

1201 N. Tustin Avenue
Anaheim, CA 92807
Fax: (714) 630-6114
Phone: (714) 630-6100

DETAIL # 850

1'-4" to 6'-0" HIGH T SHAPE RETAINING WALL W/ SURCHARGE

STRUCTURAL CALCULATIONS

FOR



**DETAIL 850 T SHAPE
1'-4" TO 6'-0" HIGH
LEVEL BACKFILL
WITH SURCHARGE FROM FREESTANDING WALL**

DESIGN BASED ON CBC 2010 EDITION AND IBC 2009 EDITION

FOUNDATION PRESSURE: 1500psf

PASSIVE PRESSURE: 200pcf

ACTIVE PRESSURE – EXPANSIVE SOIL LEVEL: 45pcf

FRiction: 0.30

CONCRETE: f_c' = 2500psi

MASONRY: f_m' = 1500psi

REINFORCING: f_y = 40000psi (Grade 40) (or as noted)

Cantilevered Retaining Wall Design

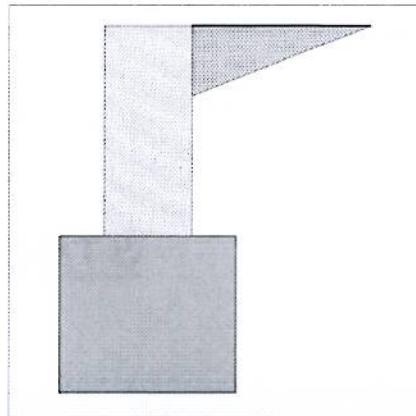
Code: IBC 2009

Criteria

Retained Height = 1.33 ft
Wall height above soil = 0.00 ft
Slope Behind Wall = 0.00 : 1
Height of Soil over Toe = 0.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Heel Active Pressure = 45.0 psf/ft
Toe Active Pressure = 45.0 psf/ft
Passive Pressure = 200.0 psf/ft
Soil Density, Heel = 125.0pcf
Soil Density, Toe = 125.0pcf
Footing||Soil Friction = 0.300
Soil height to ignore for passive pressure = 0.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
NOT Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
NOT 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
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 = 438.0 lbs
Footing Width = 1.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 1.00 ft
Footing Type Line Load
Base Above/Below Soil at Back of Wall = -1.0 ft
Poisson's Ratio = 0.300

Design Summary

Wall Stability Ratios
Overturning = 2.77 OK
Sliding = 1.72 OK

Total Bearing Load = 368 lbs
...resultant ecc. = 2.31 in

Soil Pressure @ Toe = 515 psf OK
Soil Pressure @ Heel = 37 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 721 psf
ACI Factored @ Heel = 51 psf
Footing Shear @ Toe = 1.4 psi OK
Footing Shear @ Heel = 1.0 psi OK
Allowable = 75.0 psi

Sliding Calcs (Vertical Component Used)
Lateral Sliding Force = 122.6 lbs
less 100% Passive Force = - 100.0 lbs
less 100% Friction Force = - 110.3 lbs
Added Force Req'd = 0.0 lbs OK
....for 1.5 : 1 Stability = 0.0 lbs OK

Stem Construction

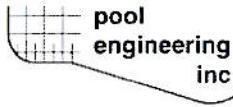
| | | | |
|--------------------------|--------|---------|---------|
| Design Height Above Ftg | ft = | 0.00 | Stem OK |
| Wall Material Above "Ht" | = | Masonry | |
| Thickness | = | 8.00 | |
| Rebar Size | = | # 4 | |
| Rebar Spacing | = | 24.00 | |
| Rebar Placed at | = | Edge | |
| Design Data | | | |
| fb/FB + fa/Fa | = | 0.023 | |
| Total Force @ Section | lbs = | 40.5 | |
| Moment....Actual | ft-# = | 17.8 | |
| Moment....Allowable | = | 776.1 | |
| Shear....Actual | psi = | 0.6 | |
| Shear....Allowable | psi = | 19.4 | |
| Wall Weight | = | 84.0 | |
| Rebar Depth 'd' | in = | 5.25 | |
| LAP SPLICE IF ABOVE | in = | 24.00 | |
| LAP SPLICE IF BELOW | in = | | |
| HOOK EMBED INTO FTG | in = | 6.00 | |

Load Factors
Building Code IBC 2009
Dead Load 1.200
Live Load 1.600
Earth, H 1.600
Wind, W 1.300
Seismic, E 1.000

Masonry Data
fm psi = 1,500
Fs psi = 20,000
Solid Grouting = Yes

Modular Ratio 'n' = 25.78
Short Term Factor = 1.000
Equiv. Solid Thick. in = 7.60
Masonry Block Type = Normal Weight
Masonry Design Method = ASD Half-Stress option used.

Concrete Data
fc psi =
fy psi =



Pool Engineering, Inc.
1201 N Tustin Ave
Anaheim, CA 92807
Tel: (714) 630-6100
Fax: (714) 630-6114

Retain Pro 9 © 1989 - 2011 Ver: 9.19 8152
Registration #: RP-1159015 RP9.19
Licensed to: Pool Engineering, Inc.

Title : 850 1'-4" Job # : 850 1'-4" Dsgnr: TLL Date: SEP 5,2007
Description....
1'-4" Retaining Wall w/ Garden Wall Surcharge Level
This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

Toe Width = 0.33 ft
Heel Width = 1.00
Total Footing Width = 1.33
Footing Thickness = 12.00 in
Key Width = 12.00 in
Key Depth = 0.00 in
Key Distance from Toe = 0.33 ft

 $f_c = 2,500 \text{ psi}$ $F_y = 40,000 \text{ psi}$
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 3.00 @ Btm.= 3.00 in

Footing Design Results

| | Toe | Heel |
|--------------------|-----------------|-----------|
| Factored Pressure | = 721 | 51 psf |
| M_u' : Upward | = 80 | 17 ft-lb |
| M_u' : Downward | = 26 | 55 ft-lb |
| M_u : Design | = 53 | 39 ft-lb |
| Actual 1-Way Shear | = 1.40 | 1.01 psi |
| Allow 1-Way Shear | = 75.00 | 75.00 psi |
| Toe Reinforcing | = #4 @ 24.00 in | |
| Heel Reinforcing | = #4 @ 12.00 in | |
| Key Reinforcing | = #4 @ 12.00 in | |

Other Acceptable Sizes & Spacings

Toe: Not req'd, $M_u < S * Fr$
Heel: Not req'd, $M_u < S * Fr$
Key: Not Req'd = $M_u < S * Fr$

Summary of Overturning & Resisting Forces & Moments

| Item |OVERTURNING.... | | |RESISTING.... | | | |
|---|---------------------|-----------------|-----------------|---------------------------|------------------|-----------------|--------------|
| | Force lbs | Distance ft | Moment ft-lb | Force lbs | Distance ft | Moment ft-lb | |
| Heel Active Pressure | = 122.5 | 0.78 | 95.2 | Soil Over Heel | = 55.5 | 1.17 | 64.8 |
| Surcharge over Heel | = | | | Sloped Soil Over Heel | = | | |
| Toe Active Pressure | = -22.5 | 0.33 | -7.5 | Surcharge Over Heel | = | | |
| Surcharge Over Toe | = | | | Adjacent Footing Load | = | | |
| Adjacent Footing Load | = 22.6 | 0.48 | 10.9 | Axial Dead Load on Stem | = | | |
| Added Lateral Load | = | | | * Axial Live Load on Stem | = | | |
| Load @ Stem Above Soil | = | | | Soil Over Toe | = | | |
| Total | = 122.6 | O.T.M. = | 98.6 | Surcharge Over Toe | = | | |
| Resisting/Overturning Ratio | = 2.77 | | | Stem Weight(s) | = 112.0 | 0.67 | 74.6 |
| Vertical Loads used for Soil Pressure = | 367.5 lbs | | | Earth @ Stem Transitions | = | | |
| | | | | Footing Weight | = 200.0 | 0.67 | 133.3 |
| | | | | Key Weight | = | 0.83 | |
| | | | | Vert. Component | = | | |
| | | | | Total = | 367.5 lbs | R.M. = | 272.8 |

