

STRUCTURAL CALCULATIONS

for the

BARN REMODEL

at

1030 Thompson Ln, Petaluma

for

Muir Wood LLC / Carlos Shelton, Agent

Date: Dec 9, 2023

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12/09/23

FOWLER STRUCTURAL ENGINEERING

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FOWLER STRUCTURAL ENGINEERING
925 WEST RAILROAD AVE, COTATI CA 94931
(707) 776-7500

Project: BARN REMODEL Proj. No: 23-15
Address: 1030 Thompson Ln, Petaluma
Owner: Muir Wood LLC / Carlos Shelton, Agent
Date: 12/1/23 12/4/23

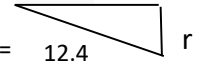
p. 1 LOADS, psf

ROOF, RAFTER FRMG Slope = r : 12 r = 3

ITEM	DESCRIPTION	CALC.	W psf	D _{HORZ}	SUBTL
Roofing	Comp shingle		4.0	4.1	
Bldg Paper	30# Felt	30 / 100	0.3	0.3	
Roof diaph	1/2" wd str pnl		1.5	1.5	6.0
Rafters	2x8 @24"oc	2.6 2	1.3	1.4	7.3
Insulation			0.5	0.5	
Ceiling	5/8" gyp brd	2.8		2.8	
Total				10.6	

$$D_{\text{HORZ}} = W f_h, f_h = \text{hypot}/12 = 1.031 \quad 12$$

$$\text{hypotenuese} = \text{sqrt.}(12^2 + r^2) = 12.4$$



→ Rafter span = 11'-6" < 15'-1" allowed [CRC Table R802.4.1(2)]
Roof live = 20 psf Table uses 20 psf LL; 10 psf DL

INTERIOR WALLS

ITEM	DESCRIPTN	CALC.	DL
Inter shtg	1/2" gyp brd, b.f.	2.2 2	4.4
Studs	2x4 @ 16"	1.3 / 1.33	1.0
Plates	2-2x4	2.6 / 5	0.5
Insul			0.3
BP Shtg	1/2" WSP		1.5
Total			7.7

EXTERIOR WALLS

ITEM	DESCRIPTN	CALC.	DL
Interior shtg	1/2" gyp brd	2.2	2.2
Studs	2x6 @ 16"	2.0 / 1.33	1.5
Plates	2-2x6	2.0 / 5	0.4
Paper	15# felt	15 / 100	0.2
Strl shtg	5/8" Shtg	2.0	2.0
Extr Fin			2.3
Total			8.6

SCOPE OF PROJECT - Barn Remodel

LATERAL BRACING - Wood structural panel conventional sheathing on exterior wall lines & two interior lines.

DESIGN CRITERIA

BUILDING CODE: 2022 California Building (CBC) & Residential (CRC) Codes

ROOF LIVE LOAD [CRC Table R301.6] $L_r = 20$ psf for slope = 3 in 12

FLOOR LIVE LOAD [CRC Table R301.5] $L = 40$ psf - Residential Room

FOUNDATION Continuous shallow spread footing 12-in min width [CRC Table R403.1(1) 1-story]
Soil Bearing allowable pressure: 1,500 psf [CRC Table R401.4.1]

SEISMIC CRITERIA (p. 2)

SEISMIC DESIGN CATEGORY D (See code refs at S_{DS} , below)

Map'd Spectral Response Acceleration

Design Spectral Response Accelerations

$S_s = 1.50$ g

$S_{DS} = 1.2 < 1.25g$ - SDC D2 Braced Walls [CRC Tbl R301.2.2.1.1]

$S_1 = 0.60$ g < 0.75, SDC D [CBC 1613.2.5]

WIND (3 Sec Gust Speed, mph)

93 Basic Design, Exp C [CBC Fig 1609.3(1)]

EXPOSURE: B

CONC COMP STRENGTH, f'_c

2500 psi

CONC REINF STEEL, GRADE

60 #4 & LARGER

40 #3 & SMALLER

Uplift [CRC Table R802.11]: Exp C, <5:12, 24" oc =296#

FOWLER STRUCTURAL ENGINEERING	Project:	BARN REMODEL	Proj. No: 23-15
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	Date:	10/23/23	

p. 2 - DESIGN CRITERIA (contd) / SEISMIC GROUND MOTION VALUES

SPECTRAL RESPONSE ACCELERATION [CBC Fig.1613.3.1(1) & ASCE 7-10, 11.4.1]

[SEAOC <https://seismicmaps.org/>]

BARN REMODEL

1030 Thompson Ln, Petaluma

Latitude, Longitude: 38.2521, -122.6820

12/1/2023, 6:30:45 PM

Design Code Reference Document

ASCE 7-16

Risk Category

II

Site Class

D - Default (See Section 11.4.3)

Type	value	Description
S_s	1.5	MCE _R ground motion. (for 0.2 second period)
S_1	0.6	MCE _R ground motion. (for 1.0s period)
S_{MS}	1.8	Site-modified spectral acceleration value
S_{M1}		Site-modified spectral acceleration value $S_{M1} = F_v S_1$ [CBC, 1613.2.3 Equa (16-37) ASCE 7, Equa (11.4-2)
S_{Ds}	1.2	Numeric seismic design value at 0.2 second SA
S_{D1}		Numeric seismic design value at 1.0 second SA $S_{D1} = 2/3 S_{M1}$ (11.4-4)
SDC	D₂	Seismic design category $S_1 < 0.75$ - SDC D; $S_{Ds} < 1.25$, SDC D2 for CRC
F_a	1.2	Site amplification factor at 0.2 second
F_v		Site amplification factor at 1.0 second CBC, Table 1613.2.3(2)
PGA	0.547	MCE _G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGAM	0.657	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds

Multiple Simple Beam

Project File: 23-15 Muir.ec6

LIC#: KW-06019286, Build:20.23.08.30

FOWLER STRUCTURAL ENGINEERING

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Description : p. B1 - BEAMS

Wood Beam Design : BEAM B1 - MAIN RIDGE BEAM

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **3-1.75x18, GP LAM LVL, Fully Braced**

Using Load Resistance Factor Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Louisiana Pacific

Wood Grade : SolidStart LVL 2900Fb-2.0E

Fb - Tension 2,900.0 psi Fc - Prll 3,200.0 psi Fv 285.0 psi Ebend- xx 2,000.0 ksi Density 28.720 pcf

Fb - Compr 2,900.0 psi Fc - Perp 750.0 psi Ft 1,800.0 psi Eminbend - xx 1,000.0 ksi

Applied Loads

Beam self weight calculated and added to loads

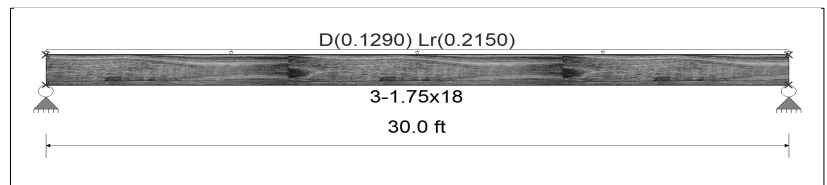
Unif Load: D = 0.0120, Lr = 0.020 k/ft, Trib= 10.750 ft

Design Summary

Max fb/Fb Ratio = **0.415 : 1**
fb : Actual : 2,482.94 psi at 15.000 ft in Span # 1
Fb : Allowable : 5,988.06 psi
Load Comb : +1.20D+1.60Lr

Max fv/FvRatio = **0.183 : 1**
fv : Actual : 112.56 psi at 28.600 ft in Span # 1
Fv : Allowable : 615.60 psi
Load Comb : +1.20D+1.60Lr

Max Reactions (k) $\begin{matrix} D & L_r & L & S & W & E & H \end{matrix}$
Left Support $\begin{matrix} 2.22 & 3.23 \\ 2.22 & 3.23 \end{matrix}$
Right Support



Max Deflections

Transient Downward	0.772 in	Total Downward	1.303 in
Ratio	466	Ratio	276
LC: Lr Only		LC: +D+Lr	
Transient Upward	0.000 in	Total Upward	0.000 in
Ratio	9999	Ratio	9999
LC:		LC:	

Wood Beam Design : BEAM B2 - CANTILEVERED RIDGE CARRYING B1

Calculations per NDS 2018, IBC 2021, ASCE 7-16

BEAM Size : **3-1.75x18, GP LAM LVL, Fully Braced**

Using Load Resistance Factor Design with IBC 2021 Load Combinations, Major Axis Bending

Wood Species : Louisiana Pacific

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Fb - Compr 2,900.0 psi Fc - Perp 750.0 psi Ft 1,800.0 psi Eminbend - xx 1,000.0 ksi

Applied Loads

Beam self weight calculated and added to loads

Unif Load: D = 0.00120, Lr = 0.020 k/ft, Trib= 10.750 ft

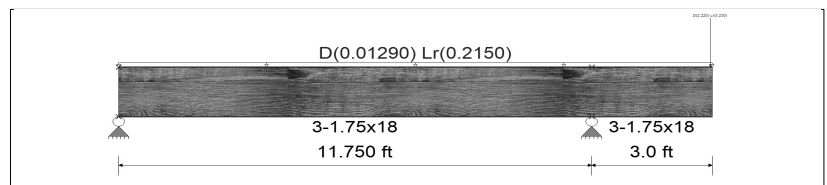
1Point: D = 2.220, Lr = 3.230 k @ 14.70 ft

Design Summary

Max fb/Fb Ratio = **0.175 : 1**
fb : Actual : 1,050.74 psi at 11.750 ft in Span # 1
Fb : Allowable : 5,988.06 psi
Load Comb : +1.20D+1.60Lr

Max fv/FvRatio = **0.217 : 1**
fv : Actual : 133.42 psi at 11.750 ft in Span # 1
Fv : Allowable : 615.60 psi
Load Comb : +1.20D+1.60Lr

Max Reactions (k) $\begin{matrix} D & L_r & L & S & W & E & H \end{matrix}$
Left Support $\begin{matrix} -0.38 & 0.37 \\ 3.07 & 6.03 \end{matrix}$
Right Support



Max Deflections

Transient Downward	0.037 in	Total Downward	0.068 in
Ratio	1930	Ratio	1052
LC: Lr Only		LC: +D+Lr	
Transient Upward	-0.015 in	Total Upward	-0.032 in
Ratio	9627	Ratio	4409
LC: Lr Only		LC: +D+Lr	

Wood Column

Project File: 23-15 Muir.ec6

LIC#: KW-06019286, Build:20.23.08.30

FOWLER STRUCTURAL ENGINEERING

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DESCRIPTION: p. C1 - COL C1 4x6+2x4 King E.S. (See p. B1, Beam B2, Reactions for Loading values.)

Code References

Calculations per NDS 2018, IBC 2021, ASCE 7-16
Load Combinations Used : IBC 2021

General Information

Analysis Method :	Load Resistance Factor Design			Wood Section Name	4x8	
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber	
Overall Column Height	9.5 ft			Wood Member Type	Sawn	
(Used for non-slender calculations)						
Wood Species	Douglas Fir-Larch			Exact Width	3.50 in	Allow Stress Modification Factors
Wood Grade	No.2			Exact Depth	7.250 in	
Fb +	900.0 psi	Fv	180.0 psi	Area	25.375 in^2	Cf or Cv for Bending 1.30
Fb -	900.0 psi	Ft	575.0 psi	Ix	111.148 in^4	Cf or Cv for Compression 1.050
Fc - Prll	1,350.0 psi	Density	31.210 pcf	Iy	25.904 in^4	Cf or Cv for Tension 1.20
Fc - Perp	625.0 psi					Cm : Wet Use Factor 1.0
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial			Ct : Temperature Factc 1.0
	Basic	1,600.0	1,600.0	1,600.0 ksi		Cfu : Flat Use Factor 1.0
	Minimum	580.0	580.0			Kf : Built-up columns 1.0
				Column Buckling Condition:		Use Cr : Repetitive ? No
				Fully braced against buckling ABOUT X-X Axis		
				ABOUT Y-Y Axis: Luy = 9.5 ft, Ky = 1.0		

Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Column self weight included : 52.247 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 9.50 ft, D = 3.070, Lr = 6.030 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio =	0.8266 : 1
Load Combination	+1.20D+1.60Lr
Governing NDS Formula	Comp Only, f_c/F_c'
Location of max.above base	0.0 ft
At maximum location values are . . .	
Applied Axial	13.395 k
Applied Mx	0.0 k-ft
Applied My	0.0 k-ft
Fc : Allowable	638.63 psi

Maximum SERVICE Lateral Load Reactions . .	
Top along Y-Y	0.0 k
Top along X-X	0.0 k
Bottom along Y-Y	0.0 k
Bottom along X-X	0.0 k

Maximum SERVICE Load Lateral Deflections . . .	
Along Y-Y	0.0 in at 0.0 ft above base
for load combination : n/a	
Along X-X	0.0 in at 0.0 ft above base
for load combination : n/a	

Other Factors used to calculate allowable stresses . . .

PASS Maximum Shear Stress Ratio =	0.0 : 1			
Load Combination	+0.90D	LRFD - Format Conversion factor	2.541	2.400
Location of max.above base	0.0 ft	LRFD - Resistance factor	0.850	0.900
Applied Design Shear	0.0 psi			2.700
Allowable Shear	0.0 psi			0.800

Load Combination Results

Load Combination	Lambda	Cp	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
+1.40D	1.000	0.209	0.2697	PASS	0.0 ft	0.0	PASS	0.0 ft
+1.20D+0.50Lr	1.000	0.209	0.4173	PASS	0.0 ft	0.0	PASS	0.0 ft
+1.20D	1.000	0.209	0.2312	PASS	0.0 ft	0.0	PASS	0.0 ft
+1.20D+1.60Lr	1.000	0.209	0.8266	PASS	0.0 ft	0.0	PASS	0.0 ft
+0.90D	1.000	0.209	0.1734	PASS	0.0 ft	0.0	PASS	0.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top	@ Base	@ Top	@ Base	@ Base	@ Top	@ Base	@ Top
D Only					3.122				
+D+Lr					9.152				

Wood Column

Project File: 23-15 Muir.ec6

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DESCRIPTION: p. C1 - COL C1 4x6+2x4 King E.S. (See p. B1, Beam B2, Reactions for Loading values.)

Maximum Reactions

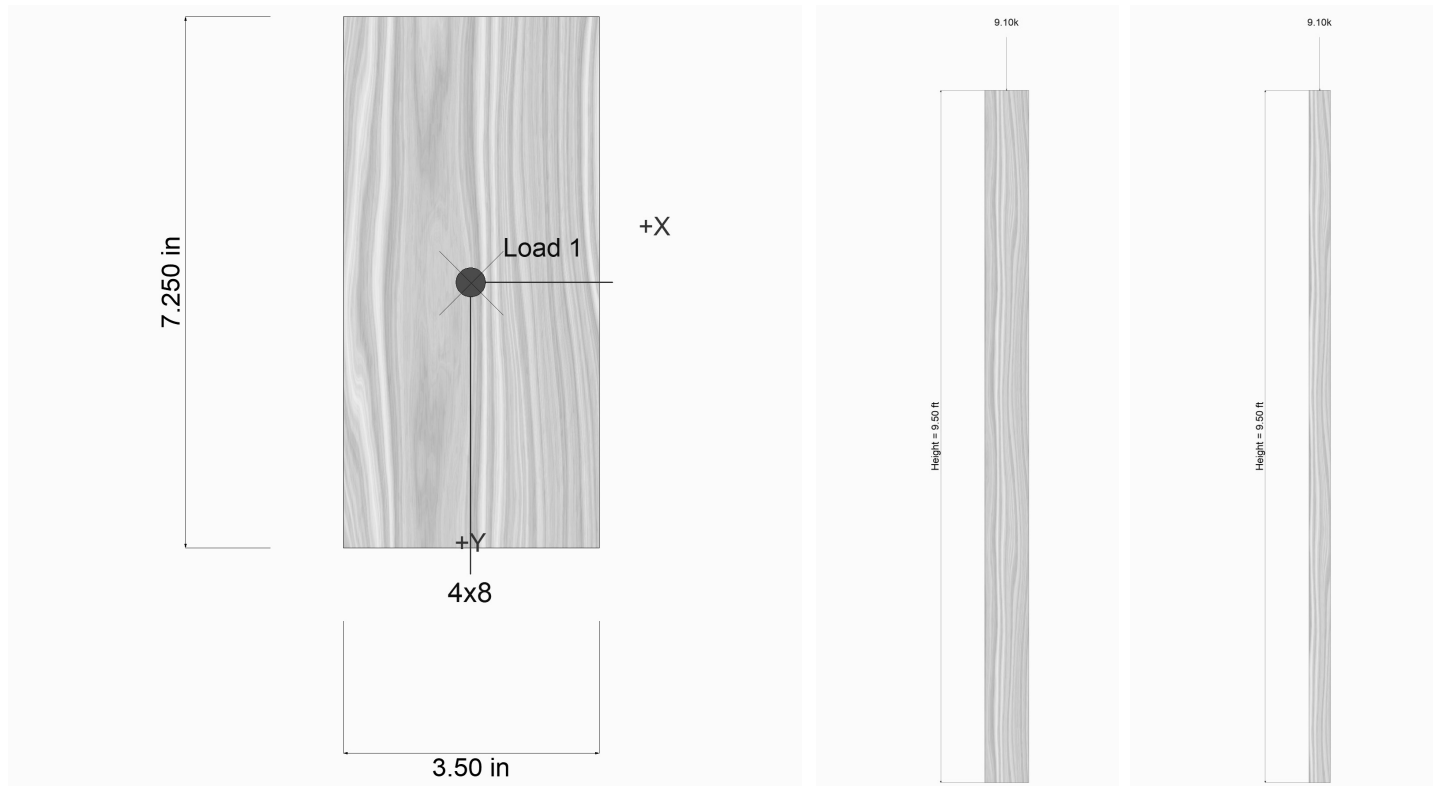
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		k-ft	Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top	@ Base	@ Base	@ Top		@ Base	@ Top
+D+0.750Lr						7.645					
+0.60D						1.873					
Lr Only						6.030					

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance	Max. Y-Y Deflection		Distance
D Only	0.0000 in	0.000 ft		0.000 in	0.000 ft	
+D+Lr	0.0000 in	0.000 ft		0.000 in	0.000 ft	
+D+0.750Lr	0.0000 in	0.000 ft		0.000 in	0.000 ft	
+0.60D	0.0000 in	0.000 ft		0.000 in	0.000 ft	
Lr Only	0.0000 in	0.000 ft		0.000 in	0.000 ft	

Sketches



General Footing

Project File: 23-15 Muir.ec6

LIC#: KW-06019286, Build:20.23.08.30

FOWLER STRUCTURAL ENGINEERING

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DESCRIPTION: p. F1 - FOOTING AT COLUMN TO RIDGE BEAM (See p. B1, Beam B2 for axial load.)

Code References

Calculations per ACI 318-19, IBC 2021, ASCE 7-16

Load Combinations Used : IBC 2021

General Information

Material Properties

f'c : Concrete 28 day strength	=	2.50 ksi
fy : Rebar Yield	=	40.0 ksi
Ec : Concrete Elastic Modulus	=	2,850.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	
Min. Overturning Safety Factor	=	1.0 : 1

Add Ftg Wt for Soil Pressure	:	No
Use ftg wt for stability, moments & shears	:	No
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Soil Design Values

Allowable Soil Bearing	=	1.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

Footing base depth below soil surface	=	ft
Allow press. increase per foot of depth when footing base is below	=	ksf
	=	ft

Increases based on footing plan dimension

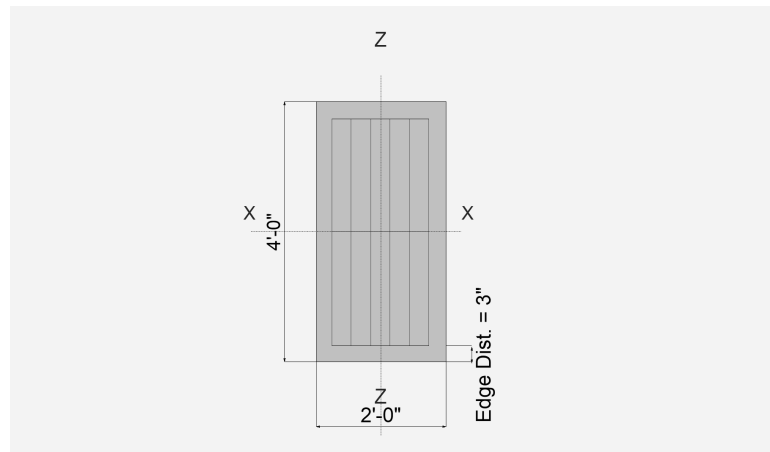
Allowable pressure increase per foot of depth	=	ksf
when max. length or width is greater than	=	ft

Dimensions

Width parallel to X-X Axis	=	2.0 ft
Length parallel to Z-Z Axis	=	4.0 ft
Footing Thickness	=	20.0 in

Pedestal dimensions...

px : parallel to X-X Axis	=	in
pz : parallel to Z-Z Axis	=	in
Height	=	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0 in



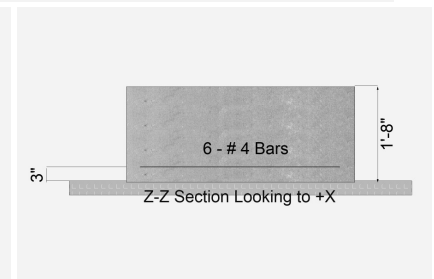
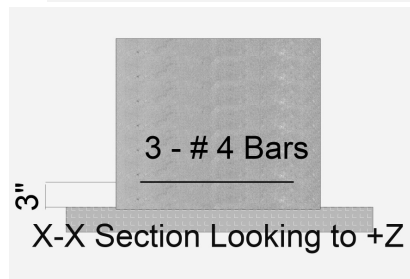
Reinforcing

Bars parallel to X-X Axis	=	3.0
Number of Bars	=	# 4
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis	=	6.0
Number of Bars	=	# 4
Reinforcing Bar Size	=	# 4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation

	Bars along X-X Axis	
# Bars required within zone	66.7 %	
# Bars required on each side of zone	33.3 %	



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	3.070	6.030				k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k

General Footing

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LIC# : KW-06019286, Build:20.23.08.30

FOWLER STRUCTURAL ENGINEERING

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DESCRIPTION: p. F1 - FOOTING AT COLUMN TO RIDGE BEAM (See p. B1, Beam B2 for axial load.)

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7587	Soil Bearing	1.138 ksf	1.50 ksf	+D+Lr about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1097	Z Flexure (+X)	0.8333 k-ft/ft	7.597 k-ft/ft	+1.20D+1.60Lr
PASS	0.1097	Z Flexure (-X)	0.8333 k-ft/ft	7.597 k-ft/ft	+1.20D+1.60Lr
PASS	0.1120	X Flexure (+Z)	3.333 k-ft/ft	29.753 k-ft/ft	+1.20D+1.60Lr
PASS	0.1120	X Flexure (-Z)	3.333 k-ft/ft	29.753 k-ft/ft	+1.20D+1.60Lr
PASS	n/a	1-way Shear (+X)	0.0 psi	75.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a
PASS	0.06535	1-way Shear (+Z)	4.901 psi	75.0 psi	+1.20D+1.60Lr
PASS	0.06535	1-way Shear (-Z)	4.901 psi	75.0 psi	+1.20D+1.60Lr
PASS	n/a	2-way Punching	8.627 psi	75.0 psi	+1.20D+1.60Lr

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc		Zecc		Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				(in)		Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	1.50	n/a	0.0			0.3838	0.3838	n/a	n/a	0.256
X-X, +D+Lr	1.50	n/a	0.0			1.138	1.138	n/a	n/a	0.759
X-X, +D+0.750Lr	1.50	n/a	0.0			0.9491	0.9491	n/a	n/a	0.633
X-X, +0.60D	1.50	n/a	0.0			0.2303	0.2303	n/a	n/a	0.154
Z-Z, D Only	1.50	0.0	n/a			n/a	n/a	0.3838	0.3838	0.256
Z-Z, +D+Lr	1.50	0.0	n/a			n/a	n/a	1.138	1.138	0.759
Z-Z, +D+0.750Lr	1.50	0.0	n/a			n/a	n/a	0.9491	0.9491	0.633
Z-Z, +0.60D	1.50	0.0	n/a			n/a	n/a	0.2303	0.2303	0.154

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
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Footing Has NO Overturning

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
X-X, +1.40D	1.075	+Z	Bottom	0.02109	Min for Bending	0.60	29.753	OK
X-X, +1.40D	1.075	-Z	Bottom	0.02109	Min for Bending	0.60	29.753	OK
X-X, +1.20D+0.50Lr	1.675	+Z	Bottom	0.03289	Min for Bending	0.60	29.753	OK
X-X, +1.20D+0.50Lr	1.675	-Z	Bottom	0.03289	Min for Bending	0.60	29.753	OK
X-X, +1.20D	0.9210	+Z	Bottom	0.01807	Min for Bending	0.60	29.753	OK
X-X, +1.20D	0.9210	-Z	Bottom	0.01807	Min for Bending	0.60	29.753	OK
X-X, +1.20D+1.60Lr	3.333	+Z	Bottom	0.06555	Min for Bending	0.60	29.753	OK
X-X, +1.20D+1.60Lr	3.333	-Z	Bottom	0.06555	Min for Bending	0.60	29.753	OK
X-X, +0.90D	0.6908	+Z	Bottom	0.01355	Min for Bending	0.60	29.753	OK
X-X, +0.90D	0.6908	-Z	Bottom	0.01355	Min for Bending	0.60	29.753	OK
Z-Z, +1.40D	0.2686	-X	Bottom	0.005268	Min for Bending	0.150	7.597	OK
Z-Z, +1.40D	0.2686	+X	Bottom	0.005268	Min for Bending	0.150	7.597	OK
Z-Z, +1.20D+0.50Lr	0.4187	-X	Bottom	0.008213	Min for Bending	0.150	7.597	OK
Z-Z, +1.20D+0.50Lr	0.4187	+X	Bottom	0.008213	Min for Bending	0.150	7.597	OK
Z-Z, +1.20D	0.2303	-X	Bottom	0.004516	Min for Bending	0.150	7.597	OK
Z-Z, +1.20D	0.2303	+X	Bottom	0.004516	Min for Bending	0.150	7.597	OK
Z-Z, +1.20D+1.60Lr	0.8333	-X	Bottom	0.01635	Min for Bending	0.150	7.597	OK
Z-Z, +1.20D+1.60Lr	0.8333	+X	Bottom	0.01635	Min for Bending	0.150	7.597	OK
Z-Z, +0.90D	0.1727	-X	Bottom	0.003387	Min for Bending	0.150	7.597	OK
Z-Z, +0.90D	0.1727	+X	Bottom	0.003387	Min for Bending	0.150	7.597	OK

FOWLER STRUCTURAL ENGINEERING
 925 W. Railroad Ave
 Cotati, CA 94931
 (707) 776-7500
 fowlerengineering@yahoo.com

Project Title: MUIR WOOD BARN
 Engineer: William Fowler
 Project ID: 23-15
 Project Descr: 1030 Thompson Ln, Petaluma, CA

Printed: 10 DEC 2023, 7:07PM

General Footing

Project File: 23-15 Muir.ec6

LIC# : KW-06019286, Build:20.23.08.30

FOWLER STRUCTURAL ENGINEERING

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DESCRIPTION: p. F1 - FOOTING AT COLUMN TO RIDGE BEAM (See p. B1, Beam B2 for axial load.)

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0.00 psi	0.00 psi	1.58 psi	1.58 psi	1.58 psi	75.00 psi	0.02	OK
+1.20D+0.50Lr	0.00 psi	0.00 psi	2.46 psi	2.46 psi	2.46 psi	75.00 psi	0.03	OK
+1.20D	0.00 psi	0.00 psi	1.35 psi	1.35 psi	1.35 psi	75.00 psi	0.02	OK
+1.20D+1.60Lr	0.00 psi	0.00 psi	4.90 psi	4.90 psi	4.90 psi	75.00 psi	0.07	OK
+0.90D	0.00 psi	0.00 psi	1.02 psi	1.02 psi	1.02 psi	75.00 psi	0.01	OK

Two-Way "Punching" Shear

All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D	2.78 psi	150.00psi	0.01854	OK
+1.20D+0.50Lr	4.34 psi	150.00psi	0.0289	OK
+1.20D	2.38 psi	150.00psi	0.01589	OK
+1.20D+1.60Lr	8.63 psi	150.00psi	0.05751	OK
+0.90D	1.79 psi	150.00psi	0.01192	OK

FOWLER STRUCTURAL ENGINEERING	Project: BARN REMODEL	Proj. No: 23-15
925 WEST RAILROAD AVE, COTATI CA 94931	Address: 1030 Thompson Ln, Petaluma	
(707) 776-7500	Owner: Muir Wood LLC / Carlos Shelton, Agent	
	Date: 12/1/23 12/9/23	

p. WB1 - WALLS

BRACED WALLS - Conventional Bracing using prescriptive method [CBC, Table 2308.6.1]

EXTERIOR: WOOD STRUCT PANEL (WSP)

SEISMIC CONTROLS [Compare CRC Tbl R602.10.3(3) Seismic, with R602.10.3(1) Wind]

CODE REFERENCES

[1] CRC Tbl R602.10.3(3) Bracing for soil class D, wall ht 10 ft, Flr D 10 psf, Roof D 15 psf, Wall spcg 25 ft / SDC D₂

[2] CRC Tbl R602.10.3.(4) Adjustment factors

WALL - Braced Wall Panels are type CS-WSP

BWL - descr	L _{BWL} feet	Req Tbl L _{Seismic}	L _s	Adj ^b	L _{Req} = L _s * Adj	BWP L _{provided}	ΣL _{Prov} feet	Comment
A - CS-WSP	24.2	0.212	5.13	1.0	5.13	4.8+4.7+3.7	13.2	> 5.1 Good
B - WSP	24.0	0.250	6.00	1.4	8.40	14.80	14.8	> 8.4 Good
C - WSP	24.0	0.250	6.00	1.4	8.40	4+14	18.0	> 8.4 Good
D - CS-WSP	24.2	0.212	5.13	1.0	5.13	2.8+6.4+3.7	12.9	> 5.1 Good
1 - CS-WSP	60.0	0.212	12.72	1.0	12.72	4.5+6+2.7	13.2	> 12.7 Good
2 - CS-WSP	60.0	0.212	12.72	1.0	12.72	14.9+6+6+15.3	42.2	> 12.7 Good

Adjustment 1.4 1.0 1.40

HOLD-DOWN - for Braced Wall end

Reqd Tension 1,800 # [CRC R602.10.2.2.1]
Allowable Tension 1,740 # 2,000 psi conc 2,350 3,000 psi conc
Simpson desn/website 2,045 # 2,500 psi conc > 1,800.# reqd in CRC
Wedge-All emb: 4.5"

1/2" X 8-1/2" WEDGE-ALL A.B.
OR: STRONG BOLT 2
By Simpson Strong-Tie
Emb min: 4-1/2"