JOB TITLE Existing Structural Floor Strengthening

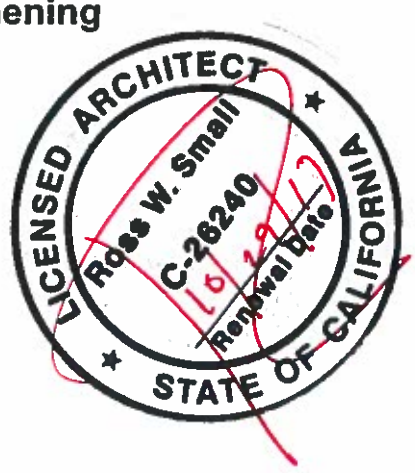
JOB NO.	SHEET NO.
CALCULATED BY JJK	DATE 1/18/16
CHECKED BY JR	DATE

STRUCTURAL CALCULATIONS

FOR

Existing Structural Floor Strengthening

939 16th St., Hermosa Beach, CA 92054



Client: Melinda Brown

The Client recognizes that the design professional's liability is limited to only the structural elements in this calculation set, and therefore, NO responsibility is warranted for any field construction errors, changes in the specified material, adequacy of other structural elements not part of this calculation set or any different loading conditions NOT considered in this calculation set.

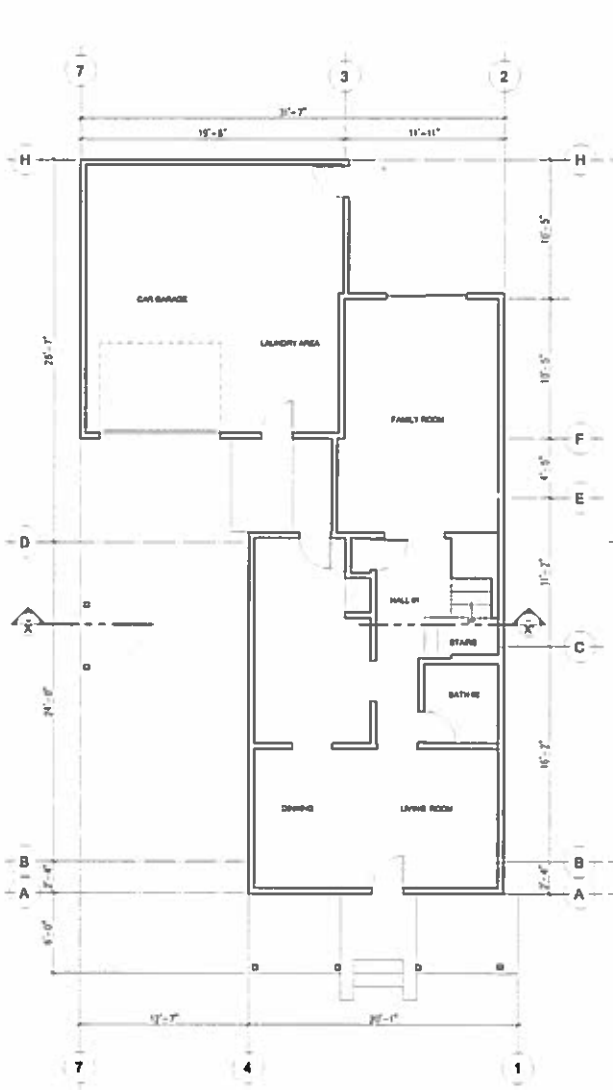
The structural calculations performed on the following pages represent the clients request for professional services involving the ***DESIGN*** or ***ANALYSIS*** of structural elements consisting of :

Scope of Work : Provide new pier supports under existing girder to stiffen vertical movements ONLY. New wood girders are also provided as required.

Provided Data : 1. Existing Field dimensions and photos

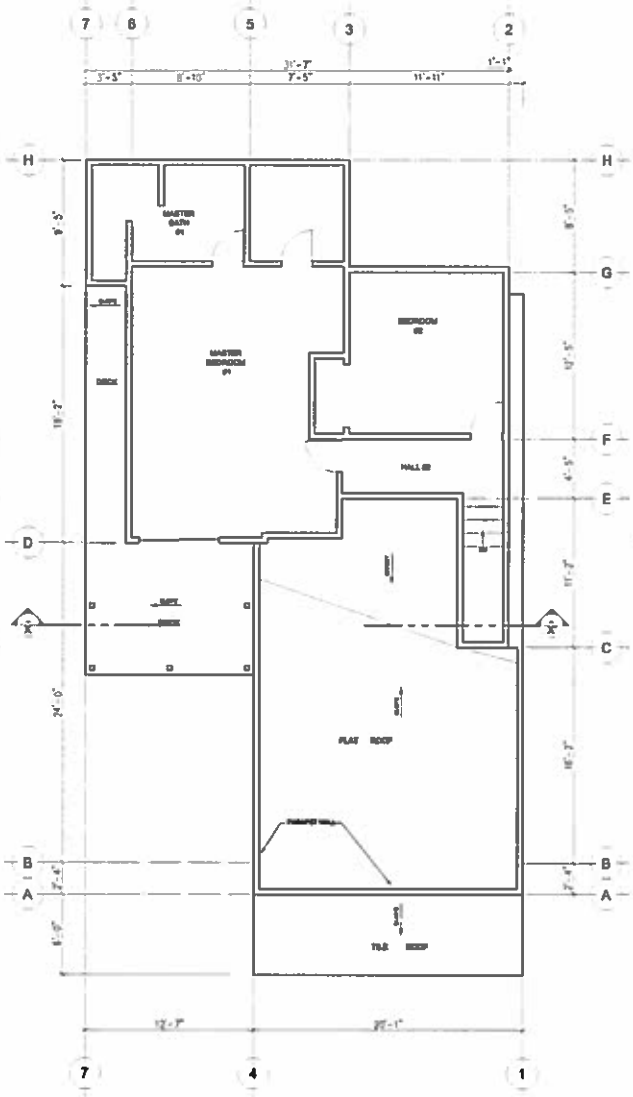
Assumptions Used : 1. No construction OVERSIGHT to be performed.
2. Existing field measurements are accurate.
3. No other structural analysis or design was performed that is not part of scope.

SITE INFORMATION



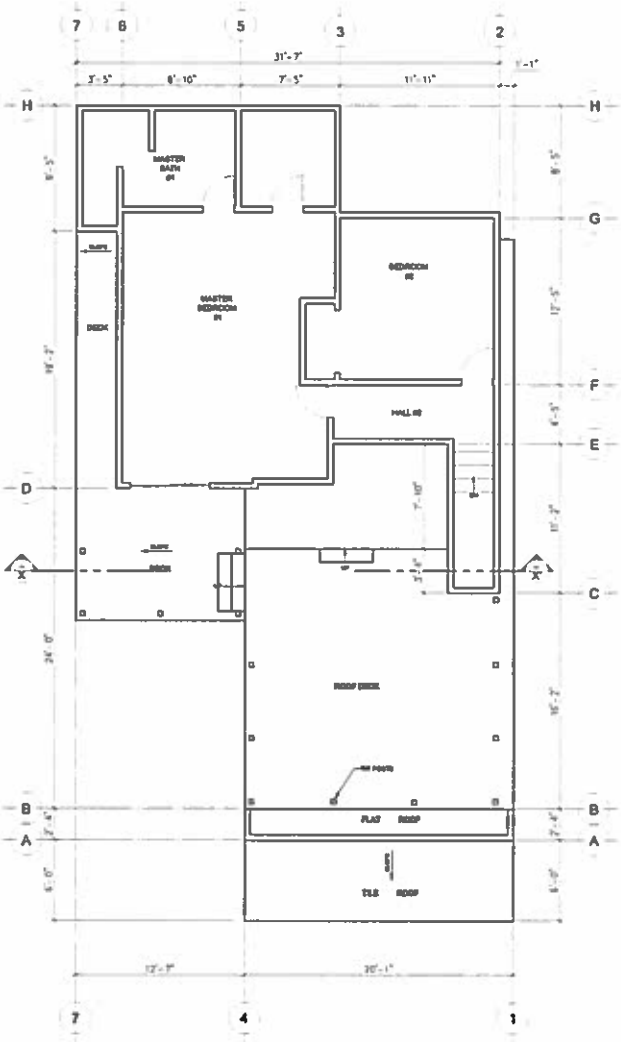
EXISTING FIRST FLOOR PLAN

1/4" = 1'-0"



EXISTING SECOND FLOOR PLAN

1/4" = 1'-0"



NEW SECOND FLOOR ROOF DECK PLAN

1/4" = 1'-0"

CALCULATIONS

CASE (1)

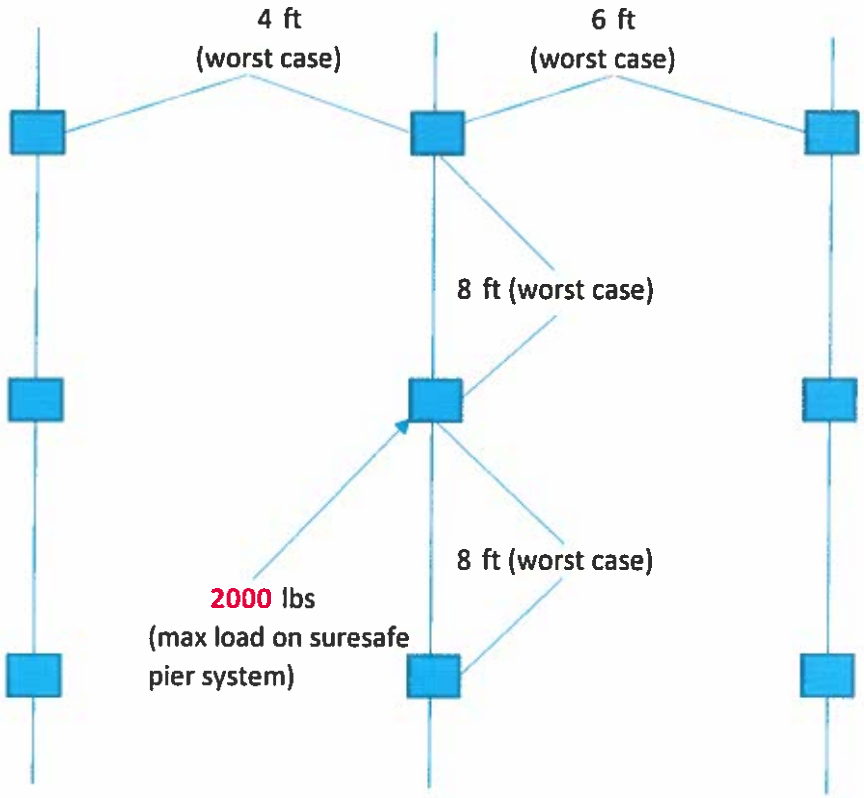
WORST CASE LOADING ON SURE SAFE PIER SYSTEM BASED ON TRIBUTARY WIDTH OF VERTICAL LOADS

ASSUMPTIONS :

Exterior walls support roof loads to exterior foundation U.O.N.

Worst case interior loadings are used to obtain maximum vertical load to sure safe concrete footing bag, wood post and base plate along with obtaining the worst case actual soil bearing pressure (See attached calculations).

ONLY worst case floor / Roof loads are used to calculate tributary vertical loads to the sure safe pier system.



Floor				Roof			
DL	=	10	psf	DL	=	0	psf
LL	=	40	psf	LL	=	0	psf

Int Wall

DL = 0 psf → 0 → (Roof + Wall Load)

Use : 2000 lbs This Load is used to check the base plate, wood post and actual brng pressure applied - (See attached calculations)

(CASE 2) INT. BRNG

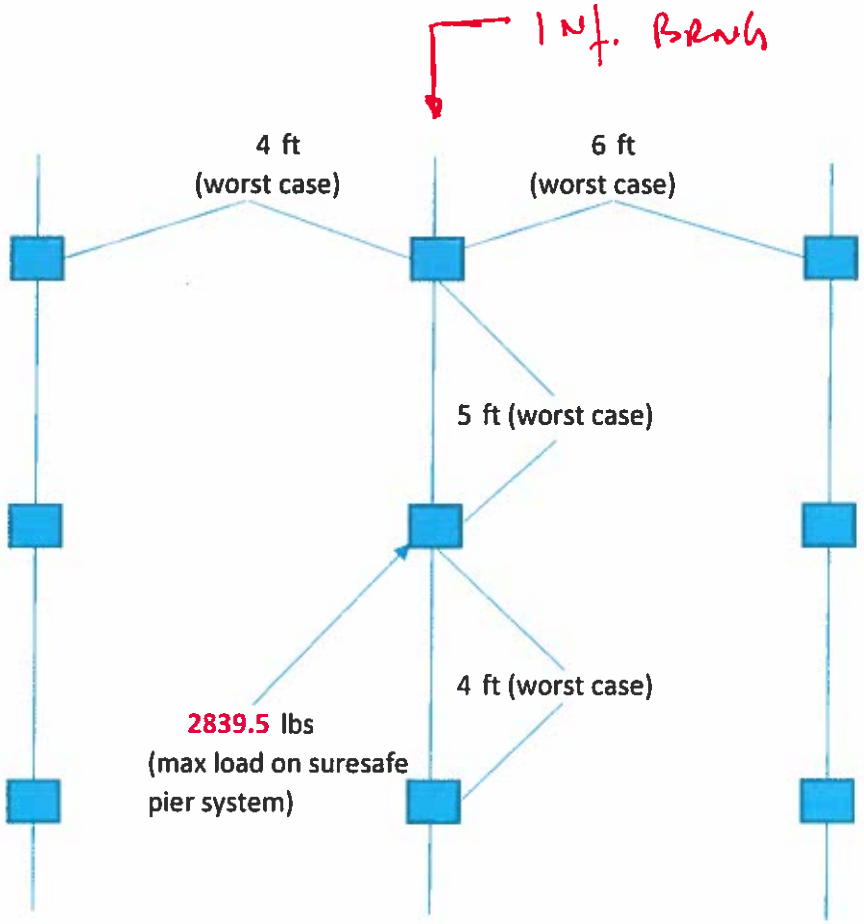
WORST CASE LOADING ON SURE SAFE PIER SYSTEM BASED ON TRIBUTARY WIDTH OF VERTICAL LOADS

ASSUMPTIONS :

Exterior walls support roof loads to exterior foundation U.O.N.

Worst case interior loadings are used to obtain maximum vertical load to sure safe concrete footing bag, wood post and base plate along with obtaining the worst case actual soil bearing pressure (See attached calculations).

ONLY worst case floor / Roof loads are used to calculate tributary vertical loads to the sure safe pier system.



Floor				Roof			
DL	=	20	psf	DL	=	15	psf
LL	=	60	psf	LL	=	20	psf

Int Wall

DL = 7 psf 1039.5 → (Roof + Wall Load)

Use : 2839.5 lbs This Load is used to check the base plate, wood post and actual brng pressure applied - (See attached calculations)

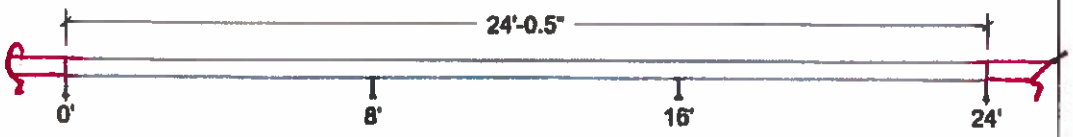
WoodWorks®	COMPANY	PROJECT
		NEW WOOD GIRDER
	Nov. 5, 2015 12:32	Beam1.wwb

Design Check Calculation Sheet
WoodWorks Sizer 10.4

Loads: WORST CONDITION

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Full UDL	No			200.0		plf
Self-weight	Dead	Full UDL	No			4.6		plf

Maximum Reactions (lbs), Bearing Capacities (lbs) and Bearing Lengths (in) :



Unfactored:							
Dead	659		1800		1800		659
Factored:							
Total	659		1800		1800		659
Bearing:							
Capacity							
Beam	1094		2446		2446		1094
Support	1211		1800		1800		1211
Anal/Des							
Beam	0.60		0.74		0.74		0.60
Support	0.54		1.00		1.00		0.54
Load comb	#1		#1		#1		#1
Length	0.50*		0.74		0.74		0.50*
Min req'd	0.50*		0.74**		0.74**		0.50*
Cb	1.00		1.50		1.50		1.00
Cb min	1.00		1.50		1.50		1.00
Cb support	1.11		1.11		1.11		1.11
Fcp sup	625		625		625		625

*Minimum bearing length setting used: 1/2" for end supports
**Minimum bearing length governed by the required width of the supporting member.

Lumber-soft, D.Fir-L, No.2, 4x6 (3-1/2"x5-1/2")
Supports: All - Timber-soft Beam, D.Fir-L No.2
Total length: 24'-0.5"; volume = 3.2 cu.ft.;
Lateral support: top= at supports, bottom= at supports;

WARNING: Member length exceeds typical stock length of 20.0 [ft]

Analysis vs. Allowable Stress and Deflection using NDS 2012 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 69	Fv' = 162	psi	fv/Fv' = 0.42
Bending(+)	fb = 712	Fb' = 1053	psi	fb/Fb' = 0.68
Bending(-)	fb = 890	Fb' = 1053	psi	fb/Fb' = 0.85
Live Defl'n	negligible			
Total Defl'n	0.19 = L/499	0.40 = L/240	in	0.48

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL	CF	Cfu	Cr	Cfrt	Ci	Cn	LC#
Fv'	180	0.90	1.00	1.00	-	-	-	-	1.00	1.00	1.00	1
Fb'+	900	0.90	1.00	1.00	1.000	1.300	1.00	1.00	1.00	1.00	-	1
Fb'-	900	0.90	1.00	1.00	1.000	1.300	1.00	1.00	1.00	1.00	-	1
Fcp'	625	-	1.00	1.00	-	-	-	-	1.00	1.00	-	-
E'	1.6 million		1.00	1.00	-	-	-	-	1.00	1.00	-	1

CRITICAL LOAD COMBINATIONS:

Shear : LC #1 = D only, V = 982, V design = 882 lbs
Bending(+): LC #1 = D only, M = 1047 lbs-ft
Bending(-): LC #1 = D only, M = 1309 lbs-ft
Deflection: LC #1 = D only (total)
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 77.6e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Continuous or Cantilevered Beams: NDS Clause 4.2.5.5 requires that normal grading provisions be extended to the middle 2/3 of 2 span beams and to the full length of cantilevers and other spans.
4. Sawn lumber bending members shall be laterally supported according to the provisions of NDS Clause 4.4.1.

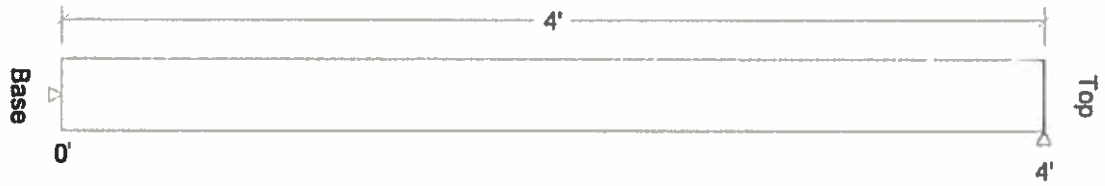
WoodWorks® SOFTWARE FOR WOOD DESIGN	COMPANY	PROJECT
		WORST LOAD
	Jan. 5, 2016 13:52	Column1

Design Check Calculation Sheet
WoodWorks Sizer 10.42

Loads:

Load	Type	Distribution	Pat-tern	Location [ft] Start	End	Magnitude Start	End	Unit
Load1	Dead	Axial		(Ecc. = 0.58")		3906		lbs
Self-weight	Dead	Axial				12		lbs

Lateral Reactions (lbs):



Unfactored:			
Dead	47		-47
Factored:			
R->L			47
Load comb			#1
L->R	47		
Load comb	#1		#1

Lumber Post, D.Fir-L, No.2, 4x4 (3-1/2"x3-1/2")
Support: Non-wood
Total length: 4'; volume = 0.3 cu.ft.;
Pinned base; Load face = width(b); Ke x Lb: 1.0 x 4.0 = 4.0 [ft]; Ke x Ld: 1.0 x 4.0 = 4.0 [ft];

Analysis vs. Allowable Stress and Deflection using NDS 2012 :

Criterion	Analysis Value	Design Value	Unit	Analysis/Design
Shear	fv = 6	Fv' = 162	psi	fv/Fv' = 0.04
Bending(+)	fb = 319	Fb' = 1215	psi	fb/Fb' = 0.26
Axial	fc = 320	Fc' = 1188	psi	fc/Fc' = 0.27
Combined (axial + eccentric moment)				Eq.15.4-3 = 0.38
Axial Bearing	fc = 320	Fc* = 1397	psi	fc/Fc* = 0.23
Live Defl'n	negligible			
Total Defl'n	0.03 = <L/999	0.27 = L/180	in	0.09

Additional Data:

FACTORS:	F/E(psi)	CD	CM	Ct	CL/CP	CF	Cfu	Cr	Cfrt	Ci	LC#
Fv'	180	0.90	1.00	1.00	-	-	-	-	1.00	1.00	1
Fb'+	900	0.90	1.00	1.00	1.000	1.500	1.00	1.00	1.00	1.00	1
Fc'	1350	0.90	1.00	1.00	0.850	1.150	-	-	1.00	1.00	1
E'	1.6 million		1.00	1.00	-	-	-	-	1.00	1.00	1
Emin'	0.58 million		1.00	1.00	-	-	-	-	1.00	1.00	1
Fc*	1350	0.90	1.00	1.00	-	1.150	-	-	1.00	1.00	1

CRITICAL LOAD COMBINATIONS:

Shear : LC #1 = D only, V = 47, V design = 47 lbs
Bending(+): LC #1 = D only, M = 190 lbs-ft
Deflection: LC #1 = D only (total)
Axial : LC #1 = D only, P = 3918 lbs
Eq.15.4-3 : LC #1 = D only Fb' = 1215
FcE= 2535 Pxe/S=fc(6xe/d)= 319
D=dead L=live S=snow W=wind I=impact Lr=roof live Lc=concentrated E=earthquake
All LC's are listed in the Analysis output
Load combinations: ASCE 7-10 / IBC 2012

CALCULATIONS:

Deflection: EI = 20.0e06 lb-in2
"Live" deflection = Deflection from all non-dead loads (live, wind, snow…)
Total Deflection = 1.50(Dead Load Deflection) + Live Load Deflection.

Design Notes:

1. WoodWorks analysis and design are in accordance with the ICC International Building Code (IBC 2012), the National Design Specification (NDS 2012), and NDS Design Supplement.
2. Please verify that the default deflection limits are appropriate for your application.
3. Axial load eccentricity applied in direction of load face only. It is the designers responsibility to check for effect of eccentricity in the other direction.

JJKGroup, Inc. Consulting Structural Engineers

PROJECT :
CLIENT :
JOB NO. :
DATE :

PAGE :
DESIGN BY :
REVIEW BY :

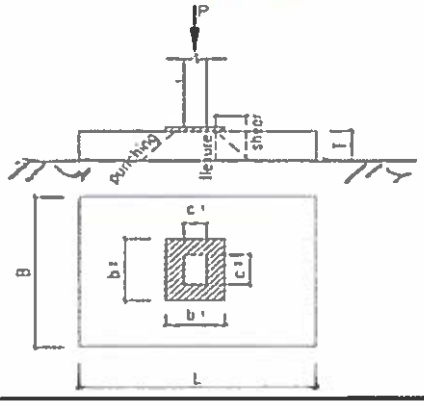
Plain Concrete Footing Design Based on ACI 318-08

INPUT DATA

COLUMN WIDTH	c_1	=	4	in
COLUMN DEPTH	c_2	=	4	in
BASE PLATE WIDTH	b_1	=	12	in
BASE PLATE DEPTH	b_2	=	12	in
FOOTING CONCRETE STRENGTH	f'c	=	2.5	ksi
REBAR YIELD STRESS	f_y	=	60	ksi
AXIAL DEAD LOAD	P_{DL}	=	3.9	k
AXIAL LIVE LOAD	P_{LL}	=	0	k
LATERAL LOAD (0=WIND, 1=SEISMIC)		=	1	Seismic,SD
SEISMIC AXIAL LOAD	P_{LAT}	=	0	k, SD
SURCHARGE	qs	=	0	ksf
SOIL WEIGHT	ws	=	0.11	kcf
FOOTING EMBEDMENT DEPTH	Df	=	0.00	ft
FOOTING THICKNESS	T	=	5	in
ALLOWABLE SOIL PRESSURE	Qa	=	1	ksf
FOOTING WIDTH	B	=	2.5	ft
FOOTING LENGTH	L	=	2.5	ft

DESIGN SUMMARY

FOOTING WIDTH	B	=	2.50	ft
FOOTING LENGTH	L	=	2.50	ft
FOOTING THICKNESS	T	=	5	in



THE FOOTING DESIGN IS ADEQUATE.

ANALYSIS

DESIGN LOADS (IBC SEC.1605.3.2 & ACI 318-08 SEC.9.2.1)

CASE 1:	DL + LL	P	=	4	k	1.2 DL + 1.6 LL	Pu	=	5	k
CASE 2:	DL + LL + E / 1.4	P	=	4	k	1.2 DL + 1.0 LL + 1.0 E	Pu	=	5	k
CASE 3:	0.9 DL + E / 1.4	P	=	4	k	0.9 DL + 1.0 E	Pu	=	4	k

CHECK SOIL BEARING CAPACITY (ACI 318-08 SEC.15.2.2)

$$q_{MAX} = \frac{P}{BL}$$

CASE 1 = 0.64 ksf, CASE 2 = 0.64 ksf, CASE 3 = 0.58 ksf

$q_{MAX} < k\,Q_a$ [Satisfactory]

where k = 1 for gravity loads, 4/3 for lateral loads.

DESIGN FOR FLEXURE (ACI 318-08 SEC.22.5.1)

$$\phi M_n = MIN\left(5\phi\sqrt{f'_c}S,\ 0.85\phi f_r S\right) = 1.58 \text{ ft-kips}$$

where ϕ = 0.6 (ACI 318-08, Section 9.3.5)
S = elastic section modulus of section = 125 in^3

$$M_u = \frac{(0.5L - 0.25b_1 - 0.25c_1)^2 P_{u,max}}{2L} = 0.79 \text{ ft-kips} < \phi M_n \quad \text{[Satisfactory]}$$

CHECK FLEXURE SHEAR (ACI 318-08 SEC.22.5.4)

$$\phi V_n = \frac{4}{3}\phi\sqrt{f'_c}BT = 6.00 \text{ kips}$$

where ϕ = 0.6 (ACI 318-08, Section 9.3.5)

$$V_u = (0.5L - 0.25b_1 - 0.25c_1 - T)\frac{P_{u,max}}{L} = 0.94 \text{ kips} < \phi V_n \quad \text{[Satisfactory]}$$

CHECK PUNCHING SHEAR (ACI 318-08 SEC.22.5.4)

$$\phi V_n = MIN\left[\left(\frac{4}{3} + \frac{8}{3\beta_c}\right),\ 2.66\right]\phi\sqrt{f'_c}(c_1 + c_2 + b_1 + b_2 + 4T)T = 20.75 \text{ kips}$$

where ϕ = 0.6 (ACI 318-08, Section 9.3.5)
β_c = ratio of long side to short side of concentrated load = 1.00

$$V_u = P_{u,max}\left[1 - \frac{1}{BL}\left(\frac{b_1 + c_1}{2} + T\right)\left(\frac{b_2 + c_2}{2} + T\right)\right] = 3.80 \text{ ft-kips} < \phi V_n \quad \text{[Satisfactory]}$$

Rev: 580002

Steel Column Base Plate

Description worst case loading

General Information

Code Ref : AISC 9th Ed ASD, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Loads

Axial Load	3.90 k
X-X Axis Moment	0.00 k-ft

Plate Dimensions

Plate Length	12.000 in
Plate Width	12.000 in
Plate Thickness	0.250 in

Support Pier Size

Pier Length	30.000 in
Pier Width	30.000 in

Steel Section TS4x4x1/4

Section Length	4.000 in
Section Width	4.000 in
Flange Thickness	0.250 in
Web Thickness	0.000 in

Allowable Stresses

Concrete f'c	3,000.0 psi
Base Plate Fy	36.00 ksi
Load Duration Factor	1.330

Anchor Bolt Data

Dist. from Plate Edge	2.000 in
Bolt Count per Side	2
Tension Capacity	5.500 k
Bolt Area	0.442 in2

Summary

Baseplate OK

Concrete Bearing Stress	**Bearing Stress OK**	
Actual Bearing Stress		27.1 psi
Allow per ACI318-02, Appx. = 0.3 * f'c * Sqrt(A2/A1) * LDF		2,394.0 psi
Allow per AISC J9		2,793.0 psi
Plate Bending Stress	**Thickness OK**	
Actual fb		25,168.0 psi
Max Allow Plate Fb		35,910.0 psi
Tension Bolt Force	**Bolt Tension OK**	
Actual Tension		0.000 k
Allowable		5.500 k

Full Bearing : No Bolt Tension