structural calculations for:

talerman-simon residence

3879 west mercer way
mercer island washington

client: floisand studio

15 august 2018

index:

giraf design
9220 roosevelt way ne seattle wa 98115-2842
(206) 621-0060 p (206) 621-0061 f
girafdesign@gmail.com http://girafdesign.net

LOCATION:
3879 WEST MERCER WAY
MERCER ISLAND WASHINGTON

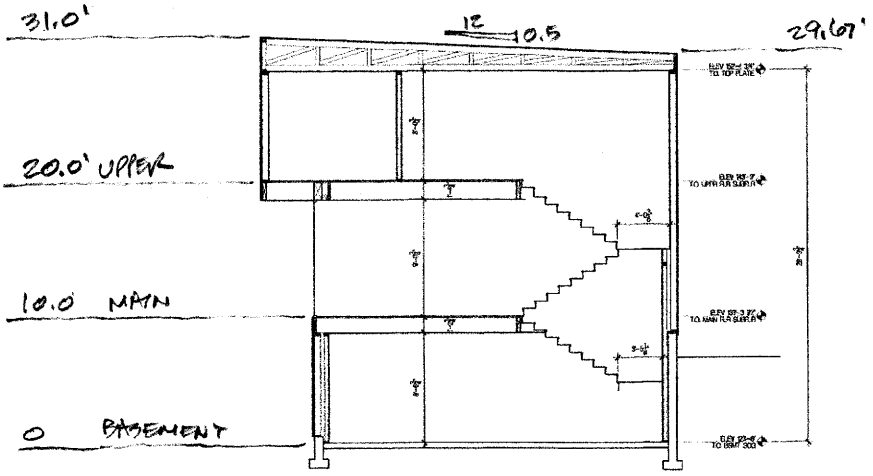
47.5748° N
122.2404° W

SEISMIC (PER USGS)

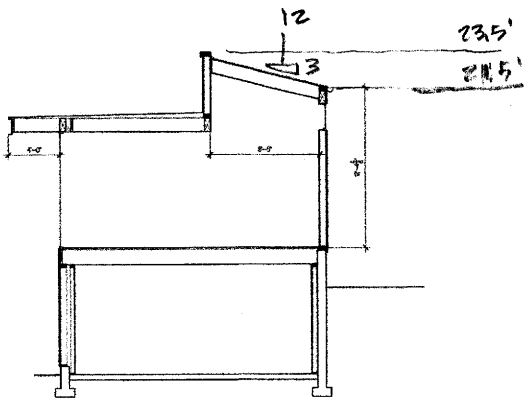
(SEE SC-2)

WIND (MERCER ISLAND WIND MAP)

85 MPH
EXPOSURE C
Kzt - 1.3 (WORST CASE)



2 NORTH-SOUTH SECTION @ DINING



1 NORTH-SOUTH SECTION @ LIVING

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

project: TAUERMAN - SIMON RESIDENCE

client: FLOISAND STUDIO

date: 6-24-18

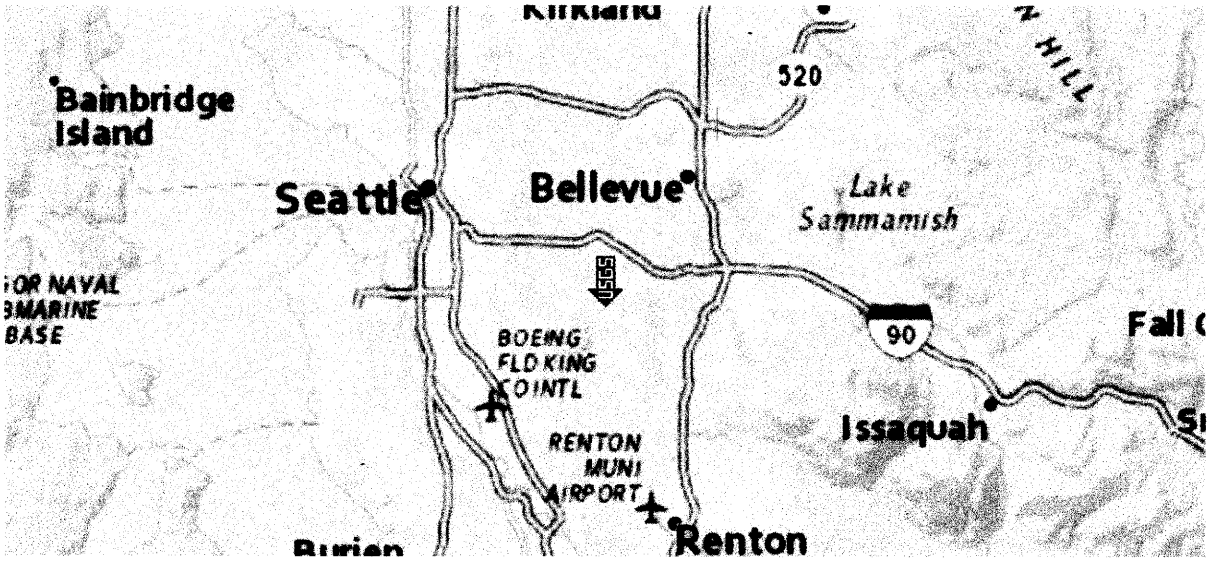
proj #: 2018-024

sheet: DC-1

USGS Design Maps Summary Report

User–Specified Input

Report Title	talerman-simon residence Sun June 24, 2018 19:10:19 UTC
Building Code Reference Document	2012/2015 International Building Code (which utilizes USGS hazard data available in 2008)
Site Coordinates	47.5748°N, 122.2404°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

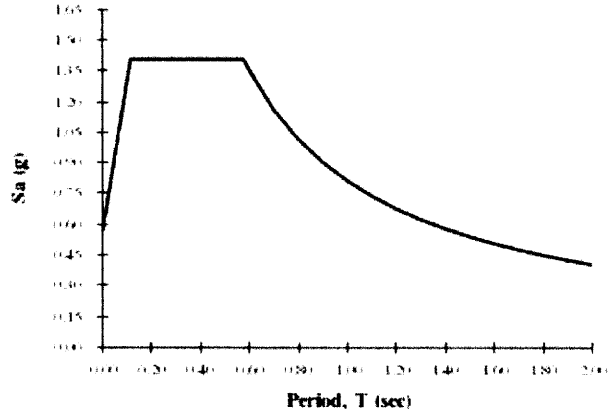


USGS–Provided Output

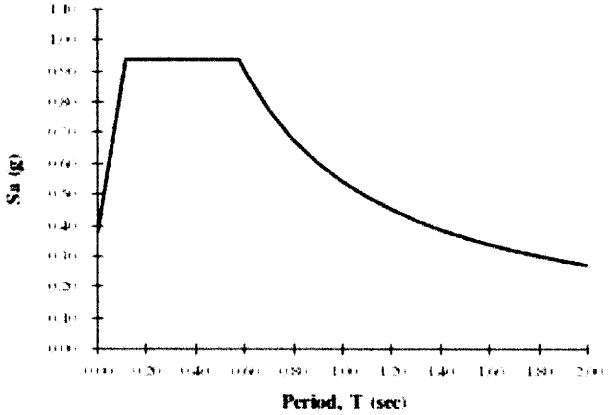
S_S =	1.406 g	S_{MS} =	1.406 g	S_{DS} =	0.938 g	Fa = 1.0
S_1 =	0.541 g	S_{M1} =	0.812 g	S_{D1} =	0.541 g	Fv = 1.50

For information on how the SS and S1 values above have been calculated from probabilistic (risk-targeted) and deterministic ground motions in the direction of maximum horizontal response, please return to the application and select the "2009 NEHRP" building code reference document.

MCE_R Response Spectrum



Design Response Spectrum



DC-2

seismic loads (asce 7-10)

equiv lateral force procedure

risk factor	II	1.5-1
	I	
imp. factor	1	table 1.5-2
site class	D	table 20.3-1
R =	6.5	table 12.2-1

S_s =	1.406		usgs maps
S_1 =	0.541		usgs maps
F_a =	1	table 11.4-1	
F_v =	1.5	table 11.4-2	
S_{DS}=	0.938		
S_{D1}=	0.541		
Cs=	0.14431	eqn 12.8-2	
Cs_{ASD}=	0.10102		

vertical design loads

criteria

asce 7-10

ibc 2015

dead loads		TYPICAL FLOOR		GARAGE FLOOR	
roofing	3 psf	flooring	2 psf	3" CONC.	37.5 psf
1/2" plywood	1.5 psf	3/4" plywood	2.3 psf	1 1/8" PLY.	3.4 psf
trusses	4 psf	joists/beams	4 psf	JOISTS/BMS	8.0 psf
insulation	1 psf	misc/mech	1 psf	MISC/MECH	1.0 psf
misc/mech	1 psf	5/8" gwb	3.1		
5/8" gwb	3.1 psf		12.4 psf		49.9 psf
	13.6 psf				
use	15 psf	use	15 psf		50 psf

live loads

roof (snow)	62 psf	garage 40 psf
floor (residential)	40 psf	decks 60 psf

soil bearing

2000 psf	zipper-geo

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9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f

wind loads (asce 7-10)

MWFRS part 1

exposure	C		
V=	85	mph	
K_d=	0.85		table 26.6-1
risk factor	1		table 1.5-1
G=	0.85		26.9.1

$K_{zt}= (1+K_1K_2K_3)^2 =$ **1.30**

0.5:12 roof

roof angle	2.39	degrees
ground to top of roof	30	ft
bottom of roof to top of roof	1.33	ft
(mean roof height) h=	29.335	ft

3:12 roof

roof angle	14.04	degrees
ground to top of roof	23.5	ft
bottom of roof to top of roof	2	ft
(mean roof height) h=	22.5	ft

pressure coefficients from figure 6-6:

bldg. face	C_p
windward wall	0.8
leeward wall	-0.5
windward roof	0
leeward roof	-0.6

*note: Cp values are conservative worst case values

pressures

Ht	K_z	q_z	$P_{ww\ walls}$	$P_{lw walls}$	**P_{walls} (psf)**
0-15	0.85	17.37	11.81	8.51	**20.33**
15-20	0.9	18.39	12.51	8.51	**21.02**
20-25	0.94	19.21	13.06	8.51	**21.58**
25-30	0.98	20.03	13.62	8.51	**22.13**
30-40	1.04	21.26	14.45	8.51	**22.97**

P_{roof} (psf)	
10.21	**0.5:12 rf.**

P_{roof} (psf)	
9.80	**3:12 roof**

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9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f

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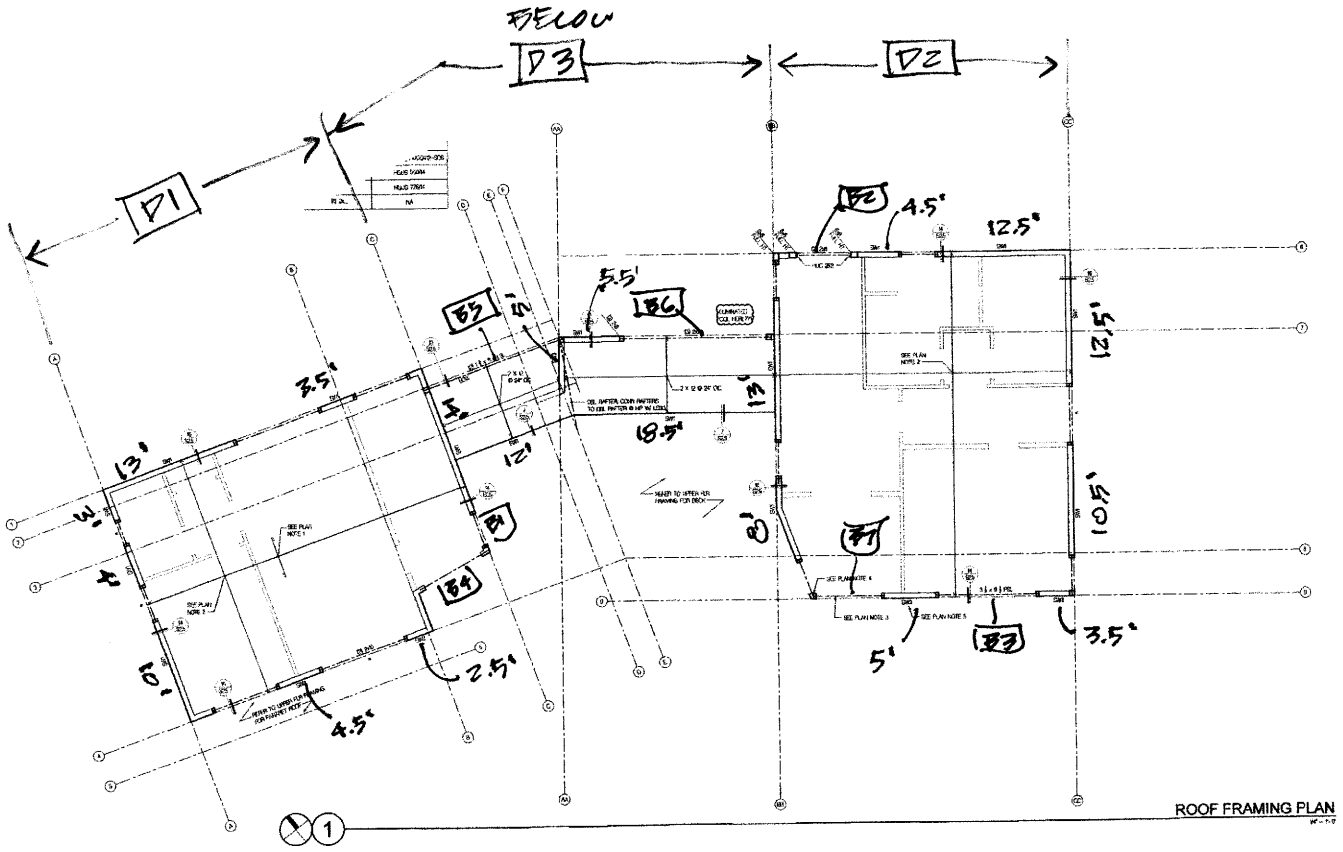
date: 24/06/2018
project #: 2018-024
design: nic
sheet: **dc-4**



PLAN NORTH

ROOF FRAMING KEY PLAN

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 office
(206) 898-4229 cell
girafdesign@gmail.com
http://girafdesign.net

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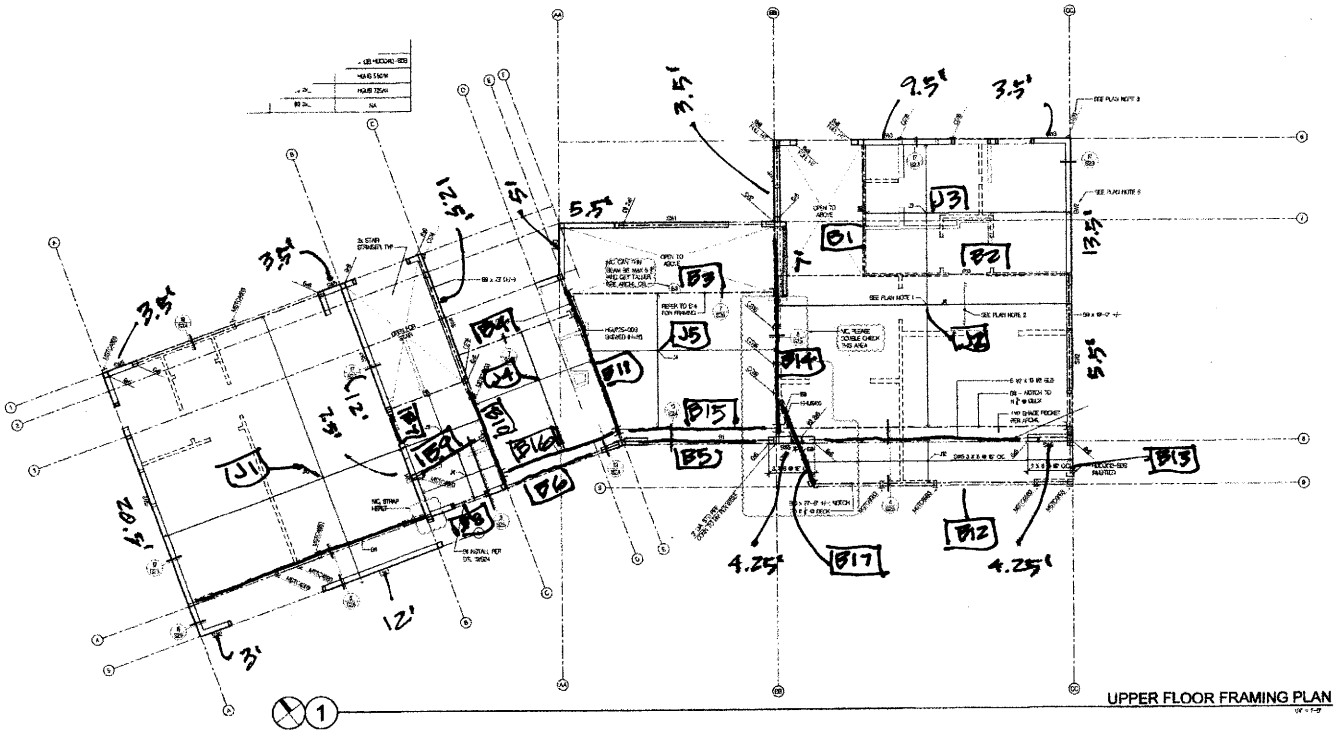
client: FOUSAND STUDIO

date: Δ8-12-18

proj #: 2018.024

sheet: Δ KP-1



PLAN NORTH

UPPER FLOOR FRAMING KEY PLAN

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 office
(206) 898-4229 cell
girafdesign@gmail.com
http://girafdesign.net

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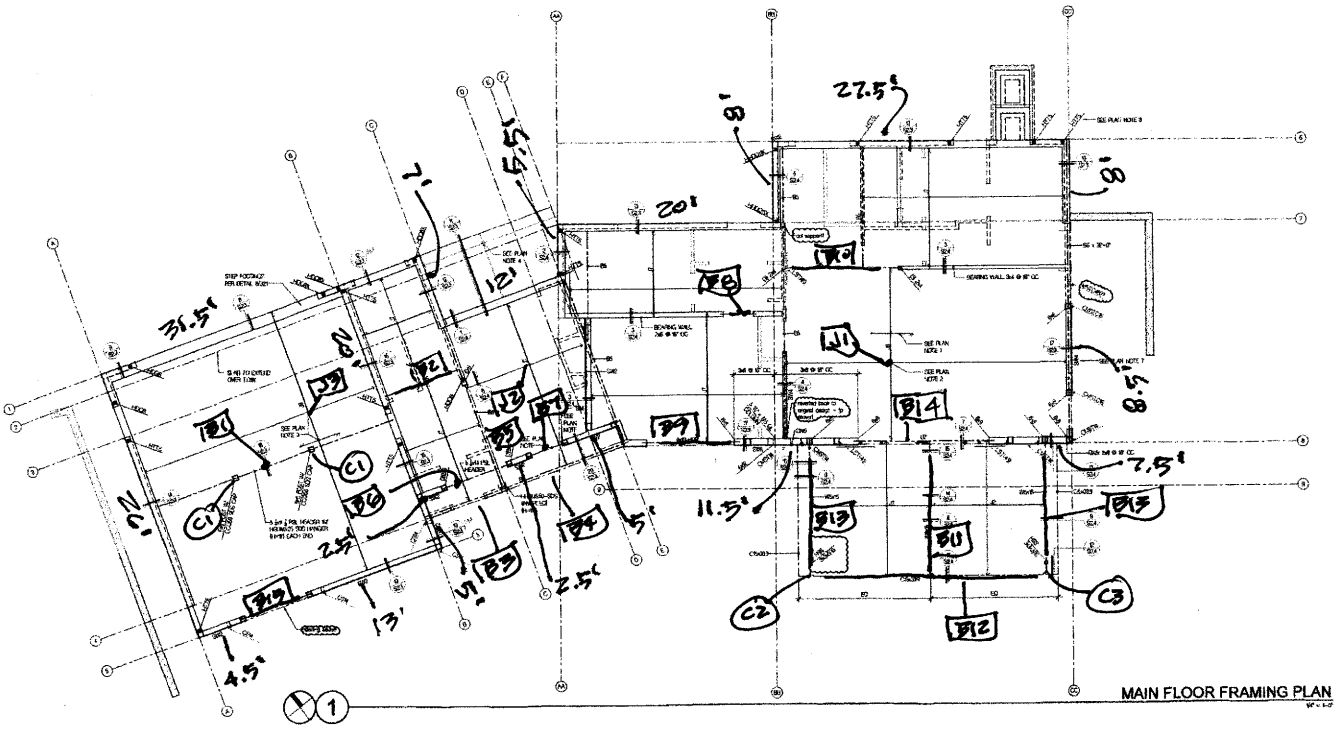
client: FLOISAND STUDIO

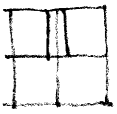
date: 08-12-18

proj #: 2018-024

sheet: AKP-2



PLAN NORTH



MAIN FLOOR FRAMING KEY PLAN

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 office
(206) 898-4229 cell
girafdesign@gmail.com
http://girafdesign.net

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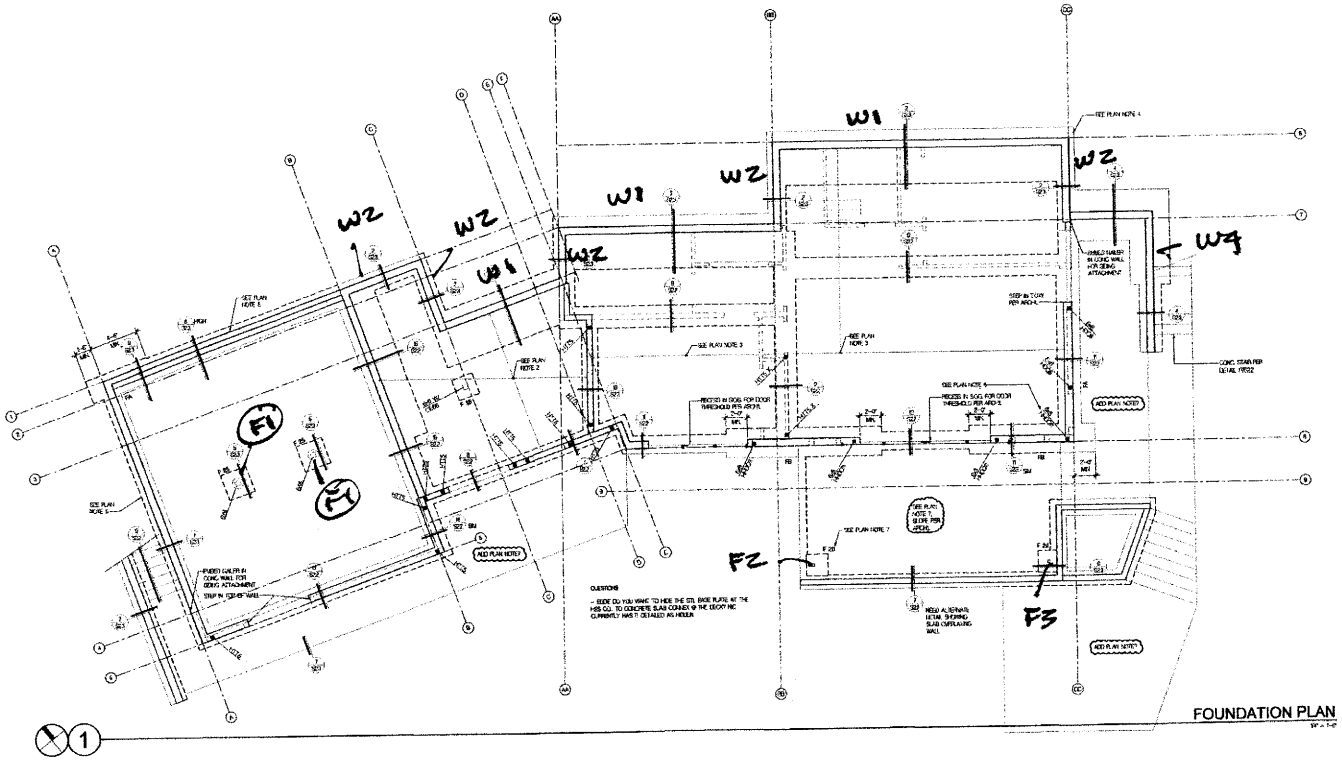
client: FLOISAND STUDIO

date: 08.17.18

proj #: 2018 - 024

sheet: AP - 3



PLAN NORTH

FOUNDATION KEY PLAN

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 office
(206) 898-4229 cell
girafdesign@gmail.com
http://girafdesign.net

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client: FOISAND STUDIO

date: 08.12.18

proj #: 2018-024

sheet: AKP-4

LATERAL

SEISMIC

DIAPH ↓ TRIB WALLS ↓

ROOF [D1] A = 690 ϕ DL = 15 + 8 = 23 PSF
[D2] A = 867 ϕ DL = 15 + 8 = 23 PSF
∴ W ROOF = 35.8 → 36k

UPPER FLOOR A FLOOR = 1557 ϕ DL = 15+16 = 31 PSF
[D3] = 313 ϕ DL = 15 + 8 = 23 PSF
A DECK = 607 ϕ DL = 15 + 8 = 23 PSF
∴ W UPPER = 69.4 → 70k

MAIN A FLOOR = 1627 ϕ DL = 15+16 = 31 PSF
A GARAGE = 600 ϕ DL = 50 + 16 = 66 PSF
A DECK = 223 ϕ DL = 15 PSF
∴ W MAIN = 93.4 → 94k

∴ Σ W = 200 k.
∴ EASD = 20.20k

REDISTRIBUTION

LEV (ZC)	Hzc (FT)	Wzc (K)	Hzc.Wzc (FT.K)	Vzc (ASD) (K)
R	30	36	1080	6.38
U	20	70	1400	8.27
M	10	94	940	5.55
	Σ	200	3420	20.20

D 8-13-18 SLIGHT CHANGES TO AREAS FOR SEISMIC BUT NOT CLOSE TO MATCHING WIND LOADS (MOSTLY REDUCTIONS)

WIND (ASD LOADS)

NORTH-SOUTH

ROOF
[D1] $\bar{w}$ = 149 plf
[D2] $\bar{w}$ = 149 plf
∴ W ROOF = 8.79k.

UPPER
$\bar{w}$ L.C = 221 plf
$\bar{w}$ C PB = 215 plf
$\bar{w}$ PB-CC = 221 plf
∴ W UPPER = 20.13k

MAIN
$\bar{w}$ = 167 plf
∴ W MAIN = 15.11 k.

∴ Σ W N-S = 44.03k.

EAST-WEST

ROOF
[D1] $\bar{w}$ = 149 plf
[D2] $\bar{w}$ = 149 plf
∴ W ROOF = 8.20 k.

UPPER
WIND (LEE) (164)
$\bar{w}$ = 136 + 85 = 221 plf
$\bar{w}$ 1-5 (WIND) = 142 plf
1-5 (LEE) = 113 plf
$\bar{w}$ 1-2 / 8-9 = 124 plf
W UPPER FROM WEST = 4.27k
W UPPER FROM EAST = 5.52k
Σ W UPPER = 9.79k.

MAIN
WIND (LEE) (167)
$\bar{w}$ = 125 + 78 = 203 plf
$\bar{w}$ DECK = 81 plf
W MAIN FROM WEST = 4.51k
W MAIN FROM EAST = 5.65k
∴ Σ W MAIN = 10.16k
∴ Σ W E-W = 28.15k

WIND CRITICAL BY FAR THROUGHOUT

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
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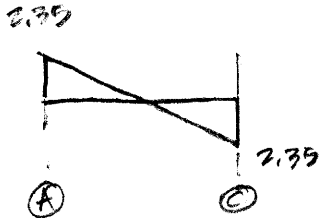
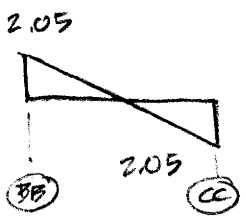
DIAPHRAGMS

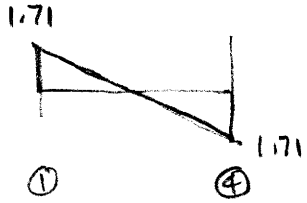
ROOF SEE KP-1

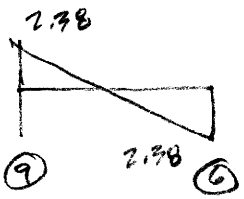
B1



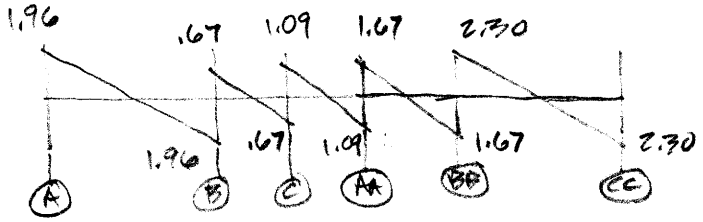
B2

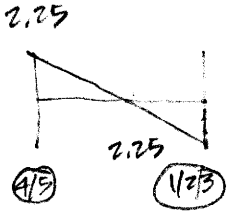


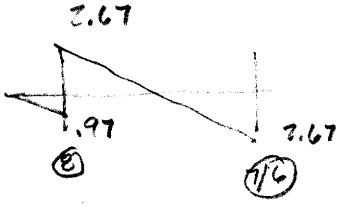




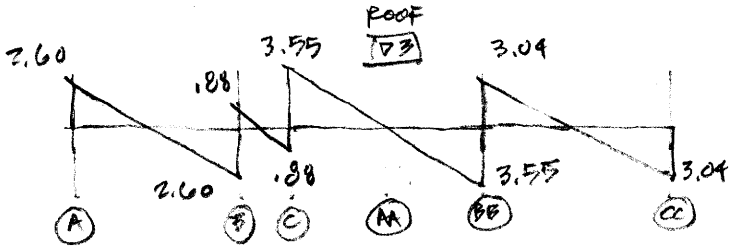
MAIN SEE KP-3

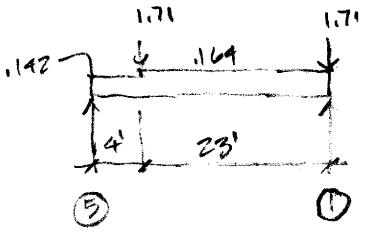


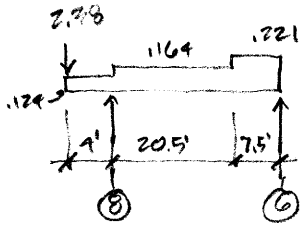


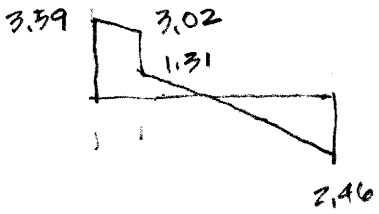


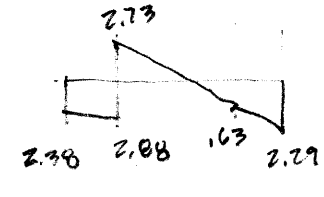
UPPER SEE KP-2











giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

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SHEAR WALLS

(1) V_{ROOF} = 1.71k. ℓ_{lw} = 16.5'
v = 104 plf SW1
FHD = 1.14 – DL MSTC48B3 / CS16.

V_{UPPER} = 4.17k ℓ_{lw} = 7'
v = 596 plf SW5
FHD = 7.09 – DL HDQ8

(1/2/3) V_{MAIN} = 6.42k. ℓ_{lw} = 43.5'
v = 148 plf 8" CONC
v_c = 1.6 psi 2x – w/ 5/8"ϕ @ 48" o.c.

(4) V_{ROOF} = 1.71k ℓ_{lw} = 7'
v = 244 plf USE SW2
FHD = 2.68 – DL MSTC48B3 / CS14

(5) V_{UPPER} = 3.59k ℓ_{lw} = 15'
v = 239 plf SW2
FHD = 2.39 – DL CS14

(4.5) V_{MAIN} = 5.84k. ℓ_{lw} = 27.5'
v = 212 plf USE SW2
FHD = 4.51 – DL HTT5

(6) V_{ROOF} = 2.38k. ℓ_{lw} = 17'
v = 140 plf SW1
FHD = 1.54 – DL CS16
(309 @ FULL HT. COL.)

V_{UPPER} = 4.67k. ℓ_{lw} = 13'
v = 359 plf USE SW3
FHD = 5.13 – DL HTT5

(7/6) V_{MAIN} = 7.34k. ℓ_{lw} = 47.5'
v = 154 plf 8" CONC. WALL
v_c = 1.6 psi ✓
2x – w/ 5/8"ϕ @ 48" o.c.

(9) V_{ROOF} = 2.38k. ℓ_{lw} = 8.5'
v = 280 plf USE SW3
FHD = 3.08 – DL HSTC66B3

(8) V_{UPPER} = 5.61k. ℓ_{lw} = 8.5'
v = 660 plf SW5
FHD = 6.6 k – DL CMST14

V_{MAIN} = 9.25k. ℓ_{lw} = 19'
v = 487 plf USE SW5
FHD = 11.5 – DL HHDQ11

(A) V_{ROOF} = 2.35k. ℓ_{lw} = 17'
v = 139 plf SW1
FHD = 1.52 – DL (STRAY WINDOWS NO NET UPLIFT)

V_{UPPER} = 4.95k. ℓ_{lw} = 20.5'
v = 241 plf SW2
FHD = 3.85 – DL HTT5

V_{MAIN} = 6.91k. ℓ_{lw} = 26'
v = 266 plf 8" CONC. WALL
v_c = 2.8 psi ✓
4x – PLATE w/ 5/8"ϕ @ 48" o.c.

CONT →

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

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(B) VUPPER = 3.48k.   ℄ lw = 19.5'
v = 178 plf   SW1
FHD = 1.78 - DL   HTT5 / CS14

VMAIN = 6.11k.   ℄ lw = 20' CONC. 5' WOOD
v CONC = 306 plf
8" CONC. WALL (SW2)
vc = 3.2 psi ✓
4x - W/ 5/8"Φ @ 48" o.c.

(C) VROOF = 2.35k.   ℄ lw = 14'
v = 168 plf   SW1
FHD = 1.85 - DL   CS14 / MSTC48B3

VUPPER = 6.78k   ℄ lw = 12.5'
v = 542 plf   SW4
FHD = 7.14 - DL   HDQ8

VMAIN = 8.54k.   ℄ lw = 7'
v = 1220 plf   8" CONC. WALL
vc = 12.7 psi ✓

FROM 2 LOW ROOF
(AA) VUPPER = 2.06k.   ℄ lw = 5'
v = 412 plf   SW3
FHD = 4.94 - DL   HTT5

VMAIN = 4.82   ℄ lw = 5.5'
v = 876 plf   8" CONC WALL
vc = 9.1 psi ✓

FOR REDUNDANCY USE STUD WALL
(AA') VMAIN = 2.76k.   lw = 10'
v = 276 plf   SW2
FHD = 2.76 - DL   HTT5

(BB) VROOF = 2.05k.   ℄ lw = 21'
v = 98 plf   SW1
FHD = 1.07 - DL   CS16

VUPPER = 8.64k.   ℄ lw = 10.5'
v = 822 plf   SW5
FHD = 8.23 - DL   HDQ8

VMAIN = 12.61k.   ℄ lw = 8'
v = 1576 plf   8" CONC. WALL
vc = 16.4 psi ✓   (*)

(CC) VROOF = 2.05k.   ℄ lw = 23'
v = 89 plf   SW1
FHD = .98 - DL   NO NET UPLIFT

VUPPER = 5.09k.   ℄ lw = 19'
v = 268 plf   SW2
FHD = 3.66 - DL   CMSTC16 / HTT5
MSTC48B3

VMAIN = 7.39k.   ℄ lw = 8' CONC 8.5 WOOD
v CONC = 924 psi ✓ 8" CONC
v WOOD = 418 plf
USE SW4
FHD = 8.21 - DL   HDQ8

(*) FOR REDUNDANCY USE STUD WALL
(BB') VMAIN = 3.97k.   ℄ lw = 8'
v = 496 plf   SW4
FHD = 4.96 - DL   HTT5

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
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sheet: LT-4

ROOF FRAMING

SEE KP-1

TRUSSES

DESIGN BY OTHERS

RAFTERS 24" o.c.

R1 l = 9'
w = 80plf

1 3/4 x 11 7/8 LSL @ 24" o.c.
FOR INSULATION

BEAMS

B1 l = 3.5' M = .96 FT.K
w = .63 KLF V = 1.10
(2) 2x8

B2 l = 5' M = 2.0 FT.K.
w = .64 KLF V = 1.6 K.
(2) 2x8 $\Delta_{TL} < L/800$

B3 l = 10.25' M = 8.41 FT.K.
w = .64 KLF V = 3.28 K.
3 1/2 x 9 1/2 LSL $\Delta_{TL} = L/800$
USE 3 1/2 x 9 1/2 LVL $\Delta_{TL} = L/800$

B4 l = 6.5' M = .85 FT.K.
w = .16 KLF V = .52
(2) 2x8 $\Delta_{TL} < L/1,000$

B5 l = 13.25' M = 3.95 FT.K
w = .18 KLF V = 1.21 K.
(2) 1 3/4 x 11 7/8 LSL
Δ_{max} L/963

B6 l = 10.5' M = 2.48 FT.K
w = .18 KLF V = .95 K.
(2) 2x10

B7 l = 6.25' M = 5.13 FT.K.
w = .64 KLF V = 2.0
(2) 2x10

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

project: TALERMAN-SIMON RESIDENCE

client: FLOISAND STUDIO

date: Δ 8-13-18

proj #: 2018-024

sheet: RF-1

UPPER FLOOR FRAMING

SEE KP-2

JOISTS 16" o.c.

J1 l = 23.5' w = 73plf
16" TJI 560 @ 16" o.c.

J2 l = 27' w = 73plf
16" TJI 560 @ 16" o.c.

J3 l = 19' w = 73plf
16" TJI 210 @ 16" o.c.

J4 l_{MAX} = 11.5' w = 100plf
11 7/8" TJI 110 @ 16" o.c.

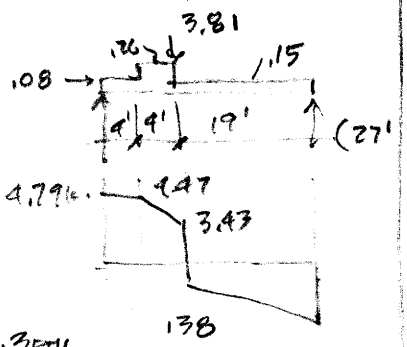
J5 l_{MAX} = 12.5' w = 100plf
11 7/8" TJI 110 @ 16" o.c.

J2 OPTION 14" DEEP.
14" TJI 560 @ 12" o.c.

BEAMS

B1 l = 12.5' M = 11.9ft-k.
w = .61klf V = 3.81k.
(2) 1 3/4 x 16 LVL $\Delta_{LL} < L/1000$

B2



M = 34.3ft-k.
V = 4.79k.

TRY 5 1/4 x 16 PSL $\Delta_{TL} = L/328$
7 x 16 PSL $\Delta_{TL} = L/440$

B3 l = 19.5' M = 30.42ft-k
w = .64klf V = 6.24k.

7 x 11 7/8 PSL ✓ $\Delta_{LL} = L/375$
→ 5 1/4 x 14 PSL $\Delta_{LL} = L/460$

B4 l = 12' M = 10.98ft-k
w = .61klf V = 3.66k.
3 1/2 x 11 7/8 LSL $\Delta_{LL} = L/680$

B5 l = 14' M = 3.7ft-k.
w = .15klf V = 1.05k.
4 x 12 (DF/L #1) $\Delta_{TL} < L/900$

B6 l = 10' M = 1.88ft-k.
w = .15 V = .75k.
3 1/2 x 11 7/8 PSL

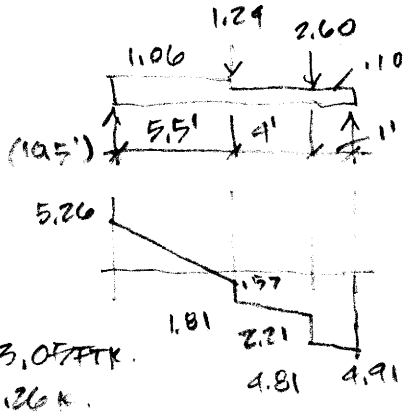
B7 l = 3.5' M = 1.99ft-k.
w = .97klf V = 1.70k.
(2) 2x8

B8 l = 3.25' M = .25ft-k
w = .19klf V = .31k.
(2) 2x8

B9 l = 7.5' M = 2.32ft-k.
w = .33klf V = 1.24k.

(2) 1 3/4 x 16 LVL

B10



M = 13.0ft-k.
V = 5.26k.

5 1/4 x 16 PSL (RIP TO 11 7/8 @ DECK)

CONT →

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

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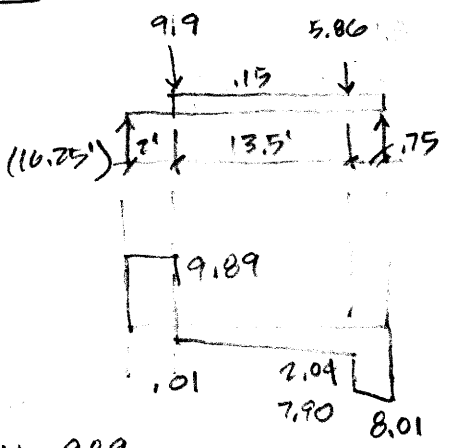
B11



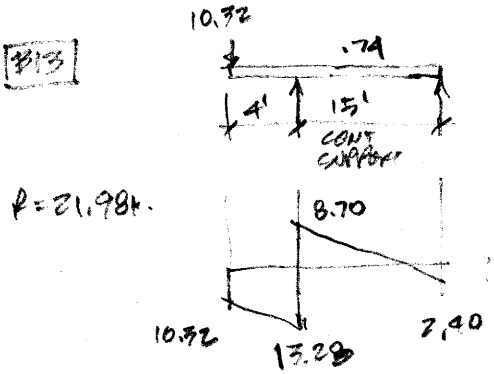
M = 9.89
V = 19.78FTK.

7x11 7/8 PSL Δ TL = L/548

B12 L = 24' M = 61.9FTK.
W = .86KLF V = 10.32K.

(2) 5¼x16 PSL Δ TL = L/321

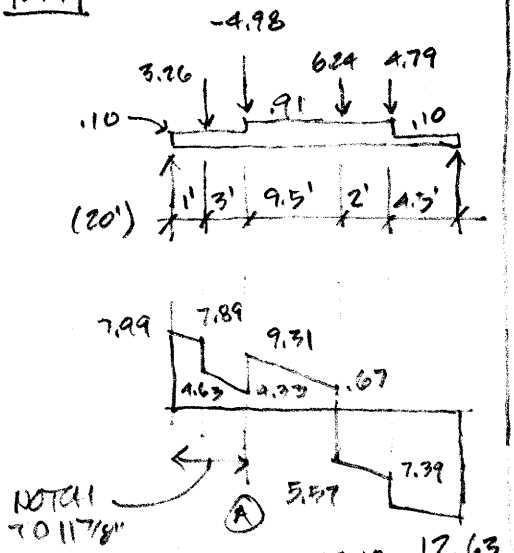
B13



M = 47.2FTK.
V = 13.28K

5¼x16 PSL Δ CANT TL = .37"
USE (2) 5¼x16 PSL

B14



M = 68.78FTK M_A = 21.38FT.K
V = 12.63K. V_A = 7.99K.

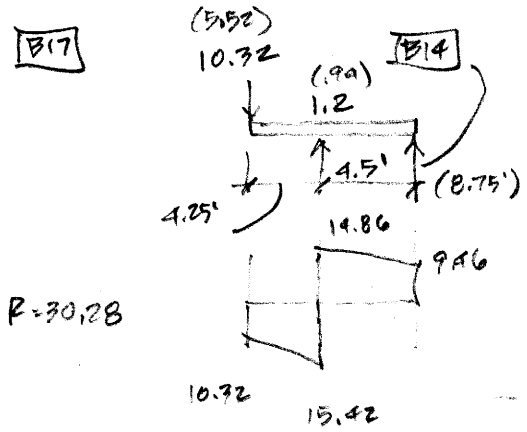
7x16 PSL + 5¼x16 PSL

Δ TL = L/468

B15 L = 14.5' M = 11.83FT.K
W = .45KLF V = 3.26K.
TRY 3½x11¼ PSL Δ TL = L/323
5¼x11¼ PSL

B16 L = 11.5' M = 7.44FT.K
W = .45KLF V = 2.6K
3½x11¼ PSL

B17



M = 54.72FTK.
V = 15.42K.
MAX REACTION @ B14
(NO ROOF SNOW) = -4.98

7x16 PSL

Δ CANT TL = L/329.
USE (2) 5¼x16 PSL (Δ < ¼")

B18 L = 3.5' M = 1.5FT.K.
W = .98 V = 1.72K.

USE 4x8

B19 L = 3.5' M =
W = .82
(2) 2x8

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

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proj #: 2018-024

client: FLOISAND STUDIO sheet: UF-2

MAIN FLOOR FRAMING

SEE KP-3 & KP-4

JOISTS 16" o.c.

J1 l = 16'
w = 73 plf

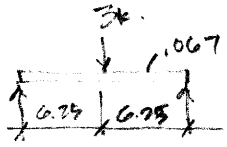
14" TJI/210 @ 16" o.c.

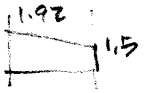
J2 l = 14' HAM
14" TJI/110 @ 16" o.c.

J3 l = 12.5' M = 2.13 ft-k
w = 120 plf V = .75k

OR 3000# LOAD OVER 4½" x 4½"

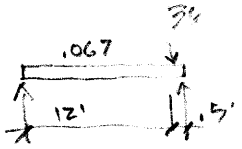
CASE 1

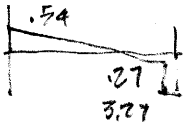




M = 10.68 ft-k
V = 1.92k

CASE 2





M = 2.18 ft-k
V = 3.29k

3½" x 11⅞ LSL @ 16
Δ_u L/527
3½" x 11⅞ PSL Δ_u L/694 ✓
@ 16" o.c.

J4 l = 12.25' M = 1.88 ft-k
w = 100 plf V = .61k

2x12 SLOPE TO 7¼" (MIN.)

(2) 2x_ @ 16" o.c.
Δ_u = L/932

J5 l = 9.25' M = 1.07 ft-k
w = 100 plf V = .96k

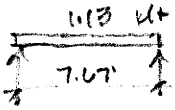
2x12 SLOPED TO 8" (MIN)

Δ_u < L/1000

BEAMS

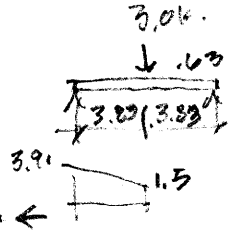
B1

CASE 1



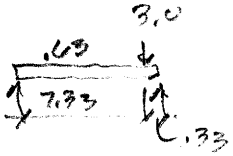
M = 8.30 ft-k.
V = 4.33k.

CASE 2



M = 10.37 ft-k ←
V = 3.91k.

CASE 3



V = 5.29k ←

5¼ x 9½ PSL

Δ_u ⓑ < L/1000
Δ_u ⓒ < L/1000

FOR DETAILING
USE 5¼ x 11⅞ PSL
W/ HGUM 5.25/SDS
HANGER.

B2 l = 7.5' M = 3.30 ft-k.
w = 47 V = 1.76

3½ x 14 LSL

B3 l = 7.5' M = 3.5 ft-k.
w = .39 k/ft V = 1.31k.
MATCH B4

B4 l = 12' M = 2.88 ft-k.
w = .16 k/ft V = .96
3½ x 14 LSL

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

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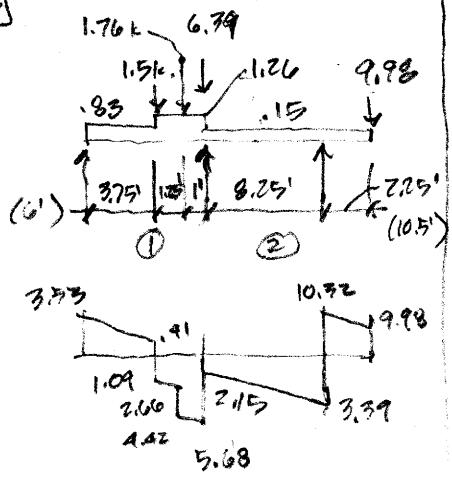
B5

(±HD 7.14k)



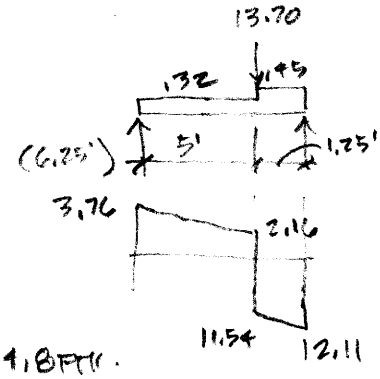
① $M_{MAX} = 7.38$ FT.K.
$V_{MAX} = 5.68$k

② $M_{MAX} = 22.8$ FT.K
$V_{MAX} = 10.32$ FT.K

TRY 5 1/4 x 14 PSL

Δ_{LL} @ CANT ONLY = L/580 ✓

B6



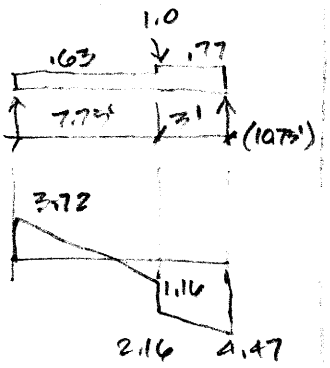
M = 14.8 FT.K.
V = 12.11
5 1/2 x 11 7/8 PSL
Δ_{LL} FROM CANT BM < L/500
USE 5 1/2 x 14 PSL
TO MINIMIZE EFFECT @ CANT BM.

B7 $l = 3.75'$ M = .59 FT.K.
w = .95 V = .73k
(2) 2x8

B8 $l = 3.75'$ M = .91 FT.K.
w = .69 k/ft V = 1.12k.
(2) 2x8

B9 $l = 8.75'$ M = 3.92 FT.K.
w = .91 k/ft V = 1.79k
TRY 4x10 Δ_{TL} = L/760

B10

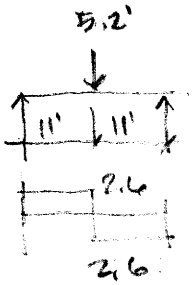


M = 11.0 FT.K.
V = 4.47k.
5 1/2 x 14 LSL Δ_{TL} = L/728

B11 $l = 12.5'$ M = 16.2 FT.K.
w = .63 k/ft V = 5.19k.

TRY W8 x 15
Δ_{LL} = L/575
W8 x 18

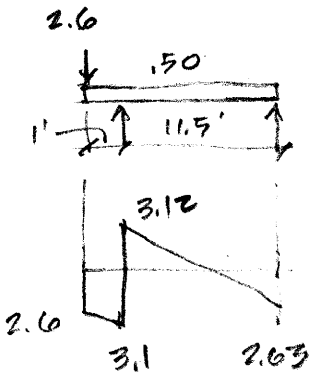
B12



M = 28.6 FT.K.
V = 2.6k.

C15 x 33.9 ✓
Δ_{LL} < L/1500

B13

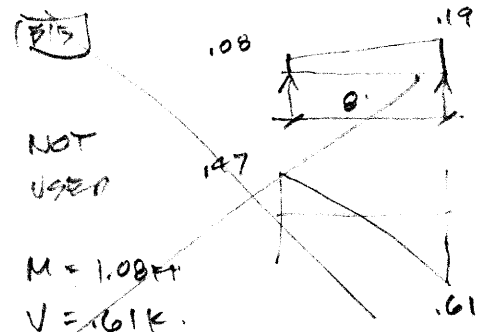


$M_{+MAX} = 6.91$ FT.K.
$M_{-} = 2.85$ FT.K.
$V_{MAX} = 3.12$k.

TRY W6 x 9
Δ_{LL} = L/416
USE W6 x 16 Δ_{LL} < L/700

B14 → SEE MF-3

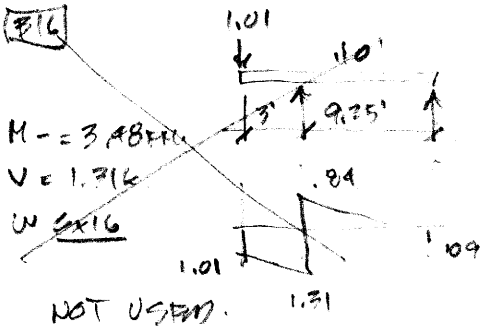
B15



NOT USED

M = 1.08 FT.K.
V = .61k.
4x10 PT TO SLOPE (7'-6" MIN)

B16



M = 3.48 FT.K.
V = 1.31k
W 8x16

NOT USED.

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

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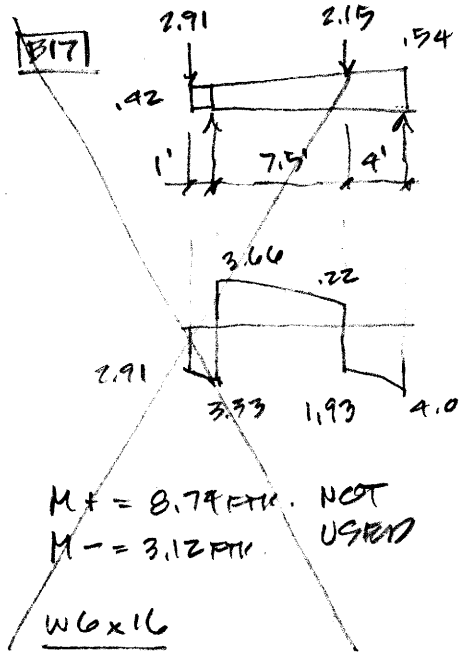
client: FLORIAN STUDIO

date: Δ 8-14-18
proj #: 2018-024
sheet: MF-2

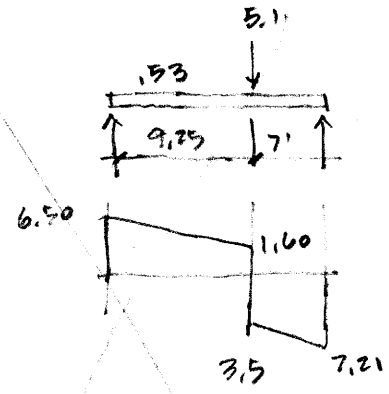
B17



M+ = 8.79 FT-K. NOT USED
M− = 3.12 FT-K

W6x16

B18



M = 37.5 FT-K. NOT USED
V = 7.21 K.
TRY 8¾x13.5 GLB
Δ_LL = .32" L/602
USE 10¾x13.5 GLB
Δ_LL = .26" L/740

COLUMNS

C1 P MAX = 7.83 K
8.67 K ←

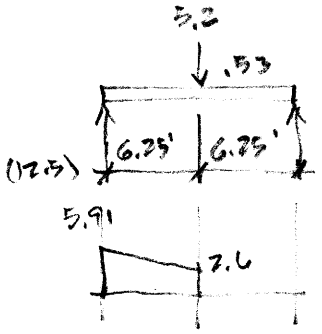
6x6 f_c = 286 psi ✓

C2 P = 6.99 K. } ℓ = 10'
C3 P = 6.06 K. } HSS 3½x3½x¼

C4 P = 19.21 K. (IN COMBINATION WIND O.T.)

6x6 f_c = 635 psi

B14



M = 26.6 FT-K.
V = 5.91 K.
10¾x13.5 GLB

Δ_TL = .166" < L/900

B15 ℓ = 6.5'

CASE ① w = .65 K/ft
M = 3.43 FT-K.
V = 2.11 K.

CASE ② w = .39 K/ft
P = 3 K.
M = 6.93 FT-K. 5¼x9½ PSL
V = 4.3 K.

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

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client: FLOISAND STUDIO

date: 08-14-18

proj #: 2018-024

sheet: MF-3

FOUNDATIONS

SEE FP-5

SOIL (PER ZIPPER GEO)

* 2,000 PSF BEARING
  35 PCF ACTIVE
  50 PCF AT REST
* 0.35 COEFF OF FRICTION
* 250 PCF PASSIVE
* INCLUDING 1.5 F.O.S.

CONC

f'_c = 3,000 psi
Fy = 60 ksi

FOOTINGS C HOLD-DOWNS

HDQ8 PAB7

de = 8½"
F = 13"
∴ D = 14"
B = 2'-2"

HHDQ11 PAP

de = 10½"
F = 16"
∴ D = 16"
B = 2'-8"

FOOTINGS

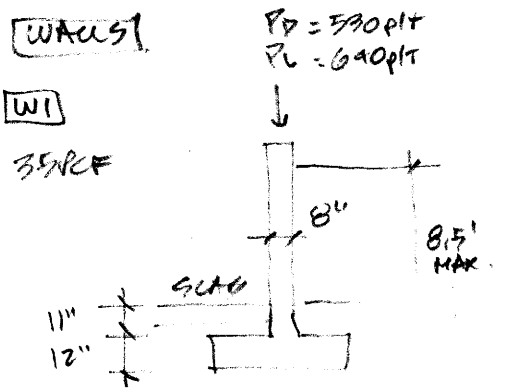
(F1) P_{MAX} = 8.67k
$A_{B\,MIN}$ = 4.7 □
2'-6" x 2'-6" x 12"

(F2) P_{MAX} = 6.99k.
(F3) A_{BMIN} = 3.78 □
2'-0" x 2'-0" x 12"

(F4) P_{MAX} = 19.21k.
$A_{B\,MIN}$ = 10.38 □
3'-6" x 3'-6" x 16"

WALLS

W1

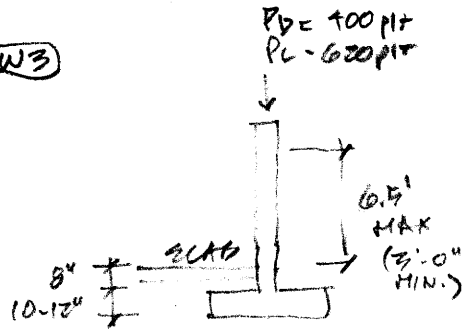


SEE FD-2 & 3

W2 SPANNING HORIZ

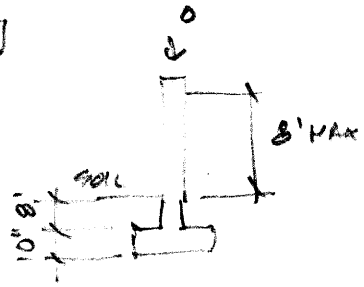
l_{MAX} = 7.33'
425 PSF MAX
w = 425
wu = 680 plf
Mu = 4.57 K-FT
8.5' MAX
50 PCF
d = 7"
F = .049
∴ kn = 93 ∴ ρ = 1.33 x .00176
∴ As = .196 #4 @ 12" o.c.

W3



SEE FD-4 & 5 @ HIGHEST
& FD-6 & 7 @ LOWEST

W4



SEE FD-8 & 9 @ H ≤ 8'
FD-10 & 11 @ H ≤ 6'
FD-12 & 13 @ H ≤ 4'

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060 p
(206) 621-0061 f
girafdesign@gmail.com
http://girafdesign.net

project: TAUERMAN-SIMON RESIDENCE
client: FORSAND STUDIO

date: 7-7-18
proj #: 2018-024
sheet: FD-1

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W1

Date: 7 JUL 2018

This Wall in File: c:\users\nic\documents\retainpro 10 project files\talerman-simon.RPX

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License : KW-06056085
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Cantilevered Retaining Wall Design

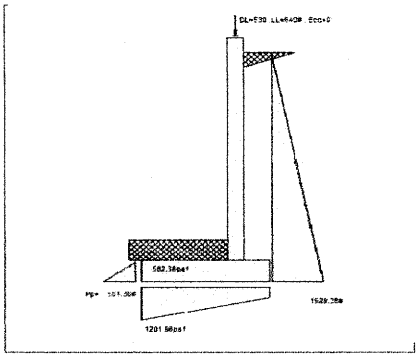
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	9.50 ft
Wall height above soil	=	0.67 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	11.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	375.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.525
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

Axial Dead Load	=	530.0 lbs
Axial Live Load	=	640.0 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
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios

Overturning	=	2.11 OK
Sliding	=	1.30 Ratio < 1.5!
Total Bearing Load	=	4,461 lbs
...resultant ecc.	=	3.47 in
Soil Pressure @ Toe	=	1,202 psf OK
Soil Pressure @ Heel	=	582 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,511 psf
ACI Factored @ Heel	=	732 psf
Footing Shear @ Toe	=	24.4 psi OK
Footing Shear @ Heel	=	6.5 psi OK
Allowable	=	82.2 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	1,929.4 lbs
less 100% Passive Force	= -	501.3 lbs
less 100% Friction Force	= -	2,005.9 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	386.8 lbs NG

Load Factors

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

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	10.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.821**
Total Force @ Section	lbs =	2,527.0
Moment....Actual	ft-# =	8,002.2
Moment.....Allowable	=	9,745.5
Shear.....Actual	psi =	34.0
Shear.....Allowable	psi =	82.2
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.19

Masonry Data

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

Concrete Data

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

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W1

Date: 7 JUL 2018

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Cantilevered Retaining Wall Design

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

Footing Dimensions & Strengths

Toe Width	=	3.33 ft
Heel Width	=	1.67
Total Footing Width	=	5.00
Footing Thickness	=	12.00 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	=	1,511	732 psf
Mu' : Upward	=	7,421	395 ft-#
Mu' : Downward	=	687	779 ft-#
Mu: Design	=	6,733	384 ft-#
Actual 1-Way Shear	=	24.45	6.49 psi
Allow 1-Way Shear	=	82.16	82.16 psi

Toe Reinforcing = # 5 @ 10.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 9.26 in, #5@ 14.35 in, #6@ 20.37 in, #7@ 27.78 in, #8@ 36.57 in, #9@ 46
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	1,929.4	3.50	6,752.8	Soil Over Heel	=	1,143.8	4.50	5,145.2
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=	530.0	3.66	1,941.6
Load @ Stem Above Soil	=				* Axial Live Load on Stem	=	640.0	3.66	2,344.5
	=				Soil Over Toe	=		1.67	
					Surcharge Over Toe	=			
Total		1,929.4	**O.T.M.**	6,752.8	Stem Weight(s)	=	1,017.0	3.66	3,725.6
	=		=		Earth @ Stem Transitions	=	380.0	4.16	1,582.1
Resisting/Overturning Ratio		= **2.11**			Footing Weight	=	750.0	2.50	1,875.0
Vertical Loads used for Soil Pressure	=	4,460.8 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		3,820.8 lbs	**R.M.=**	14,269.4

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

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)	0.068	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.

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W3

Date: 7 JUL 2018

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Cantilevered Retaining Wall Design

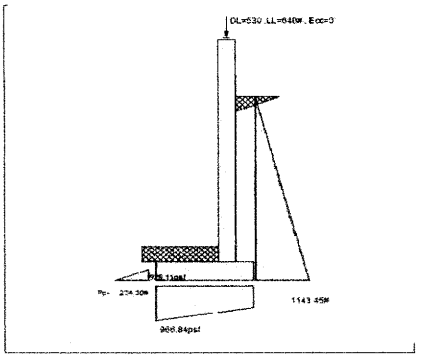
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	7.25 ft
Wall height above soil	=	2.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	8.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	375.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.525
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

Axial Dead Load	=	530.0 lbs
Axial Live Load	=	640.0 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
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios

Overturning	=	2.49 OK
Sliding	=	1.50 OK
Total Bearing Load	=	3,470 lbs
...resultant ecc.	=	0.15 in
Soil Pressure @ Toe	=	967 psf OK
Soil Pressure @ Heel	=	929 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,232 psf
ACI Factored @ Heel	=	1,183 psf
Footing Shear @ Toe	=	21.6 psi OK
Footing Shear @ Heel	=	0.0 psi OK
Allowable	=	82.2 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	1,143.5 lbs
less 100% Passive Force	= -	234.4 lbs
less 100% Friction Force	= -	1,485.5 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

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

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	10.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.548**
Total Force @ Section	lbs =	1,471.8
Moment....Actual	ft-# =	3,556.7
Moment.....Allowable	=	6,495.1
Shear.....Actual	psi =	19.6
Shear.....Allowable	psi =	82.2
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.25

Masonry Data

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

Concrete Data

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

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W3

Date: 7 JUL 2018

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Cantilevered Retaining Wall Design

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

Footing Dimensions & Strengths

Toe Width	=	2.33 ft
Heel Width	=	1.33
Total Footing Width	=	3.66
Footing Thickness	=	10.00 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	=	1,232	1,183 psf
Mu' : Upward	=	3,315	261 ft-#
Mu' : Downward	=	288	263 ft-#
Mu: Design	=	3,028	2 ft-#
Actual 1-Way Shear	=	21.59	0.05 psi
Allow 1-Way Shear	=	82.16	82.16 psi

Toe Reinforcing = # 4 @ 10.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings
Toe: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.89 in, #9@ 5
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	1,143.5	2.69	3,081.0	Soil Over Heel	=	577.1	3.33	1,920.8
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=	530.0	2.66	1,411.6
Load @ Stem Above Soil	=				* Axial Live Load on Stem	=	640.0	2.66	1,704.5
	=				Soil Over Toe	=		1.17	
					Surcharge Over Toe	=			
Total		1,143.5	**O.T.M.**	3,081.0	Stem Weight(s)	=	975.0	2.66	2,596.8
	=		=		Earth @ Stem Transitions	=	290.0	3.16	917.4
					Footing Weight	=	457.5	1.83	837.2
					Key Weight	=			
					Vert. Component	=			
					Total =		2,829.6 lbs	**R.M.=**	7,683.7

Resisting/Overturning Ratio = 2.49
Vertical Loads used for Soil Pressure = 3,469.6 lbs

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

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)	0.072	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.

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W3

Date: 7 JUL 2018

This Wall in File: c:\users\nic\documents\retainpro 10 project files\talerman-simon.RPX

Cantilevered Retaining Wall Design

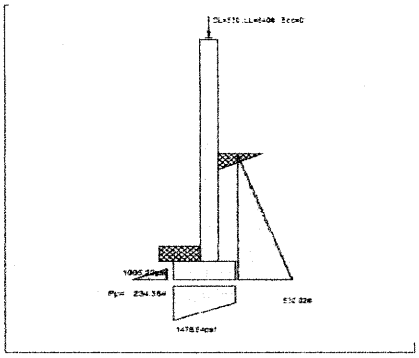
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	4.67 ft
Wall height above soil	=	5.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	8.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	375.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.525
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

Axial Dead Load	=	530.0 lbs
Axial Live Load	=	640.0 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
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios

Overturning	=	3.52 OK
Sliding	=	2.77 OK
Total Bearing Load	=	2,987 lbs
...resultant ecc.	=	0.71 in
Soil Pressure @ Toe	=	1,479 psf OK
Soil Pressure @ Heel	=	1,085 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,901 psf
ACI Factored @ Heel	=	1,395 psf
Footing Shear @ Toe	=	9.2 psi OK
Footing Shear @ Heel	=	4.8 psi OK
Allowable	=	82.2 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	530.0 lbs
less 100% Passive Force	= -	234.4 lbs
less 100% Friction Force	= -	1,232.1 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

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

Stem Construction

		Bottom
		As < Min %
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	18.00
Rebar Placed at	=	Center
Design Data		
fb/FB + fa/Fa	=	No Good
Total Force @ Section	lbs =	610.6
Moment....Actual	ft-# =	950.6
Moment.....Allowable	=	2,321.3
Shear.....Actual	psi =	12.7
Shear.....Allowable	psi =	82.2
Wall Weight	=	100.0
Rebar Depth 'd'	in =	4.00

Masonry Data

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

Concrete Data

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

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W3

Date: 7 JUL 2018

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Cantilevered Retaining Wall Design

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

Footing Dimensions & Strengths

Toe Width	=	1.00 ft
Heel Width	=	1.33
Total Footing Width	=	2.33
Footing Thickness	=	10.00 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	=	1,901	1,395 psf
Mu' : Upward	=	914	318 ft-#
Mu' : Downward	=	40	181 ft-#
Mu: Design	=	874	-137 ft-#
Actual 1-Way Shear	=	9.24	4.75 psi
Allow 1-Way Shear	=	82.16	82.16 psi

Toe Reinforcing = # 4 @ 10.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings
Toe: Not req'd, Mu < S * Fr
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	530.0	1.83	972.3	Soil Over Heel	=	371.7	2.00	742.8
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=	530.0	1.33	706.7
Load @ Stem Above Soil	=				* Axial Live Load on Stem	=	640.0	1.33	853.3
	=				Soil Over Toe	=		0.50	
					Surcharge Over Toe	=			
Total		530.0	**O.T.M.**	972.3	Stem Weight(s)	=	967.0	1.33	1,289.3
	=		=		Earth @ Stem Transitions	=	186.8	1.83	342.5
					Footing Weight	=	291.3	1.17	339.3
					Key Weight	=			
					Vert. Component	=			
					Total =		2,346.8 lbs	**R.M.=**	3,420.6

Resisting/Overturning Ratio = 3.52
Vertical Loads used for Soil Pressure = 2,986.8 lbs

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

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)	0.170	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.

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W4

Date: 9 JUL 2018

This Wall in File: c:\users\nic\documents\retainpro 10 project files\talerman-simon.RPX

Cantilevered Retaining Wall Design

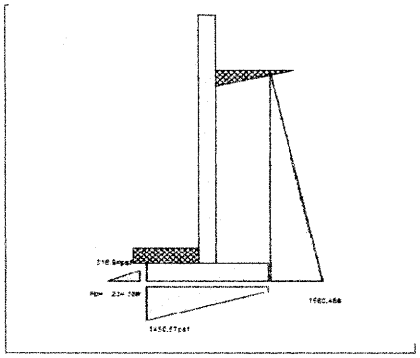
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	8.67 ft
Wall height above soil	=	2.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	8.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	375.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.525
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios

Overturning	=	2.52 OK
Sliding	=	1.52 OK
Total Bearing Load	=	4,132 lbs
...resultant ecc.	=	5.97 in
Soil Pressure @ Toe	=	1,451 psf OK
Soil Pressure @ Heel	=	319 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,741 psf
ACI Factored @ Heel	=	383 psf
Footing Shear @ Toe	=	23.4 psi OK
Footing Shear @ Heel	=	16.1 psi OK
Allowable	=	82.2 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	1,580.5 lbs
less 100% Passive Force	= -	234.4 lbs
less 100% Friction Force	= -	2,169.2 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

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

Stem Construction

		Bottom
		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00
Rebar Size	=	# 5
Rebar Spacing	=	10.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.624**
Total Force @ Section	lbs =	2,104.7
Moment....Actual	ft-# =	6,082.7
Moment.....Allowable	=	9,745.5
Shear.....Actual	psi =	28.3
Shear.....Allowable	psi =	82.2
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.19

Masonry Data

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

Concrete Data

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

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W4

Date: 9 JUL 2018

This Wall in File: c:\users\nic\documents\retainpro 10 project files\talerman-simon.RPX

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Cantilevered Retaining Wall Design

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

Footing Dimensions & Strengths

Toe Width	=	2.00 ft
Heel Width	=	2.67
Total Footing Width	=	4.67
Footing Thickness	=	10.00 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	=	1,741	383 psf
Mu' : Upward	=	3,094	1,158 ft-#
Mu' : Downward	=	494	2,806 ft-#
Mu: Design	=	2,600	1,649 ft-#
Actual 1-Way Shear	=	23.38	16.13 psi
Allow 1-Way Shear	=	82.16	82.16 psi

Toe Reinforcing = # 5 @ 17.22 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings
Toe: #4@ 11.11 in, #5@ 17.22 in, #6@ 24.44 in, #7@ 33.33 in, #8@ 43.89 in, #9@ 5
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

Item		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#		.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	1,580.5	3.17	5,006.6	Soil Over Heel	=	2,084.3	3.67	7,645.8
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=				* Axial Live Load on Stem	=			
	=				Soil Over Toe	=		1.00	
					Surcharge Over Toe	=			
Total		1,580.5	**O.T.M.**	5,006.6	Stem Weight(s)	=	1,117.0	2.33	2,606.3
	=		=		Earth @ Stem Transitions	=	346.8	2.83	982.6
					Footing Weight	=	583.8	2.34	1,363.1
					Key Weight	=			
					Vert. Component	=			
					Total =		4,131.8 lbs	**R.M.=**	12,597.8

Resisting/Overturning Ratio = 2.52
Vertical Loads used for Soil Pressure = 4,131.8 lbs

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

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus	250.0	pci
Horizontal Defl @ Top of Wall (approximate only)	0.096	in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W4

Date: 7 JUL 2018

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Cantilevered Retaining Wall Design

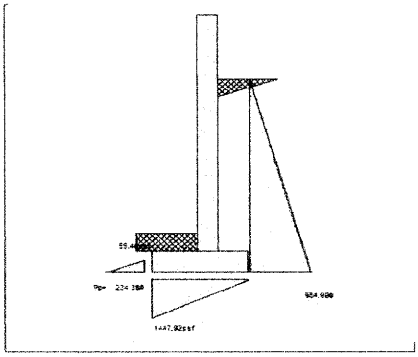
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	6.67 ft
Wall height above soil	=	2.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	8.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	375.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.525
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios

Overturning	=	2.06 OK
Sliding	=	1.51 OK
Total Bearing Load	=	2,383 lbs
...resultant ecc.	=	5.87 in
Soil Pressure @ Toe	=	1,448 psf OK
Soil Pressure @ Heel	=	55 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,738 psf
ACI Factored @ Heel	=	67 psf
Footing Shear @ Toe	=	14.8 psi OK
Footing Shear @ Heel	=	8.7 psi OK
Allowable	=	82.2 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	985.0 lbs
less 100% Passive Force	= -	234.4 lbs
less 100% Friction Force	= -	1,251.0 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

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

Stem Construction

		Bottom
		As < Min %
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	16.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	No Good
Total Force @ Section	lbs =	1,245.3
Moment....Actual	ft-# =	2,768.3
Moment.....Allowable	=	4,119.2
Shear.....Actual	psi =	16.6
Shear.....Allowable	psi =	82.2
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.25

Masonry Data

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

Concrete Data

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

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W4

Date: 7 JUL 2018

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Cantilevered Retaining Wall Design

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

Footing Dimensions & Strengths

Toe Width	=	1.50 ft
Heel Width	=	1.67
Total Footing Width	=	3.17
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 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	=	1,738	67 psf
Mu' : Upward	=	1,658	122 ft-#
Mu' : Downward	=	93	559 ft-#
Mu: Design	=	1,565	437 ft-#
Actual 1-Way Shear	=	14.83	8.69 psi
Allow 1-Way Shear	=	82.16	82.16 psi
Toe Reinforcing	=	# 4 @ 16.00 in	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings
Toe: Not req'd, Mu < S * Fr
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#			.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	985.0	2.50	2,463.2	Soil Over Heel	=	802.9	2.67	2,142.5
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=				* Axial Live Load on Stem	=			
	=				Soil Over Toe	=		0.75	
					Surcharge Over Toe	=			
Total		985.0	**O.T.M.**	2,463.2	Stem Weight(s)	=	916.9	1.83	1,681.0
	=		=		Earth @ Stem Transitions	=	266.8	2.33	622.4
Resisting/Overturning Ratio		= **2.06**			Footing Weight	=	396.3	1.59	628.1
Vertical Loads used for Soil Pressure =		2,382.9 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		2,382.9 lbs	**R.M.=**	5,074.0

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

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)	0.116	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.

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic
Description....
wall W4

Date: 7 JUL 2018

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Cantilevered Retaining Wall Design

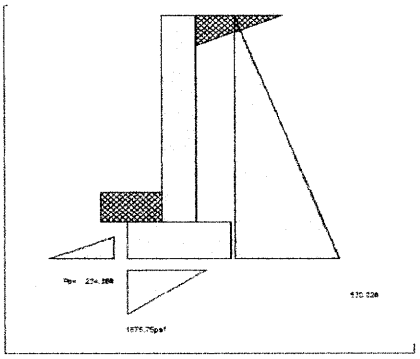
Code: IBC 2012,ACI 318-11,ACI 530-11

Criteria

Retained Height	=	4.67 ft
Wall height above soil	=	0.00 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	8.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	2,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	375.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	0.00 pcf
Footing||Soil Friction	=	0.525
Soil height to ignore for passive pressure	=	12.00 in



Surcharge Loads

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

Axial Load Applied to Stem

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

Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	0.0 psf

Adjacent Footing Load

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

Design Summary

Wall Stability Ratios

Overturning	=	1.67 OK
Sliding	=	1.71 OK
Total Bearing Load	=	1,276 lbs
...resultant ecc.	=	5.91 in
Soil Pressure @ Toe	=	1,676 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	2,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	2,011 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	2.7 psi OK
Footing Shear @ Heel	=	5.8 psi OK
Allowable	=	82.2 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	530.0 lbs
less 100% Passive Force	= -	234.4 lbs
less 100% Friction Force	= -	669.7 lbs
Added Force Req'd	=	0.0 lbs OK
....for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

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

Stem Construction

		Bottom
		As < Min %
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	18.00
Rebar Placed at	=	Center

Design Data

fb/FB + fa/Fa	=	No Good
Total Force @ Section	lbs =	610.6
Moment....Actual	ft-# =	950.6
Moment.....Allowable	=	2,321.3
Shear.....Actual	psi =	12.7
Shear.....Allowable	psi =	82.2
Wall Weight	=	100.0
Rebar Depth 'd'	in =	4.00

Masonry Data

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

Concrete Data

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

giraf design
9220 roosevelt way ne
seattle wa 98115-2842
(206) 621-0060
girafdesign@gmail.com

Title talerman-simon residence
Job # 2018-024 Dsgnr: nic Date: 7 JUL 2018
Description....
wall W4

This Wall in File: c:\users\nic\documents\retainpro 10 project files\talerman-simon.RPX

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Cantilevered Retaining Wall Design

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

Footing Dimensions & Strengths

Toe Width	=	0.67 ft
Heel Width	=	1.33
Total Footing Width	=	2.00
Footing Thickness	=	10.00 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	=	2,011	0 psf
Mu' : Upward	=	385	1 ft-#
Mu' : Downward	=	54	181 ft-#
Mu: Design	=	331	180 ft-#
Actual 1-Way Shear	=	2.71	5.81 psi
Allow 1-Way Shear	=	82.16	82.16 psi
Toe Reinforcing	=	# 4 @ 18.00 in	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings
Toe: Not req'd, Mu < S * Fr
Heel: Not req'd, Mu < S * Fr
Key: No key defined

Summary of Overturning & Resisting Forces & Moments

		.....OVERTURNING..... Force lbs	Distance ft	Moment ft-#			.....RESISTING..... Force lbs	Distance ft	Moment ft-#
Heel Active Pressure	=	530.0	1.83	972.3	Soil Over Heel	=	371.7	1.67	620.2
Surcharge over Heel	=				Sloped Soil Over Heel	=			
Surcharge Over Toe	=				Surcharge Over Heel	=			
Adjacent Footing Load	=				Adjacent Footing Load	=			
Added Lateral Load	=				Axial Dead Load on Stem	=			
Load @ Stem Above Soil	=				* Axial Live Load on Stem	=			
	=				Soil Over Toe	=		0.34	
					Surcharge Over Toe	=			
Total		530.0	**O.T.M.**	972.3	Stem Weight(s)	=	467.0	1.00	468.6
	=		=		Earth @ Stem Transitions	=	186.8	1.50	280.8
Resisting/Overturning Ratio		= **1.67**			Footing Weight	=	250.0	1.00	250.0
Vertical Loads used for Soil Pressure	=	1,275.5 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		1,275.5 lbs	**R.M.=**	1,619.6

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

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)	0.109	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.