Rev 01 CO 09-132841

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JAN 23 2012

MICROFILMED

LYVER ENGINEERING AND DESIGN
7950 SE 105th, Portland, Oregon 97266
Ph: 503.705.5283 Fax: 503.482.7849 Troy@LyverEAD.com www.LyverEAD.com

Design for;

MIRANDA HOMES

These calculations are for the design and detailing of SITE RETAINING WALL to be constructed at COLONY PARK APARTMENTS, 3541 SW Beaverton Hillsdale Highway, Portland, OR 97211.

The information contained is for the sole use of MIRANDA HOMES to construct and install new PROJECT SITE RETAINING WALL. All other work performed by others is outside the scope of this design.

STRUCTURAL REGISTERED PROFESSIONAL ENGINEER 12894 OREGON JULY 8, 2003 TROY D. LYVER PE. RENEWAL: DEC. 31, 20

Job Number 11-031

October 3, 2011

09-132 BLD Rev 01 Co MICRO 2

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LYVER ENGINEERING AND DESIGN

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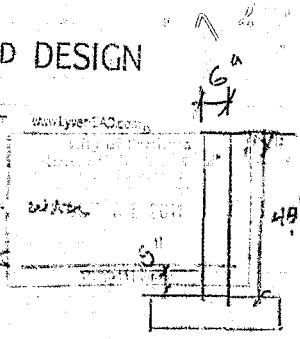

DESIGN OF LOAD FORM SAND RETAINING WALL

USE MAXIMUM 5½" x 20GA SIDING AT 12" O.C. w/ #3 HOOPS

MODEL CONCRETE WALL: (USE SOIL PRESS FROM FOR PROJECT)

$t_{WALL} = 5\frac{1}{2}"$
$EFP = 35 pcf$
$f = 0.30$
$P_{WALL} = 250 psf$
USE $Q = 1000 psf$

$H_{WALL} = 4'-0"$
w/ 8" SOIL @ TOE

FROM OUTPUT $V_{MAX} = 594 \#$ @ 1'-0" OC $V_u = 435 \#$

$M_{MAX} = 600 \#$ $M = 594 / 1.6 = 373 \#$

USE 5½" x 20GA SIDING @ 12" o.c.

DESIGN LOAD @ BASE $T = C = \frac{594 (12)}{4\frac{1}{2} (1.6)} = 990 \#$

20 GA = 33 MIL

CHECK TO TRANSFER BY FRICTION OF SUBGRADE SOIL

USE SCREWS TO TAKE OUT FRICTION LOAD

#10 SCREW w/ 33 MIL $V_{ALL} = 177 \#$/SCREW

$\frac{990 \#}{4} = 248 \#$/SCREW SOIL LOAD DURATION $177 (1.4) = 248$

P. USE (4) #10 SCREWS

2½

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SEE SHEARWALL OUTPUT FOR SOIL & WIND LOADS

THE STUDS ARE TIED TOGETHER w/ #3 REINF. STEEL

MIN HORIZ STEEL .0018(40)(5.5) = 0.4 IN²

USE (3) #3 HORIZ WALL

FOOTING: .0018(24)(5.5) = 0.24 IN²

USE (2) #3 FTG

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LYVER ENGINEERING AND DESIGN

Title: Cherry Pict Retaining Wall Job# 11-08
Dsgnr:
Project Desc: Design of Mechanically Stabilized Retaining Wall
Project Notes:

Cantilevered Retaining Wall

ENERCALC, INC. 1983-2011, Build:6.11.9.30, Ver:6.11.9.30

Description: 4'-5" Cantilever Wall

Criteria

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

Vertical component of active lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
NOT USED for Overturning Resistance

Soil Data

Allow Soil Bearing	=	1,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
Toe Active Pressure	=	35.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	110.00 pcf
Soil Density, Toe	=	0.00 pcf
Friction Coeff btwn Fig & Soil	=	0.400
Soil height to ignore for passive pressure	=	12.00 in

Calculations per ACI 318-08, ACI 530-08, IBC 2009, CBC 2010, ASCE 7-05

Design Summary

Wall Stability Ratios

Overturning	=	1.67	OK
Sliding	=	2.30	OK
(Vertical Component NOT Used)			
Total Bearing Load	=	685 lbs	
...resultant ecc.	=	2.58 in	
Soil Pressure @ Toe	=	649 psf	OK
Soil Pressure @ Heel	=	64 psf	OK
Allowable	=	1,000 psf	
Soil Pressure Less Than Allowable			
ACI Factored @ Toe	=	1,019 psf	
ACI Factored @ Heel	=	77 psf	
Footing Shear @ Toe	=	3.1 psi	OK
Footing Shear @ Heel	=	2.8 psi	OK
Allowable	=	75.0 psi	

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	340.3 lbs
less 100% Passive Force	=	507.8 lbs
less 100% Friction Force	=	278.8 lbs
Added Force Req'd	=	0.0 lbs OK
...for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

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 =	0.00
Wall Material Above "Ht"	=	Concrete
Thickness	in =	6.50
Rebar Size	=	# 5
Rebar Spacing	in =	18.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	0.756
Total Force @ Section	lbs =	455.6
Moment....Actual	ft-# =	594.5
Moment....Allowable	ft-# =	3,202.5
Shear....Actual	psi =	0.8
Shear....Allowable	psi =	75.0
Wall Weight	psf =	68.8
Rebar Depth 'd'	in =	3.69
Lap splice if above	in =	12.00
Lap splice if below	in =	6.00
Hook bar bend into footing	in =	6.00

Concrete Data

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

Mu @ 12'a

$M_{use} = 595/1.6 = 373$

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LYVER ENGINEERING AND DESIGN

Title: County Cost Retaining Wall — Job #
Designer:
Project Desc.:
Project Notes:

Cantilevered Retaining Wall

Description:

Footing Dimensions & Strengths

Toe Width	=	0.75
Heel Width	=	0.75
Total Footing Width	=	1.50
Footing Thickness	=	7.00 in
Key Width	=	12.00 in
Key Depth	=	12.00 in
Key Distance from Toe	=	2.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top 1.00 @ Btm = 1.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	1,019	77 psf
Mu': Upward	=	242	0 ft-k
Mu': Downward	=	54	27 ft-k
Mu: Design	=	188	27 ft-k
Actual 1-Way Shear	=	3.11	2.83 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: Not req'd, Mu < S * Fr

Summary of Overturning & Resisting Forces & Moments

Item		OVERTURNING Force lbs	OVERTURNING Distance ft	OVERTURNING Moment ft-lb	RESISTING Force lbs	RESISTING Distance ft	RESISTING Moment ft-lb
Heel Active Pressure	=	367.6	1.53	561.6			
Surcharge over Heel	=				126.3	1.35	173.8
Toe Active Pressure	=	-27.3	0.42	-11.4			
Surcharge Over Toe	=						
Adjacent Footing Load	=						
Added Lateral Load	=						
Load @ Stem Above Soil	=						
Soil Over Heel	=						
Sloped Soil Over Heel	=						
Surcharge Over Heel	=						
Adjacent Footing Load	=						
Axial Dead Load on Stem	=						
* Axial Live Load on Stem	=						
Soil Over Toe	=					0.38	
Surcharge Over Toe	=						
Stem Weight(s)	=				275.0	0.98	269.3
Earth @ Stem Transitions	=						
Footing Weight	=				131.3	0.75	98.4
Key Weight	=				150.0	2.50	375.0
Vert. Component	=						
Total	=	340.3	O.T.M. =	550.3	Total = 684.6 lbs	R.M. =	916.5

Resisting/Overturning Ratio = 1.67
Vertical Loads used for Soil Pressure = 684.6 lbs

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

Boulton Envelope

LENO LLC

11-031

4'-0" Stud 550NF150-20GA

6/12

Interior-550NF150-20GA-1.rsd

Cold Formed Steel Design Parameters

	Label	Shape	Length	Lbyy[ft]	Lbzz[ft]	Lcomp to...	Lcomp bo...	Kyy	Kzz	Cm-yy	Cm-zz	Cb	R	y-axis	z-axis
1	M1	550NF15...	4	0	0	0	0	1	1						

Cold Formed Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1E5 F)	Density[lb/ft^3]	Yield[ksi]	Ultimate[ksi]
1	A570_33	2.95e+7	1.1346e+7	.3	.65	490	33000	52000
2	A653_SS_50	2.95e+7	1.1346e+7	.3	.65	490	50000	65000
3	Fy=43.1 (22ga)	2.95e+7	1.1346e+7	.3	.65	490	43100	55400
4	Fy=33 (18Ga)	2.95e+7	1.1346e+7	.3	.65	490	33000	52000
5	Fy=40 (20Ga)	2.95e+7	1.1346e+7	.3	.65	490	40000	49500

Cold Formed Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	CF1A	1.5CGY.25X	Beam	None	A570_33	Typical	.131	.022	.052	5.37e-5

Joint Loads and Enforced Displacements (BLC 1 : Dead Load)

	Joint Label	L,D,M	Direction	Magnitude[lb,lb-ft, (in,rad)]
1	N2	L	X	165

Envelope AISI Cold Formed Steel Code Checks

	Member	Shape	Code	Loc[ft]	LC	Shear	Loc[ft]	Dir	LC	phiPn[lb]	phiTn[lb]	Cb	phiMny	phiMnz	Cm	Cmy	Cmz	AISI Eqn
1	M1	550NF15...	.868	0	1	.226	0	y	1	5177.835	9933	1	166.764	1152.421	1	0	0	C3.3.1-1

Load Combinations

	Description	SolvePD...	SRSS	B,C, Factor	B,C, Factor	B,C, Factor	B,C, Factor	B,C, Factor	B,C, Factor	B,C, Factor	B,C, Factor
1	IBC 16-8	Yes	Y	DL	1						
2	IBC 16-9	Yes	Y	DL	1	LL	.75	LS	.75		
3	IBC 16-10 (a)	Yes	Y	DL	1	RL	1				
4	IBC 16-10 (b)	Yes	Y	DL	1	SL	1				
5	IBC 16-10 (c)	Yes	Y	DL	1	RL	1				
6	IBC 16-10 (d)	Yes	Y	DL	1	LL	.75	LS	.75	RL	.75
7	IBC 16-11 (b)	Yes	Y	DL	1	LL	.75	LS	.75	SL	.75
8	IBC 16-11 (c)	Yes	Y	DL	1	LL	.75	LS	.75	RL	.75
9	IBC 16-12 (a)	Yes	Y	DL	1	WL	1				
10	IBC 16-12 (b)	Yes	Y	DL	1	WL	1				
11	IBC 16-13 (a)	Yes	Y	DL	1	WL	.75	LL	.75	LS	.75
12	IBC 16-13 (b)	Yes	Y	DL	1	WL	.75	LL	.75	LS	.75
13	IBC 16-13 (c)	Yes	Y	DL	1	WL	.75	LL	.75	LS	.75
14	IBC 16-13 (d)	Yes	Y	DL	1	SL	.75	LL	.75	LS	.75
15	IBC 16-13 (e)	Yes	Y	DL	1	WL	.75	LL	.75	LS	.75
16	IBC 16-13 (f)	Yes	Y	DL	1	SL	.75	LL	.75	LS	.75
17	IBC 16-14	Yes	Y	DL	.6	WL	1				
18	IBC 16-15	Yes	Y	DL	.6	WL	1				

Load Combination Design

	Description	ASIF	CD	ASIF	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Footings
1	IBC 16-8		.9		Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	IBC 16-9				Yes	Yes	Yes	Yes	Yes	Yes	Yes
3	IBC 16-10 (a)		1.25		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Load Combination Design (Continued)

	Description	ASIF	CD	ASIF	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Footings
4	IBC 16-10 (b)		1.15		Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	IBC 16-10 (c)		1.15		Yes	Yes	Yes	Yes	Yes	Yes	Yes
6	IBC 16-10 (d)		1.25		Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	IBC 16-11 (b)		1.15		Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	IBC 16-11 (c)		1.15		Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	IBC 16-12 (a)		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	IBC 16-12 (b)		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
11	IBC 16-13 (a)		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	IBC 16-13 (b)		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	IBC 16-13 (c)		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
14	IBC 16-13 (d)		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
15	IBC 16-13 (e)		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
16	IBC 16-13 (f)		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
17	IBC 16-14		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes
18	IBC 16-15		1.6		Yes	Yes	Yes	Yes	Yes	Yes	Yes

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N1	max	-99	17	0	1	0	1	0	1	0	1	660	1
2		min	-165	1	[illegible]	17	0	1	0	1	[illegible]	17	[illegible]	17
3	Totals:	max	-99	17	0	1	0	1						
4		min	-165	1	[illegible]	17	0	16						

Envelope Member Section Forces

	Member	Sec		Axial [lb]	LC	y Shear [lb]	LC	z Shear [lb]	LC	Torque [lb-ft]	LC	y-y Momen...	LC	z-z Momen...	LC
1	M1	1	max	0	1	165	1	0	1	0	1	0	1	660	1
2			min	0	1	99	17	0	1	0	1	0	1	396	17
3		2	max	0	1	165	1	0	1	0	1	0	1	623.333	1
4			min	0	1	99	17	0	1	0	1	0	1	374	17
5		3	max	0	1	165	1	0	1	0	1	0	1	586.667	1
6			min	0	1	99	17	0	1	0	1	0	1	352	17
7		4	max	0	1	165	1	0	1	0	1	0	1	550	1
8			min	0	1	99	17	0	1	0	1	0	1	330	17
9		5	max	0	1	165	1	0	1	0	1	0	1	513.333	1
10			min	0	1	99	17	0	1	0	1	0	1	308	17
11		6	max	0	1	165	1	0	1	0	1	0	1	476.667	1
12			min	0	1	99	17	0	1	0	1	0	1	286	17
13		7	max	0	1	165	1	0	1	0	1	0	1	440	1
14			min	0	1	99	17	0	1	0	1	0	1	264	17
15		8	max	0	1	165	1	0	1	0	1	0	1	403.333	1
16			min	0	1	99	17	0	1	0	1	0	1	242	17
17		9	max	0	1	165	1	0	1	0	1	0	1	366.667	1
18			min	0	1	99	17	0	1	0	1	0	1	220	17
19		10	max	0	1	165	1	0	1	0	1	0	1	330	1
20			min	0	1	99	17	0	1	0	1	0	1	198	17
21		11	max	0	1	165	1	0	1	0	1	0	1	293.333	1
22			min	0	1	99	17	0	1	0	1	0	1	176	17
23		12	max	0	1	165	1	0	1	0	1	0	1	256.667	1
24			min	0	1	99	17	0	1	0	1	0	1	154	17
25		13	max	0	1	165	1	0	1	0	1	0	1	220	1
26			min	0	1	99	17	0	1	0	1	0	1	132	17
27		14	max	0	1	165	1	0	1	0	1	0	1	183.333	1
28			min	0	1	99	17	0	1	0	1	0	1	110	17
29		15	max	0	1	165	1	0	1	0	1	0	1	146.667	1
30			min	0	1	99	17	0	1	0	1	0	1	88	17

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[lb]	LC	y Shear[lb]	LC	z Shear[lb]	LC	Torque[lb-ft]	LC	y-y Momen...	LC	z-z Momen...	LC
31		16	max	0	1	165	1	0	1	0	1	0	1	110	1
32			min	0	1	99	17	0	1	0	1	0	1	66	17
33		17	max	0	1	165	1	0	1	0	1	0	1	73.333	1
34			min	0	1	99	17	0	1	0	1	0	1	44	17
35		18	max	0	1	165	1	0	1	0	1	0	1	36.667	1
36			min	0	1	99	17	0	1	0	1	0	1	22	17
37		19	max	0	1	165	1	0	1	0	1	0	1	0	1
38			min	0	1	99	17	0	1	0	1	0	1	0	1

Fasteners (Screws and Welds)

Screw Table Notes

1. Screw spacing and edge distance shall not be less than 3 x D. (D = Nominal screw diameter)
2. The allowable screw values are based on the steel properties of the members being connected, per AISI section E4.
3. When connecting materials of different metal thicknesses or yield strength, the lowest applicable values should be used.
4. Screw strength needs to be verified by the screw manufacturer.
5. *Values include a 3.0 factor of safety.*
6. Applied loads may be multiplied by 0.75 for seismic or wind loading, per AISI A 5.1.3.
7. Allowable loads are based on mill certified steel.

Allowable Loads for Screw Connections

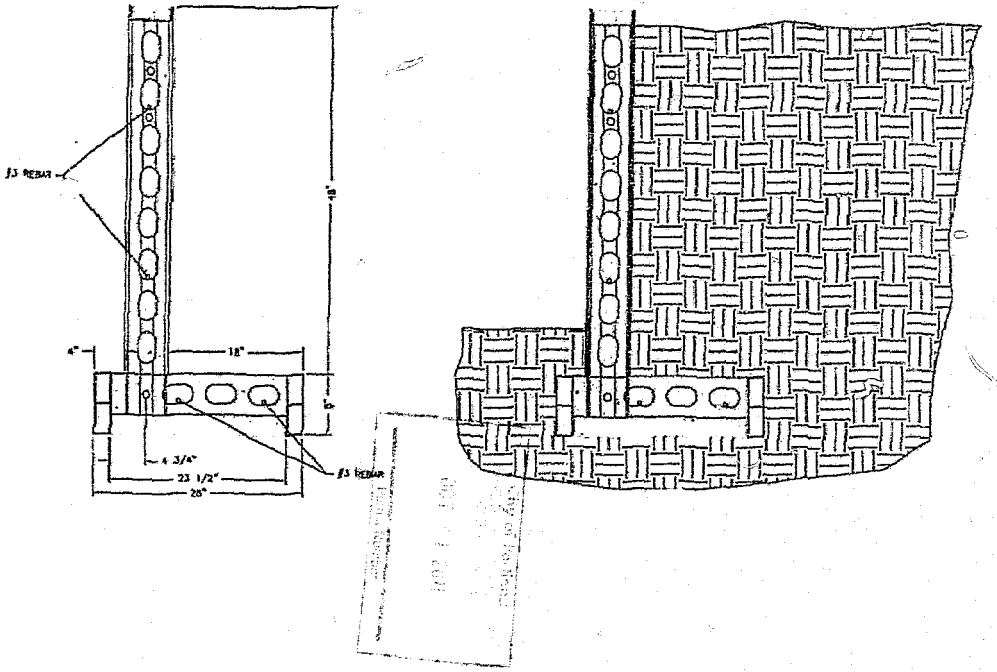
Mil	Thickness in.	Properties: Yield ksi	Tensile ksi	#8 Screw: Shear lbs.	Pullout lbs.	#8 Screw: Shear lbs.	Pullout lbs.	#10 Screw: Shear lbs.	Pullout lbs.	#12 Screw: Shear lbs.	Pullout lbs.
18	0.0188	33	45	80	33	98	38	71	46	79	57
27	0.0283	33	45	111	55	131	66	131	66	139	78
33	0.0312	33	45	129	55	143	66	151	76	161	85
30	0.0346	33	45	151	61	164	72	172	84	186	95
43	0.0451	33	45	224	78	244	94	283	109	280	124
54	0.0566	50	65	456	144	496	171	534	195	569	225
68	0.0713	50	65	576	181	624	215	756	249	805	284

Weld Table Notes

1. Weld capacities based on AISI, section E2
2. When connecting materials of different metal thicknesses or yield strength, the lowest applicable values should be used.
3. Values include a 2.5 factor of safety.
4. Applied loads may be multiplied by 0.75 for seismic or wind loading per AISI A 5.1.3.
5. Allowable loads are based on mill certified steel.

Allowable Loads for Fillet Welds and Flare Groove Welds

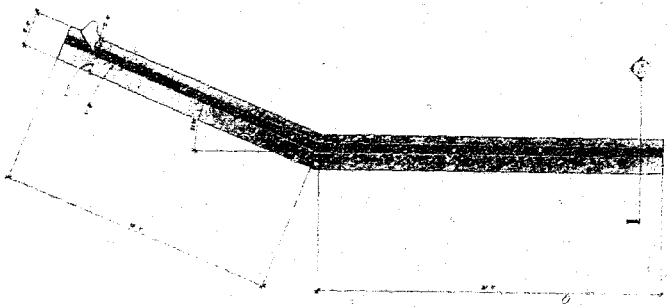
Mil	Design Thickness in.	Steel Properties: Yield ksi	Tensile ksi	E6000 Electrodes lbs/in
43	0.0451	33	45	509
54	0.0566	33	45	764
68	0.0713	33	45	963
43	0.0451	50	65	870
54	0.0566	50	65	1304
68	0.0713	50	65	1360

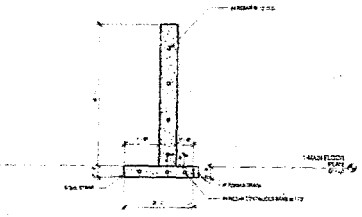

#3 REBAR
18"
4"
4 3/4"
23 1/2"
28"
#3 REBAR

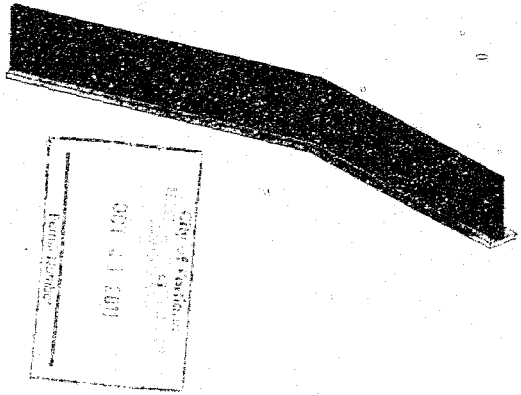
VOLUME:
20' WALL = 41.33 CF
16' WALL = 30.67 CF

FOOTING = 24.07 CF

TOTAL VOLUME = 96.07 CF







Miranda Homes

PLANS

COLONY PARK

D

R. GEIGER

9-14-11

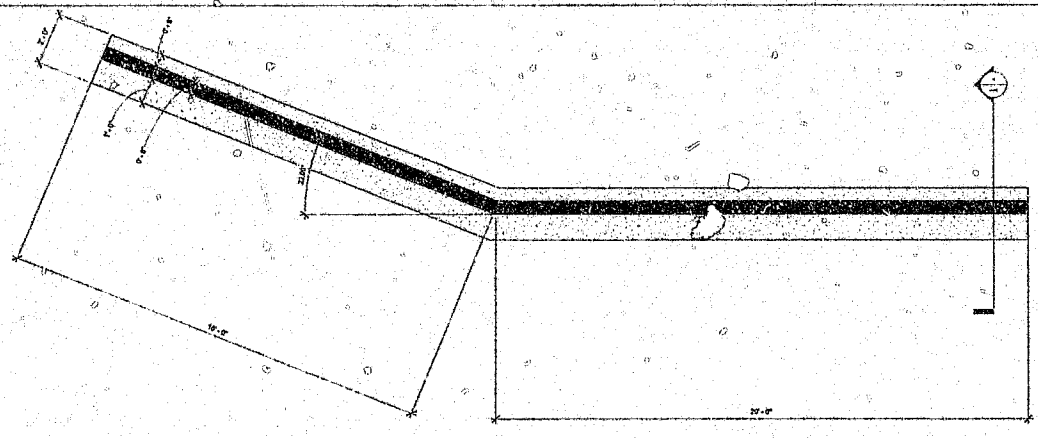
As Indicated

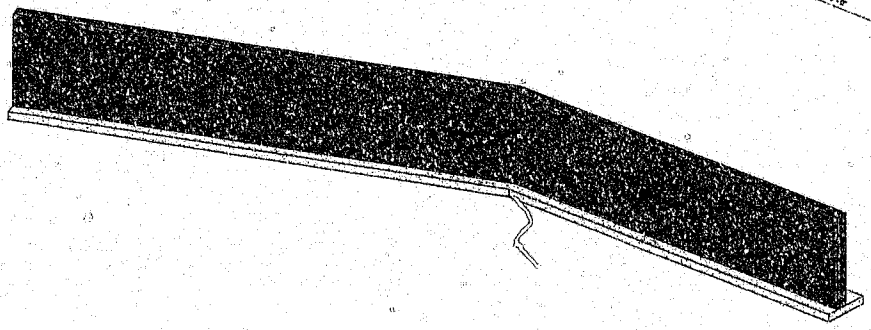
A1.1

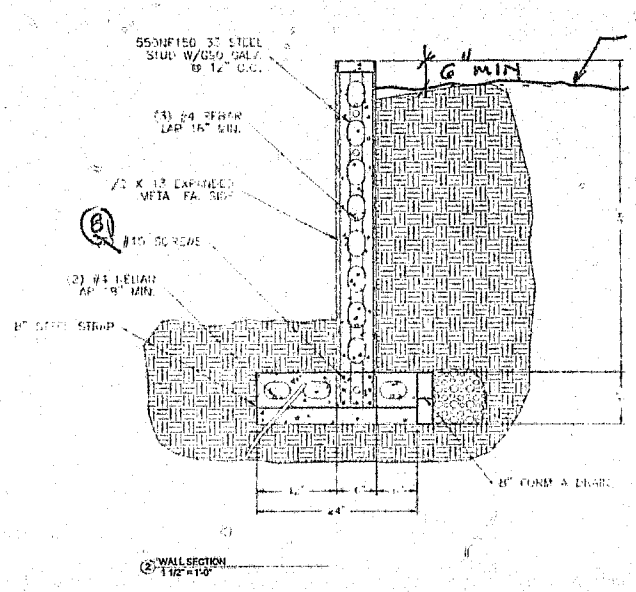
VOLUME:
20' WALL = 41.33 CF
16' WALL = 30.67 CF

FOOTING = 24.07 CF

TOTAL VOLUME = 96.07 CF







2 WALL SECTION
1 1/2" = 1'-0"

STRUCTURAL
REGISTERED PROFESSIONAL ENGINEER
52994
OREGON
JULY 9, 2001
TROY D. LYVER, P.E.
RENEWAL: DEC. 31, 20[illegible]

City of Portland
OCT 31 2011
Permit Number

COLONY PARK

PLANS

Miranda Homes

17223 SE ROYER RD
DAMASCUS, OR 97089
Ph: (503) 658-4518
FAX: (503)658-4695

Print Date and Time: 10/21/2011 4:39:38 PM
Project number: 4021
Size: D
Drawn by: K. GEIGER
Date: 9-14-11
Scale: As Indicated

A1.1

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7950 SE 106th, Portland, Oregon 97266
p 503.705.5283 f 503.482.7449 a Troy.Lyver-EAD.com www.Lyver-EAD.com

October 20, 2011

Mr. John Huey
Miranda Homes

Reference: Colony Park Retaining Wall
5200 SE Harney Drive

LEAD Project No: 11-031 **COP#09-132841-REV-01-CO**

Subject: City of Portland Structural Check sheet

Dear Mr. Huey-

The following information is intended to be in response to the City of Portland structural check sheet dated October 14, 2011 by Mr. Miklos Ugrai. The check sheet comments are attached herewith. The following items directly correlate to the items listed on the check sheet:

1. The calculations are using the moment from the Enercalc output which is an ultimate load. The 1.6 factor is reducing the ultimate load to a working load value.

2. See updated calculation. We have revised to match your interpretation of the level arm.

3. The studs are embedded into the concrete. There is horizontal steel that passes from stud to stud in the wall and horizontally in the footing.

4. The soil bearing is spread over the full width of the footing. The studs are embedded into the concrete and the force is transferred in to the footing

through the horizontal bars in the footing. In addition, the top flange of the steel pushes down on the concrete which then spreads out conservatively at a 2 to 1. This spreads the load out 2" for every inch of depth. That spreads the load out to the mid point of the space between the studs without accounting for the horizontal reinforcing.

5. The studs are zinc coated. The supplier can provide additional information as required.

6. Please refer to the stud's information supplied by the manufacturer. The steel studs are fabricated in a shop and sent to the site. Therefore, the lower safety is used due to the tighter tolerances of construction.

7. Please refer to attached revised calculation. The use of the 1.4 factor was in error. Please see the updated calculation and sketch.

8. Please refer to the attached revised Enercalc output. The footing is shown to match the size and orientation shown on the structural section. The keyway is not required.

We trust this information is satisfactory for your needs; however, if you should have any further questions, or require additional information, please feel free to contact our office.

Sincerely,

Troy D. Lyver, PE/SE.
Owner
Lyver Engineering and Design, llc

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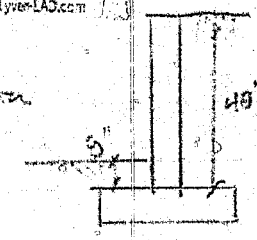


DESIGN OF LOAD FORM SHD RETAINING WALL

USE MIRAMAR 5½" V 20GA SHDG
AT 12" O.C. W/ #3 HOOK

MODEL CONCRETE WEIGHT (USE 20% PRISM FROM SOIL FOR PRISM)

$t_{WALL} = 5\frac{1}{2}"$
EFP = 35 pcf
f = 0.30
PRISM = 250 pcf
USE $\Phi = 1000$ psf

$H_{WALL} = 4'-0"$
W/ 8' SURCHARGE TOP

FROM OUTPUT $W_u = 594$ #/ft @ 1'-0" OC
$V_u = 435$ #

$M_{ALL} = 1200$ #
$M = \frac{1}{2}(1.6)(373.43)$
WORKING STRESS

USE 5½" V 20GA SHD @ 4'-0" OC

DESIGN CONN @ BASE

$T = C = \frac{594}{2}(2) = 990$ #
ULT TO WIRE

20 GA = 33 MIL

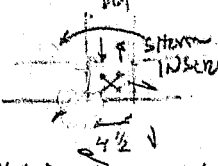
STEEL IS 75% TOO BY STRENGTH OF EMBEDDED SHD

USE SCREWS TO TAKE LOT SHEARLOAD

#10 SCREW @ 33 MIL $V_{ALL} = 177$ #/SCREW

$\frac{1260}{177} = 7$ $\frac{990}{7} = 141$ #/SCREW SHEAR LOAD DURATION

∴ USE (9) #10 SCREWS



USE $\frac{594}{110}(12) = 1260$ #

2/12

LYVER ENGINEERING AND DESIGN
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Title : Colony Park Retaining Wall Job # 11-031
Dsgnr: TDL
Project Desc.: Design of Miranda Homes Steel Stud retaining wall.
Project Notes :

Printed: 20 OCT 2011, 3:34PM

Cantilevered Retaining Wall

File: C:\LEAD JOB FILES\2011 Jobs\11-031 (Miranda Homes, Colony Park Wall)\11-031_Wall calcs.c6
ENERCALC, INC. 1983-2011, Build:6.11.9.30, Ver:6.11.9.30
Lic. # : KW-06009286 License : Lyver Engineering and Design, llc

Description : 4'-0" total height wall.

Criteria

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

Vertical component of active Lateral soil pressure options:
NOT USED for Soil Pressure.
NOT USED for Sliding Resistance.
NOT USED for Overturning Resistance.

Soil Data

Allow Soil Bearing	=	1,000.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	35.0 psf/ft
Toe Active Pressure	=	35.0 psf/ft
Passive Pressure	=	250.0 psf/ft
Soil Density, Heel	=	150.00 pcf
Soil Density, Toe	=	0.00 pcf
Friction Coeff btwn Ftg & Soil	=	0.400
Soil height to ignore for passive pressure	=	0.00 in

Calculations per ACI 318-08, ACI 530-08, IBC 2009, CBC 2010, ASCE 7-05

Design Summary

Wall Stability Ratios

Overturning	=	1.90 OK
Sliding	=	1.55 OK
(Vertical Component NOT Used)		
Total Bearing Load	=	800 lbs
...resultant ecc.	=	4.19 in
Soil Pressure @ Toe	=	819 psf OK
Soil Pressure @ Heel	=	0 psf OK
Allowable	=	1,000 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	933 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	3.5 psi OK
Footing Shear @ Heel	=	5.8 psi OK
Allowable	=	75.0 psi

Sliding Calcs (Vertical Component NOT Used)

Lateral Sliding Force	=	350.0 lbs
less 100% Passive Force	= -	222.2 lbs
less 100% Friction Force	= -	320.0 lbs
Added Force Req'd	=	0.0 lbs OK
...for 1.5 : 1 Stability	=	0.0 lbs OK

Load Factors

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	in =	5.50
Rebar Size	=	# 5
Rebar Spacing	in =	18.00
Rebar Placed at	=	Edge
Design Data		
fb/FB + fa/Fa	=	0.186
Total Force @ Section	lbs =	435.6
Moment....Actual	ft-l =	594.5
Moment....Allowable	ft-l =	3,202.6
Shear....Actual	psi =	9.8
Shear)....Allowable	psi =	75.0
Wall Weight	psf =	68.8
Rebar Depth 'd'	in =	3.69
Lap splice if above	in =	23.40
Lap splice if below	in =	6.00
Hook embed into footing	in =	6.00
Concrete Data		
f'c	psi =	2,500.0
Fy	psi =	60,000.0

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Title : Colony Park Retaining Wall — Job # 11-031
Dsgnr: TDL
Project Desc.: Design of Miranda Homes Steel Stud retaining wall.
Project Notes :

Printed: 20 OCT 2011, 2:34PM

Cantilevered Retaining Wall

File: C:\LEAD JOB FILES\2011 Jobs\11-031 Miranda Homes Colony Park Wall\11-031_wall calc.ecd
ENERCALC, INC. 1983-2011, Build:6.11.8.30, Ver:6.11.8.30

Description : 4'-0" total height wall.

Footing Dimensions & Strengths

Toe Width	=	1.00 ft
Heel Width	=	1.00
Total Footing Width	=	2.00
Footing Thickness	=	8.00 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 1.00 @ Btm.= 1.00 in

Footing Design Results

		Toe	Heel
Factored Pressure	=	983	0 psf
Mu' : Upward	=	409	0 ft-lb
Mu' : Downward	=	120	123 ft-lb
Mu: Design	=	288	123 ft-lb
Actual 1-Way Shear	=	3.45	5.83 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		Force lbs	Distance ft	Moment ft-lb
OVERTURNING				
Heel Active Pressure	=	381.1	1.56	592.8
Surcharge over Heel	=			
Toe Active Pressure	=	-31.1	0.44	-13.8
Surcharge Over Toe	=			
Adjacent Footing Load	=			
Added Lateral Load	=			
Load @ Stem Above Soil	=			
Total	=	350.0	O.T.M. =	579.0
Resisting/Overturning Ratio	=	1.90		
Vertical Loads used for Soil Pressure	=	800.0 lbs		

Item		Force lbs	Distance ft	Moment ft-lb
RESISTING				
Soil Over Heel	=	325.0	1.73	562.0
Sloped Soil Over Heel	=			
Surcharge Over Heel	=			
Adjacent Footing Load	=			
Axial Dead Load on Stem	=			
* Axial Live Load on Stem	=			
Soil Over Toe	=		0.50	
Surcharge Over Toe	=			
Stem Weight(s)	=	275.0	1.23	338.0
Earth @ Stem Transitions	=			
Footing Weight	=	200.0	1.00	200.0
Key Weight	=			
Vert. Component	=			
Total	=	800.0 lbs	R.M. =	1,100.0

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