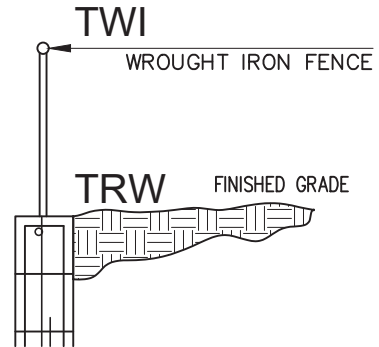
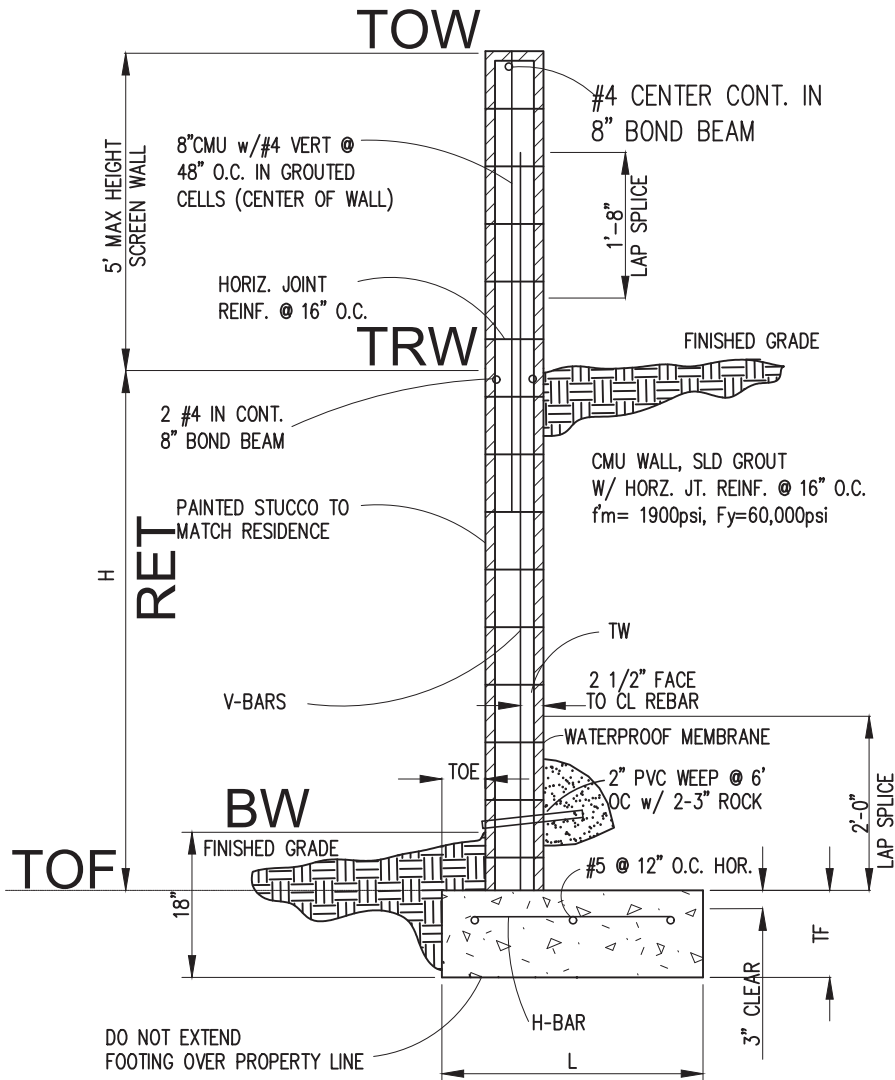


CMU WALL (Partial Retention)



DESIGN NOTES:

WIND ABOVE BACKFILL = 15psf
ALLOW SOIL PRESSURE = 1500psf
FOOTING CONCRETE f'_c = 2500psi
FOOTING REBAR F_y = 60,000psi

MASONRY

ASTM C90
 f'_m = 1900psi
GROUT SOLID f'_c = 2000psi
TYPE "S" MORTAR, RUNNING BOND

REINFORCING

GR 60 ASTM A615 UNO

CONCRETE

ASTM C-94 2500psi @ 28 DAYS

SOIL

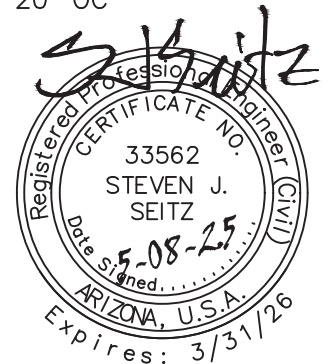
SANDY/GRAVEL, WELL DRAINED
DESIGN IS NOT ALLOWED AT EXPANSIVE SOIL

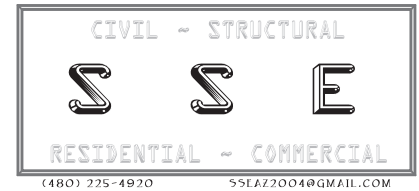
NOTE:

WALL LENGTHS GREATER THAN 40' SHALL HAVE 1/4" EXPANSION JOINTS AT 20' OC

DO NOT EXTEND FOOTING OVER PROPERTY LINE

H HEIGHT	TW	V-BAR	L LENGTH	TF	TOE	H-BAR
4'-0"	8"	#4@ 24" oc	4'-8"	12"	8"	#4@ 18" oc
6'-0"	8"	#5@ 16" oc	7'-0"	12"	8"	#5@ 16" oc





Cantilevered Retaining Wall

Project File: Sivarajan.ec6

LIC# : KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

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DESCRIPTION: Civil Retaining Wall 4'-0" with 5' Screen Wall_rev

Code Reference:

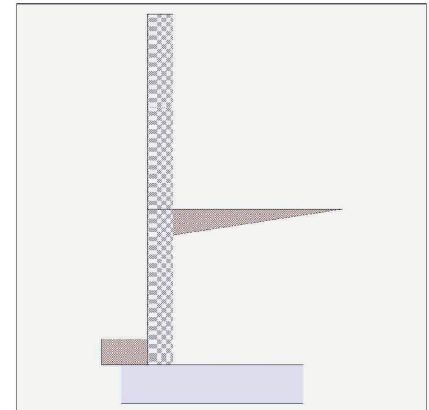
Calculations per IBC 2021, ACI 318-19, TMS 402-16

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	5.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	8.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 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	=	0.250
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

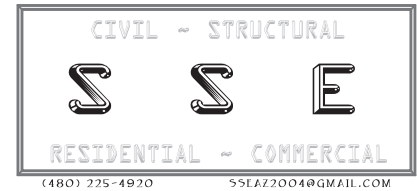
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

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	=	16.2 psf (Service 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



Cantilevered Retaining Wall

Project File: Sivarajan.ec6

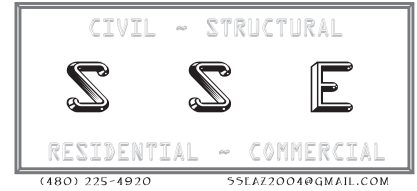
LIC#: KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

(c) ENERCALC, LLC 1982-2025

DESCRIPTION: Civil Retaining Wall 4'-0" with 5' Screen Wall_rev

Design Summary		Stem Construction		2nd	Bottom		
Wall Stability Ratios		Design Height Above Ftg	ft =	Stem OK	Stem OK		
Overturning	= 4.55 OK	Wall Material Above "Ht"	=	Masonry	Masonry		
Sliding	= 1.50 OK	Design Method	=	ASD	ASD	SD	SD
Global Stability	= 3.73	Thickness	=	8.00	8.00		
		Rebar Size	=	# 4	# 4		
		Rebar Spacing	=	48.00	24.00		
		Rebar Placed at	=	Center	Edge		
Total Bearing Load	= 2,415 lbs	Design Data					
...resultant ecc.	= 2.44 in	fb/FB + fa/Fa	=	0.000	0.000		
Eccentricity within middle third		Total Force @ Section					
Soil Pressure @ Toe	= 599 psf OK	Service Level	lbs =	81.0	361.0		
Soil Pressure @ Heel	= 351 psf OK	Strength Level	lbs =				
Allowable	= 1,500 psf	Moment....Actual					
Soil Pressure Less Than Allowable		Service Level	ft-# =	202.5	899.8		
ACI Factored @ Toe	= 838 psf	Strength Level	ft-# =				
ACI Factored @ Heel	= 491 psf	Moment....Allowable					
Footing Shear @ Toe	= 2.9 psi OK	Moment.....Allowable	ft-# =	0.0	0.0		
Footing Shear @ Heel	= 2.6 psi OK	Shear.....Actual					
Allowable	= 75.0 psi	Service Level	psi =	0.9	3.9		
		Strength Level	psi =				
Sliding Calcs		Shear.....Allowable	psi =	77.5	77.5		
Lateral Sliding Force	= 518.5 lbs	Anet (Masonry)	in2 =	91.50	91.50		
less 100% Passive Force	= - 222.2 lbs	Wall Weight	psf =	0.0	0.0		
less 100% Friction Force	= - 555.6 lbs	Rebar Depth 'd'	in =	0.00	0.00		
Added Force Req'd	= 0.0 lbs OK	Masonry Data					
...for 1.5 Stability	= 0.0 lbs OK	fm	psi =	1,500	1,500		
Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing		Fs	psi =	20,000	20,000		
		Solid Grouting	=	Yes	Yes		
		Modular Ratio 'n'	=	21.48	21.48		
		Equiv. Solid Thick.	in =	0.62	0.62		
		Masonry Block Type	=				
		Masonry Design Method	=	ASD			
Load Factors		Concrete Data					
Building Code		fc	psi =				
Dead Load	1.200	Fy	psi =				
Live Load	1.600						
Earth, H	1.600						
Wind, W	1.000						
Seismic, E	1.000						



Cantilevered Retaining Wall

Project File: Sivarajan.ec6

LIC#: KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

(c) ENERCALC, LLC 1982-2025

DESCRIPTION: Civil Retaining Wall 4'-0" with 5' Screen Wall_rev

Footing Data

Toe Width	=	0.67 ft
Heel Width	=	4.01
Total Footing Width	=	4.68
Footing Thickness	=	12.00 in

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

	<u>Toe</u>	<u>Heel</u>	
Factored Pressure	= 838	491	psf
Mu' : Upward	= 184	3,208	ft-#
Mu' : Downward	= 90	4,351	ft-#
Mu: Design	= 94	1,144	ft-#
φ Mn	= 2,500	2,500	ft-#
Actual 1-Way Shear	= 2.88	2.58	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		
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: $\phi Mn = \phi * 5 * \lambda * \sqrt{fc} * Sm$

Heel: $\phi Mn = \phi * 5 * \lambda * \sqrt{fc} * Sm$

Key: No key defined

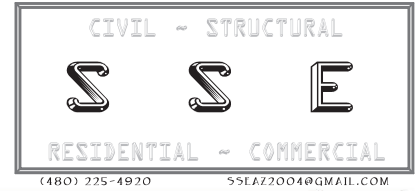
Min footing T&S reinf Area	1.21	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft

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



Cantilevered Retaining Wall

Project File: Sivarajan.ec6

LIC#: KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

(c) ENERCALC, LLC 1982-2025

DESCRIPTION: Civil Retaining Wall 4'-0" with 5' Screen Wall_rev

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	437.5	1.67	729.2	Soil Over HL (ab. water tbl)	1,471.1	3.01	4,425.5
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.01	4,425.5
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	81.0	7.50	607.5	Soil Over Toe =	49.1	0.34	16.5
				Surcharge Over Toe =			
				Stem Weight(s) =			
				Earth @ Stem Transitions =			
Total	= 518.5	O.T.M.	= 1,336.7	Footing Weight =	702.0	2.34	1,642.7
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	4.55	Total =	2,222.2 lbs	R.M.=	6,084.6
Vertical Loads used for Soil Pressure =		2,415.3 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.

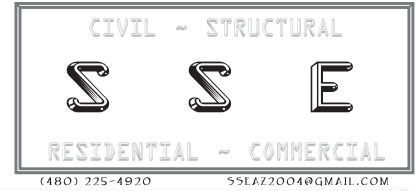
Tilt

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) 0.032 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.



Cantilevered Retaining Wall

Project File: Sivarajan.ec6

LIC# : KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

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DESCRIPTION: Civil Retaining Wall 4'-0" with 5' Screen Wall_rev

Rebar Lap & Embedment Lengths Information

Stem Design Segment: 2nd

Stem Design Height: 4.00 ft above top of footing

Calculated Rebar Stress, fs = 0.00 psi

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 20.00 in
 Development length for #4 bar specified in this stem design segment = 12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Calculated Rebar Stress, fs = 0.00 psi

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) = 20.00 in
 Development length for #4 bar specified in this stem design segment = 12.00 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 6.00 in
 As Provided = 0.1000 in2/ft
 As Required = 0.0000 in2/ft

Cantilevered Retaining Wall

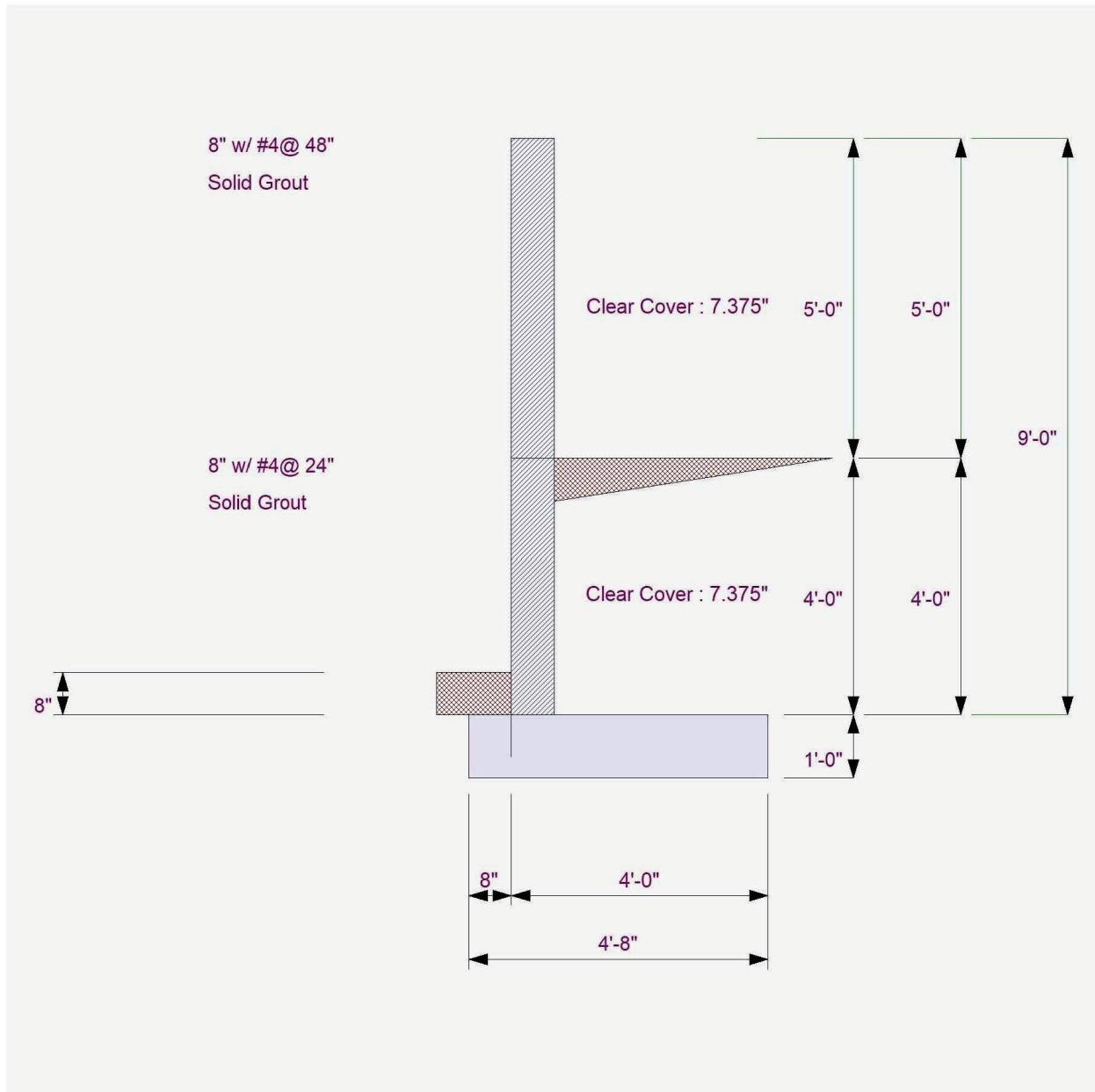
Project File: Sivarajan.ec6

LIC# : KW-06015823, Build:20.25.01.29

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DESCRIPTION: Civil Retaining Wall 4'-0" with 5' Screen Wall_rev



