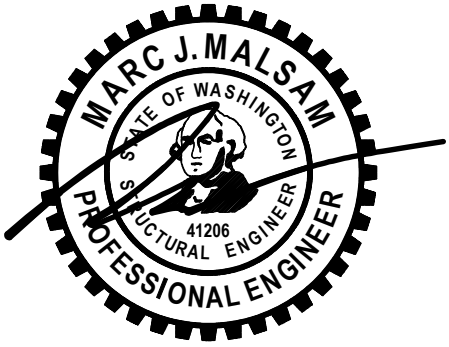
STRUCTURAL CALCULATIONS FOR:

6221 83RD PL SE

MERCER ISLAND, WA

ARCHITECT: JULIAN WEBER ARCH + DESIGN

MAY 27, 2022



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DESIGN CRITERIA IBC 2018

DEAD LOADS

ROOF		ROOF DECK		FLOOR	
Composition	2.5 psf	Composition	2.5 psf	3/4" Plywood	2.4 psf
3/4" Plywood	2.4 psf	3/4" Plywood	2.4 psf	TJI @ 16" o.c.	2.3 psf
Truss @ 24" o.c.	3.0 psf	Truss @ 24" o.c.	3.0 psf	Flooring	1.0 psf
Insulation	1.0 psf	1 1/2" Rigid	2.3 psf	Gyp Board (5/8")	2.8 psf
Gyp Board (5/8")	2.8 psf	Gyp Board (5/8")	2.8 psf	MEP	1.5 psf
MEP	1.5 psf	MEP	1.5 psf		
Solar Panels	5.0 psf	Palletized Deck	5.0 psf		
Total	18.2 psf	Total	19.5 psf	Total	10.0 psf
Use	20.0 psf	Use	20.0 psf	Use	15.0 psf

LIVE LOADS/OCCUPANCY

		ROOF LIVE		FLOOR LIVE		DECK LIVE	
Risk Category	II	Snow =	25 psf	Occupancy =	40 psf	Occupancy =	60 psf
Roof Deck	No			Stair/Corridor =	40 psf		
Common Access	No						

SEISMIC CRITERIA ASCE 7-16 Ch. 11 & Ch. 12

Imp. Factor =	1.00	Seismic Ht, hn=	45 ft	
Site Class =	D(Default)	T, Building=	0.3	
R Value =	6.5	Ts=	0.5	
Geo. Ground Hazard?	**No w/ASCE 11.4.8 Excep's**			
S_s =	1.464	F_a =	1.200	Table 11.4-1
S_1 =	0.507	F_v =	NULL	Table 11.4-2
S_{ms} =	1.757	x 2/3 = S_{ds} =	**1.171**	Eqn. 11.4-3
S_{m1} =	NULL	x 2/3 = S_{d1} =	**NULL**	Eqn. 11.4-4

C_{SULT} =	**0.180**
C_{SALL} =	**0.126**

T/Ts= 0.672 ≤ 1.5

Okay, Cs Eqn. 12.8-2

SEISMIC WEIGHT ASCE 7-16 12.7.2

Partitions = 15 psf

***Roof weight = 1/2 Partition + Roof DL**

***Floor weight = Full Partition + Floor DL**

ROOF 26.0 psf ROOF DECK 27.0 psf

FLOOR 25.0 psf

SEISMIC DESIGN CATEGORY IBC 1613.2.5

Seismic DC= D

WIND CRITERIA ASCE 7-16 Ch. 27 Directional Procedure

V =	110 mph	K_d =	0.85
Exposure =	B	G =	0.85
h =	25 ft	K_{zt} =	1.60 ***See Kzt Worksheet**

Roof Slope = 4 : 12 = 18 °

PRESSURE COEFFICIENTS (Cp)

Windward Wall =	0.8	Windward Roof =	0.2
Leeward Wall =	-0.5	Leeward Roof =	-0.6

PRESSURE (PSF) $q = 0.00256 K_z K_{zt} K_d V^2$

Ht	K_z	q_z	$0.6xq_z$ [1]	q_h	P_{WW}	P_{LW}	P_{WALL}	P_{ROOF}
0-15	0.57	24.0	14.4		9.8	7.1	**16.9**	
15-20	0.62	26.1	15.7		10.7	7.1	**17.7**	
20-25	0.66	27.8	16.7	16.7	11.3	7.1	**18.4**	**11.3**
25-30	0.70	29.5	17.7		12.0	7.1	**19.1**	
30-35	0.73	30.8	18.5		12.5	7.1	**19.6**	
35-40	0.76	32.0	19.2		13.1	7.1	**20.2**	
40-45	0.79	33.3	20.0		13.6	7.1	**20.7**	
45-50	0.81	34.1	20.5		13.9	7.1	**21.0**	

[1] Per IBC 2018 1605.3.1 Basic Load Combinations

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6221 83rd PL SE
Project

Mercer Island, WA

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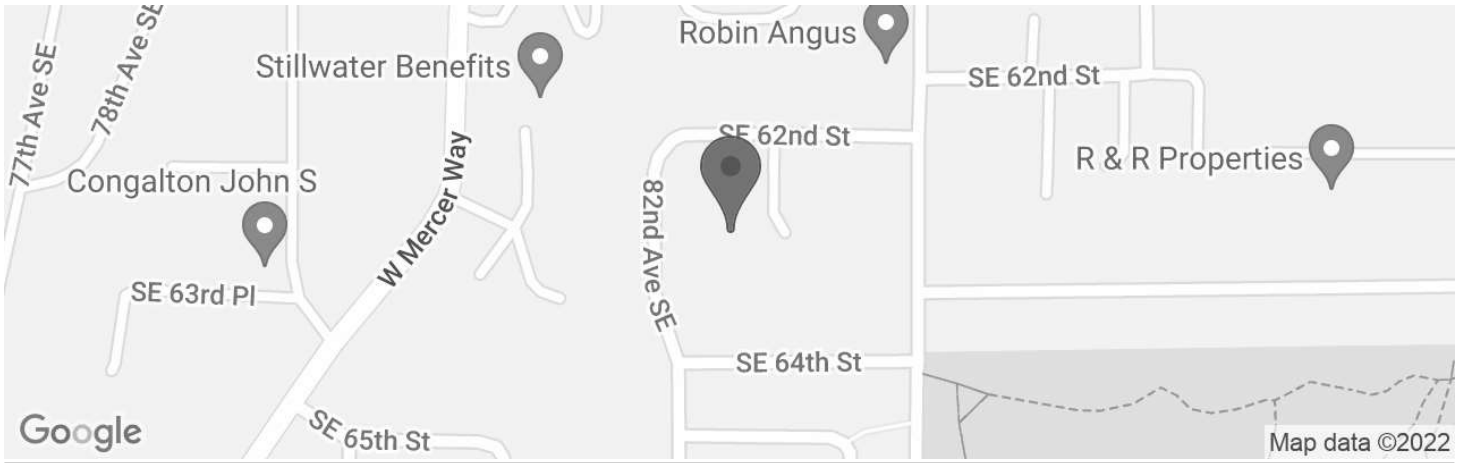
DC1
Sheet

OSHPD

6221 83rd PL SE

6221 83rd Pl SE, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.5464898, -122.228772



Date	5/10/2022, 8:50:35 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	1.464	MCE_R ground motion. (for 0.2 second period)
S_1	0.507	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.757	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.171	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

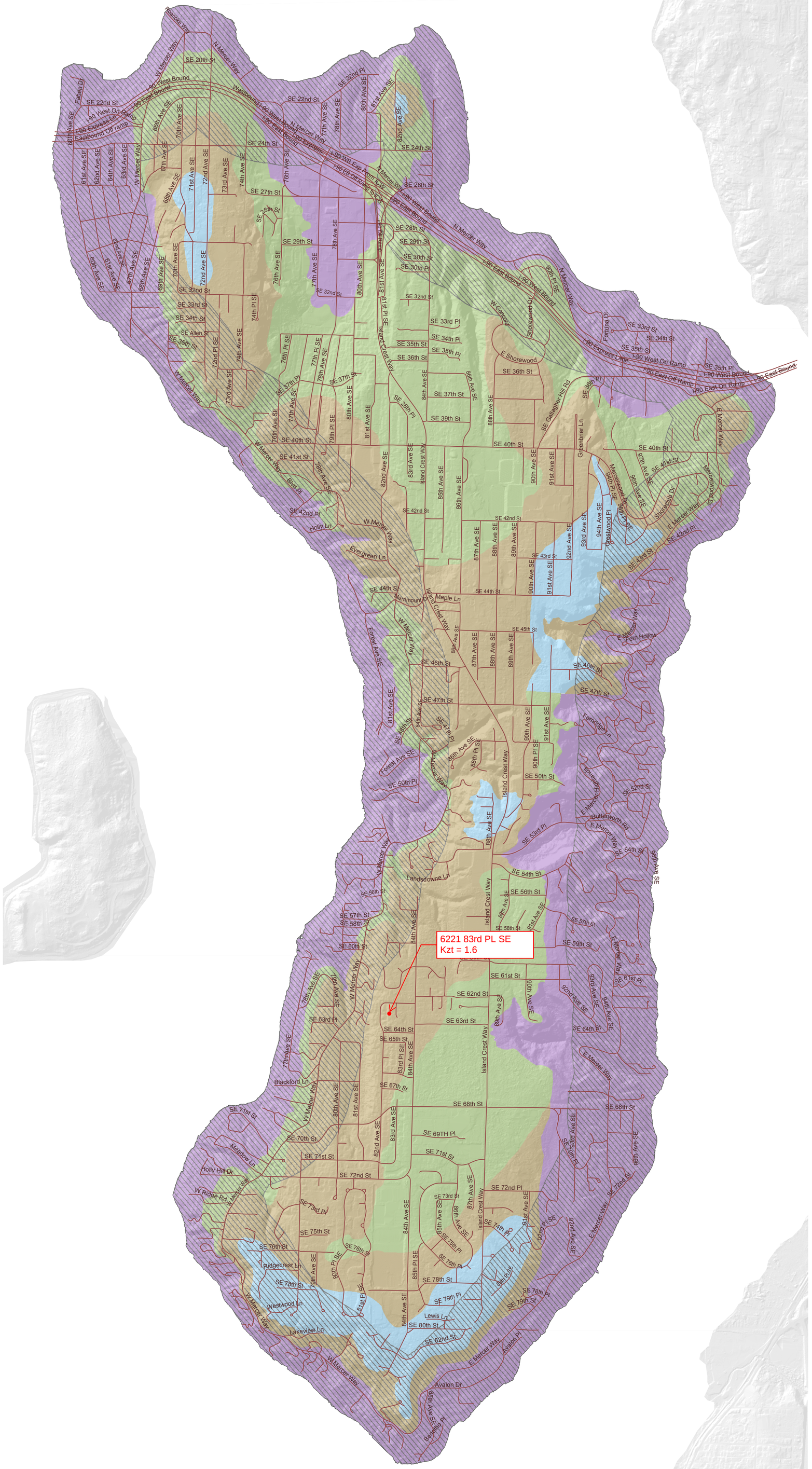
Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.627	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.752	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	1.464	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.624	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	4.26	Factored deterministic acceleration value. (0.2 second)
S1RT	0.507	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.565	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.642	Factored deterministic acceleration value. (1.0 second)
PGAd	1.42	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.902	Mapped value of the risk coefficient at short periods

Mercer Island Wind Exposure and Wind Speed-Up (Topographic Effect)

by Development Services Group (DSG), City of Mercer Island
April 2009

0 0.5 1 Kilometers 1:12,000
0 0.5 1 Miles

T N



WIND EXPOSURE CATEGORIES & WIND SPEED-UP FACTORS
(ICC Section 1609 & ASCE 7-05 Chapter 6)

It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the Kzt factor to be utilized for each specific project. The Kzt factors and wind exposure categories indicated on this map are the minimum values accepted by the City of Mercer Island without requiring the design professional to submit additional calculations and supporting topographic documentation (to verify the values utilized in their wind load determination).

Please note – The Kzt values indicated on this map are approximations based upon periodic calculations of representative samplings around Mercer Island. These values are intended for City of Mercer Island's plan review purposes only.

WIND EXPOSURE CATEGORIES:

Wind Exposure Category	
	Exposure 'C' (1500 feet from Lake)
	Exposure 'B' (all other areas)

WIND SPEED-UP (TOPOGRAPHIC EFFECT) - K_zt Factor :

K_zt Factor	
	$K_zt = 1.0$
	$K_zt = 1.3$
	$K_zt = 1.6$
	$K_zt = 1.9$

GENERAL NOTES FOR WIND EXPOSURE AND WIND SPEED-UP MAP

This map is the Wind Exposure Category and Wind Speed-up (Topographic Effects) Map for the City of Mercer island. This map shows the minimum wind exposure category and the minimum wind speed-up, "K_zt" factor, which will be accepted without site specific documentation and calculation.

Other wind speed phenomena may occur on Mercer Island that is not specifically indentified on this map. It is the responsibility of the Owner (or their Design Professional) to review site conditions and determine the appropriate design wind speed and exposure category for their specific project and location.

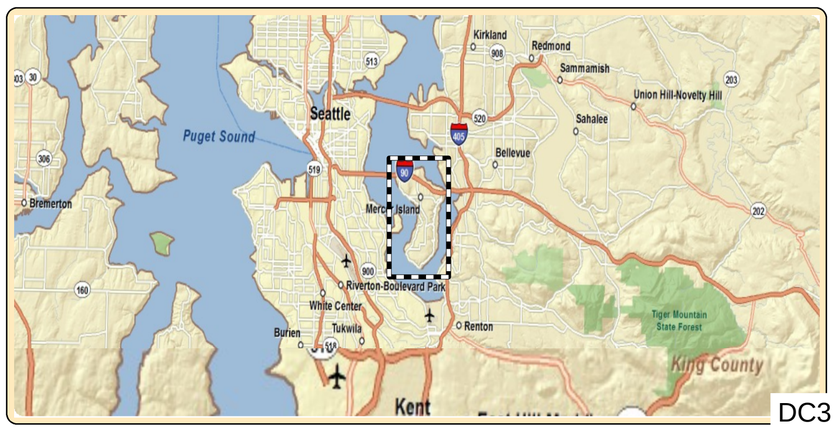
This map is for the sole use of the staff of the City of Mercer Island's Development Services Group (DSG) for the purposes of permit application evaluation. This map provides DSG staff a general assessment of Wind Exposure Category and Wind Speed-up (Topographic Effects). All areas have not been specifically evaluated and there may be locations that are not correctly represented on this map. It is the responsibility of individual property owners and map users to evaluate risk associated with their proposed development. No site-specific assessment of risk is implied or otherwise indicated by the City of Mercer Island with this map.

Information about data used for the map, references, and data limitation are all described the associated "Read Me" document. The digital version of this map is accompanied by a meta data file containing pertinent information about map construction. This data map is available on the City of Mercer Island website.

The City of Mercer Island is using guidance provided within ICC Section 1609 & ASCE 7-05 Chapter 6 regarding definitions used when creating this map.

DEFINITIONS:

K_zt factor:	The topographic effect of wind speed-up at isolated hills, ridges, and escarpments constituting abrupt changes in the general topography, located in any exposure category, that meet all of the conditions noted in ASCE 7-05 Minimum Design Loads for Buildings and Other Structures, Section 6.5.7.
Exposure B:	The wind exposure category that applies where the site in question is located a minimum of 1500 feet from the shoreline and the mean roof height is less than or equal to 30 feet per IBC 2006 section 1609.4.3.
Exposure C:	The wind exposure category that applies where the site in question is located within 1500 feet from the shoreline per IBC 2006 section 1609.4.3.
Wind Speed:	Minimum 85 mph 3-second gust per IRC Figure R301.2(4)

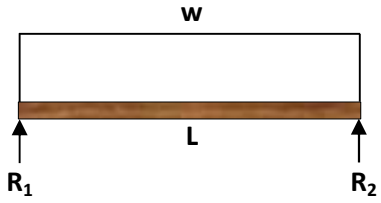


DC3

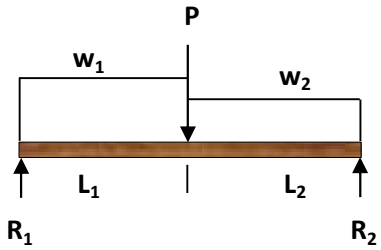
TYPICAL BEAM CASES

***ASSUME CASE 1 FOR ALL BEAMS U.N.O.**

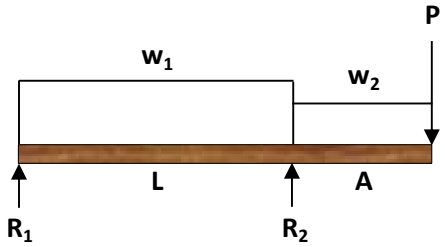
CASE #1: (C1)



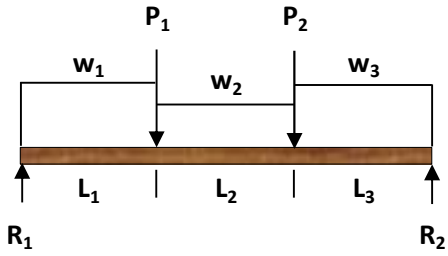
CASE #2: (C2)



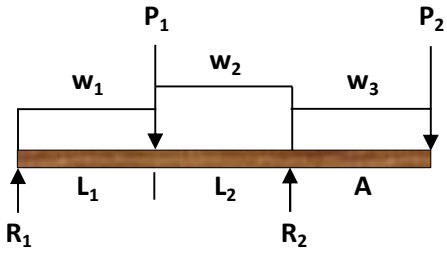
CASE #3: (C3)



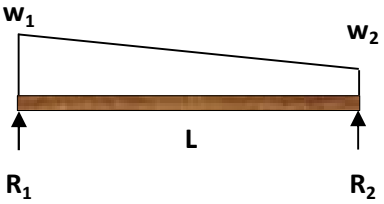
CASE #4: (C4)



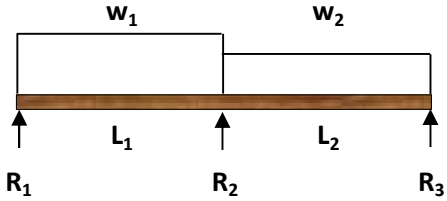
CASE #5: (C5)



CASE #6: (C6)



CASE #7: (C7)



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	Design
	DC4
	Sheet

LATERAL ANALYSIS

Seismic:

Level	Area (ft^2)	Unit Wt (psf)	Weight (kips)	Avg Ht (ft)	Wi·Hi (k-ft)	Distrib. (%)	Shear, V (kips)	Uniform (plf)
Roof	2000	26	52.70	22.5	1185.75	61%	**8.73**	239 / 157
Level 2	2400	25	61.50	12.5	768.75	39%	**5.66**	124 / 102

Totals: 114.20 k 1954.50 100% **14.39 k**

Base Shear:

V = C_S x W

= 0.18 x 114.2k = 20.56 kips (Ultimate)

= 0.126 x 114.2k = 14.39 kips (Allowable)

Wind:

North-South Exposure

Level	Trib (ft)	Wind Load (#/ft)	Length (ft)	Shear, V (kips)	
Roof	5.5	2.5' x 18.4 + 3' x 17.7 = 100 plf	36.5	**3.65**	EQ
Level 2	11.25	2' x 17.7 + 9.25' x 16.9 = 192 plf	45.5	**8.74**	

12.39 k

East-West Exposure

Level	Trib (ft)	Wind Load (#/ft)	Length (ft)	Shear, V (kips)	
Roof	5.5	2.5' x 18.4 + 3' x 17.7 = 100 plf	55.5	**5.55**	EQ
Level 2	11.25	2' x 17.7 + 9.25' x 16.9 = 192 plf	55.5	**10.66**	

16.21 k

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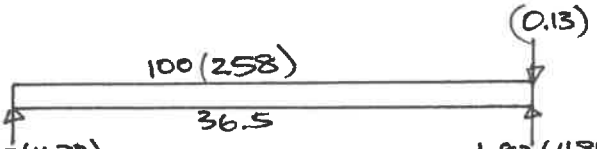
Sheet

LATERAL ANALYSIS

NORTH-SOUTH EXPOSURE
(SEISMIC VALUES IN PARENTHESIS)

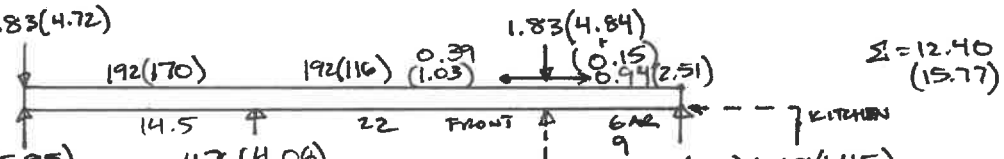
Roof: 9' - 0" Plate



$\Sigma = 3.66$ (9.56)

R (k):	1.83 (4.72)	1.83 (4.84)
L (ft):	2.75+3.5+4.4 = 10.65	12.5+5.9+3.5 = 21.9
V (#/ft):	172 (443)	84 (221)
SW:	SW3-2	SW4
OT:	1.5 (4.0)	0.7 (2.0)
HD:	(3) CS16	(2) CS16
H:W:	900 (2)(2.75)/9 = 550 > 443 ✓ 1.4(900)(2)(2.75)/9 = 770 > 172 ✓	350 (2)(3.5)/9 = 272 > 221 ✓ 1.4(350)(2)(3.5)/9 = 381 > 84 ✓

Level 2: 10' - 0" Plate



$\Sigma = 12.40$ (15.77)

R (k):	3.22 (5.95)	4.76 (4.06)	0.50 (1.45)	2.24 (2.86)	1.68 (1.45)
L (ft):	5.75+3.5+4.4 = 13.65	11.9	5.9	(2) WSWH18X9	3
V (#/ft):	236 (436)	400 (341)	85 (246)		560 (483)
SW:	SW3-2	SW3	SW4		SW2
OT:	2.7 (5.0)	4.0 (3.4)	0.8 (2.4) 1.5 (4.4)	9.4 (12.0)	5.6 (4.8)
STRAPPED	4.2 (9.0)				
HD:	HDU8	HDU5	HDU4 HDU8	WSWH-AB	HDU8
STRAPPED	(2) MST60 / HDU11				
H:W:	900 (2)(3.5)/10 = 630 > 436 ✓ 1.4(900)(2)(3.5)/10 = 882 > 236 ✓	—	—		—

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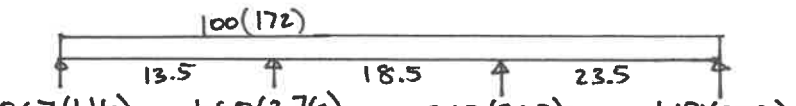
Date	5/11/2022
Proj. No.	0329.2022.01.01
Design	BRR
Sheet	L-2

LATERAL ANALYSIS

EAST-WEST EXPOSURE
(SEISMIC VALUES IN PARENTHESIS)

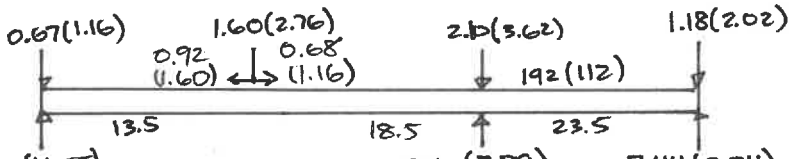
Roof: 9' - 0" Plate



Σ = 5.55 (9.36)

