Project Title: STALLINGS RETAINING WALL
Engineer: CAROL CHADWICK, PE
Project ID: FL21247
Project Descr:

Cantilevered Retaining Wall

Project File: stallings.ec6

LIC# : KW-06015106, Build:20.24.09.03 CAROL CHADWICK, PE (c) ENERCALC, LLC 1982-2024

DESCRIPTION: 4' wall CMU

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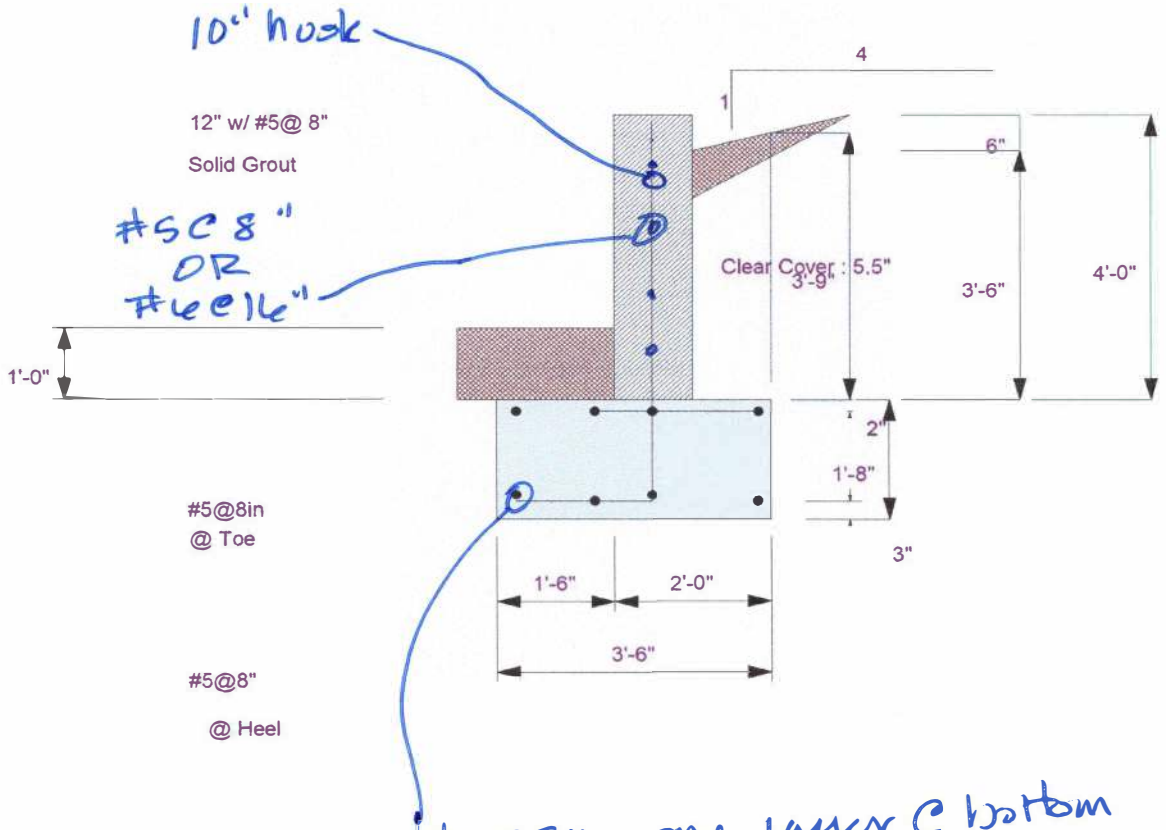
6 blocks



#5 @ 8" – one layer @ bottom

OR

#5 @ 16" – two layers @ top & bottom

Carol Chadwick, P.E.
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307.680.1772
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This item has been digitally signed and sealed by Carol Chadwick, P.E. on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

CAROL J. CHADWICK LICENSE No. 82560 STATE OF FLORIDA PROFESSIONAL ENGINEER

Digitally signed by Carol Chadwick
DN: c=US, o=Florida, dnQualifier=A01410D0000018D463B4E7500032FEE, cn=Carol Chadwick
Date: 2024.11.20 14:07:34 -05'00'

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Code Reference

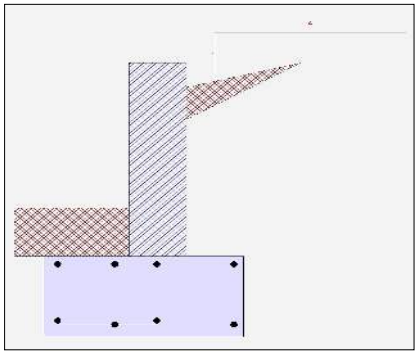
Calculations per IBC 2012 1807.3, CBC 2013, ASCE 7-10

Criteria

Retained Height	=	3.50 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	4.00
Height of Soil over Toe	=	12.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,500.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	250.0 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 (Strength Level)	=	0.0 psf

Adjacent Footing Load

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

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Design Summary

Wall Stability Ratios

Overturning	=	3.08	OK
Sliding	=	2.61	OK
Global Stability	=	4.68	
Total Bearing Load	=	1,685 lbs	
...resultant ecc.	=	4.93 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	701 psf	OK
Soil Pressure @ Heel	=	121 psf	OK
Allowable	=	2,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	981 psf	
ACI Factored @ Heel	=	170 psf	
Footing Shear @ Toe	=	2.5 psi	OK
Footing Shear @ Heel	=	2.3 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs

Lateral Sliding Force	=	513.5 lbs	
less 100% Passive Force	-	763.9 lbs	
less 100% Friction Force	-	575.5 lbs	
Added Force Req'd	=	0.0 lbs	OK
....for 1.5 Stability	=	0.0 lbs	OK

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

Load Factors

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

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Masonry
Design Method	=	ASD
Thickness	=	12.00
Rebar Size	=	# 5
Rebar Spacing	=	8.00
Rebar Placed at	=	Center
Design Data		
fb/FB + fa/Fa	=	**0.064**
Total Force @ Section		
Service Level	lbs =	214.4
Strength Level	lbs =	
Moment....Actual		
Service Level	ft-# =	250.1
Strength Level	ft-# =	
Moment.....Allowable	=	3,887.8
Shear.....Actual		
Service Level	psi =	1.5
Strength Level	psi =	
Shear.....Allowable	psi =	43.6
Anet (Masonry)	in2 =	139.50
Wall Weight	psf =	0.0
Rebar Depth 'd'	in =	5.81

Masonry Data

f'm	psi =	1,500
Fs	psi =	20,000
Solid Grouting	=	Yes
Modular Ratio 'n'	=	21.48
Equiv. Solid Thick.	in =	11.63
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	
Fy	psi =	

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Footing Data

Toe Width	=	1.50 ft
Heel Width	=	2.00
Total Footing Width	=	3.50
Footing Thickness	=	20.00 in

f'c = 3,000 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	=	981	170	psf
Mu' : Upward	=	973	124	ft-#
Mu' : Downward	=	648	587	ft-#
Mu: Design	=	325	463	ft-#
φ Mn	=	33,965	36,057	ft-#
Actual 1-Way Shear	=	2.51	2.35	psi
Allow 1-Way Shear	=	82.16	82.16	psi

Toe Reinforcing = # 5 @ 8.00 in
Heel Reinforcing = # 5 @ 8.00 in
Key Reinforcing = None Spec'd
Footing Torsion, Tu = 0.00 ft-lbs
Footing Allow. Torsion, φ Tn = 0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 5.55 in, #5@ 8.61 in, #6@ 12.22 in, #7@ 16.66 in, #8@ 21.94 in, #9@ 27.77 in, #10@ 35.27 in

Heel: #4@ 5.55 in, #5@ 8.61 in, #6@ 12.22 in, #7@ 16.66 in, #8@ 21.94 in, #9@ 27.77 in, #10@ 35.27 in

Key: No key defined

Min footing T&S reinf Area 1.51 in2
Min footing T&S reinf Area per foot 0.43 in2 /ft

If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 5.56 in	#4@ 11.11 in
#5@ 8.61 in	#5@ 17.22 in
#6@ 12.22 in	#6@ 24.44 in

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Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)		513.5	1.81	927.1	Soil Over HL (ab. water tbl)	385.0	3.00	1,155.0
HL Act Pres (be water tbl)					Soil Over HL (bel. water tbl)		3.00	1,155.0
Hydrostatic Force					Water Table			
Buoyant Force	=				Sloped Soil Over Heel	= 13.8	3.17	43.5
Surcharge over Heel	=				Surcharge Over Heel	=		
Surcharge Over Toe	=				Adjacent Footing Load	=		
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soil	=				Soil Over Toe	= 165.0	0.75	123.8
	=				Surcharge Over Toe	=		
					Stem Weight(s)	=		
					Earth @ Stem Transitions	=		
Total	=	513.5	**O.T.M.** =	927.1	Footing Weight	= 875.0	1.75	1,531.3
					Key Weight	=	2.00	
					Vert. Component	=		
					Total =	1,438.8 lbs	**R.M.=**	2,853.5

Resisting/Overturning Ratio = **3.08**
Vertical Loads used for Soil Pressure = 1,685.0 lbs

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	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.

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Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom
Stem Design Height: 0.00 ft above top of footing
Calculated Rebar Stress, fs = 1286.60 psi

Lap Splice length for #5 bar specified in this stem design segment (25.4.2.3a) =	25.00 in
Development length for #5 bar specified in this stem design segment =	12.00 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	6.39 in
As Provided =	0.4650 in2/ft
As Required =	0.0288 in2/ft

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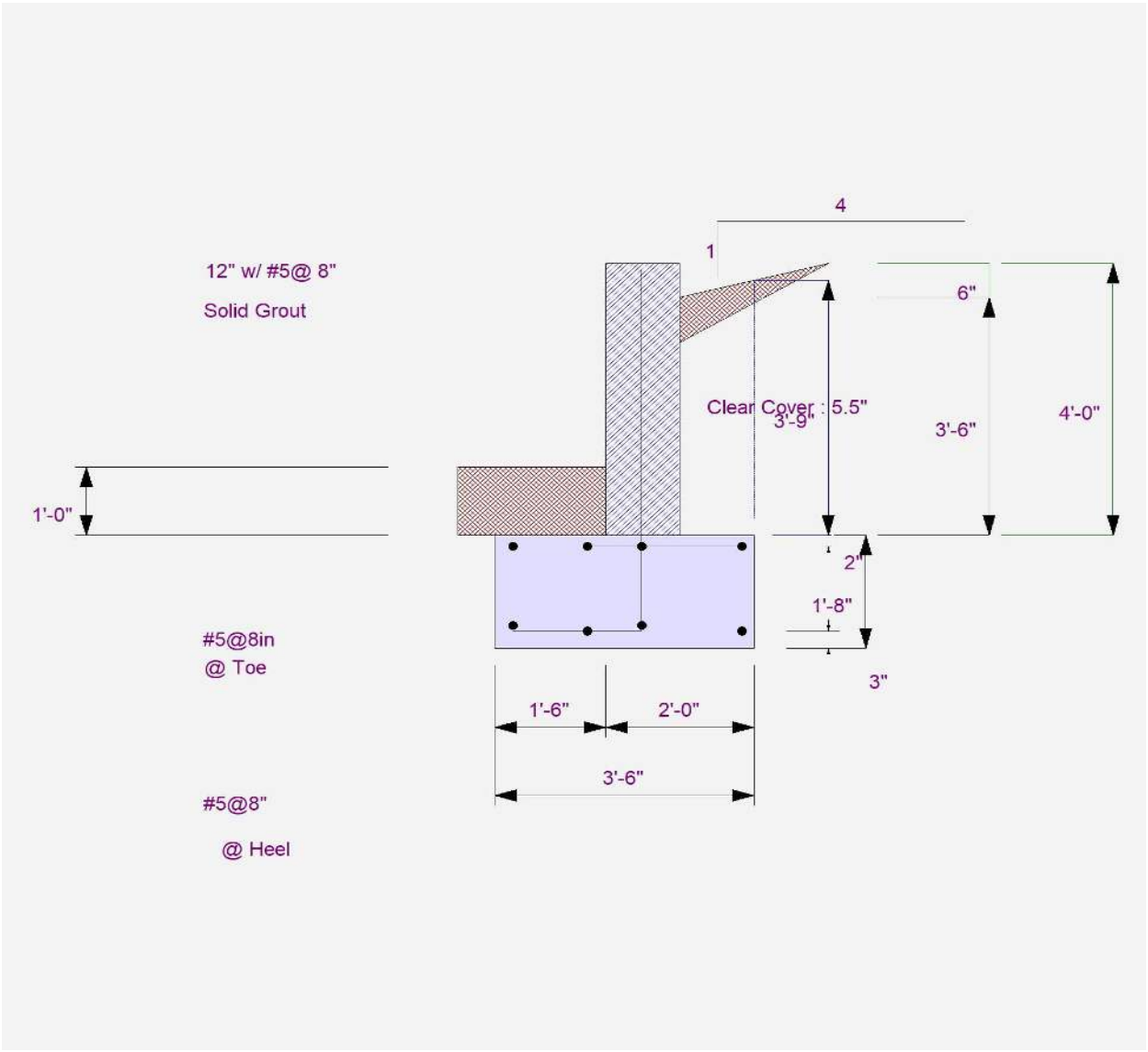

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