



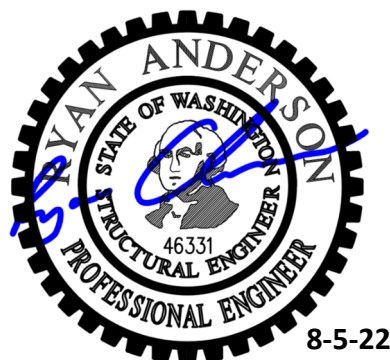
Structural Calculations For:

Jaffe Residence

Remodel and Addition

8455 SE 83rd St.

Mercer Island, WA 98040



Prepared for: Suyama Peterson Deguchi

Job #: 00043-2022-03

Date: August 5, 2022



SEATTLE
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⊕ ssfengineers.com

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 8455 SE 83rd Street
 City: Mercer Island State: WA
 ZIP: 98040
 Latitude: 47.5287 N
 Longitude: -122.2281 W
 Ground Elevation 261 ft

Occupancy Category

Risk Category: II ASCE 7 Table 1.5-1

Seismic Load Summary:

Analysis Procedure: Equivalent Lateral Force Procedure
 Lateral System: Light-frame (wood) Walls Sheathed with Wood
 Structural Panels Rated for Shear Resistance
 R: 6.50 $C_d = 4$
 Base Shear V = 17 kips $\Omega_o = 2.5$
 $S_s = 1.467$ $S_1 = 0.505$
 $S_{DS} = 1.17$ $S_{D1} = 0.57$
 $C_s = 0.181$ $I_e = 1.0$



Story Information

Stories Above Grade (Including Mezzanine Levels) 3

Horizontal and Vertical Irregularities:

Is the building a "Regular Structure"? (No horizontal or vertical irregularities) Yes

Wind Load Summary:

V = 98 $K_{z1} = 1.00$
 Exposure = C

Dead Loads:

Roof		Floor	
Roofing	1 psf	Finish Floor	2 psf
1/2" Sheathing	1.8 psf	3/4" Sheathing	2.7 psf
Trusses @ 24" oc	2.5 psf	Joists @ 16" oc	2.2 psf
Misc./Mech.	1.5 psf	Misc./Mech.	2 psf
Ceiling Finish	2.8 psf	Ceiling Finish	2.8
Solar Panels	5 psf		11.7 psf
	15 psf	Use	12 psf
Use	15 psf		

Live Loads:

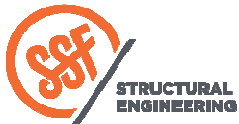
Roof	20 psf	Deck	60 psf
Floor	40 psf		

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	0.61		

Soils:

Soils Report Provided?	No	To be approved by the authority having jurisdiction, per 11.8.2 exception.	
Allowable Bearing	1500 psf	Active	55/35 pcf (Restrained/Unrestrained)
Sliding, μ	0.3	Seismic Surcharge	8H
Passive	250 pcf		



Jaffe Residence

Criteria

DATE 8/5/2022

PROJ. #

DESIGN VMB

SHEET 1

Wind Design - MWFRS

ASCE 7 Chapter 27 - Directional Procedure

Design Method	ASD
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Wind Coefficients

Exposure	C	
V=	98	mph
K_d =	0.85	Table 26.6-1
K_{zt} =	0.85	Table 26.10-1
K_e =	0.99	Table 26.9-1
G=	0.85	26.9.4

Transverse Wind Pressures

L/B = 0.50 h/L = 0.27

Pressure Coefficients from Figure 27.3-1:

Bldg Face	C_p
Windward Wall	0.8
Leeward Wall	-0.50
Windward Roof	-0.26 / 0.24
Leeward Roof	-0.60

Location and Building Dimensions

Calculate K_{zt} ?	Yes	
K_{zt}	1.00	
Roof Type	Gable	
Roof Slope - Transverse Dir	22.45	degrees
Roof Slope - Long Dir	0	degrees
Ground to top of roof	18	ft
Bot of roof to top of roof	10	ft
Mean Roof Height, h	13	ft
Short Plan Dimension	47.75	ft
Long Plan Dimension	95.75	ft
Parapet ?	No	
Ground to top of parapet		ft
Average Parapet Height		ft

Velocity Pressure at Mean Roof Height, q_h =	17.6	psf
--	------	-----

Wall Pressures (Unfactored):

ASD

Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lw\ walls}$	$P_{w\ walls\ (psf)}$
0-15	0.85	17.60	11.97	7.47	11.66
15-20	0.9	18.63	12.67	7.47	12.08
20-25	0.94	19.46	13.23	7.47	12.42
25-30	0.98	20.29	13.80	7.47	12.76
30-40	1.04	21.53	14.64	7.47	13.27
41-50	1.09	22.56	15.34	7.47	13.69
51-60	1.13	23.39	15.91	7.47	14.03
61-70	1.17	24.22	16.47	7.47	14.36
71-80	1.21	25.05	17.03	7.47	14.70
81-90	1.24	25.67	17.46	7.47	14.95
91-100	1.26	26.08	17.74	7.47	15.12

Roof Pressures (Unfactored)

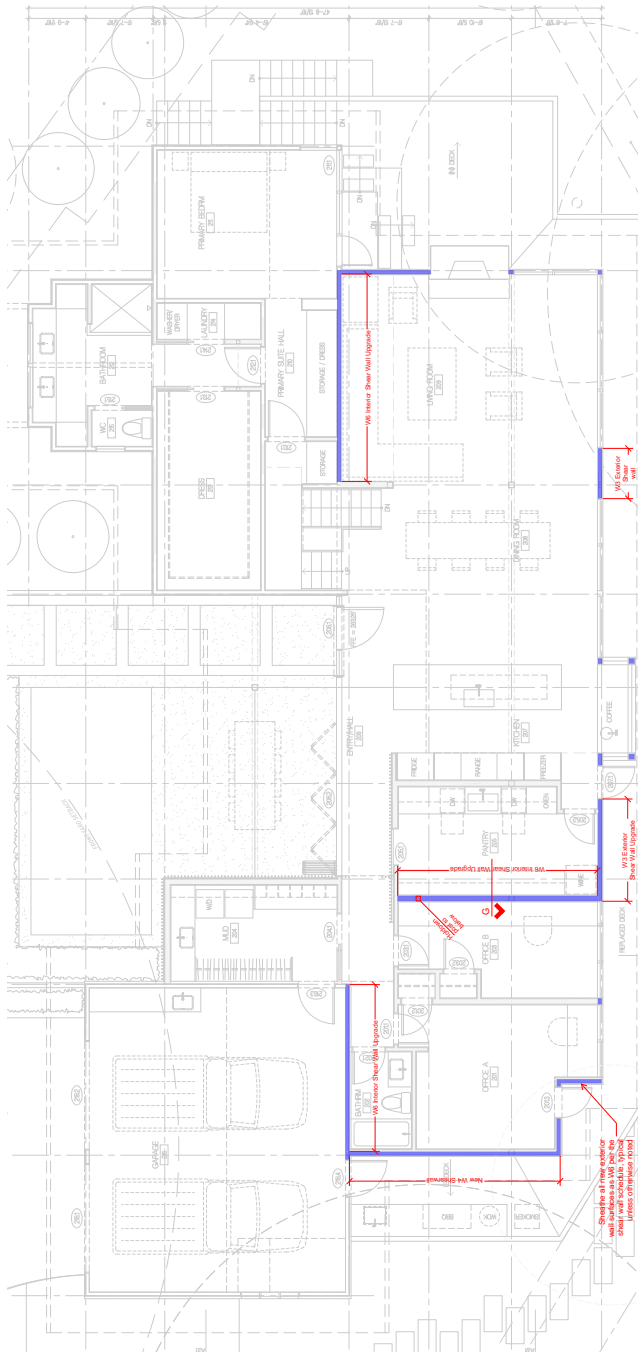
ASD

Windward		Leeward	Horiz Proj (psf)
Max	Min		
3.5	-3.9	-9.0	7.49

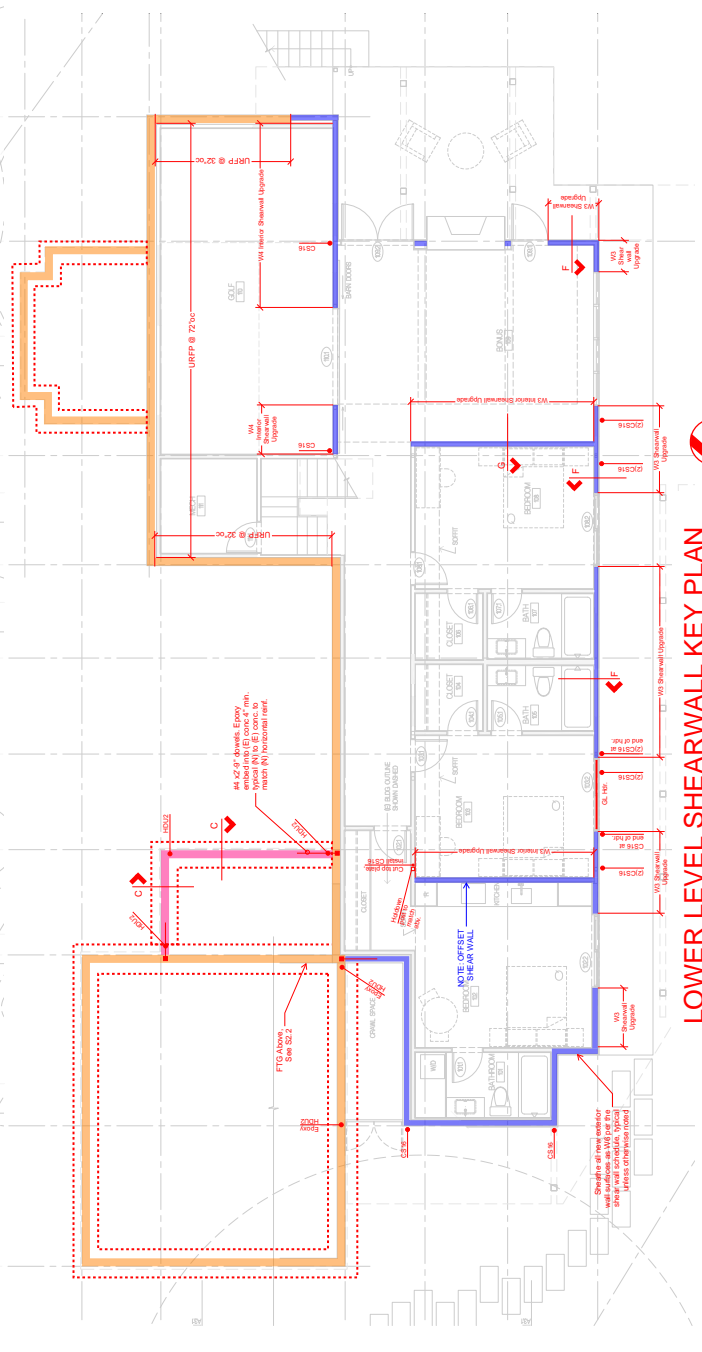


Jaffe Residence _____
 Wind Criteria _____

DATE 8/5/2022 _____
 PROJ. # _____
 DESIGN VMB _____
 SHEET 3 _____



MAIN LEVEL SHEARWALL KEY PLAN
 scale: 1/16" = 1'-0"



LOWER LEVEL SHEARWALL KEY PLAN
 scale: 1/16" = 1'-0"



SEISMIC WEIGHT

$$W_s(\text{Roof}) = \text{Roof} + 1.0 \text{ AW} \\ = 15(420 \text{ S.F.}) + 10(375 \text{ S.F.}) \\ = 93.900 \text{ k}$$

NOTE: DAYLIT BUILDING w/ MAIN FLOOR AT GRABS.
THEREFORE BASE SHEAR TAKEN AT MAIN FLOOR

SEISMIC STORY SHEAR ($\rho = 1.3$, ASD, $C_s = 0.181$)

$$V_s(\text{Roof}) = 15.43 \text{ kip}$$

WIND LOADING (15-ft HEIGHT)

$$W_w(\text{Roof}) = (4.5 \text{ ft} + 0.75(10 \text{ ft}))(12.42 \text{ PSF}) \\ = 149.04 \text{ PLF}$$

WIND LOADING ($K_{zt} = 1.0$, ASD, $V = 98 \text{ MPH}$, EXP. C)

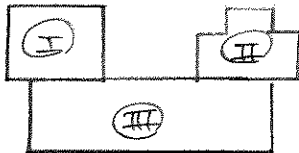
NORTH/SOUTH ($L_f = 95.75 \text{ ft}$) EAST/WEST ($L_f = 47.75 \text{ ft}$)

$$V_w = 14.27 \text{ k}$$

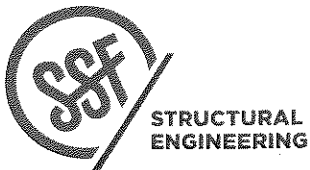
$$V_w = 7.12 \text{ k}$$

BY OBSERVATION, SEISMIC GOV'S FOR BOTH DIRECTIONS

DIVISION of SEISMIC WEIGHT BY AREA



$A(I) = 715 \text{ S.F.}$	$V(I)_{80} = 0.233$	$V(I) = 3.60 \text{ k}$
$A(II) = 940 \text{ S.F.}$	$V(II)_{80} = 0.306$	$V(II) = 4.72 \text{ k}$
$A(III) = 1420 \text{ S.F.}$	$V(III)_{80} = 0.461$	$V(III) = 7.11 \text{ k}$
$\Sigma A = 3775 \text{ S.F.}$	$V_{80} = 1.00 \text{ } \therefore \text{OK}$	$\Sigma V = 15.43 \text{ k } \therefore \text{OK}$



JAKE RESIDENCES
PROJECT
LATERAL LOADING (WINDS + SEISMIC)

DATE 7/11/22
PROJ. # VMS
DESIGN
SHEET 2

LATERAL DESIGN (SHEAR WALLS, N/E)

$v(1) = 0.67 \text{ k (E)}$
 0.89 k (W)

$L_w = 16.25 \text{ ft}$
 $r = 55 \text{ \# / ft}$
 $S.W. = \textcircled{W6}$
 $OT = 0.49 \text{ k}$
 $OTR = 0.56 \text{ k}$
 $OT' = 0$
 $H_b = \textcircled{\text{NO OT}}$
 $USE H_{b02}$

$v(2) = 2.99 \text{ k (E)}$
 2.60 k (W)

$L_w = 17.5 \text{ ft}$
 $r = 171 \text{ \# / ft}$
 $S.W. = \textcircled{W6}$
 $OT = 1.54 \text{ k}$
 $OTR = 0.79 \text{ k}$
 $OT' = 0.75 \text{ k}$
 $H_b = \textcircled{H_{b02}}$

$v(4) = 3.70 \text{ k (E)}$
 3.49 k (W)

$L_w = 30.5 \text{ ft}$
 $r = 121 \text{ \# / ft}$
 $S.W. = \textcircled{W6}$
 $OT = 1.09 \text{ k}$
 $OTR = 0.63 \text{ k}$
 $OT' = 0.46 \text{ k}$
 $H_b = \textcircled{H_{b02} / CR16}$

$v(7) = 4.32 \text{ k (E)}$
 3.55 k (W)

$L_w = 15 \text{ ft}$
 $r = 288 \text{ \# / ft}$
 $S.W. = \textcircled{W4}$
 $OT = 2.59 \text{ k}$
 $OTR = 0.68 \text{ k}$
 $OT' = 1.91 \text{ k}$
 $H_b = \textcircled{H_{b02}}$

$v(9) = 3.36 \text{ k (E)}$
 2.78 k (W)

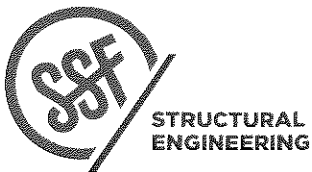
$L_w = 15.75 \text{ ft}$
 $r = 213 \text{ \# / ft}$
 $S.W. = \textcircled{W6}$
 $OT = 1.92 \text{ k}$
 $OTR = 0.34 \text{ k}$
 $OT' = 1.58 \text{ k}$
 $H_b = H_{b02}$

$v(10) = 0.41 \text{ k (E)}$
 0.78 k (W)

$L_w = 11.75 \text{ ft}$
 $r = 68 \text{ \# / ft}$
 $S.W. = \textcircled{W6}$
 $OT = 0.60 \text{ k}$
 $OTR = 0.53 \text{ k}$
 $OT' = 0.03 \text{ k}$
 $H_b = \textcircled{H_{b02}}$

NO S.W.
 BELOW @
 STACK, C-D

$L_w' = 8.25 \text{ ft}$
 $r = 407 \text{ \# / ft}$
 $S.W. = \textcircled{W3}$
 $OT = 3.67 \text{ k}$
 $OTR = 0.37 \text{ k}$
 $OT' = 3.30 \text{ k}$
 $H_b = \textcircled{H_{b04}}$



JAFFS DESIGNERS
 PROJECT _____

 LATERAL DESIGN - NORTH / EAST

DATE 7/11/22
 PROJ. # VMA
 DESIGN _____
 SHEET 3

LATERAL DESIGN (SHEAR WALLS, E/W)

$V(G) = 1.80 \text{ k (E)}$
WEST 1.64 k (W)

$V(F) = 2.20 \text{ k (E)}$
EAST 2.76 k (W)

$V(D) = 7.87 \text{ k (E)}$
 3.56 k (W)

$V(A) = 3.56 \text{ k (E)}$
 1.56 k (W)

$L_w = 4.5 \text{ f}$

$v = 400 \text{ \#/f}$

S.W. = (W3)

OT = 3.60 k

OTR = /

OT' = 3.60 k

Hb = (Hb04)

$L_w = 22.5 \text{ f}$

$v = 123 \text{ \#/f}$

S.W. = (W6)

OT = 1.10 k

OTR = 0.83 k

OT' = 0.21 k

Hb = (Hb02)

$L_w = 39.5 \text{ f}$

$v = 200 \text{ \#/f}$

S.W. = (W6)

OT = 1.79 k

OTR = 0.60 k

OT' = 1.19 k

Hb = (Hb02)

$L_w = 12.25 \text{ RDX}$

$v = 290 \text{ \#/f}$

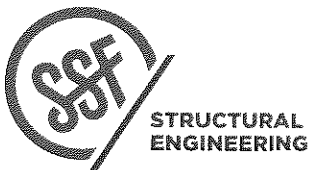
S.W. = (W4)

OT = 2.62 k

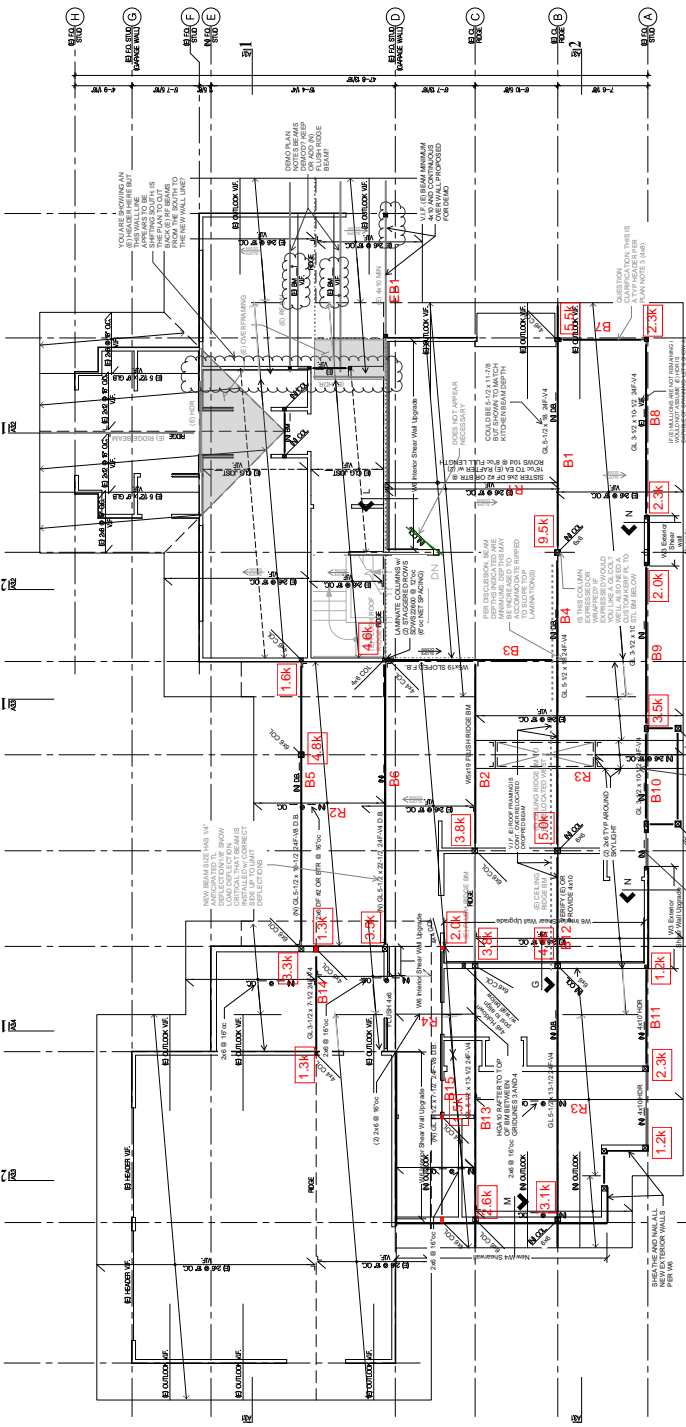
OTR = /

OT' = 2.62 k

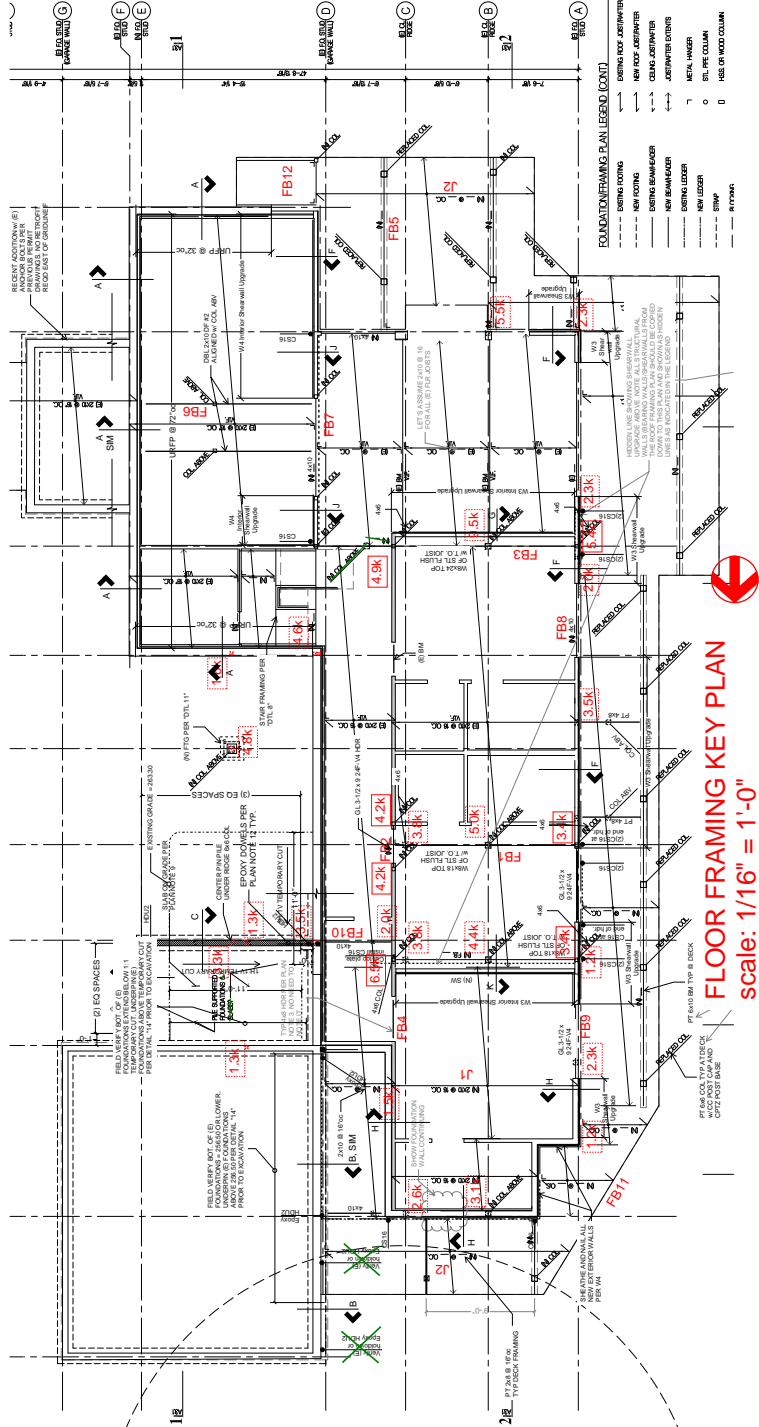
Hb = (Hb04 / (2)CS16)



PROJECT JAKS RESIDENCE
DATE 7/11/22
PROJ. # VMS
DESIGN LATERAL DESIGN - EAST/WEST
SHEET 4

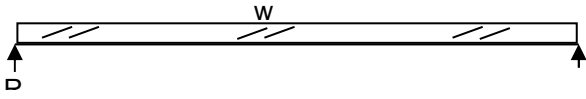


ROOF FRAMING KEY PLAN
 scale: 1/16" = 1'-0"

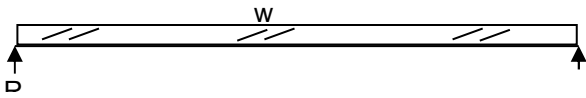


FLOOR FRAMING KEY PLAN
 scale: 1/16" = 1'-0"

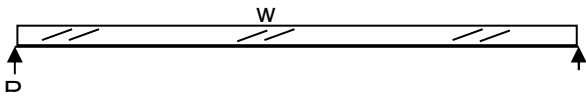
Reinf. Rafter	R1	DF-L	3	x 6
w=	53	plf	R=	378 lbs
L=	14.25	ft	M=	1,345 ft-lbs
b=	3.00	in	Fb=	1,067 psi
d=	5.50	in	Fv=	32 psi
E=	1700	ksi	Δ =	0.70 in
Cv=	1.00	≤ 1.0	I/	246



Lvg Rm Beam	B1	GL	5 1/2	x 11 7/8
w=	440	plf	R=	3,960 lbs
L=	18	ft	M=	17,820 ft-lbs
b=	5.50	in	Fb=	1,654 psi
d=	11.88	in	Fv=	81 psi
E=	1800	ksi	Δ =	0.75 in
Cv=	1.00	≤ 1.0	I/	287

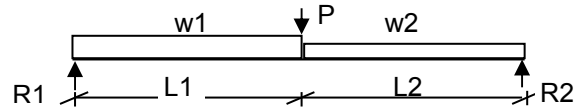


Ktch Ridge Bm	B2	PSL	7	x 5 1/2
w=	300	plf	R=	2,400 lbs
L=	16	ft	M=	9,600 ft-lbs
b=	7.00	in	Fb=	3,264 psi
d=	5.50	in	Fv=	88 psi
E=	2000	ksi	Δ =	2.28 in
Cv=	1.00	≤ 1.0	I/	84



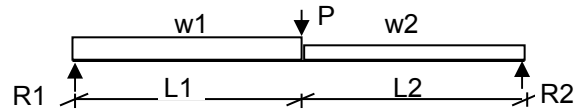
Steel Size	W5X19			
I =	26.3	in ⁴	Fy=	50 ksi
Δ =	0.58	in	Mn/ Ω =	28.9 k-ft
I/	331		Vn/ Ω =	20.8 kips

Sloped Beam	B3	PSL	7	x 5 1/2
w1=	160	plf	R1 =	2,319 lbs
w2=	160	plf	R2 =	2,401 lbs
L1=	7.5	ft	M =	12,890 lb-ft
L2=	7.0	ft	Fb =	4,383 psi
X=	7.5	ft	Fv =	91 psi
P=	2,400	lbs	Δ =	2.17 in
b=	7.00	in	I/	80
d=	5.50	in	Cv=	1.00
E=	2,000	ksi		

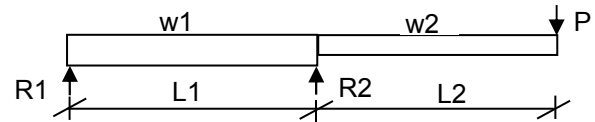


Steel Size	W5X19			
I =	26.3	in ⁴	Fy=	50 ksi
Δ =	0.553	in	Mn/ Ω =	28.9 k-ft
I/	315		Vn/ Ω =	37.5 kips

Kitchen Beam	B4	PSL	5 1/2	x 18
w1=	290	plf	R1 =	4,732 lbs
w2=	440	plf	R2 =	6,268 lbs
L1=	16	ft	M =	38,592 lb-ft
L2=	9	ft	Fb =	1,559 psi
X=	16.0	ft	Fv =	85 psi
P=	2,400	lbs	Δ =	0.72 in
b=	5.50	in	I/	419
d=	18.00	in	Cv=	0.94
E=	2,000	ksi		



Entry Rafters	R2	DF-L	2	x 6
w1=	53	plf	R1=	96 lbs
w2=	53	plf	R2=	537 lbs
L1=	7	ft	M+=	88 lb-ft
L2=	4	ft	M-=	624 lb-ft
X=	3.50	ft	Fb=	990 psi
P=	50	lbs	Fv=	46 psi
b=	1.50	in	Δ span=	(0.012) in
d=	5.50	in	I span/	(6,765)
E=	1,700	ksi	Δ cant=	0.27 in
Cv=	1.00		I cant/	353



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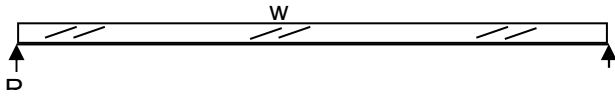
Project: Jaffe Residence Date: 08/05/22

Roof Framing Project #: _____

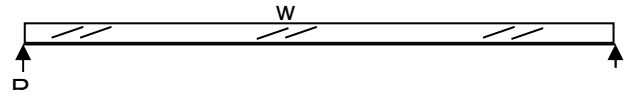
Design: RJA

Sheet: 6

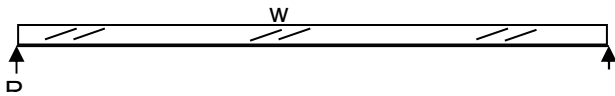
Exterior Terrace Bm		B5	GL	5 1/2 x 10 1/2
w=	400	plf	R=	3,200 lbs
L=	16	ft	M=	12,800 ft-lbs
b=	5.50	in	Fb=	1,520 psi
d=	10.50	in	Fv=	74 psi
E=	1800	ksi	Δ=	0.62 in
Cv=	1.00	≤1.0	I/	311



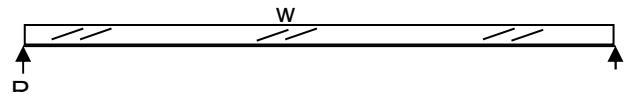
Typ Header		B7	HF	4 x 8
w=	160	plf	R=	800 lbs
L=	10	ft	M=	2,000 ft-lbs
b=	3.50	in	Fb=	783 psi
d=	7.25	in	Fv=	42 psi
E=	1300	ksi	Δ=	0.25 in
Cv=	1.00	≤1.0	I/	482



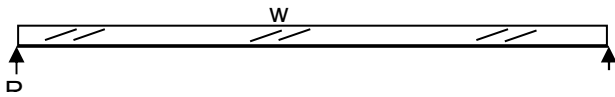
Existing Bdrm Bm		EB1	HF	4 x 10
w=	320	plf	R=	1,560 lbs
L=	9.75	ft	M=	3,803 ft-lbs
b=	3.50	in	Fb=	914 psi
d=	9.25	in	Fv=	61 psi
E=	1300	ksi	Δ=	0.22 in
Cv=	1.00	≤1.0	I/	540



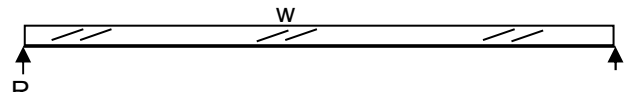
Hdr @ W. lvg rm		B8	GL	3 1/2 x 10 1/2
w=	310	plf	R=	2,248 lbs
L=	14.5	ft	M=	8,147 ft-lbs
b=	3.50	in	Fb=	1,520 psi
d=	10.50	in	Fv=	81 psi
E=	1800	ksi	Δ=	0.51 in
Cv=	1.00	≤1.0	I/	343



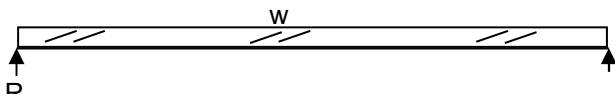
Rafter @ Skylight		R3	DF-L	3 x 6
w=	150	plf	R=	563 lbs
L=	7.5	ft	M=	1,055 ft-lbs
b=	3.00	in	Fb=	837 psi
d=	5.50	in	Fv=	45 psi
E=	1700	ksi	Δ=	0.15 in
Cv=	1.00	≤1.0	I/	596



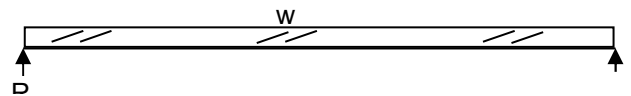
Hdr @ W. dining rm		B9	GL	3 1/2 x 10 1/2
w=	310	plf	R=	2,093 lbs
L=	13.5	ft	M=	7,062 ft-lbs
b=	3.50	in	Fb=	1,318 psi
d=	10.50	in	Fv=	74 psi
E=	1800	ksi	Δ=	0.38 in
Cv=	1.00	≤1.0	I/	425



Entry Beam		B6	GL	5 1/2 x 24
w=	290	plf	R=	3,432 lbs
L=	23.67	ft	M=	20,310 ft-lbs
b=	5.50	in	Fb=	462 psi
d=	24.00	in	Fv=	32 psi
E=	1800	ksi	Δ=	0.18 in
Cv=	0.92	≤1.0	I/	1582

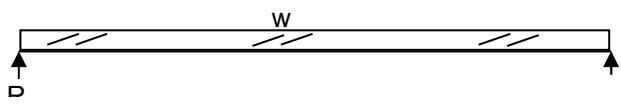


Hdr @ W. Kitchn		B10	DF-L	4 x 8
w=	310	plf	R=	1,163 lbs
L=	7.5	ft	M=	2,180 ft-lbs
b=	3.50	in	Fb=	853 psi
d=	7.25	in	Fv=	58 psi
E=	1700	ksi	Δ=	0.12 in
Cv=	1.00	≤1.0	I/	771

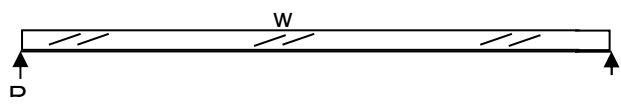


Project: Jaffe Residence Date: 08/05/22
Roof Framing Project #: _____
 Design: RJA
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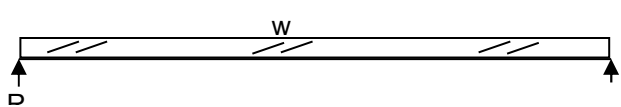
Hdr @ W. Office B		B11	DF-L	4	x 10
w=	310	plf	R=	1,318	lbs
L=	8.5	ft	M=	2,800	ft-lbs
b=	3.50	in	Fb=	673	psi
d=	9.25	in	Fv=	50	psi
E=	1700	ksi	Δ =	0.09	in
Cv=	1.00	≤ 1.0	I/	1099	



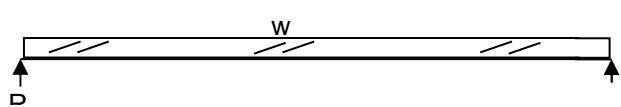
Mud Room Bm		B14	DF-L	4	x 8
w=	300	plf	R=	1,275	lbs
L=	8.5	ft	M=	2,709	ft-lbs
b=	3.50	in	Fb=	991	psi
d=	7.50	in	Fv=	62	psi
E=	1700	ksi	Δ =	0.17	in
Cv=	1.00	≤ 1.0	I/	606	



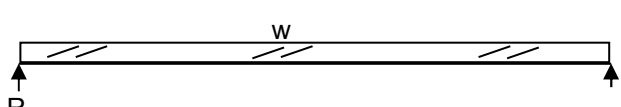
Pantry Beam		B12	DF-L	4	x 10
w=	290	plf	R=	1,414	lbs
L=	9.75	ft	M=	3,446	ft-lbs
b=	3.50	in	Fb=	829	psi
d=	9.25	in	Fv=	55	psi
E=	1700	ksi	Δ =	0.15	in
Cv=	1.00	≤ 1.0	I/	779	



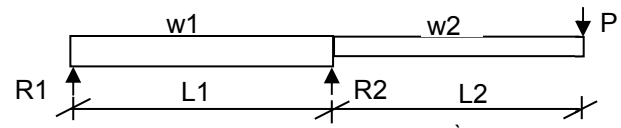
Beam		B15	GL	3 1/2	x 7 1/2
w=	140	plf	R=	980	lbs
L=	14	ft	M=	3,430	ft-lbs
b=	3.50	in	Fb=	1,254	psi
d=	7.50	in	Fv=	51	psi
E=	1800	ksi	Δ =	0.55	in
Cv=	1.00	≤ 1.0	I/	307	



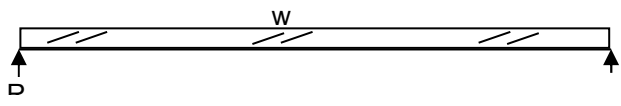
Office Ridge Bm		B13	GL	5 1/2	x 13 1/2
w=	290	plf	R=	3,118	lbs
L=	21.5	ft	M=	16,757	ft-lbs
b=	5.50	in	Fb=	1,204	psi
d=	13.50	in	Fv=	56	psi
E=	1800	ksi	Δ =	0.69	in
Cv=	0.98	≤ 1.0	I/	376	



Rafter		R4	HF	3	x 6
w1=	53	plf	R1=	-347	lbs
w2=	53	plf	R2=	896	lbs
L1=	2.75	ft	M+=	-	lb-ft
L2=	3.83	ft	M-=	1,155	lb-ft
X=	1.38	ft	Fb=	916	psi
P=	200	lbs	Fv=	43	psi
b=	3.00	in	Δ span=	(0.016)	in
d=	5.50	in	I span/	(2,039)	
E=	1,300	ksi	Δ cant=	0.29	in
Cv=	1.00		I cant/	318	



Addition Rafter		R3	DF-L	2	x 6
w=	34	plf	R=	153	lbs
L=	9	ft	M=	344	ft-lbs
b=	1.50	in	Fb=	546	psi
d=	5.50	in	Fv=	25	psi
E=	1700	ksi	Δ =	0.14	in
Cv=	1.00	≤ 1.0	I/	761	




Project: Jaffe Residence Date: 08/05/22
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GEOMETRY

Connection Type	Single-Plate		
Support Designation	W5X19		
Support Type	Beam-Web	OK	
Beam Designation	W5X19		
Beam Gap from Support	0.50 in	OK	
	<u>Length c</u>	<u>Height dc</u>	
Top Flange Cope	2.30	0.60 in	OK
Bottom Flange Cope ..	2.30	0.60 in	OK
Plate Width W	3.50 in	Bolted	OK
Plate Thickness =	0.375 in	, L = 3.50 in	OK
Eccentricity to Beam CL	0.00 in		
	<u>Horizontal</u>	<u>Vertical</u>	
Edge Distance	1.00	0.75 in	OK

MATERIALS

	<u>Yield Fy</u>	<u>Tensile Fu</u>	
Support	50.0	65.0	ksi
Beam	50.0	65.0	ksi
Plate	36.0	58.0	ksi
Modulus of Elasticity	29000		ksi
Use 2 Rows of 3/4" diam A325 Bolts @ 2.0 in			
Use 5/16" fillet weld Strength			
		70.0	ksi

DESIGN CODES

Steel Design	AISC 360-10
Load Combinations	ASCE 7-10

UNFACTORED LOADS

	<u>Dead</u>	<u>Live</u>	<u>RLive</u>	<u>Snow</u>	<u>Wind</u>	<u>Seismic</u>	
Vertical Load P	0.9	1.5	0.0	0.0	0.0	0.0	kip

CONNECTION STRENGTH (kip)

<u>Limit States</u>	<u>Ω</u>	<u>Rn</u>	<u>Rn/Ω</u>
Bolt Shear Rupture at Support	2.00	N.A.	N.A.
Bolt Shear Rupture at Beam	2.00	17.3	8.7
Plate Bearing Holes at Support	2.00	N.A.	N.A.
Plate Bearing Holes at Beam	2.00	14.6	7.3
Plate Shear Yielding	1.50	28.4	18.9
Plate Shear Rupture	2.00	24.5	12.2
Plate Block Shear	2.00	32.9	16.4
Plate Flexural Local Buckling	1.67	11.0	6.6
Support Bearing Bolt Holes	2.00	N.A.	N.A.
Beam Bearing Bolt Holes	2.00	21.1	10.5
Beam Web Shear Yielding	1.50	32.0	21.3
Beam Web Shear Rupture	2.00	24.5	12.2
Beam Web Block Shear	2.00	46.5	23.2
Beam Flexural Local Buckling	1.67	12.5	7.5
Beam Flexural Yielding	1.67	N.A.	N.A.
Weld Shear at Support	2.00	65.0	32.5
Weld Shear at Beam Web	2.00	N.A.	N.A.
Allowable Strength Rn/Ω		6.6	kip
Pa / Rn/Ω Design Ratio		0.36	OK

COMBINED LOADS (kip)

<u>Load Combination</u>	<u>Pa</u>
① 1.0D+1.0L	2.4
② 1.0D+1.0Lr	0.9
③ 1.0D+1.0S	0.9
④ 1.0D+0.8L+0.8Lr	2.0
⑤ 1.0D+0.8L+0.8S	2.0
⑥ 1.0D+0.6W	0.9
⑦ 1.0D+0.7E	0.9
⑧ 1.0D+0.8L+0.8Lr+0.5W	2.0
⑨ 1.0D+0.8L+0.8S+0.5W	2.0
⑩ 0.0D+0.0L+0.0Lr+0.0E	0.0
⑪ 1.0D+0.8L+0.8S+0.5E	2.0
⑫ 0.6D+0.6W	0.5
⑬ 0.6D+0.7E	0.5

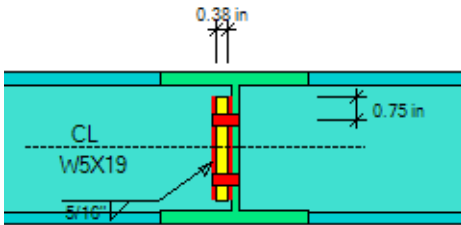


DESIGN CHECKS

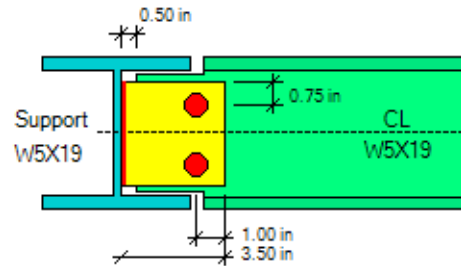
Minimum Angle Thickness Ratio	N.A.	Plate Shear-Bending Interaction Ratio	1.30	NG
Minimum Angle Weld Size Ratio	N.A.	Minimum Tee Weld Size Ratio	N.A.	
Minimum Plate Thickness Ratio	1.00	Minimum Tee Bolt Diameter Ratio	N.A.	
Minimum Plate Weld Size Ratio	0.75	Maximum Tee Stem Thickness Ratio	N.A.	
Maximum Plate Thickness Ratio	N.A.			

GEOMETRIC CONSTRAINTS

Connector Width on Support Check	OK	Beam Setback Check	OK
Connector Width on Beam Check	OK	Beam Top Cope Check	OK
Connector Length Check	OK	Beam Bottom Cope Check	OK



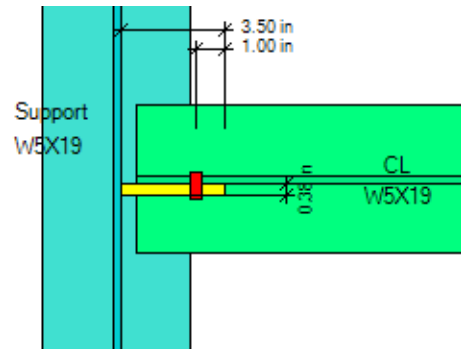
FRONT VIEW



SIDE VIEW

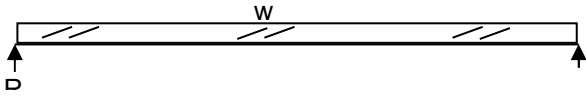
DESIGN SUMMARY

Connection Strength Ratio	0.36	✓
Design Check Ratio	1.00	✓
Geometric Constraints Check	OK	✓

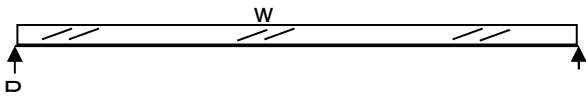


TOP VIEW

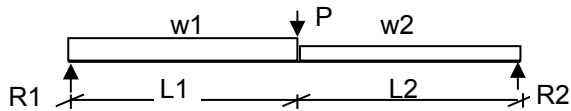
New Floor Joists		J1	HF	2	x 10
w=	70	plf	R=	519	lbs
L=	14.83	ft	M=	1,924	ft-lbs
b=	1.50	in	Fb=	1,080	psi
d=	9.25	in	Fv=	50	psi
E=	1300	ksi	Δ =	0.59	in
Cv=	1.00	≤ 1.0	I/	300	



Deck Joists		J2	HF	2	x 8
w=	100	plf	R=	450	lbs
L=	9	ft	M=	1,013	ft-lbs
b=	1.50	in	Fb=	925	psi
d=	7.25	in	Fv=	54	psi
E=	1300	ksi	Δ =	0.24	in
Cv=	1.00	≤ 1.0	I/	453	

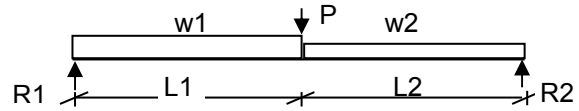


gl 5 Bm		FB1	PSL	7	x 9 1/4
w1=	52	plf	R1 =	3,019	lbs
w2=	52	plf	R2 =	2,774	lbs
L1=	7.25	ft	M =	20,524	lb-ft
L2=	8.00	ft	Fb =	2,467	psi
X=	7.3	ft	Fv =	69	psi
P=	5,000	lbs	Δ =	0.76	in
b=	7.00	in	I/	242	
d=	9.25	in	Cv=	1.00	
E=	2,000	ksi			

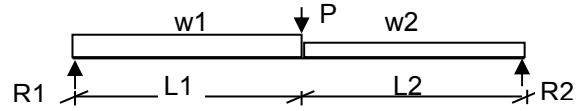


Steel Size		W8X21			
I =	75.3	in ⁴	Fy=	50	ksi
Δ =	0.320	in	Mn/ Ω =	50.9	k-ft
I/	572		Vn/ Ω =	58.5	kips

Beam		FB2	GL	3 1/2	x 9
w1=	575	plf	R1 =	4,256	lbs
w2=	575	plf	R2 =	4,256	lbs
L1=	2	ft	M =	6,568	lb-ft
L2=	2	ft	Fb =	1,668	psi
X=	1.8	ft	Fv =	182	psi
P=	6,500	lbs	Δ =	0.03	in
b=	3.50	in	I/	1,342	
d=	9.00	in	Cv=	1.00	
E=	1,800	ksi			

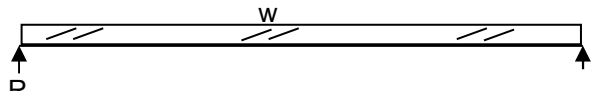


GL 8 Beam		FB3	HF	4	x 12
w1=	52	plf	R1 =	5,380	lbs
w2=	52	plf	R2 =	4,913	lbs
L1=	7.25	ft	M =	37,639	lb-ft
L2=	8.00	ft	Fb =	6,118	psi
X=	7.3	ft	Fv =	203	psi
P=	9,500	lbs	Δ =	2.35	in
b=	3.50	in	I/	78	
d=	11.25	in	Cv=	1.00	
E=	1,300	ksi			



Steel Size		W8X24			
I =	82.7	in ⁴	Fy=	50	ksi
Δ =	0.530	in	Mn/ Ω =	57.6	k-ft
I/	346		Vn/ Ω =	54.8	kips

Beam		FB4	DF-L	4	x 8
w=	546	plf	R=	1,024	lbs
L=	3.75	ft	M=	960	ft-lbs
b=	3.50	in	Fb=	376	psi
d=	7.25	in	Fv=	41	psi
E=	1700	ksi	Δ =	0.01	in
Cv=	1.00	≤ 1.0	I/	3500	



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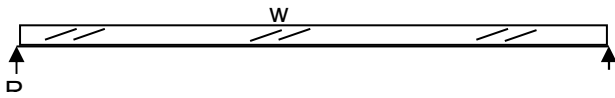
Project: Jaffe Residence Date: 08/05/22

Floor Framing Project #: _____

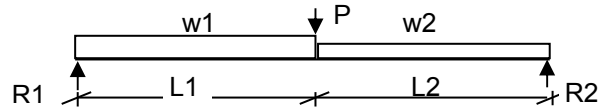
Design: RJA

Sheet: 11

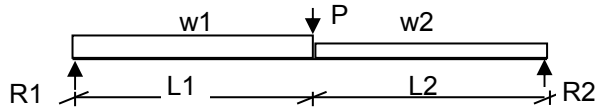
Deck Beam		FB5	HF 6 x 10
w=	562	plf	R= 2,810 lbs
L=	10	ft	M= 7,025 ft-lbs
b=	5.50	in	Fb= 1,019 psi
d=	9.50	in	Fv= 68 psi
E=	1300	ksi	Δ = 0.25 in
Cv=	1.00	≤ 1.0	I/ 485



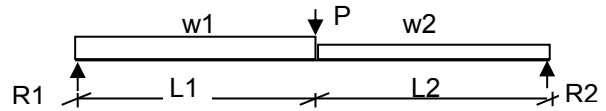
Beam		FB9	GL 3 1/2 x 9
w1=	628	plf	R1 = 3,810 lbs
w2=	628	plf	R2 = 2,572 lbs
L1=	1.5	ft	M = 5,009 lb-ft
L2=	5.0	ft	Fb = 1,272 psi
X=	1.5	ft	Fv = 159 psi
P=	2,300	lbs	Δ = 0.07 in
b=	3.50	in	I/ 1,054
d=	9.00	in	Cv= 1.00
E=	1,800	ksi	



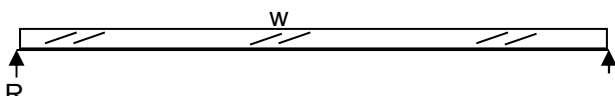
Beam		FB6	HF 3 x 10
w1=	52	plf	R1 = 795 lbs
w2=	52	plf	R2 = 660 lbs
L1=	6	ft	M = 3,834 lb-ft
L2=	9	ft	Fb = 1,075 psi
X=	6.0	ft	Fv = 41 psi
P=	675	lbs	Δ = 0.51 in
b=	3.00	in	I/ 351
d=	9.25	in	Cv= 1.00
E=	1,300	ksi	