R (k):	0.67(1.16)	1.60(2.76)	2.10(3.62)	1.18(2.02)
L (ft):	14	9+7.9=16.9	11.9+15.25+9.5=36.65	13.4
V (#/ft):	48(83)	95(163)	57(99)	88(151)
SW:	SW6	SW6	SW6	SW6
OT:	—	0.9(1.5)	—	0.8(1.4)
HD:	—	CS16	—	CS16
H:W:	—	—	—	—

Level 2: 10' - 0" Plate



Σ = 16.21 (15.78)

R (k):	4.66(4.55)		8.11(7.89)	3.44(3.34)
L (ft):	15		21+12+9.5=42.5	22.25+8.75=31.0
V (#/ft):	311(303)		191(186)	111(108)
SW:	SW4		SW6	SW6
OT:	3.1(3.0)		1.9(1.9)	1.1(1.1)
HD:	HDU5		(2)CS16/HDU4	HDU4
H:W:	—		—	—

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L-3	Sheet

VERTICAL ANALYSIS

Typical Units: L = ft, W = klf, P = kip, R = kip, M = k-ft, V = k, Fb = ksi, Fv = psi
Units in (Parenthesis) represent Dead Load or 0.6DL (Ωo=2.5)

ROOF FRAMING

#300 - CANT BM

C3
L=22
A=6
$W_1 = (24/2)(0.02) = 0.24$
$W_2 = (24/2)(0.045) = 0.54$

P=2.2
R_1=1.6
R_2=9.1
M=-22.9

f_b=-0.9
F_b=70
$\Delta_L = 0.22 = 24/651$

GL 5½X18

#301 - CANT BM

C3
L=9.25
A=1.25
$W_1 = W_2 = (18/2)(0.045) = 0.41$

P=0
R_1=1.9
R_2=2.5
M=4.2

f_b=0.3
F_b=31
Δ_L=-0.003

GL 3½X18 → BUMP UP TO GL 5½X18

#302 - CANT BM

C3
L=15
A=3
$W_1 = W_2 = 0.09$

P=2.5
R_1=0.15
R_2=4.0
M=-7.9

f_b=-0.3
F_b=40
$\Delta_L = 0.04 = 24/1927$

GL 5½X18

#303 - INT BM

L=20.5
$W = (41.5/2)(0.045) = 0.93$
R=9.5
M=48.9

f_b=1.5
F_b=103
$\Delta_T = 0.48 = 4/509$

GL 5½X21

C3
L=12
A=5
$W_1 = (18/2)(0.02) = 0.18$
$W_2 = (18/2)(0.045) = 0.41$

P=0
R_1=0.7
R_2=3.6
M=-5.1

f_b=-0.2
F_b=17
$\Delta_L = 0.02 = 24/7609$

GL 5½X21

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5/12/2022
Date
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Design
V-1
Sheet

VERTICAL ANALYSIS

SECOND FLOOR FRAMING

Typical Units: L = ft, W = klf, P = kip, R = kip, M = k-ft, V = k, Fb = ksi, Fv = psi
Units in (Parenthesis) represent Dead Load or 0.6DL (Ωo=2.5)

#200 - INT BM AT GARAGE

L = 13
W = (23.25/2)(0.055) = 0.64
R = 4.2
M = 13.5
ϕ_b = 1.3
R_L = 81
Δ_T = 0.30 = L/524

GL 5½X11⅞

#201 - BM AT GARAGE

C4
L_1 = 8
L_2 = 3
L_3 = 12.25

$W_1 = W_2 = W_3 = 0.07 + (8.5/2)(0.045) + 0.15 + 0.045 = 0.46$

P_1 = 4.2
P_2 = [5.0]

R_1 = 8.1
R_2 = 6.8
M = 50.2
ϕ_b = 1.1
R_L = 82
Δ_T = 0.41 = L/680

GL 5½X24

#202 - BM AT GARAGE DOOR

L = 20.5
W = (8.5/2)(0.045) = 0.19
R = 2.0
M = 10.0
ϕ_b = 0.4
R_L = 28
Δ_T = 0.10 = L/2365

GL 3½X24

#203 - E/W BM AT STAIR

L = 6.5
W = (9/2)(0.055) = 0.25
R = 0.8
M = 1.3
ϕ_b = 0.12
R_L = 13
Δ_T = 0.007 = L/10732

GL 5½X11⅞

#204 - N/S BM AT STAIR

C2
L_1 = 8.75
L_2 = 8.75
W_1 = 0.07
W_2 = 0.07 + (7/2)(0.055) = 0.26
P = 0.8

R_1 = 1.4
R_2 = 2.3
M = 9.8
ϕ_b = 0.9
R_L = 46
Δ_T = 0.36 = L/577

GL 5½X11⅞

#205 - BM AT DINING

L = 13
W = 0.07 + (8/2)(0.045) + 0.15 + 0.045 = 0.45

R = 2.9
M = 9.5
ϕ_b = 0.9
R_L = 57
Δ_T = 0.21 = L/745

GL 5½X11⅞

#206 - INT BM

C4
L_1 = 1.5
L_2 = 4.75
L_3 = 7.5

$W_1 = W_2 = (3\frac{1}{2})(0.055) + 0.15 + (3\frac{1}{2})(0.045) = 1.70$

$W_3 = 0.045 + (9/2)(0.055) + 0.15 + (18/2)(0.045) = 0.85$

P_1 = [± 3.8]
P_2 = 4.3 [± 3.8]

R_1 = 12.3 [14.9]
R_2 = 9.0 [10.6]
M = 43.6 [55.4]

$S_x = \frac{43.6}{50}(12)(1.67) = 17.5\ in^3$

TRY W10X26 S_x = 27.9 > 17.5 ✓

Δ = 0.33 = L/501

W10X26 → BUMP UP W10X45

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VERTICAL ANALYSIS

SECOND FLOOR FRAMING

Typical Units: L = ft, W = klf, P = kip, R = kip, M = k-ft, V = k, Fb = ksi, Fv = psi
Units in (Parenthesis) represent Dead Load or 0.6DL (Ωo=2.5)

#207 - BM OVER KITCHEN

C2
$L_1 = 13$
$L_2 = 2.75$

$W_1 = (22.5/2)(0.045) = 0.51$
$W_2 = (14.5/2)(0.045) + 0.07 + 0.15 + 0.09 = 0.64$

$P = 11.0\ [16.0]$

$R_1 = 6.0\ [6.8]$ $\quad \delta = 0.8\ [1.0]$
$R_2 = 13.5\ [17.5]$ $\quad R = 138\ [185]$
$M = 34.9\ [45.8]$ $\quad \Delta_T = 0.13 = L/1440$

GL 5½X24

#208 - BM OVER DECK

C5
$L_1 = 6$
$L_2 = 7.5$
$A = 35$

$W_1 = W_2 = 0.07 + 0.15 + 0.09 = 0.31$
$W_3 = 0.09$

$P_1 = 1.1$
$P_2 = 0.7$
$R_1 = 2.7$ $\quad \delta = -0.2$
$R_2 = 3.0$ $\quad R = 101$
$M = 10.3$ $\quad \Delta_L = -0.41 = L/287$

PSL 5¼X11⅞

#209 - BM UNDER WALL

$L = 7$
$W = (13.5/2)(0.055) + (3/2)(0.045) + 0.15 + (13.5/2)(0.045) = 0.89$

$R = 3.1$ $\quad \delta = 0.5$
$M = 5.5$ $\quad R = 51$
$\Delta_T = 0.03 = L/2414$

GL 5½X11⅞

#210 - INT BM

C2
$L_1 = 8.5$
$L_2 = 7.5$

$W_1 = (13/2)(0.045) + (17.5/2)(0.055) + 0.15 + (24/2)(0.045) = 1.46$
$W_2 = (31/2)(0.055) + 0.15 + (31/2)(0.045) = 1.70$

$P = 2.7\ [3.8]$
$R_1 = 13.4\ [15.1]$
$R_2 = 14.5\ [16.5]$
$M = 60.9\ [76.0]$

$S_x = \frac{60.9}{50}(12)(1.67) = 24.4$

Try W10X45 $\quad S_x = 49.1 > 24.4$ ✓
$\Delta_T = 0.38 = L/510$

W10X45

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VERTICAL ANALYSIS

FIRST FLOOR FRAMING

Typical Units: L = ft, W = klf, P = kip, R = kip, M = k-ft, V = k, Fb = ksi, Fv = psi
Units in (Parenthesis) represent Dead Load or 0.6DL (Ωo=2.5)

#100 - BM ABOVE CLOSET

C2
$L_1 = 6.25$
$L_2 = 5.25$

$W_1 = (22/2)(0.055) = 0.61$
$W_2 = (15.5/2)(0.055) + 0.04 + 0.15 + 0.045 = 0.66$

$P = 14.1\ [16.1]$

$R_1 = 9.9\ [10.9]$
$R_2 = 11.2\ [12.3]$
$M = 50.2\ [55.9]$

$S_x = \frac{50.2}{50}(12)(1.67) = 20.1$

TRY W10X45

$S_x = 49.1 > 20.1$
$\Delta_T = 0.14 = L/989$

W10X45

#101 - N/S BM AT BATHRM

C2
$L_1 = 6$
$L_2 = 2.75$
$W_1 = W_2 = 0.07$
$P = 9.9\ [10.9]$

$R_1 = 3.4\ [3.7]$
$R_2 = 7.1\ [7.8]$
$M = 19.2\ [21.1]$

$f_b = 1.4\ [1.5]$
$f_v = 12.7\ [13.9]$
$\Delta_T = 0.10 = L/1002$

PSL 7X11 7/8

#102 - INT BM

C2
$L_1 = 12.75$
$L_2 = 2.5$

$W_1 = (13/2)(0.08) + (18/2)(0.055) = 1.02$
$W_2 = (31/2)(0.055) = 0.85$

$P = 26.8\ [31.2]$

$R_1 = 12.1\ [12.9]$
$R_2 = 29.8\ [33.5]$
$M = 72.2\ [81.0]$

$S_x = \frac{72.2}{50}(12)(1.67) = 28.9$

TRY W16X57

$S_x = 92.2 > 28.9$ ✓
$\Delta_T = 0.13 = L/1411$

W16X57

#103 - CANT BM

C3
$L = 3$
$A = 3$
$W_1 = (18/2)(0.02) + (13/2)(0.02) = 0.31$
$W_2 = (31/2)(0.08) = 1.24$
$P = 0$

$R_1 = -1.4$
$R_2 = 6.0$
$M = -5.6$

$f_b = -0.2$
$f_v = 28$
$\Delta_C = 0.01 = 24/2100$

GL 5 1/2 X 18 → BUMP TO W16X57

#104 - WEST BM

C2
$L_1 = 4$
$L_2 = 1$
$W_1 = W_2 = 0.07 + 0.15 + 0.07 + 0.15 + 0.09 = 0.53$
$P = [22.5]$

$R_1 = [5.8]$
$R_2 = [9.3]$
$M = [9.1]$

$f_b = [0.8]$
$f_v = [28]$ ← $26.5(1.6) = 42.4 > 28$

GL 5 1/2 X 18

#105 - CANT BM

C3
$L = 15$
$A = 6.5$
$W_1 = (26/2)(0.02) + 0.15 + (17.5/2)(0.02) = 0.59$
$W_2 = (18/2)(0.08) + 0.15 + (18/2)(0.045) + 0.15 = 1.43$
$P = [4.8]$

$R_1 = 2.4\ [0.3]$
$R_2 = 15.7\ [22.6]$
$M = -30.2\ [-61.9]$

$f_b = -0.7\ [-1.4]$
$f_v = 7.3\ [28]$
$\Delta_C = 0.12 = 24/1352$

GL 5 1/2 X 24

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VERTICAL ANALYSIS

Foundation: 1,500 psf Assumed Soil Bearing

Side	North
Roof	.54
Wall	.15
Level 2	.41
Wall	.15
Level 1	.07
Wall	
Foundation	.50
Totals:	1.82

North: 1.82 / 1.50 (12) = 14.6" Wide Ftg Req'd Use 18" Wide Ftg

Point Loads on the Stem Walls:

Maximum 8.0 kip point load distributed over 4'-0" of continuous 18" wide footing = 1.33 psf OK

PT LOADS

P=6"/1.5KSF = 4.0# → USE 2'-0" SQ FTG

P=22.6/1.5 = 15.0# → USE 4'-0" SQ FTG

P=42/1.5 = 28.0# → USE 5'-0" W X 10'-0" L

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Title : 4'-0" Wall with Slab 6" Wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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 Toe	=	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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.23 OK
Slab Resists All Sliding !		
Total Bearing Load	=	865 lbs
...resultant ecc.	=	3.77 in
Soil Pressure @ Toe	=	640 psf OK
Soil Pressure @ Heel	=	78 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	768 psf
ACI Factored @ Heel	=	94 psf
Footing Shear @ Toe	=	6.7 psi OK
Footing Shear @ Heel	=	2.9 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	394.8 lbs

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

Top Stem

			Stem OK
Design Height Above Ftg		ft =	0.00
Wall Material Above "Ht"		=	Concrete
Thickness		=	6.00
Rebar Size		=	# 4
Rebar Spacing		=	18.00
Rebar Placed at		=	Edge
Design Data			
fb/FB + fa/Fa		=	**0.243**
Total Force @ Section	lbs	=	448.0
Moment....Actual	ft-#	=	597.3
Moment.....Allowable		=	2,455.6
Shear.....Actual	psi	=	8.8
Shear.....Allowable	psi	=	75.0
Wall Weight		=	75.0
Rebar Depth 'd'	in	=	4.25
LAP SPLICE IF ABOVE	in	=	18.72
LAP SPLICE IF BELOW	in	=	
HOOK EMBED INTO FTG	in	=	6.00

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	1.50 ft
Heel Width	=	0.91
Total Footing Width	=	2.41
Footing Thickness	=	9.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	768	94 psf
Mu' : Upward	=	706	11 ft-#
Mu' : Downward	=	206	60 ft-#
Mu: Design	=	501	49 ft-#
Actual 1-Way Shear	=	6.68	2.94 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
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	=	394.8	1.58	625.2	Soil Over Heel	=	196.8	2.21	433.9
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	=	60.0	0.75	45.0
					Surcharge Over Toe	=			
Total		394.8	**O.T.M.**	625.2	Stem Weight(s)	=	337.5	1.75	590.6
	=		=		Earth @ Stem Transitions	=			
Resisting/Overturning Ratio		= **2.23**			Footing Weight	=	271.1	1.21	326.7
Vertical Loads used for Soil Pressure	=	865.4 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		865.4 lbs	**R.M.=**	1,396.3

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

DESIGNER NOTES:

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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	5.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning = 2.27 OK

Slab Resists All Sliding !

Total Bearing Load	=	1,308 lbs
...resultant ecc.	=	4.49 in
Soil Pressure @ Toe	=	762 psf OK
Soil Pressure @ Heel	=	110 psf OK
Allowable	=	1,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	914 psf
ACI Factored @ Heel	=	132 psf
Footing Shear @ Toe	=	8.4 psi OK
Footing Shear @ Heel	=	5.3 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force = 595.5 lbs

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

Top Stem

		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	6.00
Rebar Size	=	# 4
Rebar Spacing	=	18.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.475**
Total Force @ Section	lbs =	700.0
Moment....Actual	ft-# =	1,166.7
Moment.....Allowable	=	2,455.6
Shear.....Actual	psi =	13.7
Shear.....Allowable	psi =	75.0
Wall Weight	=	75.0
Rebar Depth 'd'	in =	4.25
LAP SPLICE IF ABOVE	in =	18.72
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.00

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	1.75 ft
Heel Width	=	1.25
Total Footing Width	=	3.00
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	914	132 psf
Mu' : Upward	=	1,167	55 ft-#
Mu' : Downward	=	303	245 ft-#
Mu: Design	=	864	189 ft-#
Actual 1-Way Shear	=	8.41	5.34 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
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	=	595.5	1.94	1,157.9	Soil Over Heel	=	450.0	2.63	1,181.3
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	=	70.0	0.88	61.3
					Surcharge Over Toe	=			
Total		595.5	**O.T.M.**	1,157.9	Stem Weight(s)	=	412.5	2.00	825.0
	=		=		Earth @ Stem Transitions	=			
Resisting/Overturning Ratio		=	**2.27**		Footing Weight	=	375.0	1.50	562.5
Vertical Loads used for Soil Pressure	=	1,307.5 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		1,307.5 lbs	**R.M.=**	2,630.0

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

DESIGNER NOTES:

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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.03	OK
Slab Resists All Sliding !			
Total Bearing Load	=	1,555 lbs	
...resultant ecc.	=	6.25 in	
Soil Pressure @ Toe	=	841 psf	OK
Soil Pressure @ Heel	=	48 psf	OK
Allowable	=	1,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,009 psf	
ACI Factored @ Heel	=	57 psf	
Footing Shear @ Toe	=	12.3 psi	OK
Footing Shear @ Heel	=	7.1 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	817.2 lbs

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

Top Stem

		Stem OK
Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	6.00
Rebar Size	=	# 4
Rebar Spacing	=	16.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.733**
Total Force @ Section	lbs =	1,008.0
Moment....Actual	ft-# =	2,016.0
Moment.....Allowable	=	2,749.3
Shear.....Actual	psi =	19.8
Shear.....Allowable	psi =	75.0
Wall Weight	=	75.0
Rebar Depth 'd'	in =	4.25
LAP SPLICE IF ABOVE	in =	18.72
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.09

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 6'-0" Wall with Slab 6" Wall
Job # :
Descr: 6'-0" wall with Slab 6" wall
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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	2.25 ft
Heel Width	=	1.25
Total Footing Width	=	3.50
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,009	57 psf
Mu' : Upward	=	2,038	35 ft-#
Mu' : Downward	=	501	285 ft-#
Mu: Design	=	1,536	250 ft-#
Actual 1-Way Shear	=	12.32	7.12 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
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-#)
Item									
Heel Active Pressure	=	817.2	2.28	1,861.3	Soil Over Heel	=	540.0	3.13	1,687.5
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	=	90.0	1.13	101.3
					Surcharge Over Toe	=			
Total		817.2	O.T.M.	1,861.3	Stem Weight(s)	=	487.5	2.50	1,218.8
	=		=		Earth @ Stem Transitions	=			
Resisting/Overturning Ratio		=	2.03		Footing Weight	=	437.5	1.75	765.6
Vertical Loads used for Soil Pressure	=	1,555.0 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		1,555.0 lbs	R.M.=	3,773.1

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 4'-0" Wall with Slab 8" Wall
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Dsgnr: ICT
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	4.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.35 OK
Slab Resists All Sliding !		
Total Bearing Load	=	961 lbs
...resultant ecc.	=	3.42 in
Soil Pressure @ Toe	=	715 psf OK
Soil Pressure @ Heel	=	110 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	858 psf
ACI Factored @ Heel	=	132 psf
Footing Shear @ Toe	=	6.4 psi OK
Footing Shear @ Heel	=	2.7 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	394.8 lbs

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

Top Stem

		Stem OK
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	=	Edge
Design Data		
fb/FB + fa/Fa	=	**0.163**
Total Force @ Section	lbs =	448.0
Moment....Actual	ft-# =	597.3
Moment.....Allowable	=	3,655.6
Shear.....Actual	psi =	6.0
Shear.....Allowable	psi =	75.0
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.25
LAP SPLICE IF ABOVE	in =	18.72
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.00

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

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Title : 4'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	1.25 ft
Heel Width	=	1.08
Total Footing Width	=	2.33
Footing Thickness	=	9.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	858	132 psf
Mu' : Upward	=	569	15 ft-#
Mu' : Downward	=	143	61 ft-#
Mu: Design	=	426	46 ft-#
Actual 1-Way Shear	=	6.42	2.73 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
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	=	394.8	1.58	625.2	Soil Over Heel	=	198.4	2.12	421.3
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	=	50.0	0.63	31.3
					Surcharge Over Toe	=			
Total		394.8	**O.T.M.**	625.2	Stem Weight(s)	=	450.0	1.58	712.5
	=		=		Earth @ Stem Transitions	=			
Resisting/Overturning Ratio		= **2.35**			Footing Weight	=	262.1	1.17	305.4
Vertical Loads used for Soil Pressure	=	960.5 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		960.5 lbs	**R.M.=**	1,470.4

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
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206.789.6038

Title : 5'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	5.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.04	OK
Slab Resists All Sliding !			
Total Bearing Load	=	1,222 lbs	
...resultant ecc.	=	5.19 in	
Soil Pressure @ Toe	=	828 psf	OK
Soil Pressure @ Heel	=	36 psf	OK
Allowable	=	1,500 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	993 psf	
ACI Factored @ Heel	=	43 psf	
Footing Shear @ Toe	=	8.9 psi	OK
Footing Shear @ Heel	=	3.5 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	595.5 lbs

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

Top Stem

		Stem OK
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	=	Edge
Design Data		
fb/FB + fa/Fa	=	0.319
Total Force @ Section	lbs =	700.0
Moment....Actual	ft-# =	1,166.7
Moment.....Allowable	=	3,655.6
Shear.....Actual	psi =	9.3
Shear.....Allowable	psi =	75.0
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.25
LAP SPLICE IF ABOVE	in =	18.72
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.00

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
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206.789.6038

Title : 5'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	1.75 ft
Heel Width	=	1.08
Total Footing Width	=	2.83
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	993	43 psf
Mu' : Upward	=	1,221	8 ft-#
Mu' : Downward	=	303	74 ft-#
Mu: Design	=	918	67 ft-#
Actual 1-Way Shear	=	8.93	3.48 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	None Spec'd	
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	=	595.5	1.94	1,157.9	Soil Over Heel	=	248.0	2.62	650.6
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	=	70.0	0.88	61.3
					Surcharge Over Toe	=			
Total		595.5	**O.T.M.**	1,157.9	Stem Weight(s)	=	550.0	2.08	1,145.8
	=		=		Earth @ Stem Transitions	=			
Resisting/Overturning Ratio		= **2.04**			Footing Weight	=	353.8	1.42	500.6
Vertical Loads used for Soil Pressure	=	1,221.8 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		1,221.8 lbs	**R.M.=**	2,358.2

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 6'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	6.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning = 2.12 OK

Slab Resists All Sliding !

Total Bearing Load	=	1,691 lbs
...resultant ecc.	=	5.64 in
Soil Pressure @ Toe	=	907 psf OK
Soil Pressure @ Heel	=	85 psf OK
Allowable	=	1,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,088 psf
ACI Factored @ Heel	=	103 psf
Footing Shear @ Toe	=	12.4 psi OK
Footing Shear @ Heel	=	6.6 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	817.2 lbs

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

Top Stem

Stem OK

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	=	Edge

Design Data

fb/FB + fa/Fa	=	0.551
Total Force @ Section	lbs =	1,008.0
Moment....Actual	ft-# =	2,016.0
Moment.....Allowable	=	3,655.6
Shear.....Actual	psi =	13.4
Shear.....Allowable	psi =	75.0
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.25
LAP SPLICE IF ABOVE	in =	18.72
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.00

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	2.00 ft
Heel Width	=	1.41
Total Footing Width	=	3.41
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,088	103 psf
Mu' : Upward	=	1,791	48 ft-#
Mu' : Downward	=	396	280 ft-#
Mu: Design	=	1,395	232 ft-#
Actual 1-Way Shear	=	12.40	6.64 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = None Spec'd
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	=	817.2	2.28	1,861.3	Soil Over Heel	= 535.2	3.04	1,626.1
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	= 80.0	1.00	80.0
					Surcharge Over Toe	=		
Total		817.2	O.T.M.	1,861.3	Stem Weight(s)	= 650.0	2.33	1,516.7
	=		=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		= **2.12**			Footing Weight	= 426.3	1.71	726.8
Vertical Loads used for Soil Pressure	=	1,691.5 lbs			Key Weight	=		
					Vert. Component	=		
					Total =	1,691.5 lbs	**R.M.**=	3,949.5

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 7'-0" Wall with Slab 8" Wall
Job # :
Dsgnr: ICT
Descr: 7'-0" wall with Slab 8" wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	7.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning = 2.08 OK
Slab Resists All Sliding !

Total Bearing Load	=	2,163 lbs
...resultant ecc.	=	6.60 in
Soil Pressure @ Toe	=	1,020 psf OK
Soil Pressure @ Heel	=	86 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,225 psf
ACI Factored @ Heel	=	103 psf
Footing Shear @ Toe	=	16.8 psi OK
Footing Shear @ Heel	=	10.1 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	1,073.8 lbs

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

Top Stem

Stem OK

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	11.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	**0.544**
Total Force @ Section	lbs =	1,372.0
Moment....Actual	ft-# =	3,201.3
Moment.....Allowable	=	5,883.6
Shear.....Actual	psi =	18.3
Shear.....Allowable	psi =	75.0
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.25
LAP SPLICE IF ABOVE	in =	18.72
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.00

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 7'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	2.25 ft
Heel Width	=	1.66
Total Footing Width	=	3.91
Footing Thickness	=	10.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,225	103 psf
Mu' : Upward	=	2,555	98 ft-#
Mu' : Downward	=	501	571 ft-#
Mu: Design	=	2,054	474 ft-#
Actual 1-Way Shear	=	16.77	10.07 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 4 @ 11.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 11.25 in, #5@ 17.25 in, #6@ 24.50 in, #7@ 33.50 in, #8@ 44.00 in, #9@ 4
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	=	1,073.8	2.61	2,803.9	Soil Over Heel	= 834.4	3.41	2,848.1
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	= 90.0	1.13	101.3
					Surcharge Over Toe	=		
Total		1,073.8	O.T.M.	2,803.9	Stem Weight(s)	= 750.0	2.58	1,937.5
	=		=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		= 2.08			Footing Weight	= 488.8	1.96	955.5
Vertical Loads used for Soil Pressure	=	2,163.2 lbs			Key Weight	=		
					Vert. Component	=		
					Total =	2,163.2 lbs	R.M.=	5,842.3

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 8'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	8.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning = 2.03 OK

Slab Resists All Sliding !

Total Bearing Load	=	2,623 lbs
...resultant ecc.	=	8.01 in
Soil Pressure @ Toe	=	1,047 psf OK
Soil Pressure @ Heel	=	79 psf OK
Allowable	=	1,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,256 psf
ACI Factored @ Heel	=	95 psf
Footing Shear @ Toe	=	16.3 psi OK
Footing Shear @ Heel	=	9.7 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	1,417.5 lbs

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

Top Stem

Stem OK

Design Height Above Ftg	ft =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	8.00
Rebar Size	=	# 4
Rebar Spacing	=	9.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	**0.671**
Total Force @ Section	lbs =	1,792.0
Moment....Actual	ft-# =	4,778.7
Moment.....Allowable	=	7,122.4
Shear.....Actual	psi =	23.9
Shear.....Allowable	psi =	75.0
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.25
LAP SPLICE IF ABOVE	in =	18.72
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	6.00

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
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Title : 8'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	3.00 ft
Heel Width	=	1.66
Total Footing Width	=	4.66
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,256	95 psf
Mu' : Upward	=	4,530	87 ft-#
Mu' : Downward	=	1,026	657 ft-#
Mu: Design	=	3,504	570 ft-#
Actual 1-Way Shear	=	16.32	9.70 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 4 @ 9.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 9.50 in, #5@ 14.50 in, #6@ 20.50 in, #7@ 28.00 in, #8@ 36.75 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	=	1,417.5	3.00	4,252.5	Soil Over Heel	= 953.6	4.16	3,970.2
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	= 120.0	1.50	180.0
					Surcharge Over Toe	=		
Total		1,417.5	**O.T.M.**	4,252.5	Stem Weight(s)	= 850.0	3.33	2,833.3
	=		=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		= **2.03**			Footing Weight	= 699.0	2.33	1,628.7
Vertical Loads used for Soil Pressure		= 2,622.6 lbs			Key Weight	=		
					Vert. Component	=		
					Total =	2,622.6 lbs	**R.M.=**	8,612.2

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 9'-0" Wall with Slab 8" Wall
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Descr: 9'-0" wall with Slab 8" wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	9.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning = 1.87 OK

Slab Resists All Sliding !

Total Bearing Load	=	2,937 lbs
...resultant ecc.	=	10.31 in
Soil Pressure @ Toe	=	1,138 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	1,500 psf

Soil Pressure Less Than Allowable

ACI Factored @ Toe	=	1,365 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	20.6 psi OK
Footing Shear @ Heel	=	11.7 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	1,750.0 lbs

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

Top Stem

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

Design Data

fb/FB + fa/Fa	=	**0.838**
Total Force @ Section	lbs =	2,268.0
Moment....Actual	ft-# =	6,804.0
Moment.....Allowable	=	8,121.3
Shear.....Actual	psi =	30.5
Shear.....Allowable	psi =	75.0
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.19
LAP SPLICE IF ABOVE	in =	23.40
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	8.70

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	3.50 ft
Heel Width	=	1.66
Total Footing Width	=	5.16
Footing Thickness	=	12.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,365	0 psf
Mu' : Upward	=	6,473	43 ft-#
Mu' : Downward	=	1,397	728 ft-#
Mu: Design	=	5,077	685 ft-#
Actual 1-Way Shear	=	20.59	11.71 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 5 @ 12.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 9.50 in, #5@ 14.50 in, #6@ 20.50 in, #7@ 28.00 in, #8@ 36.75 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	=	1,750.0	3.33	5,833.3	Soil Over Heel	=	1,072.8	4.66	5,002.8
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	=	140.0	1.75	245.0
					Surcharge Over Toe	=			
Total		1,750.0	O.T.M.	5,833.3	Stem Weight(s)	=	950.0	3.83	3,641.7
	=		=		Earth @ Stem Transitions	=			
Resisting/Overturning Ratio		= 1.87			Footing Weight	=	774.0	2.58	1,996.9
Vertical Loads used for Soil Pressure	=	2,936.8 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		2,936.8 lbs	R.M.=	10,886.4

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 10'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	10.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.94 OK
Slab Resists All Sliding !		
Total Bearing Load	=	4,043 lbs
...resultant ecc.	=	10.89 in
Soil Pressure @ Toe	=	1,402 psf OK
Soil Pressure @ Heel	=	27 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,682 psf
ACI Factored @ Heel	=	32 psf
Footing Shear @ Toe	=	18.8 psi OK
Footing Shear @ Heel	=	14.1 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	2,214.8 lbs

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

Top Stem

		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	=	0.970
Total Force @ Section	lbs =	2,800.0
Moment....Actual	ft-# =	9,333.3
Moment.....Allowable	=	9,623.1
Shear.....Actual	psi =	37.7
Shear.....Allowable	psi =	75.0
Wall Weight	=	100.0
Rebar Depth 'd'	in =	6.19
LAP SPLICE IF ABOVE	in =	23.40
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	10.16

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
Seattle, WA 98104
206.789.6038

Title : 10'-0" Wall with Slab 8" Wall
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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	3.50 ft
Heel Width	=	2.16
Total Footing Width	=	5.66
Footing Thickness	=	15.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,682	32 psf
Mu' : Upward	=	8,220	198 ft-#
Mu' : Downward	=	1,672	1,857 ft-#
Mu: Design	=	6,548	1,659 ft-#
Actual 1-Way Shear	=	18.84	14.09 psi
Allow 1-Way Shear	=	75.00	75.00 psi

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

Other Acceptable Sizes & Spacings

Toe: #4@ 7.50 in, #5@ 11.50 in, #6@ 16.50 in, #7@ 22.25 in, #8@ 29.50 in, #9@ 37
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	=	2,214.8	3.75	8,305.7	Soil Over Heel	= 1,792.0	4.91	8,804.7
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	= 140.0	1.75	245.0
					Surcharge Over Toe	=		
Total		2,214.8	**O.T.M.**	8,305.7	Stem Weight(s)	= 1,050.0	3.83	4,025.0
	=		=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		= **1.94**			Footing Weight	= 1,061.3	2.83	3,003.3
Vertical Loads used for Soil Pressure	=	4,043.3 lbs			Key Weight	=		
					Vert. Component	=		
					Total	= 4,043.3 lbs	**R.M.=**	16,078.0

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
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Title : 11'-0" Wall with Slab 10" Wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	11.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	2.00 OK
Slab Resists All Sliding !		
Total Bearing Load	=	4,760 lbs
...resultant ecc.	=	10.93 in
Soil Pressure @ Toe	=	1,401 psf OK
Soil Pressure @ Heel	=	103 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,681 psf
ACI Factored @ Heel	=	123 psf
Footing Shear @ Toe	=	22.4 psi OK
Footing Shear @ Heel	=	15.0 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	2,626.1 lbs

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

Top Stem

Design Height Above Ftg	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	10.00
Rebar Size	=	# 6
Rebar Spacing	=	12.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.883
Total Force @ Section	lbs =	3,388.0
Moment....Actual	ft-# =	12,422.7
Moment.....Allowable	=	14,069.5
Shear.....Actual	psi =	37.0
Shear.....Allowable	psi =	75.0
Wall Weight	=	125.0
Rebar Depth 'd'	in =	7.63
LAP SPLICE IF ABOVE	in =	28.08
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	11.02

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	4.00 ft
Heel Width	=	2.33
Total Footing Width	=	6.33
Footing Thickness	=	15.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f'c = 2,500 psi	Fy =	60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top 2.00	@ Btm.=	3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,681	123 psf
Mu' : Upward	=	10,826	276 ft-#
Mu' : Downward	=	2,184	2,026 ft-#
Mu: Design	=	8,642	1,751 ft-#
Actual 1-Way Shear	=	22.44	14.98 psi
Allow 1-Way Shear	=	75.00	75.00 psi
Toe Reinforcing	=	# 6 @ 12.00 in	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	None Spec'd	

Other Acceptable Sizes & Spacings

Toe: #4@ 7.50 in, #5@ 11.50 in, #6@ 16.50 in, #7@ 22.25 in, #8@ 29.50 in, #9@ 37
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	=	2,626.1	4.08	10,723.2	Soil Over Heel	= 1,975.6	5.58	11,027.1
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	= 160.0	2.00	320.0
					Surcharge Over Toe	=		
Total		2,626.1	O.T.M.	10,723.2	Stem Weight(s)	= 1,437.5	4.42	6,349.0
	=		=		Earth @ Stem Transitions	=		
Resisting/Overturning Ratio		= 2.00			Footing Weight	= 1,186.9	3.17	3,756.5
Vertical Loads used for Soil Pressure	=	4,760.0 lbs			Key Weight	=		
					Vert. Component	=		
					Total =	4,760.0 lbs	R.M.=	21,452.6

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

DESIGNER NOTES:

Malsam Tsang Engineering Corporation
122 S. Jackson St., Suite 210
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Title : 12'-0" Wall with Slab 10" Wall
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Cantilevered Retaining Wall Design

Criteria

Retained Height	=	12.00 ft
Wall height above soil	=	0.50 ft
Slope Behind Wall	=	0.00 : 1
Height of Soil over Toe	=	4.00 in
Water height over heel	=	0.0 ft

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
	=	
Passive Pressure	=	150.0 psf/ft
Soil Density, Heel	=	120.00 pcf
Soil Density, Toe	=	120.00 pcf
Footing||Soil Friction	=	0.350
Soil height to ignore for passive pressure	=	0.00 in

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
NOT Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
NOT 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		
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

Design Summary

Wall Stability Ratios

Overturning	=	1.88 OK
Slab Resists All Sliding !		
Total Bearing Load	=	5,178 lbs
...resultant ecc.	=	13.18 in
Soil Pressure @ Toe	=	1,489 psf OK
Soil Pressure @ Heel	=	27 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	1,787 psf
ACI Factored @ Heel	=	32 psf
Footing Shear @ Toe	=	26.8 psi OK
Footing Shear @ Heel	=	17.2 psi OK
Allowable	=	75.0 psi

Sliding Calcs Slab Resists All Sliding !

Lateral Sliding Force	=	3,072.3 lbs

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

Top Stem

Design Height Above Ftg	ft =	Stem OK 0.00
Wall Material Above "Ht"	=	Concrete
Thickness	=	10.00
Rebar Size	=	# 6
Rebar Spacing	=	9.00
Rebar Placed at	=	Edge

Design Data

fb/FB + fa/Fa	=	0.881
Total Force @ Section	lbs =	4,032.0
Moment....Actual	ft-# =	16,128.0
Moment.....Allowable	=	18,302.4
Shear.....Actual	psi =	44.1
Shear.....Allowable	psi =	75.0
Wall Weight	=	125.0
Rebar Depth 'd'	in =	7.63
LAP SPLICE IF ABOVE	in =	28.08
LAP SPLICE IF BELOW	in =	
HOOK EMBED INTO FTG	in =	10.96

Hook embedment reduced by stress ratio

Masonry Data

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

Concrete Data

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

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Cantilevered Retaining Wall Design

Footing Dimensions & Strengths

Toe Width	=	4.50 ft
Heel Width	=	2.33
Total Footing Width	=	6.83
Footing Thickness	=	15.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 2.00 @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,787	32 psf
Mu' : Upward	=	14,194	180 ft-#
Mu' : Downward	=	2,764	2,187 ft-#
Mu: Design	=	11,430	2,008 ft-#
Actual 1-Way Shear	=	26.78	17.25 psi
Allow 1-Way Shear	=	75.00	75.00 psi

Toe Reinforcing = # 6 @ 9.00 in
Heel Reinforcing = None Spec'd
Key Reinforcing = None Spec'd

Other Acceptable Sizes & Spacings

Toe: #4@ 7.50 in, #5@ 11.50 in, #6@ 16.50 in, #7@ 22.25 in, #8@ 29.50 in, #9@ 37
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	=	3,072.3	4.42	13,569.5	Soil Over Heel	=	2,155.2	6.08	13,107.2
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	=	180.0	2.25	405.0
					Surcharge Over Toe	=			
Total		3,072.3	O.T.M.	13,569.5	Stem Weight(s)	=	1,562.5	4.92	7,682.3
	=		=		Earth @ Stem Transitions	=			
Resisting/Overturning Ratio		= 1.88			Footing Weight	=	1,280.6	3.42	4,373.3
Vertical Loads used for Soil Pressure		= 5,178.3 lbs			Key Weight	=			
					Vert. Component	=			
					Total =		5,178.3 lbs	R.M.=	25,567.8

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

DESIGNER NOTES: