Engineering West, L.L.C.

3785 North 1100 West
Pleasant View, UT 84414
(801) 643-5710

4 June 2013

MEMO:

RE: The Retreat Entry Walls
Review Comments

Gentlemen,

This memo addresses changes made to the calculations based on the review comments.

Comments on S1:

1) The shear resistance of the re-enforcing was adequate without a key; However, a key has been shown in the calculation sketches if one is desired. This can be accomplished using a 2 x 4 as a form in the top of the footing.

2) Detail F4 showing an intersection or corner would occur where the dead men tie into the stem. This would put this detail in compression and the embedment isn't to critical.

Comments on Sheet 8

3) The soils report specifies an active lateral pressure coefficient of 0.35 for walls that can rotate over 0.4%. Our value of 0.4 is therefore slightly conservative. This is based on native soils being used as backfill.

4) Calculations have been added to check soil bearing pressure.

5) Calculations have been added to check sliding stability.

I was informed that the maximum height of the retaining wall is going to be 9'-0. I have added a sheet showing this option.

We have received word from Earthtec Engineering, Inc. that the 1,500 psf assumption on soil bearing is adequate.

Respectfully;

Steven J. Carlson, P.E.

E13087-01

Engineering West, L.L.C.

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Design Calculations

23 May 2013

Project
The Retreat Entry Walls
Wolf Creek
Lewis Homes

Design Codes

International Building Code 2009
ASCE 7-10 (Minimum Design Loads for Buildings and Other Structures)
ACI 318-08 (Building Code Requirements for Structural Concrete)
ACI 530-08 (Building Code Requirements for Masonry Structures)
AISC ASD 13th Ed. (Structural Steel)
ANSI / AF&PA NDS 05 (National Design Specification for Wood Construction)

Design Criteria

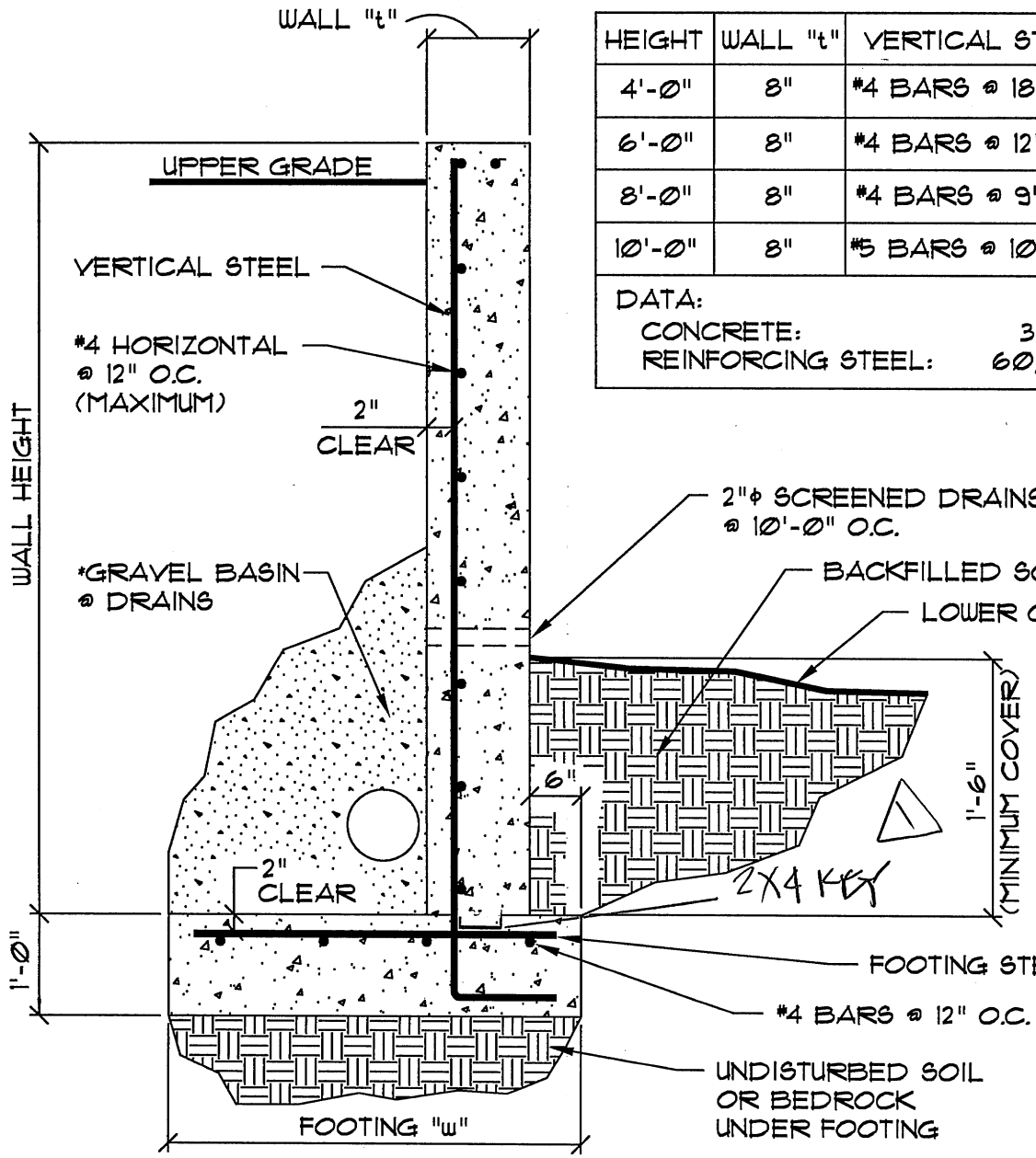
Concrete	
Compressive Strength Slabs on Grade / Footings	2,500 PSI
Foundations	3,000 PSI
Suspended Slabs	4,000 PSI
Reinforcement	
Grade 60, Yield Strength	60,000 PSI
Tensile Strength	90,000 PSI

General Notes

These calculations, and accompanying plans, are for one project, at one location only.
All plans and calculations should be wet stamped.
Engineering West's scope covers structural design of concrete only. Specifically excluded is geotechnical design.: Even if this information is included on a stamped drawings.
Construction materials and details shall be in strict conformance with the latest edition of the International Building Code and other referenced standards. Details not in conformance with the calculations shall be approved in writing by the engineer.
Unless specifically indicated no investigation has been made by Engineering West, of the lot, or it's soil characteristics, to determine it's ability to support the structure. Engineering West, LLC has assumed a 1,500 psf allowable soil bearing pressure. If there are any concerns with regard to the site a geo-technical specialist should be consulted. If conditions indicate a need for additional structural design, based on the soil conditions, including grade, Engineering West should be notified immediately.
The above design criteria should be reviewed and approved by the building official and contractor to assure actual conditions meet those used. Engineering West should be notified immediately of any discrepancies. Unless otherwise agreed in writing maximum total liability to Engineering West, L.L.C. will be limited to the dollar value of the engineering performed.

HEIGHT	WALL "t"	VERTICAL STEEL	FTG "w"	FOOTING STEEL
4'-0"	8"	#4 BARS @ 18" O.C.	2'-9"	#4 BARS @ 18" O.C.
6'-0"	8"	#4 BARS @ 12" O.C.	3'-6"	#4 BARS @ 12" O.C.
8'-0"	8"	#4 BARS @ 9" O.C.	4'-6"	#4 BARS @ 9" O.C.
10'-0"	8"	#5 BARS @ 10" O.C.	5'-6"	#5 BARS @ 10" O.C.

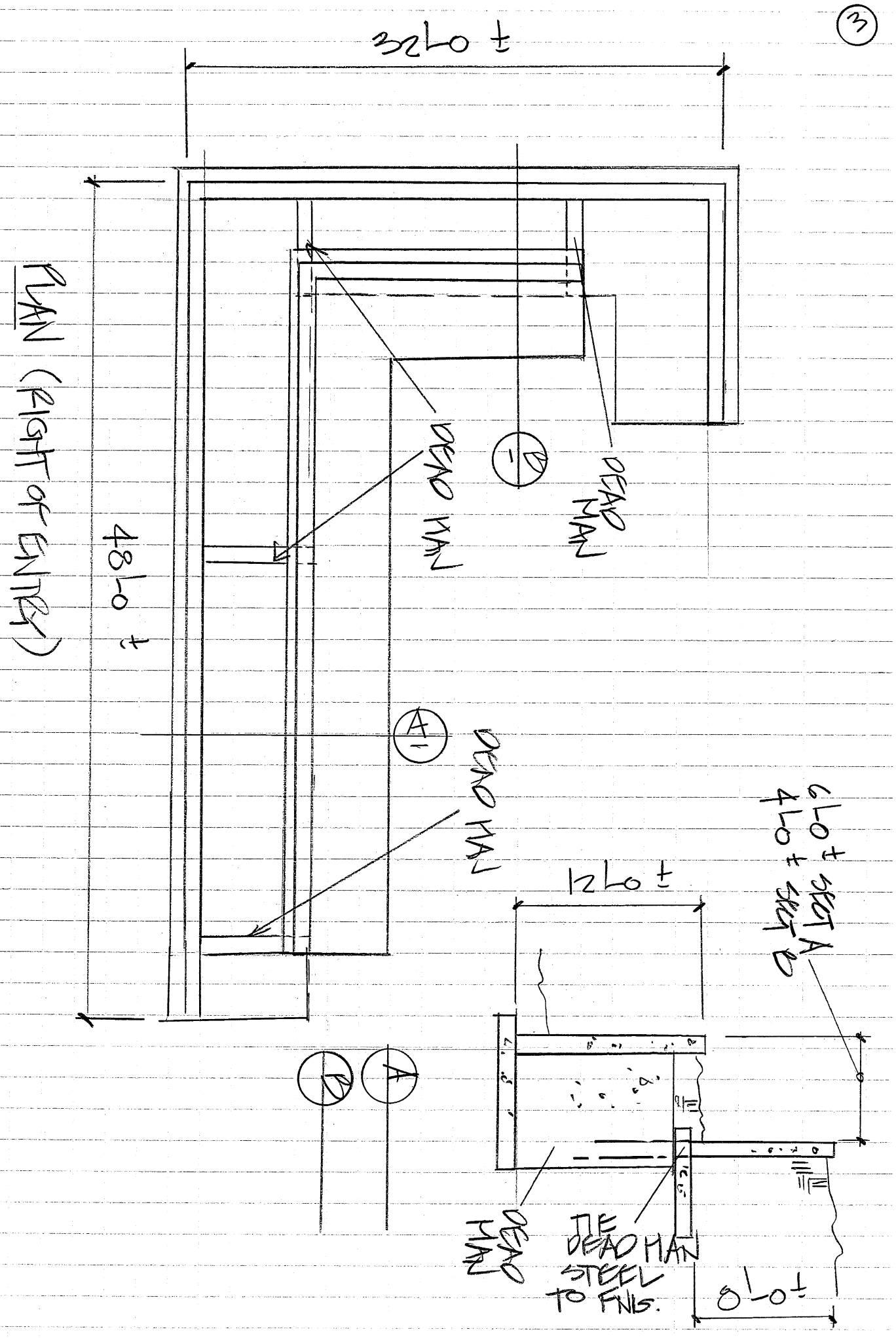
DATA:
CONCRETE: 3,000 PSI
REINFORCING STEEL: 60,000 PSI

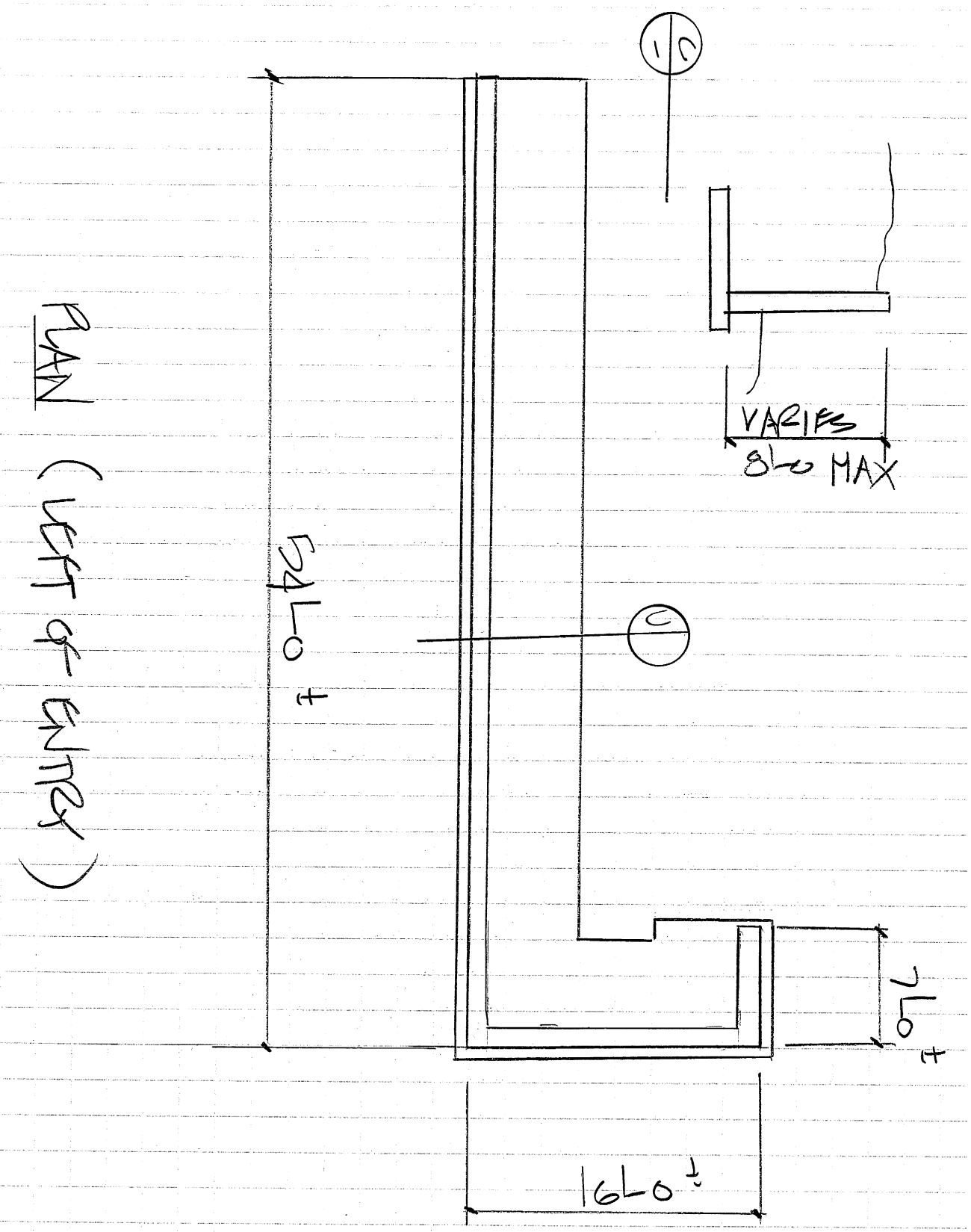


*DRAIN SYSTEM MUST PREVENT WATER BUILD-UP BEHIND WALLS (WALL NOT DESIGNED FOR HYDRO-STATIC LOAD)

F1 / -- SECTION THRU RETAINING WALL

SCALE: NONE


32'-0 ±
PLAN (RIGHT OF ENTRY)
48'-0 ±
DEAD MAN
DEAD MAN
B
A
DEAD MAN
12'-0 ±
6'-0 ±
SECT A
4'-0 ±
SECT B
DEAD MAN
TIE DEAD MAN STEEL TO FNG.
8'-0 ±



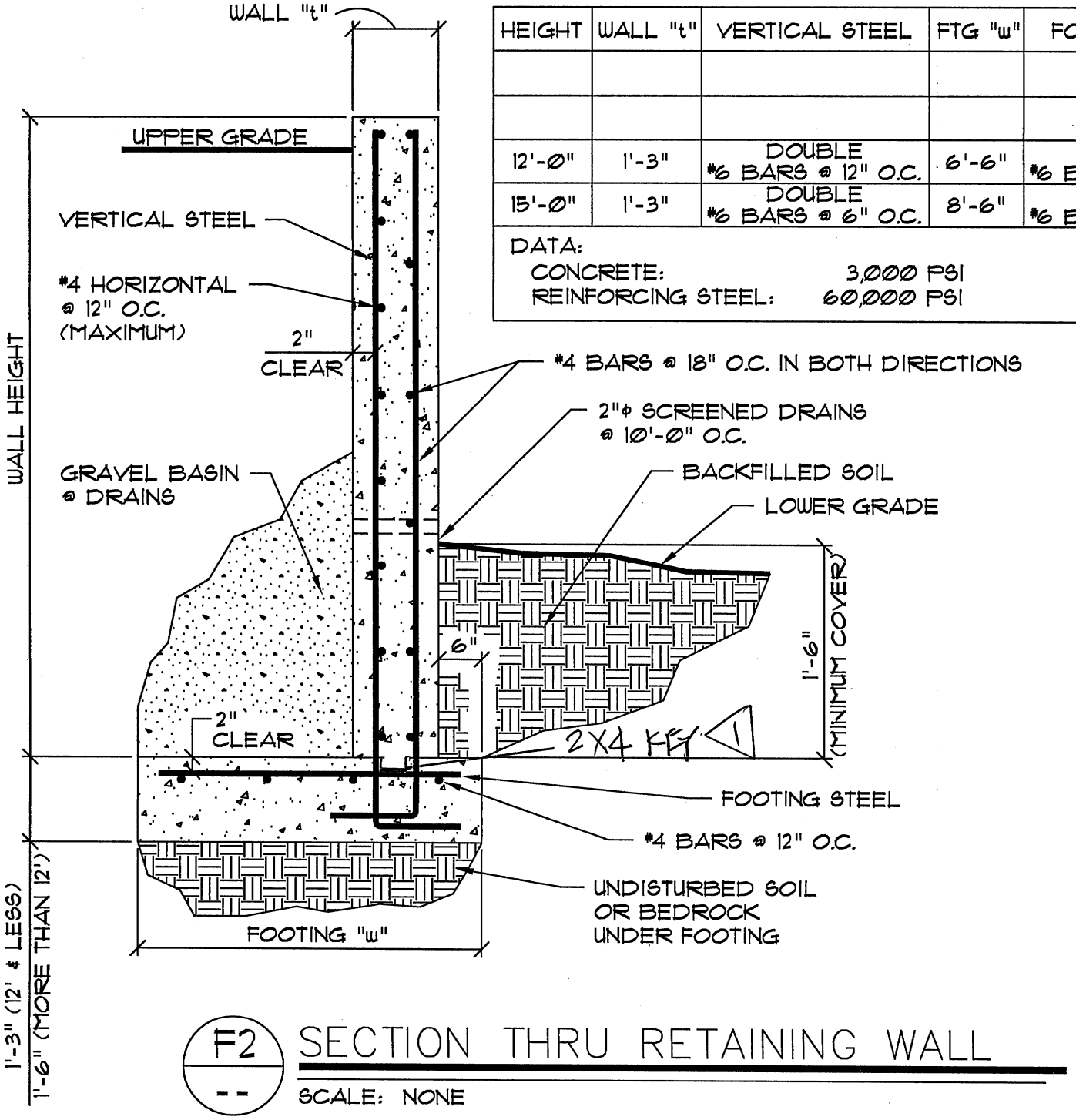
PLAN (LEFT OF ENTRY)

9

1 4/4/13

HEIGHT	WALL "t"	VERTICAL STEEL	FTG "w"	FOOTING STEEL
12'-0"	1'-3"	DOUBLE #6 BARS @ 12" O.C.	6'-6"	DOUBLE #6 BARS @ 12" O.C.
15'-0"	1'-3"	DOUBLE #6 BARS @ 6" O.C.	8'-6"	DOUBLE #6 BARS @ 6" O.C.

DATA:
CONCRETE: 3,000 PSI
REINFORCING STEEL: 60,000 PSI



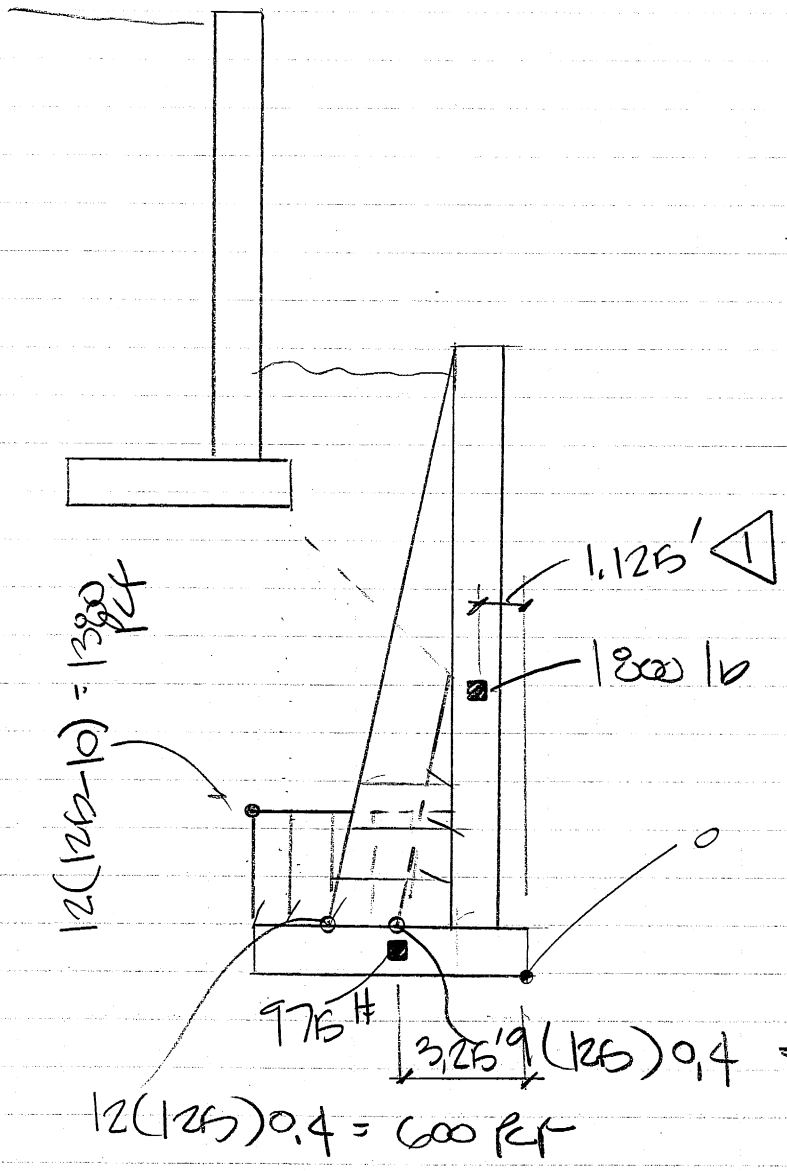
F2 / --

SECTION THRU RETAINING WALL

SCALE: NONE

TWELVE FOOT RETAINING WALLS

△1 6/4/13 (7)



$\Sigma M_0 = 0$: $-450\left(\frac{5}{2}\right)\left(\frac{5}{3}\right) - 600\left(\frac{12}{2}\right)\left(\frac{12}{3}\right) + 1380(5)(4)$

△1 $+ 1800(1,125) + 975\left(\frac{6,5}{2}\right) =$

$-16,275 + 32,794 = 16,518$ OK

$M_{MAX\ OPEN} = 600\left(\frac{12}{2}\right)\left(\frac{12}{3}\right) + 450\left(\frac{5}{2}\right)\left(\frac{5}{3}\right) = \underline{16,275}$ FT LB

$M_{MAX\ FTNG} = 1380(5)^2/2 = \underline{17,250}$ FT LB

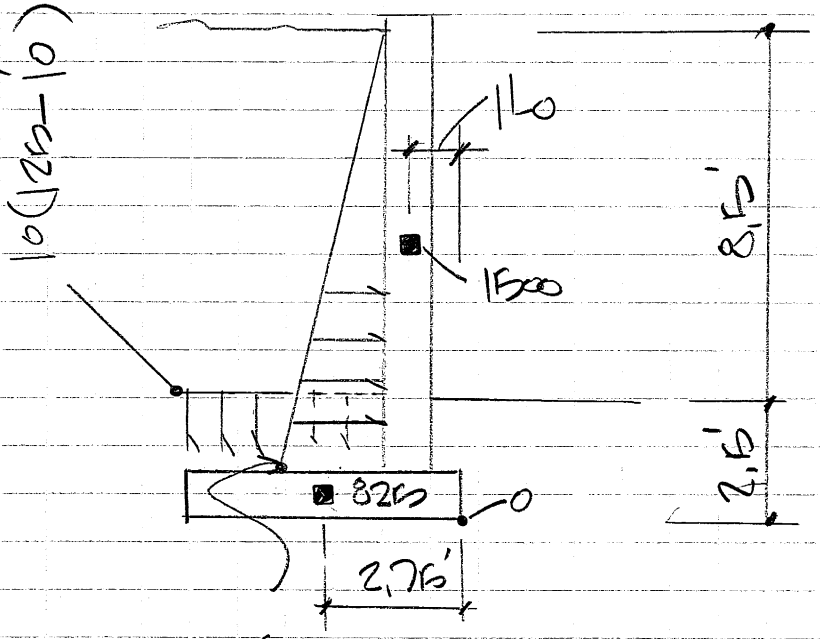
EIGHT FOOT RETAINING WALLS

$w_A = 10(125-0) = 1150$ PCF

UNKNOWN SOILS

USE $w = 125$ PCF

USE $K_q = 0.4$



$10(125)0.4 = 500$ LB/FT

CHECK 10LO WALL

$$\Sigma M_0 = -500\left(\frac{10}{2}\right)\left(4\tfrac{1}{3}\right) + 1150(4)3.5 + 825(2.75) + 1500(1) = 0$$

$$+9034 \text{ LB OK}$$

$$M_{MAX_{SOIL}} = 500\left(\frac{10}{2}\right)\left(\frac{10}{3}\right) = \underline{8,333} \text{ FT LB}$$

$$M_{MAX_{FOOT}} = 1150(4)2.5 = 11,500 \text{ FT LB}$$

CHECK STEM 10-0 WALLS

TRY #5 @ 10" O.C.

$$9 - \frac{60(0.31)}{0.85(3)10} = 0.73$$

$$M_u = 0.9(60)\left(0.31\left(\frac{13}{10}\right)\right)\left(10 - \frac{0.73}{2}\right) = 16{,}129 \text{ FT-LBS}$$

OK

$$1.7(8333) = 14{,}166 \text{ FT-LBS}$$

CHECK FOOTING 10-0 WALLS

SAME OK.

TWELVE FOOT WALL STEM

TRY #6 @ 10

$$q = \frac{60(0.44)}{0.85(3)10} = 1.03 \text{ KSF}$$

$$M_u = 0.9(60{,}000)\left(0.44\left(\frac{12}{10}\right)\left(10 - \frac{1.03}{2}\right)\right) = 22{,}530 \text{ FT LBS}$$

$$1.7(16{,}275) = 27{,}668 \text{ FT LBS}$$ INCREASE TO #6 @ 12"

$$q = \frac{60(0.88)}{0.85(3)12} = 1.72 \text{ KSF}$$

$$M_u = 0.9(60{,}000)(0.88)\left(13 - \frac{1.72}{2}\right) = 48{,}064 \text{ FT LBS}$$ OK

REVIEW COMMENTS

CHECK BEARING PRESSURE

VERTICAL LOADS:

STEM	1500
FTNG	825
	2325

$\frac{2325}{5.5} = 423 \text{ lb/ft}^2$

ADD TO SOIL BEARING

$\frac{(4)1150}{5.5} + 423 = 1259$ PSF OK.

HAVE WILL BE LESS THAN q' ∴ CONSERVATIVE

CHECK SLIDING

K_a (SOILS REPORT) = 0.35

TOTAL LATERAL FORCE

$0.35(125)10 = 437.5$ PSF

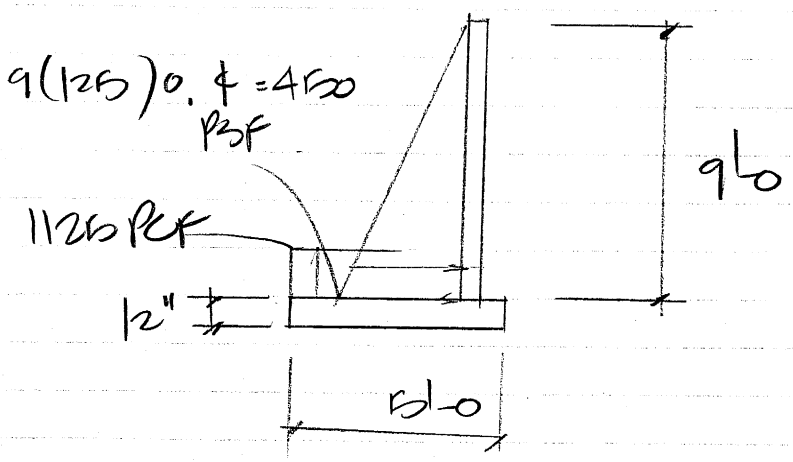
$437.5\left(\frac{10}{2}\right) = 2187.5$ lb/ft

PASSIVE $350 PSF (2.5) = 843$ lb/ft

FRICTION $0.3((1150 \times 4) + 1500 + 825) =$ 2070 lb/ft

$2070 + 843 = 2920$ lb/ft OK.

FOR 9'-0 WALLS



$$\Sigma M_0 = -4500\left(\frac{5}{2}\right)\left(\frac{5}{3}\right) - 4500\left(\frac{9}{2}\right)\left(\frac{9}{3}\right) + 1125(3.5)3.25 + 5(150)\left(\frac{5}{2}\right) + 9(150)1 =$$

$$-79500 + 16,022 = 8071 \text{ FT LBS}$$

OK

MOMENT IN STEM

-7950 FT LBS

$$\frac{0.2}{0.75} = 0.2667 \text{ IN}^2/\text{FT} \qquad = 0.31$$

$$\frac{0.31}{0.8333} = 0.372 \text{ IN}^2/\text{FT}$$

TRY #5 @ 12" O.C.

$$q = \frac{60(0.31)}{0.85(3)12} = 0.61$$

$$M_u = 0.9(60{,}000)(0.31)\left(6 - \frac{0.61}{2}\right) = 7946 \text{ FT LBS}$$

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6/3/13