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

DESIGNER NOTES:

Cantilevered Retaining Wall Design

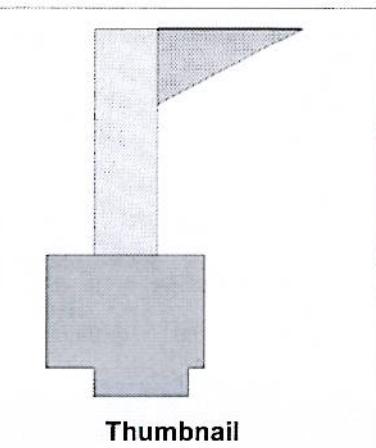
Code: IBC 2009

Criteria

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

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Heel Active Pressure = 45.0 psf/ft
Toe Active Pressure = 45.0 psf/ft
Passive Pressure = 200.0 psf/ft
Soil Density, Heel = 125.0 pcf
Soil Density, Toe = 125.0 pcf
Footing||Soil Friction = 0.300
Soil height to ignore for passive pressure = 0.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
NOT Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
NOT 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
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 = 438.0 lbs
Footing Width = 1.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 1.00 ft
Footing Type Line Load
Base Above/Below Soil at Back of Wall = -1.0 ft
Poisson's Ratio = 0.300

Design Summary

Wall Stability Ratios

| | | |
|-----------------------------------|---|------------|
| Overturning | = | 3.06 OK |
| Sliding | = | 1.67 OK |
| Total Bearing Load | = | 668 lbs |
| ...resultant ecc. | = | 1.70 in |
| Soil Pressure @ Toe | = | 605 psf OK |
| Soil Pressure @ Heel | = | 197 psf OK |
| Allowable | = | 1,500 psf |
| Soil Pressure Less Than Allowable | = | |
| ACI Factored @ Toe | = | 863 psf |
| ACI Factored @ Heel | = | 281 psf |
| Footing Shear @ Toe | = | 2.8 psi OK |
| Footing Shear @ Heel | = | 0.9 psi OK |
| Allowable | = | 75.0 psi |

Sliding Calcs (Vertical Component Used)

| | | |
|---------------------------|---|-------------|
| Lateral Sliding Force | = | 213.1 lbs |
| less 100% Passive Force | = | - 156.3 lbs |
| less 100% Friction Force | = | - 200.4 lbs |
| Added Force Req'd | = | 0.0 lbs OK |
|for 1.5 : 1 Stability | = | 0.0 lbs OK |

Stem Construction

Top Stem

| | | |
|-------------------------|------|---------|
| Design Height Above Ftg | ft = | 0.00 |
| Wall Material Above "H" | = | Masonry |
| Thickness | = | 8.00 |
| Rebar Size | = | # 4 |
| Rebar Spacing | = | 24.00 |
| Rebar Placed at | = | Edge |

Design Data

| | | |
|-----------------------|--------|-------|
| fb/FB + fa/Fa | = | 0.083 |
| Total Force @ Section | lbs = | 104.9 |
| Moment....Actual | ft-# = | 64.6 |
| Moment....Allowable | = | 776.1 |
| Shear....Actual | psi = | 1.7 |
| Shear....Allowable | psi = | 19.4 |
| Wall Weight | = | 84.0 |
| Rebar Depth 'd' | in = | 5.25 |
| LAP SPLICE IF ABOVE | in = | 24.00 |
| LAP SPLICE IF BELOW | in = | |
| HOOK EMBED INTO FTG | in = | 6.00 |

Load Factors

| | |
|---------------|----------|
| Building Code | IBC 2009 |
| Dead Load | 1.200 |
| Live Load | 1.600 |
| Earth, H | 1.600 |
| Wind, W | 1.300 |
| Seismic, E | 1.000 |

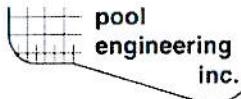
Masonry Data

| | | |
|----------------|-------|--------|
| f'm | psi = | 1,500 |
| Fs | psi = | 20,000 |
| Solid Grouting | = | Yes |

| | | |
|-----------------------|------|------------------------------|
| Modular Ratio 'n' | = | 25.78 |
| Short Term Factor | = | 1.000 |
| Equiv. Solid Thick. | in = | 7.60 |
| Masonry Block Type | = | Normal Weight |
| Masonry Design Method | = | ASD Half-Stress option used. |

Concrete Data

| | | |
|-----|-------|--|
| f'c | psi = | |
| Fy | psi = | |



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Retain Pro 9 © 1989 - 2011 Ver: 9.19 8152
Registration #: RP-1159015 RP9.19
Licensed to: Pool Engineering, Inc.

Title : 850 2'-0"

Job # : 850 2'-0"

Description....

Page: _____

Dsgnr: TLL

Date: SEP 5,2007

2'-0" Retaining Wall w/ Garden Wall Surcharge

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010.

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

| | | |
|----------------------------|-----------------------------|-----------------|
| Toe Width | = | 0.50 ft |
| Heel Width | = | 1.17 |
| Total Footing Width | = | 1.67 |
| Footing Thickness | = | 12.00 in |
| Key Width | = | 12.00 in |
| Key Depth | = | 3.00 in |
| Key Distance from Toe | = | 0.50 ft |
| f _c = 2,500 psi | F _y = 40,000 psi | |
| Footing Concrete Density = | 150.00 pcf | |
| Min. As % | = | 0.0018 |
| Cover @ Top | 3.00 | @ Btm.= 3.00 in |

Footing Design Results

| | Toe | Heel |
|-----------------------------------|------------------|-----------|
| Factored Pressure | = 863 | 281 psf |
| Mu' : Upward | = 175 | 80 ft-# |
| Mu' : Downward | = 47 | 124 ft-# |
| Mu: Design | = 128 | 45 ft-# |
| Actual 1-Way Shear | = 2.77 | 0.94 psi |
| Allow 1-Way Shear | = 75.00 | 75.00 psi |
| Toe Reinforcing | = None Spec'd | |
| Heel Reinforcing | = # 4 @ 12.00 in | |
| Key Reinforcing | = # 4 @ 12.00 in | |
| Other Acceptable Sizes & Spacings | | |
| Toe: Not req'd, Mu < S * Fr | | |
| Heel: Not req'd, Mu < S * Fr | | |
| Key: Not Req'd = Mu < 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 | = 202.5 | 1.00 | 202.5 | Soil Over Heel | = 125.0 | 1.42 | 177.1 |
| Surcharge over Heel | = | | | Sloped Soil Over Heel | = | | |
| Toe Active Pressure | = -22.5 | 0.33 | -7.5 | Surcharge Over Heel | = | | |
| Surcharge Over Toe | = | | | Adjacent Footing Load | = 87.6 | 1.42 | 124.1 |
| Adjacent Footing Load | = 33.1 | 0.90 | 29.8 | Axial Dead Load on Stem = | | | |
| Added Lateral Load | = | | | * Axial Live Load on Stem = | | | |
| Load @ Stem Above Soil = | | | | Soil Over Toe | = | | |
| | | | | Surcharge Over Toe | = | | |
| | | | | Stem Weight(s) | = 168.0 | 0.83 | 140.0 |
| | | | | Earth @ Stem Transitions = | | | |
| Total = 213.1 O.T.M. = 224.8 | | | | Footing Weight | = 250.0 | 0.83 | 208.3 |
| Resisting/Overturning Ratio = 3.06 | | | | Key Weight | = 37.5 | 1.00 | 37.5 |
| Vertical Loads used for Soil Pressure = 668.1 lbs | | | | Vert. Component | = | | |
| | | | | Total = 668.1 lbs R.M. = 687.0 | | | |

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

DESIGNER NOTES:

Cantilevered Retaining Wall Design

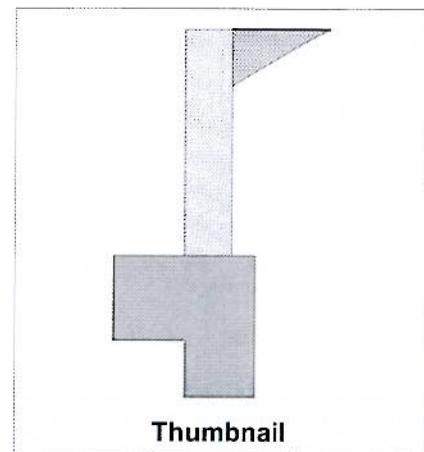
Code: IBC 2009

Criteria

Retained Height = 2.67 ft
 Wall height above soil = 0.00 ft
 Slope Behind Wall = 0.00 : 1
 Height of Soil over Toe = 0.00 in
 Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
 Equivalent Fluid Pressure Method
 Heel Active Pressure = 45.0 psf/ft
 Toe Active Pressure = 45.0 psf/ft
 Passive Pressure = 200.0 psf/ft
 Soil Density, Heel = 125.0 pcf
 Soil Density, Toe = 125.0 pcf
 Footing||Soil Friction = 0.300
 Soil height to ignore for passive pressure = 0.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
 NOT Used To Resist Sliding & Overturning
 Surcharge Over Toe = 0.0 psf
 NOT 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 = 438.0 lbs
 Footing Width = 1.00 ft
 Eccentricity = 0.00 in
 Wall to Ftg CL Dist = 1.00 ft
 Footing Type = Line Load
 Base Above/Below Soil at Back of Wall = -1.0 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 = 2.48 OK
 Sliding = 1.60 OK

 Total Bearing Load = 779 lbs
 ...resultant ecc. = 2.50 in

 Soil Pressure @ Toe = 633 psf OK
 Soil Pressure @ Heel = 146 psf OK
 Allowable = 1,500 psf
 Soil Pressure Less Than Allowable
 ACI Factored @ Toe = 894 psf
 ACI Factored @ Heel = 206 psf
 Footing Shear @ Toe = 5.0 psi OK
 Footing Shear @ Heel = 1.4 psi OK
 Allowable = 75.0 psi

Sliding Calcs (Vertical Component Used)
 Lateral Sliding Force = 318.8 lbs
 less 100% Passive Force = - 277.8 lbs
 less 100% Friction Force = - 233.7 lbs

 Added Force Req'd = 0.0 lbs OK
for 1.5 : 1 Stability = 0.0 lbs OK

Stem Construction

| Design Height Above Ftg | ft = 0.00 | Top Stem |
|--------------------------|--------------|----------|
| Wall Material Above "Ht" | = Masonry | |
| Thickness | = 8.00 | |
| Rebar Size | = # 4 | |
| Rebar Spacing | = 24.00 | |
| Rebar Placed at | = Edge | |
| Design Data | | |
| fb/Fb + fa/Fa | = 0.208 | |
| Total Force @ Section | lbs = 188.7 | |
| Moment....Actual | ft-# = 161.7 | |
| Moment....Allowable | = 776.1 | |
| Shear.....Actual | psi = 3.0 | |
| Shear.....Allowable | psi = 19.4 | |
| Wall Weight | = 84.0 | |
| Rebar Depth 'd' | in = 5.25 | |
| LAP SPLICE IF ABOVE | in = 24.00 | |
| LAP SPLICE IF BELOW | in = | |
| HOOK EMBED INTO FTG | in = 6.00 | |

Load Factors

| | |
|---------------|----------|
| Building Code | IBC 2009 |
| Dead Load | 1.200 |
| Live Load | 1.600 |
| Earth, H | 1.600 |
| Wind, W | 1.300 |
| Seismic, E | 1.000 |

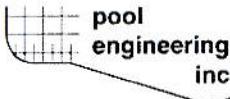
Masonry Data

| | |
|----------------|--------------|
| f'm | psi = 1,500 |
| Fs | psi = 20,000 |
| Solid Grouting | = Yes |

| | |
|-----------------------|--------------------------------|
| Modular Ratio 'n' | = 25.78 |
| Short Term Factor | = 1.000 |
| Equiv. Solid Thick. | in = 7.60 |
| Masonry Block Type | = Normal Weight |
| Masonry Design Method | = ASD Half-Stress option used. |

Concrete Data

| | |
|-----|-------|
| f'c | psi = |
| Fy | psi = |



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Licensed to: Pool Engineering, Inc.

Title : 850 2'-8"

Job # : 850 2'-8"

Description....

Page:

Date: SEP 5,2007

2'-8" Retaining Wall w/ Garden Wall Surcharge

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

Toe Width = 1.00 ft
Heel Width = 1.00
Total Footing Width = 2.00
Footing Thickness = 12.00 in
Key Width = 12.00 in
Key Depth = 8.00 in
Key Distance from Toe = 1.00 ft
 $f_c = 2,500 \text{ psi}$ $F_y = 40,000 \text{ psi}$
Footing Concrete Density = 150.0 pcf
Min. As % = 0.0018
Cover @ Top 3.00 @ Btm.= 3.00 in

Footing Design Results

| | Toe | Heel |
|--------------------|------------------|-----------|
| Factored Pressure | = 894 | 206 psf |
| M_u' : Upward | = 517 | 33 ft# |
| M_u' : Downward | = 143 | 85 ft# |
| M_u : Design | = 374 | 52 ft# |
| Actual 1-Way Shear | = 5.02 | 1.35 psi |
| Allow 1-Way Shear | = 75.00 | 75.00 psi |
| Toe Reinforcing | = None Spec'd | |
| Heel Reinforcing | = # 4 @ 12.00 in | |
| Key Reinforcing | = # 4 @ 12.00 in | |

Other Acceptable Sizes & Spacings

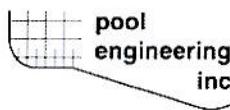
Toe: Not req'd, $M_u < S * Fr$
Heel: Not req'd, $M_u < S * Fr$
Key: Not Req'd = $M_u < S * Fr$

Summary of Overturning & Resisting Forces & Moments

| Item |OVERTURNING.... | | |RESISTING.... | | | |
|---|---------------------|-----------------------|----------------|---|----------------|----------------|-------|
| | Force lbs | Distance ft | Moment ft-# | Force lbs | Distance ft | Moment ft-# | |
| Heel Active Pressure | = 302.6 | 1.22 | 369.8 | Soil Over Heel | = 111.1 | 1.83 | 203.7 |
| Surcharge over Heel | = | | | Sloped Soil Over Heel | = | | |
| Toe Active Pressure | = -22.5 | 0.33 | -7.5 | Surcharge Over Heel | = | | |
| Surcharge Over Toe | = | | | Adjacent Footing Load | = 43.8 | 1.83 | 80.3 |
| Adjacent Footing Load | = 38.7 | 1.39 | 53.9 | Axial Dead Load on Stem | = | | |
| Added Lateral Load | = | | | * Axial Live Load on Stem | = | | |
| Load @ Stem Above Soil | = | | | Soil Over Toe | = | | |
| Total | = 318.8 | O.T.M. = 416.3 | | Surcharge Over Toe | = | | |
| Resisting/Overturning Ratio | = 2.48 | | | Stem Weight(s) | = 224.0 | 1.33 | 298.7 |
| Vertical Loads used for Soil Pressure = | 779.0 lbs | | | Earth @ Stem Transitions | = | | |
| | | | | Footing Weight | = 300.0 | 1.00 | 300.0 |
| | | | | Key Weight | = 100.0 | 1.50 | 150.0 |
| | | | | Vert. Component | = | | |
| | | | | Total = 779.0 lbs R.M. = 1,032.7 | | | |

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

DESIGNER NOTES:



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Registration #: RP-1159015 RRP9.19
Licensed to: Pool Engineering, Inc.

