Supplemental Structural Calculations for:

61st St SE MI

Project Address:
3038 61st St SE
Mercer Island, WA 98040

Design per
2018 International Building Code
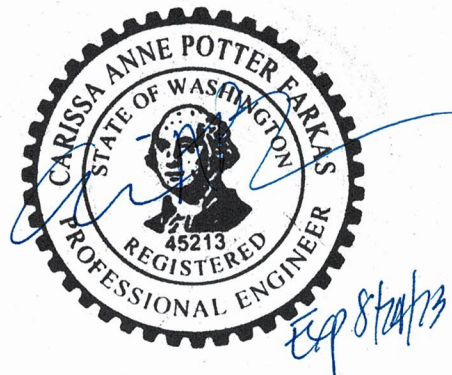
CARISSA ANNE POTTER FARKAS
STATE OF WASHINGTON
45213
REGISTERED
PROFESSIONAL ENGINEER

Exp 8/24/23

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

Project Name/Number : 2147 jabooda
Title **WINDOW WELL RET WALLS**
Dsgnr:
Description....

Page : 1
Date: 11 MAY 2023

This Wall in File: c:\users\toshiba\documents\retainpro 10 project files\2147 jabooda 61st.rpx

RetainPro (c) 1987-2018, Build 11.18.12.04
License : KW-06064278
License To : cfse

Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Criteria

Retained Height	=	7.00 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	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Active Heel Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	350.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.450
Soil height to ignore for passive pressure	=	12.00 in
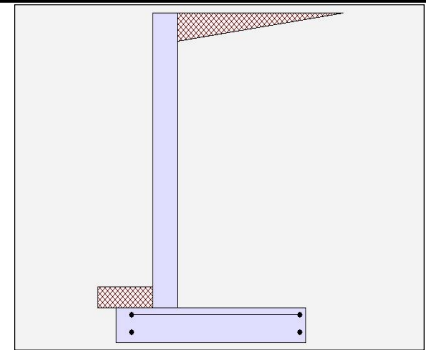
Surcharge Loads

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

Earth Pressure Seismic Load

Method : Uniform
Multiplier Used = 7.000
(Multiplier used on soil density)

Uniform Seismic Force = 54.833
Total Seismic Force = 429.528

Design Summary

Wall Stability Ratios

Overturning	=	3.18 OK
Sliding	=	1.50 OK
Total Bearing Load	=	4,289 lbs
...resultant ecc.	=	6.73 in
Soil Pressure @ Toe	=	1,370 psf OK
Soil Pressure @ Heel	=	290 psf OK
Allowable	=	2,000 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,917 psf
ACI Factored @ Heel	=	406 psf
Footing Shear @ Toe	=	7.7 psi OK
Footing Shear @ Heel	=	9.4 psi OK
Allowable	=	75.0 psi

Sliding Calcs

Lateral Sliding Force	=	1,374.5 lbs
less 100% Passive Force	= -	136.1 lbs
less 100% Friction Force	= -	1,930.1 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 Stability	=	0.0 lbs OK

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

Load Factors

Building Code	IBC 2015,ACI
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Stem Construction

Bottom
Stem OK

Design Height Above Ftg ft =		0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	LRFD
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	8.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	**0.384**

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	1,755.8

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	4,544.8
Moment.....Allowable	=	11,799.2

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	23.6
Shear.....Allowable	psi =	75.0
Anet (Masonry)	in2 =	
Rebar Depth 'd'	in =	6.19

Masonry Data

f'm	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

f'c	psi =	2,500.0
Fy	psi =	60,000.0

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

Project Name/Number : 2147 jabooda
Title   window wells
Dsgnr:
Description....

Page : 2
Date: 11 MAY 2023

This Wall in File: c:\users\toshiba\documents\retainpro 10 project files\2147 jabooda 61st.rpx

RetainPro (c) 1987-2018, Build 11.18.12.04
License : KW-06064278
License To : cfse

Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing
As (based on applied moment) :	0.1721 in2/ft	
(4/3) * As :	0.2295 in2/ft	Min Stem T&S Reinf Area 1.344 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 :	0.2295 in2/ft	#4@ 12.50 in #4@ 25.00 in
Provided Area :	0.465 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 Dimensions & Strengths

Toe Width	=	1.00 ft
Heel Width	=	4.17
Total Footing Width	=	5.17
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c =   2,500 psi   Fy = 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	=	1,917	406 psf
Mu' : Upward	=	910	4,584 ft-#
Mu' : Downward	=	111	7,106 ft-#
Mu: Design	=	799	2,522 ft-#
Actual 1-Way Shear	=	7.66	9.35 psi
Allow 1-Way Shear	=	40.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
Heel Reinforcing	=	# 4 @ 9.99 in	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel: #4@ 11.10 in, #5@ 17.21 in, #6@ 24.43 in, #7@ 33.32 in, #8@ 43.88 in, #9@ 5
Key: No key defined

Min footing T&S reinf Area   1.12   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

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#			.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	1,073.8	2.61	2,803.9	Soil Over Heel	=	2,942.8	3.42	10,059.5
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=				* Axial Live Load on Stem	=			
Seismic Earth Load	=	300.7	3.92	1,177.6	Soil Over Toe	=		0.50	
	=				Surcharge Over Toe	=			
Total		1,374.5	O.T.M.	3,981.5	Stem Weight(s)	=	700.0	1.33	933.3
					Earth @ Stem Transitions	=			
	=		=		Footing Weight	=	646.3	2.59	1,670.6
Resisting/Overturning Ratio		=	3.18		Key Weight	=			
Vertical Loads used for Soil Pressure =		4,289.1 lbs			Vert. Component	=			
					Total =		4,289.1 lbs	R.M.=	12,663.4

If seismic is included, the OTM and sliding ratios
be 1.1 per section 1807.2.3 of IBC 2009 or IBC 201

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.

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

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

Project Name/Number : 2147 jabooda

Title   window wells
Dsgnr:
Description....

Page : 3

Date: 11 MAY 2023

This Wall in File: c:\users\toshiba\documents\retainpro 10 project files\2147 jabooda 61st.rpx

Cantilevered Retaining Wall

Code: IBC 2015,ACI 318-14,ACI 530-13

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)	0.052	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.