Cantilevered Retaining Wall

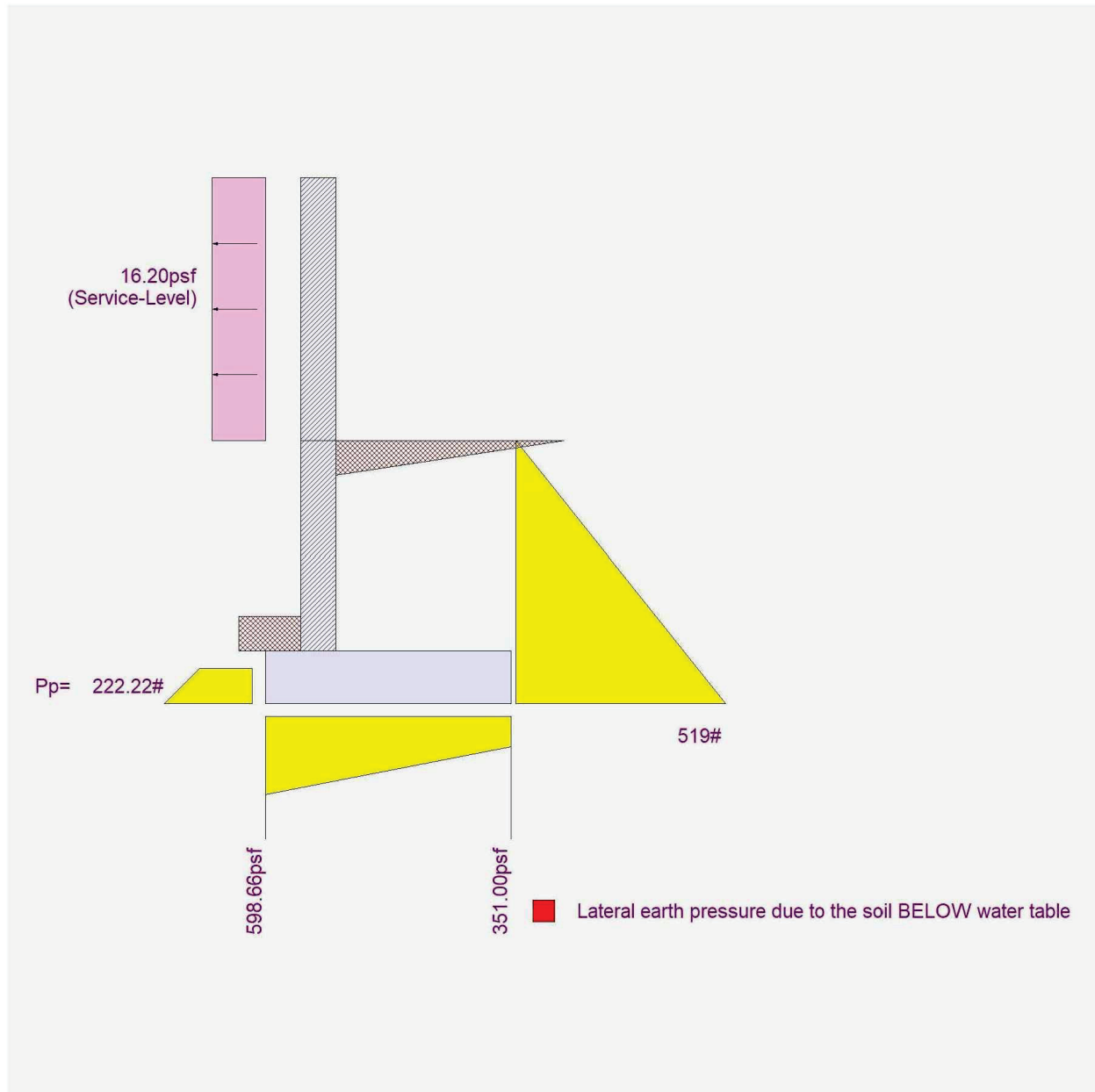
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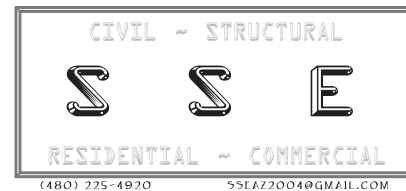
LIC# : KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