Title : 850 3'-4" Job # : 850 3'-4" Dsgnr: TLL Date: SEP 5,2007

Description... 3'-4" Retaining Wall w/ Garden Wall Surcharge Level

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010

Cantilevered Retaining Wall Design

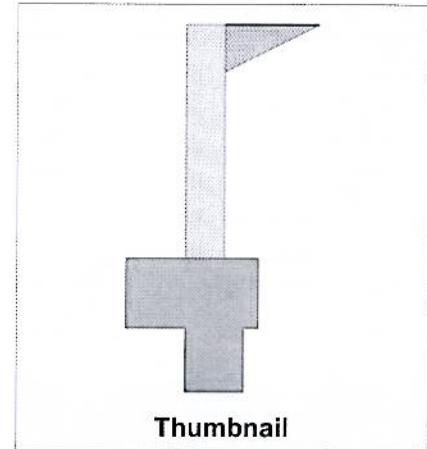
Code: IBC 2009

Criteria

Retained Height = 3.33 ft
Wall height above soil = 0.00 ft
Slope Behind Wall = 0.00 : 1
Height of Soil over Toe = 0.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Heel Active Pressure = 45.0 psf/ft
Toe Active Pressure = 45.0 psf/ft
Passive Pressure = 200.0 psf/ft
Soil Density, Heel = 125.00 pcf
Soil Density, Toe = 125.00 pcf
Footing||Soil Friction = 0.300
Soil height to ignore for passive pressure = 0.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
NOT Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
NOT 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 = 438.0 lbs
Footing Width = 1.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 1.00 ft
Footing Type Line Load
Base Above/Below Soil at Back of Wall = -1.0 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 = 2.30 OK
Sliding = 1.56 OK

Total Bearing Load = 1,068 lbs
...resultant ecc. = 3.52 in

Soil Pressure @ Toe = 846 psf OK
Soil Pressure @ Heel = 104 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,195 psf
ACI Factored @ Heel = 146 psf
Footing Shear @ Toe = 7.4 psi OK
Footing Shear @ Heel = 2.9 psi OK
Allowable = 75.0 psi

Sliding Calcs (Vertical Component Used)
Lateral Sliding Force = 441.7 lbs
less 100% Passive Force = - 367.4 lbs
less 100% Friction Force = - 320.3 lbs
Added Force Req'd = 0.0 lbs OK
....for 1.5 : 1 Stability = 0.0 lbs OK

Stem Construction

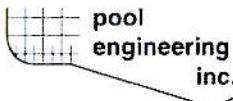
| Design Height Above Ftg | | Top Stem |
|--------------------------|--------|----------|
| | ft = | 0.00 |
| Wall Material Above "Ht" | = | Masonry |
| Thickness | = | 8.00 |
| Rebar Size | = | # 4 |
| Rebar Spacing | = | 24.00 |
| Rebar Placed at | = | Edge |
| Design Data | | |
| fb/FB + fa/Fa | = | 0.411 |
| Total Force @ Section | lbs = | 286.3 |
| Moment....Actual | ft-# = | 319.1 |
| Moment....Allowable | = | 776.1 |
| Shear.....Actual | psi = | 4.5 |
| Shear.....Allowable | psi = | 19.4 |
| Wall Weight | = | 84.0 |
| Rebar Depth 'd' | in = | 5.25 |
| LAP SPLICE IF ABOVE | in = | 24.00 |
| LAP SPLICE IF BELOW | in = | |
| HOOK EMBED INTO FTG | in = | 6.00 |

Load Factors
Building Code IBC 2009
Dead Load 1.200
Live Load 1.600
Earth, H 1.600
Wind, W 1.300
Seismic, E 1.000

Masonry Data
fm psi = 1,500
Fs psi = 20,000
Solid Grouting = Yes

Modular Ratio 'n' = 25.78
Short Term Factor = 1.000
Equiv. Solid Thick. in = 7.60
Masonry Block Type = Normal Weight
Masonry Design Method = ASD Half-Stress option used.

Concrete Data
fc psi =
Fy psi =



Pool Engineering, Inc.
1201 N Tustin Ave
Anaheim, CA 92807
Tel: (714) 630-6100
Fax: (714) 630-6114

Title : 850 3'-4" Job # : 850 3'-4" Dsgnr: TLL Date: SEP 5,2007
Description....

3'-4" Retaining Wall w/ Garden Wall Surcharge Level

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010.

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Registration #: RP-1159015 RP9.19
Licensed to: Pool Engineering, Inc.

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

Toe Width = 1.00 ft
Heel Width = 1.25
Total Footing Width = 2.25
Footing Thickness = 12.00 in
Key Width = 12.00 in
Key Depth = 11.00 in
Key Distance from Toe = 1.00 ft
 $f_c = 2,500 \text{ psi}$ $F_y = 40,000 \text{ psi}$
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 3.00 @ Btm.= 3.00 in

Footing Design Results

| | Toe | Heel |
|--------------------|------------------|-----------|
| Factored Pressure | = 1,195 | 146 psf |
| M_u' : Upward | = 690 | 74 ft-lb |
| M_u' : Downward | = 143 | 223 ft-lb |
| M_u : Design | = 547 | 149 ft-lb |
| Actual 1-Way Shear | = 7.37 | 2.92 psi |
| Allow 1-Way Shear | = 75.00 | 75.00 psi |
| Toe Reinforcing | = None Spec'd | |
| Heel Reinforcing | = # 4 @ 12.00 in | |
| Key Reinforcing | = # 4 @ 12.00 in | |

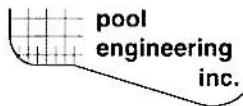
Other Acceptable Sizes & Spacings
 Toe: Not req'd, $M_u < S * Fr$
 Heel: Not req'd, $M_u < S * Fr$
 Key: Not Req'd = $M_u < S * Fr$

Summary of Overturning & Resisting Forces & Moments

| Item |OVERTURNING..... | | |RESISTING..... | | | |
|---|-----------------------|-----------------------|--------------|---|-------------|--------------|-------|
| | Force lbs | Distance ft | Moment ft-lb | Force lbs | Distance ft | Moment ft-lb | |
| Heel Active Pressure | = 422.4 | 1.44 | 610.1 | Soil Over Heel | = 243.0 | 1.96 | 475.9 |
| Surcharge over Heel | = | | | Sloped Soil Over Heel | = | | |
| Toe Active Pressure | = -22.5 | 0.33 | -7.5 | Surcharge Over Heel | = | | |
| Surcharge Over Toe | = | | | Adjacent Footing Load | = 69.7 | 1.96 | 136.5 |
| Adjacent Footing Load | = 41.8 | 1.94 | 80.9 | Axial Dead Load on Stem = | | | |
| Added Lateral Load | = | | | * Axial Live Load on Stem = | | | |
| Load @ Stem Above Soil = | | | | Soil Over Toe | = | | |
| Total | = 441.7 | O.T.M. = 683.5 | | Surcharge Over Toe | = | | |
| Resisting/Overturning Ratio | | | | Stem Weight(s) | = 280.0 | 1.33 | 373.3 |
| Vertical Loads used for Soil Pressure = | 1,067.7 lbs | | | Earth @ Stem Transitions = | | | |
| | | | | Footing Weight | = 337.5 | 1.13 | 379.7 |
| | | | | Key Weight | = 137.5 | 1.50 | 206.3 |
| | | | | Vert. Component | = | | |
| | | | | Total = 1,067.7 lbs R.M. = 1,571.6 | | | |

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

DESIGNER NOTES:



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Retain Pro 9 © 1989 - 2011 Ver: 9.19 8152
Registration #: RP-1159015 RRP.19
Licensed to: Pool Engineering, Inc.

Title : 850 4'-0"
Job # : 850 4'-0"
Dsgnr: TLL
Description....
4'-0" Retaining Wall w/ Garden Wall Surcharge Level
This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010

Page: SEP 5,2007

Cantilevered Retaining Wall Design

Code: IBC 2009

Criteria

Retained Height = 4.00 ft
Wall height above soil = 0.00 ft
Slope Behind Wall = 0.00 : 1
Height of Soil over Toe = 0.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Heel Active Pressure = 45.0 psf/ft
Toe Active Pressure = 45.0 psf/ft
Passive Pressure = 200.0 psf/ft
Soil Density, Heel = 125.0 pcf
Soil Density, Toe = 125.0 pcf
Footing||Soil Friction = 0.300
Soil height to ignore for passive pressure = 0.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
NOT Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
NOT 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 = 438.0 lbs
Footing Width = 1.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 1.00 ft
Footing Type Line Load
Base Above/Below Soil at Back of Wall = -1.0 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 = 1,394 lbs
...resultant ecc. = 4.69 in

Soil Pressure @ Toe = 1,080 psf OK
Soil Pressure @ Heel = 35 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable

ACI Factored @ Toe = 1,526 psf
ACI Factored @ Heel = 49 psf

Footing Shear @ Toe = 10.0 psi OK
Footing Shear @ Heel = 5.0 psi OK
Allowable = 75.0 psi

Sliding Calcs (Vertical Component Used)

| | | |
|--------------------------|---|-----------|
| Lateral Sliding Force | = | 583.5 lbs |
| less 100% Passive Force | = | 469.4 lbs |
| less 100% Friction Force | = | 418.2 lbs |

Added Force Req'd = 0.0 lbs OK
....for 1.5 : 1 Stability = 0.0 lbs OK

Stem Construction

| Design Height Above Ftg | ft | Top Stem |
|--------------------------|----|----------|
| | = | 0.00 |
| Wall Material Above "Ht" | = | Masonry |
| Thickness | = | 8.00 |
| Rebar Size | = | # 4 |
| Rebar Spacing | = | 16.00 |
| Rebar Placed at | = | Edge |

Design Data

| | | |
|-----------------------|------|---------|
| fb/Fb + fa/Fa | = | 0.604 |
| Total Force @ Section | lbs | = 400.5 |
| Moment....Actual | ft-# | = 547.2 |
| Moment....Allowable | = | 905.4 |
| Shear....Actual | psi | = 6.4 |
| Shear....Allowable | psi | = 19.4 |
| Wall Weight | = | 84.0 |
| Rebar Depth 'd' | in | = 5.25 |
| LAP SPLICE IF ABOVE | in | = 24.00 |
| LAP SPLICE IF BELOW | in | |
| HOOK EMBED INTO FTG | in | = 6.00 |

Load Factors

| | |
|---------------|----------|
| Building Code | IBC 2009 |
| Dead Load | 1.200 |
| Live Load | 1.600 |
| Earth, H | 1.600 |
| Wind, W | 1.300 |
| Seismic, E | 1.000 |

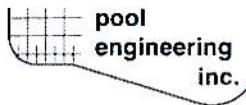
Masonry Data

| | | |
|----------------|-----|----------|
| f'm | psi | = 1,500 |
| Fs | psi | = 20,000 |
| Solid Grouting | = | Yes |

| | | |
|-----------------------|----|------------------------------|
| Modular Ratio 'n' | = | 25.78 |
| Short Term Factor | = | 1.000 |
| Equiv. Solid Thick. | in | = 7.60 |
| Masonry Block Type | = | Normal Weight |
| Masonry Design Method | = | ASD Half-Stress option used. |

Concrete Data

| | | |
|-----|-----|--|
| f'c | psi | |
| Fy | psi | |



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Registration #: RP-1159015 RP9.19
Licensed to: Pool Engineering, Inc.

Title : 850 4'-0" Job # : 850 4'-0" Dsgnr: TLL Date: SEP 5,2007

Description....

4'-0" Retaining Wall w/ Garden Wall Surcharge

Level

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

| | | |
|---------------------------|----------------------------|-----------------|
| Toe Width | = | 1.00 ft |
| Heel Width | = | 1.50 |
| Total Footing Width | = | 2.50 |
| Footing Thickness | = | 12.00 in |
| Key Width | = | 12.00 in |
| Key Depth | = | 14.00 in |
| Key Distance from Toe | = | 1.00 ft |
| $f_c = 2,500 \text{ psi}$ | $F_y = 40,000 \text{ psi}$ | |
| Footing Concrete Density | = | 150.0 pcf |
| Min. As % | = | 0.0018 |
| Cover @ Top | 3.00 | @ Btm.= 3.00 in |

Footing Design Results

| | Toe | Heel |
|--------------------|------------------|-----------|
| Factored Pressure | = 1,526 | 49 psf |
| M_u' : Upward | = 882 | 123 ft-# |
| M_u' : Downward | = 143 | 455 ft-# |
| M_u : Design | = 740 | 332 ft-# |
| Actual 1-Way Shear | = 10.01 | 5.02 psi |
| Allow 1-Way Shear | = 75.00 | 75.00 psi |
| Toe Reinforcing | = # 4 @ 16.00 in | |
| Heel Reinforcing | = # 4 @ 12.00 in | |
| Key Reinforcing | = # 4 @ 12.00 in | |

Other Acceptable Sizes & Spacings

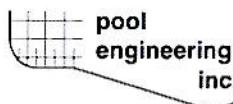
Toe: Not req'd, $M_u < S * Fr$
 Heel: Not req'd, $M_u < S * Fr$
 Key: Not Req'd = $M_u < S * Fr$

Summary of Overturning & Resisting Forces & Moments

| Item |OVERTURNING..... | | |RESISTING..... | | | |
|---|-----------------------|-------------------------|----------------|---------------------------|---|----------------|-------|
| | Force lbs | Distance ft | Moment ft-# | Force lbs | Distance ft | Moment ft-# | |
| Heel Active Pressure | = 562.5 | 1.67 | 937.5 | Soil Over Heel | = 416.7 | 2.08 | 868.1 |
| Surcharge over Heel | = | | | Sloped Soil Over Heel | = | | |
| Toe Active Pressure | = -22.5 | 0.33 | -7.5 | Surcharge Over Heel | = | | |
| Surcharge Over Toe | = | | | Adjacent Footing Load | = 91.3 | 2.08 | 190.1 |
| Adjacent Footing Load | = 43.5 | 2.52 | 109.4 | Axial Dead Load on Stem | = | | |
| Added Lateral Load | = | | | * Axial Live Load on Stem | = | | |
| Load @ Stem Above Soil | = | | | Soil Over Toe | = | | |
| | | | | Surcharge Over Toe | = | | |
| | | | | Stem Weight(s) | = 336.0 | 1.33 | 448.0 |
| | | | | Earth @ Stem Transitions | = | | |
| Total | = 583.5 | O.T.M. = 1,039.4 | | Footing Weight | = 375.0 | 1.25 | 468.8 |
| Resisting/Overturning Ratio | | = 2.15 | | Key Weight | = 175.0 | 1.50 | 262.5 |
| Vertical Loads used for Soil Pressure = | 1,393.9 lbs | | | Vert. Component | = | | |
| | | | | | Total = 1,393.9 lbs R.M. = 2,237.4 | | |

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

DESIGNER NOTES:



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Registration #: RP-1159015 RRP9.19
Licensed to: Pool Engineering, Inc.

Title : 850 4'-8" Job # : 850 4'-8" Dsgnr: TLL Date: SEP 5,2007

Description....

4'-8" Retaining Wall w/ Garden Wall Surcharge

Level

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010

Cantilevered Retaining Wall Design

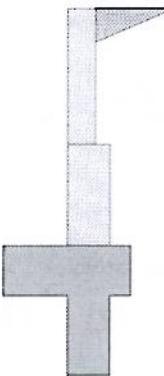
Code: IBC 2009

Criteria

Retained Height = 4.67 ft
Wall height above soil = 0.00 ft
Slope Behind Wall = 0.00 : 1
Height of Soil over Toe = 0.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Heel Active Pressure = 45.0 psf/ft
Toe Active Pressure = 45.0 psf/ft
Passive Pressure = 200.0 psf/ft
Soil Density, Heel = 125.0 pcf
Soil Density, Toe = 125.0 pcf
Footing||Soil Friction = 0.300
Soil height to ignore for passive pressure = 0.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
NOT Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
NOT 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
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 = 438.0 lbs
Footing Width = 1.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 1.00 ft
Footing Type Line Load
Base Above/Below Soil at Back of Wall = -1.0 ft
Poisson's Ratio = 0.300

Design Summary

Wall Stability Ratios

Overturning = 2.19 OK
Sliding = 1.55 OK

Total Bearing Load = 1,626 lbs
...resultant ecc. = 4.84 in

Soil Pressure @ Toe = 979 psf OK
Soil Pressure @ Heel = 104 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,376 psf
ACI Factored @ Heel = 147 psf
Footing Shear @ Toe = 12.6 psi OK
Footing Shear @ Heel = 3.8 psi OK
Allowable = 75.0 psi

Sliding Calcs (Vertical Component Used)
Lateral Sliding Force = 744.6 lbs
less 100% Passive Force = - 667.4 lbs
less 100% Friction Force = - 487.7 lbs

Added Force Req'd = 0.0 lbs OK
....for 1.5 : 1 Stability = 0.0 lbs OK

Stem Construction

| | Top Stem | 2nd |
|----------------------------|--------------|--------------|
| Design Height Above Ftg ft | Stem OK 2.00 | Stem OK 0.00 |
| Wall Material Above "Ht" | Masonry | Masonry |
| Thickness | = 8.00 | = 12.00 |
| Rebar Size | = # 4 | = # 4 |
| Rebar Spacing | = 24.00 | = 16.00 |
| Rebar Placed at | = Edge | = Edge |
| Design Data | | |
| fb/FB + fa/Fa | = 0.208 | = 0.413 |
| Total Force @ Section lbs | = 188.7 | = 532.8 |
| Moment....Actual ft-# | = 161.7 | = 857.4 |
| Moment....Allowable ft-# | = 776.1 | = 2,074.4 |
| Shear.....Actual psi | = 3.0 | = 4.9 |
| Shear.....Allowable psi | = 19.4 | = 19.4 |
| Wall Weight psf | = 84.0 | = 133.0 |
| Rebar Depth 'd' in | = 5.25 | = 9.00 |
| LAP SPLICE IF ABOVE in | = 24.00 | = 24.00 |
| LAP SPLICE IF BELOW in | = 24.00 | |
| HOOK EMBED INTO FTG in | | = 6.00 |

Masonry Data

| | | |
|----------------|--------------|--------|
| f'm | psi = 1,500 | 1,500 |
| Fs | psi = 20,000 | 20,000 |
| Solid Grouting | = Yes | Yes |

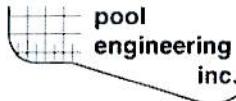
| | | |
|-----------------------|--------------------------------|-------|
| Modular Ratio 'n' | = 25.78 | 25.78 |
| Short Term Factor | = 1.000 | 1.000 |
| Equiv. Solid Thick. | in = 7.60 | 11.60 |
| Masonry Block Type | = Normal Weight | |
| Masonry Design Method | = ASD Half-Stress option used. | |

Concrete Data

| | |
|-----|-------|
| f'c | psi = |
| Fy | psi = |

Load Factors

| | |
|---------------|----------|
| Building Code | IBC 2009 |
| Dead Load | 1.200 |
| Live Load | 1.600 |
| Earth, H | 1.600 |
| Wind, W | 1.300 |
| Seismic, E | 1.000 |



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Registration #: RP-1159015 RP9.19
Licensed to: Pool Engineering, Inc.

Title : 850 4'-8" Job # : 850 4'-8" Dsgnr: TLL Date: SEP 5,2007
Description....

4'-8" Retaining Wall w/ Garden Wall Surcharge Level

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

| | | |
|----------------------------|-----------------------------|-----------------|
| Toe Width | = | 1.50 ft |
| Heel Width | = | 1.50 |
| Total Footing Width | = | 3.00 |
| Footing Thickness | = | 12.00 in |
| Key Width | = | 12.00 in |
| Key Depth | = | 19.00 in |
| Key Distance from Toe | = | 1.50 ft |
| f _c = 2,500 psi | F _y = 40,000 psi | |
| Footing Concrete Density | = | 150.00pcf |
| Min. As % | = | 0.0018 |
| Cover @ Top | 3.00 | @ Btm.= 3.00 in |

Footing Design Results

| | To | Heel |
|-----------------------------------|------------------|-----------|
| Factored Pressure | = 1,376 | 147 psf |
| M _u ' : Upward | = 1,742 | 70 ft-lb |
| M _u ' : Downward | = 322 | 289 ft-lb |
| M _u : Design | = 1,420 | 219 ft-lb |
| Actual 1-Way Shear | = 12.63 | 3.81 psi |
| Allow 1-Way Shear | = 75.00 | 75.00 psi |
| Toe Reinforcing | = # 4 @ 16.00 in | |
| Heel Reinforcing | = # 4 @ 12.00 in | |
| Key Reinforcing | = # 4 @ 12.00 in | |
| Other Acceptable Sizes & Spacings | | |
| Toe: Not req'd, Mu < S * Fr | | |
| Heel: Not req'd, Mu < S * Fr | | |
| Key: Not Req'd = Mu < S * Fr | | |

Summary of Overturning & Resisting Forces & Moments

| Item |OVERTURNING..... | | |RESISTING..... | | | |
|---|-----------------------|-------------------------|--------------|--|-------------|--------------|-------|
| | Force lbs | Distance ft | Moment ft-lb | Force lbs | Distance ft | Moment ft-lb | |
| Heel Active Pressure | = 722.6 | 1.89 | 1,365.0 | Soil Over Heel | = 291.7 | 2.75 | 802.1 |
| Surcharge over Heel | = | | | Sloped Soil Over Heel | = | | |
| Toe Active Pressure | = -22.5 | 0.33 | -7.5 | Surcharge Over Heel | = | | |
| Surcharge Over Toe | = | | | Adjacent Footing Load | = 45.3 | 2.75 | 124.6 |
| Adjacent Footing Load | = 44.5 | 3.12 | 138.9 | Axial Dead Load on Stem = | | | |
| Added Lateral Load | = | | | * Axial Live Load on Stem = | | | |
| Load @ Stem Above Soil = | | | | Soil Over Toe | = | | |
| Total | = 744.6 | O.T.M. = 1,496.4 | | Surcharge Over Toe | = | | |
| Resisting/Overturning Ratio | | | | Stem Weight(s) | = 490.0 | 1.92 | 942.7 |
| Vertical Loads used for Soil Pressure = | 1,625.6 lbs | | | Earth @ Stem Transitions = | = 111.1 | 2.33 | 259.3 |
| | | | | Footing Weight | = 450.0 | 1.50 | 675.0 |
| | | | | Key Weight | = 237.5 | 2.00 | 475.0 |
| | | | | Vert. Component | = | | |
| | | | | Total = 1,625.6 lbs R.M.= 3,278.7 | | | |

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

DESIGNER NOTES:

Cantilevered Retaining Wall Design

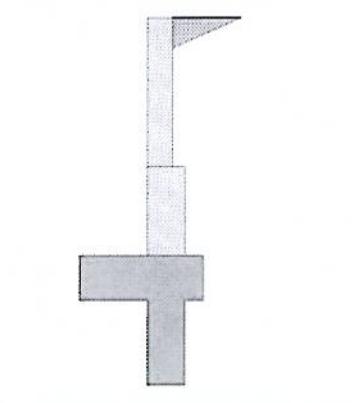
Code: IBC 2009

Criteria

Retained Height = 5.33 ft
Wall height above soil = 0.00 ft
Slope Behind Wall = 0.00 : 1
Height of Soil over Toe = 0.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Heel Active Pressure = 45.0 psf/ft
Toe Active Pressure = 45.0 psf/ft
Passive Pressure = 200.0 psf/ft
Soil Density, Heel = 125.0pcf
Soil Density, Toe = 125.0pcf
Footing||Soil Friction = 0.300
Soil height to ignore for passive pressure = 0.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel = 0.0 psf
NOT Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
NOT 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 = 438.0 lbs
Footing Width = 1.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 1.00 ft
Footing Type Line Load
Base Above/Below Soil at Back of Wall = -1.0 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 | = | 2.06 OK |
| Sliding | = | 1.52 OK |

Total Bearing Load = 1,845 lbs
...resultant ecc. = 5.79 in

Soil Pressure @ Toe = 1,034 psf OK
Soil Pressure @ Heel = 73 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,453 psf
ACI Factored @ Heel = 103 psf
Footing Shear @ Toe = 15.7 psi OK
Footing Shear @ Heel = 4.6 psi OK
Allowable = 75.0 psi

Sliding Calcs (Vertical Component Used)

| | | |
|--------------------------|---|-------------|
| Lateral Sliding Force | = | 925.0 lbs |
| less 100% Passive Force | = | - 850.7 lbs |
| less 100% Friction Force | = | - 553.6 lbs |

Added Force Req'd = 0.0 lbs OK
....for 1.5 : 1 Stability = 0.0 lbs OK

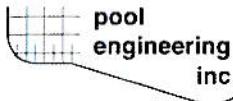
Stem Construction

| Design Height Above Ftg | ft = | Top Stem | 2nd |
|--------------------------|--------|----------|---------|
| | 2.00 | Stem OK | 0.00 |
| Wall Material Above "Ht" | = | Masonry | Masonry |
| Thickness | = | 8.00 | 12.00 |
| Rebar Size | = | # 4 | # 4 |
| Rebar Spacing | = | 16.00 | 8.00 |
| Rebar Placed at | = | Edge | Edge |
| Design Data | | | |
| fb/FB + fa/Fa | = | 0.352 | 0.448 |
| Total Force @ Section | lbs = | 286.3 | 684.0 |
| Moment....Actual | ft-# = | 319.1 | 1,261.6 |
| Moment....Allowable | ft-# = | 905.4 | 2,814.4 |
| Shear.....Actual | psi = | 4.5 | 6.3 |
| Shear.....Allowable | psi = | 19.4 | 19.4 |
| Wall Weight | psf = | 84.0 | 133.0 |
| Rebar Depth 'd' | in = | 5.25 | 9.00 |
| LAP SPLICE IF ABOVE | in = | 24.00 | 24.00 |
| LAP SPLICE IF BELOW | in = | 24.00 | |
| HOOK EMBED INTO FTG | in = | | 6.00 |

| Masonry Data | | | |
|-----------------------|-------|------------------------------|--------|
| f'm | psi = | 1,500 | 1,500 |
| Fs | psi = | 20,000 | 20,000 |
| Solid Grouting | = | Yes | Yes |
| Modular Ratio 'n' | = | 25.78 | 25.78 |
| Short Term Factor | = | 1.000 | 1.000 |
| Equiv. Solid Thick. | in = | 7.60 | 11.60 |
| Masonry Block Type | = | Normal Weight | |
| Masonry Design Method | = | ASD Half-Stress option used. | |
| Concrete Data | | | |
| fc | psi = | | |
| Fy | psi = | | |

Load Factors

| | |
|---------------|----------|
| Building Code | IBC 2009 |
| Dead Load | 1.200 |
| Live Load | 1.600 |
| Earth, H | 1.600 |
| Wind, W | 1.300 |
| Seismic, E | 1.000 |



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1201 N Tustin Ave
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Tel: (714) 630-6100
Fax: (714) 630-6114

Retain Pro 9 © 1989 - 2011 Ver: 9.19 8152
Registration #: RP-1159015 RP9.19
Licensed to: Pool Engineering, Inc.

Title : 850 5'-4"
Job # : 850 5'-4" Dsgnr: TLL Date: SEP 5,2007
Description....

5'-4" Retaining Wall w/ Garden Wall Surcharge Level

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010.

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

| | | |
|--------------------------|------|------------------|
| Toe Width | = | 1.83 ft |
| Heel Width | = | 1.50 |
| Total Footing Width | = | 3.33 |
| Footing Thickness | = | 12.00 in |
| Key Width | = | 12.00 in |
| Key Depth | = | 23.00 in |
| Key Distance from Toe | = | 1.83 ft |
| fc = 2,500 psi | Fy = | 40,000 psi |
| Footing Concrete Density | = | 150.00 pcf |
| Min. As % | = | 0.0018 |
| Cover @ Top | 3.00 | @ Btrm.= 3.00 in |

Footing Design Results

| | <u>Toe</u> | <u>Heel</u> |
|-----------------------------------|------------------|-------------|
| Factored Pressure | = 1,453 | 103 psf |
| Mu' : Upward | = 2,541 | 57 ft-# |
| Mu' : Downward | = 456 | 322 ft-# |
| Mu: Design | = 2,086 | 264 ft-# |
| Actual 1-Way Shear | = 15.66 | 4.61 psi |
| Allow 1-Way Shear | = 75.00 | 75.00 psi |
| Toe Reinforcing | = # 4 @ 8.00 in | |
| Heel Reinforcing | = # 4 @ 12.00 in | |
| Key Reinforcing | = # 4 @ 12.00 in | |
| Other Acceptable Sizes & Spacings | | |
| Toe: Not req'd, Mu < S * Fr | | |
| Heel: Not req'd, Mu < S * Fr | | |
| Key: Not Req'd = Mu < S * Fr | | |

Summary of Overturning & Resisting Forces & Moments

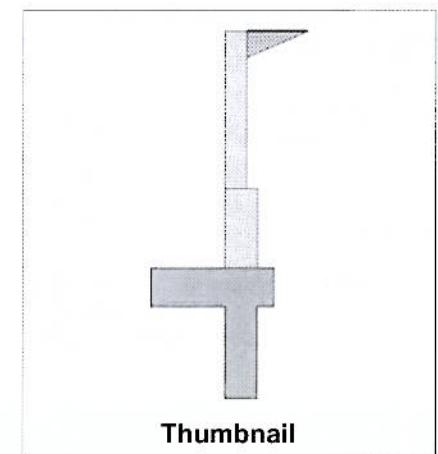
| Item |OVERTURNING..... | | |RESISTING..... | | | |
|---|-----------------------|----------------|----------------|-----------------------------|----------------|----------------|---------|
| | Force lbs | Distance ft | Moment ft-# | Force lbs | Distance ft | Moment ft-# | |
| Heel Active Pressure | = 902.4 | 2.11 | 1,905.0 | Soil Over Heel | = 333.3 | 3.08 | 1,027.6 |
| Surcharge over Heel | = | | | Sloped Soil Over Heel | = | | |
| Toe Active Pressure | = -22.5 | 0.33 | -7.5 | Surcharge Over Heel | = | | |
| Surcharge Over Toe | = | | | Adjacent Footing Load | = 39.8 | 3.08 | 122.8 |
| Adjacent Footing Load | = 45.1 | 3.74 | 168.7 | Axial Dead Load on Stem = | | | |
| Added Lateral Load | = | | | * Axial Live Load on Stem = | | | |
| Load @ Stem Above Soil = | | | | Soil Over Toe | = | | |
| | | | | Surcharge Over Toe | = | | |
| | | | | Stem Weight(s) | = 546.0 | 2.25 | 1,227.1 |
| Total | = 925.0 | O.T.M. = | 2,066.2 | Earth @ Stem Transitions = | = 138.9 | 2.67 | 370.3 |
| Resisting/Overturning Ratio | = 2.06 | | | Footing Weight | = 500.0 | 1.67 | 833.2 |
| Vertical Loads used for Soil Pressure = | 1,845.4 lbs | | | Key Weight | = 287.5 | 2.33 | 670.7 |
| | | | | Vert. Component | = | | |
| | | | | Total = | 1,845.4 lbs | R.M.= | 4,251.7 |

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

DESIGNER NOTES:

Cantilevered Retaining Wall Design

Code: IBC 2009



Thumbnail

Criteria

Retained Height = 6.00 ft
Wall height above soil = 0.00 ft
Slope Behind Wall = 0.00 : 1
Height of Soil over Toe = 0.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 1,500.0 psf
Equivalent Fluid Pressure Method
Heel Active Pressure = 45.0 psf/ft
Toe Active Pressure = 45.0 psf/ft
Passive Pressure = 200.0 psf/ft
Soil Density, Heel = 125.00 pcf
Soil Density, Toe = 125.00 pcf
Footing||Soil Friction = 0.300
Soil height to ignore for passive pressure = 0.00 in

Surcharge Loads

Surcharge Over Heel = 0.0 psf
NOT Used To Resist Sliding & Overturning
Surcharge Over Toe = 0.0 psf
NOT 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
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 = 438.0 lbs
Footing Width = 1.00 ft
Eccentricity = 0.00 in
Wall to Ftg CL Dist = 1.00 ft
Footing Type Line Load
Base Above/Below Soil at Back of Wall = -1.0 ft
Poisson's Ratio = 0.300

Design Summary

Wall Stability Ratios

| | | |
|-------------|---|---------|
| Overturning | = | 2.01 OK |
| Sliding | = | 1.54 OK |

Total Bearing Load = 2,091 lbs
...resultant ecc. = 6.42 in

Soil Pressure @ Toe = 1,035 psf OK
Soil Pressure @ Heel = 80 psf OK
Allowable = 1,500 psf
Soil Pressure Less Than Allowable = 1,035 psf
ACI Factored @ Toe = 1,453 psf
ACI Factored @ Heel = 113 psf
Footing Shear @ Toe = 18.5 psi OK
Footing Shear @ Heel = 5.2 psi OK
Allowable = 75.0 psi

Sliding Calcs (Vertical Component Used)

| | | |
|--------------------------|---|---------------|
| Lateral Sliding Force | = | 1,125.4 lbs |
| less 100% Passive Force | = | - 1,111.1 lbs |
| less 100% Friction Force | = | - 627.4 lbs |

Added Force Req'd = 0.0 lbs OK
....for 1.5 : 1 Stability = 0.0 lbs OK

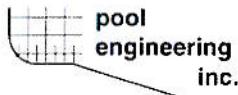
Stem Construction

| Design Height Above Ftg | | Top Stem | 2nd |
|--------------------------|--------|----------|---------|
| ft | = | 2.00 | 0.00 |
| Wall Material Above "Ht" | = | Masonry | Masonry |
| Thickness | = | 8.00 | 12.00 |
| Rebar Size | = | # 4 | # 4 |
| Rebar Spacing | = | 16.00 | 8.00 |
| Rebar Placed at | = | Edge | Edge |
| Design Data | | | |
| fb/FB + fa/Fa | = | 0.604 | 0.630 |
| Total Force @ Section | Ibs = | 400.5 | 854.8 |
| Moment....Actual | ft-# = | 547.2 | 1,773.8 |
| Moment....Allowable | ft-# = | 905.4 | 2,814.4 |
| Shear....Actual | psi = | 6.4 | 7.9 |
| Shear....Allowable | psi = | 19.4 | 19.4 |
| Wall Weight | psf = | 84.0 | 133.0 |
| Rebar Depth 'd' | in = | 5.25 | 9.00 |
| LAP SPLICE IF ABOVE | in = | 24.00 | 24.00 |
| LAP SPLICE IF BELOW | in = | 24.00 | |
| HOOK EMBED INTO FTG | in = | | 6.00 |

Load Factors

| | |
|---------------|----------|
| Building Code | IBC 2009 |
| Dead Load | 1.200 |
| Live Load | 1.600 |
| Earth, H | 1.600 |
| Wind, W | 1.300 |
| Seismic, E | 1.000 |

| Masonry Data | | |
|-----------------------|--------------------------------|--------|
| f'm | psi = 1,500 | 1,500 |
| Fs | psi = 20,000 | 20,000 |
| Solid Grouting | = Yes | Yes |
| Modular Ratio 'n' | = 25.78 | 25.78 |
| Short Term Factor | = 1.000 | 1.000 |
| Equiv. Solid Thick. | in = 7.60 | 11.60 |
| Masonry Block Type | = Normal Weight | |
| Masonry Design Method | = ASD Half-Stress option used. | |
| Concrete Data | | |
| f'c | psi = | |
| Fy | psi = | |



Pool Engineering, Inc.
1201 N Tustin Ave
Anaheim, CA 92807
Tel: (714) 630-6100
Fax: (714) 630-6114

Title : 850 6'-0" Job # : 850 6'-0" Dsgnr: TLL Date: SEP 5,2007
Description...
6'-0" Retaining Wall w/ Garden Wall Surcharge Level

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Registration #: RP-1159015 RP9.19
Licensed to: Pool Engineering, Inc.

This Wall in File: W:\Retain Pro\2010 CBC\STANDARD 2010

Cantilevered Retaining Wall Design

Code: IBC 2009

Footing Dimensions & Strengths

| | | |
|--------------------------------------|-----------------|----------|
| Toe Width | = | 2.25 ft |
| Heel Width | = | 1.50 |
| Total Footing Width | = | 3.75 |
| Footing Thickness | = | 12.00 in |
| Key Width | = | 12.00 in |
| Key Depth | = | 28.00 in |
| Key Distance from Toe | = | 2.25 ft |
| fc = 2,500 psi | Fy = 40,000 psi | |
| Footing Concrete Density = 150.00pcf | | |
| Min. As % | = | 0.0018 |
| Cover @ Top 3.00 | @ Btm.= 3.00 in | |

Footing Design Results

| | <u>Toe</u> | <u>Heel</u> |
|--------------------|------------------|-------------|
| Factored Pressure | = 1,453 | 113 psf |
| Mu' : Upward | = 3,609 | 57 ft-# |
| Mu' : Downward | = 656 | 354 ft-# |
| Mu: Design | = 2,953 | 298 ft-# |
| Actual 1-Way Shear | = 18.54 | 5.19 psi |
| Allow 1-Way Shear | = 75.00 | 75.00 psi |
| Toe Reinforcing | = # 4 @ 8.00 in | |
| Heel Reinforcing | = # 4 @ 12.00 in | |
| Key Reinforcing | = # 4 @ 12.00 in | |

Other Acceptable Sizes & Spacings

Toe: #4@ 13.25 in, #5@ 20.50 in, #6@ 29.00 in, #7@ 39.25 in, #8@ 48.25 in, #9@ 4
Heel: Not req'd, Mu < S * Fr
Key: Not Req'd = Mu < 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 = | 1,102.5 | 2.33 | 2,572.5 | Soil Over Heel | = 375.0 | 3.50 | 1,312.5 |
| Surcharge over Heel = | | | | Sloped Soil Over Heel | = | | |
| Toe Active Pressure = | -22.5 | 0.33 | -7.5 | Surcharge Over Heel | = | | |
| Surcharge Over Toe = | | | | Adjacent Footing Load | = 35.0 | 3.50 | 122.6 |
| Adjacent Footing Load = | 45.4 | 4.38 | 198.7 | Axial Dead Load on Stem = | | | |
| Added Lateral Load = | | | | * Axial Live Load on Stem = | | | |
| Load @ Stem Above Soil = | | | | Soil Over Toe | = | | |
| | | | | Surcharge Over Toe | = | | |
| | | | | Stem Weight(s) | = 602.0 | 2.66 | 1,599.5 |
| Total = 1,125.4 O.T.M. = 2,763.7 | | | | Earth @ Stem Transitions | = 166.7 | 3.08 | 513.9 |
| Resisting/Overturning Ratio = 2.01 | | | | Footing Weight | = 562.5 | 1.88 | 1,054.7 |
| Vertical Loads used for Soil Pressure = 2,091.2 lbs | | | | Key Weight | = 350.0 | 2.75 | 962.5 |
| | | | | Vert. Component | = | | |
| | | | | Total = 2,091.2 lbs R.M.= 5,565.7 | | | |

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

DESIGNER NOTES:

