

Retain Pro 9 © 1989 - 2011 Ver: 9.24 8167  
Registration #: RP-1197945 RP9.24  
Licensed to: ENERCALC, INC

## Cantilevered Retaining Wall Design

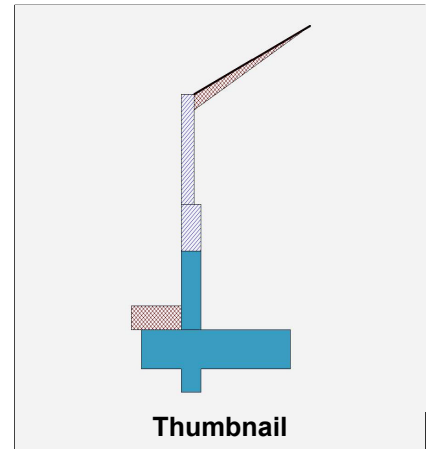
Code: IBC 2006

### Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	2.00 : 1
Height of Soil over Toe	=	12.00 in
Water height over heel	=	0.0 ft

### Soil Data

Allow Soil Bearing	=	3,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	45.0 psf/ft
Toe Active Pressure	=	30.0 psf/ft
Passive Pressure	=	389.0 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



Thumbnail

### 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
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	0.0 psf

### Adjacent Footing Load

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

### Axial Load Applied to Stem

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

### Design Summary

<b>Wall Stability Ratios</b>	
Overturning	= 2.00 OK
Sliding	= 1.42 Ratio < 1.5!
Total Bearing Load	= 9,035 lbs
...resultant ecc.	= 18.38 in
Soil Pressure @ Toe	= 2,716 psf OK
Soil Pressure @ Heel	= 0 psf OK
Allowable	= 3,000 psf
Soil Pressure Less Than Allowable	
ACI Factored @ Toe	= 3,802 psf
ACI Factored @ Heel	= 0 psf
Footing Shear @ Toe	= 9.8 psi OK
Footing Shear @ Heel	= 26.0 psi OK
Allowable	= 75.0 psi
<b>Sliding Calcs (Vertical Component NOT Used)</b>	
Lateral Sliding Force	= 4,251.0 lbs
less 100% Passive Force	= - 2,420.4 lbs
less 100% Friction Force	= - 3,613.9 lbs
Added Force Req'd	= 0.0 lbs OK
...for 1.5 : 1 Stability	= 342.1 lbs NG

### Stem Construction

	Top Stem	2nd	3rd
Design Height Above Ftg	ft = 5.33	Stem OK 3.33	Stem OK 0.00
Wall Material Above "Ht"	= Masonry	Masonry	Concrete
Thickness	= 8.00	12.00	12.00
Rebar Size	= # 5	# 5	# 7
Rebar Spacing	= 32.00	16.00	16.00
Rebar Placed at	= Edge	Edge	Edge
<b>Design Data</b>			
fb/FB + fa/Fa	= 0.681	0.583	0.656
Total Force @ Section	lbs = 490.7	1,001.0	3,576.0
Moment....Actual	ft-# = 763.9	2,225.6	11,992.0
Moment....Allowable	ft-# = 1,121.1	3,820.4	18,288.8
Shear.....Actual	psi = 7.8	9.3	31.2
Shear.....Allowable	psi = 38.7	38.7	75.0
Wall Weight	psf = 78.0	124.0	150.0
Rebar Depth 'd'	in = 5.25	9.00	9.56
LAP SPLICE IF ABOVE	in = 30.00	30.00	26.99
LAP SPLICE IF BELOW	in = 30.00	13.63	
HOOK EMBED INTO FTG			14.70
Lap splice above base reduced by stress ratio			

### Masonry Data

f <sub>m</sub>	psi = 1,500	1,500
F <sub>s</sub>	psi = 24,000	24,000
Solid Grouting	= Yes	Yes
Modular Ratio 'n'	= 21.48	21.48
Short Term Factor	= 1.000	1.000
Equiv. Solid Thick.	in = 7.60	11.60
Masonry Block Type	= Medium Weight	
Masonry Design Method	= ASD	

### Concrete Data

f <sub>c</sub>	psi = 2,500.0
F <sub>y</sub>	psi = 60,000.0

### Load Factors

Building Code	IBC 2006
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.600
Seismic, E	1.000

This Wall in File: c:\users\mdb\documents\retainpro9\exam

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#### Footing Dimensions & Strengths

Toe Width	=	2.00 ft
Heel Width	=	5.50
Total Footing Width	=	7.50
Footing Thickness	=	20.00 in
Key Width	=	12.00 in
Key Depth	=	12.00 in
Key Distance from Toe	=	2.00 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

	<u>Toe</u>	<u>Heel</u>
Factored Pressure	= 3,802	0 psf
$M_u'$ : Upward	= 6,842	4,646 ft-#
$M_u'$ : Downward	= 1,008	21,475 ft-#
$M_u$ : Design	= 5,834	16,830 ft-#
Actual 1-Way Shear	= 9.78	26.05 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 7 @ 16.00 in	
Heel Reinforcing	= # 6 @ 16.00 in	
Key Reinforcing	= None Spec'd	

#### Other Acceptable Sizes & Spacings

Toe: Not req'd,  $M_u < S * Fr$   
 Heel: #4@ 6.50 in, #5@ 10.00 in, #6@ 14.00 in, #7@ 19.25 in, #8@ 25.25 in, #9@ 31  
 Key: Not req'd,  $M_u < S * Fr$

#### Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
Heel Active Pressure	= 4,357.7	4.64	20,214.7	Soil Over Heel	= 4,950.0	5.25	25,987.5
Surcharge over Heel	=			Sloped Soil Over Heel	= 556.9	6.00	3,341.3
Toe Active Pressure	= -106.7	0.89	-94.8	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	= 220.0	1.00	220.0
				Surcharge Over Toe	=		
				Stem Weight(s)	= 1,111.8	2.45	2,718.7
				Earth @ Stem Transitions	= 171.2	2.83	485.2
				Footing Weight	= 1,875.0	3.75	7,031.3
				Key Weight	= 150.0	2.50	375.0
				Vert. Component	=		
				<b>Total =</b>	<b>9,034.9 lbs</b>	<b>R.M. =</b>	<b>40,158.9</b>

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

DESIGNER NOTES: