OCD2016-00431

HGA.
Architecture | Engineering | Planning

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APPROVED PLAN
SEP 3 0 2016
BY
SAN MATEO COUNTY BUILDING
INSPECTION DIVISION

San Mateo County Department of Public Works and Health System Behavioral Health and Recovery Services

Serenity House

JOB COPY
TO REMAIN ON
SITE AT ALL TIMES

Structural Calculations

REGISTERED PROFESSIONAL ENGINEER
BRENT A. FORSLIN
S 3124
EXP. 3/31/2017
STRUCTURAL
STATE OF CALIFORNIA

REVISION
SEP 0 6 2016
San Mateo County
Building Inspection

Commission No: 3505-003-01
Serenity House – County of San Mateo
Date: August 26, 2016

Floor loads

Finish	1
Sheathing	2
Framing	4
MEP	2
Ceiling	4
Partitions	15
	28 psf → Say 30 psf

Live = 40 psf

Materials:

DFL No.1 & Better –(JOISTS)

$F_b = 1,200$ psi $E = 1\,800\,000$ psi

$F_v = 180$ psi $E_{min} = 660\,000$ psi

$C_m = 1.0$

$C_F = 1.3$ (2x6)

$C_D = 1.0$

$C_t = 1.0$

$C_L = 0.95$ $F_b^* = 1200 \times (1.3) \times (1.15) = 1794$ psi

$C_{fu} = 1.0$

$C_i = 1.0$

$C_r = 1.15$ (Joist)

$F_b' = 1794 \times 0.95 = 1704$ psi

$F_v' = 180 \times (1.0)^4 = 180$ psi

Materials

DFL No.1 & Better – (HEADER)

$F_b = 1200$ $E = 1\,800\,000$ psi

$F_v = 180$ $E_{min} = 660\,000$ psi

$C_m = 1.0$

$C_F = 1.3$ (4x6 or 8)

$C_D = 1.0$

$C_t = 1.0$

$C_L = 1.0$ $F_b^* = 1200 \times 1.3 \approx$ 1560 psi

$C_{fu} = 1.0$

$C_r = 1.0$

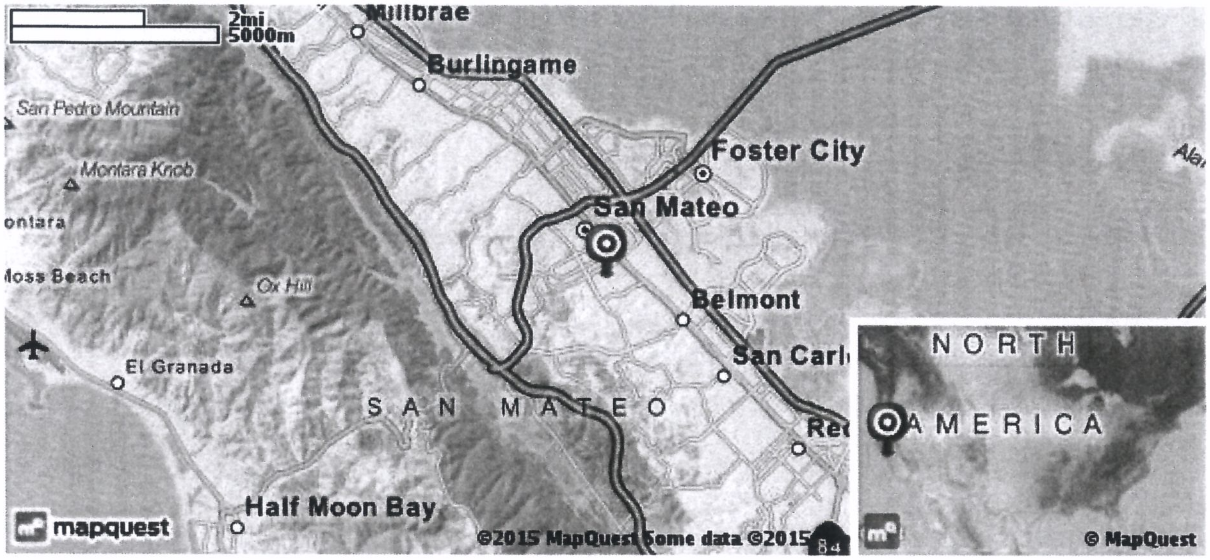
$F_b' =$ 1560 psi

$F_v' =$ 180 psi

USGS Design Maps Summary Report

User–Specified Input

Report Title	San Mateo Serenity House Mon November 9, 2015 15:45:23 UTC
Building Code Reference Document	ASCE 7-10 Standard (which utilizes USGS hazard data available in 2008)
Site Coordinates	37.531°N, 122.302°W
Site Soil Classification	Site Class D – "Stiff Soil"
Risk Category	I/II/III

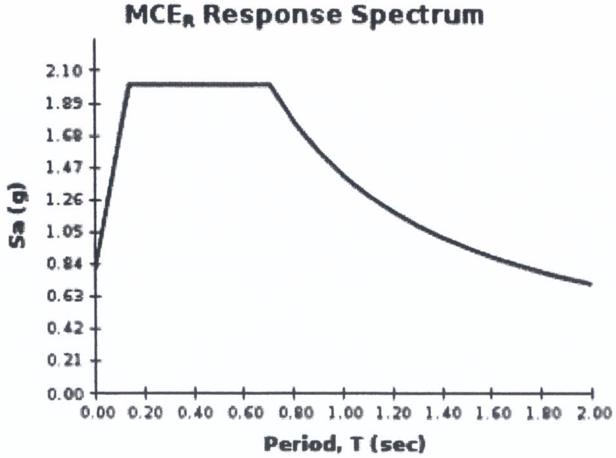


USGS–Provided Output

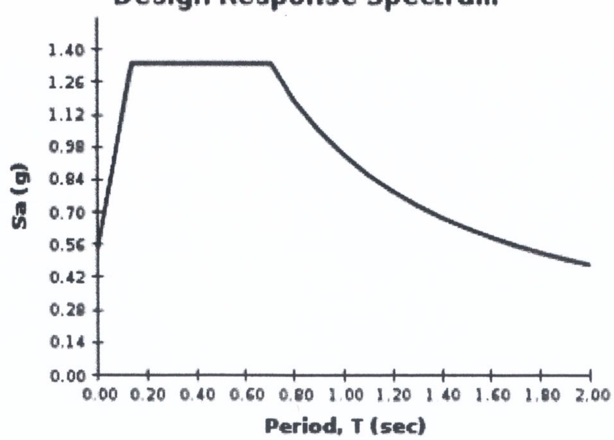
$S_S =$	2.012 g	$S_{MS} =$	2.012 g	$S_{DS} =$	1.341 g
$S_1 =$	0.948 g	$S_{M1} =$	1.421 g	$S_{D1} =$	0.948 g

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



For PGA_M, T_L, C_{RS}, and C_{R1} values, please view the detailed report.

Check new floor Spans   8'-0" Span

$W = (30 + 40) \times 1.33' = \underline{\underline{93 \text{ plf}}}$

$M = \dfrac{93 (8)^2}{8} = \underline{\underline{744 \text{ lb}\cdot\text{ft}}}$

$S_r = \dfrac{744 \times 12}{1704} = \underline{\underline{5.24 \text{ in}^3}}$

$A_r = \dfrac{[93 \times 8/2] \times 1.5}{180 \text{ psi}} = \underline{\underline{3.10 \text{ in}^2}}$

$\ell/480 = 0.20''$

$\ell/240 = 0.40$

$I_r = \dfrac{5(93)\, 8^4 (1728)}{384 (1\,800\,000)\, 0.40} = \underline{11.9 \text{ in}^4}$

$I_r = \dfrac{5(53)\, 8^4 (1728)}{384 (1\,800\,000)\, 0.20} = \underline{\underline{13.6 \text{ in}^4}}$ ← Controls

2x6

$S_x = 7.56 \text{ in}^3 > 5.24$

$I_x = 20.80 \text{ in}^4 > 13.6$

$A = 8.25 \text{ in}^2 > 3.10$

All ok - Use 2x6 at 16" o.c.

New Header - Near Lift

Trib = 4'-3" max , Span = 6'-0" max

$W = (30 + 40) \times 4.25' = \underline{298\ plf}$

$W_L = \underline{170\ plf}$

$M = (298)(6)^2/8 = \underline{1341\ ft \cdot lbs}$

$V = 298 \times 6/2 = \underline{894\ lbs}$

Try Sawn Lumber

$l/360 = 0.20"$ $l/240 = 0.30"$

$$I_r = \frac{5(170)\,6^4(1728)}{384(1800000)\,0.20} = \underline{13.8\ in^4}$$

$$I_r = \frac{5(298)\,6^4(1728)}{384(1800000)\,0.30} = \underline{16.1\ in^4} \leftarrow \text{Controls}$$

$$S_r = \frac{1341 \times 12}{1560} = \underline{10.3\ in^3}$$

$$A_r = \frac{894 \times 1.5}{180} = \underline{7.45\ in^2}$$

Use 4x6

$A = 19.25\ in^2$

$S_x = 17.65\ in^3$

$I_x = 48.53\ in^4$

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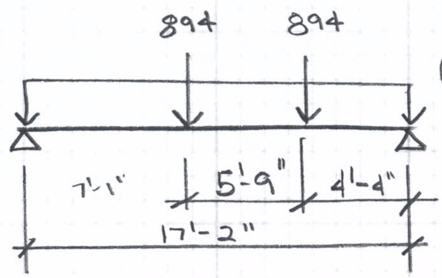
BEAM AT FIRST FLOOR W/LIFT SUPPORT POSTS



$W = (30 + 40) \times 1.0 = \underline{70 \text{ plf}}$

$\delta_{lim} = \ell/240 = \underline{0.86"}$ Live $\delta = \ell/480 = \underline{0.43"}$

From RISA

M = 7815 lb·ft R = 1638 lbs

V = 1638 lbs

EQ w

$$w = \frac{8(7815)}{(17.167)^2} = 212 \text{ plf}$$

$$\delta = \frac{270(212)(17.167)^4}{[2.0\times10^6]\,3.5\,(11.875)^3} + \frac{28.8(212)(17.167)^2}{[2.0\times10^6](3.5)(11.875)} = \underline{\underline{0.44"}}$$

Total Load ✓

- Use 3.5 x 11.875 LVL on one side

Check Bi-axial Case w/ Lift - 5.25 x 11.875 LVL

$M_z = 6721$ lb·ft $M_{az} = 29{,}900$ lb·ft

$M_y = 2819$ lb·ft $M_{ay} = \frac{3430 \times 54.55}{12} = \underline{\underline{15592 \text{ lb·ft}}}$

$$S_y = \frac{\frac{11.875 \times (5.25)^3}{12}}{(5.25/2)} = 54.55$$

$$\frac{6721}{29900} + \frac{2819}{15592} = \underline{\underline{0.41 \le 1.0}}$$

12' High Fence Post

Wind = 16 psf (ASD)

6' Trib

$W = 16\,psf \times 6' = 96\,plf$

$\delta_{lim} = 2\ell/120 = \ell/60 \qquad 144/60 = 2.4''$

$$I_r = \frac{(0.096)(12)^4\,1728}{8\,(29000)\,2.4''} = \underline{\underline{6.912\,in^4}}$$

$$M_u = 1.67(0.096)(12)^2/2 = 11.54\,k\cdot ft$$

$$Z_r = \frac{11.54 \times 12}{0.9\,(46)} = \underline{\underline{3.34\,in^3}}$$

HSS 5x2x1/4

$I_x = 8.08\,in^4$ ✓

$Z_x = 4.27\,in^3$ ✓

$S_x = 3.23\,in^3$ ✓

Base PL

$OTM\ M_u = 1.67(0.096 \times 12) \times 6' = \underline{\underline{11.54\,k.ft}}$

Try 6x 9½" Long   y = Conc. Bearing length.

$C = (2.2\,ksi)(6y) = 13.2y \qquad M_u = 11.54 \times 12 = 138.48\,k\cdot in$

Arm = $8.5'' - y/2$

Solve for y

$$6.6y^2 - 112.2y + 138.48 = 0$$

$y = 1.33''$

$C = 13.2(1.33) = 17.69\,k \qquad T = C$

bolt

$N_u = T/2 = 17.69/2 = \underline{8.84\,k/bolt}$

$$A_r = \frac{8.84}{0.75(45\,ksi)} = 0.264\,in^2 \quad \therefore \text{Use } 5/8$$

(A307)

$A_g = \underline{0.307\,in^2}$ ✓

Base PL Cont'd

treq. – tension

bending Arm = 3.5" – 2.5" = 1"

T = 17.69 k

$M_u = 17.69 \times 1'' / 6''$ wide PL = **2.94 k-in/in**

$t_r = \sqrt{\dfrac{4\,(2.94)}{0.9\,(36\,ksi)}} = 0.602''$

treq – Bearing

Arm = 2" – Y/2 = 2 – 1.33/2 = 1.34"

$M_u = 17.69 \times 1.34 / 6'' = 3.936$ k-in/in

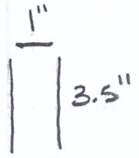
$t_r = \sqrt{\dfrac{4\,(3.936)}{0.9\,(36\,ksi)}} = 0.697''$

Use 5/8" PL

PL 5/8 x 6" x 0'-9½"
w/ 5/8" Φ A307 Anchor Bolts

Weld Tube to PL

$M_u = 11.54 \times 12 = 138.43$ k-in $V_u = 1.92$ k

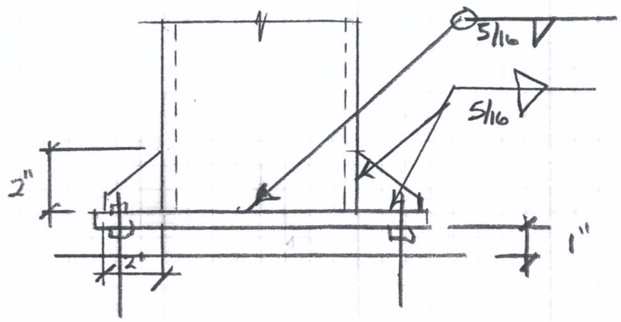


$\Sigma l_w = 2(1'') + 2(3.5'') = 9''$

$S_w = \dfrac{3.5^2}{3} + (1 \cdot 5) = 9.08\ in^2$

$r_u = \dfrac{1.92}{9''} + \dfrac{138.43}{9.08} = 15.4$ k/in   Very large

– Use 2x2 PL stiffeners w/ 5/16 fillets



Pier 14" x 18"

$A_r = 0.01(14 \times 18) = 2.52\ in^2$

Use #8 bars

$4(0.79) = 3.16\ in^2$

Bending

$A_s = 2(0.79) = 1.58 \qquad d = 12.5"$

$$\phi M_n = \frac{0.9\left[60(1.58)\left(12.5 - \frac{60(1.58)}{2(0.85)4(14)}\right)\right]}{12} = 81.8\ k.ft$$

$M_u = 11.54\ k.ft + 1.67(0.096 \times 12) \times 4.5' = 20.2\ k.ft \le \phi M_n$ — ok ✓

$$l_{dh} = \left[\frac{0.02(60\,000)}{1.0\sqrt{4000}}\right] 1.0" = 18.97"$$

$18.97 \times 0.7 = 13.3"$ ✓

Conc Pier Under fence Post

18" x 14"

$A_{s_{p}} = 18 \times 14 \times 0.01 = 2.52 \text{ in}^2$

4-#7

$A_s = 2.40$ – Say ok (A little light)

$\phi M_n =$

$d = 18" - [2" + 0.375 + 0.5"] = 15"$

$A_s = 0.60 \times 2 = \underline{1.20 \text{ in}^2}$

$$\phi M_n = \frac{0.9\left[60(1.20)\left(15" - \frac{60(1.20)}{2(0.85)4(14")}\right)\right]}{12} = \underline{76.9 \text{ k·ft}}$$

$M_u = 11.54 \text{ k·ft} + [1.67(0.096)12'] \times 4' = \underline{19.24 \text{ k·ft} \leq 76.9} \checkmark$ ok