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DESCRIPTION: Civil Retaining Wall 4'-0" with 5' Screen Wall_rev





Cantilevered Retaining Wall

Project File: Sivarajan.ec6

LIC# : KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

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DESCRIPTION: Civil Retaining Wall 6'-0" with 5' Screen Wall_rev

Code Reference:

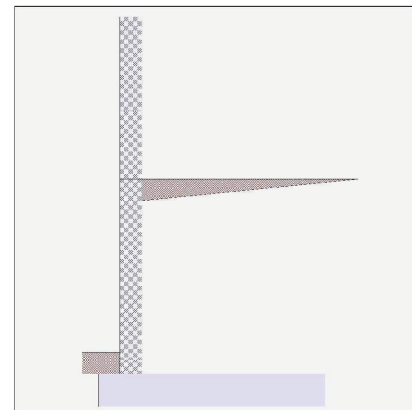
Calculations per IBC 2021, ACI 318-19, TMS 402-16

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	5.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	8.00 in
Water table above bottom of footing	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 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	=	0.250
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

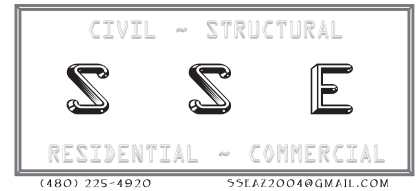
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

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	=	16.2 psf (Service 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	=	Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300



Cantilevered Retaining Wall

Project File: Sivarajan.ec6

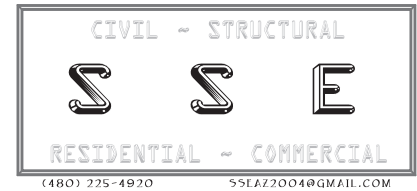
LIC#: KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

(c) ENERCALC, LLC 1982-2025

DESCRIPTION: Civil Retaining Wall 6'-0" with 5' Screen Wall_rev

Design Summary		Stem Construction		2nd	Bottom		
Wall Stability Ratios		Design Height Above Ftg		ft =	Stem OK	Stem OK	
Overturning	= 6.96 OK	Wall Material Above "Ht"	= Masonry	6.00	6.00	0.00	
Sliding	= 1.53 OK	Design Method	= ASD				Masonry
Global Stability	= 3.38	Thickness	= 8.00				ASD
		Rebar Size	= # 4				SD
		Rebar Spacing	= 48.00				SD
		Rebar Placed at	= Center				
		Design Data					
Total Bearing Load	= 5,215 lbs	fb/FB + fa/Fa	= 0.000				
...resultant ecc.	= 1.06 in	Total Force @ Section					
Eccentricity within middle third		Service Level	lbs =	81.0		711.0	
Soil Pressure @ Toe	= 743 psf OK	Strength Level	lbs =				
Soil Pressure @ Heel	= 639 psf OK	Moment....Actual					
Allowable	= 1,500 psf	Service Level	ft-# =	202.5		1,948.5	
Soil Pressure Less Than Allowable		Strength Level	ft-# =				
ACI Factored @ Toe	= 1,041 psf	Moment....Allowable	ft-# =	0.0		0.0	
ACI Factored @ Heel	= 894 psf	Shear.....Actual					
Footing Shear @ Toe	= 4.1 psi OK	Service Level	psi =	0.9		7.8	
Footing Shear @ Heel	= 0.9 psi OK	Strength Level	psi =				
Allowable	= 75.0 psi	Shear.....Allowable	psi =	77.5		77.5	
Sliding Calcs		Anet (Masonry)	in2 =	91.50		91.50	
Lateral Sliding Force	= 938.5 lbs	Wall Weight	psf =	0.0		0.0	
less 100% Passive Force	= - 222.2 lbs	Rebar Depth 'd'	in =	0.00		0.00	
less 100% Friction Force	= - 1,209.2 lbs	Masonry Data					
Added Force Req'd	= 0.0 lbs OK	f _m	psi =	1,500		1,500	
....for 1.5 Stability	= 0.0 lbs OK	F _s	psi =	20,000		20,000	
Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing		Solid Grouting	=	Yes		Yes	
		Modular Ratio 'n'	=	21.48		21.48	
		Equiv. Solid Thick.	in =	0.62		0.62	
		Masonry Block Type	=				
		Masonry Design Method	=	ASD			
Load Factors		Concrete Data					
Building Code		f _c	psi =				
Dead Load	1.200	F _y	psi =				
Live Load	1.600						
Earth, H	1.600						
Wind, W	1.000						
Seismic, E	1.000						



Cantilevered Retaining Wall

Project File: Sivarajan.ec6

LIC#: KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

(c) ENERCALC, LLC 1982-2025

DESCRIPTION: Civil Retaining Wall 6'-0" with 5' Screen Wall_rev

Footing Data

Toe Width	=	0.67 ft
Heel Width	=	6.33
Total Footing Width	=	7.00
Footing Thickness	=	12.00 in

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

		<u>Toe</u>	<u>Heel</u>	
Factored Pressure	=	1,041	894	psf
Mu' : Upward	=	233	14,972	ft-#
Mu' : Downward	=	90	16,505	ft-#
Mu: Design	=	142	1,533	ft-#
φ Mn	=	2,500	2,500	ft-#
Actual 1-Way Shear	=	4.11	0.88	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		
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: $\phi Mn = \phi * 5 * \lambda * \sqrt{fc} * Sm$

Heel: $\phi Mn = \phi * 5 * \lambda * \sqrt{fc} * Sm$

Key: No key defined

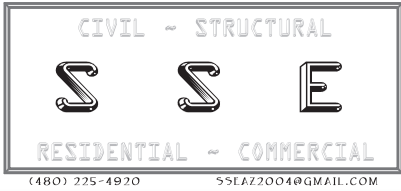
Min footing T&S reinf Area	1.81	in2
Min footing T&S reinf Area per foot	0.26	in2 /ft

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



Cantilevered Retaining Wall

Project File: Sivarajan.ec6

LIC# : KW-06015823, Build:20.25.01.29

Gilbert Structural LLC

(c) ENERCALC, LLC 1982-2025

DESCRIPTION: Civil Retaining Wall 6'-0" with 5' Screen Wall_rev

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....			RESISTING.....		
	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	857.5	2.33	2,000.8	Soil Over HL (ab. water tbl)	3,737.8	4.17	15,580.4
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		4.17	15,580.4
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	81.0	9.50	769.5	Soil Over Toe =	49.1	0.34	16.5
				Surcharge Over Toe =			
				Stem Weight(s) =			
				Earth @ Stem Transitions =			
Total	= 938.5	O.T.M. =	2,770.3	Footing Weight =	1,050.0	3.50	3,675.0
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 6.96		Total =	4,836.9 lbs	R.M. =	19,271.9
Vertical Loads used for Soil Pressure =		5,215.4 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

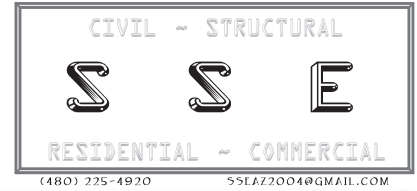
Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.032 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.



Cantilevered Retaining Wall

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LIC# : KW-06015823, Build:20.25.01.29

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DESCRIPTION: Civil Retaining Wall 6'-0" with 5' Screen Wall_rev

Rebar Lap & Embedment Lengths Information

Stem Design Segment: 2nd

Stem Design Height: 6.00 ft above top of footing

Calculated Rebar Stress, fs = 0.00 psi

Lap Splice length for #4 bar specified in this stem design segment (25.4.2.4a) =	20.00 in
Development length for #4 bar specified in this stem design segment =	12.00 in

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Calculated Rebar Stress, fs = 0.00 psi

Lap Splice length for #5 bar specified in this stem design segment (25.4.2.4a) =	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 =	6.00 in
As Provided =	0.2325 in2/ft
As Required =	0.0000 in2/ft

Cantilevered Retaining Wall

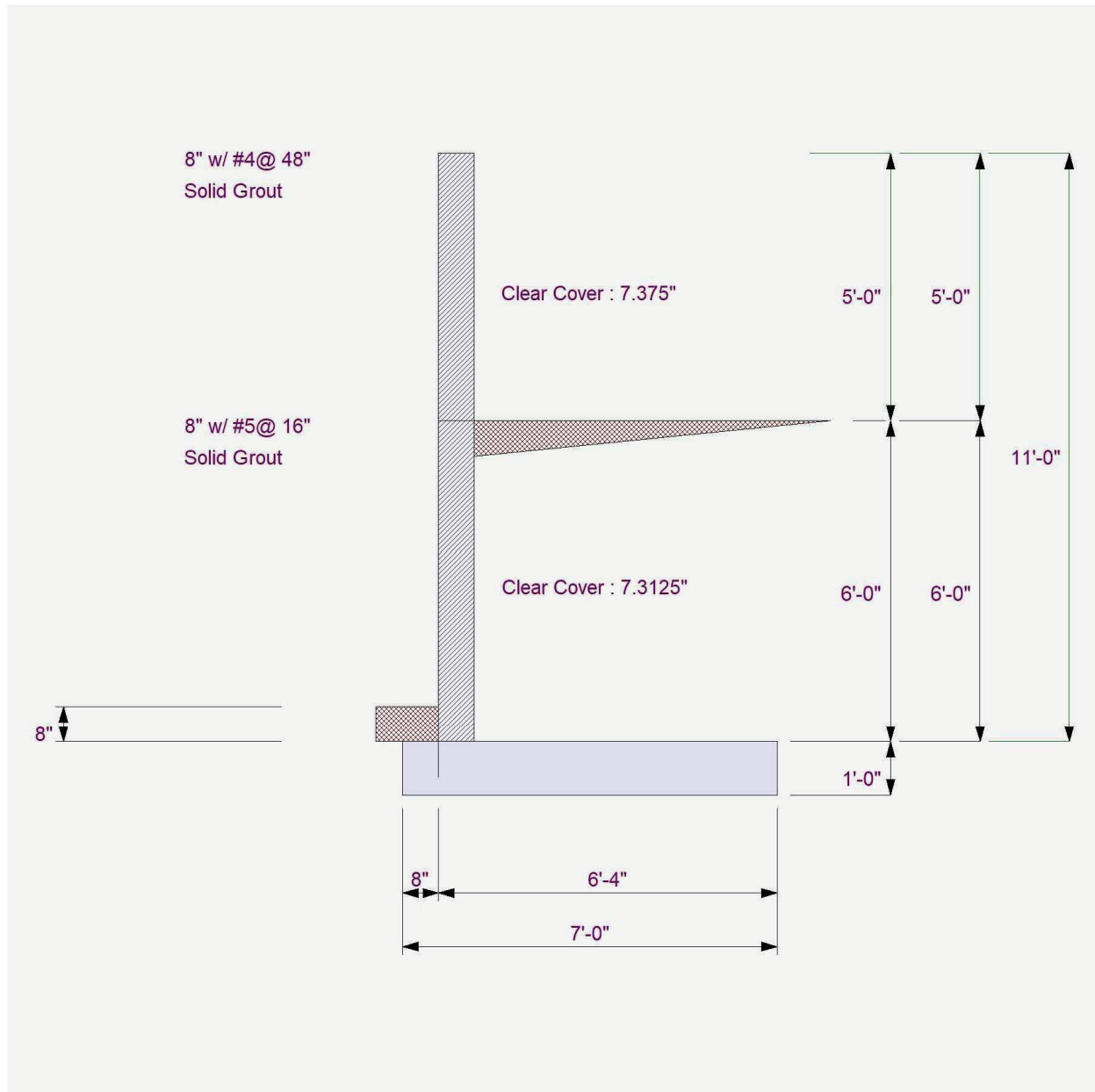
Project File: Sivarajan.ec6

LIC# : KW-06015823, Build:20.25.01.29

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DESCRIPTION: Civil Retaining Wall 6'-0" with 5' Screen Wall_rev



Cantilevered Retaining Wall

Project File: Sivarajan.ec6

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DESCRIPTION: Civil Retaining Wall 6'-0" with 5' Screen Wall_rev