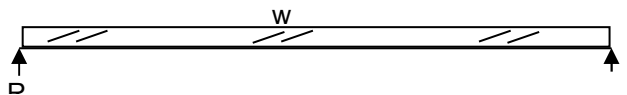
Beam		FB10	HF 4 x 10
w1=	52	plf	R1 = 1,489 lbs
w2=	52	plf	R2 = 823 lbs
L1=	2	ft	M = 2,875 lb-ft
L2=	4	ft	Fb = 691 psi
X=	2.0	ft	Fv = 67 psi
P=	2,000	lbs	Δ = 0.05 in
b=	3.50	in	I/ 1,588
d=	9.25	in	Cv= 1.00
E=	1,300	ksi	



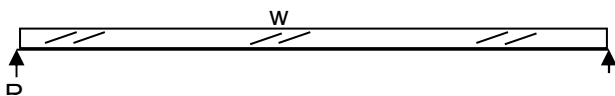
Beam		FB7	DF-L 4 x 10
w=	572	plf	R= 2,337 lbs
L=	8.17	ft	M= 4,773 ft-lbs
b=	3.50	in	Fb= 1,147 psi
d=	9.25	in	Fv= 88 psi
E=	1700	ksi	Δ = 0.15 in
Cv=	1.00	≤ 1.0	I/ 671



Angled Deck Beam		FB11	HF 6 x 10
w=	270	plf	R= 1,181 lbs
L=	8.75	ft	M= 2,584 ft-lbs
b=	5.50	in	Fb= 395 psi
d=	9.25	in	Fv= 29 psi
E=	1300	ksi	Δ = 0.08 in
Cv=	1.00	≤ 1.0	I/ 1390



Beam		FB8	HF 4 x 10
w=	650	plf	R= 1,950 lbs
L=	6	ft	M= 2,925 ft-lbs
b=	3.50	in	Fb= 703 psi
d=	9.25	in	Fv= 67 psi
E=	1300	ksi	Δ = 0.06 in
Cv=	1.00	≤ 1.0	I/ 1140



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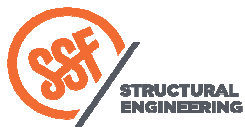
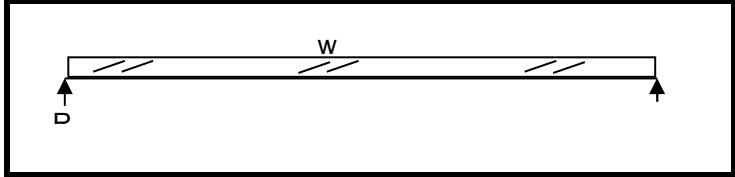
Project: Jaffe Residence Date: 08/05/22

Floor Framing Project #: _____

Design: RJA

Sheet: 12

South Stair Stringer		FB12	HF	2	x 8
w=	93.1	plf	R=	314	lbs
L=	6.75	ft	M=	530	ft-lbs
b=	1.50	in	Fb=	452	psi
d=	7.50	in	Fv=	34	psi
E=	1300	ksi	Δ =	0.06	in
Cv=	1.00	≤ 1.0	I/	1277	



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Project: Jaffe Residence Date: 08/05/22
Floor Framing Project #: _____
 Design: RJA
 Sheet: 13

Beam Analysis

Beam:		GL 5 Bm - FB1					
Load	Dead	Live	Roof Live	Seismic	Factored	Location	
Distributed (k/ft)	w ₁	0.016	0.053			0.069	
	w ₂					0.000	
	w ₃					0.000	
	w ₄					0.000	
	w ₅					0.000	
	w ₆					0.000	
	w ₇					0.000	
	w ₈					0.000	
	w ₉					0.000	
	w ₁₀					0.000	
Trapezoidal (k/ft/ft)	t ₁					0.000	
	t ₂					0.000	
	t ₃					0.000	
	t ₄					0.000	
	t ₅					0.000	
	t ₆					0.000	
Point (k)	P ₁	1.875	3.125			5.000	7.25
	P ₂	1.425	2.375			3.800	14.25
	P ₃					0.000	
	P ₄					0.000	
	P ₅					0.000	
	P ₆					0.000	
	P ₇					0.000	
	P ₈					0.000	
	P ₉					0.000	
	P ₁₀					0.000	

Support Locations and Reactions	
# of Supports	2
Total Beam Length	15.25
Left End Condition	Pinned
Right End Condition	Pinned
R ₁	3.398 0.00
R ₂	6.454 15.25
R ₃	0.000 15.25
R ₄	0.000 15.25
R ₅	0.000 15.25
R ₆	0.000 15.25
R ₇	0.000 15.25
R ₈	0.000 15.25
R ₉	0.000 15.25
R ₁₀	0.000 15.25

Demand Output	
Location, ft	10.00
Shear, k	-2.29
Moment, k-ft M =	16.78
Deflection, in D =	-0.40
Δ/Span	L/458

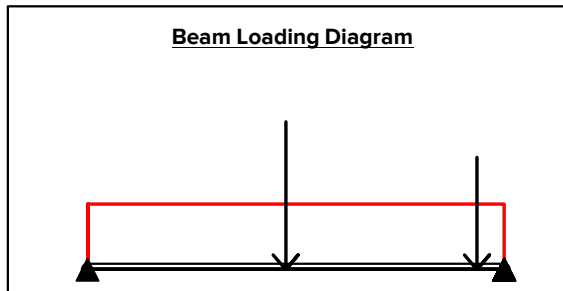
Load Factors	
Dead	1.00
Live	1.00
Roof Live	1.00
Seismic	1.00

Stresses @ Input Location	
f _v (psi)	-1226
f _b (psi)	13249

Max/Min Stresses	
f _v _MAX (psi)	1818
f _v _MIN (psi)	-3449
f _b _MAX (psi)	18000
f _b _MIN (psi)	0

Beam Properties	
E (ksi)	29000
b (in)	7
d (in)	9.25
I (in ⁴)	61.9
S (in ³)	15.2
A (in ²)	1.87
I (Override)	
S (Override)	
A (Override)	

Steel Beam Section		W8x18	
F _y , ksi	50		
Beam Weight (plf)	18		
Axis of Bending	Strong		
Unbr. Length (L _b), ft	0		
C _b	1		
A _w	1.87 in ²	V _r /Ω _v	37.4 k
S	15.2 in ³	φ _v V _n	56.2 k
Z	17 in ³	M _r /Ω _b	42.4 k-ft
I	61.9 in ⁴	φ _b M _n	63.8 k-ft



Span	V _L (kips)	V _R (kips)	M(-) (k-ft)	M(+) (k-ft)	Δ _{TL} (in)	@ x =	L/	Δ _{LL} (in)	@ x =	L/
Span 1	3.4	-6.45	-	22.8	-0.454 (†)	7.6	L/403	-0.29 (†)	7.6	L/631

SEATTLE 2124 Third Ave, Suite 100, Seattle, WA 98121 | ☎ 206.443.6212
 TACOMA 934 Broadway, Suite 100, Tacoma, WA 98402 | ☎ 253.284.9470
 SWENSON SAY FAGÉT | sseengineers.com



PROJECT Jaffe Residence

DATE 8/5/2022

PROJ. # _____

DESIGN RJA

SHEET _____

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall

Code Reference

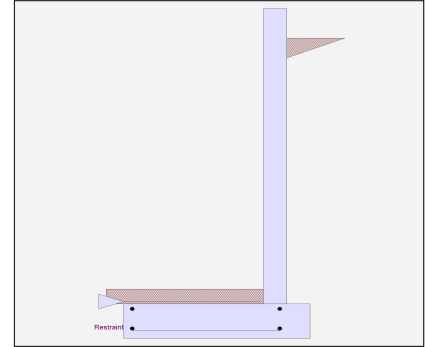
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	1.00 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	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||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		

Axial Load Applied to Stem

Axial Dead Load	=	100.0 lbs
Axial Live Load	=	400.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

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

Adjacent Footing Load

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

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall

Design Summary

Wall Stability Ratios

Overturning	=	1.87	OK
Slab Resists All Sliding !			
Global Stability	=	1.36	
Total Bearing Load	=	3,429 lbs	
...resultant ecc.	=	7.18 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	1,077 psf	OK
Soil Pressure @ Heel	=	210 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,508 psf	
ACI Factored @ Heel	=	294 psf	
Footing Shear @ Toe	=	20.9 psi	OK
Footing Shear @ Heel	=	5.5 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs

Lateral Sliding Force	=	1,808.8 lbs
-----------------------	---	-------------

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

Load Factors

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

Stem Construction

Design Height Above Ftg

ft =	Stem OK		
0.00			
Wall Material Above "Ht"	=	Concrete	
Design Method	=	SD	SD SD
Thickness	=	8.00	
Rebar Size	=	# 6	
Rebar Spacing	=	12.00	
Rebar Placed at	=	Edge	

Design Data

fb/FB + fa/Fa	=	0.661
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	2,268.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	6,804.0

Moment.....Allowable	=	10,280.8
----------------------	---	----------

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	33.6

Shear.....Allowable	psi =	82.2
---------------------	-------	------

Anet (Masonry)	in2 =	
----------------	-------	--

Wall Weight	psf =	100.0
-------------	-------	-------

Rebar Depth 'd'	in =	5.63
-----------------	------	------

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0
Fy	psi =	60,000.0

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>	
Bottom Stem			
As (based on applied moment) :	0.2849 in ² /ft		
(4/3) * As :	0.3799 in ² /ft	Min Stem T&S Reinf Area 1.920 in ²	
200bd/fy : 200(12)(5.625)/60000 :	0.225 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 :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.2849 in ² /ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.44 in ² /ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.9144 in ² /ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	4.00 ft
Heel Width	=	1.33
Total Footing Width	=	5.33
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 3,000 psi	Fy = 60,000 psi	
Footing Concrete Density = 150.00 pcf		
Min. As % = 0.0018		
Cover @ Top 2.00	@ Btm. = 3.00 in	

Footing Design Results

	<u>Toe</u>	<u>Heel</u>
Factored Pressure	= 1,508	294 psf
Mu' : Upward	= 9,631	76 ft-#
Mu' : Downward	= 2,280	343 ft-#
Mu: Design	= 7,351 OK	267 ft-# OK
phiMn	= 20,183	3,944 ft-#
Actual 1-Way Shear	= 20.88	5.48 psi
Allow 1-Way Shear	= 82.16	43.82 psi
Toe Reinforcing	= # 6 @ 12.00 in	
Heel Reinforcing	= None Spec'd	
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@ 7.93 in, #5@ 12.30 in, #6@ 17.46 in, #7@ 23.80 in, #8@ 31.34 in, #9@ 39.68 in, #10@ 50.39 in

Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm

Key: No key defined

Min footing T&S reinf Area 1.61 in²
Min footing T&S reinf Area per foot 0.30 in²/ft

If one layer of horizontal bars:

#4@ 7.94 in
#5@ 12.30 in
#6@ 17.46 in

If two layers of horizontal bars:

#4@ 15.87 in
#5@ 24.60 in
#6@ 34.92 in

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	1,808.8	3.39	6,129.9	Soil Over HL (ab. water tbl)	746.3	5.00	3,730.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		5.00	3,730.0
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	100.0	4.33	433.3
Added Lateral Load =				* Axial Live Load on Stem =	400.0	4.33	1,733.3
Load @ Stem Above Soil =				Soil Over Toe =	250.0	2.00	500.0
				Surcharge Over Toe =			
				Stem Weight(s) =	1,000.0	4.33	4,333.3
				Earth @ Stem Transitions =			
Total	= 1,808.8	O.T.M. =	6,129.9	Footing Weight =	932.8	2.67	2,485.8
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 1.87		Total =	3,029.0 lbs	R.M.=	11,482.5
Vertical Loads used for Soil Pressure =		3,429.0 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) 0.056 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.

SSF Engineers
2124 3rd Ave Suite 100
Seattle, WA 98121

Project Title: Jaffe Residence
Engineer: Ryan Anderson
Project ID:
Project Descr: Foundation Retaining Walls

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #6 bar specified in this stem design segment =	25.63 in
Development length for #6 bar specified in this stem design segment =	19.72 in
Hooked embedment length into footing for #6 bar specified in this stem design segment =	7.45 in
As Provided =	0.4400 in ² /ft
As Required =	0.2849 in ² /ft

Cantilevered Retaining Wall

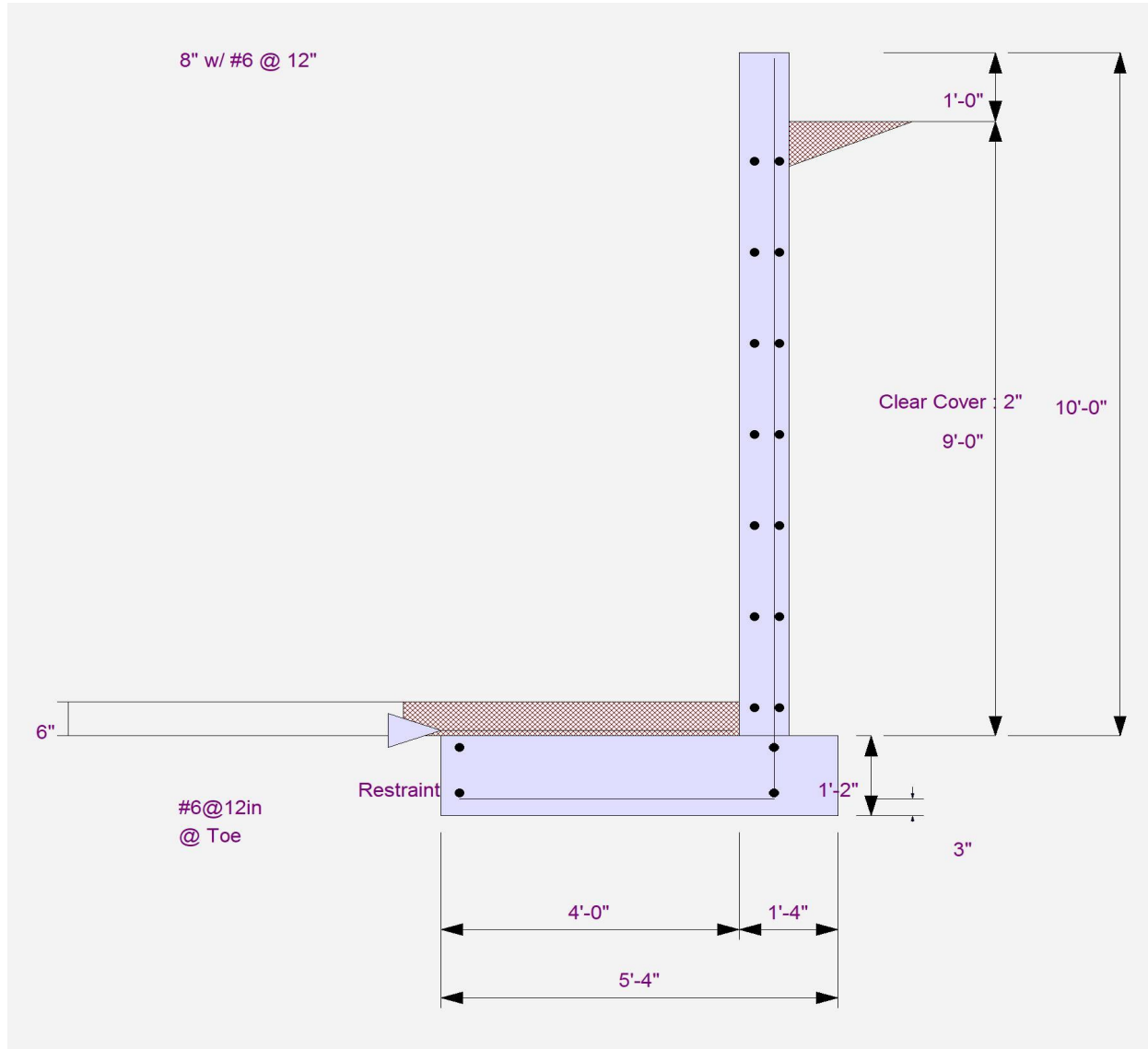
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall



Cantilevered Retaining Wall

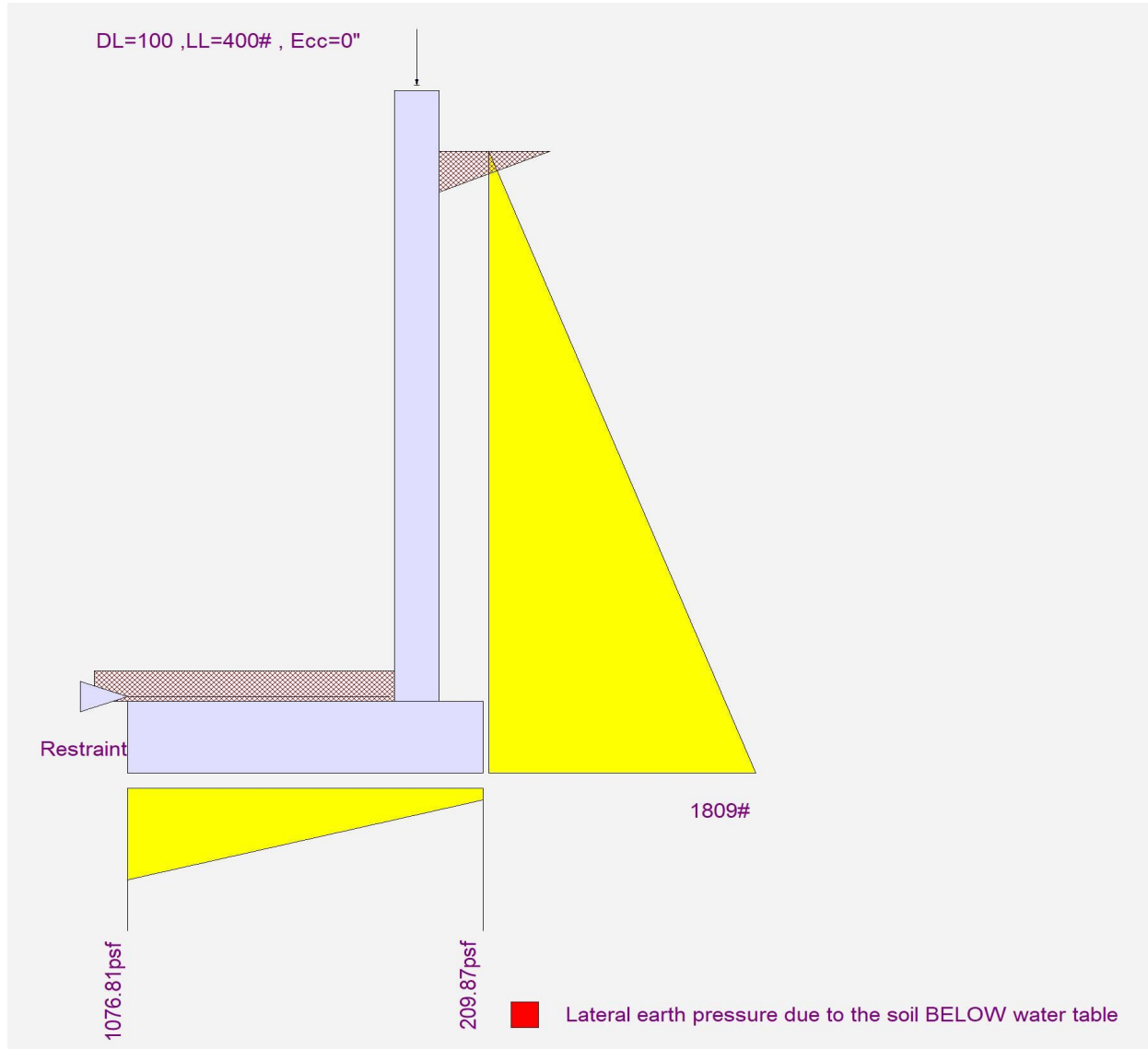
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall



Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall + Seismic

Code Reference

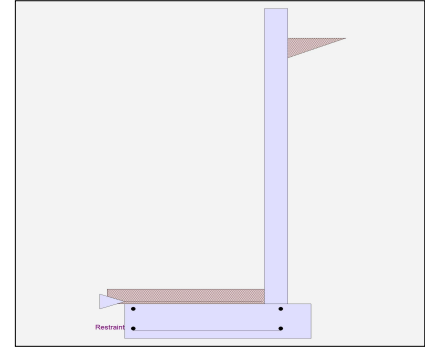
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	1.00 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	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||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		

Axial Load Applied to Stem

Axial Dead Load	=	100.0 lbs
Axial Live Load	=	400.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	8.000
(Multiplier used on soil density)		

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	=	0.0 psf (Strength Level)

Uniform Seismic Force	=	81.333
Total Seismic Force	=	826.889

Adjacent Footing Load

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

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall + Seismic

Design Summary

Wall Stability Ratios

Overturning	=	1.27 Ratio < 1.5!
Slab Resists All Sliding !		
Global Stability	=	1.36
Total Bearing Load	=	3,429 lbs
...resultant ecc.	=	17.48 in
Eccentricity outside middle third		
Soil Pressure @ Toe	=	1,892 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,648 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	29.7 psi OK
Footing Shear @ Heel	=	7.2 psi OK
Allowable	=	82.2 psi

Sliding Calcs

Lateral Sliding Force	=	2,387.6 lbs
-----------------------	---	-------------

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

Load Factors

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

Stem Construction

Design Height Above Ftg

ft =	Stem OK		
0.00			
Wall Material Above "Ht"	=	Concrete	
Design Method	=	SD	SD SD
Thickness	=	8.00	
Rebar Size	=	# 6	
Rebar Spacing	=	12.00	
Rebar Placed at	=	Edge	

Design Data

fb/FB + fa/Fa	=	0.982
---------------	---	-------

Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	3,000.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	10,098.0

Moment.....Allowable	=	10,280.8
----------------------	---	----------

Shear.....Actual

Service Level	psi =	
Strength Level	psi =	44.4

Shear.....Allowable	psi =	82.2
---------------------	-------	------

Anet (Masonry)	in2 =	
----------------	-------	--

Wall Weight	psf =	100.0
-------------	-------	-------

Rebar Depth 'd'	in =	5.63
-----------------	------	------

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0
Fy	psi =	60,000.0

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall + Seismic

Concrete Stem Rebar Area Details

	Vertical Reinforcing	Horizontal Reinforcing	
Bottom Stem			
As (based on applied moment) :	0.4229 in ² /ft		
(4/3) * As :	0.5639 in ² /ft	Min Stem T&S Reinf Area 1.920 in ²	
200bd/fy : 200(12)(5.625)/60000 :	0.225 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 :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.4229 in ² /ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.44 in ² /ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	0.9144 in ² /ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	4.00 ft
Heel Width	=	1.33
Total Footing Width	=	5.33
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 3,000 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	= 2,648		0 psf
Mu' : Upward	= 13,401		0 ft-#
Mu' : Downward	= 2,280		343 ft-#
Mu: Design	= 11,121 OK		343 ft-# OK
phiMn	= 20,183		3,944 ft-#
Actual 1-Way Shear	= 29.69		7.19 psi
Allow 1-Way Shear	= 82.16		43.82 psi
Toe Reinforcing	= # 6 @ 12.00 in		
Heel Reinforcing	= None Spec'd		
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@ 7.41 in, #5@ 11.49 in, #6@ 16.31 in, #7@ 22.24 in, #8@ 29.29 in, #9@ 37.07 in, #10@ 47.08 in

Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm

Key: No key defined

Min footing T&S reinf Area 1.61 in²
Min footing T&S reinf Area per foot 0.30 in²/ft

If one layer of horizontal bars:

#4@ 7.94 in
#5@ 12.30 in
#6@ 17.46 in

If two layers of horizontal bars:

#4@ 15.87 in
#5@ 24.60 in
#6@ 34.92 in

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall + Seismic

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	1,808.8	3.39	6,129.9	Soil Over HL (ab. water tbl)	746.3	5.00	3,730.0
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		5.00	3,730.0
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	100.0	4.33	433.3
Added Lateral Load =				* Axial Live Load on Stem =	400.0	4.33	1,733.3
Load @ Stem Above Soil =				Soil Over Toe =	250.0	2.00	500.0
Seismic Earth Load =	578.8	5.08	2,942.3	Surcharge Over Toe =			
=				Stem Weight(s) =	1,000.0	4.33	4,333.3
Total	= 2,387.6	O.T.M. =	9,072.2	Earth @ Stem Transitions =			
				Footing Weight =	932.8	2.67	2,485.8
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 1.27		Total =	3,029.0 lbs	R.M.=	11,482.5
Vertical Loads used for Soil Pressure =		3,429.0 lbs					

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

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) 0.099 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.

SSF Engineers
2124 3rd Ave Suite 100
Seattle, WA 98121

Project Title: Jaffe Residence
Engineer: Ryan Anderson
Project ID:
Project Descr: Foundation Retaining Walls

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall + Seismic

Rebar Lap & Embedment Lengths Information

Stem Design Segment: Bottom

Stem Design Height: 0.00 ft above top of footing

Lap Splice length for #6 bar specified in this stem design segment =	25.63 in
Development length for #6 bar specified in this stem design segment =	19.72 in
Hooked embedment length into footing for #6 bar specified in this stem design segment =	11.06 in
As Provided =	0.4400 in ² /ft
As Required =	0.4229 in ² /ft

Cantilevered Retaining Wall

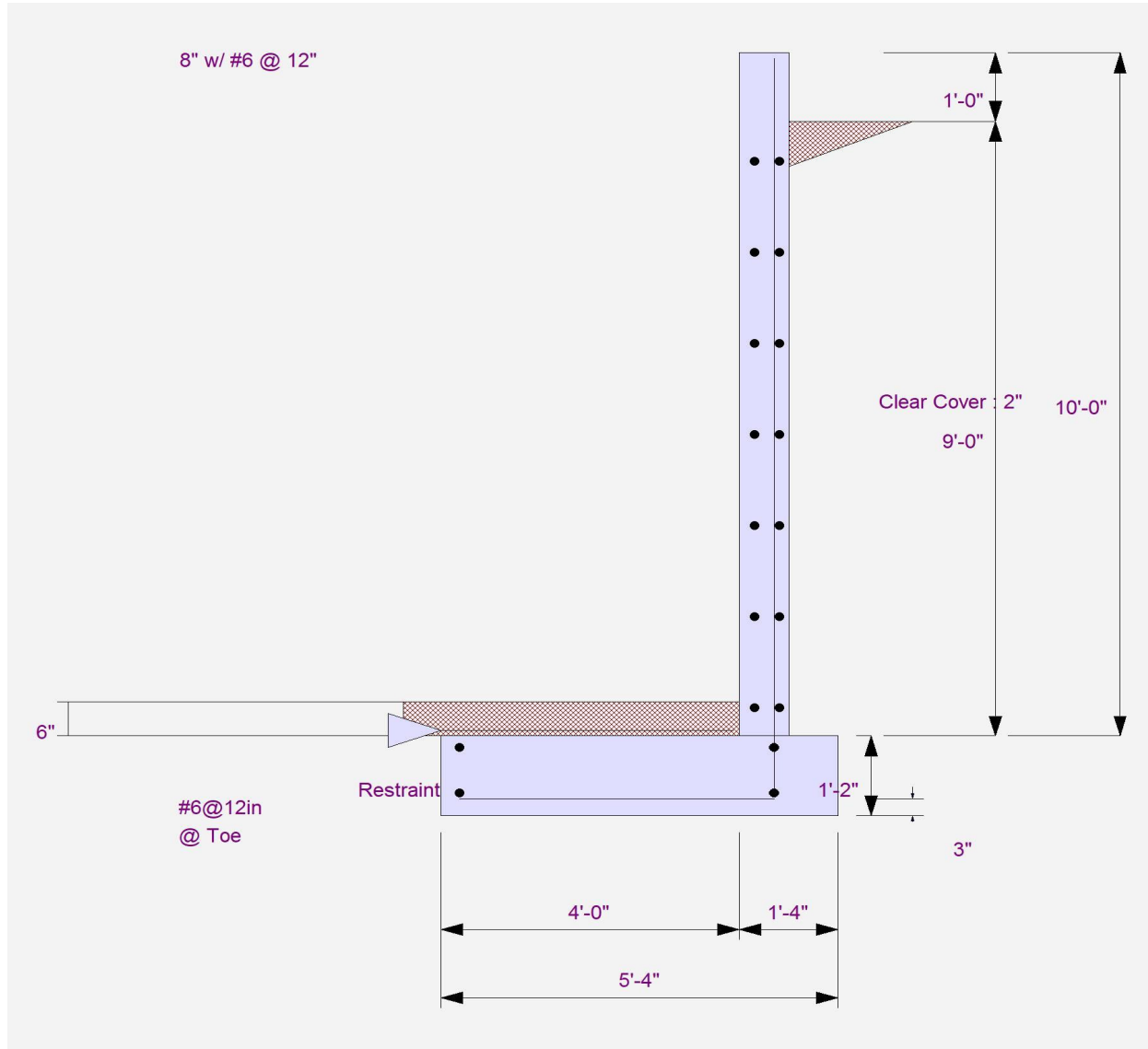
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall + Seismic



Cantilevered Retaining Wall

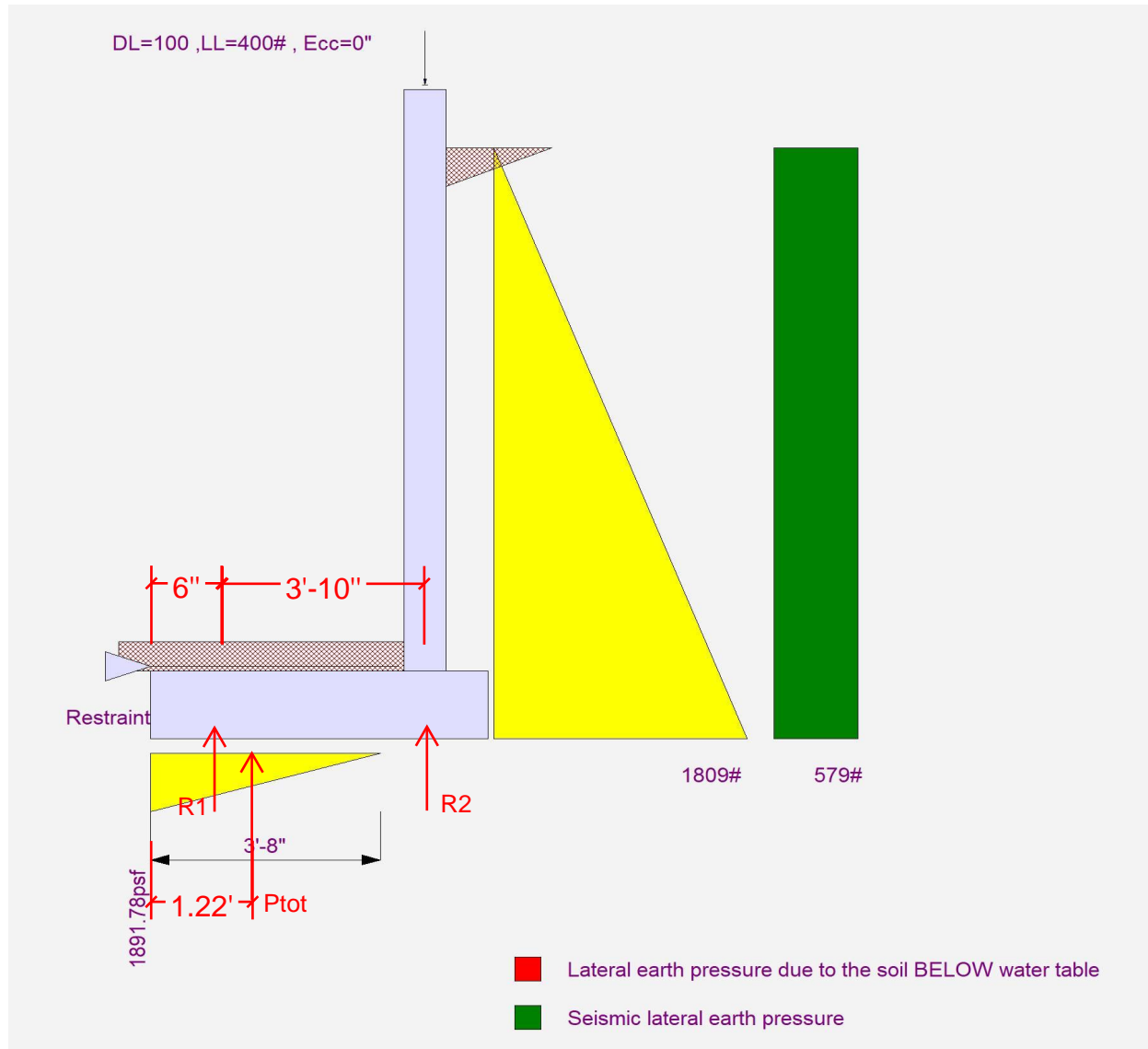
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 9' Tall Wall + Seismic



$P_{tot} = 1/2(1891)(3.67) = 3.43k$
 (2) 2" pin piles:
 $R1 = 2.78k, R2 = 0.65k$
 2" pin pile capacity = 6k (includes FS = 2.0)
 Increase capacity by 1/3 for transient loading = 8k
 Pin Pile Spacing = $8k/2.78 = 2.9'oc$ max

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall + Seismic

Code Reference

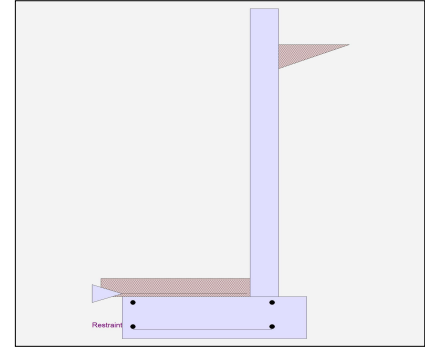
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	7.00 ft
Wall height above soil	=	1.00 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	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||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		

Axial Load Applied to Stem

Axial Dead Load	=	100.0 lbs
Axial Live Load	=	400.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	8.000
(Multiplier used on soil density)		

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	=	0.0 psf (Strength Level)

Uniform Seismic Force	=	65.333
Total Seismic Force	=	533.556

Adjacent Footing Load

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

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall + Seismic

Design Summary

Wall Stability Ratios

Overturning	=	1.54	OK
Slab Resists All Sliding !			
Global Stability	=	1.71	
Total Bearing Load	=	2,826 lbs	
...resultant ecc.	=	9.53 in	
Eccentricity outside middle third			
Soil Pressure @ Toe	=	1,374 psf	OK
Soil Pressure @ Heel	=	0 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,924 psf	
ACI Factored @ Heel	=	0 psf	
Footing Shear @ Toe	=	18.8 psi	OK
Footing Shear @ Heel	=	5.5 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs

Lateral Sliding Force	=	1,540.6 lbs
-----------------------	---	-------------

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

Load Factors

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

Stem Construction

Design Height Above Ftg	ft =	Stem OK		
Wall Material Above "Ht"	=	Concrete		
Design Method	=	SD	SD	SD
Thickness	=	8.00		
Rebar Size	=	# 5		
Rebar Spacing	=	12.00		
Rebar Placed at	=	Edge		

Design Data

fb/FB + fa/Fa	=	0.585
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	1,829.3

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	4,802.0

Moment.....Allowable	=	8,206.3
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Shear.....Actual

Service Level	psi =	
Strength Level	psi =	24.6

Shear.....Allowable	psi =	82.2
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Anet (Masonry)	in2 =	
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Wall Weight	psf =	100.0
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Rebar Depth 'd'	in =	6.19
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Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0
Fy	psi =	60,000.0

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall + Seismic

Concrete Stem Rebar Area Details

	Vertical Reinforcing	Horizontal Reinforcing	
Bottom Stem			
As (based on applied moment) :	0.1818 in2/ft		
(4/3) * As :	0.2424 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 :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.2424 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 :	1.0059 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	3.00 ft
Heel Width	=	1.33
Total Footing Width	=	4.33
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c =	3,000 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	= 1,924		0 psf
Mu' : Upward	= 6,552		7 ft-#
Mu' : Downward	= 1,283		277 ft-#
Mu: Design	= 5,270 OK		270 ft-# OK
phiMn	= 14,485		3,944 ft-#
Actual 1-Way Shear	= 18.84		5.48 psi
Allow 1-Way Shear	= 82.16		43.82 psi
Toe Reinforcing	= # 5 @ 12.00 in		
Heel Reinforcing	= None Spec'd		
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@ 7.93 in, #5@ 12.30 in, #6@ 17.46 in, #7@ 23.80 in, #8@ 31.34 in, #9@ 39.68 in, #10@ 50.39 in

Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm

Key: No key defined

Min footing T&S reinf Area 1.31 in2
Min footing T&S reinf Area per foot 0.30 in2 /ft

If one layer of horizontal bars:

#4@ 7.94 in
#5@ 12.30 in
#6@ 17.46 in

If two layers of horizontal bars:

#4@ 15.87 in
#5@ 24.60 in
#6@ 34.92 in

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall + Seismic

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	1,167.2	2.72	3,177.2	Soil Over HL (ab. water tbl)	580.4	4.00	2,320.7
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		4.00	2,320.7
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	100.0	3.33	333.3
Added Lateral Load =				* Axial Live Load on Stem =	400.0	3.33	1,333.3
Load @ Stem Above Soil =				Soil Over Toe =	187.5	1.50	281.3
Seismic Earth Load =	373.5	4.08	1,525.1	Surcharge Over Toe =			
=				Stem Weight(s) =	800.0	3.33	2,666.7
Total	= 1,540.6	O.T.M. =	4,702.3	Earth @ Stem Transitions =			
				Footing Weight =	757.8	2.17	1,640.5
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 1.54		Total =	2,425.7 lbs	R.M.=	7,242.5
Vertical Loads used for Soil Pressure =		2,825.7 lbs					

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

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) 0.071 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.

SSF Engineers
2124 3rd Ave Suite 100
Seattle, WA 98121

Project Title: Jaffe Residence
Engineer: Ryan Anderson
Project ID:
Project Descr: Foundation Retaining Walls

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall + 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 =	21.36 in
Development length for #5 bar specified in this stem design segment =	16.43 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	7.50 in
As Provided =	0.3100 in/ft
As Required =	0.2424 in/ft

Cantilevered Retaining Wall

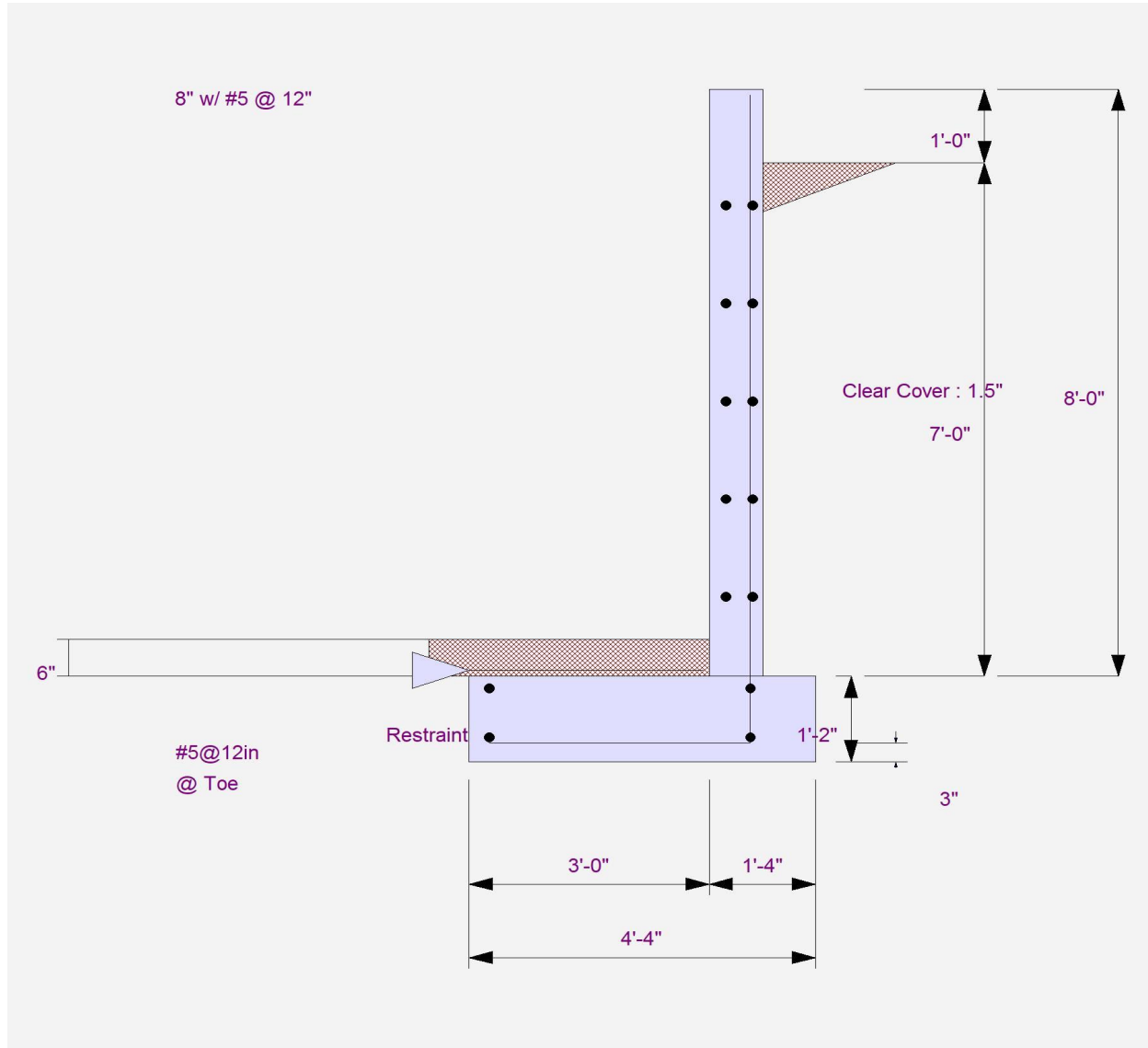
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall + Seismic



Cantilevered Retaining Wall

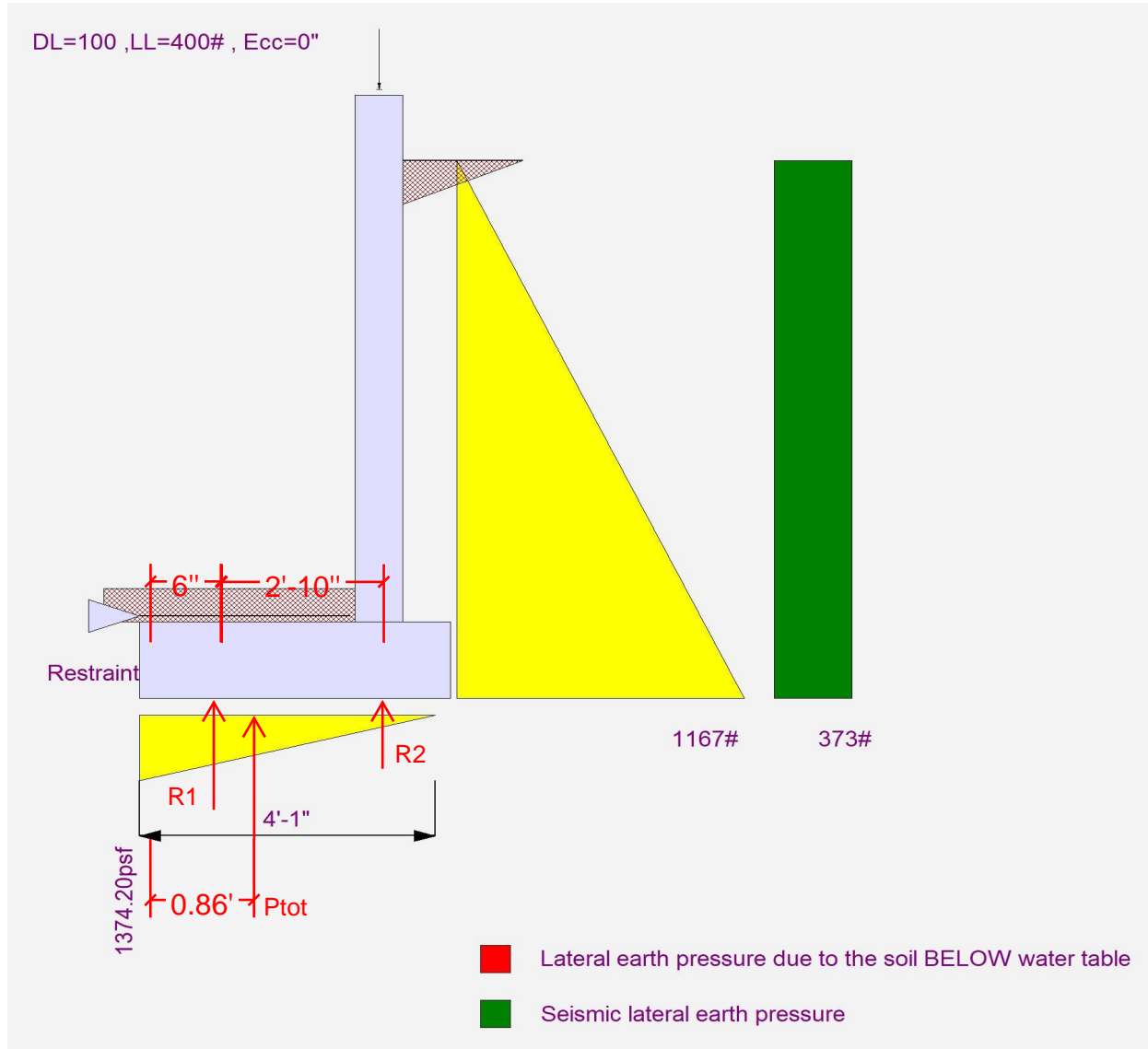
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall + Seismic



$P_{tot} = 1/2(1374)(4.08) = 2.82k$
 (2) 2" pin piles:
 $R1 = 1.96k, R2 = 0.86k$
 2" pin pile capacity = 6k (includes FS = 2.0)
 Increase capacity by 1/3 for transient loading = 8k
 Pin Pile Spacing = $8k/1.96 = 4.08'oc$ max

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall

Code Reference

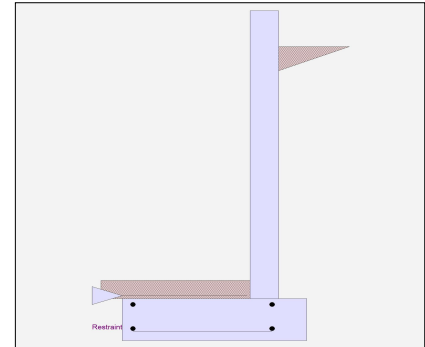
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	7.00 ft
Wall height above soil	=	1.00 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	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||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		

Axial Load Applied to Stem

Axial Dead Load	=	100.0 lbs
Axial Live Load	=	400.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

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

Adjacent Footing Load

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

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall

Design Summary

Wall Stability Ratios

Overturning	=	2.28	OK
Slab Resists All Sliding !			
Global Stability	=	1.71	
Total Bearing Load	=	2,826 lbs	
...resultant ecc.	=	3.05 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	883 psf	OK
Soil Pressure @ Heel	=	422 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,236 psf	
ACI Factored @ Heel	=	591 psf	
Footing Shear @ Toe	=	12.9 psi	OK
Footing Shear @ Heel	=	2.9 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs

Lateral Sliding Force	=	1,167.2 lbs
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Vertical component of active lateral soil pressure IS
 NOT considered in the calculation of soil bearing

Load Factors

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

Stem Construction

Design Height Above Ftg

ft =	Stem OK	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	SD
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.390
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	1,372.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	3,201.3

Moment.....Allowable	=	8,206.3
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Shear.....Actual

Service Level	psi =	
Strength Level	psi =	18.5

Shear.....Allowable	psi =	82.2
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Anet (Masonry)	in2 =	
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Wall Weight	psf =	100.0
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Rebar Depth 'd'	in =	6.19
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Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0
Fy	psi =	60,000.0

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall Wall

Concrete Stem Rebar Area Details

	<u>Vertical Reinforcing</u>	<u>Horizontal Reinforcing</u>	
Bottom Stem			
As (based on applied moment) :	0.1212 in ² /ft		
(4/3) * As :	0.1616 in ² /ft	Min Stem T&S Reinf Area 1.536 in ²	
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 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 :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.1728 in ² /ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.31 in ² /ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	1.0059 in ² /ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	3.00 ft
Heel Width	=	1.33
Total Footing Width	=	4.33
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 3,000 psi	Fy = 60,000 psi	
Footing Concrete Density = 150.00 pcf		
Min. As % = 0.0018		
Cover @ Top 2.00	@ Btm. = 3.00 in	

Footing Design Results

	<u>Toe</u>	<u>Heel</u>
Factored Pressure	= 1,236	591 psf
Mu' : Upward	= 4,891	137 ft-#
Mu' : Downward	= 1,283	277 ft-#
Mu: Design	= 3,609 OK	140 ft-# OK
phiMn	= 14,485	3,944 ft-#
Actual 1-Way Shear	= 12.95	2.85 psi
Allow 1-Way Shear	= 82.16	43.82 psi
Toe Reinforcing	= # 5 @ 12.00 in	
Heel Reinforcing	= None Spec'd	
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@ 7.93 in, #5@ 12.30 in, #6@ 17.46 in, #7@ 23.80 in, #8@ 31.34 in, #9@ 39.68 in, #10@ 50.39 in

Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm

Key: No key defined

Min footing T&S reinf Area 1.31 in²
Min footing T&S reinf Area per foot 0.30 in² /ft

If one layer of horizontal bars:

#4@ 7.94 in
#5@ 12.30 in
#6@ 17.46 in

If two layers of horizontal bars:

#4@ 15.87 in
#5@ 24.60 in
#6@ 34.92 in

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

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DESCRIPTION: 7' Tall Wall

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	1,167.2	2.72	3,177.2	Soil Over HL (ab. water tbl)	580.4	4.00	2,320.7
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		4.00	2,320.7
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	100.0	3.33	333.3
Added Lateral Load =				* Axial Live Load on Stem =	400.0	3.33	1,333.3
Load @ Stem Above Soil =				Soil Over Toe =	187.5	1.50	281.3
				Surcharge Over Toe =			
				Stem Weight(s) =	800.0	3.33	2,666.7
				Earth @ Stem Transitions =			
Total	= 1,167.2	O.T.M. =	3,177.2	Footing Weight =	757.8	2.17	1,640.5
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 2.28		Total =	2,425.7 lbs	R.M.=	7,242.5
Vertical Loads used for Soil Pressure =		2,825.7 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) 0.045 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.

SSF Engineers
2124 3rd Ave Suite 100
Seattle, WA 98121

Project Title: Jaffe Residence
Engineer: Ryan Anderson
Project ID:
Project Descr: Foundation Retaining Walls

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 7' Tall 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 = 21.36 in

Development length for #5 bar specified in this stem design segment = 16.43 in

Hooked embedment length into footing for #5 bar specified in this stem design segment = 6.00 in

As Provided = 0.3100 in²/ft

As Required = 0.1728 in²/ft

Cantilevered Retaining Wall

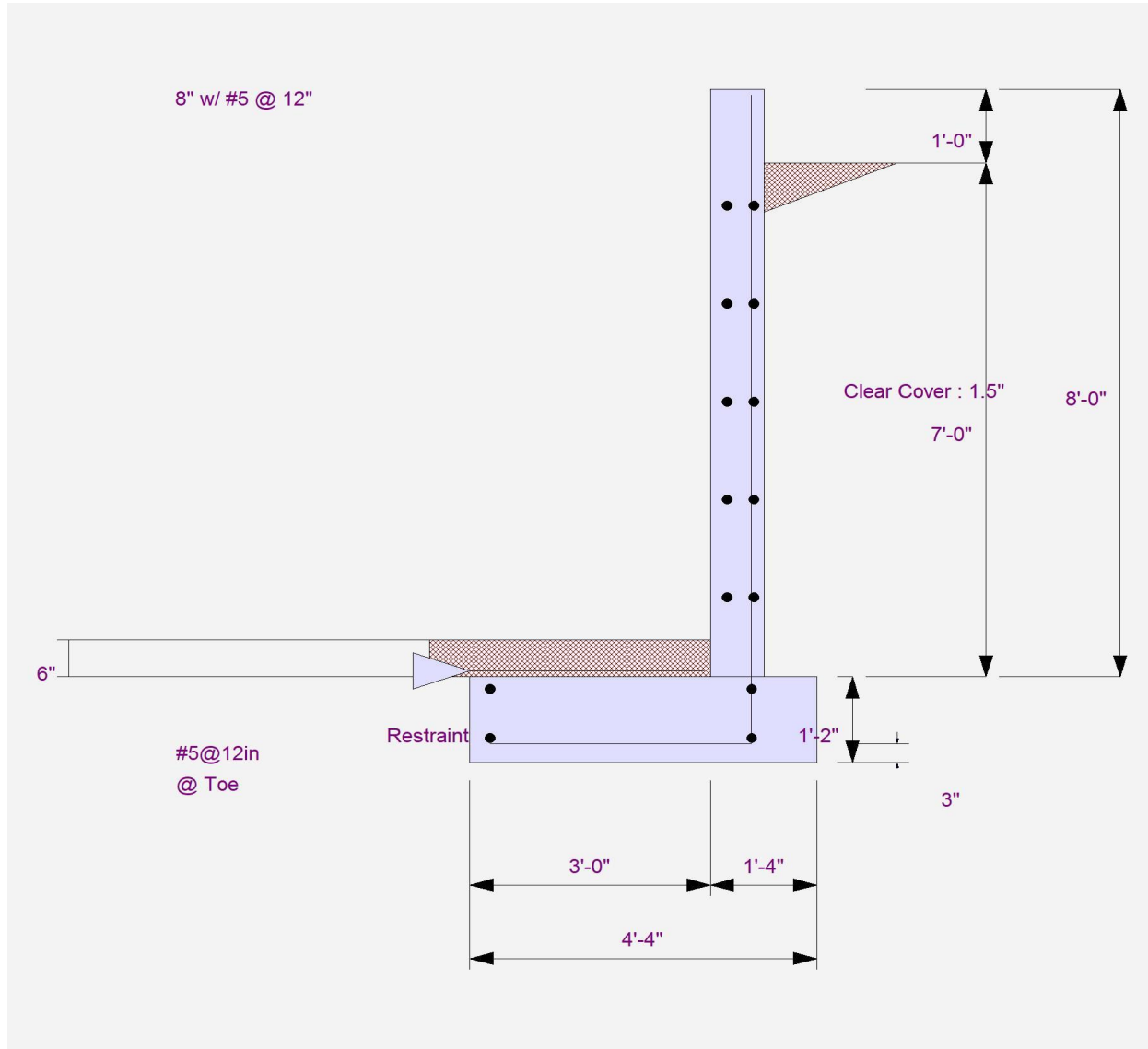
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LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

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DESCRIPTION: 7' Tall Wall



Cantilevered Retaining Wall

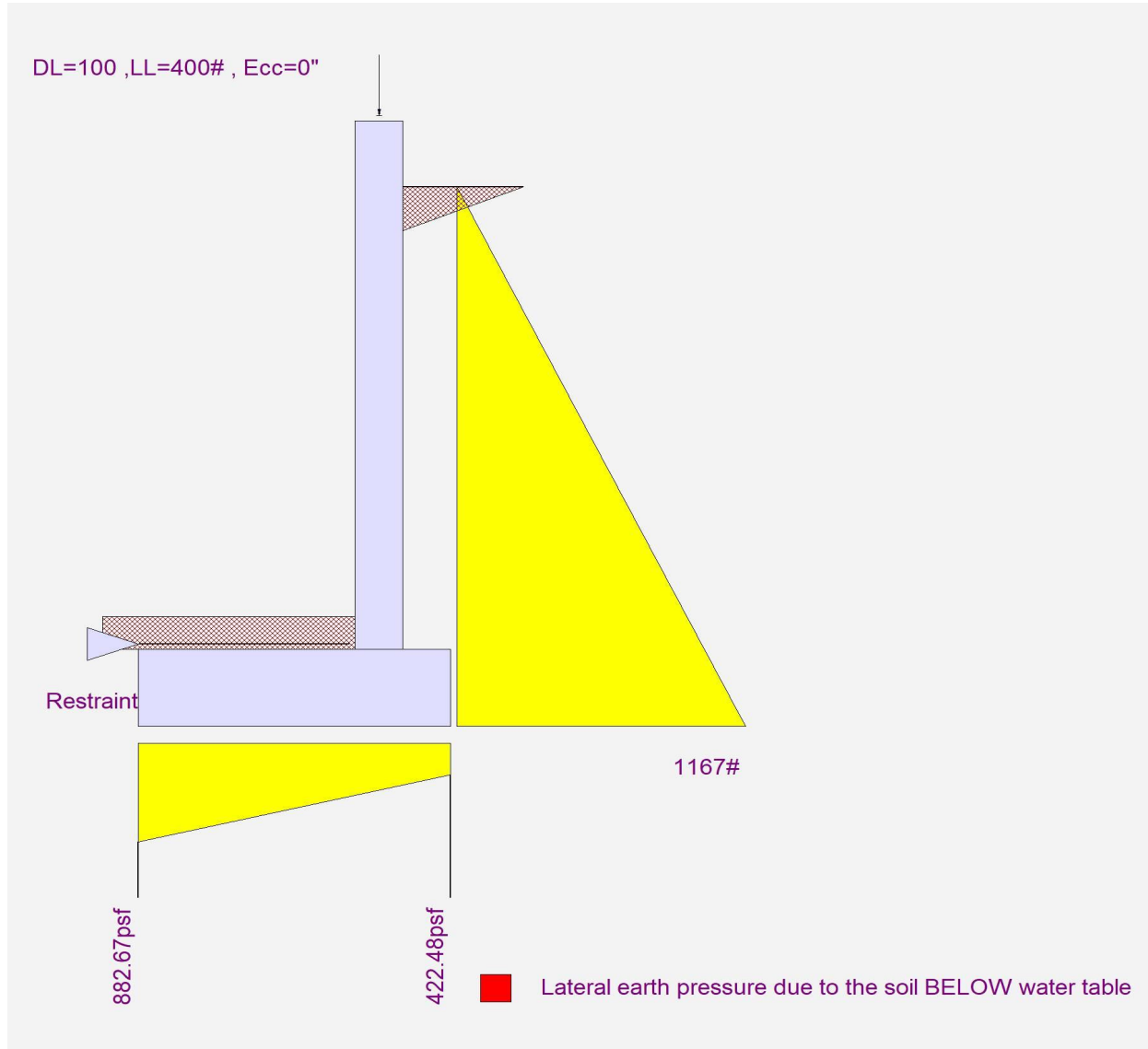
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LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

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DESCRIPTION: 7' Tall Wall



Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall + Seismic

Code Reference

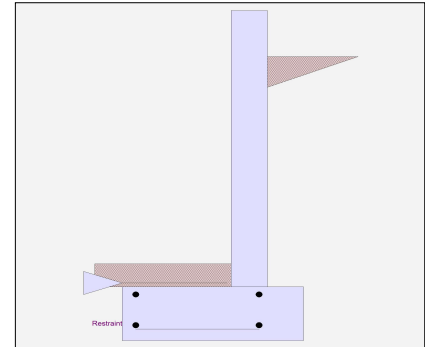
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	5.00 ft
Wall height above soil	=	1.00 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	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||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		

Axial Load Applied to Stem

Axial Dead Load	=	100.0 lbs
Axial Live Load	=	400.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Method	:	Uniform
Multiplier Used	=	8.000
(Multiplier used on soil density)		

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	=	0.0 psf (Strength Level)

Uniform Seismic Force	=	49.333
Total Seismic Force	=	304.222

Adjacent Footing Load

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

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall + Seismic

Design Summary

Wall Stability Ratios

Overturning	=	1.96	OK
Slab Resists All Sliding !			
Global Stability	=	2.28	
Total Bearing Load	=	2,222 lbs	
...resultant ecc.	=	4.43 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	1,111 psf	OK
Soil Pressure @ Heel	=	224 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,555 psf	
ACI Factored @ Heel	=	313 psf	
Footing Shear @ Toe	=	9.2 psi	OK
Footing Shear @ Heel	=	2.4 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs

Lateral Sliding Force	=	878.4 lbs
-----------------------	---	-----------

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

Load Factors

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

Stem Construction

Design Height Above Ftg

ft =	Stem OK		
Wall Material Above "Ht"	=	Concrete	
Design Method	=	SD	SD SD
Thickness	=	8.00	
Rebar Size	=	# 5	
Rebar Spacing	=	12.00	
Rebar Placed at	=	Edge	

Design Data

fb/FB + fa/Fa	=	0.217
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	946.7

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	1,783.3

Moment.....Allowable	=	8,206.3
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Shear.....Actual

Service Level	psi =	
Strength Level	psi =	12.7

Shear.....Allowable	psi =	82.2
---------------------	-------	------

Anet (Masonry)	in2 =	
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Wall Weight	psf =	100.0
-------------	-------	-------

Rebar Depth 'd'	in =	6.19
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Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0
Fy	psi =	60,000.0

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall + Seismic

Concrete Stem Rebar Area Details

	Vertical Reinforcing	Horizontal Reinforcing	
Bottom Stem			
As (based on applied moment) :	0.0675 in2/ft		
(4/3) * As :	0.09 in2/ft	Min Stem T&S Reinf Area 1.152 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 :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.1728 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 :	1.0059 in2/ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	1.33
Total Footing Width	=	3.33
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 3,000 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	= 1,555	313 psf
Mu' : Upward	= 2,613	87 ft-#
Mu' : Downward	= 570	211 ft-#
Mu: Design	= 2,043 OK	124 ft-# OK
phiMn	= 14,485	3,944 ft-#
Actual 1-Way Shear	= 9.25	2.41 psi
Allow 1-Way Shear	= 82.16	43.82 psi
Toe Reinforcing	= # 5 @ 12.00 in	
Heel Reinforcing	= None Spec'd	
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@ 7.93 in, #5@ 12.30 in, #6@ 17.46 in, #7@ 23.80 in, #8@ 31.34 in, #9@ 39.68 in, #10@ 50.39 in

Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm

Key: No key defined

Min footing T&S reinf Area 1.01 in2
Min footing T&S reinf Area per foot 0.30 in2 /ft

If one layer of horizontal bars:

#4@ 7.94 in
#5@ 12.30 in
#6@ 17.46 in

If two layers of horizontal bars:

#4@ 15.87 in
#5@ 24.60 in
#6@ 34.92 in

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall + Seismic

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	665.5	2.06	1,367.9	Soil Over HL (ab. water tbl)	414.6	3.00	1,243.1
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.00	1,243.1
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	100.0	2.33	233.3
Added Lateral Load =				* Axial Live Load on Stem =	400.0	2.33	933.3
Load @ Stem Above Soil =				Soil Over Toe =	125.0	1.00	125.0
Seismic Earth Load =	213.0	3.08	656.6	Surcharge Over Toe =			
=				Stem Weight(s) =	600.0	2.33	1,400.0
Total =	878.4	O.T.M.	2,024.6	Earth @ Stem Transitions =			
				Footing Weight =	582.8	1.67	970.3
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	1.96	Total =	1,822.3 lbs	R.M.=	3,971.7
Vertical Loads used for Soil Pressure =		2,222.3 lbs					

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

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) 0.056 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.

SSF Engineers
2124 3rd Ave Suite 100
Seattle, WA 98121

Project Title: Jaffe Residence
Engineer: Ryan Anderson
Project ID:
Project Descr: Foundation Retaining Walls

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall + 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 =	21.36 in
Development length for #5 bar specified in this stem design segment =	16.43 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	6.00 in
As Provided =	0.3100 in ² /ft
As Required =	0.1728 in ² /ft

Cantilevered Retaining Wall

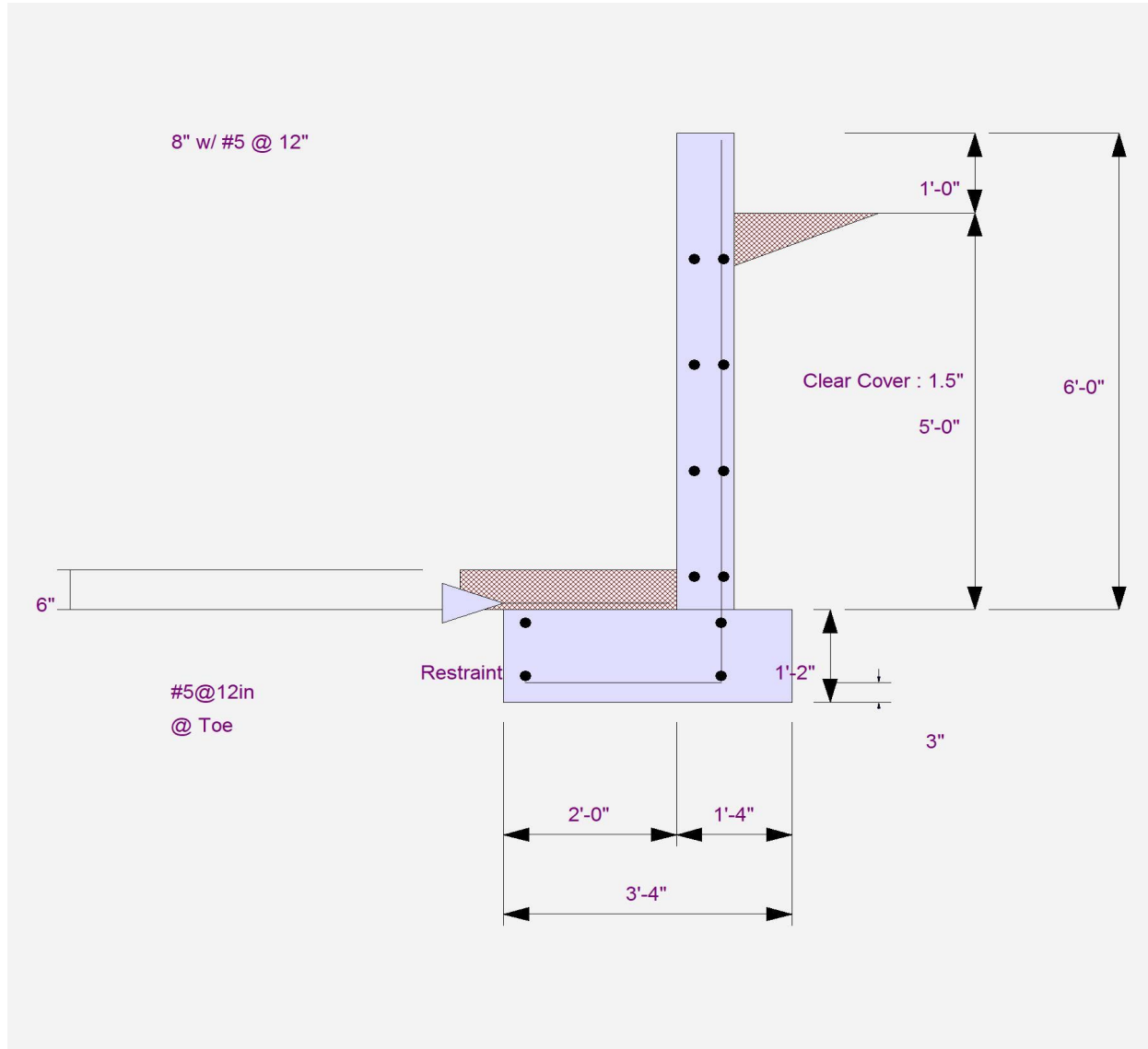
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall + Seismic



Cantilevered Retaining Wall

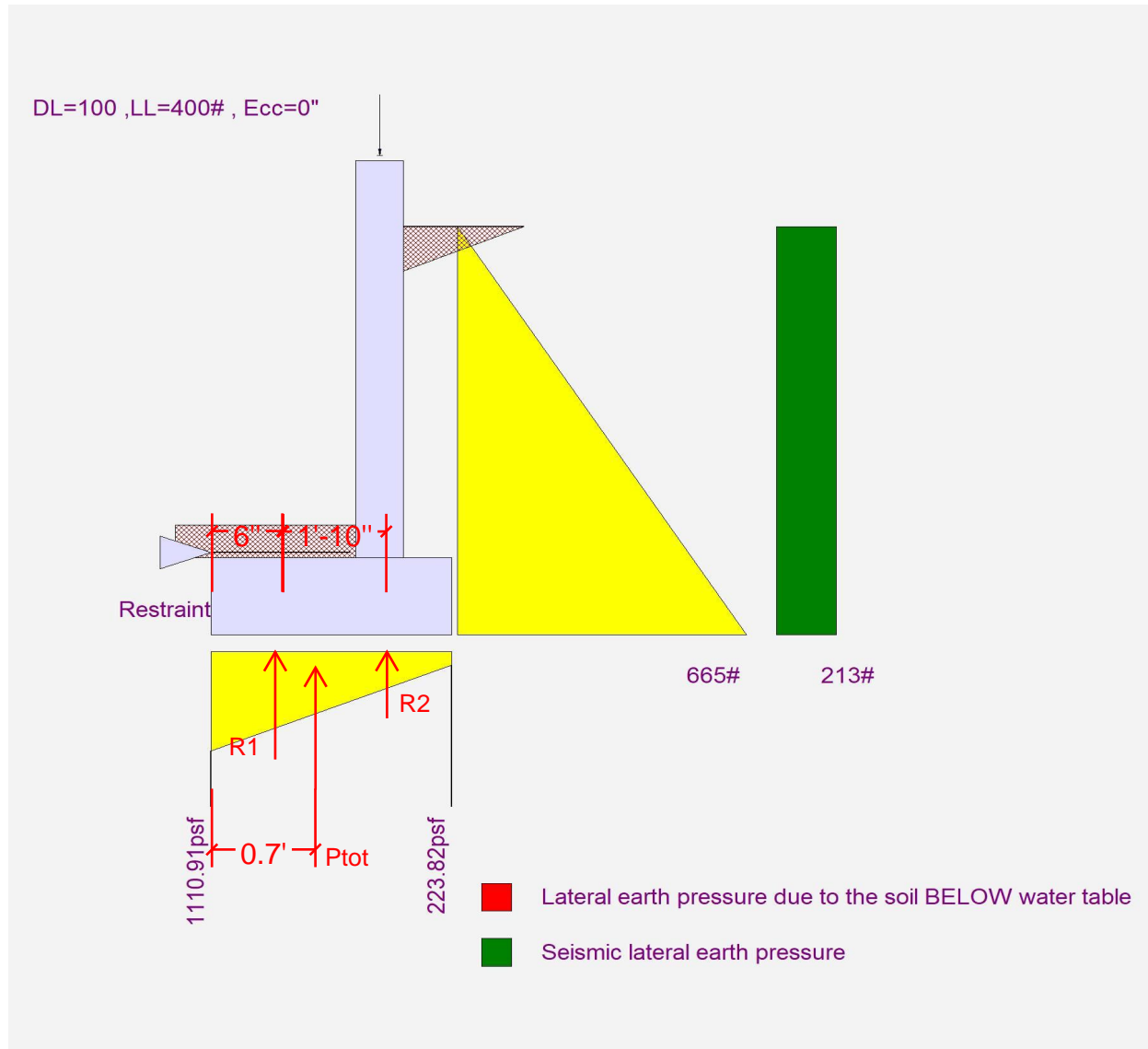
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall + Seismic



$P_{tot} = 1/2(1110)(4) = 2.22k$
 (2) 2" pin piles:
 $R1 = 1.37k$, $R2 = 0.85k$
 2" pin pile capacity = 6k (includes FS = 2.0)
 Increase capacity by 1/3 for transient loading = 8k
 Pin Pile Spacing = $8k/1.37 = 5.83'oc$ max

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall

Code Reference

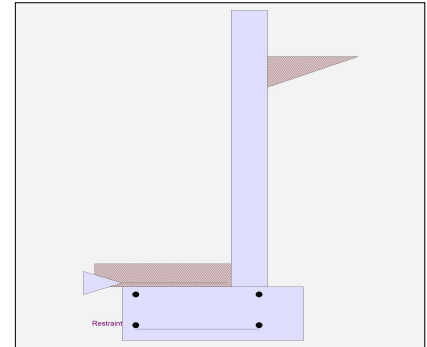
Calculations per IBC 2018 1807.3, CBC 2019, ASCE 7-16

Criteria

Retained Height	=	5.00 ft
Wall height above soil	=	1.00 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	=	300.0 psf/ft
Soil Density, Heel	=	125.00 pcf
Soil Density, Toe	=	125.00 pcf
Footing||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		

Axial Load Applied to Stem

Axial Dead Load	=	100.0 lbs
Axial Live Load	=	400.0 lbs
Axial Load Eccentricity	=	0.0 in

Lateral Load Applied to Stem

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

Adjacent Footing Load

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

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall

Design Summary

Wall Stability Ratios

Overturning	=	2.90	OK
Slab Resists All Sliding !			
Global Stability	=	2.28	
Total Bearing Load	=	2,222 lbs	
...resultant ecc.	=	0.88 in	
Eccentricity within middle third			
Soil Pressure @ Toe	=	756 psf	OK
Soil Pressure @ Heel	=	579 psf	OK
Allowable	=	2,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,058 psf	
ACI Factored @ Heel	=	811 psf	
Footing Shear @ Toe	=	6.3 psi	OK
Footing Shear @ Heel	=	0.6 psi	OK
Allowable	=	82.2 psi	

Sliding Calcs

Lateral Sliding Force	=	665.5 lbs
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Vertical component of active lateral soil pressure IS
NOT considered in the calculation of soil bearing

Load Factors

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

Stem Construction

Design Height Above Ftg

ft =	Stem OK	0.00
Wall Material Above "Ht"	=	Concrete
Design Method	=	SD
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.142
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Total Force @ Section

Service Level	lbs =	
Strength Level	lbs =	700.0

Moment....Actual

Service Level	ft-# =	
Strength Level	ft-# =	1,166.7

Moment.....Allowable	=	8,206.3
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Shear.....Actual

Service Level	psi =	
Strength Level	psi =	9.4

Shear.....Allowable	psi =	82.2
---------------------	-------	------

Anet (Masonry)	in2 =	
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Wall Weight	psf =	100.0
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Rebar Depth 'd'	in =	6.19
-----------------	------	------

Masonry Data

f'm	psi =	
Fs	psi =	
Solid Grouting	=	
Modular Ratio 'n'	=	
Equiv. Solid Thick.	=	
Masonry Block Type	=	
Masonry Design Method	=	ASD

Concrete Data

f'c	psi =	3,000.0
Fy	psi =	60,000.0

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall

Concrete Stem Rebar Area Details

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0442 in ² /ft		
(4/3) * As :	0.0589 in ² /ft	Min Stem T&S Reinf Area 1.152 in ²	
200bd/fy : 200(12)(6.1875)/60000 :	0.2475 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 :	
	=====	<u>One layer of :</u> <u>Two layers of :</u>	
Required Area :	0.1728 in ² /ft	#4@ 12.50 in	#4@ 25.00 in
Provided Area :	0.31 in ² /ft	#5@ 19.38 in	#5@ 38.75 in
Maximum Area :	1.0059 in ² /ft	#6@ 27.50 in	#6@ 55.00 in

Footing Data

Toe Width	=	2.00 ft
Heel Width	=	1.33
Total Footing Width	=	3.33
Footing Thickness	=	14.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 3,000 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	= 1,058	811 psf	
Mu' : Upward	= 2,017	182 ft-#	
Mu' : Downward	= 570	211 ft-#	
Mu: Design	= 1,447 OK	29 ft-#	OK
phiMn	= 14,485	3,944 ft-#	
Actual 1-Way Shear	= 6.30	0.57 psi	
Allow 1-Way Shear	= 82.16	43.82 psi	
Toe Reinforcing	= # 5 @ 12.00 in		
Heel Reinforcing	= None Spec'd		
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@ 7.93 in, #5@ 12.30 in, #6@ 17.46 in, #7@ 23.80 in, #8@ 31.34 in, #9@ 39.68 in, #10@ 50.39 in

Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm

Key: No key defined

Min footing T&S reinf Area 1.01 in²
Min footing T&S reinf Area per foot 0.30 in²/ft

If one layer of horizontal bars:

#4@ 7.94 in
#5@ 12.30 in
#6@ 17.46 in

If two layers of horizontal bars:

#4@ 15.87 in
#5@ 24.60 in
#6@ 34.92 in

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall

Summary of Overturning & Resisting Forces & Moments

Item	.....OVERTURNING.....			.....RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	665.5	2.06	1,367.9	Soil Over HL (ab. water tbl)	414.6	3.00	1,243.1
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		3.00	1,243.1
Hydrostatic Force				Water Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =	100.0	2.33	233.3
Added Lateral Load =				* Axial Live Load on Stem =	400.0	2.33	933.3
Load @ Stem Above Soil =				Soil Over Toe =	125.0	1.00	125.0
				Surcharge Over Toe =			
				Stem Weight(s) =	600.0	2.33	1,400.0
				Earth @ Stem Transitions =			
Total	= 665.5	O.T.M.	= 1,367.9	Footing Weight =	582.8	1.67	970.3
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		=	2.90	Total =	1,822.3 lbs	R.M.=	3,971.7
Vertical Loads used for Soil Pressure =		2,222.3 lbs		* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.			

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

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci
Horizontal Defl @ Top of Wall (approximate only) 0.038 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.

SSF Engineers
2124 3rd Ave Suite 100
Seattle, WA 98121

Project Title: Jaffe Residence
Engineer: Ryan Anderson
Project ID:
Project Descr: Foundation Retaining Walls

Cantilevered Retaining Wall

Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall 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 =	21.36 in
Development length for #5 bar specified in this stem design segment =	16.43 in
Hooked embedment length into footing for #5 bar specified in this stem design segment =	6.00 in
As Provided =	0.3100 in ² /ft
As Required =	0.1728 in ² /ft

Cantilevered Retaining Wall

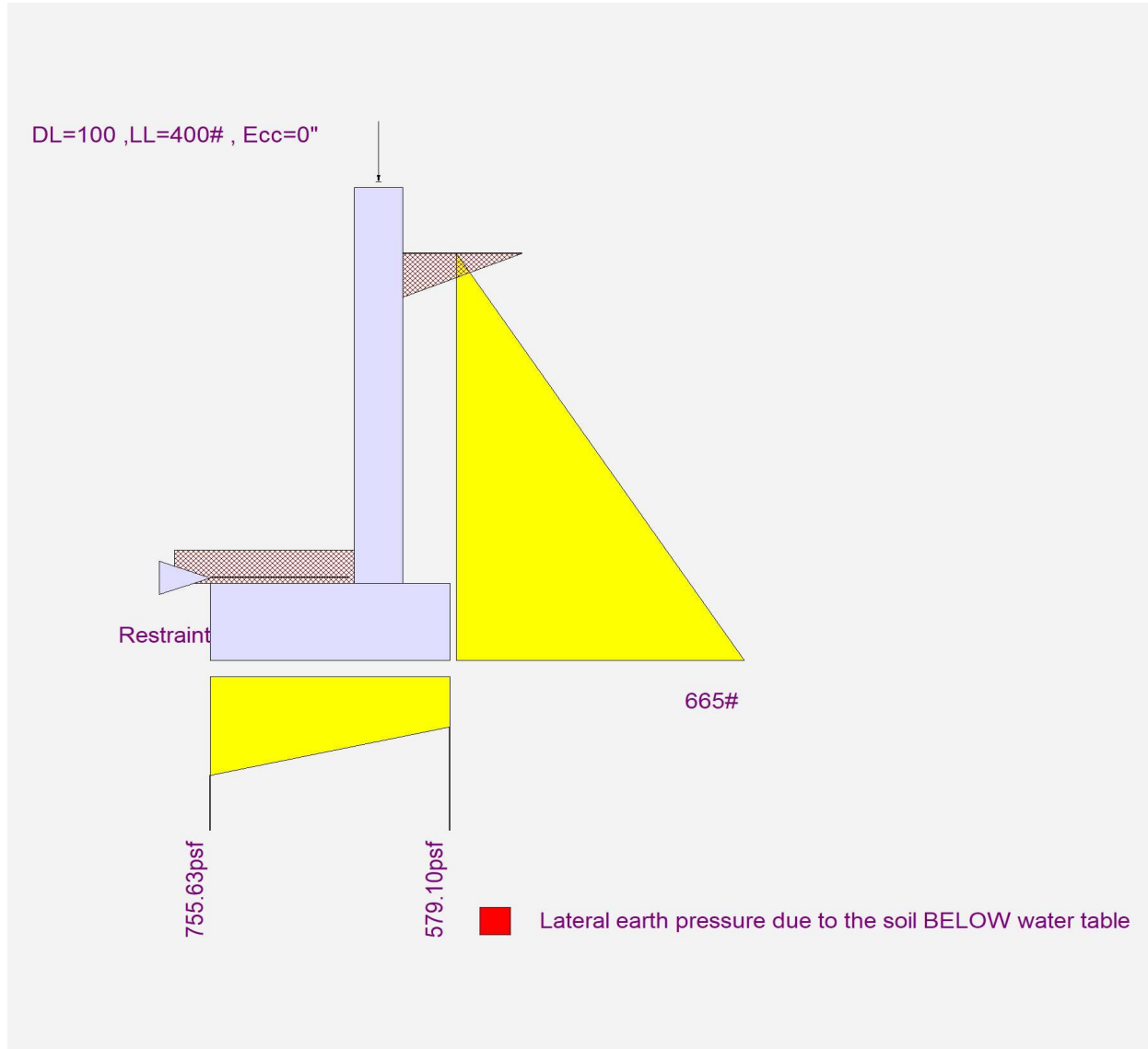
Project File: Jaffe Retaining Walls.ec6

LIC# : KW-06014947, Build:20.22.7.25

SWENSON SAY FAGET

(c) ENERCALC INC 1983-2022

DESCRIPTION: 5' Tall Wall



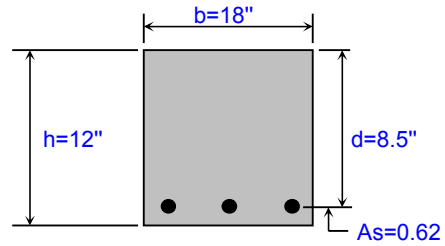
RECTANGULAR CONCRETE BEAM/SECTION ANALYSIS

**Flexure, Shear, Crack Control, and Inertia for Singly or Doubly Reinforced Sections
Per ACI 318-99 Code**

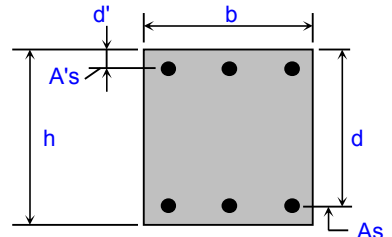
Job Name:	Jaffe Residence	Subject:	Grade Beam
Job Number:		Originator:	RJA
		Checker:	RJA

Input Data:

Beam or Slab Section?	Beam
Exterior or Interior Exposure?	Exterior
Reinforcing Yield Strength, f_y =	60 ksi
Concrete Comp. Strength, f'_c =	2.5 ksi
Beam Width, b =	18.000 in.
Depth to Tension Reinforcing, d =	8.500 in.
Total Beam Depth, h =	12.000 in.
Tension Reinforcing, A_s =	0.620 in. ²
No. of Tension Bars in Beam, N_b =	2.000
Tension Reinf. Bar Spacing, s_1 =	12.000 in.
Clear Cover to Tension Reinf., C_c =	3.000 in.
Depth to Compression Reinf., d' =	0.000 in.
Compression Reinforcing, A'_s =	0.000 in. ²
Working Stress Moment, M_a =	2.14 ft-kips
Ultimate Design Moment, M_u =	3.21 ft-kips
Ultimate Design Shear, V_u =	2.57 kips
Total Stirrup Area, A_v (stirrup) =	0.000 in. ²
Tie/Stirrup Spacing, s_2 =	0.0000 in.



Singly Reinforced Section



Doubly Reinforced Section

Results:

Moment Capacity Check for Beam-Type Section:

β ₁ =	0.85
c =	1.144 in.
a =	0.973 in.
ρ _b =	0.01782
ρ(prov) =	0.00405
ρ(min) =	0.00333
A_s (min) =	0.510 in. ² <= A_s = 0.62 in. ² , O.K.
ρ(temp) =	N.A. (total for section)
A_s (temp) =	N.A. in. ² /face
ρ(max) =	0.01336
A_s (max) =	2.044 in. ² >= A_s = 0.62 in. ² , O.K.
f 's =	N.A. ksi
φM _n =	22.36 ft-k >= M _u = 3.21 ft-k, O.K.

Crack Control (Distribution of Reinf.):

Per ACI 318

E _s =	29000 ksi
E _c =	2850 ksi
n =	10.18 n = E _s /E _c
f _s =	5.31 ksi
f _s (used) =	5.31 ksi
s ₁ (max) =	81.30 in. >= s ₁ = 12 in., O.K.

Per ACI 318

d _c =	3.5000 in.
z =	32.10 k/in.
z(allow) =	145.00 k/in. >= z = 32.1 k/in., O.K.

Shear Capacity Check for Beam-Type Section:

φV _c =	13.01 kips
φV _s =	0.00 kips
φV _n = φV _c +φV _s =	13.01 kips >= V _u = 2.57 kips, O.K.
φV _s (max) =	52.02 kips >= V _s = 0 kips, O.K.

Moment of Inertia for Deflection:

f _r =	0.375 ksi
k _d =	2.1155 in.
I _g =	2592.00 in. ⁴
M _{cr} =	13.50 ft-k
I _{cr} =	313.96 in. ⁴
I _e =	2592.00 in. ⁴ (for deflection)

Comments: