

Supplemental Structural Calculations for:

Huber Residence

9611 SE 72nd St Mercer Island, WA 98040



Prepared for: Brandt Design Group

Job #: 01519-2021-06

Date: April 19, 2022



Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	12.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Surcharge Loads

Surcharge Over Heel 0.0 psf Surcharge Over Heel = 0.0 ps Used To Resist Sliding & Overturning Surcharge Over Toe = 0.0 Used for Sliding & Overturning

Axial Load Applied to Stem

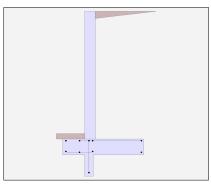
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Soil Data

Allow Soil Bearing	= Moth	3,000.0	psf
Equivalent Fluid Pressure Active Heel Pressure	=		psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	125.00	pcf
Soil Density, Toe	=	0.00	pcf
Footing Soil Friction	=	0.300	
Soil height to ignore for passive pressure	=	12.00	in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 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

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall

Design Summary			Stem Construction		Bottom				
			Design Height Above Ftg	ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=					
Overturning	=	2.38 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.54 OK	Thickness	=	10.00				
Global Stability	=	1.87	Rebar Size	=	# 7				
·			Rebar Spacing	=	9.00				
Total Bearing Load	=	8,893 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	11.76 in	Design Data ————		0.676				
Soil Pressure @ Toe		O CEC not OV	fb/FB + fa/Fa	=	0.676				
Soil Pressure @ Heel	=	2,656 psf OK 116 psf OK	Total Force @ Section						
Allowable	=	3,000 psf	Service Level	lbs =	4 000 0				
Soil Pressure Less			Strength Level MomentActual	lbs =	4,032.0				
ACI Factored @ Toe	=	3,718 psf		ft-# =					
ACI Factored @ Heel	=	162 psf		ft-# =	16,128.0				
Footing Shear @ Toe	=	10.0 psi OK	MomentAllowable		23,826.6				
Footing Shear @ Heel	=	17.4 psi OK		=	23,020.0				
Allowable	=	75.0 psi	ShearActual	:					
			Service Level	psi =					
Sliding Calcs			Strength Level	psi =	44.4				
Lateral Sliding Force	=	3,189.4 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		_,	Anet (Masonry)	in2 =					
less 100% Friction Force	≡ -	•	Wall Weight	psf =	125.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	7.56				
for 1.5 Stability	=	0.0 lbs OK	Masonry Data						
Vertical component of active	late	ral coil pressure IS	f'm	:-					
NOT considered in the calcu			Fs	psi = psi =					
		. o. oo boag	Solid Grouting	psi =					
Load Factors			Modular Ratio 'n'	=					
Building Code			Equiv. Solid Thick.	=					
Dead Load		1.200	Masonry Block Type	=					
Live Load		1.600	Masonry Design Method	=	ASD				
Earth, H		1.600	Concrete Data						
Wind, W		1.600	f'c	psi=	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.4948 in2/ft

(4/3) * As: 0.6597 in2/ft Min Stem T&S Reinf Area 2.880 in2

200bd/fy: 200(12)(7.5625)/60000: 0.3025 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.240 in2/ft

0.0018bh : 0.0018(12)(10) : 0.216 in2/ft Horizontal Reinforcing Options :
========= One layer of : Two layers of : Two layers

 Required Area :
 0.4948 in2/ft
 #4@ 10.00 in
 #4@ 20.00 in

 Provided Area :
 0.8 in2/ft
 #5@ 15.50 in
 #5@ 31.00 in

 Maximum Area :
 1.0245 in2/ft
 #6@ 22.00 in
 #6@ 44.00 in

Footing Data

= 1.75 ft
= 4.67
= 6.42
= 18.00 in
= 8.00 in
= 24.00 in
e = 1.75 ft
Fy = 60,000 psi sity = 150.00 pcf
= 0.0018
@ Btm.= 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	3,718	162 psf
Mu': Upward	=	5,199	6,393 ft-#
Mu': Downward	=	528	15,203 ft-#
Mu: Design	=	4,670	8,810 ft-#
phiMn	=	37,413	29,913 ft-#
Actual 1-Way Shear	=	9.96	17.42 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#7@12.00	in
Heel Reinforcing	=	#6@12.00	in
Key Reinforcing	=	#4@10.55	in
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 2.49 in2
Min footing T&S reinf Area per foot 0.39 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 6.17 in #4@ 12.35 in #5@ 9.57 in #5@ 19.14 in #6@ 13.58 in #6@ 27.16 in

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall

Summary of Overturning & Resisting Forces & Moments

OVERTURNING			R	RESISTING			
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	3,189.4	4.50	14,352.2	Soil Over HL (ab. water tbl)	5,749.0	4.50	25,868.6
HL Act Pres (be water tbl) Hydrostatic Force	•		,	Soil Over HL (bel. water tbl) Watre Table		4.50	25,868.6
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	=			Soil Over Toe =		0.88	
	=			Surcharge Over Toe =			
				Stem Weight(s) =	1,500.0	2.17	3,250.0
				Earth @ Stem Transitions =			
Total	= 3,189.4	O.T.M. =	14,352.2	Footing Weight =	1,443.6	3.21	4,631.1
				Key Weight =	200.0	2.08	416.7
Resisting/Overturning	Ratio	=	2.38	Vert. Component =			
Vertical Loads used for	r Soil Pressure	e = 8,892.6	6 lbs	Total =	-,	bs R.M.=	34,166.3
				* Axial live load NOT included	in total display	ed, or used fo	r overturning

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

Project File: Typical Detail Co-04-06.EC6

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) 0.138 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: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 (c) ENERCALC INC 1983-2022 SWENSON SAY FAGET

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #7 bar specified in this stem design segment = 40.95 in Development length for #7 bar specified in this stem design segment = 31.50 in

Hooked embedment length into footing for #7 bar specified in this stem design segment = 9.09 in As Provided = 0.8000 in2/ft As Required = 0.4948 in2/ft

Cantilevered Retaining Wall

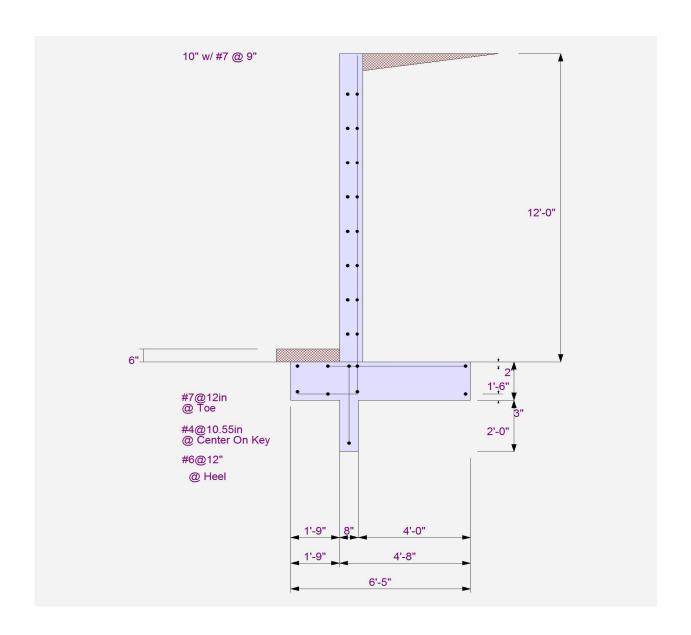
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall



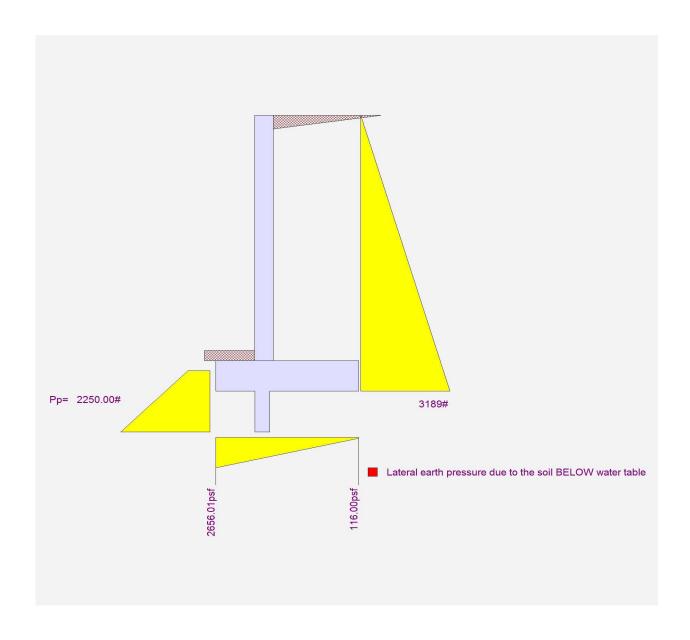
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SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall



Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

LIC#: KW-06014947, Build:20.22.3.31 **DESCRIPTION:** Retaining Wall Schedule 12'-0" Retaining Wall W/ Seismic

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	12.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	4,000.0 psf
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
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

Earth Pressure Seismic Load

Method: Uniform Multiplier Used 6.000 (Multiplier used on soil density)

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Uniform Seismic Force = 81.000 Total Seismic Force = 1,093.500

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 LIC#: KW-06014947, Build:20.22.3.31

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DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall W/ Seismic

Design Summary		•	Stem Construction	_	Bottom				
			Design Height Above Ftg	— ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	1.75 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.24 Ratio < 1.5	Thickness	=	10.00				
Global Stability	=	1.87	Rebar Size	=	# 7				
			Rebar Spacing	=	9.00				
Total Bearing Load	=	8,893 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	18.73 in	Design Data ————— fb/FB + fa/Fa		0.921				
Soil Pressure @ Toe	=	3,599 psf OK	Total Force @ Section	=	0.921				
Soil Pressure @ Heel	=	0 psf OK	Service Level	lbs=					
Allowable	=	4,000 psf	Strength Level		E 004 0				
Soil Pressure Less			MomentActual	lbs =	5,004.0				
ACI Factored @ Toe	=	5,039 psf		ft-#=					
ACI Factored @ Heel	=	0 psf	Strength Level	ft-# =	21,960.0				
Footing Shear @ Toe	=	13.7 psi OK	MomentAllowable	=	23,826.6				
Footing Shear @ Heel	=	27.4 psi OK		=	23,020.0				
Allowable	=	75.0 psi	ShearActual Service Level	nai					
			Strength Level	psi =	<i>1</i>				
Sliding Calcs			=	psi =	55.1				
Lateral Sliding Force	=	3,954.8 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		2,250.0 lbs	Anet (Masonry)	in2 =					
less 100% Friction Force	_	2,667.8 lbs	Wall Weight	psf =	125.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	7.56				
for 1.5 Stability	=	1,014.5 lbs NG	Masonry Data						
Vertical component of active	later	al soil pressure IS	f'm	psi=					
NOT considered in the calcu			Fs	psi =					
			Solid Grouting	psi =					
Load Factors			Modular Ratio 'n'	=					
Building Code			Equiv. Solid Thick.	=					
Dead Load		1.200	Masonry Block Type	=					
Live Load		1.600	Masonry Design Method	=	ASD				
Earth, H		1.600	Concrete Data						
Wind, W		1.600	f'c	psi=	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall W/ Seismic

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.6737 in2/ft

(4/3) * As: 0.8982 in2/ft Min Stem T&S Reinf Area 2.880 in2

200bd/fy: 200(12)(7.5625)/60000: 0.3025 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.240 in2/ft

 $0.0018 \text{bh}: 0.0018 \text{(12)(10)}: \\ 0.216 \text{ in2/ft} \\ ========= \\ \text{One layer of:} \\ \text{Two layers of:} \\ \text{Required Area:} \\ 0.6737 \text{ in2/ft} \\ \text{#4@ 10.00 in} \\ \text{#4@ 20.00 in} \\ \text{Two layers of:} \\ \text{$

 Required Area :
 0.6737 in2/ft
 #4@ 10.00 in
 #4@ 20.00 in

 Provided Area :
 0.8 in2/ft
 #5@ 15.50 in
 #5@ 31.00 in

 Maximum Area :
 1.0245 in2/ft
 #6@ 22.00 in
 #6@ 44.00 in

Footing Data

Toe Width Heel Width Total Footing Width	= =	1.75 ft 4.67 6.42
Footing Thickness	=	18.00 in
Key Width Key Depth Key Distance from To	= = oe =	8.00 in 24.00 in 1.75 ft
f'c = 2,500 psi Footing Concrete De Min. As % Cover @ Top 2.0	nsity = =	60,000 psi 150.00 pcf 0.0018 Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	5,039	0 psf
Mu': Upward	=	6,805	2,228 ft-#
Mu': Downward	=	528 1	15,203 ft-#
Mu: Design	=	6,277 1	12,975 ft-#
phiMn	=	37,413	29,913 ft-#
Actual 1-Way Shear	=	13.67	27.41 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#7 @ 12.00 in	
Heel Reinforcing	=	#6@12.00 in	
Key Reinforcing	=	# 4 @ 9.12 in	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 2.49 in2
Min footing T&S reinf Area per foot 0.39 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 6.17 in #4@ 12.35 in #5@ 9.57 in #5@ 19.14 in #6@ 13.58 in #6@ 27.16 in

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DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall W/ Seismic

Summary of Overturning & Resisting Forces & Moments

		OV Force	ERTURNING Distance	 Moment			R Force	ESISTING Distance	Moment
Item		lbs	ft	ft-#			lbs	ft	ft-#
HL Act Pres (ab water	tbl)	3,189.4	4.50	14,352.2	Soil Over HL (ab. wa	ater tbl)	5,749.0	4.50	25,868.6
HL Act Pres (be water the Hydrostatic Force	,	•		•	Soil Over HL (bel. w Watre Table	ater tbl)		4.50	25,868.6
Buoyant Force	=				Sloped Soil Over He	el =			
Surcharge over Heel	=				Surcharge Over Hee	I =			
Surcharge Over Toe	=				Adjacent Footing Loa	ad =			
Adjacent Footing Load	=				Axial Dead Load on	Stem =			
Added Lateral Load	=				* Axial Live Load on S	tem =			
Load @ Stem Above S	oil =				Soil Over Toe	=		0.88	
Seismic Earth Load	=	765.5	6.75	5,166.8	Surcharge Over Toe	=			
	=			•	Stem Weight(s)	=	1,500.0	2.17	3,250.0
			- –		Earth @ Stem Trans	itions=			
Total	=	3,954.8	O.T.M. =	19,519.0	Footing Weight	=	1,443.6	3.21	4,631.1
					Key Weight	=	200.0	2.08	416.7
Resisting/Overturni	_		=	1.75	Vert. Component	=			
Vertical Loads used	I for So	il Pressure	= 8,892.0	6 lbs		Total =	8,892.6	lbs R.M.=	34,166.3
If seismic is included,	the OT	M and slidir	ng ratios		* Axial live load NOT in resistance, but is included				r overturning

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci Horizontal Defl @ Top of Wall (approximate only) 0.187 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe,

because the wall would then tend to rotate into the retained soil.

Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall W/ Seismic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #7 bar specified in this stem design segment = 40.95 in Development length for #7 bar specified in this stem design segment = 31.50 in

Hooked embedment length into footing for #7 bar specified in this stem design segment = 12.38 in As Provided = 0.8000 in2/ft As Required = 0.6737 in2/ft

Cantilevered Retaining Wall

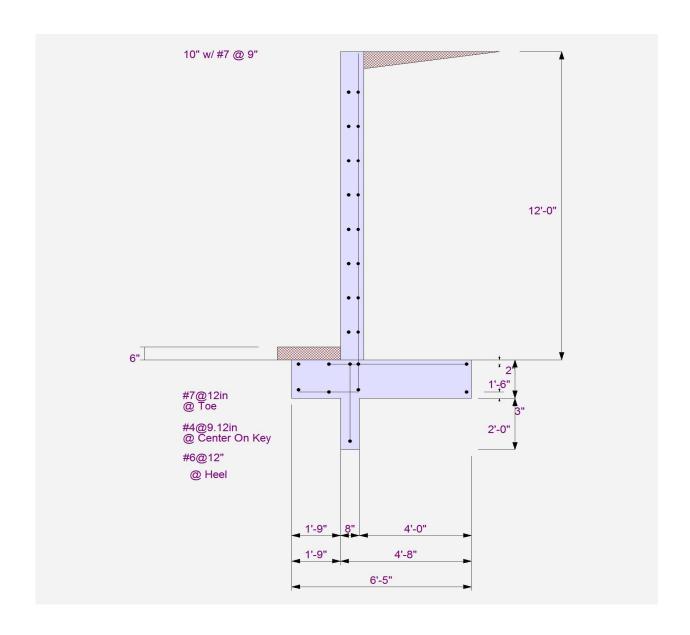
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SWENSON SAY FAGET

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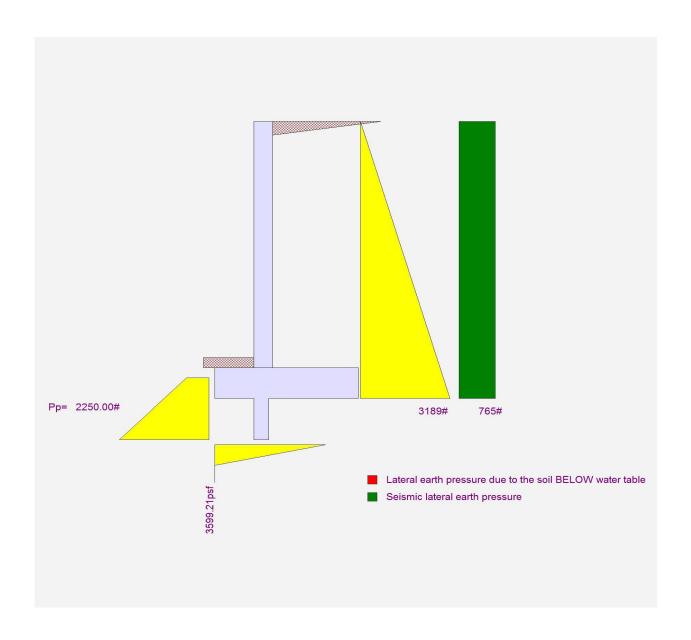
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Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Surcharge Loads

Surcharge Over Heel 0.0 psf Surcharge Over Heel = 0.0 ps Used To Resist Sliding & Overturning Surcharge Over Toe = 0.0 Used for Sliding & Overturning

Axial Load Applied to Stem

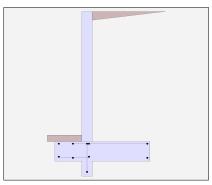
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Soil Data

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	3,000.0 od	psf
Active Heel Pressure	=	35.0	psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	125.00	pcf
Soil Density, Toe	=	0.00	pcf
Footing Soil Friction	=	0.300	
Soil height to ignore for passive pressure	=	12.00	in

Lateral Load Applied to Stem

Lateral LoadHeight to TopHeight to Bottom Load Type	= = =	0.0 #/ft 0.00 ft 0.00 ft Wind (W)
Load Type	_	(Service Level)
Wind on Exposed Stem (Service 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

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall

Design Summary			Stem Construction		Bottom				
			Design Height Above Ftg	 ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	3.01 OK	Design Method	_	SD	SD	SD	SD	SD
Sliding	=	1.52 OK	Thickness	=	8.00				
Global Stability	=	2.07	Rebar Size	=	# 7				
•			Rebar Spacing	=	12.00				
Total Bearing Load	=	7,191 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	7.22 in	Design Data ————		0.712				
Soil Pressure @ Toe		1,849 psf OK	fb/FB + fa/Fa	=	0.712				
Soil Pressure @ Heel	=	484 psf OK	Total Force @ Section	11					
Allowable	_	3,000 psf	Service Level	lbs =	0.000.0				
Soil Pressure Less			Strength Level MomentActual	lbs =	2,800.0				
ACI Factored @ Toe	=	2,588 psf		ft-# =					
ACI Factored @ Heel	=	677 psf		ft-# =	9,333.3				
Footing Shear @ Toe	=	6.6 psi OK	MomentAllowable	=	13,107.2				
Footing Shear @ Heel	=	10.3 psi OK	ShearActual	=	13,107.2				
Allowable	=	75.0 psi	Service Level	psi=					
			Strength Level		44.0				
Sliding Calcs				psi =	41.9				
Lateral Sliding Force	=	2,314.4 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		1,354.2 lbs	(),	in2 =					
less 100% Friction Force	_	,	Wall Weight	psf =	100.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	5.56				
for 1.5 Stability	=	0.0 lbs OK	Masonry Data						
Vertical component of active	later	al soil pressure IS	f'm	psi=					
NOT considered in the calcu			Fs	psi =					
		· ·	Solid Grouting	=					
Load Factors			Modular Ratio 'n'	=					
Building Code			Equiv. Solid Thick.	=					
Dead Load		1.200	Masonry Block Type	=					
Live Load		1.600	Masonry Design Method	=	ASD				
Earth, H		1.600	Concrete Data						
Wind, W		1.000	f'c	psi =	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.3955 in2/ft

(4/3) * As: 0.5274 in2/ft Min Stem T&S Reinf Area 1.920 in2

200bd/fy: 200(12)(5.5625)/60000: 0.2225 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

 Required Area :
 0.3955 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.6 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 0.7535 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width	=	1.75 ft
Heel Width	=	4.42
Total Footing Width	1 =	6.17
Footing Thickness	=	18.00 in
Key Width	=	8.00 in
Key Depth	=	14.00 in
Key Distance from	Toe =	1.75 ft
f'c = 2,500 ps Footing Concrete D Min. As % Cover @ Top 2	ensity = =	60,000 psi 150.00 pcf 0.0018 Btm.= 3.00 in

Footing Design Results

		Toe	 Heel
Factored Pressure	=	2,588	677 psf
Mu': Upward	=	3,686	7,482 ft-#
Mu' : Downward	=	528	12,441 ft-#
Mu: Design	=	3,158	4,959 ft-#
phiMn	=	37,413	29,913 ft-#
Actual 1-Way Shear	=	6.64	10.32 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#7 @ 12.00 i	in
Heel Reinforcing	=	#6@12.00i	'n
Key Reinforcing	=	# 4 @ 13.89 i	in
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 2.40 in2
Min footing T&S reinf Area per foot 0.39 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 6.17 in #4@ 12.35 in #5@ 9.57 in #5@ 19.14 in #6@ 13.58 in #6@ 27.16 in

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall

Summary of Overturning & Resisting Forces & Moments

Item		Force	ERTURNING Distance ft	Moment ft-#		Ri Force Ibs	SISTING Distance ft	Moment ft-#
HL Act Pres (ab water tb	D	2,314.4	3.83	8,871.8	Soil Over HL (ab. water tbl)	4,686.7	4.29	20,112.0
HL Act Pres (be water to Hydrostatic Force	,	2,014.4	0.00	0,071.0	Soil Over HL (bel. water tbl Watre Table)	4.29	20,112.0
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 So	il =				Soil Over Toe =		0.88	
	=				Surcharge Over Toe =			
					Stem Weight(s) =	1,000.0	2.08	2,083.3
					Earth @ Stem Transitions=			
Total	=	2,314.4	O.T.M. =	8,871.8	Footing Weight =	1,387.4	3.08	4,277.2
					Key Weight =	116.7	2.08	243.1
Resisting/Overturnin	g Rati	io	=	3.01	Vert. Component =			
Vertical Loads used f	or Soi	I Pressure	= 7,190.7	' lbs	Total =	7,190.7	bs R.M.=	26,715.6
					* Axial live load NOT included	d in total display	ed, or used fo	r overturning

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

Project File: Typical Detail Co-04-06.EC6

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) 0.083 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.

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #7 bar specified in this stem design segment = 40.95 in

Development length for #7 bar specified in this stem design segment = 31.50 in

Hooked embedment length into footing for #7 bar specified in this stem design segment = 9.69 in

As Provided = 0.6000 in2/ft

As Required = 0.3955 in2/ft

Cantilevered Retaining Wall

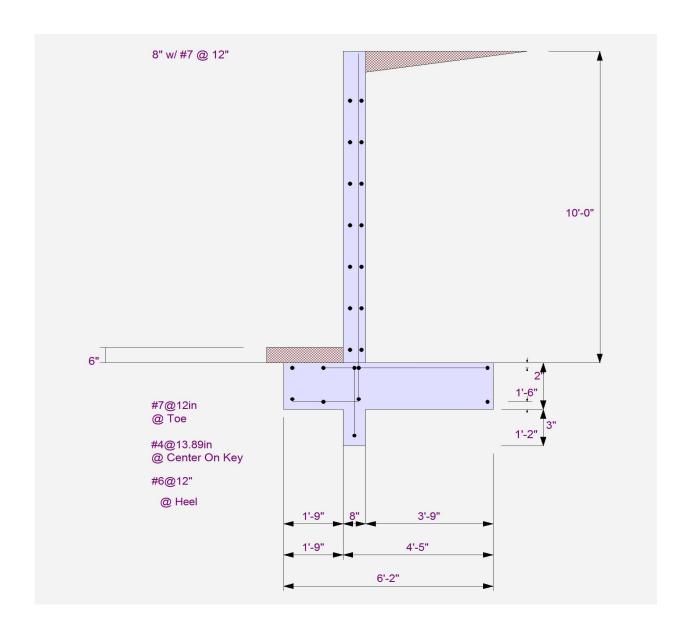
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall



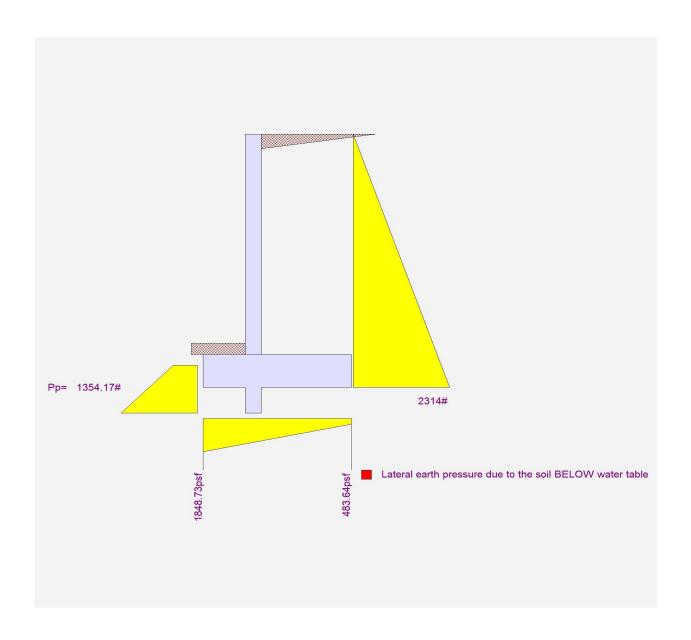
Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall



Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall W/ Seismic

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Surcharge Loads

Surcharge Over Heel 0.0 psf Surcharge Over Heel = 0.0 ps Used To Resist Sliding & Overturning Surcharge Over Toe 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

Earth Pressure Seismic Load

Method: Uniform Multiplier Used 6.000 (Multiplier used on soil density)

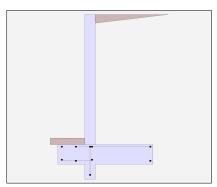
Soil Data

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	4,000.0	psf
Active Heel Pressure	=		psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	125.00	pcf
Soil Density, Toe	=	0.00	pcf
Footing Soil Friction	=	0.300	
Soil height to ignore for passive pressure	=	12.00	in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service Level)) =	0.0 psf

Uniform Seismic Force = 69.000 Total Seismic Force = 793.500



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

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

IC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall W/ Seismic

Design Summary			Stem Construction	_	Bottom				
			Design Height Above Ftg	 ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	2.21 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.22 Ratio < 1.5	il Thickness	=	8.00				
Global Stability	=	2.07	Rebar Size	=	# 7				
•			Rebar Spacing	=	12.00				
Total Bearing Load	=	7,191 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	12.55 in	Design Data		0.075				
Soil Pressure @ Toe		2.252 not OV	fb/FB + fa/Fa	=	0.975				
Soil Pressure @ Heel	=	2,353 psf OK 0 psf OK	Total Force @ Section	п					
Allowable	_	4,000 psf	Service Level	lbs =	0.400.0				
Soil Pressure Less			Strength Level MomentActual	lbs =	3,490.0				
ACI Factored @ Toe	=	3,294 psf		ft-# =					
ACI Factored @ Heel	=	0 psf	Strength Level	ft-# =	12,783.3				
Footing Shear @ Toe	=	8.6 psi OK	MomentAllowable		•				
Footing Shear @ Heel	=	15.9 psi OK		=	13,107.2				
Allowable	=	75.0 psi	ShearActual	:					
			Service Level	psi =					
Sliding Calcs			Strength Level	psi =	52.3				
Lateral Sliding Force	=	2,869.8 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		1,354.2 lbs	Anet (Masonry)	in2 =					
less 100% Friction Force		2,157.2 lbs	Wall Weight	psf =	100.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	5.56				
for 1.5 Stability	=	793.4 lbs NG	Masonry Data						
Vertical component of active	lator	al coil proceura IS	f'm	:-					
NOT considered in the calcu			Fs	psi = psi =					
		. o. oo 20ag	Solid Grouting	psi =					
Load Factors			Modular Ratio 'n'	=					
Building Code			Equiv. Solid Thick.	=					
Dead Load		1.200	Masonry Block Type	=					
Live Load		1.600	Masonry Design Method	=	ASD				
Earth, H		1.600	Concrete Data						
Wind, W		1.000	f'c	psi=	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall W/ Seismic

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.5417 in2/ft

(4/3) * As: 0.7223 in2/ft Min Stem T&S Reinf Area 1.920 in2

200bd/fy: 200(12)(5.5625)/60000: 0.2225 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

 Required Area :
 0.5417 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.6 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 0.7535 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width		=	1	.75 ft
Heel Width		=	4	.42
Total Footing Wid	lth	=	6	.17
Footing Thickness	3	=	18	.00 in
Key Width		=	8	.00 in
Key Depth		=	14	.00 in
Key Distance from	n Toe	=	1.	.75 ft
f'c = 2,500		=y =		000 psi
Footing Concrete	Density	=	150	.00 pcf
Min. As %		=	0.00	18
Cover @ Top	2.00	@	Btm.=	3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	3,294	0 psf
Mu': Upward	=	4,563	4,533 ft-#
Mu': Downward	=	528	12,441 ft-#
Mu: Design	=	4,034	7,908 ft-#
phiMn	=	37,413	29,913 ft-#
Actual 1-Way Shear	=	8.65	15.89 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#7@12.00 i	n
Heel Reinforcing	=	#6@12.00 i	n
Key Reinforcing	=	# 4 @ 13.89 i	n
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 2.40 in2
Min footing T&S reinf Area per foot 0.39 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 6.17 in #4@ 12.35 in #5@ 9.57 in #5@ 19.14 in #6@ 13.58 in #6@ 27.16 in

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-06.EC6
(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall W/ Seismic

Summary of Overturning & Resisting Forces & Moments

Item		Force	ERTURNING. Distance ft	Moment ft-#	_		Force	SISTING Distance ft	Moment ft-#
HL Act Pres (ab water tbl	1)	2,314.4	3.83	8,871.8	Soil Over HL (ab. water t	tbl)	4,686.7	4.29	20,112.0
HL Act Pres (be water tbl Hydrostatic Force	,	,-		-,-	Soil Over HL (bel. water Watre Table	tbl)		4.29	20,112.0
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	n =			
Added Lateral Load	=				* Axial Live Load on Stem	=			
Load @ Stem Above Soil	l =				Soil Over Toe	=		0.88	
Seismic Earth Load	=	555.5	5.75	3,193.8	Surcharge Over Toe	=			
	=			,	Stem Weight(s)	=	1,000.0	2.08	2,083.3
					Earth @ Stem Transitions	s=			
Total	=	2,869.8	O.T.M. =	12,065.6	Footing Weight	=	1,387.4	3.08	4,277.2
					Key Weight	=	116.7	2.08	243.1
Resisting/Overturning	_			2.21	Vert. Component	=			
Vertical Loads used for	or So	il Pressure	= 7,190.7	' lbs	Tota	al =	7,190.7 lk	os R.M.=	26,715.6
If seismic is included, the	e OTI	M and slidin	g ratios		* Axial live load NOT included resistance, but is included				r overturning

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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) 0.106 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: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall W/ Seismic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #7 bar specified in this stem design segment = 40.95 in Development length for #7 bar specified in this stem design segment = 31.50 in

Hooked embedment length into footing for #7 bar specified in this stem design segment = 13.27 in As Provided = 0.6000 in2/ft As Required = 0.5417 in2/ft

Cantilevered Retaining Wall

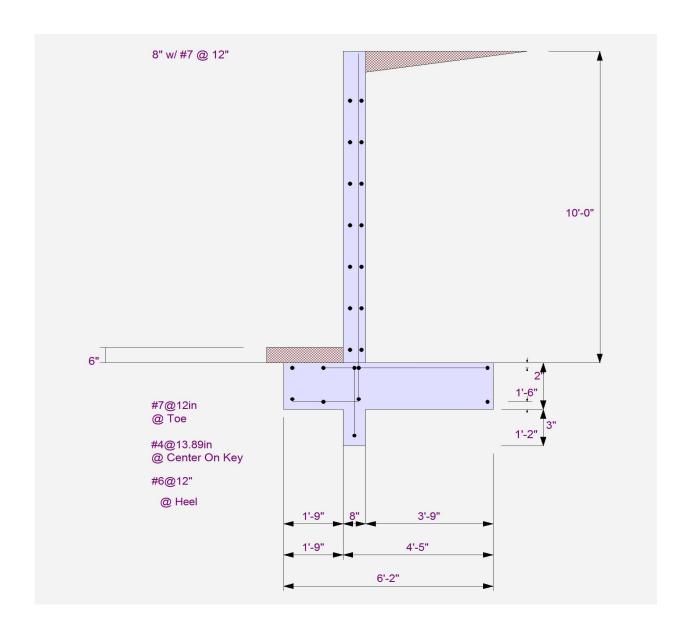
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall W/ Seismic



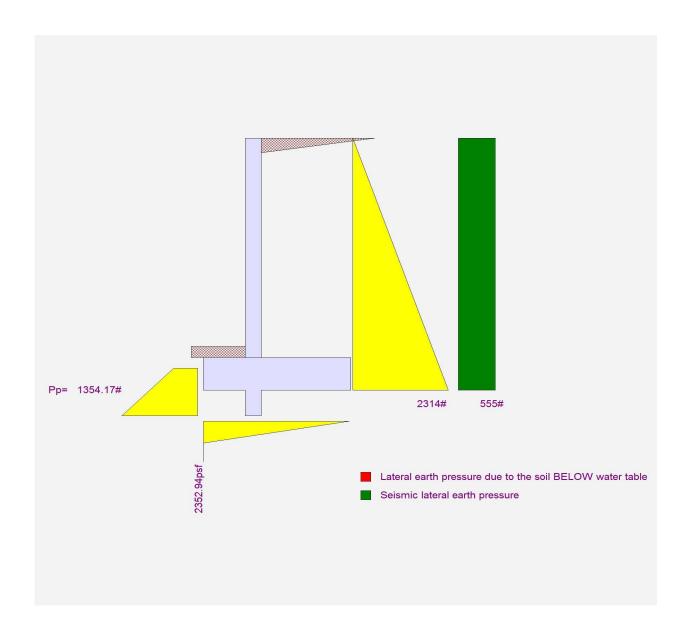
Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 10'-0" Retaining Wall W/ Seismic



Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

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

Surcharge Loads

Surcharge Over Heel 0.0 psf Surcharge Over Heel = 0.0 ps Used To Resist Sliding & Overturning Surcharge Over Toe = 0.0 Used for Sliding & Overturning

Axial Load Applied to Stem

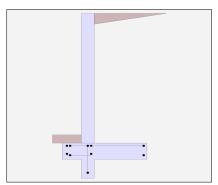
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Soil Data

Allow Soil Bearing	=	3,000.0 psf
Equivalent Fluid Pressure Active Heel Pressure	=	10a 35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
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		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall

Design Summary			Stem Construction	_	Bottom				
			Design Height Above Ftg	_ ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	2.60 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.56 OK	Thickness	=	8.00				
Global Stability	=	2.00	Rebar Size	=	# 5				
•			Rebar Spacing	=	12.00				
Total Bearing Load	=	4,328 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	7.66 in	Design Data —						
0.115			fb/FB + fa/Fa	=	0.588				
Soil Pressure @ Toe	=	1,830 psf OK	Total Force @ Section						
Soil Pressure @ Heel	=	130 psf OK	Service Level	lbs =					
Allowable Soil Pressure Less	= Thon	3,000 psf	Strength Level	lbs =	1,792.0				
ACI Factored @ Toe			MomentActual						
ACI Factored @ Toe ACI Factored @ Heel	=	2,562 psf 182 psf		ft-# =					
			Strength Level	ft-# =	4,778.7				
Footing Shear @ Toe	=	6.3 psi OK	MomentAllowable	=	8,121.3				
Footing Shear @ Heel	=	11.0 psi OK	ShearActual						
Allowable	=	75.0 psi	Service Level	psi=					
Cliding Color			Strength Level	psi =	24.1				
Sliding Calcs Lateral Sliding Force		4 447 5 16-	ShearAllowable	psi =	75.0				
•	=	1,417.5 lbs	Anet (Masonry)	in2 =	75.0				
less 100% Passive Force less 100% Friction Force	-	916.7 lbs 1,298.5 lbs	` ,		100.0				
		,	Wall Weight	psf =	100.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.19				
for 1.5 Stability	=	0.0 lbs OK	Masonry Data						
Vertical component of active	o lotor	ral anil propoura IC	f'm						
NOT considered in the calcu			Fs	psi=					
TVOT CONSIdered III the calcu	uialioi	i or son bearing	Solid Grouting	psi =					
Load Factors			Modular Ratio 'n'	=					
Building Code			Equiv. Solid Thick.						
Dead Load		1.200	Masonry Block Type	=					
Live Load		1.600	, , , , , , , , , , , , , , , , , , , ,		ASD				
Earth, H		1.600	Masonry Design Method Concrete Data	=	ASD				
Wind, W		1.000	f'c	psi=	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				
00.011110, L		1.000	ı y	Pai =	00,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.1809 in2/ft

(4/3) * As: 0.2413 in2/ft Min Stem T&S Reinf Area 1.536 in2

200bd/fy: 200(12)(6.1875)/60000: 0.2475 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

0.0018bh : 0.0018(12)(8) : 0.1728 in2/ft Horizontal Reinforcing Options :

=========== One layer of : Two layers of :

Required Area : 0.2413 in2/ft #4@ 12.50 in #4@ 25.00 in

 Required Area :
 0.2413 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.31 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 0.8382 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width Heel Width	= _	3	.00 ft .42
Total Footing Width	=		.42
Footing Thickness	=	12	.00 in
Key Width	=	8	.00 in
Key Depth	=	14	.00 in
Key Distance from Toe	=	1.	.00 ft
f'c = 2,500 psi Footing Concrete Densit	Fy = ty =		000 psi .00 pcf
Min. As %	=	0.00)18
Cover @ Top 2.00	@ E	3tm.=	3.00 in

Footing Design Results

		<u>Toe</u>	Heel
Factored Pressure	=	2,562	182 psf
Mu': Upward	=	1,191	2,555 ft-#
Mu': Downward	=	128	5,216 ft-#
Mu: Design	=	1,064	2,661 ft-#
phiMn	=	11,610	13,005 ft-#
Actual 1-Way Shear	=	6.30	11.02 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#5@12.00 in	
Heel Reinforcing	=	#5@12.00 in	
Key Reinforcing	=	# 4 @ 13.89 in	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsion	n, p	hi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 1.14 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 9.26 in #4@ 18.52 in #5@ 14.35 in #5@ 28.70 in #6@ 20.37 in #6@ 40.74 in

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall

Summary of Overturning & Resisting Forces & Moments

		OV	ERTURNING			R	RESISTING		
Item		Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water th	ol)	1.417.5	3.00	4,252.5	Soil Over HL (ab. water tbl)	2,749.3	3.04	8,361.6	
HL Act Pres (be water to Hydrostatic Force	,	, -		,	Soil Over HL (bel. water tbl) Watre Table)	3.04	8,361.6	
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 So	il =				Soil Over Toe =		0.50		
	=				Surcharge Over Toe =				
					Stem Weight(s) =	800.0	1.33	1,066.7	
					Earth @ Stem Transitions =				
Total	=	1,417.5	O.T.M. =	4,252.5	Footing Weight =	662.4	2.21	1,462.6	
					Key Weight =	116.7	1.33	155.6	
Resisting/Overturnin	g Rat	io	=	2.60	Vert. Component =				
Vertical Loads used t	for So	il Pressure	= 4,328.4	4 lbs	Total =	4,328.4	lbs R.M.=	11,046.4	
					* Axial live load NOT included	d in total displa	yed, or used fo	r overturning	

^{*} 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) 0.092 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: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment = 23.40 in

Development length for #5 bar specified in this stem design segment = 18.00 in

Hooked embedment length into footing for #5 bar specified in this stem design segment = 8.17 in

As Provided = 0.3100 in2/ft

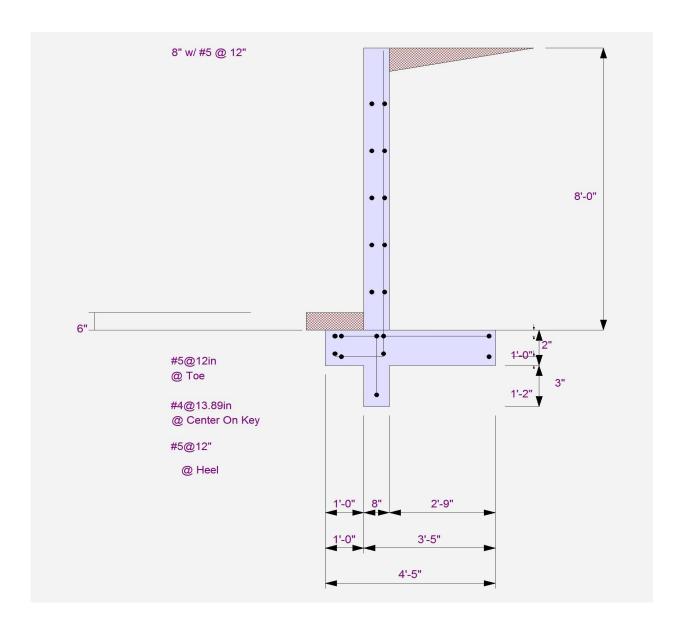
As Required = 0.2413 in2/ft

Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET **DESCRIPTION:** Retaining Wall Schedule 8'-0" Retaining Wall



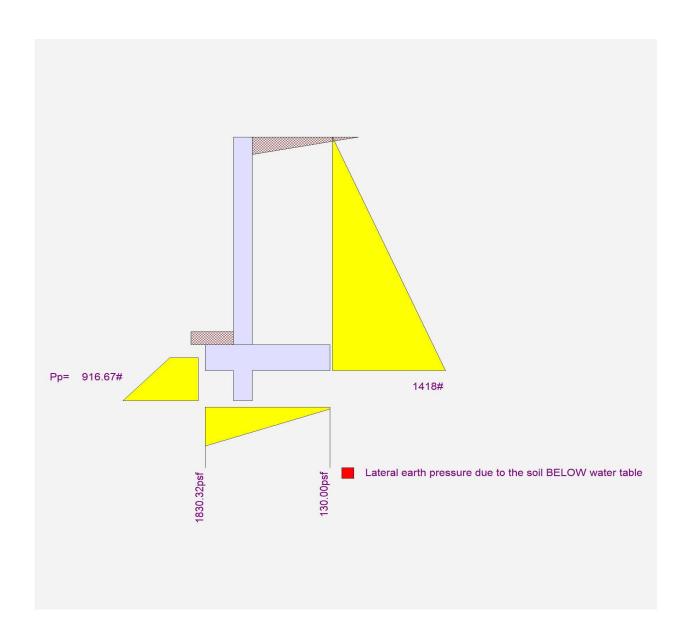
Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall



Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall W/ Seismic

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

Code Reference:

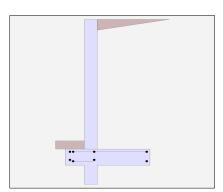
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

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

Soil Data

= Meth	4,000.0 psf
=	35.0 psf/fr
=	
=	300.0 psf/fr
=	125.00 pcf
=	0.00 pcf
=	0.300
=	12.00 in
	Meth = = = =



Surcharge Loads

Surcharge Over Heel = 0.0	
Used To Resist Sliding & Overturnin	g
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

Earth Pressure Seismic Load

Method: Uniform

Multiplier Used = 6.000
(Multiplier used on soil density)

Lateral Load Applied to Stem

Lateral LoadHeight to TopHeight to Bottom	=	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Sten (Strength Level)	n =	0.0 psf

Uniform Seismic Force = 54.000 Total Seismic Force = 486.000

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

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall W/ Seismic

Design Summary		S	tem Construction		Bottom				
			Design Height Above Ftg	ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	1.91 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.26 Ratio < 1.5!	THICKHESS	=	8.00				
Global Stability	=	2.00	Rebar Size	=	# 5				
			Rebar Spacing	=	12.00				
Total Bearing Load	=	4,328 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	11.90 in	Design Data		0.004				
Cail Danassura & Tan		0.070 01/	fb/FB + fa/Fa	=	0.801				
Soil Pressure @ Toe Soil Pressure @ Heel	=	2,373 psf OK 0 psf OK	Total Force @ Section						
		4,000 psf	Service Level	lbs =					
Allowable Soil Pressure Less	= Than		Strength Level	lbs =	2,224.0				
ACI Factored @ Toe	=	3,322 psf	MomentActual						
ACI Factored @ Heel	_	0,022 psi		ft-# =					
Footing Shear @ Toe	=	8.3 psi OK	Strength Level	ft-# =	-,				
Footing Shear @ Heel	_	17.6 psi OK	MomentAllowable	=	8,121.3				
Allowable	_	75.0 psi	ShearActual						
Mowable		70.0 poi	Service Level	psi=					
Sliding Calcs			Strength Level	psi=	30.0				
Lateral Sliding Force	=	1,757.7 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		916.7 lbs	Anet (Masonry)	in2 =					
less 100% Friction Force	= -	1,298.5 lbs	Wall Weight	psf=	100.0				
Added Force Reg'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.19				
for 1.5 Stability	=	421.4 lbs NG							
•			Masonry Data						
Vertical component of active			f'm	psi=					
NOT considered in the calcu	ılatioı	n of soil bearing	Fs	psi=					
			Solid Grouting	=					
Load Factors			Modular Ratio 'n'	=					
Building Code Dead Load		1.200	Equiv. Solid Thick.	=					
Live Load		1.600	Masonry Block Type	=					
Earth, H		1.600	Masonry Design Method	=	ASD				
•			Concrete Data		0.500.0				
Wind, W		1.600 1.000	f'c	psi =	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall W/ Seismic

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.2464 in2/ft

(4/3) * As: 0.3285 in2/ft Min Stem T&S Reinf Area 1.536 in2

200bd/fy: 200(12)(6.1875)/60000: 0.2475 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

 Required Area :
 0.2475 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.31 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 0.8382 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width	=	1.00 ft
Heel Width	=	3.42
Total Footing Wid	lth =	4.42
Footing Thickness	S =	12.00 in
Key Width	=	8.00 in
Key Depth	=	14.00 in
Key Distance fron	n Toe =	1.00 ft
f'c = 2,500 p Footing Concrete		60,000 psi 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	=	3,322	0	psf
Mu' : Upward	=	1,509	1,180	ft-#
Mu': Downward	=	128	5,216	ft-#
Mu: Design	=	1,382	4,035	ft-#
phiMn	=	11,610	13,005	ft-#
Actual 1-Way Shear	=	8.32	17.60	psi
Allow 1-Way Shear	=	75.00	75.00	psi
Toe Reinforcing	=	#5@12.00 in		
Heel Reinforcing	=	#5@12.00 in		
Key Reinforcing	=	None Spec'd		
Footing Torsion, Tu		=	0.00	ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00	ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 1.14 in2
Min footing T&S reinf Area per foot 0.26 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 9.26 in #4@ 18.52 in #5@ 14.35 in #5@ 28.70 in #6@ 20.37 in #6@ 40.74 in

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-06.EC6
(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall W/ Seismic

Summary of Overturning & Resisting Forces & Moments

		OV	ERTURNING				RE	SISTING	
Item		Force lbs	Distance ft	Moment ft-#	_		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tb	ol)	1,417.5	3.00	4,252.5	Soil Over HL (ab. water	er tbl)	2,749.3	3.04	8,361.6
HL Act Pres (be water tb Hydrostatic Force	,	, -		,	Soil Over HL (bel. wate Watre Table	er tbl)		3.04	8,361.6
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 St				
Added Lateral Load	=				* Axial Live Load on Ster	m =			
Load @ Stem Above So	il =				Soil Over Toe	=		0.50	
Seismic Earth Load	=	340.2	4.50	1,530.9	Surcharge Over Toe	=			
	=				Stem Weight(s)	=	800.0	1.33	1,066.7
					Earth @ Stem Transition	ons=			
Total	=	1,757.7	O.T.M. =	5,783.4	Footing Weight	=	662.4	2.21	1,462.6
					Key Weight	=	116.7	1.33	155.6
Resisting/Overturnin	•		=	1.91	Vert. Component	=			
Vertical Loads used f	or So	il Pressure	= 4,328.4	l lbs	To	tal =	4,328.4	bs R.M.=	11,046.4
If seismic is included, th	ne OTI	M and slidir	ng ratios		 Axial live load NOT inc resistance, but is included 				r overturning

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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) 0.119 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: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall W/ Seismic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #5 bar specified in this stem design segment = 23.40 in Development length for #5 bar specified in this stem design segment = 18.00 in

Hooked embedment length into footing for #5 bar specified in this stem design segment = 8.38 in As Provided = 0.3100 in2/ft As Required = 0.2475 in2/ft

Cantilevered Retaining Wall

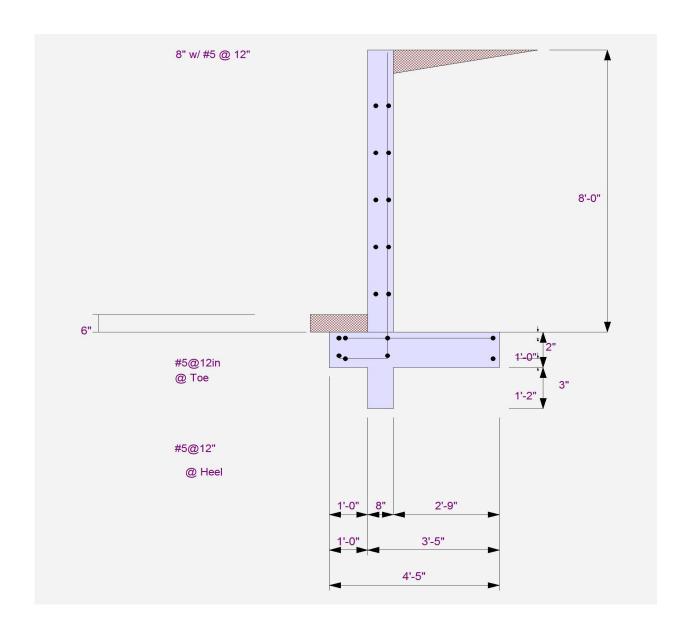
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall W/ Seismic



Cantilevered Retaining Wall

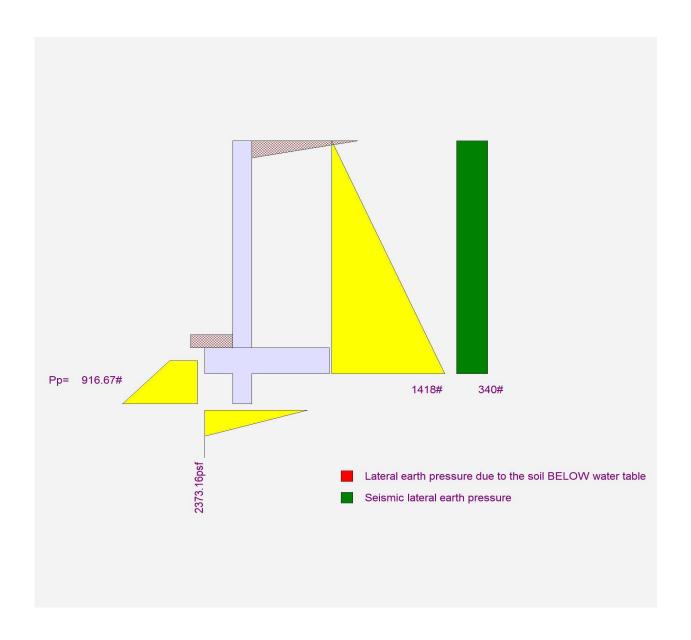
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 8'-0" Retaining Wall W/ Seismic



Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

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

Surcharge Loads

Surcharge Over Heel 0.0 psf Surcharge Over Heel = 0.0 ps Used To Resist Sliding & Overturning Surcharge Over Toe = 0.0 Used for Sliding & Overturning

Axial Load Applied to Stem

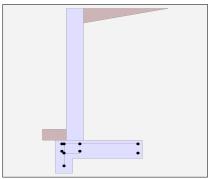
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Soil Data

= Meth	3,000.0 psf
=	35.0 psf/ft
=	
=	300.0 psf/ft
=	125.00 pcf
=	0.00 pcf
=	0.300
=	12.00 in
	= =

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Sten (Strength Level)	n =	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

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall

	•		· ·						
Design Summary			Stem Construction		Bottom				
			Design Height Above Ftg	 ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	2.64 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.57 OK	Thickness	=	8.00				
Global Stability	=	2.22	Rebar Size	=	# 4				
,			Rebar Spacing	=	12.00				
Total Bearing Load	=	2.774 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	6.84 in	Design Data ————						
			fb/FB + fa/Fa	=	0.367				
Soil Pressure @ Toe	=	1,682 psf OK	Total Force @ Section						
Soil Pressure @ Heel	=	0 psf OK	Service Level	lbs =					
Allowable		3,000 psf	Strength Level	lbs =	1,008.0				
Soil Pressure Less			MomentActual						
ACI Factored @ Toe	=	2,355 psf	Service Level	ft-# =					
ACI Factored @ Heel	=	0 psf	Strength Level	ft-# =	2,016.0				
Footing Shear @ Toe	=	0.4 psi OK	MomentAllowable	=	5,492.3				
Footing Shear @ Heel	=	6.9 psi OK	ShearActual		-,				
Allowable	=	94.9 psi	Service Level	psi =					
			Strength Level	•	40.4				
Sliding Calcs			ŭ	psi =	13.4				
Lateral Sliding Force	=	817.2 lbs	ShearAllowable	psi =	94.9				
less 100% Passive Force		450.0 lbs	Anet (Masonry)	in2 =					
less 100% Friction Force	≡ -	832.3 lbs	Wall Weight	psf =	100.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.25				
for 1.5 Stability	=	0.0 lbs OK							
			Masonry Data						
Vertical component of active			f'm	psi =					
NOT considered in the calcu	ilation c	of soil bearing	Fs	psi=					
			Solid Grouting	=					
Load Factors			Modular Ratio 'n'	=					
Building Code		1.200	Equiv. Solid Thick.	=					
Dead Load			Masonry Block Type	=					
Live Load		1.600	Masonry Design Method	=	ASD				
Earth, H		1.600	Concrete Data						
Wind, W		1.600	f'c	psi =	4,000.0				
Seismic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.0755 in2/ft

(4/3) * As: 0.1007 in2/ft Min Stem T&S Reinf Area 1.152 in2

200bd/fy: 200(12)(6.25)/60000: 0.25 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

0.0018bh : 0.0018(12)(8) : 0.1728 in2/ft Horizontal Reinforcing Options : ========= One layer of : Two layers of :

 Required Area :
 0.1728 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.2 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 1.3547 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width		=	0	.42 ft
Heel Width		=	2	.92
Total Footing Wi	dth	=	3	.34
Footing Thicknes	ss	=	10	.00 in
Key Width		=	8	.00 in
Key Depth		=	8	.00 in
Key Distance fro	m Toe	=	0	.00 ft
f'c = 4,000 Footing Concrete Min. As %		=y = =		000 psi .00 pcf
Cover @ Top	2.00	<u> </u>		3.00 in
J . op		_		

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	2,355	0 psf
Mu' : Upward	=	199	1,288 ft-#
Mu': Downward	=	20	2,666 ft-#
Mu: Design	=	179	1,378 ft-#
phiMn	=	5,943	6,843 ft-#
Actual 1-Way Shear	=	0.39	6.88 psi
Allow 1-Way Shear	=	94.87	94.87 psi
Toe Reinforcing	=	#4@12.00 in	
Heel Reinforcing	=	# 4 @ 12.00 in	
Key Reinforcing	=	# 4 @ 13.89 in	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsion	n, p	hi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 0.72 in2
Min footing T&S reinf Area per foot 0.22 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 11.11 in #4@ 22.22 in #5@ 17.22 in #5@ 34.44 in #6@ 24.44 in #6@ 48.89 in

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-06.EC6
(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall

Summary of Overturning & Resisting Forces & Moments

Item		Force	ERTURNING Distance ft	Moment ft-#		Force lbs	ESISTING Distance ft	Moment ft-#
HL Act Pres (ab water tb	ol)	817.2	2.28	1,861.3	Soil Over HL (ab. water tbl)	1,690.0	2.21	3,740.5
HL Act Pres (be water to Hydrostatic Force	,	017.2	2.20	1,001.0	Soil Over HL (bel. water tbl) Watre Table		2.21	3,740.5
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 So	il =				Soil Over Toe =		0.21	
	=				Surcharge Over Toe =			
	_				Stem Weight(s) =	600.0	0.75	452.0
					Earth @ Stem Transitions =			
Total	=	817.2	O.T.M. =	1,861.3	Footing Weight =	417.5	1.67	697.2
					Key Weight =	66.7	0.33	22.2
Resisting/Overturnin	g Rati	0	=	2.64	Vert. Component =			
Vertical Loads used f	or Soil	l Pressure	= 2,774.2	2 lbs	Total =	,	lbs R.M.=	4,912.0
•	_			-	· -	,		, -

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

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci Horizontal Defl @ Top of Wall (approximate only) 0.084 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: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment = 15.60 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 = 0.2000 in2/ft

As Required = 0.1728 in2/ft

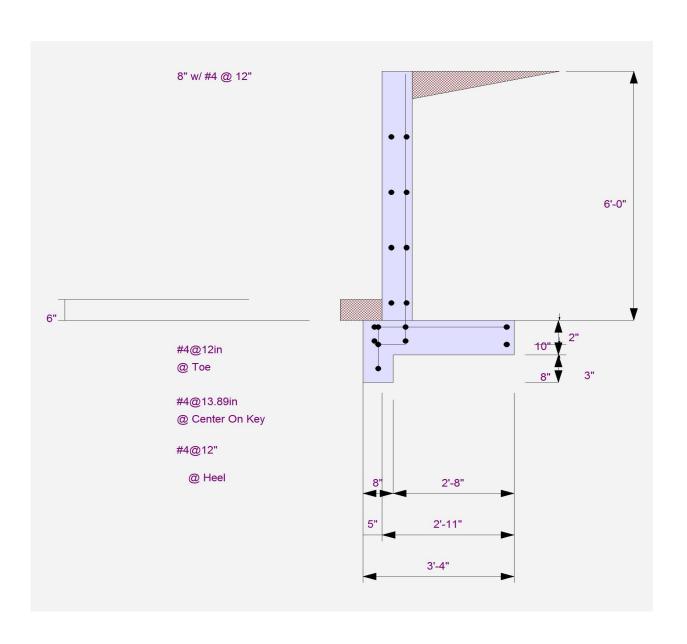
SWENSON SAY FAGET

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall



Cantilevered Retaining Wall

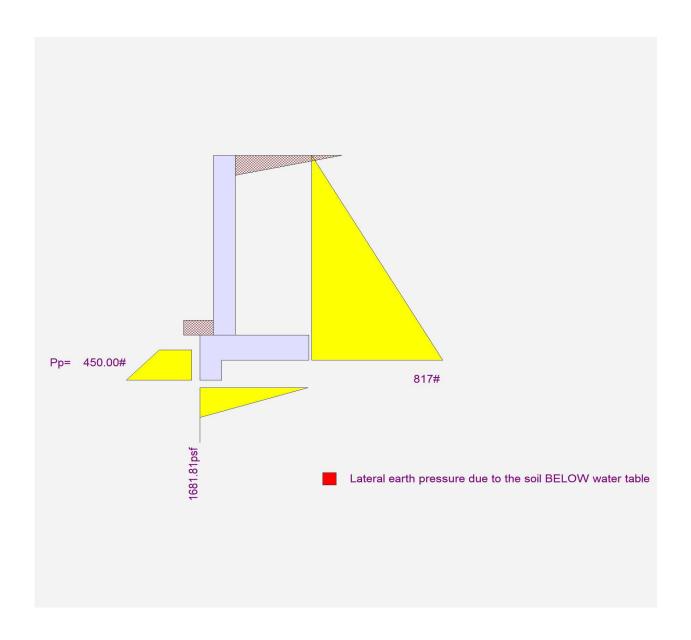
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall



Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall W/ Seismic

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

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

Soil Data

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	4,000.0 psf
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in

Surcharge Loads

Surcharge Over Heel =	0.0 psf
Used To Resist Sliding & C	verturning
Surcharge Over Toe =	0.0
Used for Sliding & Overturn	ing

Axial Load Applied to Stem

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

Earth Pressure Seismic Load

Method: Uniform

Multiplier Used = 6.000
(Multiplier used on soil density)

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Uniform Seismic Force = 41.000 Total Seismic Force = 280.167

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 LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall W/ Seismic

Design Summary		S	Stem Construction	_	Bottom				
			Design Height Above Ftg	 ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=					
Overturning	=	1.95 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.27 Ratio < 1.5	! Thickness	=	8.00	02	0.2	02	0.2
Global Stability	=	2.22	Rebar Size	=	# 4				
•			Rebar Spacing	=	12.00				
Total Bearing Load	=	2,774 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	9.64 in	Design Data		0.508				
Soil Pressure @ Toe		2,139 psf OK	fb/FB + fa/Fa Total Force @ Section	=	0.508				
Soil Pressure @ Heel	=	2,139 psi OK 0 psf OK		lla a					
Allowable	_	4,000 psf	Service Level	lbs =	4.054.0				
Soil Pressure Less			Strength Level MomentActual	lbs =	1,254.0				
ACI Factored @ Toe	=	2,995 psf		ft-#=					
ACI Factored @ Heel	=	0 psf	Strength Level	ft-# =	2,754.0				
Footing Shear @ Toe	=	0.4 psi OK	MomentAllowable	=	5,412.6				
Footing Shear @ Heel	=	11.6 psi OK	ShearActual	_	3,412.0				
Allowable	=	75.0 psi	Service Level	noi –					
			Strength Level	psi =	40.7				
Sliding Calcs			•	psi =	16.7				
Lateral Sliding Force	=	1,013.3 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		450.0 lbs	Anet (Masonry)	in2 =	400.0				
less 100% Friction Force		832.1 lbs	Wall Weight	psf =	100.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.25				
for 1.5 Stability	=	237.8 lbs NG	Masonry Data						
Vertical component of active	e late	ral soil pressure IS	f'm	psi=					
NOT considered in the calcu			Fs	psi =					
		· ·	Solid Grouting	=					
Load Factors			Modular Ratio 'n'	=					
Building Code			Equiv. Solid Thick.	=					
Dead Load		1.200	Masonry Block Type	=					
Live Load		1.600	Masonry Design Method	=	ASD				
Earth, H		1.600	Concrete Data		0.500.0				
Wind, W Seismic, E		1.600 1.000	f'c	psi =	2,500.0				
Seisifiic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall W/ Seismic

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.1032 in2/ft

(4/3) * As: 0.1376 in2/ft Min Stem T&S Reinf Area 1.152 in2

200bd/fy: 200(12)(6.25)/60000: 0.25 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

0.0018bh : 0.0018(12)(8) : 0.1728 in2/ft Horizontal Reinforcing Options :

============ One layer of : Two layers of :

Required Area : 0.1728 in2/ft #4@ 12.50 in #4@ 25.00 in

 Required Area :
 0.1728 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.2 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 0.8467 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	2.92
Total Footing Wid	dth =	3.34
Footing Thicknes	s =	10.00 in
Key Width	=	8.00 in
Key Depth	=	8.00 in
Key Distance from	m Toe =	0.42 ft
f'c = 2,500		
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	=	2,995	0 psf
Mu' : Upward	=	245	663 ft-#
Mu': Downward	=	19	2,666 ft-#
Mu: Design	=	226	2,002 ft-#
phiMn	=	5,863	6,763 ft-#
Actual 1-Way Shear	=	0.40	11.65 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 4 @ 12.00 in	
Heel Reinforcing	=	# 4 @ 12.00 in	
Key Reinforcing	=	# 4 @ 13.89 in	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 0.72 in2
Min footing T&S reinf Area per foot 0.22 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 11.11 in #4@ 22.22 in #5@ 17.22 in #5@ 34.44 in #6@ 24.44 in #6@ 48.89 in

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-06.EC6
(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall W/ Seismic

Summary of Overturning & Resisting Forces & Moments

			ERTURNING					SISTING	
Item		Force lbs	Distance ft	Moment ft-#	_		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water th	d)	817.2	2.28	1,861.3	Soil Over HL (ab. water	tbl)	1,690.0	2.21	3,733.8
HL Act Pres (be water to Hydrostatic Force	,			,	Soil Over HL (bel. water Watre Table	r tbl)		2.21	3,733.8
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 Ster	m =			
Added Lateral Load	=				* Axial Live Load on Stem	n =			
Load @ Stem Above So	il =				Soil Over Toe	=		0.21	
Seismic Earth Load	=	196.1	3.42	670.1	Surcharge Over Toe	=			
	=				Stem Weight(s)	=	600.0	0.75	449.6
					Earth @ Stem Transition	ns=			
Total	=	1,013.3	O.T.M. =	2,531.4	Footing Weight	=	417.0	1.67	695.6
					Key Weight	=	66.7	0.75	50.0
Resisting/Overturnin	_		=	1.95	Vert. Component	=			
Vertical Loads used f	or So	il Pressure :	= 2,773.	7 lbs	Tota	al =	2,773.7 lk	s R.M.=	4,928.9
If seismic is included, th	e OT	M and slidin	g ratios		 * Axial live load NOT inclu resistance, but is include 				r overturning

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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) 0.107 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

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

Project File: Typical Detail Co-04-06.EC6

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall W/ Seismic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

LIC#: KW-06014947, Build:20.22.3.31

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment = 18.72 in Development length for #4 bar specified in this stem design segment = 14.40 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 7.26 in

As Provided = 0.2000 in2/ft

As Required = 0.1728 in2/ft

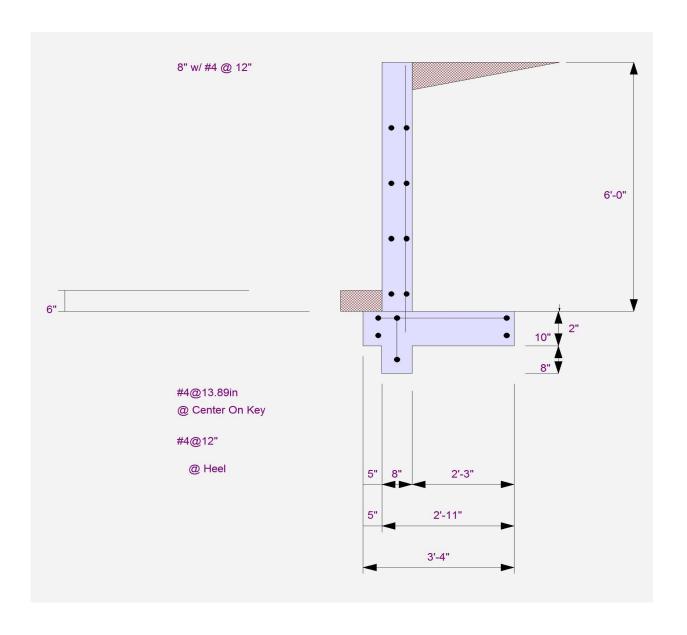
Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall W/ Seismic



Cantilevered Retaining Wall

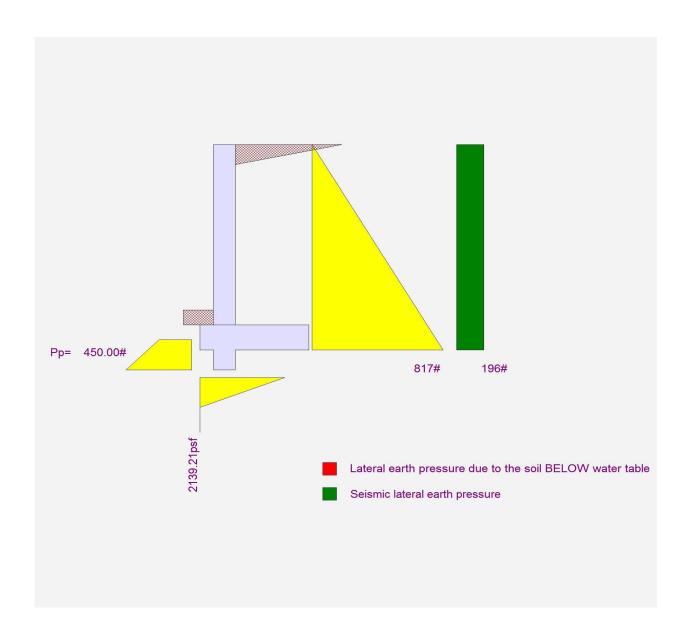
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 6'-0" Retaining Wall W/ Seismic



Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-06.EC6
(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

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

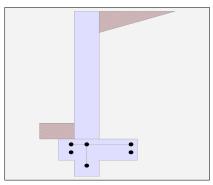
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Soil Data

Allow Soil Bearing Equivalent Fluid Pressure	= Moth	3,000.0 psf
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Sten (Strength Level)	n =	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

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall

			_						
Design Summary			Stem Construction		Bottom				
			Design Height Above Ftg	ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	2.28 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.73 OK	Thickness	=	8.00				
Global Stability	=	2.36	Rebar Size	=	# 4				
			Rebar Spacing	=	18.00				
Total Bearing Load	=	1,160 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	4.69 in	Design Data ————— fb/FB + fa/Fa	=	0.163				
Soil Pressure @ Toe	=	1,186 psf OK	Total Force @ Section	=	0.103				
Soil Pressure @ Heel	_	0 psf OK	Service Level	lbs =					
Allowable	=	3,000 psf	Strength Level	lbs =	448.0				
Soil Pressure Less			MomentActual	105 =	440.0				
ACI Factored @ Toe	=	1,660 psf		ft-# =					
ACI Factored @ Heel	=	0 psf		ft-# =	597.3				
Footing Shear @ Toe	=	1.1 psi OK	MomentAllowable		3,655.6				
Footing Shear @ Heel	=	6.0 psi OK		=	3,000.0				
Allowable	=	75.0 psi	ShearActual Service Level	no:					
				psi =					
Sliding Calcs			Strength Level	psi =	6.0				
Lateral Sliding Force	=	381.1 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		311.1 lbs	` ,	in2 =					
less 100% Friction Force	≡ -	348.1 lbs	Wall Weight	psf =	100.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.25				
for 1.5 Stability	=	0.0 lbs OK	Masonry Data						
Vertical component of active	lator	al coil proceuro IS	f'm						
NOT considered in the calcu			Fs	psi =					
Tro i concidenda in ine calca	iadioii	or con boaring	Solid Grouting	psi = =					
Load Factors			Modular Ratio 'n'	=					
Building Code			Equiv. Solid Thick.	=					
Dead Load		1.200	Masonry Block Type	=					
Live Load		1.600	Masonry Design Method	=	ASD				
Earth, H		1.600	Concrete Data						
Wind, W		1.600	f'c	psi=	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.0224 in2/ft

(4/3) * As: 0.0298 in2/ft Min Stem T&S Reinf Area 0.768 in2

Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft 200bd/fy: 200(12)(6.25)/60000: 0.25 in2/ft

0.0012bh: 0.0012(12)(8): 0.1152 in2/ft Horizontal Reinforcing Options: Two layers of: _____ One layer of : Required Area: 0.1152 in2/ft #4@ 12.50 in #4@ 25.00 in

Provided Area: 0.1333 in2/ft #5@ 19.38 in #5@ 38.75 in Maximum Area: 0.8467 in2/ft #6@ 27.50 in #6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	1.67
Total Footing Wid	dth =	2.09
Footing Thickness	S =	8.00 in
Key Width	=	8.00 in
Key Depth	=	6.00 in
Key Distance from	m Toe =	0.42 ft
f'c = 2,500 Footing Concrete		= 60,000 psi 150.00 pcf
Min. As %		0.0018
Cover @ Top	2.00 @	2 Btm.= 3.00 in
2010. G 10p		, D 0.00 III

Footing Design Results

-			_
		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	1,660	0 psf
Mu': Upward	=	133	94 ft-#
Mu': Downward	=	17	362 ft-#
Mu: Design	=	117	268 ft-#
phiMn	=	4,063	4,963 ft-#
Actual 1-Way Shear	=	1.08	6.04 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#4@12.00 in	
Heel Reinforcing	=	# 4 @ 12.00 in	
Key Reinforcing	=	# 4 @ 13.89 in	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 0.36 in2 Min footing T&S reinf Area per foot in2 /ft 0.17

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 13.89 in #4@ 27.78 in #5@ 21.53 in #5@ 43.06 in #6@ 30.56 in #6@ 61.11 in

Cantilevered Retaining Wall

Project File: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall

Summary of Overturning & Resisting Forces & Moments

Item		Force	ERTURNING Distance ft	Moment ft-#		Force lbs	ESISTING Distance ft	Moment ft-#
HL Act Pres (ab water tb	D)	381.1	1.56	592.8	Soil Over HL (ab. water tbl) 501.7	1.58	794.8
HL Act Pres (be water tb Hydrostatic Force	,	00111		332.3	Soil Over HL (bel. water to Watre Table	1)	1.58	794.8
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 Soi	l =				Soil Over Toe =	=	0.21	
	=				Surcharge Over Toe =	=		
					Stem Weight(s) =	400.0	0.75	299.7
					Earth @ Stem Transitions=	=		
Total	=	381.1	O.T.M. =	592.8	Footing Weight =	208.6	1.04	217.6
					Key Weight =	50.0	0.75	37.5
Resisting/Overturning	g Ratio	0	=	2.28	Vert. Component =	=		
Vertical Loads used for	or Soil	Pressure	= 1,160.3	3 lbs	Total :	= 1,160.3	lbs R.M.=	1,349.6
					* Axial live load NOT include	d in total display	ed, or used fo	r 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) 0.063 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: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment = 18.72 in Development length for #4 bar specified in this stem design segment = 14.40 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 7.26 in

As Provided = 0.1333 in2/ft

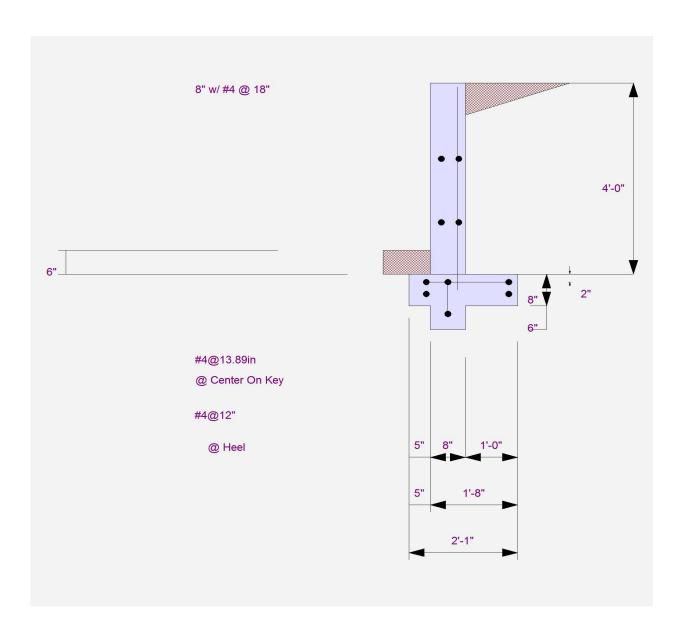
As Required = 0.1152 in2/ft

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall



SWENSON SAY FAGET

Cantilevered Retaining Wall

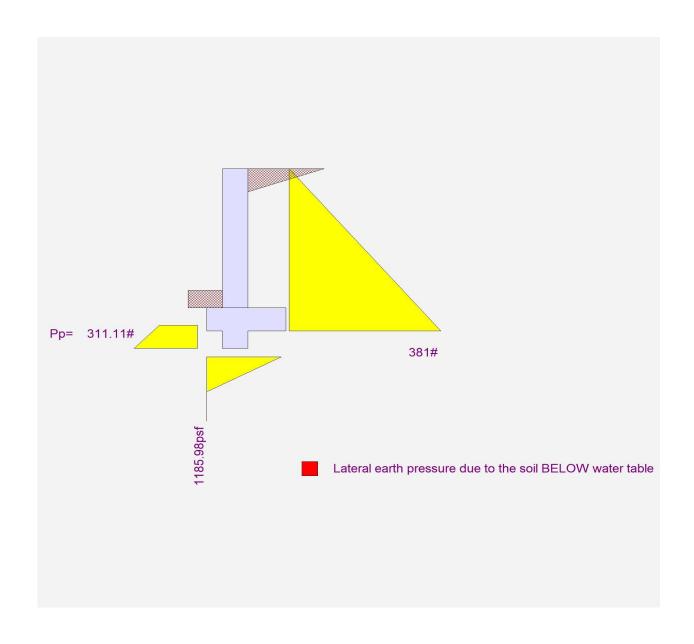
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall



Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall W/ Seismic

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	4,000.0 psf
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
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

Earth Pressure Seismic Load

Method: Uniform

Multiplier Used = 6.000
(Multiplier used on soil density)

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom Load Type	= = =	0.0 #/ft 0.00 ft 0.00 ft Wind (W)
		(Service Level)
Wind on Exposed Stem (Strength Level)) =	0.0 psf

Uniform Seismic Force = 28.000 Total Seismic Force = 130.667

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

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall W/ Seismic

Design Summary			Stem Construction	_	Bottom				
			Design Height Above Ftg	 ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	1.67 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.30 Ratio < 1.5	! Thickness	=	8.00				
Global Stability	=	2.36	Rebar Size	=	# 4				
			Rebar Spacing	=	18.00				
Total Bearing Load	=	1,160 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	6.90 in	Design Data ————— fb/FB + fa/Fa	_	0.224				
Soil Pressure @ Toe	=	1,652 psf OK	Total Force @ Section	=	0.224				
Soil Pressure @ Heel	=	0 psf OK	Service Level	lbs =					
Allowable	=	4,000 psf	Strength Level	lbs =	560.0				
Soil Pressure Less			MomentActual	IDS =	0.00				
ACI Factored @ Toe	=	2,313 psf		ft-# =					
ACI Factored @ Heel	=	0 psf		ft-# =	821.3				
Footing Shear @ Toe	=	1.6 psi OK	MomentAllowable	=	3,655.6				
Footing Shear @ Heel	=	9.7 psi OK		=	3,055.0				
Allowable	=	75.0 psi	ShearActual	:					
			Service Level	psi =					
Sliding Calcs			Strength Level	psi =	7.5				
Lateral Sliding Force	=	472.6 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		266.7 lbs	Anet (Masonry)	in2 =					
less 100% Friction Force	≡ -	348.1 lbs	Wall Weight	psf =	100.0				
Added Force Req'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.25				
for 1.5 Stability	=	94.1 lbs NG	Masanni Data						
Vertical component of active	lotorol	acil proceure IC	Masonry Data f'm						
NOT considered in the calcul			Fs	psi=					
TVO I CONSIDERED IN THE CAICA	iation o	oon bearing	Solid Grouting	psi =					
Load Factors			Modular Ratio 'n'	=					
Building Code			Equiv. Solid Thick.	=					
Dead Load		1.200	Masonry Block Type	=					
Live Load		1.600	Masonry Design Method	=	ASD				
Earth, H		1.600	Concrete Data						
Wind, W		1.600	f'c	psi=	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall W/ Seismic

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.0308 in2/ft

(4/3) * As: 0.041 in2/ft Min Stem T&S Reinf Area 0.768 in2

200bd/fy: 200(12)(6.25)/60000: 0.25 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

 Required Area :
 0.1152 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.1333 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 0.8467 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width	= 0.42 ft
Heel Width	= 1.67
Total Footing Width	= 2.09
Footing Thickness	= 8.00 in
Key Width	= 8.00 in
Key Depth	= 6.00 in
Key Distance from Too	= 0.42 ft
f'c = 2,500 psi Footing Concrete Dens Min. As % Cover @ Top 2.00	sity = 150.00 pcf = 0.0018

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,313	0 psf
Mu': Upward	=	180	9 ft-#
Mu' : Downward	=	17	362 ft-#
Mu: Design	=	163	353 ft-#
phiMn	=	4,063	4,963 ft-#
Actual 1-Way Shear	=	1.56	9.65 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#4@12.00 in	
Heel Reinforcing	=	# 4 @ 12.00 in	
Key Reinforcing	=	# 4 @ 13.89 in	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 0.36 in2
Min footing T&S reinf Area per foot 0.17 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 13.89 in #4@ 27.78 in #5@ 21.53 in #5@ 43.06 in #6@ 30.56 in #6@ 61.11 in

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-06.EC6
(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall W/ Seismic

Summary of Overturning & Resisting Forces & Moments

	OV Force	ERTURNING Distance	 Moment		RE	SISTING Distance	Moment
Item	lbs	ft	ft-#		lbs	ft	ft-#
HL Act Pres (ab water tbl)	381.1	1.56	592.8	Soil Over HL (ab. water tbl)	501.7	1.58	794.8
HL Act Pres (be water tbl) Hydrostatic Force				Soil Over HL (bel. water tbl) Watre Table		1.58	794.8
5	=			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 :	=			Soil Over Toe =		0.21	
Seismic Earth Load	= 91.5	2.33	213.4	Surcharge Over Toe =			
	=			Stem Weight(s) =	400.0	0.75	299.7
_				Earth @ Stem Transitions=			
Total :	= 472.6	O.T.M. =	806.3	Footing Weight =	208.6	1.04	217.6
				Key Weight =	50.0	0.75	37.5
Resisting/Overturning		=	1.67	Vert. Component =			
Vertical Loads used for	Soil Pressure	= 1,160.3	3 lbs	Total =	1,160.3 l	bs R.M.=	1,349.6
If seismic is included, the	OTM and slidir	ng ratios		* Axial live load NOT included resistance, but is included for			r overturning

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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) 0.088 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: Typical Detail Co-04-06.EC6 (c) ENERCALC INC 1983-2022 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall W/ Seismic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment = 18.72 in Development length for #4 bar specified in this stem design segment = 14.40 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 7.26 in As Provided = 0.1333 in2/ft As Required = 0.1152 in2/ft

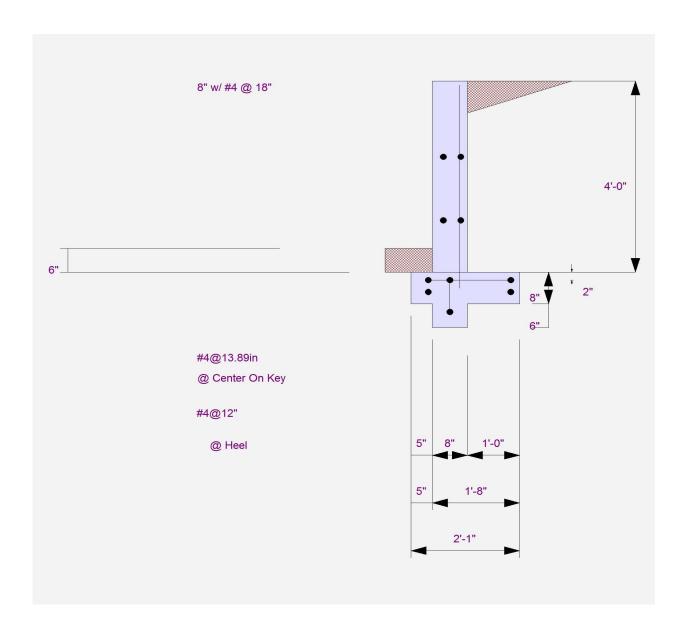
Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall W/ Seismic



Cantilevered Retaining Wall

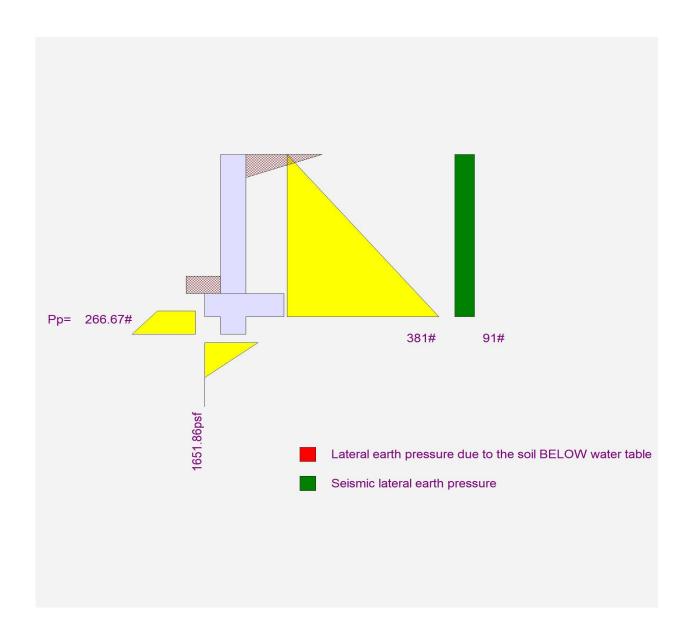
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 4'-0" Retaining Wall W/ Seismic



Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-06.EC6
(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	3.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

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

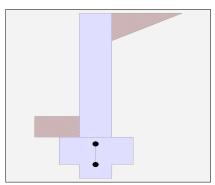
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Soil Data

Allow Soil Bearing Equivalent Fluid Pressure	= Meth	3,000.0 psf
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.300
Soil height to ignore for passive pressure	=	12.00 in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Service 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

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall

Design Summary			Stem Construction	_	Bottom				
			Design Height Above Ftg	_ ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	_				
Overturning	=	2.00 OK	Design Method	=	SD	SD	SD	SD	SD
Sliding	=	1.62 OK	Thickness	=	8.00	-			
Global Stability	=	2.66	Rebar Size	=	# 4				
•			Rebar Spacing	=	18.00				
Total Bearing Load	=	647 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	3.75 in	Design Data						
0.110		000 (0)(fb/FB + fa/Fa	=	0.068				
Soil Pressure @ Toe Soil Pressure @ Heel	=	969 psf OK 0 psf OK	Total Force @ Section						
	=	3,000 psf	Service Level	lbs =					
Allowable Soil Pressure Less	= Than Δ		Strength Level	lbs =	252.0				
ACI Factored @ Toe	=	1,357 psf	MomentActual						
ACI Factored @ Heel	=	0 psf		ft-# =	050.0				
Footing Shear @ Toe	=	0.6 psi OK	g =	ft-# =					
Footing Shear @ Heel	=	3.0 psi OK	MomentAllowable	=	3,655.6				
Allowable	=	75.0 psi	ShearActual						
,		. о.о ро.	Service Level	psi =					
Sliding Calcs			Strength Level	psi=	3.4				
Lateral Sliding Force	=	235.3 lbs	ShearAllowable	psi=	75.0				
less 100% Passive Force	-	187.5 lbs	Anet (Masonry)	in2 =					
less 100% Friction Force	≡ -	194.2 lbs	Wall Weight	psf=	100.0				
Added Force Reg'd	=	0.0 lbs OK	Rebar Depth 'd'	in=	6.25				
for 1.5 Stability	=	0.0 lbs OK	•						
			Masonry Data						
Vertical component of active			f'm	psi=					
NOT considered in the calcu	lation of	f soil bearing	Fs	psi=					
Load Fastons			Solid Grouting	=					
Load Factors Building Code			Modular Ratio 'n'	=					
Dead Load		1.200	Equiv. Solid Thick.	=					
Live Load		1.600	Masonry Block Type	=	400				
Earth, H		1.600	Masonry Design Method	=	ASD				
Wind, W		1.000	Concrete Data	psi=	2,500.0				
Seismic, E		1.000	Fy	psi =	60,000.0				
23.0iiio, E		1.000	· y	P31 –	00,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.0094 in2/ft

(4/3) * As: 0.0126 in2/ft Min Stem T&S Reinf Area 0.576 in2

200bd/fy: 200(12)(6.25)/60000: 0.25 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

0.0012bh : 0.0012(12)(8) : 0.1152 in2/ft Horizontal Reinforcing Options :
=========== One layer of : Two layers of :

Required Area : 0.1152 in2/ft #4@ 12.50 in #4@ 25.00 in

 Required Area :
 0.1152 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.1333 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 0.8467 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft	
Heel Width	=	1.10	
Total Footing Wid	dth =	1.52	
Footing Thicknes	S =	8.00 in	
Key Width	=	8.00 in	
Key Depth	=	4.00 in	
Key Distance from	m Toe =	0.42 ft	
f'c = 2,500 Footing Concrete		150.00 pcf	
Min. As %	=	0.0018	
Cover @ Top	2.00	2 Btm.= 3.00 ii	n

Footing Design Results

			_
		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	1,357	0 psf
Mu' : Upward	=	105	3 ft-#
Mu': Downward	=	17	54 ft-#
Mu: Design	=	88	51 ft-#
phiMn	=	900	900 ft-#
Actual 1-Way Shear	=	0.64	2.98 psi
Allow 1-Way Shear	=	40.00	40.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	# 4 @ 13.89 in	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsion	n, p	hi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 0.26 in2
Min footing T&S reinf Area per foot 0.17 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 13.89 in #4@ 27.78 in #5@ 21.53 in #5@ 43.06 in #6@ 30.56 in #6@ 61.11 in

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall

Summary of Overturning & Resisting Forces & Moments

		OV	ERTURNIN	G		RI	ESISTING	
Item		Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water th	ol)	235.3	1.22	287.6	Soil Over HL (ab. water tbl)	162.5	1.30	211.1
HL Act Pres (be water th	,				Soil Over HL (bel. water tbl)		1.30	211.1
Hydrostatic Force	,				Watre 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 So	il =				Soil Over Toe =		0.21	
	=				Surcharge Over Toe =			
					Stem Weight(s) =	300.0	0.75	224.8
					Earth @ Stem Transitions =			
Total	=	235.3	O.T.M. =	287.6	Footing Weight =	151.6	0.76	114.9
					Key Weight =	33.3	0.75	25.0
Resisting/Overturnin	_		=	2.00	Vert. Component =			
Vertical Loads used t	for Soi	l Pressure	= 647	.4 lbs	Total =	647.4	lbs R.M.=	575.8
					* Axial live load NOT included i	in total display	ed, or used fo	r overturning

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

Project File: Typical Detail Co-04-06.EC6

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) 0.053 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: Typical Detail Co-04-06.EC6 (c) ENERCALC INC 1983-2022 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment = 18.72 in Development length for #4 bar specified in this stem design segment = 14.40 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 7.26 in As Provided = 0.1333 in2/ft As Required = 0.1152 in2/ft

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET **DESCRIPTION:** Retaining Wall Schedule 3'-0" Retaining Wall

8" w/ #4 @ 18"

3'-0"

#4@13.89in
@ Center On Key

Cantilevered Retaining Wall

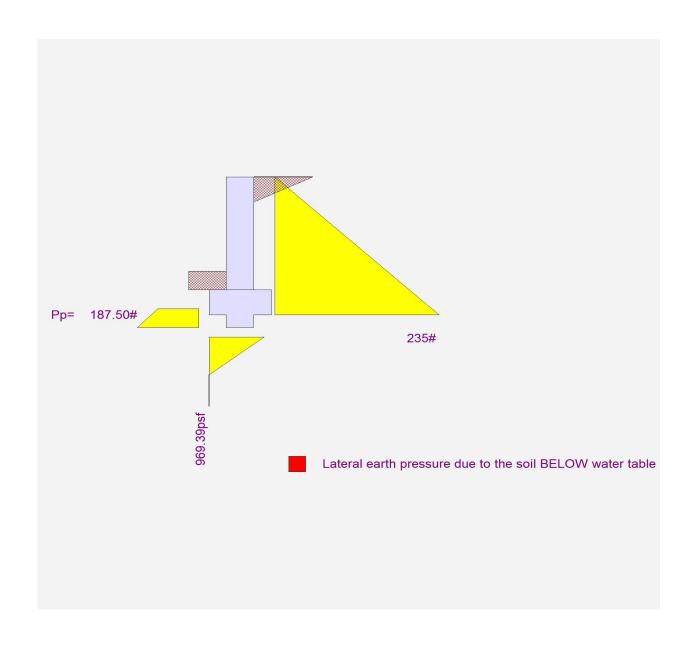
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall



Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall W/Seismic

Project File: Typical Detail Co-04-06.EC6

(c) ENERCALC INC 1983-2022

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	3.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data Allow Soil Be

= Meth	4,000.0 psf
=	35.0 psf/fr
=	
=	300.0 psf/fr
=	125.00 pcf
=	0.00 pcf
=	0.300
=	12.00 in
	Meth = = = =

Surcharge Loads

	0 psf
Used To Resist Sliding & Overturn	ing
Surcharge Over Toe = 0.0	o ¯
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

Earth Pressure Seismic Load

Method: Uniform

Multiplier Used = 6.000
(Multiplier used on soil density)

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem (Strength Level)	=	0.0 psf

Uniform Seismic Force = 22.000 Total Seismic Force = 80.667

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 LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall W/Seismic

Design Summary		S	tem Construction	_	Bottom				
			Design Height Above Ftg	— ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"		Concrete				
Overturning	=	1.44 Ratio < 1.5		_	SD	SD	SD	SD	SD
Sliding	=	1.30 Ratio < 1.5	! Thickness	=	8.00	O.D	O.D	OD	OD
Global Stability	=	2.65	Rebar Size	=	# 4				
,			Rebar Spacing	=	18.00				
Total Bearing Load	=	638 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	5.77 in	Design Data —						
0.115		4.500 (0)(fb/FB + fa/Fa	=	0.096				
Soil Pressure @ Toe Soil Pressure @ Heel	=	1,592 psf OK	Total Force @ Section						
	=	0 psf OK	Service Level	lbs =					
Allowable Soil Pressure Less	= Than	4,000 psf	Strength Level	lbs =	318.0				
ACI Factored @ Toe	=	2,228 psf	MomentActual						
ACI Factored @ Heel	=	0 psf	Service Level	ft-# =					
Footing Shear @ Toe	=	1.1 psi OK	Strength Level	ft-# =	351.0				
Footing Shear @ Heel	_	3.3 psi OK	MomentAllowable	=	3,655.6				
Allowable	=	75.0 psi	ShearActual						
Mowabic	_	70.0 poi	Service Level	psi=					
Sliding Calcs			Strength Level	psi =	4.2				
Lateral Sliding Force	=	291.7 lbs	ShearAllowable	psi =	75.0				
less 100% Passive Force		187.5 lbs	Anet (Masonry)	in2 =					
less 100% Friction Force	≡ -	191.4 lbs	Wall Weight	psf=	100.0				
Added Force Reg'd	=	0.0 lbs OK	Rebar Depth 'd'	in =	6.25				
for 1.5 Stability	=	58.7 lbs NG	1105a. 20p a		0.20				
•			Masonry Data						
Vertical component of active			f'm	psi=					
NOT considered in the calcu	ılation	of soil bearing	Fs	psi=					
			Solid Grouting	=					
Load Factors			Modular Ratio 'n'	=					
Building Code Dead Load		1.200	Equiv. Solid Thick.	=					
Live Load		1.600	Masonry Block Type	=					
Earth, H		1.600	Masonry Design Method	=	ASD				
Wind, W		1.600	Concrete Data	noi -	2 500 0				
Seismic, E		1.000	f'c	psi = psi =	2,500.0 60,000.0				
Jeisiiiic, L		1.000	Fy	psi =	00,000.0				

Project File: Typical Detail Co-04-06.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall W/Seismic

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.0132 in2/ft

(4/3) * As: 0.0175 in2/ft Min Stem T&S Reinf Area 0.576 in2

200bd/fy: 200(12)(6.25)/60000: 0.25 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.192 in2/ft

0.0012bh : 0.0012(12)(8) : 0.1152 in2/ft Horizontal Reinforcing Options : ========= One layer of : Two layers of :

 Required Area :
 0.1152 in2/ft
 #4@ 12.50 in
 #4@ 25.00 in

 Provided Area :
 0.1333 in2/ft
 #5@ 19.38 in
 #5@ 38.75 in

 Maximum Area :
 0.8467 in2/ft
 #6@ 27.50 in
 #6@ 55.00 in

Footing Data

Toe Width	=	0.42 ft
Heel Width	=	1.08
Total Footing Wid	dth =	1.50
Footing Thickness	S =	8.00 in
Key Width	=	8.00 in
Key Depth	=	4.00 in
Key Distance from	n Toe =	0.42 ft
f'c = 2,500 Footing Concrete		150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00 @	2 Btm.= 3.00 in

Footing Design Results

<u>Toe</u>	<u>Heel</u>
2,228	0 psf
159	0 ft-#
17	49 ft-#
143	49 ft-#
900	900 ft-#
1.11	3.27 psi
40.00	40.00 psi
None Spec'd	
None Spec'd	
None Spec'd	
=	0.00 ft-lbs
niTu =	0.00 ft-lbs
	2,228 159 17 143 900 1.11 40.00 None Spec'd None Spec'd

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 0.26 in2
Min footing T&S reinf Area per foot 0.17 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 13.89 in #4@ 27.78 in #5@ 21.53 in #5@ 43.06 in #6@ 30.56 in #6@ 61.11 in

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET Project File: Typical Detail Co-04-06.EC6 (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall W/Seismic

Summary of Overturning & Resisting Forces & Moments

Item		Force lbs	ERTURNING Distance ft	Moment ft-#			Force lbs	ESISTING Distance ft	Moment ft-#
HL Act Pres (ab water tbl	1)	235.3	1.22	287.6	Soil Over HL (ab. wa	ter tbl)	155.0	1.29	199.8
HL Act Pres (be water tbl Hydrostatic Force	,				Soil Over HL (bel. wa Watre Table	ter tbl)		1.29	199.8
Buoyant Force	=				Sloped Soil Over Hee	l =			
Surcharge over Heel	=				Surcharge Over Heel	=			
Surcharge Over Toe	=				Adjacent Footing Load	= b			
Adjacent Footing Load	=				Axial Dead Load on S	item =			
Added Lateral Load	=				* Axial Live Load on St	em =			
Load @ Stem Above Soil	l =				Soil Over Toe	=		0.21	
Seismic Earth Load	=	56.5	1.83	103.5	Surcharge Over Toe	=			
	=				Stem Weight(s)	=	300.0	0.75	224.8
					Earth @ Stem Transit	ions=			
Total	=	291.7	O.T.M. =	391.1	Footing Weight	=	149.6	0.75	111.9
					Key Weight	=	33.3	0.75	25.0
Resisting/Overturning	-		=	1.44	Vert. Component	=			
Vertical Loads used for	or So	I Pressure	= 637.9	9 lbs	T	otal =	637.9	lbs R.M.=	561.5
If seismic is included, the	e OTI	M and slidin	g ratios		* Axial live load NOT in resistance, but is inclu				r overturning

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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) 0.089 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: Typical Detail Co-04-06.EC6 LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall W/Seismic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #4 bar specified in this stem design segment = 18.72 in Development length for #4 bar specified in this stem design segment = 14.40 in

Hooked embedment length into footing for #4 bar specified in this stem design segment = 7.26 in As Provided = 0.1333 in2/ft As Required = 0.1152 in2/ft

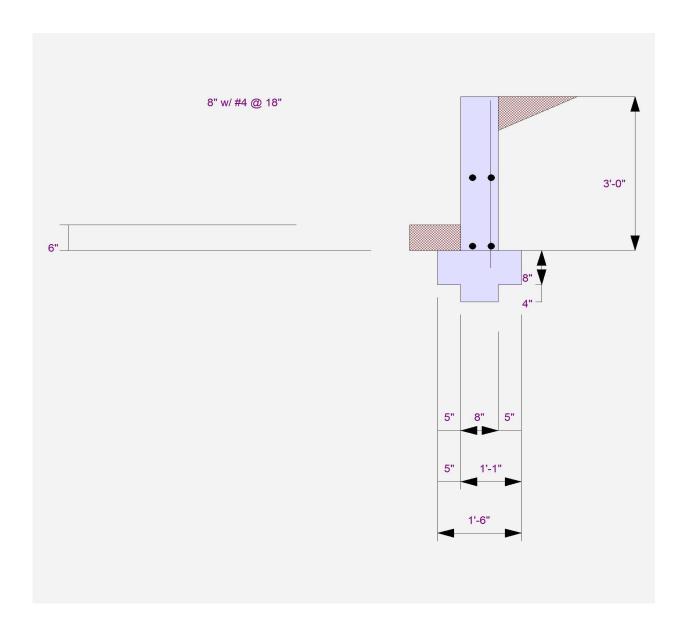
Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-06.EC6

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall W/Seismic



Cantilevered Retaining Wall

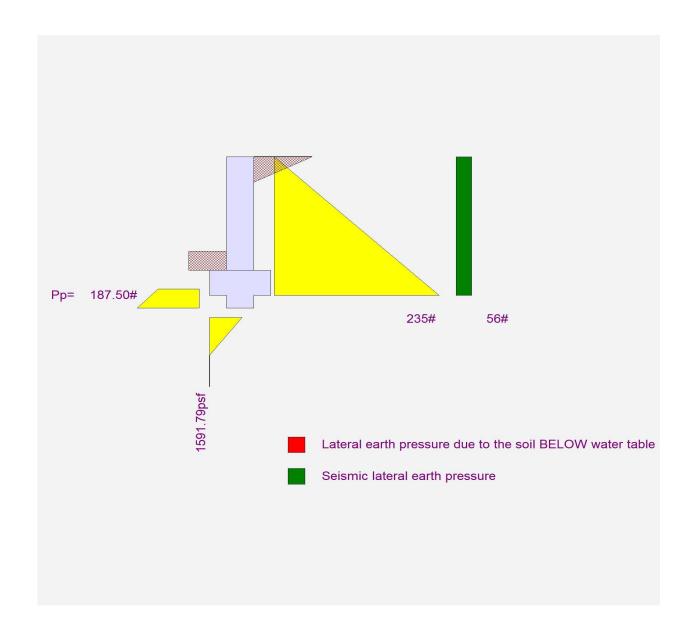
Project File: Typical Detail Co-04-06.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 3'-0" Retaining Wall W/Seismic



Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-07.EC6

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	12.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Surcharge Loads

Surcharge Over Heel = 250.0 psf Used To Resist Sliding & Overturning Surcharge Over Toe = 0.0 Used for Sliding & Overturning

Axial Load Applied to Stem

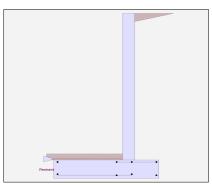
Axial Dead Load	=	0.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Soil Data

Allow Soil Bearing Equivalent Fluid Pressure	=	3,000.0 psf
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing Soil Friction	=	0.450
Soil height to ignore for passive pressure	=	12.00 in

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
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		Spread Footing
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Project File: Typical Detail Co-04-07.EC6

Cantilevered Retaining Wall LIC#: KW-06014947, Build:20.22.3.31

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic

Design Summary			Stem Construction		Bottom				
			Design Height Above Ftg	 ft =	Stem OK 0.00				
Wall Stability Ratios			Wall Material Above "Ht"	=	Concrete				
Overturning	=	1.56 OK	Design Method	=	SD	SD	SD	SD	SD
Slab Resists	s All :	Sliding!	Thickness	=	10.00				
Global Stability	=	1.47	Rebar Size	=	# 7				
•			Rebar Spacing	=	8.00				
Total Bearing Load	=	6,048 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	20.39 in	Design Data ————						
0 11 0 0 7		0.004 (.014	fb/FB + fa/Fa	=	0.918				
Soil Pressure @ Toe Soil Pressure @ Heel	=	2,094 psf OK	· · · · · · · · · · · · · · · · · · ·						
	=	0 psf OK	OCIVICO ECVCI	lbs =					
Allowable Soil Pressure Less	= Than	3,000 psf	3	lbs =	5,376.0				
ACI Factored @ Toe	=	2,931 psf	MomentActual						
ACI Factored @ Heel	=	0 psf		ft-# =					
Footing Shear @ Toe	=	33.8 psi OK	- · · · · ·	ft-# =	24,192.0				
Footing Shear @ Heel	=	22.1 psi OK	womentAllowable	=	26,327.0				
Allowable	_	75.0 psi	ShearActual						
Allowabic	_	70.0 psi	Service Level	psi =					
Sliding Calcs			Strength Level	psi=	59.2				
Lateral Sliding Force	=	4,134.4 lbs	ShearAllowable	psi=	75.0				
3	_	.,	Anet (Masonry)	in2 =					
			Wall Weight	psf=	125.0				
			Rebar Depth 'd'	in=	7.56				
			. 1020. 20p u						
			Masonry Data						
Vertical component of active				psi=					
NOT considered in the calcu	ılatior	n of soil bearing	Fs	psi=					
			Solid Grouting	=					
Load Factors			Modular Ratio 'n'	=					
Building Code Dead Load		1.200	Equiv. Solid Thick.	=					
Live Load		1.600	Masonry Block Type	=					
Earth, H		1.600	Masonry Design Method	=	ASD				
Wind, W		1.000	Concrete Data	noi -	2 500 0				
Seismic, E		1.000	f'c	psi = psi =	2,500.0 60,000.0				
Ocialillo, L		1.000	Fy	h2i =	00,000.0				

Project File: Typical Detail Co-04-07.EC6

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.7422 in2/ft

(4/3) * As: 0.9895 in2/ft Min Stem T&S Reinf Area 2.880 in2

200bd/fy: 200(12)(7.5625)/60000: 0.3025 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.240 in2/ft

 Required Area :
 0.7422 in2/ft
 #4@ 10.00 in
 #4@ 20.00 in

 Provided Area :
 0.9 in2/ft
 #5@ 15.50 in
 #5@ 31.00 in

 Maximum Area :
 1.0245 in2/ft
 #6@ 22.00 in
 #6@ 44.00 in

Footing Data

Toe Width	=	4.75 ft
Heel Width	=	2.50
Total Footing Width	=	7.25
Footing Thickness	=	18.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi Fy Footing Concrete Density Min. As %	y = =	60,000 psi 150.00 pcf 0.0018
Cover @ Top 2.00	@	Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	2,931	0 psf
Mu': Upward	=	24,004	1 ft-#
Mu' : Downward	=	3,892	3,431 ft-#
Mu: Design	=	20,112	3,430 ft-#
phiMn	=	54,690	29,913 ft-#
Actual 1-Way Shear	=	33.84	22.08 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#7 @ 8.00 in	
Heel Reinforcing	=	#6@12.00 in	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	ohi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 2.82 in2
Min footing T&S reinf Area per foot 0.39 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 6.17 in #4@ 12.35 in #5@ 9.57 in #5@ 19.14 in #6@ 13.58 in #6@ 27.16 in

Cantilevered Retaining Wall

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

Project File: Typical Detail Co-04-07.EC6
(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic

Summary of Overturning & Resisting Forces & Moments

	0\	/ERTURNING			RE	SISTING	
Item	Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tbl)	3,189.4	4.50	14,352.2	Soil Over HL (ab. water tbl)	2,500.0	6.42	16,041.7
HL Act Pres (be water tbl) Hydrostatic Force	-,		,	Soil Over HL (bel. water tbl) Watre Table		6.42	16,041.7
D	=			Sloped Soil Over Heel =			
	= 945.0	6.75	6,378.8	Surcharge Over Heel =	416.7	6.42	2,673.6
	=	00	0,0.0.0	Adjacent Footing Load =			
	=			Axial Dead Load on Stem =			
	=			* Axial Live Load on Stem =			
Load @ Stem Above Soil	=			Soil Over Toe =		2.38	
	=			Surcharge Over Toe =			
	_			Stem Weight(s) =	1,500.0	5.17	7,750.0
_				Earth @ Stem Transitions =			
Total	= 4,134.4	O.T.M. =	20,730.9	Footing Weight =	1,631.3	3.63	5,913.3
				Key Weight =			
Resisting/Overturning	Ratio	=	1.56	Vert. Component =			
Vertical Loads used for	Soil Pressure	= 6,047.9	9 lbs	Total =	6,047.9 I	bs R.M.=	32,378.6
				* Axial live load NOT included in	n total display	ed, or used for	r overturning

^{*} 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) 0.096 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.

Project File: Typical Detail Co-04-07.EC6

0.9000 in2/ft

0.7422 in2/ft

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

As Provided =

As Required =

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #7 bar specified in this stem design segment = 40.95 in

Development length for #7 bar specified in this stem design segment = 31.50 in

Hooked embedment length into footing for #7 bar specified in this stem design segment = 12.12 in

Cantilevered Retaining Wall

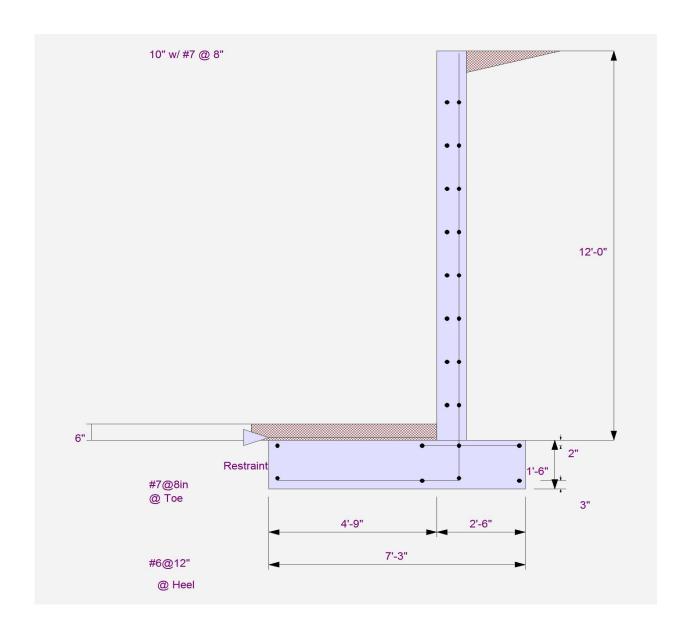
Project File: Typical Detail Co-04-07.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic



Cantilevered Retaining Wall

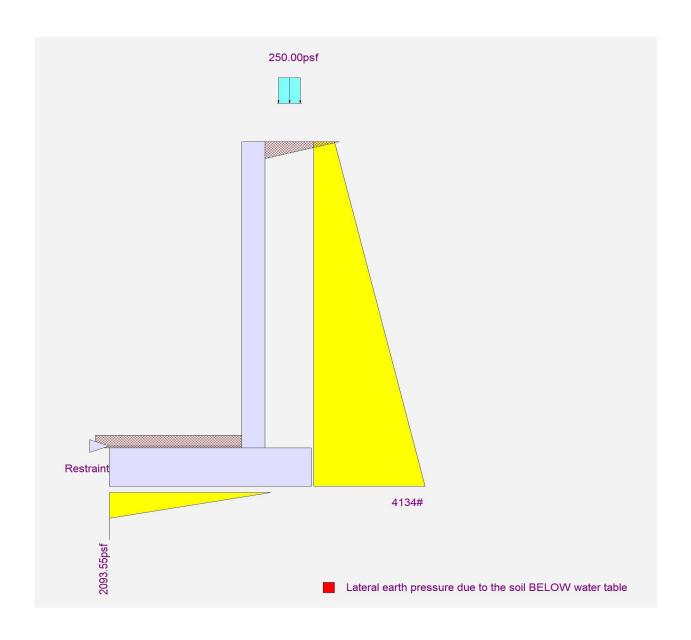
Project File: Typical Detail Co-04-07.EC6

LIC#: KW-06014947, Build:20.22.3.31

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic



Cantilevered Retaining Wall

Project File: Typical Detail Co-04-07.EC6

LIC# : KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic and Seismic

Code Reference:

Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	12.00 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	6.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	4,000.0	psf
Equivalent Fluid Pressure Active Heel Pressure	ivietn =		psf/ft
	=		
Passive Pressure	=	300.0	psf/ft
Soil Density, Heel	=	125.00	pcf
Soil Density, Toe	=	0.00	pcf
Footing Soil Friction	=	0.450	
Soil height to ignore			
for passive pressure	=	12.00	in

Restrance

Surcharge Loads

Surcharge Over Heel = 250.0 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

Earth Pressure Seismic Load

Method: Uniform

Multiplier Used = 6.000
(Multiplier used on soil density)

Lateral Load Applied to Stem

Lateral Load Height to Top Height to Bottom	= = =	0.0 #/ft 0.00 ft 0.00 ft
Load Type	=	Wind (W) (Service Level)
Wind on Exposed Stem	' =	0.0 psf

Uniform Seismic Force = 81.000 Total Seismic Force = 1,093.500

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 LIC#: KW-06014947, Build:20.22.3.31

Project File: Typical Detail Co-04-07.EC6 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic and Seismic

Design Summary		5	Stem Construction	_	Bottom				
Wall Stability Ratios			Design Height Above Ftg Wall Material Above "Ht"	 ft = =	Ratio > 1.0 0.00 Concrete				
Overturning	=	1.25 Ratio < 1.5		=	SD	SD	SD	SD	SD
Slab Resist	s All	Sliding!	Thickness	_	10.00	OB	OB	OB	OD
Global Stability	=	1.47	Rebar Size	=	# 7				
Clobal Glability			Rebar Spacing	=	8.00				
Total Bearing Load	=	6.048 lbs	Rebar Placed at	=	Edge				
resultant ecc.	=	30.64 in	Design Data						
			fb/FB + fa/Fa	=	1.140				
Soil Pressure @ Toe	=	3,763 psf OK	Total Force @ Section						
Soil Pressure @ Heel	=	0 psf OK	Service Level	lbs =					
Allowable Soil Pressure Less	= Tho	4,000 psf	Strength Level	lbs =	6,348.0				
ACI Factored @ Toe	= =	5,268 psf	MomentActual						
ACI Factored @ Heel	=	0 psf	Service Level	ft-# =					
Footing Shear @ Toe	=	41.1 psi OK	Strength Level	ft-# =	30,024.0				
Footing Shear @ Heel	_	22.1 psi OK	MomentAllowable	=	26,327.0				
Allowable	=	75.0 psi	ShearActual						
Allowable	_	70.0 psi	Service Level	psi =					
Sliding Calcs			Strength Level	psi=	70.0				
Lateral Sliding Force	=	4.899.8 lbs	ShearAllowable	psi =	75.0				
3		.,	Anet (Masonry)	in2 =					
			Wall Weight	psf=	125.0				
			Rebar Depth 'd'	in =	7.56				
			Masonry Data						
Vertical component of active			f'm	psi=					
NOT considered in the calcu	ulatio	n of soil bearing	Fs	psi =					
			Solid Grouting	=					
Load Factors			Modular Ratio 'n'	=					
Building Code Dead Load		1.200	Equiv. Solid Thick.	=					
Live Load		1.200	Masonry Block Type	=					
Earth, H		1.600	Masonry Design Method	=	ASD				
•		1.000	Concrete Data	:	0.500.0				
Wind, W Seismic, E		1.000	f'c	psi =	2,500.0				
Seisifiic, E		1.000	Fy	psi =	60,000.0				

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Cantilevered Retaining Wall

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DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic and Seismic

Concrete Stem Rebar Area Details

Bottom Stem Vertical Reinforcing Horizontal Reinforcing

As (based on applied moment): 0.9211 in2/ft

(4/3) * As: 1.2281 in2/ft Min Stem T&S Reinf Area 2.880 in2

200bd/fy: 200(12)(7.5625)/60000: 0.3025 in2/ft Min Stem T&S Reinf Area per ft of stem Height: 0.240 in2/ft

 0.0018bh : 0.0018(12)(10) :
 0.216 in2/ft
 Horizontal Reinforcing Options :

 Sequired Area :
 0.9211 in2/ft
 H4@ 10.00 in
 #4@ 20.00 in

 Required Area :
 0.9211 in2/ft
 #4@ 10.00 in
 #4@ 20.00 in

 Required Area :
 0.9211 in2/ft
 #4@ 10.00 in
 #4@ 20.00 in

 Provided Area :
 0.9 in2/ft
 #5@ 15.50 in
 #5@ 31.00 in

 Maximum Area :
 1.0245 in2/ft
 #6@ 22.00 in
 #6@ 44.00 in

Footing Data

Toe Width	=	4.75 ft
Heel Width	=	2.50
Total Footing Wid	dth =	7.25
Footing Thickness	S =	18.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from	n Toe =	0.00 ft
f'c = 2,500		
Footing Concrete	Density =	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00 @	Btm.= 3.00 in

Footing Design Results

		Toe	<u>Heel</u>
Factored Pressure	=	5,268	0 psf
Mu': Upward	=	31,145	0 ft-#
Mu' : Downward	=	3,892	3,431 ft-#
Mu: Design	=	27,253	3,431 ft-#
phiMn	=	54,690	29,913 ft-#
Actual 1-Way Shear	=	41.13	22.13 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	#7 @ 8.00 in	
Heel Reinforcing	=	#6@12.00 in	
Key Reinforcing	=	None Spec'd	
Footing Torsion, Tu		=	0.00 ft-lbs
Footing Allow. Torsio	n, p	hi Tu =	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: Heel: Key:

Min footing T&S reinf Area 2.82 in2
Min footing T&S reinf Area per foot 0.39 in2 /ft

If one layer of horizontal bars: If two layers of horizontal bars:

#4@ 6.17 in #4@ 12.35 in #5@ 9.57 in #5@ 19.14 in #6@ 13.58 in #6@ 27.16 in

Cantilevered Retaining Wall

LIC#: KW-06014947, Build:20.22.3.31 SWENSON SAY FAGET (c) ENERCALC INC 1983-2022

Project File: Typical Detail Co-04-07.EC6

DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic and Seismic

Summary of Overturning & Resisting Forces & Moments

OVERTURNING				R	RESISTING			
Item		Force lbs	Distance ft	Moment ft-#		Force lbs	Distance ft	Moment ft-#
HL Act Pres (ab water tb	I)	3,189.4	4.50	14,352.2	Soil Over HL (ab. water th	2,500.0	6.42	16,041.7
HL Act Pres (be water tb Hydrostatic Force	,	•		,	Soil Over HL (bel. water the Watre Table	ol)	6.42	16,041.7
Buoyant Force	=				Sloped Soil Over Heel	=		
Surcharge over Heel Surcharge Over Toe	=	945.0	6.75	6,378.8		= 416.7 =	6.42	2,673.6
Adjacent Footing Load	=				Axial Dead Load on Stem	=		
Added Lateral Load	=				* Axial Live Load on Stem	=		
Load @ Stem Above Soi	il =					=	2.38	
Seismic Earth Load	=	765.5	6.75	5,166.8	Surcharge Over Toe	=		
	=				Stem Weight(s)	= 1,500.0	5.17	7,750.0
					Earth @ Stem Transitions	=		
Total	=	4,899.8	O.T.M. =	25,897.7	Footing Weight	= 1,631.3	3.63	5,913.3
					Key Weight	=		
Resisting/Overturning	g Rat	io	=	1.25	Vert. Component	=		
Vertical Loads used f	or So	il Pressure	= 6,047.9) lbs	Total	= 6,047.9	lbs R.M.=	32,378.6
If seismic is included, th	e OT	M and slidir	ng ratios		* Axial live load NOT include resistance, but is included	ed in total display	ed, or used fo	r overturning

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

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) 0.173 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: Typical Detail Co-04-07.EC6

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DESCRIPTION: Retaining Wall Schedule 12'-0" Retaining Wall w/ Slab and Traffic and Seismic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #7 bar specified in this stem design segment = 40.95 in

Development length for #7 bar specified in this stem design segment = 31.50 in

Hooked embedment length into footing for #7 bar specified in this stem design segment = 14.70 in

As Provided = 0.9000 in2/ft

As Required = 0.9211 in2/ft

Cantilevered Retaining Wall

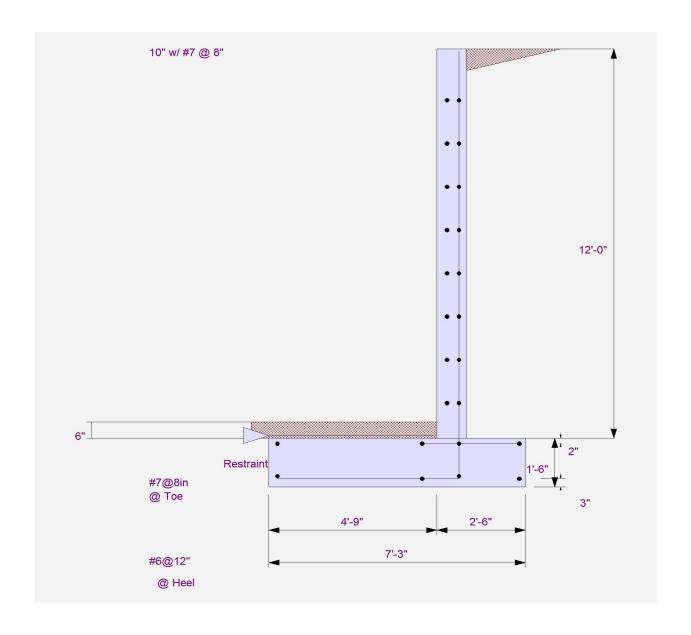
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Cantilevered Retaining Wall

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