
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.9106	0.9106	0.607
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.311	1.311	0.874
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	0.9106	0.9106	0.607
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.9106	0.9106	0.607
Z-Z, +D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.9106	0.9106	0.607
Z-Z, +D+0.750Lr+0.750L+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.311	1.311	0.874
Z-Z, +D+0.750L+0.750S+0.450W+H	1.50	0.0	n/a	n/a	n/a	0.9106	0.9106	0.607
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	0.9106	0.9106	0.607
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.5463	0.5463	0.364
Z-Z, +0.60D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.5463	0.5463	0.364

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturing				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				



Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 7 AUG 2022, 4:53PM

General Footing

File: LH ENCLAVES LOT 20_CALCS.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. #: KW-06005427

IRON/ROCK ENGINEERING

DESCRIPTION: FOOTING SF1

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.06866	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.40D+1.60H	0.06866	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.07727	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.07727	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.05885	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.05885	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+1.60Lr+0.50L+1.60H	0.1178	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+1.60Lr+0.50L+1.60H	0.1178	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.1178	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.1178	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50L+1.60S+1.60H	0.05885	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50L+1.60S+1.60H	0.05885	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.05885	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.05885	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50Lr+0.50L+W+1.60H	0.07727	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50Lr+0.50L+W+1.60H	0.07727	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50L+0.50S+W+1.60H	0.05885	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50L+0.50S+W+1.60H	0.05885	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50L+0.70S+E+1.60H	0.05885	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +1.20D+0.50L+0.70S+E+1.60H	0.05885	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +0.90D+W+0.90H	0.04414	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +0.90D+W+0.90H	0.04414	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +0.90D+E+0.90H	0.04414	+Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
X-X, +0.90D+E+0.90H	0.04414	-Z	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.40D+1.60H	0.06866	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.40D+1.60H	0.06866	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.07727	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.07727	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.05885	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.05885	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+1.60Lr+0.50L+1.60H	0.1178	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+1.60Lr+0.50L+1.60H	0.1178	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.1178	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.1178	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50L+1.60S+1.60H	0.05885	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50L+1.60S+1.60H	0.05885	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.05885	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.05885	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50Lr+0.50L+W+1.60H	0.07727	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50Lr+0.50L+W+1.60H	0.07727	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50L+0.50S+W+1.60H	0.05885	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50L+0.50S+W+1.60H	0.05885	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50L+0.70S+E+1.60H	0.05885	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +1.20D+0.50L+0.70S+E+1.60H	0.05885	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +0.90D+W+0.90H	0.04414	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +0.90D+W+0.90H	0.04414	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +0.90D+E+0.90H	0.04414	-X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK
Z-Z, +0.90D+E+0.90H	0.04414	+X	Bottom	0.2592	Min Temp %	0.3320	12.861	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60L+0.50S+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60Lr+0.50L+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50L+1.60S+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50Lr+0.50L+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50L+0.50S+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50L+0.70S+E+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+0.90D+W+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK

F16

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 AUG 2022, 4:53PM

General Footing

File: LH ENCLAVES LOT 20_CALCS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. #: KW-06005427

IRON ROCK ENGINEERING

DESCRIPTION: FOOTING SF1

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
Two-Way "Punching" Shear								All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+0.50Lr+1.60L+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+1.60L+0.50S+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+1.60Lr+0.50L+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+1.60Lr+0.50W+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+0.50L+1.60S+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+1.60S+0.50W+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+0.50Lr+0.50L+W+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+0.50L+0.50S+W+1.60H	4.47 psi	150.00 psi	0.0298	OK
+1.20D+0.50L+0.70S+E+1.60H	4.47 psi	150.00 psi	0.0298	OK
+0.90D+W+0.90H	4.47 psi	150.00 psi	0.0298	OK
+0.90D+E+0.90H	4.47 psi	150.00 psi	0.0298	OK

F17

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 AUG 2022, 4:54PM

File: LH ENCLAVES LOT 20_CALC.006

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

General Footing

Lic. #: KW-06005427

DESCRIPTION: FOOTING SF2

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : IBC 2018

General Information

Material Properties

f_c : Concrete 28 day strength	=	2.50	ksi
f_y : Rebar Yield	=	60.0	ksi
E_c : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
ϕ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=		
Min Allow % Temp Reinf.	=	0.00180	
Min. Overturning Safety Factor	=	1.50 : 1	
Min. Sliding Safety Factor	=	1.50 : 1	
Add Ftg Wt for Soil Pressure	:	Yes	
Use ftg wt for stability, moments & shears	:	Yes	
Add Pedestal Wt for Soil Pressure	:	Yes	
Use Pedestal wt for stability, mom & shear	:	Yes	

Soil Design Values

Allowable Soil Bearing	=	1.50	ksf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	200.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	1.50	ft
Allow press. increase per foot of depth when footing base is below	=		ksf/ft

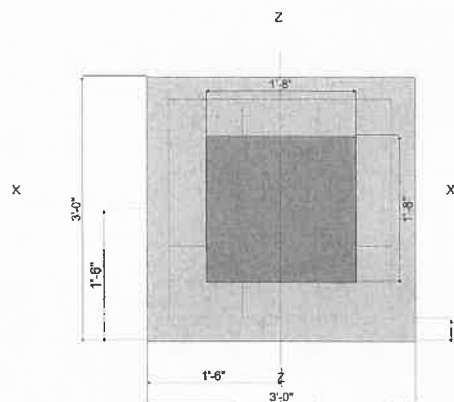
Increases based on footing plan dimension

Allowable pressure increase per foot of depth when max. length or width is greater than	=		ksf/ft
---	---	--	--------

Dimensions

Width parallel to X-X Axis	=	3	ft
Length parallel to Z-Z Axis	=	3.0	ft
Footing Thickness	=	12.0	in

Pedestal dimensions...	=		
px : parallel to X-X Axis	=	20.0	in
pz : parallel to Z-Z Axis	=	20.0	in
Height	=	14.0	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0	in



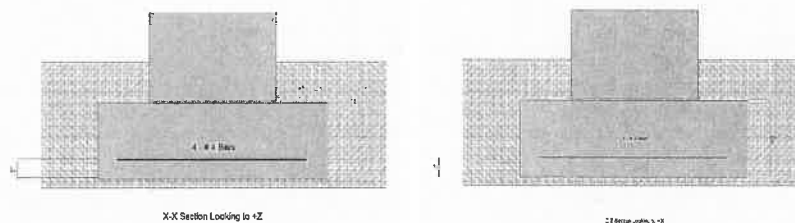
Reinforcing

Bars parallel to X-X Axis	=		
Number of Bars	=	4.0	
Reinforcing Bar Size	=	# 4	
Bars parallel to Z-Z Axis	=		
Number of Bars	=	4.0	
Reinforcing Bar Size	=	# 4	

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

	n/a
# Bars required within zone	n/a
# Bars required on each side of zone	n/a



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	6.650	4.310				k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k

FLS

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 AUG 2022, 4:54PM

File: LH ENCLAVES LOT 20_CALCS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

General Footing

Lic. #: KW-06005427

DESCRIPTION: FOOTING SF2

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9687	Soil Bearing	1.453 ksf	1.50 ksf	+D+Lr+H about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.03614	Z Flexure (+X)	0.3767 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.03614	Z Flexure (-X)	0.3767 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.03614	X Flexure (+Z)	0.3767 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.03614	X Flexure (-Z)	0.3767 k-ft/ft	10.424 k-ft/ft	+1.20D+1.60Lr+0.50L+1.60H
PASS	n/a	1-way Shear (+X)	0.0 psi	75.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	n/a	1-way Shear (+Z)	0.0 psi	75.0 psi	n/a
PASS	n/a	1-way Shear (-Z)	0.0 psi	75.0 psi	n/a
PASS	n/a	2-way Punching	5.261 psi	75.0 psi	+1.20D+1.60Lr+0.50L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc (in)	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, +D+H	1.50	n/a	0.0	0.9741	0.9741	n/a	n/a	0.649
X-X, +D+L+H	1.50	n/a	0.0	0.9741	0.9741	n/a	n/a	0.649
X-X, +D+Lr+H	1.50	n/a	0.0	1.453	1.453	n/a	n/a	0.969
X-X, +D+S+H	1.50	n/a	0.0	0.9741	0.9741	n/a	n/a	0.649
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.333	1.333	n/a	n/a	0.889
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	0.9741	0.9741	n/a	n/a	0.649
X-X, +D+0.60W+H	1.50	n/a	0.0	0.9741	0.9741	n/a	n/a	0.649
X-X, +D+0.70E+H	1.50	n/a	0.0	0.9741	0.9741	n/a	n/a	0.649
X-X, +D+0.750Lr+0.750L+0.450W+H	1.50	n/a	0.0	1.333	1.333	n/a	n/a	0.889
X-X, +D+0.750L+0.750S+0.450W+H	1.50	n/a	0.0	0.9741	0.9741	n/a	n/a	0.649
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	0.9741	0.9741	n/a	n/a	0.649
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.5845	0.5845	n/a	n/a	0.390
X-X, +0.60D+0.70E+0.60H	1.50	n/a	0.0	0.5845	0.5845	n/a	n/a	0.390
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.9741	0.9741	0.649
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	0.9741	0.9741	0.649
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	1.453	1.453	0.969
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.9741	0.9741	0.649
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.333	1.333	0.889
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	0.9741	0.9741	0.649
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.9741	0.9741	0.649
Z-Z, +D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.9741	0.9741	0.649
Z-Z, +D+0.750Lr+0.750L+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.333	1.333	0.889
Z-Z, +D+0.750L+0.750S+0.450W+H	1.50	0.0	n/a	n/a	n/a	0.9741	0.9741	0.649
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	0.9741	0.9741	0.649
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.5845	0.5845	0.390
Z-Z, +0.60D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.5845	0.5845	0.390

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturing				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

F19

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.

Project Title:
Engineer:
Project ID:
Project Descr:

Title Block Line 6

Printed: 7 AUG 2022, 4:54PM

General Footing

File: LH ENCLAVES LOT 20_CALCS.ec6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. #: KW-06005427

IRON-ROCK ENGINEERING

DESCRIPTION: FOOTING SF2

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.2408	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.40D+1.60H	0.2408	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.2596	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.2596	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.2064	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.2064	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+1.60Lr+0.50L+1.60H	0.3767	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+1.60Lr+0.50L+1.60H	0.3767	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.3767	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.3767	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50L+1.60S+1.60H	0.2064	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50L+1.60S+1.60H	0.2064	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.2064	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.2064	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50Lr+0.50L+W+1.60H	0.2596	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50Lr+0.50L+W+1.60H	0.2596	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50L+0.50S+W+1.60H	0.2064	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50L+0.50S+W+1.60H	0.2064	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50L+0.70S+E+1.60H	0.2064	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +1.20D+0.50L+0.70S+E+1.60H	0.2064	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +0.90D+W+0.90H	0.1548	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +0.90D+W+0.90H	0.1548	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +0.90D+E+0.90H	0.1548	+Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
X-X, +0.90D+E+0.90H	0.1548	-Z	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.40D+1.60H	0.2408	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.40D+1.60H	0.2408	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.2596	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.2596	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.2064	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.2064	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+1.60Lr+0.50L+1.60H	0.3767	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+1.60Lr+0.50L+1.60H	0.3767	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.3767	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.3767	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50L+1.60S+1.60H	0.2064	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50L+1.60S+1.60H	0.2064	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.2064	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.2064	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50Lr+0.50L+W+1.60H	0.2596	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50Lr+0.50L+W+1.60H	0.2596	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50L+0.50S+W+1.60H	0.2064	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50L+0.50S+W+1.60H	0.2064	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50L+0.70S+E+1.60H	0.2064	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +1.20D+0.50L+0.70S+E+1.60H	0.2064	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +0.90D+W+0.90H	0.1548	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +0.90D+W+0.90H	0.1548	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +0.90D+E+0.90H	0.1548	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
Z-Z, +0.90D+E+0.90H	0.1548	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50Lr+1.60L+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60L+0.50S+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60Lr+0.50L+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60Lr+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50L+1.60S+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+1.60S+0.50W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50Lr+0.50L+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50L+0.50S+W+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+1.20D+0.50L+0.70S+E+1.60H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
+0.90D+W+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK

720

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 AUG 2022, 4:54PM

General Footing

File: LH ENCLAVES LOT 20_CALC.S.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.5.31
 IRON ROCK ENGINEERING

Lic. #: KW-08005427

DESCRIPTION: FOOTING SF2

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	0.00 psi	0.00 psi	0.00 psi	0.00 psi	0.00 psi	75.00 psi	0.00	OK
Two-Way "Punching" Shear								All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	3.36 psi	150.00psi	0.02242	OK
+1.20D+0.50Lr+1.60L+1.60H	3.63 psi	150.00psi	0.02417	OK
+1.20D+1.60L+0.50S+1.60H	2.88 psi	150.00psi	0.01922	OK
+1.20D+1.60Lr+0.50L+1.60H	5.26 psi	150.00psi	0.03507	OK
+1.20D+1.60Lr+0.50W+1.60H	5.26 psi	150.00psi	0.03507	OK
+1.20D+0.50L+1.60S+1.60H	2.88 psi	150.00psi	0.01922	OK
+1.20D+1.60S+0.50W+1.60H	2.88 psi	150.00psi	0.01922	OK
+1.20D+0.50Lr+0.50L+W+1.60H	3.63 psi	150.00psi	0.02417	OK
+1.20D+0.50L+0.50S+W+1.60H	2.88 psi	150.00psi	0.01922	OK
+1.20D+0.50L+0.70S+E+1.60H	2.88 psi	150.00psi	0.01922	OK
+0.90D+W+0.90H	2.16 psi	150.00psi	0.01442	OK
+0.90D+E+0.90H	2.16 psi	150.00psi	0.01442	OK

F21

Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.

Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 7 AUG 2022, 4:55PM

File: LH ENCLAVES LOT 20_CALCS.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

General Footing

Lic. #: KW-06005427

DESCRIPTION: FOOTING SF3

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : IBC 2018

General Information

Material Properties

f_c : Concrete 28 day strength	=	2.50 ksi
f_y : Rebar Yield	=	60.0 ksi
E_c : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
ϕ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.50 : 1
Min. Sliding Safety Factor	=	1.50 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	Yes
Use Pedestal wt for stability, mom & shear	:	Yes

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	200.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Footing base depth below soil surface	=	1.50 ft
Allow press. increase per foot of depth when footing base is below	=	ksf
	=	ft

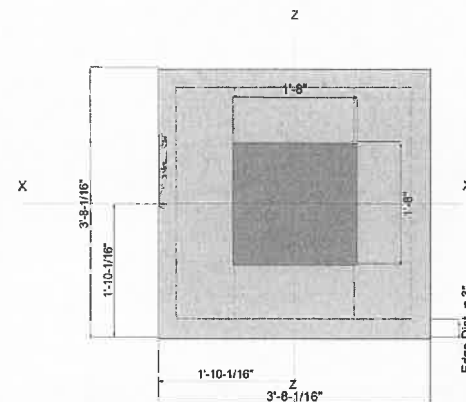
Increases based on footing plan dimension

Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
	=	ft

Dimensions

Width parallel to X-X Axis	=	3.670 ft
Length parallel to Z-Z Axis	=	3.670 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...	=	
px : parallel to X-X Axis	=	20.0 in
pz : parallel to Z-Z Axis	=	20.0 in
Height	=	14.0 in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



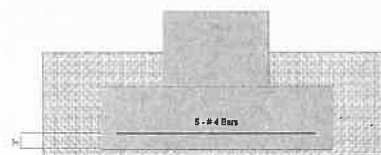
Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	5
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis	=	
Number of Bars	=	5
Reinforcing Bar Size	=	# 4

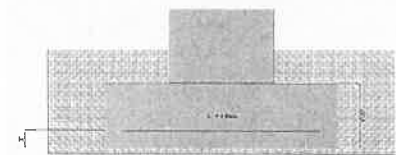
Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

# Bars required within zone	n/a
# Bars required on each side of zone	n/a



X-X Section Looking to +Z



Z-Z Section Looking to +X

Applied Loads

	D	Lr	L	S	W	E	H	
P : Column Load	=	9.070	6.790					k
OB : Overburden	=							ksf
M-xx	=							k-ft
M-zz	=							k-ft
V-x	=							k
V-z	=							k

FR

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 AUG 2022, 4:55PM

General Footing

Lic. #: KKW-06005427

File: LH ENCLAVES LOT 20_CALC.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON/ROCK/ENGINEERING

DESCRIPTION: FOOTING SF3

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.9340	Soil Bearing	1.401 ksf	1.50 ksf	+D+Lr+H about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.07744	Z Flexure (+X)	0.8241 k-ft/ft	10.642 k-ft/ft	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.07744	Z Flexure (-X)	0.8241 k-ft/ft	10.642 k-ft/ft	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.07744	X Flexure (+Z)	0.8241 k-ft/ft	10.642 k-ft/ft	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.07744	X Flexure (-Z)	0.8241 k-ft/ft	10.642 k-ft/ft	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.05211	1-way Shear (+X)	3.908 psi	75.0 psi	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.05211	1-way Shear (-X)	3.908 psi	75.0 psi	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.05211	1-way Shear (+Z)	3.908 psi	75.0 psi	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.05211	1-way Shear (-Z)	3.908 psi	75.0 psi	+1.20D+1.60Lr+0.50L+1.60H
PASS	0.07975	2-way Punching	11.963 psi	150.0 psi	+1.20D+1.60Lr+0.50L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, +D+H	1.50	n/a	0.0	0.8969	0.8969	n/a	n/a	0.598
X-X, +D+L+H	1.50	n/a	0.0	0.8969	0.8969	n/a	n/a	0.598
X-X, +D+Lr+H	1.50	n/a	0.0	1.401	1.401	n/a	n/a	0.934
X-X, +D+S+H	1.50	n/a	0.0	0.8969	0.8969	n/a	n/a	0.598
X-X, +D+0.750Lr+0.750L+H	1.50	n/a	0.0	1.275	1.275	n/a	n/a	0.850
X-X, +D+0.750L+0.750S+H	1.50	n/a	0.0	0.8969	0.8969	n/a	n/a	0.598
X-X, +D+0.60W+H	1.50	n/a	0.0	0.8969	0.8969	n/a	n/a	0.598
X-X, +D+0.70E+H	1.50	n/a	0.0	0.8969	0.8969	n/a	n/a	0.598
X-X, +D+0.750Lr+0.750L+0.450W+H	1.50	n/a	0.0	1.275	1.275	n/a	n/a	0.850
X-X, +D+0.750L+0.750S+0.450W+H	1.50	n/a	0.0	0.8969	0.8969	n/a	n/a	0.598
X-X, +D+0.750L+0.750S+0.5250E+H	1.50	n/a	0.0	0.8969	0.8969	n/a	n/a	0.598
X-X, +0.60D+0.60W+0.60H	1.50	n/a	0.0	0.5382	0.5382	n/a	n/a	0.359
X-X, +0.60D+0.70E+0.60H	1.50	n/a	0.0	0.5382	0.5382	n/a	n/a	0.359
Z-Z, +D+H	1.50	0.0	n/a	n/a	n/a	0.8969	0.8969	0.598
Z-Z, +D+L+H	1.50	0.0	n/a	n/a	n/a	0.8969	0.8969	0.598
Z-Z, +D+Lr+H	1.50	0.0	n/a	n/a	n/a	1.401	1.401	0.934
Z-Z, +D+S+H	1.50	0.0	n/a	n/a	n/a	0.8969	0.8969	0.598
Z-Z, +D+0.750Lr+0.750L+H	1.50	0.0	n/a	n/a	n/a	1.275	1.275	0.850
Z-Z, +D+0.750L+0.750S+H	1.50	0.0	n/a	n/a	n/a	0.8969	0.8969	0.598
Z-Z, +D+0.60W+H	1.50	0.0	n/a	n/a	n/a	0.8969	0.8969	0.598
Z-Z, +D+0.70E+H	1.50	0.0	n/a	n/a	n/a	0.8969	0.8969	0.598
Z-Z, +D+0.750Lr+0.750L+0.450W+H	1.50	0.0	n/a	n/a	n/a	1.275	1.275	0.850
Z-Z, +D+0.750L+0.750S+0.450W+H	1.50	0.0	n/a	n/a	n/a	0.8969	0.8969	0.598
Z-Z, +D+0.750L+0.750S+0.5250E+H	1.50	0.0	n/a	n/a	n/a	0.8969	0.8969	0.598
Z-Z, +0.60D+0.60W+0.60H	1.50	0.0	n/a	n/a	n/a	0.5382	0.5382	0.359
Z-Z, +0.60D+0.70E+0.60H	1.50	0.0	n/a	n/a	n/a	0.5382	0.5382	0.359

Overturing Stability

Rotation Axis & Load Combination...	Overturing Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturing				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				



Title Block Line 1
You can change this area
using the "Settings" menu item
and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

Printed: 7 AUG 2022, 4:55PM

General Footing

File: LH ENCLAVES LOT 20_CALC.SAC6
Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

Lic. #: KKW-06005427

IRON ROCK ENGINEERING

DESCRIPTION: FOOTING SF3

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	0.4894	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.40D+1.60H	0.4894	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.5460	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	0.5460	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.4195	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+1.60L+0.50S+1.60H	0.4195	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+1.60Lr+0.50L+1.60H	0.8241	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+1.60Lr+0.50L+1.60H	0.8241	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.8241	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	0.8241	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50L+1.60S+1.60H	0.4195	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50L+1.60S+1.60H	0.4195	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.4195	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+1.60S+0.50W+1.60H	0.4195	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50Lr+0.50L+W+1.60H	0.5460	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50Lr+0.50L+W+1.60H	0.5460	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50L+0.50S+W+1.60H	0.4195	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50L+0.50S+W+1.60H	0.4195	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50L+0.70S+E+1.60H	0.4195	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +1.20D+0.50L+0.70S+E+1.60H	0.4195	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +0.90D+W+0.90H	0.3146	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +0.90D+W+0.90H	0.3146	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +0.90D+E+0.90H	0.3146	+Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
X-X, +0.90D+E+0.90H	0.3146	-Z	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.40D+1.60H	0.4894	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.40D+1.60H	0.4894	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.5460	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	0.5460	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.4195	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	0.4195	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+1.60Lr+0.50L+1.60H	0.8241	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+1.60Lr+0.50L+1.60H	0.8241	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.8241	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	0.8241	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50L+1.60S+1.60H	0.4195	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50L+1.60S+1.60H	0.4195	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.4195	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	0.4195	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50Lr+0.50L+W+1.60H	0.5460	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50Lr+0.50L+W+1.60H	0.5460	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50L+0.50S+W+1.60H	0.4195	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50L+0.50S+W+1.60H	0.4195	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50L+0.70S+E+1.60H	0.4195	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +1.20D+0.50L+0.70S+E+1.60H	0.4195	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +0.90D+W+0.90H	0.3146	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +0.90D+W+0.90H	0.3146	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +0.90D+E+0.90H	0.3146	-X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK
Z-Z, +0.90D+E+0.90H	0.3146	+X	Bottom	0.2592	Min Temp %	0.2725	10.642	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	2.32 psi	2.32 psi	2.32 psi	2.32 psi	2.32 psi	75.00 psi	0.03	OK
+1.20D+0.50Lr+1.60L+1.60H	2.59 psi	2.59 psi	2.59 psi	2.59 psi	2.59 psi	75.00 psi	0.03	OK
+1.20D+1.60L+0.50S+1.60H	1.99 psi	1.99 psi	1.99 psi	1.99 psi	1.99 psi	75.00 psi	0.03	OK
+1.20D+1.60Lr+0.50L+1.60H	3.91 psi	3.91 psi	3.91 psi	3.91 psi	3.91 psi	75.00 psi	0.05	OK
+1.20D+1.60Lr+0.50W+1.60H	3.91 psi	3.91 psi	3.91 psi	3.91 psi	3.91 psi	75.00 psi	0.05	OK
+1.20D+0.50L+1.60S+1.60H	1.99 psi	1.99 psi	1.99 psi	1.99 psi	1.99 psi	75.00 psi	0.03	OK
+1.20D+1.60S+0.50W+1.60H	1.99 psi	1.99 psi	1.99 psi	1.99 psi	1.99 psi	75.00 psi	0.03	OK
+1.20D+0.50Lr+0.50L+W+1.60H	2.59 psi	2.59 psi	2.59 psi	2.59 psi	2.59 psi	75.00 psi	0.03	OK
+1.20D+0.50L+0.50S+W+1.60H	1.99 psi	1.99 psi	1.99 psi	1.99 psi	1.99 psi	75.00 psi	0.03	OK
+1.20D+0.50L+0.70S+E+1.60H	1.99 psi	1.99 psi	1.99 psi	1.99 psi	1.99 psi	75.00 psi	0.03	OK
+0.90D+W+0.90H	1.49 psi	1.49 psi	1.49 psi	1.49 psi	1.49 psi	75.00 psi	0.02	OK

F24

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 AUG 2022, 4:55PM

General Footing

Lic. #: KW-06005427

File: LH ENCLAVES LOT 20_CALC.S.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build:12.20.5.31

IRON ROCK ENGINEERING

DESCRIPTION: FOOTING SF3

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	1.49 psi	1.49 psi	1.49 psi	1.49 psi	1.49 psi	75.00 psi	0.02	OK
Two-Way "Punching" Shear								All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	7.11 psi	150.00 psi	0.04737	OK
+1.20D+0.50Lr+1.60L+1.60H	7.93 psi	150.00 psi	0.05283	OK
+1.20D+1.60L+0.50S+1.60H	6.09 psi	150.00 psi	0.0406	OK
+1.20D+1.60Lr+0.50L+1.60H	11.96 psi	150.00 psi	0.07975	OK
+1.20D+1.60Lr+0.50W+1.60H	11.96 psi	150.00 psi	0.07975	OK
+1.20D+0.50L+1.60S+1.60H	6.09 psi	150.00 psi	0.0406	OK
+1.20D+1.60S+0.50W+1.60H	6.09 psi	150.00 psi	0.0406	OK
+1.20D+0.50Lr+0.50L+W+1.60H	7.93 psi	150.00 psi	0.05283	OK
+1.20D+0.50L+0.50S+W+1.60H	6.09 psi	150.00 psi	0.0406	OK
+1.20D+0.50L+0.70S+E+1.60H	6.09 psi	150.00 psi	0.0406	OK
+0.90D+W+0.90H	4.57 psi	150.00 psi	0.03045	OK
+0.90D+E+0.90H	4.57 psi	150.00 psi	0.03045	OK

FLS

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # :
Description....
4' MAX HEIGHT SCREEN WALL - CMU

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

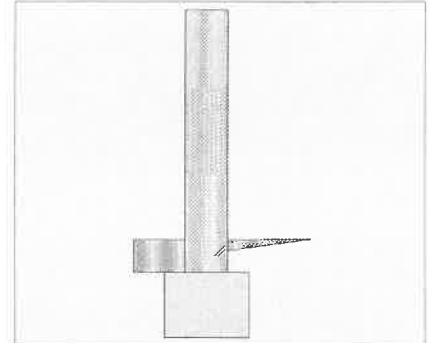
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	0.50 ft
Wall height above soil	=	3.50 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	30.0 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	1.70 OK
Sliding	=	4.36 OK
Total Bearing Load	=	572 lbs
...resultant ecc.	=	4.71 in
Soil Pressure @ Toe	=	1,398 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,957 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	3.6 psi OK
Footing Shear @ Heel	=	0.7 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	101.3 lbs
less 100% Passive Force	= -	270.0 lbs
less 100% Friction Force	= -	171.6 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	48.00
Rebar Placed at	=	Center
Design Data		
fb/FB + fa/Fa	=	0.290
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	111.8
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	237.4
Moment....Allowable		
	=	817.7
Shear....Actual		
Service Level	psi =	
Strength Level	psi =	1.2
Shear....Allowable		
	psi =	69.7
Anet (Masonry)	in2 =	91.50
Rebar Depth 'd'	in =	3.75
Masonry Data		
f _m	psi =	1,500
F _y	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Bottom

Stem OK

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f _c	psi =	
F _y	psi =	

136

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
4' MAX HEIGHT SCREEN WALL - CMU

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.33 ft
Heel Width = 1.00
Total Footing Width = 1.33
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
fc = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,957	0 psf
Mu' : Upward	= 92	0 ft-#
Mu' : Downward	= 27	27 ft-#
Mu: Design	= 65	27 ft-#
Actual 1-Way Shear	= 3.56	0.68 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Heel: Not req'd: $\mu < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Key: No key defined

Min footing T&S reinf Area 0.34 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft
If one layer of horizontal bars: #4@ 9.26 in
#5@ 14.35 in
#6@ 20.37 in
If two layers of horizontal bars: #4@ 18.52 in
#5@ 28.70 in
#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....					
Item		Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#	
Heel Active Pressure	=	38.3	0.50	19.1	Soil Over Heel	=	18.3	1.16	21.3
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=	63.0	3.25	204.8	* Axial Live Load on Stem	=			
	=				Soil Over Toe	=	18.2	0.17	3.0
					Surcharge Over Toe	=			
					Stem Weight(s)	=	336.0	0.66	222.9
					Earth @ Stem Transitions	=			
					Footing Weight	=	199.5	0.67	132.7
					Key Weight	=			
					Vert. Component	=			

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.117 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # :
Description....
6' MAX HEIGHT SCREEN WALL - CMU

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-08062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

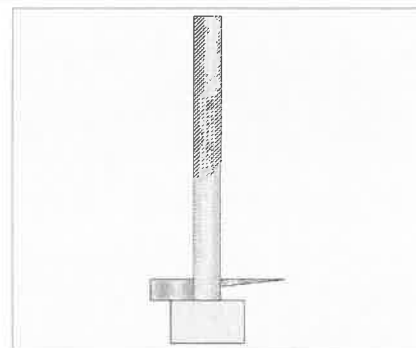
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	0.50 ft
Wall height above soil	=	6.18 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	0.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	30.0 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios

Overturning	=	1.55 OK
Sliding	=	3.61 OK
Total Bearing Load	=	900 lbs
...resultant ecc.	=	7.08 in
Soil Pressure @ Toe	=	1,844 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,582 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	7.5 psi OK
Footing Shear @ Heel	=	1.2 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	149.5 lbs
less 100% Passive Force	=	- 270.0 lbs
less 100% Friction Force	=	- 269.9 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	48.00
Rebar Placed at	=	Center

Design Data

fb/FB + fa/Fa	=	0.815
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	192.2

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	666.7
Moment....Allowable	=	817.7

Shear....Actual

Service Level	psi =	
Strength Level	psi =	2.1
Shear....Allowable	psi =	69.7
Anet (Masonry)	in2 =	91.50
Rebar Depth 'd'	in =	3.75

Masonry Data

f _m	psi =	1,500
F _y	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f _c	psi =	
F _y	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
6' MAX HEIGHT SCREEN WALL - CMU

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.58 ft
Heel Width	=	1.25
Total Footing Width	=	1.83
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f_c	=	2,500 psi
F_y	=	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm. = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,582	0 psf
M_u : Upward	= 348	0 ft-#
M_u : Downward	= 65	66 ft-#
M_u : Design	= 283	66 ft-#
Actual 1-Way Shear	= 7.47	1.20 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $M_u < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Heel: Not req'd: $M_u < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Key: No key defined

Min footing T&S reinf Area	0.47	in ²
Min footing T&S reinf Area per foot	0.26	in ² /ft
If one layer of horizontal bars:		
#4@ 9.26 in		
#5@ 14.35 in		
#6@ 20.37 in		
If two layers of horizontal bars:		
#4@ 18.52 in		
#5@ 28.70 in		
#6@ 40.74 in		

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....					
Item		Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#	
Heel Active Pressure	=	38.3	0.50	19.1	Soil Over Heel	=	32.1	1.54	49.4
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=	111.2	4.59	510.6	* Axial Live Load on Stem	=			
	=				Soil Over Toe	=	31.9	0.29	9.3
					Surcharge Over Toe	=			
					Stem Weight(s)	=	561.1	0.91	512.5
					Earth @ Stem Transitions	=			
					Footing Weight	=	274.5	0.92	251.2
					Key Weight	=			
					Vert. Component	=			

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.187	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.

F29

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

Title ENCLAVES LOT 20 RETAINING WALLS Page : 1
Job # : Dsgnr: RMD Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 4'-0" WALL HEIGHT

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

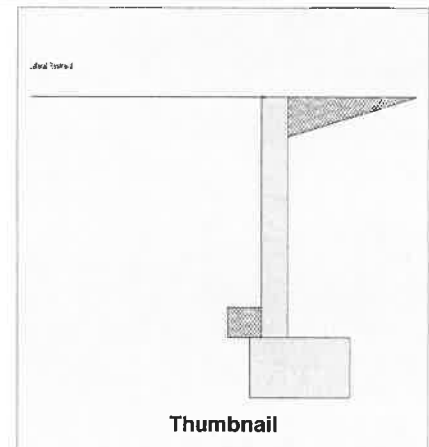
Criteria

Retained Height = 4.00 ft
Wall height above soil = 0.00 ft
Total Wall Height = 4.00 ft

Top Support Height = 4.00 ft
Slope Behind Wal = 0.00
Height of Soil over Toe = 6.00 in

Soil Data

Allow Soil Bearing = 2,000.0 psf
Equivalent Fluid Pressure Method
At-rest Heel Pressure = 52.0 psf/ft
Passive Pressure = 240.0 psf/ft
Soil Density = 110.00 pcf
Footing||Soil Frictior = 0.400
Soil height to ignore
for passive pressure = 12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

Axial Dead Load = 432.0 lbs
Axial Live Load = 225.0 lbs
Axial Load Eccentricity = 0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft

Load Type = Wind (W)
(Strength Level)

Wind on Exposed Stem = 0.0 psf

K_h Soil Density Multiplier = 0.200 g Added seismic per unit area = 0.0 psf

F_p / W_p Weight Multiplier = 0.000 g Added seismic per unit area = 0.0 psf

Adjacent Footing Load

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

Design Summary

Total Bearing Load = 1,932 lbs
...resultant ecc. = 4.95 in

Soil Pressure @ Toe = 862 psf OK
Soil Pressure @ Heel = 862 psf OK
Allowable = 2,000 psf
Soil Pressure Less Than Allowable

ACI Factored @ Toe = 2,270 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 0.9 psi OK
Footing Shear @ Heel = 0.9 psi OK
Allowable = 75.0 psi

Reaction at Top = 137.7 lbs
Reaction at Bottom = 511.3 lbs

Sliding Stability Ratio = 1.51 OK

Sliding Calcs
Lateral Sliding Force = 511.3 lbs
less 0 % Passive Force = - 0.0 lbs
less 100% Friction Force = - 772.6 lbs
Added Force Req'd = 0.0 lbs OK
...for 1.5 Stability = 0.0 lbs OK

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

Load Factors

Building Code IBC 2018, ACI
Dead Load 1.200
Live Load 1.600
Earth, H 1.600
Wind, W 1.000
Seismic, E 1.000

Concrete Stem Construction

Thickness = 6.00 in F_y = 60,000 psi
Wall Weight = 75.0 psf f_c = 2,500 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
Design Height Above Ftg	Stem OK 4.00 ft	Stem OK 1.70 ft	Stem OK 0.00 ft
Rebar Size	# 4	# 4	# 4
Rebar Spacing	18.00 in	18.00 in	18.00 in
Rebar Placed at	Center	Center	Center
Rebar Depth 'd'	3.00 in	3.00 in	3.00 in
Design Data			
$f_b / F_b + f_a / F_a$	0.000	0.200	0.000
Mu....Actual	0.0 ft-#	341.6 ft-#	0.0 ft-#
Mn * Phi....Allowable	1,705.6 ft-#	1,705.6 ft-#	1,705.6 ft-#
Shear Force @ this height	221.9 lbs		443.7 lbs
Shear.....Actual	6.16 psi		12.33 psi
Shear.....Allowable	75.00 psi		75.00 psi

Other Acceptable Sizes & Spacings:

Toe: None Spec'd -or- Not req'd: $M_u < \phi * 5 * \lambda * \sqrt{f_c} * S_m$
Heel: None Spec'd -or- Not req'd: $M_u < \phi * 5 * \lambda * \sqrt{f_c} * S_m$
Key: No key defined -or- No key defined

F30

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

Title ENCLAVES LOT 20 RETAINING WALLS Page : 2
Job # : Dsgnr: RMD Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 4'-0" WALL HEIGHT

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.230 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@183.33 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0283 in2/ft	
(4/3) * As :	0.0377 in2/ft	Min Stem T&S Reinf Area 0.132 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@183.33 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.098 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@183.33 in

Footing Strengths & Dimensions

Toe Width	=	0.33 ft
Heel Width	=	1.91
Total Footing Width	=	2.24
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f _c =	2,500 psi	F _y = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	=	2.00 in @ Btm.= 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,270	0 psf
Mu' : Upward	= 117	384 ft-#
Mu' : Downward	= 13	704 ft-#
Mu: Design	= 104	319 ft-#
Actual 1-Way Shear	= 0.91	0.93 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Min footing T&S reinf Area	0.58	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 9.26 in	#4@ 18.52 in	
#5@ 14.35 in	#5@ 28.70 in	
#6@ 20.37 in	#6@ 40.74 in	

F31

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

Title ENCLAVES LOT 20 RETAINING WALLS Page : 3
Job # : Dsgnr: RMD Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 4'-0" WALL HEIGHT

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

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

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

Overturning Moments...	Lateral lbs	Distance ft	Moment ft-#
Stem Shear @ Top of Footing =	-277.3	1.00	-277.3
Heel Active Pressure =	-234.0	0.48	-112.7
Sliding Force =	511.3		
Overturning Moment =			-390.0

Footing Overturning Stability Ratio 4.50

Net Moment Used For Soil Pressure Calculations **797.1 ft-#**

Net Mom. at Stem/Ftg Interface = **797.1 ft-#**

Allow. Mom. @ Stem/Ftg Interface = **1,066.0 ft-#**

Allow. Mom. Exceeds Applied Mom.? **Yes**

Therefore Uniform Soil Pressure = **862.3 psf**

Resisting Moments...	Vertical lbs	Lateral lbs	Distance ft	Moment ft-#
Surcharge Over Heel =				
Adjacent Footing Load =				
Axial Dead Load on Stem =	432.0		0.58	250.6
Soil Over Toe =	18.2		0.17	3.0
Stem Weight =	300.0			
Surcharge Over Toe =			0.58	174.0
Soil Over Heel =	620.4		1.54	952.3
Footing Weight =	336.0		1.12	376.3

Total Vertical Force = 1,931.6 lbs
Resisting Moment = 1,756.2

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

132

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

Title **ENCLAVES LOT 20 RETAINING WALLS** Page : 1
Job # : Dsgnr: **RMD** Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 3'-0" WALL HEIGHT

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

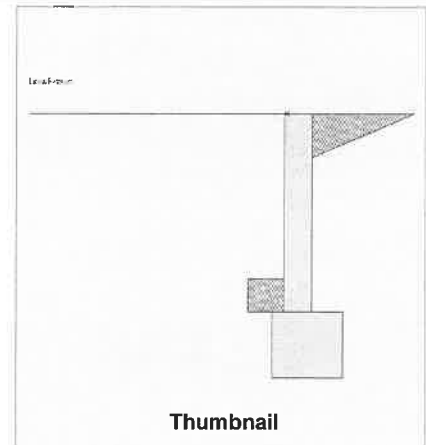
Criteria

Retained Height = 3.00 ft
Wall height above soil = 0.00 ft
Total Wall Height = 3.00 ft

Top Support Height = 3.00 ft
Slope Behind Wal = 0.00
Height of Soil over Toe = 6.00 in

Soil Data

Allow Soil Bearing = 2,000.0 psf
Equivalent Fluid Pressure Method
At-rest Heel Pressure = 52.0 psf/ft
= 240.0 psf/ft
Passive Pressure = 110.00 pcf
Soil Density = 0.400
Footing||Soil Frictior = 12.00 in
Soil height to ignore for passive pressure = 12.00 in



Thumbnail

Surcharge Loads

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

Axial Load Applied to Stem

Axial Dead Load = 432.0 lbs
Axial Live Load = 225.0 lbs
Axial Load Eccentricity = 0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft

Load Type = Wind (W)
(Strength Level)

Wind on Exposed Stem = 0.0 psf

K_h Soil Density Multiplier = 0.200 g Added seismic per unit area = 0.0 psf

F_p / W_p Weight Multiplier = 0.000 g Added seismic per unit area = 0.0 psf

Adjacent Footing Load

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

Design Summary

Total Bearing Load = 1,351 lbs
...resultant ecc. = 3.95 in

Soil Pressure @ Toe = 895 psf OK
Soil Pressure @ Heel = 895 psf OK
Allowable = 2,000 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 2,681 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 0.9 psi OK
Footing Shear @ Heel = 1.6 psi OK
Allowable = 75.0 psi
Reaction at Top = 77.0 lbs
Reaction at Bottom = 338.0 lbs
Sliding Stability Ratio = 1.60 OK
Sliding Calcs
Lateral Sliding Force = 338.0 lbs
less 0 % Passive Force = - 0.0 lbs
less 100% Friction Force = - 540.4 lbs
Added Force Req'd = 0.0 lbs OK
...for 1.5 Stability = 0.0 lbs OK

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

Load Factors

Building Code IBC 2018, ACI
Dead Load 1.200
Live Load 1.600
Earth, H 1.600
Wind, W 1.000
Seismic, E 1.000

Concrete Stem Construction

Thickness = 6.00 in F_y = 60,000 psi
Wall Weight = 75.0 psf f_c = 2,500 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
Design Height Above Ftg	Stem OK 3.00 ft	Stem OK 1.28 ft	Stem OK 0.00 ft
Rebar Size	# 4	# 4	# 4
Rebar Spacing	18.00 in	18.00 in	18.00 in
Rebar Placed at	Center	Center	Center
Rebar Depth 'd'	3.00 in	3.00 in	3.00 in
Design Data			
$f_b/FB + f_a/F_a$	0.000	0.084	0.000
Mu....Actual	0.0 ft-#	144.1 ft-#	0.0 ft-#
Mn * Phi....Allowable	1,705.6 ft-#	1,705.6 ft-#	1,705.6 ft-#
Shear Force @ this height	124.8 lbs		249.6 lbs
Shear....Actual	3.47 psi		6.93 psi
Shear....Allowable	75.00 psi		75.00 psi

Other Acceptable Sizes & Spacings:

Toe: None Spec'd -or- Not req'd: $\mu < \phi^*5*\lambda*\sqrt{f_c}*S_m$
Heel: None Spec'd -or- Not req'd: $\mu < \phi^*5*\lambda*\sqrt{f_c}*S_m$
Key: No key defined -or- No key defined

133

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

Title ENCLAVES LOT 20 RETAINING WALLS Page : 2
Job # : Dsgnr: RMD Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 3'-0" WALL HEIGHT

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.173 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@ 129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@ 183.33 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0119 in2/ft	
(4/3) * As :	0.0159 in2/ft	Min Stem T&S Reinf Area 0.099 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@ 129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@ 183.33 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.074 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@ 129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@ 183.33 in

Footing Strengths & Dimensions

Toe Width	=	0.33 ft
Heel Width	=	1.18
Total Footing Width	=	1.51
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	=	2.00 in @ Btm. = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,681	0 psf
Mu' : Upward	= 133	31 ft-#
Mu' : Downward	= 13	133 ft-#
Mu: Design	= 120	102 ft-#
Actual 1-Way Shear	= 0.91	1.60 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Min footing T&S reinf Area	0.39	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 9.26 in	#4@ 18.52 in	
#5@ 14.35 in	#5@ 28.70 in	
#6@ 20.37 in	#6@ 40.74 in	

#34

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

Title ENCLAVES LOT 20 RETAINING WALLS Page : 3
Job # : Dsgnr: RMD Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 3'-0" WALL HEIGHT

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

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

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

Overturning Moments...	Lateral lbs	Distance ft	Moment ft-#
Stem Shear @ Top of Footing =	-156.0	1.00	-156.0
Heel Active Pressure =	-182.0	0.48	-86.7
Sliding Force =	338.0		
Overturning Moment =			-242.7

Footing Overturning Stability Ratio 3.37

Net Moment Used For Soil Pressure Calculations **445.1 ft-#**

Net Mom. at Stem/Ftg Interface = **445.1 ft-#**

Allow. Mom. @ Stem/Ftg Interface = **1,066.0 ft-#**

Allow. Mom. Exceeds Applied Mom.? **Yes**

Therefore Uniform Soil Pressure = **894.7 psf**

Resisting Moments...	Vertical lbs	Lateral lbs	Distance ft	Moment ft-#
Surcharge Over Heel =				
Adjacent Footing Load =				
Axial Dead Load on Stem =	432.0		0.58	250.6
Soil Over Toe =	18.2		0.17	3.0
Stem Weight =	225.0			
Surcharge Over Toe =			0.58	130.5
Soil Over Heel =	224.4		1.17	262.5
Footing Weight =	226.5		0.76	171.0
Total Vertical Force =	1,351.1 lbs			
			Resisting Moment =	817.6

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

F35

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

Title ENCLAVES LOT 20 RETAINING WALLS Page : 1
Job # : Dsgnr: RMD Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 2'-0" WALL HEIGHT

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

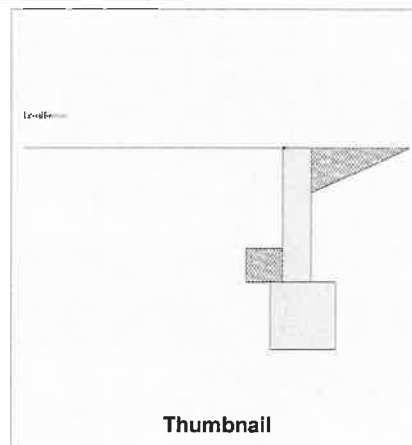
Criteria

Retained Height = 2.00 ft
Wall height above soil = 0.00 ft
Total Wall Height = 2.00 ft

Top Support Height = 2.00 ft
Slope Behind Wal = 0.00
Height of Soil over Toe = 6.00 in

Soil Data

Allow Soil Bearing = 2,000.0 psf
Equivalent Fluid Pressure Method
At-rest Heel Pressure = 52.0 psf/ft
=
Passive Pressure = 240.0 psf/ft
Soil Density = 110.00 pcf
Footing||Soil Frictior = 0.400
Soil height to ignore
for passive pressure = 12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

Axial Dead Load = 432.0 lbs
Axial Live Load = 225.0 lbs
Axial Load Eccentricity = 0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
...Height to Top = 0.00 ft
...Height to Bottom = 0.00 ft

Load Type = Wind (W)
(Strength Level)

Wind on Exposed Stem = 0.0 psf

K_h Soil Density Multiplier = 0.200 g Added seismic per unit area = 0.0 psf
 F_p / W_p Weight Multiplier = 0.000 g Added seismic per unit area = 0.0 psf

Adjacent Footing Load

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

Design Summary

Total Bearing Load = 1,135 lbs
...resultant ecc. = 3.09 in

Soil Pressure @ Toe = 853 psf OK
Soil Pressure @ Heel = 853 psf OK
Allowable = 2,000 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 2,377 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 0.9 psi OK
Footing Shear @ Heel = 0.6 psi OK
Allowable = 75.0 psi
Reaction at Top = 33.7 lbs
Reaction at Bottom = 199.3 lbs
Sliding Stability Ratio = 2.28 OK
Sliding Calcs
Lateral Sliding Force = 199.3 lbs
less 0 % Passive Force = - 0.0 lbs
less 100% Friction Force = - 453.9 lbs
Added Force Req'd = 0.0 lbs OK
...for 1.5 Stability = 0.0 lbs OK

Concrete Stem Construction

Thickness = 6.00 in F_y = 60,000 psi
Wall Weight = 75.0 psf f_c = 2,500 psi
Stem is FREE to rotate at top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
Design Height Above Ftg	Stem OK 2.00 ft	Stem OK 0.85 ft	Stem OK 0.00 ft
Rebar Size	# 4	# 4	# 4
Rebar Spacing	18.00 in	18.00 in	18.00 in
Rebar Placed at	Center	Center	Center
Rebar Depth 'd'	3.00 in	3.00 in	3.00 in
Design Data			
$f_b / F_b + f_a / F_a$	0.000	0.025	0.000
μ_uActual	0.0 ft-#	42.7 ft-#	0.0 ft-#
$M_n * \Phi$Allowable	1,705.6 ft-#	1,705.6 ft-#	1,705.6 ft-#
Shear Force @ this height	55.5 lbs		110.9 lbs
Shear.....Actual	1.54 psi		3.08 psi
Shear.....Allowable	75.00 psi		75.00 psi

Other Acceptable Sizes & Spacings:

Toe: None Spec'd -or- Not req'd: $\mu_u < \phi * 5 * \lambda * \sqrt{f_c} * S_m$
Heel: None Spec'd -or- Not req'd: $\mu_u < \phi * 5 * \lambda * \sqrt{f_c} * S_m$
Key: No key defined -or- No key defined

Load Factors

Building Code IBC 2018, ACI
Dead Load 1.200
Live Load 1.600
Earth, H 1.600
Wind, W 1.000
Seismic, E 1.000

736

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

Title ENCLAVES LOT 20 RETAINING WALLS Page : 2
Job # : Dsgnr: RMD Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 2'-0" WALL HEIGHT

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

Concrete Stem Rebar Area Details

Top Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.115 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@183.33 in

Mmax Between Ends	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.0035 in2/ft	
(4/3) * As :	0.0047 in2/ft	Min Stem T&S Reinf Area 0.066 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@183.33 in

Base Support	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0 in2/ft	
(4/3) * As :	0 in2/ft	Min Stem T&S Reinf Area 0.049 in2
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.058 in2/ft
0.0012bh : 0.0012(12)(6) :	0.0864 in2/ft	Horizontal Reinforcing Options :
	=====	One layer of : Two layers of :
Required Area :	0.0864 in2/ft	#4@ 41.67 in #4@ 83.33 in
Provided Area :	0.1333 in2/ft	#5@ 64.58 in #5@129.17 in
Maximum Area :	0.4064 in2/ft	#6@ 91.67 in #6@183.33 in

Footing Strengths & Dimensions

Toe Width	=	0.33 ft
Heel Width	=	1.00
Total Footing Width	=	1.33
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	=	2.00 in @ Btm.= 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,377	0 psf
Mu' : Upward	= 118	19 ft-#
Mu' : Downward	= 13	56 ft-#
Mu: Design	= 104	36 ft-#
Actual 1-Way Shear	= 0.91	0.64 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Min footing T&S reinf Area	0.34	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 9.26 in	#4@ 18.52 in	
#5@ 14.35 in	#5@ 28.70 in	
#6@ 20.37 in	#6@ 40.74 in	

137

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

Title ENCLAVES LOT 20 RETAINING WALLS Page : 3
Job # : Dsgnr: RMD Date: 8 AUG 2022
Description....
RESTRAINED FOUNDATION WALL - 2'-0" WALL HEIGHT

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Restrained Retaining Wall

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

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

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

Overturning Moments...	Lateral lbs	Distance ft	Moment ft-#
Stem Shear @ Top of Footing =	-69.3	1.00	-69.3
Heel Active Pressure =	-130.0	0.47	-60.7
Sliding Force =	199.3		
Overturning Moment =			-130.0

Footing Overturning Stability Ratio 4.55

Net Moment Used For Soil Pressure Calculations **292.5 ft-#**

Net Mom. at Stem/Ftg Interface = **292.5 ft-#**

Allow. Mom. @ Stem/Ftg Interface = **1,066.0 ft-#**

Allow. Mom. Exceeds Applied Mom.? **Yes**

Therefore Uniform Soil Pressure = **853.1 psf**

Resisting Moments...	Vertical lbs	Lateral lbs	Distance ft	Moment ft-#
Surcharge Over Heel =				
Adjacent Footing Load =				
Axial Dead Load on Stem =	432.0		0.58	250.6
Soil Over Toe =	18.2		0.17	3.0
Stem Weight =	150.0			
Surcharge Over Toe =			0.58	87.0
Soil Over Heel =	110.0		1.08	118.8
Footing Weight =	199.5		0.67	132.7
Total Vertical Force =	1,134.7 lbs			
			Resisting Moment =	592.0

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

F38

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # :
Description....
2'-0" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

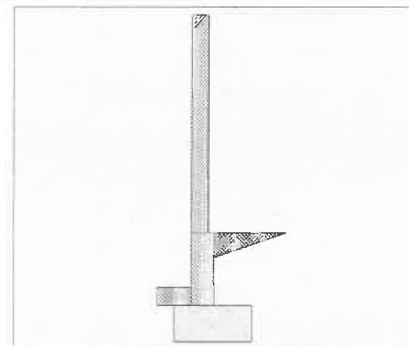
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	2.00 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios

Overturning	=	1.59 OK
Sliding	=	1.80 OK
Total Bearing Load	=	1,149 lbs
...resultant ecc.	=	8.79 in
Soil Pressure @ Toe	=	1,954 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,735 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	7.9 psi OK
Footing Shear @ Heel	=	4.0 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	255.2 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	459.7 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg

ft =	2.00	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	6.00
Rebar Size	=	# 4
Rebar Spacing	=	48.00
Rebar Placed at	=	Center

Design Data

fb/FB + fa/Fa	=	0.862
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	170.4

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	511.2
Moment....Allowable	ft-# =	592.7

Shear....Actual

Service Level	psi =	
Strength Level	psi =	2.5
Shear....Allowable	psi =	69.7
Anet (Masonry)	in2 =	67.50
Rebar Depth 'd'	in =	2.75

Masonry Data

f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	63.0

Equiv. Solid Thick.

in =	5.60	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f'c	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

F39

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
2'-0" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.50 ft
Heel Width = 1.75
Total Footing Width = 2.25
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
f_c = 2,500 psi F_y = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,735	0 psf
Mu' : Upward	= 293	0 ft-#
Mu' : Downward	= 51	341 ft-#
Mu: Design	= 242	341 ft-#
Actual 1-Way Shear	= 7.86	4.01 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f_c)*S_m
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f_c)*S_m
Key: No key defined

Min footing T&S reinf Area	0.58	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 153.0	1.00	153.0	Soil Over Heel	= 238.3	1.71 407.2
Surcharge over Heel	=			Sloped Soil Over Heel	=	
Surcharge Over Toe	=			Surcharge Over Heel	=	
Adjacent Footing Load	=			Adjacent Footing Load	=	
Added Lateral Load	=			Axial Dead Load on Stem	=	
Load @ Stem Above Soil	= 102.2	6.00	613.4	* Axial Live Load on Stem	=	
	=			Soil Over Toe	= 27.5	0.25 6.9
				Surcharge Over Toe	=	
				Stem Weight(s)	= 546.0	0.78 423.5
				Earth @ Stem Transitions	=	
				Footing Weight	= 337.5	1.13 379.7
				Key Weight	=	
				Vert. Component	=	
Total	255.2	O.T.M.	766.4	Total	1,149.3 lbs	R.M.= 1,217.2
Resisting/Overturning Ratio		= 1.59				
Vertical Loads used for Soil Pressure	=	1,149.3 lbs				

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.193 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.

F-10

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # :
Description....
2'-8" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

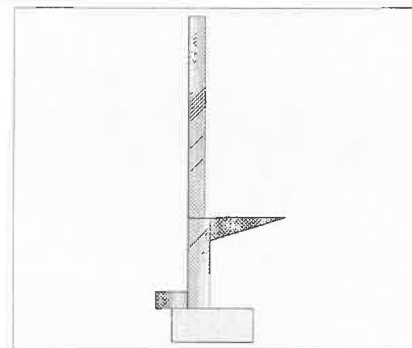
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	2.67 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	1.73 OK
Sliding	=	1.69 OK
Total Bearing Load	=	1,396 lbs
...resultant ecc.	=	8.97 in
Soil Pressure @ Toe	=	1,852 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,593 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	7.9 psi OK
Footing Shear @ Heel	=	5.1 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	331.2 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	558.6 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

	2nd	Bottom
Design Height Above Ftg	ft = 2.67	Stem OK 0.00
Wall Material Above "Ht"	=	Masonry Masonry
Design Method	=	LRFD LRFD
Thickness	=	6.00 8.00
Rebar Size	=	# 4 # 4
Rebar Spacing	=	48.00 48.00
Rebar Placed at	=	Center Edge
Design Data		
fb/FB + fa/Fa	=	0.862 0.986
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	170.4 364.3
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	511.2 1,138.7
Moment....Allowable	ft-# =	592.7 1,155.2
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	2.5 4.0
Shear.....Allowable	psi =	69.7 69.7
Anet (Masonry)	in2 =	67.50 91.50
Rebar Depth 'd'	in =	2.75 5.25
Masonry Data		
f'm	psi =	1,500 1,500
Fy	psi =	60,000 60,000
Solid Grouting	=	Yes Yes
Modular Ratio 'n'	=	21.48 21.48
Wall Weight	psf =	63.0 84.0

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

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in =	5.60 7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f'c	psi =	
Fy	psi =	

F41

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
2'-8" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	2.00
Total Footing Width	=	2.50
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f_c	=	2,500 psi
F_y	=	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm. = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,593	0 psf
Mu' : Upward	= 288	11 ft-#
Mu' : Downward	= 51	592 ft-#
Mu: Design	= 237	580 ft-#
Actual 1-Way Shear	= 7.90	5.08 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Heel: Not req'd: $\mu < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Key: No key defined

Min footing T&S reinf Area	0.65	in ²
Min footing T&S reinf Area per foot	0.26	in ² /ft
If one layer of horizontal bars:	If two layers of horizontal bars:	
#4@ 9.26 in	#4@ 18.52 in	
#5@ 14.35 in	#5@ 28.70 in	
#6@ 20.37 in	#6@ 40.74 in	

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 229.0	1.22	280.1	Soil Over Heel	= 391.6	1.83	717.9
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	= 102.2	6.67	681.9	* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
Total	331.2	O.T.M.	962.0	Stem Weight(s)	= 602.3	0.78	470.4
	=		=	Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		=	1.73	Footing Weight	= 375.0	1.25	468.8
Vertical Loads used for Soil Pressure	=	1,396.4	lbs	Key Weight	=		
				Vert. Component	=		
				Total	= 1,396.4	lbs	R.M.= 1,664.0

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.178	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe because the wall would then tend to rotate into the retained soil.



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # :
Description....
3'-4" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

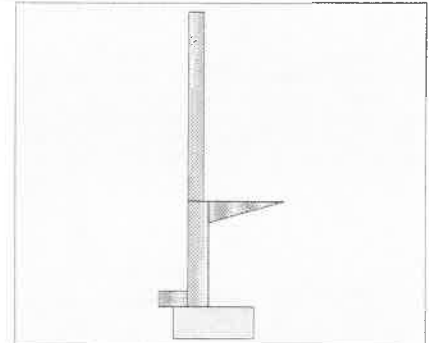
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	3.33 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	1.75 OK
Sliding	=	1.55 OK
Total Bearing Load		
...resultant ecc.	=	1,636 lbs 9.38 in
Soil Pressure @ Toe	=	1,972 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,761 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	8.7 psi OK
Footing Shear @ Heel	=	6.1 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	421.0 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	654.6 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

		2nd	Bottom
		Stem OK	Stem OK
Design Height Above Ftg	ft =	3.33	0.00
Wall Material Above "Ht"	=	Masonry	Masonry
Design Method	=	LRFD	LRFD
Thickness	=	6.00	8.00
Rebar Size	=	# 4	# 4
Rebar Spacing	=	48.00	32.00
Rebar Placed at	=	Center	Edge
Design Data			
fb/FB + fa/Fa	=	0.862	0.825
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	170.4	472.0
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	511.2	1,413.4
Moment....Allowable	ft-# =	592.7	1,713.3
Shear....Actual			
Service Level	psi =		
Strength Level	psi =	2.5	5.2
Shear....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	67.50	91.50
Rebar Depth 'd'	in =	2.75	5.25
Masonry Data			
f _m	psi =	1,500	1,500
F _y	psi =	60,000	60,000
Solid Grouting	=	Yes	Yes
Modular Ratio 'n'	=	21.48	21.48
Wall Weight	psf =	63.0	84.0

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

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in =	5.60	7.60
Masonry Block Type	=	Normal Weight	
Masonry Design Method	=	LRFD	

Concrete Data

f _c	psi =	
F _y	psi =	

FAB

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
3'-4" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	2.17
Total Footing Width	=	2.67
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f_c	=	2,500 psi
F_y	=	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm. = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,761	0 psf
Mu' : Upward	= 311	33 ft-#
Mu' : Downward	= 51	855 ft-#
Mu: Design	= 259	822 ft-#
Actual 1-Way Shear	= 8.66	6.08 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $M_u < \phi * 5 * \lambda * \sqrt{f_c} * S_m$
Heel: Not req'd: $M_u < \phi * 5 * \lambda * \sqrt{f_c} * S_m$
Key: No key defined

Min footing T&S reinf Area	0.69	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....						
Item		Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#		
Heel Active Pressure	=	318.7	1.44	460.0	Soil Over Heel	=	550.7	1.92	1,056.4	
Surcharge over Heel	=				Sloped Soil Over Heel	=				
Surcharge Over Toe	=				Surcharge Over Heel	=				
Adjacent Footing Load	=				Adjacent Footing Load	=				
Added Lateral Load	=				Axial Dead Load on Stem	=				
Load @ Stem Above Soil	=	102.2	7.33	749.4	* Axial Live Load on Stem	=				
	=				Soil Over Toe	=	27.5	0.25	6.9	
					Surcharge Over Toe	=				
Total		421.0	O.T.M.	1,209.5	Stem Weight(s)	=	657.7	0.79	516.6	
	=		=		Earth @ Stem Transitions	=				
Resisting/Overturning Ratio			=	1.75	Footing Weight	=	400.5	1.34	534.7	
Vertical Loads used for Soil Pressure	=		1,636.4	lbs	Key Weight	=				
					Vert. Component	=				
					Total	=	1,636.4	lbs	R.M.=	2,114.5

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.191	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe because the wall would then tend to rotate into the retained soil.



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
4'-0" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

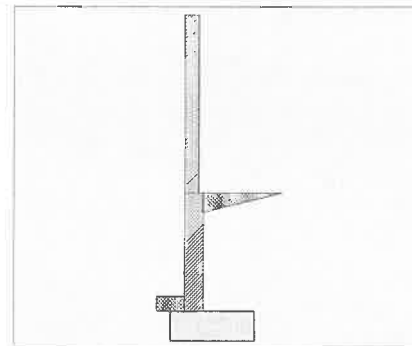
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

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

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	1.92 OK
Sliding	=	1.52 OK
Total Bearing Load	=	1,998 lbs
...resultant ecc.	=	9.59 in
Soil Pressure @ Toe	=	1,902 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,662 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	8.7 psi OK
Footing Shear @ Heel	=	6.2 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	527.2 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	799.3 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	4.00	Stem OK
Wall Material Above "H"	=	Masonry	Masonry
Design Method	=	LRFD	LRFD
Thickness	=	6.00	8.00
Rebar Size	=	# 4	# 4
Rebar Spacing	=	48.00	24.00
Rebar Placed at	=	Center	Edge
Design Data			
fb/FB + fa/Fa	=	0.862	0.785
Total Force @ Section			
Service Level	lbs =		
Strength Level	lbs =	170.4	605.6
Moment....Actual			
Service Level	ft-# =		
Strength Level	ft-# =	511.2	1,773.1
Moment....Allowable	ft-# =	592.7	2,258.3
Shear....Actual			
Service Level	psi =		
Strength Level	psi =	2.5	6.6
Shear....Allowable	psi =	69.7	69.7
Anet (Masonry)	in2 =	67.50	91.50
Rebar Depth 'd'	in =	2.75	5.25
Masonry Data			
f _m	psi =	1,500	1,500
F _y	psi =	60,000	60,000
Solid Grouting	=	Yes	Yes
Modular Ratio 'n'	=	21.48	21.48
Wall Weight	psf =	63.0	84.0

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in =	5.60	7.60
Masonry Block Type	=	Normal Weight	
Masonry Design Method	=	LRFD	

Concrete Data

f _c	psi =	
F _y	psi =	

F45

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
4'-0" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.50 ft
Heel Width = 2.50
Total Footing Width = 3.00
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
f_c = 2,500 psi F_y = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,662	0 psf
Mu' : Upward	= 306	172 ft-#
Mu' : Downward	= 51	1,406 ft-#
Mu: Design	= 255	1,234 ft-#
Actual 1-Way Shear	= 8.66	6.20 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f_c)*S_m
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f_c)*S_m
Key: No key defined

Min footing T&S reinf Area 0.78 in²
Min footing T&S reinf Area per foot 0.26 in² /ft
If one layer of horizontal bars: If two layers of horizontal bars:
#4@ 9.26 in #4@ 18.52 in
#5@ 14.35 in #5@ 28.70 in
#6@ 20.37 in #6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 425.0	1.67	708.3	Soil Over Heel	= 806.7	2.08	1,680.6
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	= 102.2	8.00	817.9	* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
Total	527.2	O.T.M.	1,526.3	Stem Weight(s)	= 714.0	0.79	563.5
	=			Earth @ Stem Transitions	=		
				Footing Weight	= 450.0	1.50	675.0
Resisting/Overturning Ratio		=	1.92	Key Weight	=		
Vertical Loads used for Soil Pressure	=	1,998.2	lbs	Vert. Component	=		

Total = 1,998.2 lbs R.M. = 2,925.9

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.176 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.

F46

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # :
Description....
4'-8" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

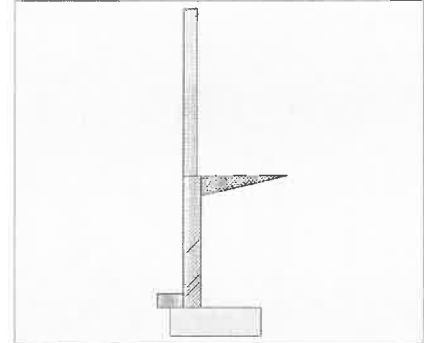
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	4.67 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	2.15 OK
Sliding	=	1.52 OK
Total Bearing Load	=	2,462 lbs
...resultant ecc.	=	9.70 in
Soil Pressure @ Toe	=	1,830 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,563 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	8.6 psi OK
Footing Shear @ Heel	=	5.7 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	648.8 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	984.7 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg		ft =	4.67	0.00
Wall Material Above "Ht"	=	Masonry	Masonry	
Design Method	=	LRFD	LRFD	
Thickness	=	6.00	8.00	
Rebar Size	=	# 4	# 4	
Rebar Spacing	=	48.00	24.00	
Rebar Placed at	=	Center	Edge	
Design Data				
fb/FB + fa/Fa	=	0.862	0.988	
Total Force @ Section				
Service Level	lbs =			
Strength Level	lbs =	170.4	763.6	
Moment....Actual				
Service Level	ft-# =			
Strength Level	ft-# =	511.2	2,230.4	
Moment....Allowable				
Strength Level	ft-# =	592.7	2,258.3	
Shear....Actual				
Service Level	psi =			
Strength Level	psi =	2.5	8.3	
Shear....Allowable				
Anet (Masonry)	in2 =	67.50	91.50	
Rebar Depth 'd'	in =	2.75	5.25	
Masonry Data				
f _m	psi =	1,500	1,500	
F _y	psi =	60,000	60,000	
Solid Grouting	=	Yes	Yes	
Modular Ratio 'n'	=	21.48	21.48	
Wall Weight	psf =	63.0	84.0	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in =	5.60	7.60
Masonry Block Type	=	Normal Weight	
Masonry Design Method	=	LRFD	

Concrete Data

f _c	psi =	
F _y	psi =	



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
4'-8" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.50 ft
Heel Width = 2.91
Total Footing Width = 3.41
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
fc = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

Factored Pressure = 2,563 0 psf
Mu' : Upward = 300 561 ft-#
Mu' : Downward = 51 2,302 ft-#
Mu: Design = 249 1,741 ft-#
Actual 1-Way Shear = 8.57 5.68 psi
Allow 1-Way Shear = 40.00 40.00 psi
Toe Reinforcing = None Spec'd
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Heel: Not req'd: $\mu < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Key: No key defined

Min footing T&S reinf Area 0.88 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft
If one layer of horizontal bars: If two layers of horizontal bars:
#4@ 9.26 in #4@ 18.52 in
#5@ 14.35 in #5@ 28.70 in
#6@ 20.37 in #6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#
Heel Active Pressure =	546.5	1.89	1,032.9	Soil Over Heel =	1,152.4	2,637.1
Surcharge over Heel =				Sloped Soil Over Heel =		
Surcharge Over Toe =				Surcharge Over Heel =		
Adjacent Footing Load =				Adjacent Footing Load =		
Added Lateral Load =				Axial Dead Load on Stem =		
Load @ Stem Above Soil =	102.2	8.67	886.4	* Axial Live Load on Stem =		
				Soil Over Toe =	27.5	6.9
				Surcharge Over Toe =		
				Stem Weight(s) =	770.3	610.4
				Earth @ Stem Transitions =		
				Footing Weight =	511.5	872.1
				Key Weight =		
				Vert. Component =		
Total	648.8	O.T.M.	1,919.4	Total =	2,461.7 lbs	R.M. = 4,126.5
Resisting/Overturning Ratio			= 2.15			
Vertical Loads used for Soil Pressure =		2,461.7 lbs				

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.159 in

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

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



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
5'-4" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

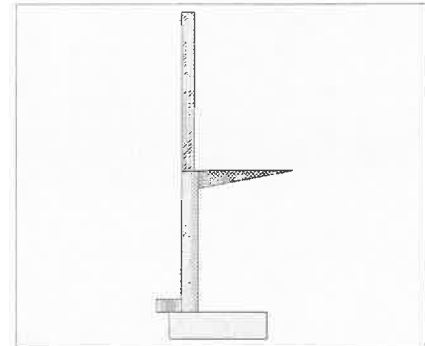
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	5.33 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	2.37 OK
Sliding	=	1.53 OK
Total Bearing Load	=	2,989 lbs
...resultant ecc.	=	9.84 in
Soil Pressure @ Toe	=	1,820 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,548 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	8.7 psi OK
Footing Shear @ Heel	=	5.1 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	783.4 lbs
less 0 % Passive Force	= -	0.0 lbs
less 100% Friction Force	= -	1,195.7 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

	2nd	Bottom
Design Height Above Ftg	ft = 5.33	Stem OK 0.00
Wall Material Above "Ht"	= Masonry	Masonry
Design Method	= LRFD	LRFD
Thickness	= 6.00	8.00
Rebar Size	= # 4	# 4
Rebar Spacing	= 48.00	16.00
Rebar Placed at	= Center	Edge
Design Data		
fb/FB + fa/Fa	= 0.862	0.844
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	170.4 943.1
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	511.2 2,792.3
Moment....Allowable	ft-# =	592.7 3,309.4
Shear....Actual		
Service Level	psi =	
Strength Level	psi =	2.5 10.3
Shear....Allowable	psi =	69.7 69.7
Anet (Masonry)	in2 =	67.50 91.50
Rebar Depth 'd'	in =	2.75 5.25
Masonry Data		
f _m	psi =	1,500 1,500
F _y	psi =	60,000 60,000
Solid Grouting	=	Yes Yes
Modular Ratio 'n'	=	21.48 21.48
Wall Weight	psf =	63.0 84.0

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in =	5.60 7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f _c	psi =	
F _y	psi =	

149

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
5'-4" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.50 ft
Heel Width = 3.33
Total Footing Width = 3.83
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

Factored Pressure = 2,548 0 psf
Mu' : Upward = 302 1,229 ft-#
Mu' : Downward = 51 3,526 ft-#
Mu: Design = 251 2,297 ft-#
Actual 1-Way Shear = 8.69 5.11 psi
Allow 1-Way Shear = 40.00 40.00 psi
Toe Reinforcing = None Spec'd
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: No key defined

Min footing T&S reinf Area 0.99 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft
If one layer of horizontal bars: If two layers of horizontal bars:
#4@ 9.26 in #4@ 18.52 in
#5@ 14.35 in #5@ 28.70 in
#6@ 20.37 in #6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#
Heel Active Pressure =	681.2	2.11	1,437.3	Soil Over Heel =	1,561.5	2.50 3,901.2
Surcharge over Heel =				Sloped Soil Over Heel =		
Surcharge Over Toe =				Surcharge Over Heel =		
Adjacent Footing Load =				Adjacent Footing Load =		
Added Lateral Load =				Axial Dead Load on Stem =		
Load @ Stem Above Soil =	102.2	9.33	953.9	* Axial Live Load on Stem =		
				Soil Over Toe =	27.5	0.25 6.9
				Surcharge Over Toe =		
				Stem Weight(s) =	825.7	0.80 656.6
				Earth @ Stem Transitions =		
				Footing Weight =	574.5	1.92 1,100.2
				Key Weight =		
				Vert. Component =		
Total	783.4	O.T.M.	2,391.2	Total =	2,989.2 lbs	R.M. = 5,664.8
Resisting/Overturning Ratio			= 2.37			
Vertical Loads used for Soil Pressure =			2,989.2 lbs			

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

Vertical component of active lateral soil pressure IS 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) 0.150 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.

ISO

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
6'-0" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

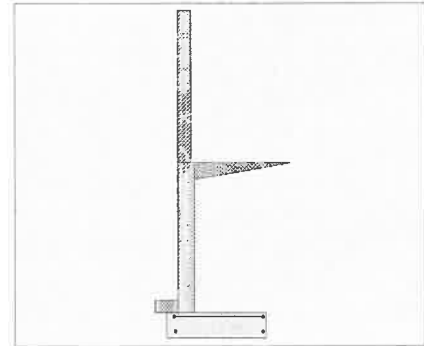
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

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

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	2.46 OK
Sliding	=	1.50 OK
Total Bearing Load	=	3,517 lbs
...resultant ecc.	=	10.22 in
Soil Pressure @ Toe	=	1,901 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,662 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	9.2 psi OK
Footing Shear @ Heel	=	5.4 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	935.2 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	1,406.9 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

	2nd	Bottom
Design Height Above Ftg	ft = 6.00	Stem OK 0.00
Wall Material Above "Ht"	= Masonry	Masonry
Design Method	= LRFD	LRFD
Thickness	= 6.00	8.00
Rebar Size	= # 4	# 4
Rebar Spacing	= 48.00	8.00
Rebar Placed at	= Center	Edge
Design Data		
fb/FB + fa/Fa	= 0.862	0.568
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	170.4 1,149.6
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	511.2 3,492.0
Moment.....Allowable	ft-# =	592.7 6,150.0
Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	2.5 12.6
Shear.....Allowable	psi =	69.7 69.7
Anet (Masonry)	in2 =	67.50 91.50
Rebar Depth 'd'	in =	2.75 5.25
Masonry Data		
f _m	psi =	1,500 1,500
F _y	psi =	60,000 60,000
Solid Grouting	=	Yes Yes
Modular Ratio 'n'	=	21.48 21.48
Wall Weight	psf =	63.0 84.0

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in = 5.60 7.60
Masonry Block Type	= Normal Weight
Masonry Design Method	= LRFD

Concrete Data

f _c	psi =
F _y	psi =

FSI

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
6'-0" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	3.67
Total Footing Width	=	4.17
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f _c =	2,500 psi	F _y = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,662	0 psf
Mu' : Upward	=	318	1,949 ft-#
Mu' : Downward	=	51	4,870 ft-#
Mu: Design	=	266	2,921 ft-#
Actual 1-Way Shear	=	9.22	5.36 psi
Allow 1-Way Shear	=	40.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	# 5 @ 14.35 in	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f_c)*S_m

Heel: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46

Key: No key defined

Min footing T&S reinf Area 1.08 in²

Min footing T&S reinf Area per foot 0.26 in² /ft

If one layer of horizontal bars:

#4@ 9.26 in

#5@ 14.35 in

#6@ 20.37 in

If two layers of horizontal bars:

#4@ 18.52 in

#5@ 28.70 in

#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 833.0	2.33	1,943.7	Soil Over Heel	= 1,982.2	2.67	5,289.2
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	= 102.2	10.00	1,022.4	* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
Total	935.2	O.T.M.	2,966.1	Stem Weight(s)	= 882.0	0.80	703.5
	=			Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		=	2.46	Footing Weight	= 625.5	2.09	1,304.2
Vertical Loads used for Soil Pressure	=	3,517.2	lbs	Key Weight	=		
				Vert. Component	=		
				Total	= 3,517.2	lbs	R.M.= 7,303.7

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.152 in

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

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



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

Title **ENCLAVES LOT 20 RETAINING WALLS**
Job # : Dsgnr: **RMD**
Description....
6'-8" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

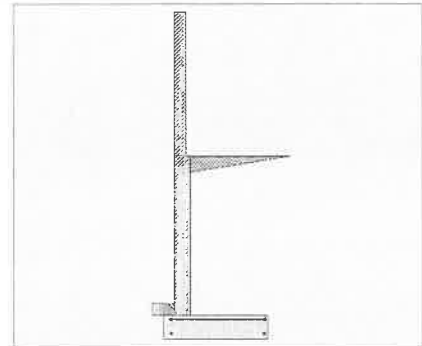
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	6.67 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	2.61 OK
Sliding	=	1.51 OK
Total Bearing Load	=	4,157 lbs
...resultant ecc.	=	10.51 in
Soil Pressure @ Toe	=	1,959 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,743 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	9.6 psi OK
Footing Shear @ Heel	=	4.9 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	1,102.1 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	1,662.7 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	6.67	2nd	Stem OK	Bottom	Stem OK
Wall Material Above "Ht"	=	Masonry		Masonry		Masonry
Design Method	=	LRFD		LRFD		LRFD
Thickness	=	6.00		8.00		8.00
Rebar Size	=	# 4		# 4		# 4
Rebar Spacing	=	48.00		8.00		8.00
Rebar Placed at	=	Center		Edge		Edge
Design Data						
fb/FB + fa/Fa	=	0.862		0.705		0.705
Total Force @ Section						
Service Level	lbs =					
Strength Level	lbs =	170.4		1,380.1		1,380.1
Moment....Actual						
Service Level	ft-# =					
Strength Level	ft-# =	511.0		4,336.8		4,336.8
Moment....Allowable	ft-# =	592.7		6,150.0		6,150.0
Shear....Actual						
Service Level	psi =					
Strength Level	psi =	2.5		15.1		15.1
Shear....Allowable	psi =	69.7		69.7		69.7
Anet (Masonry)	in2 =	67.50		91.50		91.50
Rebar Depth 'd'	in =	2.75		5.25		5.25
Masonry Data						
f'm	psi =	1,500		1,500		1,500
Fy	psi =	60,000		60,000		60,000
Solid Grouting	=	Yes		Yes		Yes
Modular Ratio 'n'	=	21.48		21.48		21.48
Wall Weight	psf =	63.0		84.0		84.0

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in =	5.60	7.60
Masonry Block Type	=	Normal Weight	
Masonry Design Method	=	LRFD	

Concrete Data

f'c	psi =	
Fy	psi =	

153

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
6'-8" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.50 ft
Heel Width = 4.08
Total Footing Width = 4.58
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
f'c = 2,500 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

Factored Pressure = 2,743 0 psf
Mu' : Upward = 329 3,136 ft-#
Mu' : Downward = 51 6,780 ft-#
Mu : Design = 278 3,643 ft-#
Actual 1-Way Shear = 9.64 4.91 psi
Allow 1-Way Shear = 40.00 75.00 psi
Toe Reinforcing = None Spec'd
Heel Reinforcing = # 5 @ 14.35 in
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm

Heel: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46

Key: No key defined

Min footing T&S reinf Area 1.19 in2

Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars:

#4@ 9.26 in

#5@ 14.35 in

#6@ 20.37 in

If two layers of horizontal bars:

#4@ 18.52 in

#5@ 28.70 in

#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#
Heel Active Pressure =	999.8	2.56	2,555.9	Soil Over Heel =	2,504.0	2.87 7,194.8
Surcharge over Heel =				Sloped Soil Over Heel =		
Surcharge Over Toe =				Surcharge Over Heel =		
Adjacent Footing Load =				Adjacent Footing Load =		
Added Lateral Load =				Axial Dead Load on Stem =		
Load @ Stem Above Soil =	102.2	10.67	1,090.8	* Axial Live Load on Stem =		
				Soil Over Toe =	27.5	0.25 6.9
				Surcharge Over Toe =		
Total	1,102.1	O.T.M.	3,646.7	Stem Weight(s) =	938.2	0.80 750.4
				Earth @ Stem Transitions =		
				Footing Weight =	687.0	2.29 1,573.2
				Key Weight =		
Resisting/Overturning Ratio			= 2.61	Vert. Component =		
Vertical Loads used for Soil Pressure =		4,156.7 lbs				

Total = 4,156.7 lbs R.M. = 9,525.2

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.151 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.

154

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
7'-4" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

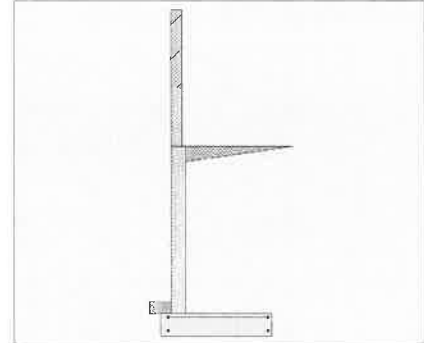
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	7.33 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	2.84 OK
Sliding	=	1.54 OK
Total Bearing Load	=	4,939 lbs
...resultant ecc.	=	10.65 in
Soil Pressure @ Toe	=	1,993 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,790 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	9.9 psi OK
Footing Shear @ Heel	=	3.9 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	1,281.9 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	1,975.4 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

	2nd	Bottom
Design Height Above Ftg	ft = 7.33	Stem OK 0.00
Wall Material Above "Ht"	= Masonry	Masonry
Design Method	= LRFD	LRFD
Thickness	= 6.00	8.00
Rebar Size	= # 4	# 4
Rebar Spacing	= 48.00	8.00
Rebar Placed at	= Center	Edge
Design Data		
fb/FB + fa/Fa	= 0.862	0.867
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	170.4 1,631.8
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	511.2 5,331.0
Moment....Allowable	ft-# =	592.7 6,150.0
Shear....Actual		
Service Level	psi =	
Strength Level	psi =	2.5 17.8
Shear....Allowable	psi =	69.7 69.7
Anet (Masonry)	in2 =	67.50 91.50
Rebar Depth 'd'	in =	2.75 5.25
Masonry Data		
fm	psi =	1,500 1,500
Fy	psi =	60,000 60,000
Solid Grouting	=	Yes Yes
Modular Ratio 'n'	=	21.48 21.48
Wall Weight	psf =	63.0 84.0

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in =	5.60 7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD
Concrete Data		
f'c	psi =	
Fy	psi =	

FGS

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
7'-4" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.50 ft
Heel Width = 4.58
Total Footing Width = 5.08
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 2,790	0 psf
Mu' : Upward	= 337	5,108 ft-#
Mu' : Downward	= 51	9,535 ft-#
Mu: Design	= 286	4,428 ft-#
Actual 1-Way Shear	= 9.92	3.93 psi
Allow 1-Way Shear	= 40.00	75.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= # 5 @ 14.35 in	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Heel: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46
Key: No key defined

Min footing T&S reinf Area	1.32	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 1,179.6	2.78	3,275.4	Soil Over Heel	= 3,155.3	3.12 9,855.1
Surcharge over Heel	=			Sloped Soil Over Heel	=	
Surcharge Over Toe	=			Surcharge Over Heel	=	
Adjacent Footing Load	=			Adjacent Footing Load	=	
Added Lateral Load	=			Axial Dead Load on Stem	=	
Load @ Stem Above Soil	= 102.2	11.33	1,158.4	* Axial Live Load on Stem	=	
	=			Soil Over Toe	= 27.5	0.25 6.9
				Surcharge Over Toe	=	
Total	1,281.9	O.T.M.	4,433.8	Stem Weight(s)	= 993.7	0.80 796.6
	=			Earth @ Stem Transitions	=	
Resisting/Overturning Ratio		=	2.84	Footing Weight	= 762.0	2.54 1,935.5
Vertical Loads used for Soil Pressure	=	4,938.5	lbs	Key Weight	=	
				Vert. Component	=	

Total = 4,938.5 lbs R.M. = 12,594.1

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.145 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.

FS6

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
8'-0" MAX HT. RETAINING

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

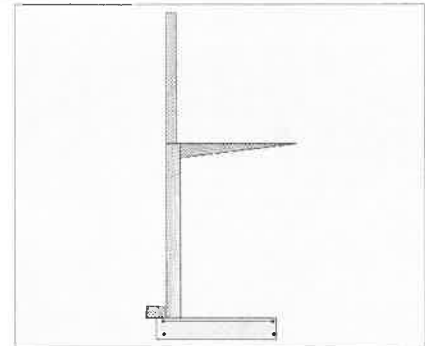
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	6.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.22 OK
Sliding	=	1.62 OK
Total Bearing Load	=	5,973 lbs
...resultant ecc.	=	10.55 in
Soil Pressure @ Toe	=	1,992 psf OK
Soil Pressure @ Heel	=	86 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,789 psf
ACI Factored @ Heel	=	120 psf
Footing Shear @ Toe	=	10.0 psi OK
Footing Shear @ Heel	=	2.1 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	1,479.2 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	2,389.3 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

	2nd	Bottom
Design Height Above Ftg	ft = 8.00	Stem OK 0.00
Wall Material Above "Ht"	= Masonry	Masonry
Design Method	= LRFD	LRFD
Thickness	= 6.00	8.00
Rebar Size	= # 4	# 5
Rebar Spacing	= 48.00	8.00
Rebar Placed at	= Center	Edge
Design Data		
fb/FB + fa/Fa	= 0.862	0.746
Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs = 170.4	1,911.2
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# = 511.2	6,516.5
Moment....Allowable	ft-# = 592.7	8,733.3
Shear.....Actual		
Service Level	psi =	
Strength Level	psi = 2.5	20.9
Shear.....Allowable	psi = 69.7	69.7
Anet (Masonry)	in2 = 67.50	91.50
Rebar Depth 'd'	in = 2.75	5.25
Masonry Data		
f'm	psi = 1,500	1,500
Fy	psi = 60,000	60,000
Solid Grouting	= Yes	Yes
Modular Ratio 'n'	= 21.48	21.48
Wall Weight	psf = 63.0	84.0

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in = 5.60	7.60
Masonry Block Type	= Normal Weight	
Masonry Design Method	= LRFD	

Concrete Data

f'c	psi =	
Fy	psi =	



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

Title **ENCLAVES LOT 20 RETAINING WALLS**
Job # : Dsgnr: **RMD**
Description....
8'-0" MAX HT. RETAINING

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	5.25
Total Footing Width	=	5.75
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'_c =	2,500 psi	F_y = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm. = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,789	120 psf
Mu' : Upward	=	339	8,708 ft-#
Mu' : Downward	=	51	13,926 ft-#
Mu: Design	=	288	5,219 ft-#
Actual 1-Way Shear	=	10.02	2.11 psi
Allow 1-Way Shear	=	40.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	# 5 @ 14.35 in	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $Mu < \phi * 5 * \lambda * b * d * \sqrt{f'_c} * S_m$

Heel: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46

Key: No key defined

Min footing T&S reinf Area 1.49 in²

Min footing T&S reinf Area per foot 0.26 in² /ft

If one layer of horizontal bars:

If two layers of horizontal bars:

#4@ 9.26 in

#4@ 18.52 in

#5@ 14.35 in

#5@ 28.70 in

#6@ 20.37 in

#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 1,377.0	3.00	4,131.0	Soil Over Heel	= 4,033.3	3.46	13,948.6
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	= 102.2	12.00	1,226.9	* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
Total	1,479.2	O.T.M.	5,357.9	Stem Weight(s)	= 1,050.0	0.80	843.5
	=	=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		=	3.22	Footing Weight	= 862.5	2.88	2,479.7
Vertical Loads used for Soil Pressure	=	5,973.3	lbs	Key Weight	=		
				Vert. Component	=		
				Total =	5,973.3	lbs R.M.=	17,278.7

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.135 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.

F58

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
2'-0" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

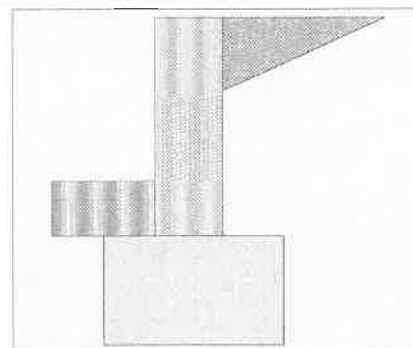
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height	=	2.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.68 OK
Sliding	=	1.53 OK
Total Bearing Load	=	586 lbs
...resultant ecc.	=	2.09 in
Soil Pressure @ Toe	=	536 psf OK
Soil Pressure @ Heel	=	135 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	750 psf
ACI Factored @ Heel	=	188 psf
Footing Shear @ Toe	=	1.7 psi OK
Footing Shear @ Heel	=	0.8 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	153.0 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	234.5 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	48.00
Rebar Placed at	=	Edge

Design Data		
fb/FB + fa/Fa	=	0.063

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	108.8
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	72.5
Moment....Allowable	=	1,155.2

Shear....Actual

Service Level	psi =	
Strength Level	psi =	1.2
Shear....Allowable	psi =	69.7
Anet (Masonry)	in2 =	91.50
Rebar Depth 'd'	in =	5.25

Masonry Data

f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f'c	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

FS9

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
2'-0" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	1.25
Total Footing Width	=	1.75
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f_c	=	2,500 psi
F_y	=	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 750	188 psf
M_u' : Upward	= 87	43 ft-#
M_u' : Downward	= 51	119 ft-#
M_u : Design	= 36	76 ft-#
Actual 1-Way Shear	= 1.67	0.79 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $M_u < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Heel: Not req'd: $M_u < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Key: No key defined

Min footing T&S reinf Area	0.45	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		
#4@ 9.26 in		
#5@ 14.35 in		
#6@ 20.37 in		
If two layers of horizontal bars:		
#4@ 18.52 in		
#5@ 28.70 in		
#6@ 40.74 in		

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....					
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#		
Heel Active Pressure	=	153.0	1.00	153.0	Soil Over Heel	=	128.3	1.46	187.2
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=		3.00		* Axial Live Load on Stem	=			
	=				Soil Over Toe	=	27.5	0.25	6.9
					Surcharge Over Toe	=			
					Stem Weight(s)	=	168.0	0.83	140.0
					Earth @ Stem Transitions	=			
					Footing Weight	=	262.5	0.88	229.7
					Key Weight	=			
					Vert. Component	=			
								</	

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.017	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.

760

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # :
Description....
2'-8" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

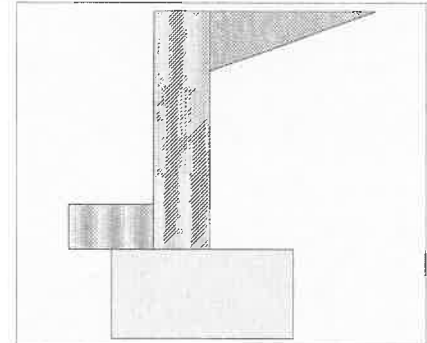
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	2.67 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.71 OK
Sliding	=	1.52 OK
Total Bearing Load	=	872 lbs
...resultant ecc.	=	2.58 in
Soil Pressure @ Toe	=	641 psf OK
Soil Pressure @ Heel	=	163 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	897 psf
ACI Factored @ Heel	=	228 psf
Footing Shear @ Toe	=	2.3 psi OK
Footing Shear @ Heel	=	1.3 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	229.0 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	348.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	48.00
Rebar Placed at	=	Edge

Design Data		
fb/FB + fa/Fa	=	0.149

Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	193.9
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	172.6
Moment....Allowable	=	1,155.2

Shear....Actual		
Service Level	psi =	
Strength Level	psi =	2.1
Shear....Allowable	psi =	69.7
Anet (Masonry)	in2 =	91.50
Rebar Depth 'd'	in =	5.25

Masonry Data		
f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data		
f'c	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

161

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
2'-8" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	1.67
Total Footing Width	=	2.17
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f_c	=	2,500 psi
F_y	=	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	897	228 psf
M_u' : Upward	=	106	167 ft-#
M_u' : Downward	=	51	357 ft-#
M_u : Design	=	54	190 ft-#
Actual 1-Way Shear	=	2.30	1.25 psi
Allow 1-Way Shear	=	40.00	40.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $M_u < \phi^5 \lambda \sqrt{f_c} S_m$
Heel: Not req'd: $M_u < \phi^5 \lambda \sqrt{f_c} S_m$
Key: No key defined

Min footing T&S reinf Area	0.56	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		
#4@ 9.26 in		
#5@ 14.35 in		
#6@ 20.37 in		
If two layers of horizontal bars:		
#4@ 18.52 in		
#5@ 28.70 in		
#6@ 40.74 in		

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	229.0	1.22	280.1		
Surcharge over Heel	=					
Surcharge Over Toe	=					
Adjacent Footing Load	=					
Added Lateral Load	=					
Load @ Stem Above Soil	=		3.67			
	=					
Total	229.0	O.T.M.	280.1			
	=		=			
Resisting/Overturning Ratio			= 3.71			
Vertical Loads used for Soil Pressure	=		872.0 lbs			

Soil Over Heel	=	294.7	1.67	491.6
Sloped Soil Over Heel	=			
Surcharge Over Heel	=			
Adjacent Footing Load	=			
Axial Dead Load on Stem	=			
* Axial Live Load on Stem	=			
Soil Over Toe	=	27.5	0.25	6.9
Surcharge Over Toe	=			
Stem Weight(s)	=	224.3	0.83	186.9
Earth @ Stem Transitions	=			
Footing Weight	=	325.5	1.09	353.2
Key Weight	=			
Vert. Component	=			

Total = 872.0 lbs R.M. = 1,038.6

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.022 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.

F62

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
3'-4" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

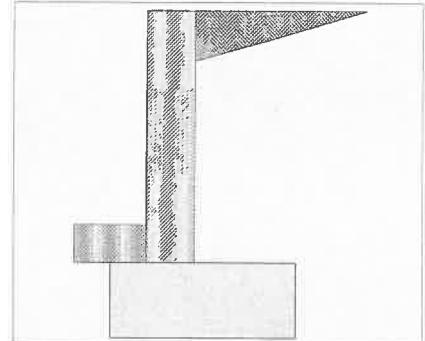
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	3.33 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.72 OK
Sliding	=	1.52 OK
Total Bearing Load	=	1,212 lbs
...resultant ecc.	=	3.11 in
Soil Pressure @ Toe	=	753 psf OK
Soil Pressure @ Heel	=	186 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,054 psf
ACI Factored @ Heel	=	261 psf
Footing Shear @ Toe	=	3.0 psi OK
Footing Shear @ Heel	=	1.7 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	318.7 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	484.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	48.00
Rebar Placed at	=	Edge

Design Data		
fb/FB + fa/Fa	=	0.290

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	301.6

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	334.8

Moment....Allowable	=	1,155.2
---------------------	---	---------

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	3.3

Shear.....Allowable	psi =	69.7
---------------------	-------	------

Anet (Masonry)	in2 =	91.50
----------------	-------	-------

Rebar Depth 'd'	in =	5.25
-----------------	------	------

Masonry Data

fm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

fc	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

163

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
3'-4" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	2.08
Total Footing Width	=	2.58
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,054	261 psf
Mu' : Upward	=	125	405 ft-#
Mu' : Downward	=	51	765 ft-#
Mu: Design	=	74	359 ft-#
Actual 1-Way Shear	=	2.96	1.66 psi
Allow 1-Way Shear	=	40.00	40.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Heel: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Key: No key defined

Min footing T&S reinf Area	0.67	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	318.7	1.44	460.0		
Surcharge over Heel	=					
Surcharge Over Toe	=					
Adjacent Footing Load	=					
Added Lateral Load	=					
Load @ Stem Above Soil	=		4.33			
	=					
Total	318.7	O.T.M.	460.0			
	=		=			
Resisting/Overturning Ratio		=	3.72			
Vertical Loads used for Soil Pressure	=	1,211.9	lbs			
Soil Over Heel	=	517.7	1.87	969.8		
Sloped Soil Over Heel	=					
Surcharge Over Heel	=					
Adjacent Footing Load	=					
Axial Dead Load on Stem	=					
* Axial Live Load on Stem	=					
Soil Over Toe	=	27.5	0.25	6.9		
Surcharge Over Toe	=					
Stem Weight(s)	=	279.7	0.83	233.1		
Earth @ Stem Transitions	=					
Footing Weight	=	387.0	1.29	499.2		
Key Weight	=					
Vert. Component	=					
Total	1,211.9	lbs R.M.	1,709.0			

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.027 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.

564

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
4'-0" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

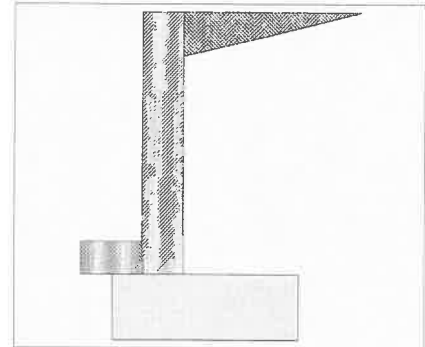
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

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

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.73 OK
Sliding	=	1.52 OK
Total Bearing Load	=	1,620 lbs
...resultant ecc.	=	3.67 in
Soil Pressure @ Toe	=	871 psf OK
Soil Pressure @ Heel	=	209 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,219 psf
ACI Factored @ Heel	=	293 psf
Footing Shear @ Toe	=	3.6 psi OK
Footing Shear @ Heel	=	2.0 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	425.0 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	648.1 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	48.00
Rebar Placed at	=	Edge

Design Data		
fb/FB + fa/Fa	=	0.502

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	435.2

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	580.3

Moment.....Allowable	=	1,155.2
----------------------	---	---------

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	4.8

Shear.....Allowable	psi =	69.7
---------------------	-------	------

Anet (Masonry)	in2 =	91.50
----------------	-------	-------

Rebar Depth 'd'	in =	5.25
-----------------	------	------

Masonry Data

f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f'c	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

F65

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
4'-0" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.50 ft
Heel Width = 2.50
Total Footing Width = 3.00
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
f_c = 2,500 psi F_y = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,219	293 psf
Mu' : Upward	= 146	809 ft-#
Mu' : Downward	= 51	1,406 ft-#
Mu: Design	= 95	597 ft-#
Actual 1-Way Shear	= 3.64	2.02 psi
Allow 1-Way Shear	= 40.00	40.00 psi
Toe Reinforcing	= None Spec'd	
Heel Reinforcing	= None Spec'd	
Key Reinforcing	= None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f_c)*S_m
Heel: Not req'd: Mu < phi*5*lambda*sqrt(f_c)*S_m
Key: No key defined

Min footing T&S reinf Area 0.78 in²
Min footing T&S reinf Area per foot 0.26 in²/ft
If one layer of horizontal bars: If two layers of horizontal bars:
#4@ 9.26 in #4@ 18.52 in
#5@ 14.35 in #5@ 28.70 in
#6@ 20.37 in #6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....				RESISTING.....				
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#		
Heel Active Pressure	=	425.0	1.67	708.3	Soil Over Heel	=	806.7	2.08	1,680.6
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=		5.00		* Axial Live Load on Stem	=			
	=				Soil Over Toe	=	27.5	0.25	6.9
					Surcharge Over Toe	=			
Total		425.0	O.T.M.	708.3	Stem Weight(s)	=	336.0	0.83	280.0
	=		=		Earth @ Stem Transitions	=			
Resisting/Overturning Ratio			=	3.73	Footing Weight	=	450.0	1.50	675.0
Vertical Loads used for Soil Pressure	=		1,620.2	lbs	Key Weight	=			
					Vert. Component	=			

Total = 1,620.2 lbs R.M. = 2,642.4

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.032 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.

F66

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
4'-8" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

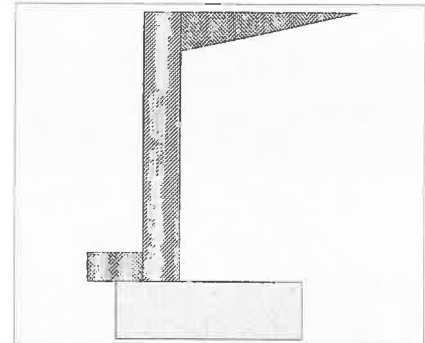
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	4.67 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.72 OK
Sliding	=	1.53 OK
Total Bearing Load	=	2,084 lbs
...resultant ecc.	=	4.28 in
Soil Pressure @ Toe	=	994 psf OK
Soil Pressure @ Heel	=	228 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,392 psf
ACI Factored @ Heel	=	319 psf
Footing Shear @ Toe	=	4.4 psi OK
Footing Shear @ Heel	=	2.3 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	546.5 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	833.5 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	48.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.799
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	593.2

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	923.4

Moment....Allowable	=	1,155.2
---------------------	---	---------

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	6.5

Shear.....Allowable	psi =	69.7
---------------------	-------	------

Anet (Masonry)	in2 =	91.50
----------------	-------	-------

Rebar Depth 'd'	in =	5.25
-----------------	------	------

Masonry Data

f _m	psi =	1,500
F _y	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f _c	psi =	
F _y	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
4'-8" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	2.91
Total Footing Width	=	3.41
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f _c =	2,500 psi	F _y = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,392	319 psf
Mu' : Upward	=	167	1,395 ft-#
Mu' : Downward	=	51	2,302 ft-#
Mu: Design	=	116	907 ft-#
Actual 1-Way Shear	=	4.36	2.33 psi
Allow 1-Way Shear	=	40.00	40.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Heel: Not req'd: $\mu < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$
Key: No key defined

Min footing T&S reinf Area	0.88	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		
#4@ 9.26 in		
#5@ 14.35 in		
#6@ 20.37 in		
If two layers of horizontal bars:		
#4@ 18.52 in		
#5@ 28.70 in		
#6@ 40.74 in		

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....			RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
Heel Active Pressure	= 546.5	1.89	1,032.9	Soil Over Heel	= 1,152.4	2.29	2,637.1
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	=	5.67		* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
Total	546.5	O.T.M.	1,032.9	Stem Weight(s)	= 392.3	0.83	326.9
	=	=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		=	3.72	Footing Weight	= 511.5	1.71	872.1
Vertical Loads used for Soil Pressure	=	2,083.7	lbs	Key Weight	=		
				Vert. Component	=		
				Total =	2,083.7	lbs R.M. =	3,843.0
* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.							

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.038	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.

FLB

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

Title **ENCLAVES LOT 20 RETAINING WALLS**
Job # : Dsgnr: **RMD**
Description....
5'-4" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

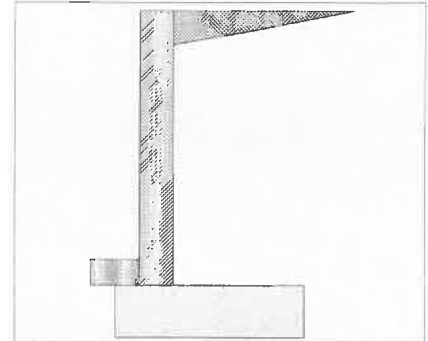
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	5.33 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.74 OK
Sliding	=	1.53 OK
Total Bearing Load	=	2,611 lbs
...resultant ecc.	=	4.85 in
Soil Pressure @ Toe	=	1,114 psf OK
Soil Pressure @ Heel	=	250 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,559 psf
ACI Factored @ Heel	=	350 psf
Footing Shear @ Toe	=	5.1 psi OK
Footing Shear @ Heel	=	2.5 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	681.2 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	1,044.5 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	40.00
Rebar Placed at	=	Edge

Design Data		
fb/FB + fa/Fa	=	0.995

Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	772.7

Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	1,372.9
Moment....Allowable	=	1,380.0

Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	8.4
Shear.....Allowable	psi =	69.7
Anet (Masonry)	in2 =	91.50
Rebar Depth 'd'	in =	5.25

Masonry Data		
fm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data		
fc	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

F69

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
5'-4" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018; Build 11.18.06.15

License : KW-06082345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	3.33
Total Footing Width	=	3.83
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,559	350 psf
Mu' : Upward	=	188	2,234 ft-#
Mu' : Downward	=	51	3,526 ft-#
Mu: Design	=	137	1,292 ft-#
Actual 1-Way Shear	=	5.05	2.52 psi
Allow 1-Way Shear	=	40.00	40.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Heel: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Key: No key defined

Min footing T&S reinf Area	0.99	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		
#4@	9.26	in
#5@	14.35	in
#6@	20.37	in
If two layers of horizontal bars:		
#4@	18.52	in
#5@	28.70	in
#6@	40.74	in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 681.2	2.11	1,437.3	Soil Over Heel	= 1,561.5	2.50	3,901.2
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	=	6.33		* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
Total	681.2	O.T.M.	1,437.3	Stem Weight(s)	= 447.7	0.83	373.1
	=			Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		=	3.74	Footing Weight	= 574.5	1.92	1,100.2
Vertical Loads used for Soil Pressure	=	2,611.2	lbs	Key Weight	=		
				Vert. Component	=		

Total = 2,611.2 lbs R.M. = 5,381.3

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.043	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.

F70

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
6'-0" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

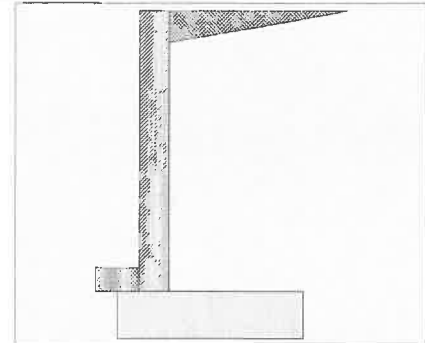
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

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

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings/Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios

Overturning	=	3.61 OK
Sliding	=	1.51 OK
Total Bearing Load	=	3,139 lbs
...resultant ecc.	=	5.61 in
Soil Pressure @ Toe	=	1,260 psf OK
Soil Pressure @ Heel	=	246 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,763 psf
ACI Factored @ Heel	=	344 psf
Footing Shear @ Toe	=	5.9 psi OK
Footing Shear @ Heel	=	2.9 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	833.0 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	1,255.7 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	24.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.867
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	979.2

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	1,958.4

Moment....Allowable	=	2,258.3
---------------------	---	---------

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	10.7

Shear.....Allowable	psi =	69.7
---------------------	-------	------

Anet (Masonry)	in2 =	91.50
----------------	-------	-------

Rebar Depth 'd'	in =	5.25
-----------------	------	------

Masonry Data

f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f'c	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

171

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
6'-0" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345
License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width = 0.50 ft
Heel Width = 3.67
Total Footing Width = 4.17
Footing Thickness = 12.00 in
Key Width = 0.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.00 ft
f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	1,763	344 psf
Mu' : Upward	213	3,090 ft-#
Mu' : Downward	51	4,870 ft-#
Mu: Design	162	1,780 ft-#
Actual 1-Way Shear	5.88	2.92 psi
Allow 1-Way Shear	40.00	40.00 psi
Toe Reinforcing	None Spec'd	
Heel Reinforcing	None Spec'd	
Key Reinforcing	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Heel: Not req'd: $\mu < \phi * 5 * \lambda * \sqrt{f'c} * S_m$
Key: No key defined

Min footing T&S reinf Area 1.08 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft
If one layer of horizontal bars: If two layers of horizontal bars:
#4@ 9.26 in #4@ 18.52 in
#5@ 14.35 in #5@ 28.70 in
#6@ 20.37 in #6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 833.0	2.33	1,943.7	Soil Over Heel	= 1,982.2	2.67	5,289.2
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	=	7.00		* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
				Stem Weight(s)	= 504.0	0.83	420.0
				Earth @ Stem Transitions	=		
				Footing Weight	= 625.5	2.09	1,304.2
				Key Weight	=		
				Vert. Component	=		

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.050 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.

772

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
6'-8" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

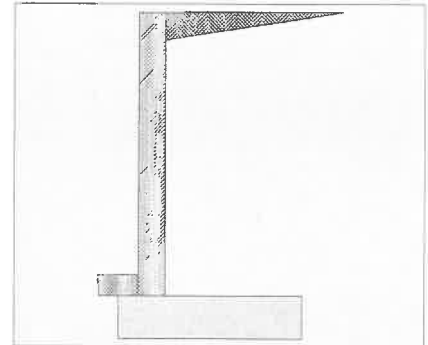
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	6.67 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.62 OK
Sliding	=	1.51 OK
Total Bearing Load	=	3,779 lbs
...resultant ecc.	=	6.25 in
Soil Pressure @ Toe	=	1,388 psf OK
Soil Pressure @ Heel	=	262 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,943 psf
ACI Factored @ Heel	=	367 psf
Footing Shear @ Toe	=	6.6 psi OK
Footing Shear @ Heel	=	3.0 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	999.8 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	1,511.5 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

Design Height Above Ftg	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	16.00
Rebar Placed at	=	Edge

Design Data		
fb/FB + fa/Fa	=	0.813

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	1,209.7

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	2,689.2

Moment....Allowable	=	3,309.4
---------------------	---	---------

Shear....Actual

Service Level	psi =	
Strength Level	psi =	13.2

Shear....Allowable	psi =	69.7
--------------------	-------	------

Anet (Masonry)	in2 =	91.50
----------------	-------	-------

Rebar Depth 'd'	in =	5.25
-----------------	------	------

Masonry Data

f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f'c	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

473

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
6'-8" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	4.08
Total Footing Width	=	4.58
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'_c =	2,500 psi	F_y = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,943	367 psf
M_u' : Upward	=	236	4,419 ft-#
M_u' : Downward	=	51	6,780 ft-#
M_u : Design	=	184	2,360 ft-#
Actual 1-Way Shear	=	6.62	3.01 psi
Allow 1-Way Shear	=	40.00	40.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $M_u < \phi * 5 * \lambda * b * d * \sqrt{f'_c} * S_m$
Heel: Not req'd: $M_u < \phi * 5 * \lambda * b * d * \sqrt{f'_c} * S_m$
Key: No key defined

Min footing T&S reinf Area	1.19	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft
If one layer of horizontal bars:		If two layers of horizontal bars:
#4@ 9.26 in		#4@ 18.52 in
#5@ 14.35 in		#5@ 28.70 in
#6@ 20.37 in		#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 999.8	2.56	2,555.9	Soil Over Heel	= 2,504.0	2.87	7,194.8
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	=	7.67		* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
				Stem Weight(s)	= 560.2	0.83	466.8
				Earth @ Stem Transitions	=		
				Footing Weight	= 687.0	2.29	1,573.2
				Key Weight	=		
				Vert. Component	=		

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.056 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
7'-4" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

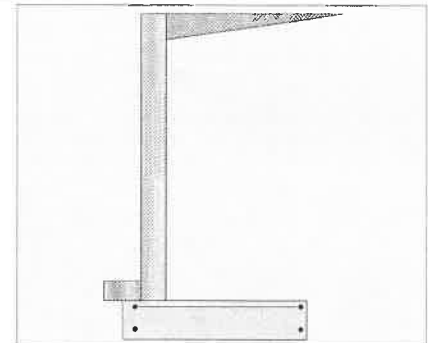
RetainPro (c) 1987-2018, Build 11.18.06.15
License : KW-06062345

Cantilevered Retaining Wall

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

Criteria	
Retained Height	= 7.33 ft
Wall height above soil	= 0.00 ft
Slope Behind Wall	= 0.00
Height of Soil over Toe	= 6.00 in
Water height over heel	= 0.0 ft

Soil Data	
Allow Soil Bearing	= 2,000.0 psf
Equivalent Fluid Pressure Method	
Active Heel Pressure	= 34.0 psf/ft
Passive Pressure	= 240.0 psf/ft
Soil Density, Heel	= 110.00 pcf
Soil Density, Toe	= 110.00 pcf
Footing Soil Friction	= 0.400
Soil height to ignore for passive pressure	= 12.00 in



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

Axial Load Applied to Stem	
Axial Dead Load	= 0.0 lbs
Axial Live Load	= 0.0 lbs
Axial Load Eccentricity	= 0.0 in

Lateral Load Applied to Stem	
Lateral Load	= 0.0 #/ft
...Height to Top	= 0.00 ft
...Height to Bottom	= 0.00 ft
Load Type	= Wind (W) (Service Level)
Wind on Exposed Stem	= 28.4 psf (Strength Level)

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

Design Summary	
Wall Stability Ratios	
Overturning	= 3.64 OK
Sliding	= 1.52 OK
Total Bearing Load	= 4,484 lbs
...resultant ecc.	= 6.85 in
Soil Pressure @ Toe	= 1,511 psf OK
Soil Pressure @ Heel	= 282 psf OK
Allowable	= 2,000 psf
Soil Pressure Less Than Allowable	
ACI Factored @ Toe	= 2,116 psf
ACI Factored @ Heel	= 395 psf
Footing Shear @ Toe	= 7.3 psi OK
Footing Shear @ Heel	= 3.1 psi OK
Allowable	= 75.0 psi
Sliding Calcs	
Lateral Sliding Force	= 1,179.6 lbs
less 0 % Passive Force	= - 0.0 lbs
less 100% Friction Force	= - 1,793.6 lbs
Added Force Req'd	= 0.0 lbs OK
....for 1.5 Stability	= 0.0 lbs OK

Stem Construction	
Design Height Above Ftg	ft = 0.00
Wall Material Above "Ht"	= Masonry
Design Method	= LRFD
Thickness	= 8.00
Rebar Size	= # 4
Rebar Spacing	= 8.00
Rebar Placed at	= Edge
Design Data	
fb/FB + fa/Fa	= 0.581
Total Force @ Section	
Service Level	lbs =
Strength Level	lbs = 1,461.4
Moment....Actual	
Service Level	ft-# =
Strength Level	ft-# = 3,570.8
Moment....Allowable	= 6,150.0
Shear.....Actual	
Service Level	psi =
Strength Level	psi = 16.0
Shear.....Allowable	psi = 69.7
Anet (Masonry)	in2 = 91.50
Rebar Depth 'd'	in = 5.25
Masonry Data	
f'm	psi = 1,500
Fy	psi = 60,000
Solid Grouting	= Yes
Modular Ratio 'n'	= 21.48
Wall Weight	psf = 84.0

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

Load Factors	
Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Equiv. Solid Thick.	in = 7.60
Masonry Block Type	= Normal Weight
Masonry Design Method	= LRFD

Concrete Data	
f'c	psi =
Fy	psi =

775

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
7'-4" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	4.50
Total Footing Width	=	5.00
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f_c	=	2,500 psi
F_y	=	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,116	395 psf
μ_u : Upward	=	257	6,134 ft-#
μ_u : Downward	=	51	9,165 ft-#
μ_u : Design	=	206	3,030 ft-#
Actual 1-Way Shear	=	7.34	3.12 psi
Allow 1-Way Shear	=	40.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	# 5 @ 14.35 in	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $\mu_u < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$

Heel: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46

Key: No key defined

Min footing T&S reinf Area 1.30 in²

Min footing T&S reinf Area per foot 0.26 in² /ft

If one layer of horizontal bars:

If two layers of horizontal bars:

#4@ 9.26 in

#4@ 18.52 in

#5@ 14.35 in

#5@ 28.70 in

#6@ 20.37 in

#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

Item	OVERTURNING.....				RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 1,179.6	2.78	3,275.4	Soil Over Heel	= 3,090.8	3.08	9,530.0
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	=	8.33		* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
Total	1,179.6	O.T.M.	3,275.4	Stem Weight(s)	= 615.7	0.83	513.1
	=	=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		=	3.64	Footing Weight	= 750.0	2.50	1,875.0
Vertical Loads used for Soil Pressure	=	4,484.0	lbs	Key Weight	=		
				Vert. Component	=		

Total = 4,484.0 lbs R.M. = 11,925.0

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.062 in

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

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

F76

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
8'-0" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\lunt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

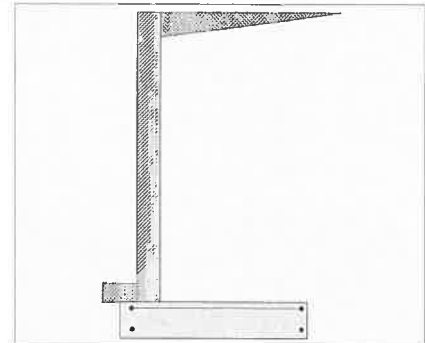
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footings/Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.64 OK
Sliding	=	1.52 OK
Total Bearing Load	=	5,245 lbs
...resultant ecc.	=	7.50 in
Soil Pressure @ Toe	=	1,642 psf OK
Soil Pressure @ Heel	=	298 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,298 psf
ACI Factored @ Heel	=	417 psf
Footing Shear @ Toe	=	8.1 psi OK
Footing Shear @ Heel	=	3.0 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	1,377.0 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	2,098.1 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

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

Design Data		
fb/FB + fa/Fa	=	0.755

Total Force @ Section		
Service Level	lbs =	
Strength Level	lbs =	1,740.8
Moment....Actual		
Service Level	ft-# =	
Strength Level	ft-# =	4,642.1
Moment....Allowable	=	6,150.0

Shear.....Actual		
Service Level	psi =	
Strength Level	psi =	19.0
Shear.....Allowable	psi =	69.7
Anet (Masonry)	in2 =	91.50
Rebar Depth 'd'	in =	5.25

Masonry Data		
f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data		
f'c	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000



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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
8'-8" MAX HT. RETAINING - NO FENCE

Page : 1
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

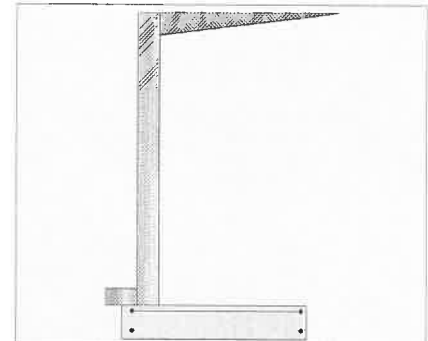
Code: IBC 2018, ACI 318-14, TMS 402-16

Criteria

Retained Height	=	8.67 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	34.0 psf/ft
	=	
Passive Pressure	=	240.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	110.00 pcf
Footing Soil Friction	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	=	28.4 psf (Strength Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios		
Overturning	=	3.55 OK
Sliding	=	1.51 OK
Total Bearing Load	=	5,989 lbs
...resultant ecc.	=	8.28 in
Soil Pressure @ Toe	=	1,792 psf OK
Soil Pressure @ Heel	=	292 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,508 psf
ACI Factored @ Heel	=	408 psf
Footing Shear @ Toe	=	9.0 psi OK
Footing Shear @ Heel	=	3.2 psi OK
Allowable	=	75.0 psi
Sliding Calcs		
Lateral Sliding Force	=	1,589.7 lbs
less 0 % Passive Force	=	0.0 lbs
less 100% Friction Force	=	2,395.8 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

Stem Construction

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

Design Data		
fb/FB + fa/Fa	=	0.961

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	2,044.6

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	5,908.9
Moment....Allowable	=	6,150.0

Shear....Actual

Service Level	psi =	
Strength Level	psi =	22.3

Shear....Allowable	psi =	69.7
--------------------	-------	------

Anet (Masonry)	in2 =	91.50
----------------	-------	-------

Rebar Depth 'd'	in =	5.25
-----------------	------	------

Masonry Data

f'm	psi =	1,500
Fy	psi =	60,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Wall Weight	psf =	84.0

Equiv. Solid Thick.	in =	7.60
Masonry Block Type	=	Normal Weight
Masonry Design Method	=	LRFD

Concrete Data

f'c	psi =	
Fy	psi =	

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

Load Factors

Building Code	IBC 2018, ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

170

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

Title ENCLAVES LOT 20 RETAINING WALLS
Job # : Dsgnr: RMD
Description....
8'-8" MAX HT. RETAINING - NO FENCE

Page : 2
Date: 8 AUG 2022

This Wall in File: y:\unt - lake havasu enclaves lot 20 structural\calculations\enclaves rw_calcs.R

RetainPro (c) 1987-2018, Build 11.18.06.15

License : KW-06062345

License To : Iron Rock Engineering, Inc.

Cantilevered Retaining Wall

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

Footing Dimensions & Strengths

Toe Width	=	0.50 ft
Heel Width	=	5.25
Total Footing Width	=	5.75
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f_c =	2,500 psi	F_y = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm. = 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,508	408 psf
M_u' : Upward	=	306	10,149 ft-#
M_u' : Downward	=	51	14,923 ft-#
M_u : Design	=	255	4,774 ft-#
Actual 1-Way Shear	=	8.95	3.18 psi
Allow 1-Way Shear	=	40.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	# 5 @ 14.35 in	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: $M_u < \phi \cdot 5 \cdot \lambda \cdot \sqrt{f_c} \cdot S_m$

Heel: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46

Key: No key defined

Min footing T&S reinf Area 1.49 in²

Min footing T&S reinf Area per foot 0.26 in²/ft

If one layer of horizontal bars:

If two layers of horizontal bars:

#4@ 9.26 in

#4@ 18.52 in

#5@ 14.35 in

#5@ 28.70 in

#6@ 20.37 in

#6@ 40.74 in

Summary of Overturning & Resisting Forces & Moments

.....OVERTURNING.....				RESISTING.....			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	= 1,589.7	3.22	5,124.0	Soil Over Heel	= 4,371.1	3.46	15,116.8
Surcharge over Heel	=			Sloped Soil Over Heel	=		
Surcharge Over Toe	=			Surcharge Over Heel	=		
Adjacent Footing Load	=			Adjacent Footing Load	=		
Added Lateral Load	=			Axial Dead Load on Stem	=		
Load @ Stem Above Soil	=	9.67		* Axial Live Load on Stem	=		
	=			Soil Over Toe	= 27.5	0.25	6.9
				Surcharge Over Toe	=		
Total	1,589.7	O.T.M.	5,124.0	Stem Weight(s)	= 728.3	0.83	606.9
	=	=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		=	3.55	Footing Weight	= 862.5	2.88	2,479.7
Vertical Loads used for Soil Pressure	=	5,989.4	lbs	Key Weight	=		
				Vert. Component	=		

Total = 5,989.4 lbs R.M. = 18,210.3

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.075 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.

