

Structural Calculations For:

LBH Residence West Site Walls

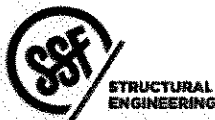
**7450 North Mercer Way
Mercer Island, WA**

**Architect: Stillwell Hanson Architects
46 Etruria Street, Suite 200
Seattle, WA 98109**

March 9, 2022



Project # 00834-2018-08



2124 Third Avenue. Ste. 100
Seattle, WA 98121 T 206. 443. 6212 F 206. 443.4870

Criteria Sheet

Codes

Structural IBC 2018
 Loading ASCE 7-16
 Wood: NDS 2018
 Steel: AISC 360-16
 Concrete: ACI 318-14
 Masonry: TMS 402/602-16

Project Location

Street & Number 7450 north Mercer Way
 City: Mercer Island State: WA
 ZIP: 98040
 Latitude: 47.5919 N
 Longitude: -122.2383 W
 Ground Elevation 38 ft

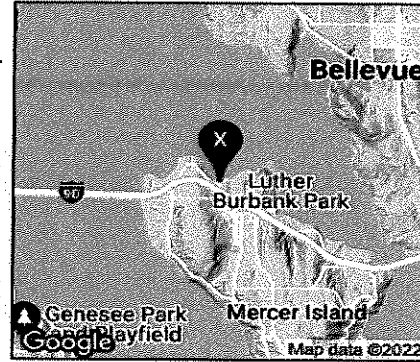
Occupancy Category

Risk Category: II ASCE 7 Table 1.5-1

Seismic Load Summary:

Analysis Procedure: Equivalent Lateral Force Procedure
 Lateral System: Ground Supported cantilever Wall or Fence

R: 2.50	C _a = 1.25
Base Shear V = 0 kips	Ω _o = 2
S _s = 1.384	S _i = 0.482
S _{DS} = 1.00	S _{D1} = 0.58
C _s = 0.400	I _e = 1.0



*E^u CORRECTION
 V_s = 150(2/10)(1.4) = 40 ft/s*

Live Loads:

Deck	60	psf
Floor	40	psf

Snow Loading Criteria:

Ground Snow, p _g	20	psf	Flat Roof Snow Load, p _f	25.0	psf
Exposure Factor, C _e	1.00		Sloped Roof Snow Load, p _s	25.0	psf
Thermal Factor, C _t	1.00				
Importance Factor, I _s	1.00				
Slope Factor, C _s	1.00				

Soils: Soils Report Provided? No To be approved by the authority having jurisdiction, per 11.8.2 exception.

Allowable Bearing	2000	psf	Active	55/35	pcf (Restrained/Unrestrained)
Sliding, μ	0.3		Seismic Surcharge	8H	
Passive	250	pcf			



STRUCTURAL
ENGINEERING

Kell 6' site wall _____
 Criteria _____

DATE 3/9/2022
 PROJ. # 00834-2018-08
 DESIGN KMR
 SHEET 2

SEATTLE TACOMA
 2724 Third Ave, Suite 100, Seattle, WA 98121 | ☎ 206.443.6212
 324 Broadway, Suite 100, Tacoma, WA 98402 | ☎ 253.284.3470
 sseengineers.com
 SWENSON SAY FAGET

Seismic Design

ASCE 7-16 Seismic Analysis Equivalent Lateral Force Procedure

Seismic Force Resisting System Per Table 12.2-1	System	Non Building Structure
	Type:	Ground Supported cantilever Wall or Fence

Seismic Design Cat.	D
Risk Category	II
Site Class	D (Default)
Diaphragm Flexibility	Flexible

i, II, or III, or IV per Table 1.5-1
Assumed default soil properties, per 11.4.3.

Section 12.8.1.3 Exceptions

Regular Structure	0
≤ 5 Stories above grade	Yes
$T \leq 0.5s$	Yes
$\rho = 1.0$	Yes
Not Site Class E or F	Yes
Risk Category I or II	Yes

If all exceptions are met, S_{DS} may be taken as 1, but not less than $0.7 \cdot (\text{Calculated } S_{DS})$

S_s	1.384 g	2% in 50 yr, Latitude & Longitude lookup
S_1	0.482 g	2% in 50 yr, Latitude & Longitude lookup
R	2.50	
C_d	1.3	
Ω_o	2	
I_e	1.00	Table 1.5-2
h_n	35.0 ft	
C_t	0.02	Table 12.8-2
x	0.75	Table 12.8-2
T_a	0.29 sec	
T	0.29 sec	Eq. 12.8-7
T_o	0.12 sec	
T_s	0.58 sec	
T_L	6.00 sec	
F_a	1.20	Table 11.4-1
F_v	1.82	Table 11.4-2
S_{MS}	1.66 g	Eq. 11.4-1
S_{M1}	0.88 g	Eq. 11.4-2
S_{DS}	1.000 g	Eq. 11.4-3
S_{D1}	0.584 g	Eq. 11.4-4
C_s	0.400 Controls	Eq. 12.8-2
	0.812	Eq. 12.8-3 need not exceed, $T < T_L$
	0.010	Eq. 12.8-5 or 12.8-6 minimum
C_s , design	0.400	Section 11.4.8 Exception 2 Applied
ρ	1.0	
C_{sasd}	0.280	

Building Period Per Alternate Analysis

T (sec)	
---------	--

Per Geotech Report

F_a	
F_v	

$$T_a = C_t h_n^x \quad \text{Eq. 12.8.7}$$

$$S_{MS} = F_a S_s \quad \text{Eq. 11.4-1}$$

$$S_{M1} = F_v S_1 \quad \text{Eq. 11.4-2}$$

$$S_{DS} = 2/3 S_{MS} \quad \text{Eq. 11.4-3}$$

$$S_{D1} = 2/3 S_{M1} \quad \text{Eq. 11.4-4}$$

$$C_s = \frac{S_{DS}}{(R/I_e)} \quad \text{Eq. 12.8-2}$$

$$C_s = \frac{S_{D1}}{T(R/I_e)} \quad \text{Eq. 12.8-3}$$

$$C_s = \frac{S_{D1} T_L}{T^2 (R/I_e)} \quad \text{Eq. 12.8-4}$$

$$C_s \geq 0.044 S_{DS} I_e \quad \text{Eq. 12.8-5}$$

$$C_s \geq 0.01 \quad \text{Eq. 12.8-5}$$

$$C_{VX} = w_x h_x^k / \sum_{i=1}^n w_x h_i^k \quad \text{Eq. 12.8-12}$$

$$F_{px} = \sum_{i=x}^n F_i / \sum_{i=x}^n w_i w_{px} \quad \text{Eq. 12.10-1}$$

$$F_{px} \geq 0.2 S_{DS} I_e w_{px} \quad \text{Eq. 12.10-2}$$

SEATTLE 2124 Third Ave, Suite 100, Seattle, WA 98121 | ☎ 206.443.6212
TACOMA 934 Broadway, Suite 100, Tacoma, WA 98402 | ☎ 253.284.9470

SEATTLE
TACOMA

seafengineers.com

SWENSON SAY FAGET



Kell 6' site wall _____
Seismic Criteria _____

DATE 3/9/2022
PROJ. # 00834-2018-08
DESIGN KMR
SHEET 3

Use menu item Settings > Printing & Title Block to set these five lines of information for your program.

Project Name/Number : 6' above grad

Title :
Dsgnr:
Description....

Page : 1
Date: 9 MAR 2022

This Wall in File: K:\2018\00834-2018-08 Kell Residence (LBH)\CA\rear site walls\20220308 revisions\6

RetainPro (c) 1987-2019, Build 11.20.03.31
License : KW-06052576
License To : SWENSON SAY FAGET

Cantilevered Retaining Wall

Code: IBC 2012, ACI 318-11, ACI 530-11

CCMU

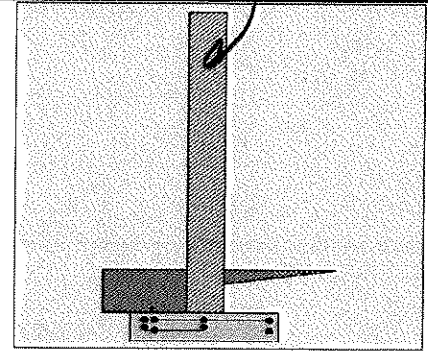
Criteria

Retained Height = 1.00 ft
Wall height above soil = 6.00 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 12.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 2,000.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 32.0 psf/ft

Passive Pressure = 250.0 psf/ft
Soil Density, Heel = 110.00 pcf
Soil Density, Toe = 0.00 pcf
Footings|Soil Friction = 0.400
Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load = 40.0 #/ft
...Height to Top = 7.00 ft
...Height to Bottom = 0.00 ft
Load Type = Seismic (E)
(Strength Level)
Wind on Exposed Stem = 0.0 psf
(Service Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios

Overtuning = 1.57 OK
Sliding = 2.46 OK

Total Bearing Load = 923 lbs
...resultant ecc. = 9.75 in

Soil Pressure @ Toe = 1,178 psf OK
Soil Pressure @ Heel = 0 psf OK
Allowable = 2,000 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,650 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 15.3 psi OK
Footing Shear @ Heel = 3.8 psi OK
Allowable = 75.0 psi

Sliding Calcs

Lateral Sliding Force = 240.4 lbs
less 100% Passive Force = - 222.2 lbs
less 100% Friction Force = - 369.3 lbs
Added Force Req'd = 0.0 lbs OK
...for 1.5 Stability = 0.0 lbs OK

Stem Construction

Design Height Above Ftg ft = 0.00
Wall Material Above "Ht" = Masonry
Design Method = ASD
Thickness = 8.00
Rebar Size = # 4
Rebar Spacing = 16.00
Rebar Placed at = Center

Design Data

fb/FB + fa/Fa = 0.823

Total Force @ Section

Service Level lbs = 212.0
Strength Level lbs = 305.6

Moment....Actual

Service Level ft-# = 691.3
Strength Level ft-# = 988.5

Moment....Allowable

= 839.5

Shear....Actual

Service Level psi = 2.3
Strength Level psi = 6.4

Shear....Allowable

psi = 45.4

Anet (Masonry)

in2 = 91.50

Rebar Depth 'd'

in = 3.75

Masonry Data

f_m psi = 1,500
F_s psi = 20,000
Solid Grouting = Yes
Modular Ratio 'n' = 21.48
Wall Weight psf = 78.0
Short Term Factor = 1.000
Equiv. Solid Thick. in = 7.60
Masonry Block Type = Medium Weight
Masonry Design Method = ASD

Concrete Data

f_c psi =
F_y psi =

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

Load Factors

Building Code IBC 2012, ACI
Dead Load 1.200
Live Load 1.600
Earth, H 1.600
Wind, W 1.000
Seismic, E 1.000

9

Use menu item Settings > Printing & Title Block to set these five lines of information for your program.

Project Name/Number : 6' above grad
 Title :
 Dsgnr:
 Description....

Page : 2
 Date: 9 MAR 2022

This Wall in File: K:\2018\00834-2018-08 Kell Residence (LBH)\CA\rear site walls\20220308 revsions\6

RetainPro (c) 1987-2019, Build 11.20.03.31
 License : KW-06052576
 License To : SWENSON SAY FAGET

Cantilevered Retaining Wall

Code: IBC 2012, ACI 318-11, ACI 530-11

Footing Data

Toe Width = 1.00 ft
 Heel Width = 1.67
 Total Footing Width = 2.67
 Footing Thickness = 8.00 in
 Key Width = 0.00 in
 Key Depth = 0.00 in
 Key Distance from Toe = 0.00 ft
 f_c = 2,500 psi F_y = 60,000 psi
 Footing Concrete Density = 150.00 pcf
 Min. As % = 0.0018
 Cover @ Top 2.00 @ Btm. = 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,650	0 psf
Mu' : Upward	= 7,793	0 ft-#
Mu' : Downward	= 2,016	169 ft-#
Mu: Design	= 481	169 ft-#
Actual 1-Way Shear	= 15.32	3.83 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 4 @ 12.00 in	
Heel Reinforcing	= # 4 @ 12.00 in	
Key Reinforcing	= None Spec'd	
Footing Torsion, Tu	=	0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 13.88 in, #5@ 21.52 in, #6@ 30.55 in, #7@ 41.66 in, #8@ 54.86 in, #9@ 6
 Heel: #4@ 13.88 in, #5@ 21.52 in, #6@ 30.55 in, #7@ 41.66 in, #8@ 54.86 in, #9@ 6
 Key: No key defined

Min footing T&S reinf Area 0.46 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

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	44.4	0.56	24.7	Soil Over HL (ab. water tbl)	110.4	2.17	239.3
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.17	239.3
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Hee =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =	196.0	4.17	816.7	* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =		0.50	
				Surcharge Over Toe =			
Total	= 240.4	O.T.M. =	841.4	Stem Weight(s) =	546.0	1.33	728.0
				Earth @ Stem Transitions =			
				Footing Weight =	267.0	1.34	356.4
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 1.57		Total =	923.4 lbs	R.M. =	1,323.8
Vertical Loads used for Soil Pressure =		923.4 lbs					

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

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

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

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 6' above grad

Title :
Dsgnr:
Description....

Page : 3
Date: 9 MAR 2022

This Wall in File: K:\2018\00834-2018-08 Kell Residence (LBH)\CA\rear site walls\20220308 revsions\6

RetainPro (c) 1987-2019, Build 11.20.03.31
License : KW-06052576
License To : SWENSON SAY FAGET

Cantilevered Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

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) 0.086 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.

6

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 6' above grad

Title :
Dsgnr :
Description....

Page : 1
Date: 9 MAR 2022

9" corr. wall

This Wall in File: k:\2018\00834-2018-08 kell residence (lbh)\ca\rear site walls\20220308 revisions\6

RetainPro (c) 1987-2019, Build 11.20.03.31
License : KW-06052576
License To : SWENSON SAY FAGET

Cantilevered Retaining Wall

Code: IBC 2012, ACI 318-11, ACI 530-11

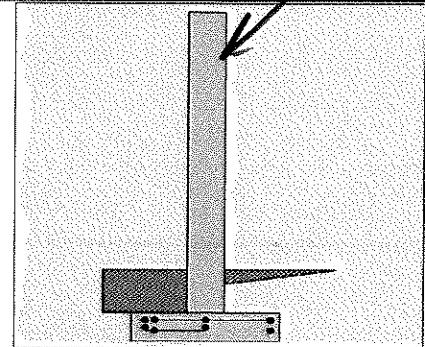
Criteria

Retained Height = 1.00 ft
Wall height above soil = 6.00 ft
Slope Behind Wall = 0.00
Height of Soil over Toe = 12.00 in
Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 2,000.0 psf
Equivalent Fluid Pressure Method
Active Heel Pressure = 32.0 psf/ft

Passive Pressure = 250.0 psf/ft
Soil Density, Heel = 110.00 pcf
Soil Density, Toe = 0.00 pcf
Footings||Soil Friction = 0.400
Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

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

Lateral Load Applied to Stem

Lateral Load = 40.0 #/ft
...Height to Top = 7.00 ft
...Height to Bottom = 0.00 ft
Load Type = Seismic (E)
(Strength Level)
Wind on Exposed Stem = 0.0 psf
(Service Level)

Adjacent Footing Load

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

Axial Load Applied to Stem

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

Design Summary

Wall Stability Ratios

Overturning = 1.82 OK
Sliding = 2.72 OK

Total Bearing Load = 1,077 lbs
...resultant ecc. = 8.36 in

Soil Pressure @ Toe = 1,125 psf OK
Soil Pressure @ Heel = 0 psf OK
Allowable = 2,000 psf
Soil Pressure Less Than Allowable
ACI Factored @ Toe = 1,575 psf
ACI Factored @ Heel = 0 psf
Footing Shear @ Toe = 11.8 psi OK
Footing Shear @ Heel = 3.4 psi OK
Allowable = 75.0 psi

Sliding Calcs

Lateral Sliding Force = 240.4 lbs
less 100% Passive Force = - 222.2 lbs
less 100% Friction Force = - 430.9 lbs
Added Force Req'd = 0.0 lbs OK
...for 1.5 Stability = 0.0 lbs OK

Stem Construction

Design Height Above Ftg = 0.00 ft = Stem OK
Wall Material Above "Ht" = Concrete
Design Method = LRFD
Thickness = 8.00
Rebar Size = # 4
Rebar Spacing = 12.00
Rebar Placed at = Center

Design Data

fb/FB + fa/Fa = 0.291

Total Force @ Section

Service Level lbs =
Strength Level lbs = 305.6

Moment....Actual

Service Level ft-# =
Strength Level ft-# = 988.5

Moment....Allowable = 3,387.6

Shear....Actual

Service Level psi =
Strength Level psi = 6.4

Shear....Allowable psi = 75.0

Anet (Masonry) in2 =

Rebar Depth 'd' in = 4.00

Masonry Data

fm psi =

Fs psi =

Solid Grouting =

Modular Ratio 'n' =

Wall Weight psf = 100.0

Short Term Factor =

Equiv. Solid Thick. =

Masonry Block Type = Medium Weight

Masonry Design Method = ASD

Concrete Data

fc psi = 2,500.0

Fy psi = 60,000.0

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

Load Factors

Building Code IBC 2012, ACI
Dead Load 1.200
Live Load 1.600
Earth, H 1.600
Wind, W 1.000
Seismic, E 1.000

7

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 6' above grad
Title :
Dsgnr :
Description....

Page : 2
Date : 9 MAR 2022

This Wall in File: k:\2018\00834-2018-08 kell residence (lbh)\ca\rear site walls\20220308 revisions\6

RetainPro (c) 1987-2019, Build 11.20.03.31
License : KW-06052576
License To : SWENSON SAY FAGET

Cantilevered Retaining Wall

Code: IBC 2012,ACI 318-11,ACI 530-11

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0597 in ² /ft		
(4/3) * As :	0.0796 in ² /ft	Min Stem T&S Reinf Area 1.344 in ²	
200bd/fy : 200(12)(4)/60000 :	0.16 in ² /ft	Min Stem T&S Reinf Area per ft of stem Height : 0.192 in ² /ft	
0.0018bh : 0.0018(12)(8) :	0.1728 in ² /ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.1728 in ² /ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.2 in ² /ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.5419 in ² /ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	1.00 ft
Heel Width	=	1.67
Total Footing Width	=	2.67
Footing Thickness	=	8.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
fc =	2,500 psi	Fy = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm.= 3.00 in

Footing Design Results

	Toe	Heel
Factored Pressure	= 1,575	0 psf
Mu' : Upward	= 7,806	2 ft-#
Mu' : Downward	= 1,512	127 ft-#
Mu: Design	= 525	125 ft-#
Actual 1-Way Shear	= 11.83	3.45 psi
Allow 1-Way Shear	= 75.00	75.00 psi
Toe Reinforcing	= # 4 @ 12.00 in	
Heel Reinforcing	= # 4 @ 12.00 in	
Key Reinforcing	= None Spec'd	
Footing Torsion, Tu	=	0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=	0.00 ft-lbs

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

Other Acceptable Sizes & Spacings

Toe: #4@ 13.88 in, #5@ 21.52 in, #6@ 30.55 in, #7@ 41.66 in, #8@ 54.86 in, #9@ 6
Heel: #4@ 13.88 in, #5@ 21.52 in, #6@ 30.55 in, #7@ 41.66 in, #8@ 54.86 in, #9@ 6
Key: No key defined

Min footing T&S reinf Area	0.46	in ²
Min footing T&S reinf Area per foot	0.17	in ² /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

Use menu item Settings > Printing & Title Block
to set these five lines of information
for your program.

Project Name/Number : 6' above grad

Title :
Dsgnr:
Description....

Page : 3
Date: 9 MAR 2022

This Wall in File: k:\2018\00834-2018-08 kell residence (lbh)\ca\rear site walls\20220308 revisions\6

RetainPro (c) 1987-2019, Build 11.20.03.31
License : KW-06052576
License To : SWENSON SAY FAGET

Cantilevered Retaining Wall

Code: IBC 2012, ACI 318-11, ACI 530-11

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	44.4	0.56	24.7	Soil Over HL (ab. water tbl)	110.4	2.17	239.3
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.17	239.3
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Hee =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =	196.0	4.17	816.7	* Axial Live Load on Stem =			
Load @ Stem Above Soil =				Soil Over Toe =		0.50	
				Surcharge Over Toe =			
				Stem Weight(s) =	700.0	1.33	933.3
				Earth @ Stem Transitions =			
Total	= 240.4	O.T.M. =	841.4	Footing Weigh =	267.0	1.34	356.4
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 1.82		Total =	1,077.4 lbs	R.M. =	1,529.1
Vertical Loads used for Soil Pressure =		1,077.4 lbs					

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

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

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

Tilt

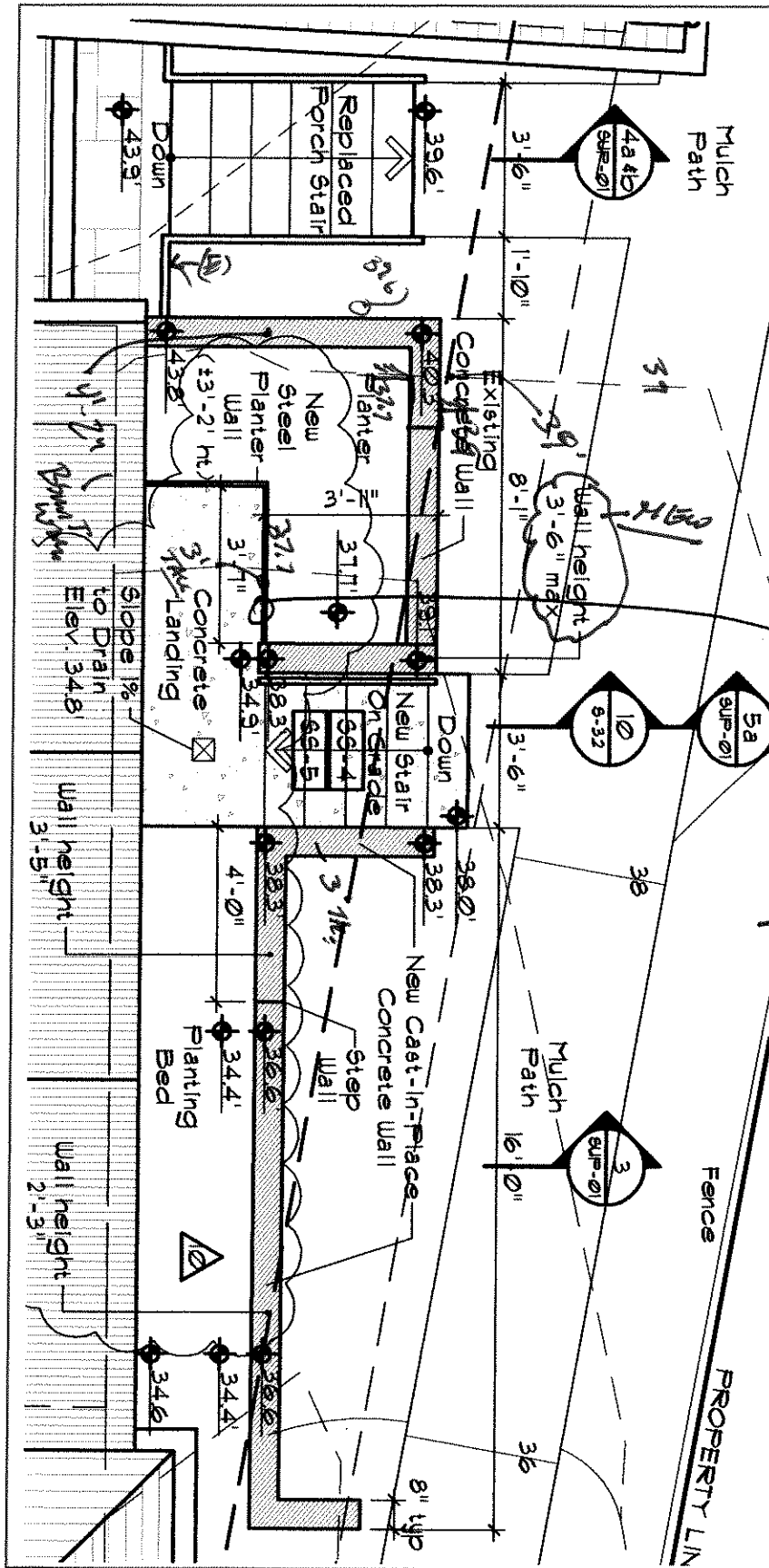
Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.082 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.



WALL SCHEDULE

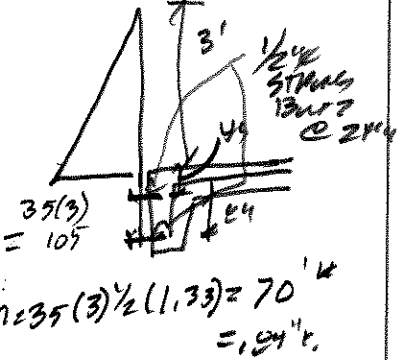
4' x 3' 9" WALL

STEEL STRIP (per)

WLL = 60 PPF
 WPL = 150 (1/2) = 50 PPF
 W₂ = 110 (2) = 220 Lb

SPAN = 6'
 $V = 660 Lb$
 $M = 990 Lb-ft$
 SYREQD = 15
 $A = 2,003 = 1/2 5907$

STEEL PLATE

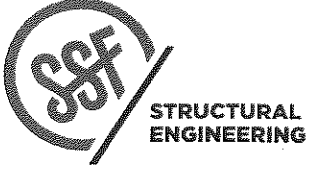


FOOTING & 4" SLAB ON GRADE
 $M = 70 (1.6) = 112 Lb-ft = 1.34 ft-k$
 4" 5.0.9 w/ #3 @ 16" o.c.
 $d = 1.5"$
 $Q_{reqd} = \frac{2.09(60)}{0.25(20.7)^2} = 188$
 $Q_{prov} = 9(60)(0.05)(1.5 - \frac{1.54}{16}) = 6" K.O.K$

SEATTLE 2124 Third Avenue, Suite 100, Seattle, WA 98121
 TACOMA 934 Broadway, Suite 100, Tacoma, WA 98402
 CENTRAL WA 414 N Pearl Street, Suite 8, Ellensburg, WA 98926

206.443.6212
 @ssengineers.com

SWENSON SAY FAGET



Kell Site Walls

PROJECT _____

DATE 03/08/2022
 0034-2018-08
 PROJ # KMR
 DESIGN 9
 SHEET