↑ from Post Calc

$V_u = 1.67(0.096) \times 12 = \underline{1.92k}$

ϕV_n – ok by inspection ✓

ldh #7

$$l_{dh} = \left[\frac{0.02(1.0)60{,}000}{1.0\sqrt{4000}}\right]0.875" = 16.6"$$

$l_{dh} = 0.70 \times 16.6 = 11.62"$ Say 12" ✓ ok

↑ 2"+ cover

RETAINING WALL DESIGN

PROJECT-
TITLE-

H(K)=	0	TOP OF
P(K)=	0	WALL
M(K-FT)=	0	FORCES

STATIC CASE

INPUT VALUES		CALC VALUES		RESIST FORCES	P(KIP)	X(FT)	PX	SOIL PRESS	
GAM(pcf)=	100	EQ FL=	44.0					Mt(K-FT)=	19.115
SUR(psf)=	40			BACKFILL	4.14	4.29	17.77	E(FT)=	0.528
Ka=	0.44	M-OT=	4.32	STEM	0.68	1.00	0.68	L/6=	1.208
Kp=	1	F-SL=	1.55	FILL	0.07	0.33	0.02	3(L/2-E)=	0.000
μ=	0.35			FOOT	1.05	3.63	3.81	P-MAX=	**0.000**
H(ft)=	8	M-add=	0.00	SURCH	0.24	4.29	1.02	P-1=	**1.224**
H'(ft)=	2	F-add=	0.00					P-2=	**0.479**
T-STEM(in)	8				6.17	3.77	23.30		
T-BASE(in)	12	M-tot=	4.32					P-CODE=	TOE
W(ft)=	7.25	F-tot=	1.55	F-RES,U=	2.16	M-RES,G=	23.30		
B(ft)=	0.67			F-RES,P=	0.20	M-RES,P=	0.13		
*C(ft)=	5.92			SUM=	2.36	SUM=	23.43	F(NET)=	1.35
Fc(psi)=	4000								
Fy(ksi)=	60			**SF-SL=**	**1.52**	**SF-OT=**	**5.43**		

CONCRETE DESIGN

STEM

h-inc= 0.1 *h (<.1)
d'= 2.5

Include Passive ? N

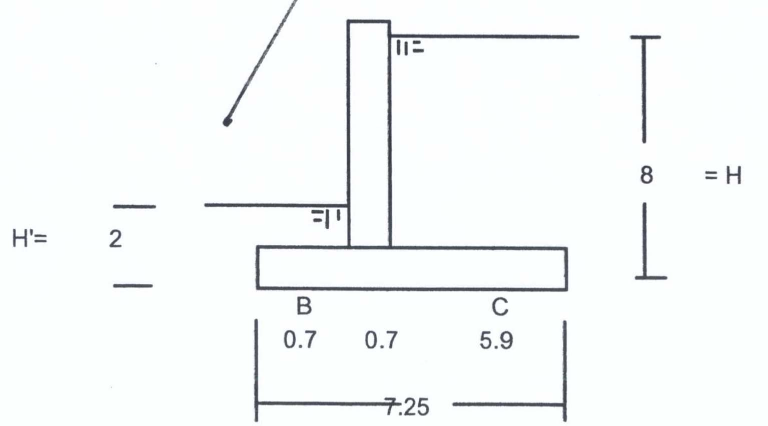
OMW 8/26/16

h	t	Mu	p	Phi-Vc	V/Vc	As
0.00	8	5.0	.00315	7.1	0.29	0.21
0.70	8	3.7	.00232	7.1	0.24	0.17
1.40	8	2.7	.00165	7.1	0.19	0.17
2.10	8	1.8	.00113	7.1	0.15	0.17
2.80	8	1.2	.00073	7.1	0.11	0.17
3.50	8	0.7	.00044	7.1	0.08	0.17
4.20	8	0.4	.00024	7.1	0.05	0.17
4.90	8	0.2	.00011	7.1	0.03	0.17
5.60	8	0.1	.00004	7.1	0.02	0.17
6.30	8	0.0	.00001	7.1	0.01	0.17
7.00	8	0.0	.00000	7.1	0.00	0.17

FTG

	HEEL	
	D-HEEL=	9.5
	LF-SOIL=	0.9
	VU-FILL=	7.49
	VU-SOIL=	4.37
	VU-NET=	3.11
OK	PHI*VC=	12.26
	MU-FILL=	23.31
	MU-SOIL=	11.63
	MU-NET=	11.68
	p=	.00245
	AS=	0.28
	AS(MIN)=	0.26
	TOE	
	D-TOE=	8.5
	VU=	-0.09
OK	PHI*VC=	10.97
	MU=	0.45
	p=	.00012
	AS=	0.01
	AS(MIN)=	0.26

LONGIT TEMP STEEL
AS= 1.88



HGA

S12 of 25

RETAINING WALL DESIGN

PROJECT-
TITLE-

H(K)=	0.264	TOP OF WALL FORCES (FENCE LOADS)
P(K)=	0.7	
M(K-FT)=	1.45	

INPUT VALUES		CALC VALUES	
GAM(pcf)=	100	EQ FL=	44.0
SUR(psf)=	0		
Ka=	0.44	M-OT=	3.75
Kp=	1	F-SL=	1.41
μ=	0.35		
H(ft)=	8	M-add=	3.56
H'(ft)=	2	F-add=	0.26
T-STEM(in)	8		
T-BASE(in)	12	M-tot=	7.32
W(ft)=	7.25	F-tot=	1.67
B(ft)=	0.67		
*C(ft)=	5.92		
Fc(psi)=	4000		
Fy(ksi)=	60		

RESIST FORCES

	P(KIP)	X(FT)	PX
BACKFILL	4.14	4.29	17.77
STEM	1.38	1.00	1.38
FILL	0.07	0.33	0.02
FOOT	1.05	3.63	3.81
SURCH	0.00	4.29	0.00
	6.64	3.46	22.98

F-RES,U=	2.32	M-RES,G=	22.98
F-RES,P=	0.20	M-RES,P=	0.13
SUM=	2.52	SUM=	23.12
SF-SL=	**1.51**	**SF-OT=**	**3.16**

SOIL PRESS

Mt(K-FT)=	15.801
E(FT)=	1.244
L/6=	1.208
3(L/2-E)=	7.143
P-MAX=	**1.858**
P-1=	**0.000**
P-2=	**0.000**
P-CODE=	TOE
F(NET)=	1.47

CONCRETE DESIGN

STEM

h-inc= 0.1 *h (<.1)
d'= 2.5

Include Passive ? N

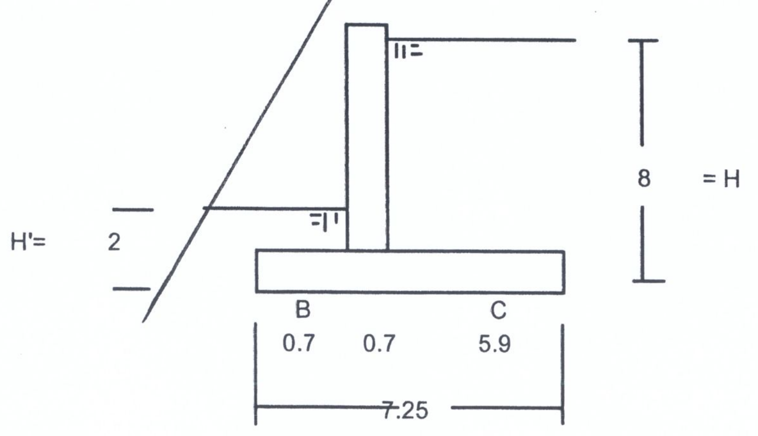
OMIT 8/26/16

h	t	Mu	p	Phi-Vc	V/Vc	As
0.00	8	9.9	.00641	7.1	0.32	0.42
0.70	8	8.4	.00541	7.1	0.27	0.36
1.40	8	7.2	.00457	7.1	0.23	0.30
2.10	8	6.1	.00389	7.1	0.19	0.26
2.80	8	5.3	.00333	7.1	0.16	0.22
3.50	8	4.6	.00287	7.1	0.13	0.19
4.20	8	4.0	.00250	7.1	0.10	0.17
4.90	8	3.5	.00220	7.1	0.09	0.17
5.60	8	3.1	.00195	7.1	0.07	0.17
6.30	8	2.8	.00173	7.1	0.07	0.17
7.00	8	2.5	.00153	7.1	0.06	0.17

FTG

	HEEL	
	D-HEEL=	9.5
	LF-SOIL=	0.9
	VU-FILL=	7.08
	VU-SOIL=	4.24
	VU-NET=	2.85
OK	PHI*VC=	12.26
	MU-FILL=	22.03
	MU-SOIL=	8.50
	MU-NET=	13.53
	p=	.00285
	AS=	0.32
	AS(MIN)=	0.26
	TOE	
	D-TOE=	8.5
	VU=	-0.13
OK	PHI*VC=	10.97
	MU=	0.68
	p=	.00017
	AS=	0.02
	AS(MIN)=	0.26

LONGIT TEMP STEEL
AS= 1.88



RETAINING WALL DESIGN

PROJECT-
TITLE-

H(K)=	0	TOP OF
P(K)=	0	WALL
M(K-FT)=	0	FORCES

STATIC CASE

INPUT VALUES		CALC VALUES	
GAM(pcf)=	100	EQ FL=	44.0
SUR(psf)=	40		
Ka=	0.44	M-OT=	2.39
Kp=	1	F-SL=	1.04
μ=	0.35		
H(ft)=	6.5	M-add=	0.00
H'(ft)=	2	F-add=	0.00
T-STEM(in)	8		
T-BASE(in)	12	M-tot=	2.39
W(ft)=	5.75	F-tot=	1.04
B(ft)=	0.67		
*C(ft)=	4.42		
Fc(psi)=	4000		
Fy(ksi)=	60		

RESIST FORCES

	P(KIP)	X(FT)	PX
BACKFILL	2.43	3.54	8.60
STEM	0.53	1.00	0.53
FILL	0.07	0.33	0.02
FOOT	0.83	2.88	2.40
SURCH	0.18	3.54	0.63
	4.04	3.02	12.18
F-RES,U=	1.41	M-RES,G=	12.18
F-RES,P=	0.20	M-RES,P=	0.13
SUM=	1.61	SUM=	12.31

SF-SL=	1.55	SF-OT=	5.16

SOIL PRESS

Mt(K-FT)=	9.927
E(FT)=	0.416
L/6=	0.958
3(L/2-E)=	0.000
P-MAX=	0.000
P-1=	1.007
P-2=	0.397
P-CODE=	TOE
F(NET)=	0.84

CONCRETE DESIGN

STEM

h-inc= 0.1 *h (<.1)
d'= 2.5

Include Passive ? N

OMIT 8/26/16

h	t	Mu	p	Phi-Vc	V/Vc	As
0.00	8	2.5	.00157	7.1	0.18	0.17
0.55	8	1.9	.00116	7.1	0.15	0.17
1.10	8	1.4	.00083	7.1	0.12	0.17
1.65	8	0.9	.00057	7.1	0.09	0.17
2.20	8	0.6	.00038	7.1	0.07	0.17
2.75	8	0.4	.00023	7.1	0.05	0.17
3.30	8	0.2	.00013	7.1	0.03	0.17
3.85	8	0.1	.00006	7.1	0.02	0.17
4.40	8	0.0	.00002	7.1	0.01	0.17
4.95	8	0.0	.00000	7.1	0.00	0.17
5.50	8	0.0	.00000	7.1	0.00	0.17

FTG

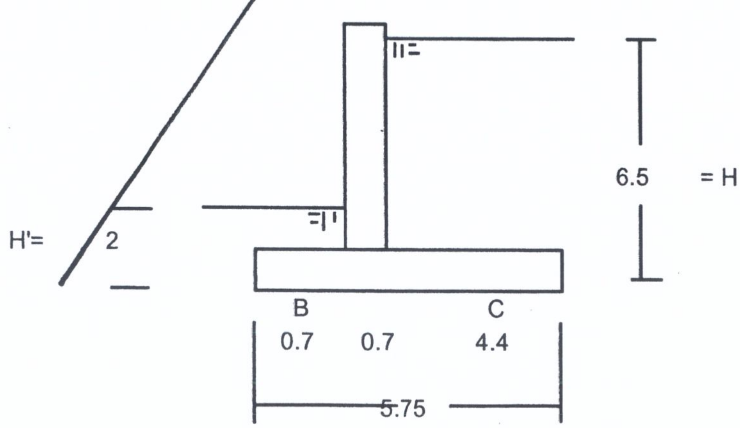
HEEL

	D-HEEL=	9.5
	LF-SOIL=	0.9
	VU-FILL=	4.67
	VU-SOIL=	2.67
	VU-NET=	2.00
OK	PHI*VC=	12.26
	MU-FILL=	10.99
	MU-SOIL=	5.40
	MU-NET=	5.59
	p=	.00116
	AS=	0.13
	AS(MIN)=	0.26

TOE

	D-TOE=	8.5
	VU=	-0.07
OK	PHI*VC=	10.97
	MU=	0.37
	p=	.00010
	AS=	0.01
	AS(MIN)=	0.26

LONGIT TEMP STEEL
AS= 1.49



RETAINING WALL DESIGN

PROJECT-
TITLE-

H(K)=	0.264	TOP OF WALL FORCES (FENCE LOADS.)
P(K)=	0.7	
M(K-FT)=	1.45	

INPUT VALUES		CALC VALUES	
GAM(pcf)=	100	EQ FL=	44.0
SUR(psf)=	0		
Ka=	0.44	M-OT=	2.01
Kp=	1	F-SL=	0.93
μ=	0.35		
H(ft)=	6.5	M-add=	3.17
H'(ft)=	2	F-add=	0.26
T-STEM(in)	8		
T-BASE(in)	12	M-tot=	5.18
W(ft)=	5.75	F-tot=	1.19
B(ft)=	0.67		
*C(ft)=	4.42		
Fc(psi)=	4000		
Fy(ksi)=	60		

RESIST FORCES

	P(KIP)	X(FT)	PX
BACKFILL	2.43	3.54	8.60
STEM	1.23	1.00	1.23
FILL	0.07	0.33	0.02
FOOT	0.83	2.88	2.40
SURCH	0.00	3.54	0.00
	4.56	2.69	12.25
F-RES,U=	1.60	M-RES,G=	12.25
F-RES,P=	0.20	M-RES,P=	0.13
SUM=	1.80	SUM=	12.39
SF-SL=	**1.51**	**SF-OT=**	**2.39**

SOIL PRESS

Mt(K-FT)=	7.208
E(FT)=	1.295
L/6=	0.958
3(L/2-E)=	4.741
P-MAX=	**1.924**
P-1=	**0.000**
P-2=	**0.000**
P-CODE=	TOE
F(NET)=	0.99

CONCRETE DESIGN

STEM

h-inc= 0.1 *h (<.1)
d'= 2.5

Include Passive ? N

OMIT 8/26/16

h	t	Mu	p	Phi-Vc	V/Vc	As
0.00	8	7.0	.00447	7.1	0.22	0.29
0.55	8	6.2	.00393	7.1	0.19	0.26
1.10	8	5.5	.00347	7.1	0.17	0.23
1.65	8	4.9	.00309	7.1	0.14	0.20
2.20	8	4.4	.00276	7.1	0.12	0.18
2.75	8	4.0	.00248	7.1	0.10	0.17
3.30	8	3.6	.00224	7.1	0.09	0.17
3.85	8	3.3	.00203	7.1	0.08	0.17
4.40	8	3.0	.00185	7.1	0.07	0.17
4.95	8	2.7	.00169	7.1	0.06	0.17
5.50	8	2.5	.00153	7.1	0.06	0.17

FTG

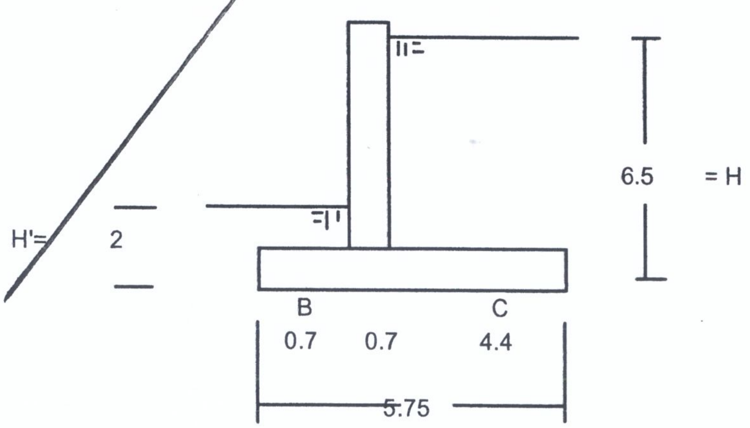
HEEL

	D-HEEL=	9.5
	LF-SOIL=	0.9
	VU-FILL=	4.37
	VU-SOIL=	2.39
	VU-NET=	1.98
OK	PHI*VC=	12.26
	MU-FILL=	10.26
	MU-SOIL=	2.88
	MU-NET=	7.39
	p=	.00154
	AS=	0.18
	AS(MIN)=	0.26

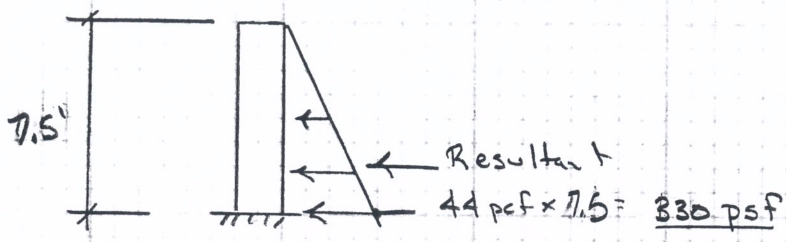
TOE

	D-TOE=	8.5
	VU=	-0.14
OK	PHI*VC=	10.97
	MU=	0.69
	p=	.00018
	AS=	0.02
	AS(MIN)=	0.26

LONGIT TEMP STEEL
AS= 1.49



Ret-Wall Stem



Resultant = $\frac{1}{2}$ (330) 7.5 = 1238 lbs

Arm = 7.5/3 = 2.5'

Surcharge = 40 psf

$K_a = 0.35$

W_s = 40 × 0.35 = 14 psf

OMIT 8/26/16

M_U = 1.6 (1.24k 2.5 + 0.014(7.5)^2/2) = 5.60 k.ft/ft

V_U = 1.6 (1.24 + 7.5 (0.014)) = 2.15 k/ft

8" Stem

$A_{s_{minv}}$ = 0.0015 (8×12) = 0.144 in^2

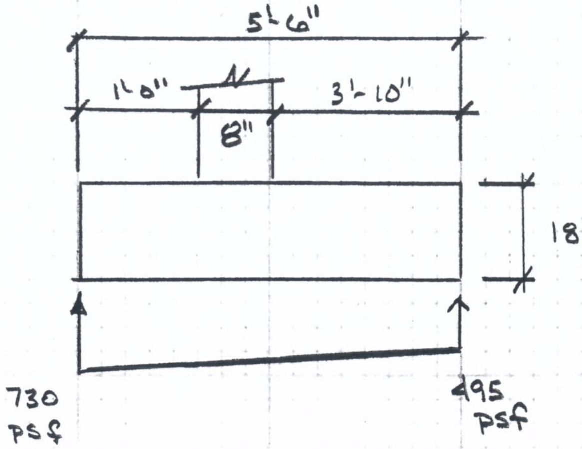
$A_{s_{minh}}$ = 0.0020 (8×12) = 0.192 in^2 ← #4 @ 12" o.c.

#5 @ 10" o.c. A_s = 0.372 d = 4"

$$\phi M_n = \frac{0.9 \left[60 (0.372) \left(4" - \frac{60 (0.372)}{2 (0.85) 4 (12")} \right) \right]}{12} = 6.24 \text{ k.ft/ft} \checkmark$$

– Use #5 @ 10" o.c.

$$\phi V_n = \frac{0.75 (2) \sqrt{4000} (4)(12)}{1000} = 4.55 \text{ k/ft} \geq 2.15 \text{ k/ft}$$



$A_{s\,min} = 0.0018 (18 \times 12) = 0.39 \text{ in}^2/\text{ft}$

$d = 18" - (3 + 0.5) = 14.5"$ Say 14"

$Mu_{max} = \frac{1.6 (0.730) 3.833^2}{2} = 8.58 \text{ k·ft/ft}$

$Vu_{max} = 1.6 (0.730) \times 3.83' = 4.47 \text{ k/ft}$

8/26/16

#4 @ 12" T&B $A_s = 0.20$ Total $= 2(0.20) = 0.40 > 0.39$

$\phi M_n = \frac{0.9 \left[60 (0.20) \left(14" - \frac{60 (0.20)}{2(0.85) 4 (12)} \right) \right]}{12} = 12.5 \text{ k/ft / ft}$ ✓ ok

$\phi V_n = \frac{0.75 (2) \sqrt{4000} (12)(14)}{1000} = 15.94 \text{ k/ft}$ ✓ ok

Use #4 AT 12" T&B Transv. BARS
– Use 5 – #5 T&B LONGIT BARS

Lift Checks - Savaria V1504

Operational Loading:

LOAD R2 = 472 lbs in/out of plane of OF Studs

- Load is D+L ∴ Use $C_D = 1.0$ for this load.

Seismic

$a_p = 1.0$

$R_p = 2.5$

$S_{DS} = 1.341$

$z/h = 1/2$

$I = 1.0$

$F_{p\,min} = 0.5\,W_p$ ← CONTROLS

OR

$F_{p\,min} = 0.3(1.341)\,1.0\,W_p$

$= 0.40\,W_p$

$$F_p = \frac{0.4\,(1.0)(1.341)(1.0)}{2.5}\left(1+2\left(\tfrac{1}{2}\right)\right)k/p = 0.43\,W_p$$

$F_{p\,min} = 0.5\,W_p$ ← Controls

W_p

Weight of Car = 500

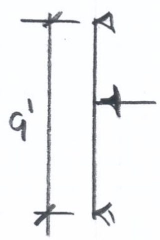
Cap. = 750 lbs

$W_p = 500 + 0.4\,(750) = 800$ lbs

$F_{P\,ASD} = 0.5\,(800) \times 0.7 = 280$ lbs

Total, Divide to two Brackets.

Check Wall Studs



$472 + \frac{280}{2} = \underline{\underline{612 \text{ lbs}}}$

DFL No1 + Better

Since Seismic load $C_D = 1.6$

$F_b' = 1704 \text{ psi} \times 1.6 = 2726 \text{ psi}$

$\text{Reaction} = 612/2 = \underline{306 \text{ lbs}}$

$\delta_{lim} = 9 \times 12/240 = 0.45''$

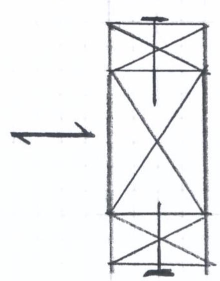
$I_r = \frac{(612)(9 \times 12)^3}{48(1\,800\,000)\,0.45''} = \underline{19.83 \text{ in}^4}$

$S_r = \frac{\frac{(612)(9)}{4} \times 12}{2726} = \underline{\underline{6.06 \text{ in}^3}}$

Use 4x6 + (2) 2x4 — Per SaVaria heavier recommendations

$\Sigma I = 2(5.36) + 19.65$
$= \underline{\underline{30.4 \text{ in}^4}}$

$\Sigma S = 2(3.06) + 11.23$
$= \underline{\underline{17.35 \text{ in}^3}}$



$I_x = 5.36$
$S_x = 3.06$

$I_y = 19.65 \text{ in}^4$
$S_y = 11.23$

$I_x = 5.36$
$S_x = 3.06$

Anchorage into 4x6

G = 0.50 DFL

Try 3/8" Φ LAGS w/ 3" total pen.

Table 11.2A (NDS)

W = 305 lbs/in

Widrawl pen = 3" − 0.21875" = 2.78"

Cap per Bolt = (305 × 2.78") × 1.6 (C_D Seismic) = **1357 lbs**

In-plane Shear − (Table 11K NDS)

$Z_{\parallel}$ = 280 lbs (@ 8D pen)

$Z_{\parallel}'$ = 280 × 1.6 = **448 lbs**

Case 1 − Full pull-out

R = 612 lbs

− 1 3/8"Φ LAG W' = 1357 lbs > 612 ✓

Case 2 − Operational pull-out only

W' = (305 × 2.78") × 1.0 (C_D) = 848 lb > 472 ✓ ok

Case 3 − Operational pull-out, Seismic in-plane

$R = \sqrt{(472)^2 + (140)^2}$ = **492 lbs** α = 73.5°

α = 90 − ARCTAN (140/472)

α = 73.5°

$$Z_{\alpha}' = \frac{(1357)(448)}{1357 \cos^2 73.5 + 448 \sin^2 73.5} = \mathbf{1166\ lbs}$$

Use Min 1 − 3/8"Φ × 4" LAG AT EACH BRACKET MOUNT LOCATION

Site Construction Details

The V1504 needs a wall that supports a minimum of 472 lb (2100 N) of pull out force at any bracket. The floor must be capable of supporting a load of 3200 lb (14.2 kN). See Figure 1. A wall with a combination of two columns of three 2x4's, or a concrete or brick wall is required.

Figure 2 details a sample wooden support wall configuration

Figure 1: Wall/Floor Loading

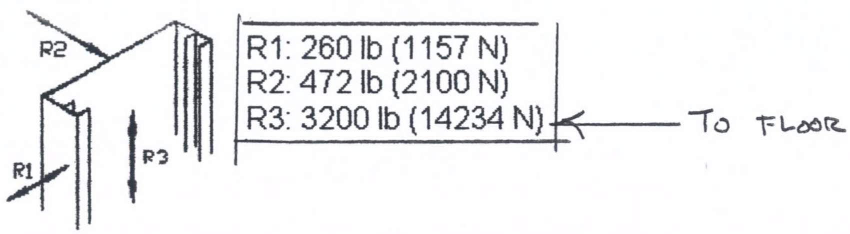
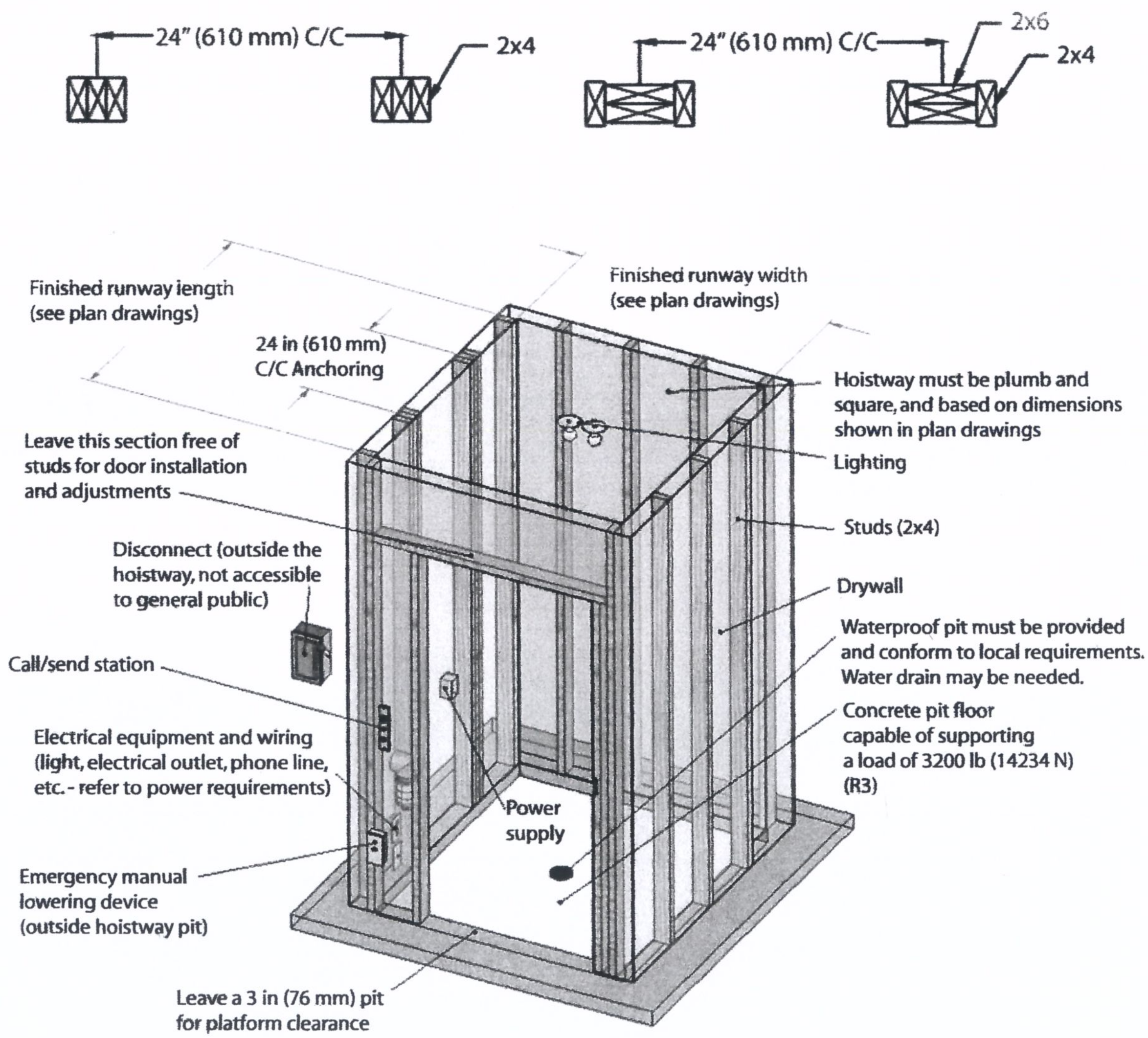


Figure 2: Sample Wooden Support Wall Configuration



HGA.
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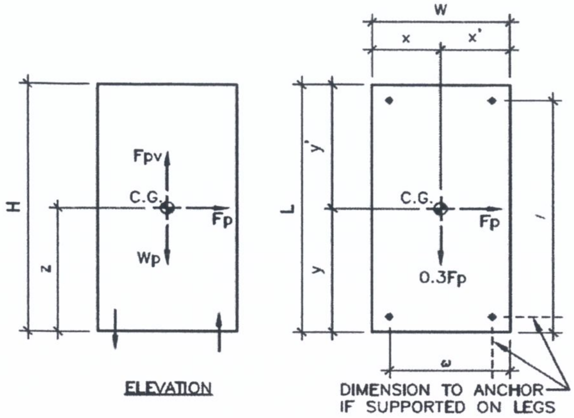
Project :	San Mateo Serenity House		
Subject:	MAU		
Comm No.:	3505-003-01	Page:	of
Name:	RWM	Date:	10/6/15

2013 CBC & ASCE 7-10 EQUIPMENT ANCHORAGE FORCES - Greenheck MAU



ELEVATION
PLAN VIEW

Height, H = 40.0 in
Height to center of gravity, z = 20.0 in
Width, W = 35.0 in
Overturning Dimension, ω = 35.0 in
# of anchors in tension, $\#_{T,\omega}$ = 2
x = 17.5 in
x' = 17.5 in
Length, L = 41.0 in
Overturning Dimension, ℓ = 41.0 in
# of anchors in tension, $\#_{T,\ell}$ = 2
y = 20.5 in
y' = 20.5 in
Weight, W_p = 300 lbs
# of anchors in shear, $\#_V$ = 4
Height of component with respect to grade, z = 15 ft
Average roof height, h = 15 ft

Seismic

Seismic design requirements for equipment are based on ASCE 7-10, Chapter 13.

COMPONENT AMPLIFICATION FACTOR
ASCE Section 13.5, 13.6 & ASCE Table 13.5-1, 13.6-1 — a_p = 2.5

COMPONENT RESPONSE MODIFICATION FACTOR
ASCE Section 13.5, 13.6 & ASCE Table 13.5-1, 13.6-1 — R_p = 6.0

DESIGN SPECTRAL RESPONSE ACCELERATION
CBC Section 1613A.3.4 & CBC Equation 16A-39 — S_{DS} = 1.341

COMPONENT IMPORTANCE FACTOR
ASCE Section 13.1.3 — I_p = 1.00

ATTACHMENT FACTOR IN CONCRETE OR MASONRY
ASCE Section 13.4.2.1 and ACI 318-10 sec D3.3.4.3 d — Ω factor = 1.0

SEISMIC DESIGN FORCE

ASCE Section 13.3.1 & ASCE Equation 13.3-1	$F_p = 0.4*a_p*S_{DS}*W_p/(R_p/I_p)(1+2z/h)$	F_p = 0.671 Wp
ASCE Section 13.3.1 & ASCE Equation 13.3-2	$F_{p,max} = 1.6*S_{DS}*I_p*W_p$	$F_{p,max}$ = 2.146 Wp
ASCE Section 13.3.1 & ASCE Equation 13.3-3	$F_{p,min} = 0.3*S_{DS}*I_p*W_p$	$F_{p,min}$ = 0.402 Wp

SEISMIC DESIGN FORCES (ASD)

ASCE Section 13.1.7 & 13.3.1	$F_{p,ASD} = 0.7(F_{p,govern})$	$F_{p,ASD}$ = 0.469 Wp
ASCE Section 13.1.7 & 13.3.1	$F_{pv,ASD} = 0.7(0.2*S_{DS}*W_p)$	$F_{pv,ASD}$ = 0.188 Wp

DESIGN FORCES

$F_{p,\Omega} = Fp_{,ASD} * W_p * \Omega$ factor = 141 lbs
OTM = z * $F_{p,\Omega}$ = 2816 lb-in
$F_{pv,ASD}$ = 56 lbs
DLRM = $(0.6W_p - F_{pv,ASD}) * x_{min}$ = 2164 lb-in

$$T = \frac{OTM - DLRM}{\omega * \#_{T,\omega}} + \frac{0.3 * OTM}{\ell * \#_{T,\ell}}$$

T = 20 lbs

$$V = \frac{F_{p,ASD,\Omega} * (2 * y_{max} / L)}{\#_V}$$

V = 35 lbs

(V is approximate when number of anchors exceeds 4)

Use (4) - 1/2"Ø Hilti Kwik Bolt TZ w/ 2" Effective Embedment (Thin Substrates Condition)
T_{ALL} = 660 lbs
V_{ALL} = 837 lbs
UNITY CHECK = 0.07 OK

USE 5/16" φ LAGS INTO 4x Blocking

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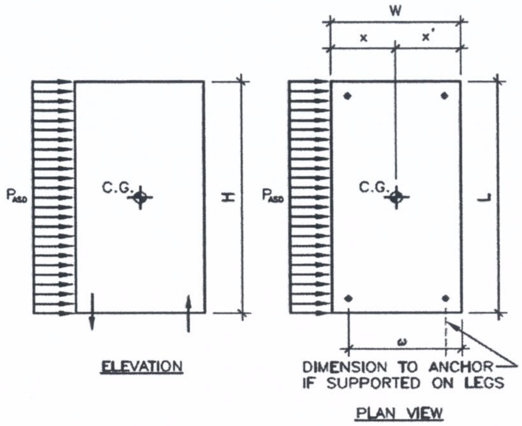
Project :	San Mateo Serenity House
Subject:	MAU
Comm No.:	3505-003-01 Page: of
Name:	RWM Date: 10/6/15

2013 CBC & ASCE 7-10 EQUIPMENT ANCHORAGE FORCES - Greenheck MAU



Height, H = 40.0 in
Width, W = 35.0 in
Overturning Dimension, ω = 35.0 in
# of anchors in tension, $\#_{T.\omega}$ = 2
x = 17.5 in
x' = 17.5 in
Length, L = 41.0 in
Weight, W_p = 300 lbs
# of anchors in shear, $\#_V$ = 4
Height of component with respect to grade, z = 15 ft

Wind

Wind design requirements for equipment are based on ASCE 7-10, Section 30.11

RISK CATEGORY (OC)
ASCE TABLE 1.5-1 — RC = II

BASIC WIND SPEED (3 SECOND GUST)
ASCE Figure 26.5-1 — V = 110 mph

EXPOSURE CATEGORY (EC)
ASCE SECTION 26.7 — EC = B

VELOCITY PRESSURE EXPOSURE COEFFICIENT
ASCE Table 29.3.1 — $k_z = 0.70$

TOPOGRAPHIC FACTOR
ASCE Section 26.8.2 — $k_{zt} = 1.0$

WIND DIRECTIONALITY FACTOR
ASCE Table 26.6.1 — $k_d = 0.85$

FORCE COEFFICIENT
ASCE Section 29.5.1 — $GC_r = 1.9$

VELOCITY PRESSURE
ASCE Section 29.3.2 — $q_z = 0.00256 * K_z * K_{zt} * K_d * V^2$ — $q_z = 18.4$ psf

DESIGN WIND FORCE
ASCE Section 29.5.1 — $P_{ASD} = 0.6 * (q_z * GC_r)$ — $P_{ASD} = 21.0$ psf

DESIGN FORCES

$F_{ASD} = P_{ASD} * (H*L/144) = 239$ lbs
$OTM = F_{ASD} * (H/2) = 4790$ lb-in
$DLRM = (0.6W_p) * x_{min} = 3150$ lb-in

$$T = \frac{OTM - DLRM}{\omega * \#_T}$$ **T =** 1 lbs

$$V = \frac{F_{ASD}}{\#_V}$$ **V =** 60 lbs

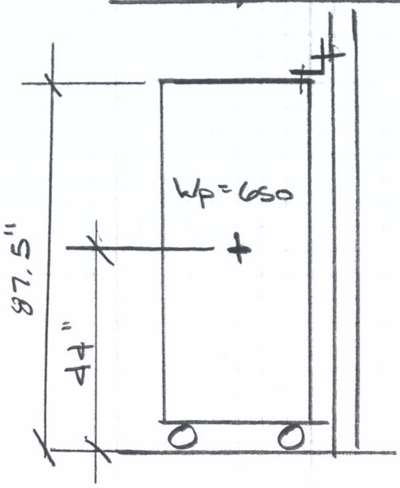
~~Use (4) - 1/2"Ø Hilti Kwik Bolt TZ w/ 2" Effective Embedment (Thin Substrates Condition)~~
~~T_{ALL} = 880 lbs~~
~~V_{ALL} = 837 lbs~~
UNITY CHECK = 0.07 ~~OK~~

Still small. Same Anchor as previous page

Architecture | Engineering | Planning

Project Freezer / Fridge Anchorage
Subject
Comm No. Page ___ of ___
Name Date

Fridge/Freezer



$a_p \sim 1.0$

$R_p \sim 2.5$

$S_{DS} = 1.34$

$I_p \sim 1.0$

$z/h = 0.5$

$$F_p = \frac{0.4(1.0)(1.34)(1.0)}{2.5}\left[1+2(1/2)\right]W_p = \underline{0.43 W_p}$$

$$F_{p_{min}} = 0.3(1.34)(1.0)W_p \sim \underline{0.40 W_p}$$

$F_p = 0.43(650) = 280$ lbs (Factored)

$F_{p_{ASD}} = 0.7 \times 280 = \underline{196 \text{ lbs}}$

Top Reaction

$R_t = 196 \text{ lbs}/2 = \underline{98 \text{ lbs}}$

Attach to 3 studs/points

∴ $98/3 = 32.7$ lbs/Anchor

– Very Small

Use #12 Wood screw

or

Mas. Anchor

Base Reaction also = 98 lbs

To permit relatively easy cleaning of kitchen, lock front bottom casters, – provide caster locks if not already provided.

Assume min 2 – front casters $98/2 = 49$ lbs of shear at each wheel – very small – say ok with caster locks. ✓

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Project Name: ______
Location: ______
Item #: ______ Qty: ______
Model #: ______

AIA #

SIS #

Model:
T-72F

T-Series:
Reach-In Solid Swing Door -10°F Freezer

Scan code for video

T-72F

- True's solid door reach-in's are designed with enduring quality that protects your long term investment.
- Designed using the highest quality materials and components to provide the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.
- Extra large evaporator coil balanced with higher horsepower compressor and large condenser maintains -10°F (-23.3°C) cabinet temperatures. Ideally suited for both frozen foods and ice cream.
- Stainless steel solid doors and front. The finest stainless available with higher tensile strength for fewer dents and scratches.
- Adjustable, heavy duty PVC coated shelves.
- Positive seal self-closing doors. Lifetime guaranteed door hinges and torsion type closure system.
- Automatic defrost system time-initiated, temperature-terminated. Saves energy consumption and provides shortest possible defrost cycle.

Bottom mounted units feature:

- "No stoop" lower shelf.
- Storage on top of cabinet.
- Compressor performs in coolest, most grease free area of kitchen.
- Easily accessible condenser coil for cleaning.

ROUGH-IN DATA

Specifications subject to change without notice.
Chart dimensions rounded up to the nearest ⅛" (millimeters rounded up to next whole number).

Model	Doors	Shelves	Cabinet Dimensions (inches) (mm)			HP	Voltage	Amps	NEMA Config.	Cord Length (total ft.) (total m)	Crated Weight (lbs.) (kg)
			L	D	H*						
T-72F	3	9	78⅛ 1985	29½ 750	78⅜ 1991	1 1½	115/60/1 230-240/50/1	12.0 9.0	5-20P ▲	9 2.74	635 289

* Height does not include 5" (127 mm) for castors or 6" (153 mm) for optional legs.

▲ Plug type varies by country.

MADE IN U.S.A. 5 YEAR COMPRESSOR WARRANTY c UL us NSF CE

APPROVALS:

AVAILABLE AT:

2/15 Printed in U.S.A.

Model: T-72F	T-Series: Reach-In Solid Swing Door -10°F Freezer	True®

STANDARD FEATURES

DESIGN

- True's commitment to using the highest quality materials and oversized refrigeration systems provides the user with colder product temperatures, lower utility costs, exceptional food safety and the best value in today's food service marketplace.

REFRIGERATION SYSTEM

- Factory engineered, self-contained, capillary tube system using environmentally friendly (CFC free) R404A refrigerant.
- Extra large evaporator coil balanced with higher horsepower compressor and large condenser; maintains -10°F (-23.3°C). Ideally suited for both frozen foods and ice cream.
- Sealed, cast iron, self-lubricating evaporator fan motor(s) and larger fan blades give True reach-in's a more efficient low velocity, high volume airflow design. This unique design ensures faster temperature recovery and shorter run times in the busiest of food service environments.
- Bottom mounted condensing unit positioned for easy cleaning. Compressor runs in coolest and most grease free area of the kitchen. Allows for storage area on top of unit.
- Automatic defrost system time-initiated, temperature-terminated. Saves energy consumption and provides shortest possible defrost cycle.

CABINET CONSTRUCTION

- Exterior - Stainless steel front. Anodized quality aluminum ends, back and top.
- Interior - attractive, NSF approved, clear coated aluminum liner. Stainless steel floor with coved corners.
- Insulation - entire cabinet structure and solid doors are foamed-in-place using Ecomate. A high density, polyurethane insulation that has zero ozone depletion potential (ODP) and zero global warming potential (GWP).
- Welded, heavy duty steel frame rail, black powder coated for corrosion protection.
- Frame rail fitted with 4" (102 mm) diameter stem castors - locks provided on front set.

DOORS

- Stainless steel exterior with white aluminum liner to match cabinet interior. Doors extend full width of cabinet shell. Door locks standard.
- Lifetime guaranteed recessed door handles. Each door fitted with 12" (305 mm) long recessed handle that is foamed-in-place with a sheet metal interlock to ensure permanent attachment.
- Positive seal self-closing doors. Lifetime guaranteed door hinges and torsion type closure system.
- Magnetic door gaskets of one piece construction, removable without tools for ease of cleaning.

SHELVING

- Nine (9) adjustable, heavy duty PVC coated wire shelves 24 ⅛"L x 22 ⅜"D (613 mm x 569 mm). Four (4) chrome plated shelf clips included per shelf.
- Shelf support pilasters made of same material as cabinet interior; shelves are adjustable on ½" (13 mm) increments.

LIGHTING

- Incandescent interior lighting - safety shielded. Lights activated by rocker switch mounted above doors.

MODEL FEATURES

- Exterior temperature display.
- Evaporator is epoxy coated to eliminate the potential of corrosion.
- Rear airflow guards prevent product from blocking optimal airflow.
- NSF-7 compliant for open food product.

ELECTRICAL

- Unit completely pre-wired at factory and ready for final connection to a 115/60/1 phase, 20 amp dedicated outlet. Cord and plug set included.

115/60/1
NEMA-5-20R

OPTIONAL FEATURES/ACCESSORIES

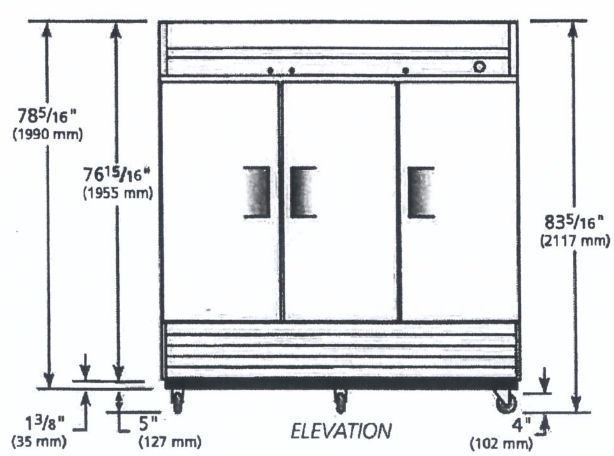
Upcharge and lead times may apply.

- ❑ 230 - 240V / 50 Hz.
- ❑ 6" (153 mm) standard legs.
- ❑ 6" (153 mm) seismic/flanged legs.
- ❑ Alternate door hinging (factory installed).
- ❑ Novelty baskets.
- ❑ Additional shelves.
- ❑ Half door bun tray racks. Each holds up to eleven 18"L x 26"D (458 mm x 661 mm) sheet pans (sold separately) (airflow guards need to be removed).
- ❑ Full door bun tray racks. Each holds up to twenty-two 18"L x 26"D (458 mm x 661 mm) sheet pans (sold separately) (airflow guards need to be removed).

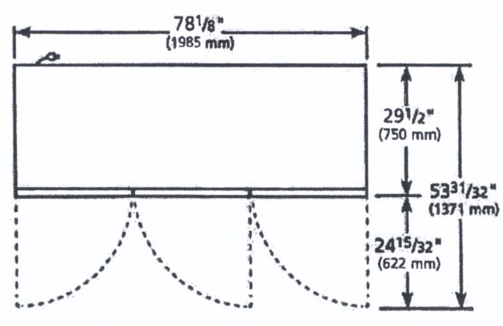
***CABINET INTERIOR**

Beginning in October of 2014, True Manufacturing began the process of changing the standard interior finishes on select products. The interior liners of these units have changed from the traditional NSF-approved white aluminum to an NSF-approved clear coated aluminum that is silver in color. In addition, the traditional white PVC coated shelves have been switched to a gray PVC coating. There are no functional differences created by any of these changes, the difference is only in the appearance. The following product lines are affected by this change: T-Series, TUC, TWT, TSSU, TFP, TPP, TMC, TRCB. A sticker will be placed on the outside packaging so that units with this change can be identified in inventory.

PLAN VIEW



ELEVATION



PLAN VIEW

WARRANTY*
Three year warranty on all parts and labor and an additional 2 year warranty on compressor. (U.S.A. only)

*RESIDENTIAL APPLICATIONS: TRUE assumes no liability for parts or labor coverage for component failure or other damages resulting from installation in non-commercial or residential applications.

METRIC DIMENSIONS ROUNDED UP TO THE NEAREST WHOLE MILLIMETER

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

KCL	Model	Elevation	Right	Plan	3D	Back
	T-72F	TFEY14E	TFEY01S	TFEY01P	TFEY143	