CHRIS OLIVEIRA AND ASSOC.

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rce 33407- CA.
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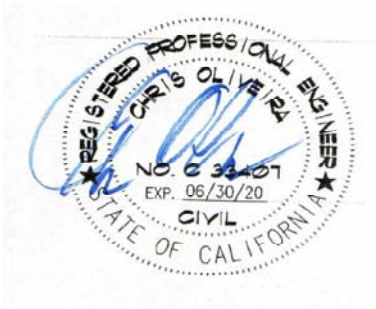
STRUCTURAL CALCULATIONS

ESPINOZA RESIDENCE

REVISED FOR PPLAN CHECK



DEC. 12,2019

2015 IBC 2016 CBC
ASCE 7 - 10
WIND EXPOSURE C
110 MPH
SDC - D
SITE CLASS D

CHRIS
OLIVEIRA
AND
ASSOCIATES

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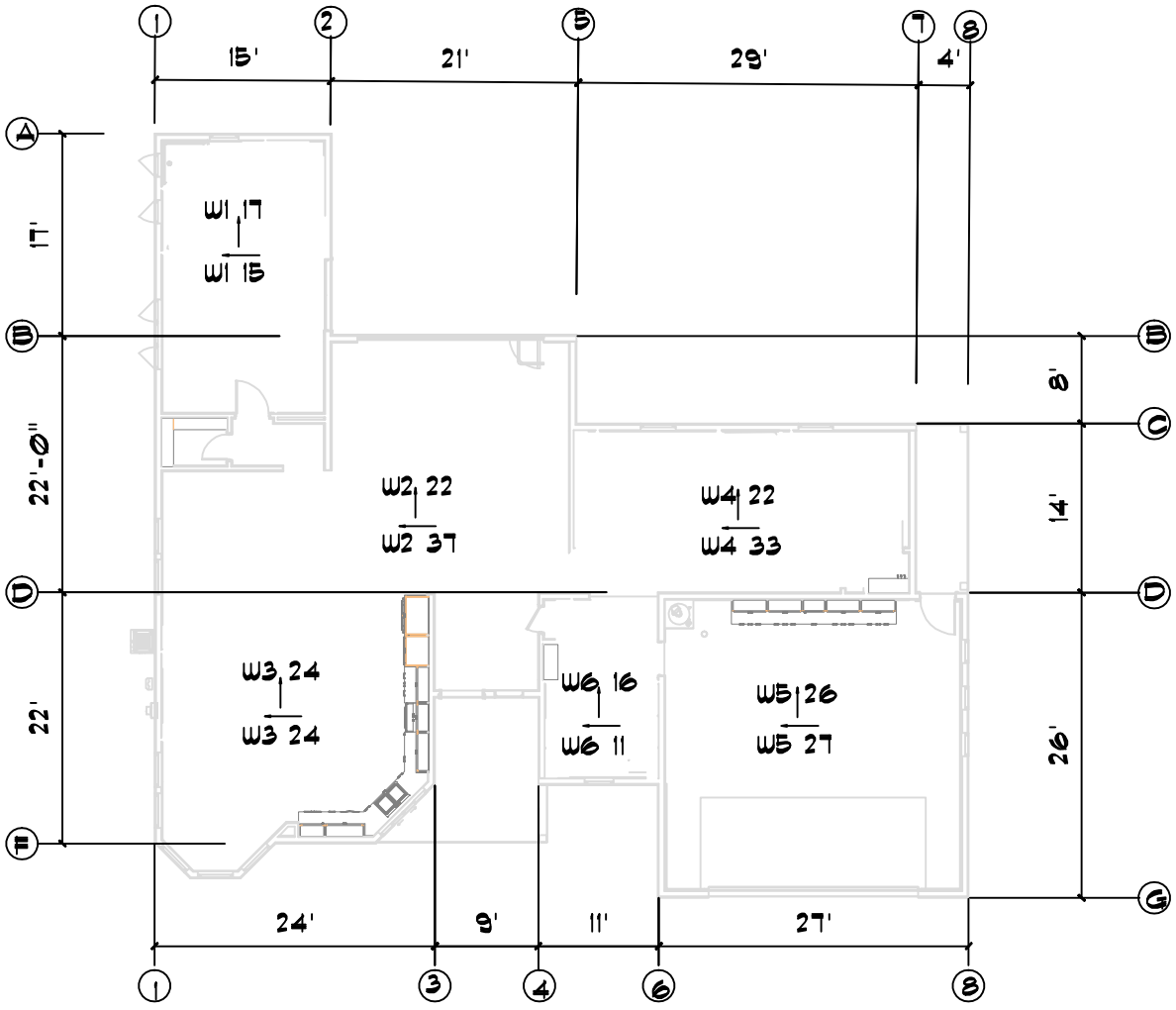
REGISTERED PROFESSIONAL ENGINEER
CHRIS OLIVEIRA
NO. C 33407
EXP. 06/30/20
CIVIL
STATE OF CALIFORNIA



LAYOUT

PAGE 1

No Scale	9/19/19	C.O.

Espinoza

residence

These calculations were prepared by Chris Oliveira

CalcSet Version 2.0 www.CalcSet.com

File: C:\calcset\espinoza 12 8 19H.xls December 8, 2019

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	1

DESIGN LOADS

Roof Load

Roofing……..	10.8	
Sheathing…… ……..	1.6	
Framing…… ……..	4.3	
Insulation…… ……..	1.6	
Ceiling…….. ……..	2.2	
Miscellaneous…… ……..	2.2	
(DL has been factored for roof slope)		
DL	**22.7**	psf
SNOW	**30.0**	psf (5:12)

ASD

ON THE TENSION SIDE OF OVERTURNING, USE 12.4.3

E = rho Qe - (.6 - .14Sds)D

MODIFICATION FOR D = 0.52286

WHEN Vs GOVERNS

Wall Load

Ext Finish	10.0	
Int Finish	2.2	
Framing	1.7	
Insulation	0.5	
Misc	0.6	
DL	**15.0**	psf

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	2

LATERAL

SEISMIC

V = Cs W *12.8.1.1 - page 71*

Cs = Sds / (R / Ie) X RHO

RHO = 1.3

Sds = 0.551 *FROM THE USGS WEBSITE*

R = 6.5

Ie = IMPORTANCE FACTOR - *TABLE 1.5-2 FOR RISK CATEGORY II = 1*

MULTIPLY BY 0.7 FOR ASD CONVERSION

Cs = 0.07714

*q = .00256 * Kz * K zt * K d * V squared* *eq 27.3-1 page 204*

Kd = wind directionality - 26.6 - table 26.6-1 *USE* *0.85*

Kz - vel press coeff - table 27.3.1 *USE* *0.94*

	B	C
25	0.66	0.94

K zt= 1 *NO TOPO EFFECTS*

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	3

LATERAL

V = velocity = 110 V squared = 12100

qz = 24.7498 psf

p = q (G Cpf - Gcpi) PSF EQ 28.4-1 PAGE 240

G Cf - EXTERNAL PRESS COEFF 0.55 TABLE 28.4-1
ZONE 1
5:12 22.2

G Cpi - INTERNAL PRESSURE COEFF - TABLE 26.11-1 USE -0.18

MULTIPLY BY 0.6 FOR ASD CONVERSION

p = 10.8404 PSF

North / South

W(1): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(17')+15(4.5')(2)] = 40 plf

W(2): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(22')+15(4.5')(2)] = 49 plf

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	4

LATERAL

W(3): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(24')+15(4.5')(2)] = 52 plf

W(4): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(22')+15(4.5')(2)] = 49 plf

W(5): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(26')+15(4.5')(2)] = 56 plf

W(6): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(16')+15(4.5')(2)] = 38 plf

Line 1 :
Vw = (130plf)(7.5') = **975** lb
Vs = (40plf)(7.5')+(49plf)(7.5')+(52plf)(12') = **1292** lb
W1 W2 W3

Line 2 :
Vw = (130plf)(7.5')+(130plf)(10.5') = **2340** lb
Vs = (40plf)(7.5')+(49plf)(10.5') = **815** lb
W1 W2

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	5

LATERAL

Line 3 :	Vw =	(130plf)(12') =	**1560** lb
	Vs =	(52plf)(12')+(49plf)(10.5') =	**1139** lb
		W3 W2	
Line 4 :	Vw =	(130plf)(5.5') =	**715** lb
	Vs =	(38plf)(5.5') =	**209** lb
		W6	
Line 5 :	Vw =	(130plf)(10.5')+(130plf)(14.5') =	**3250** lb
	Vs =	(49plf)(10.5')+(49plf)(14.5') =	**1225** lb
		W2 W4	
Line 6 :	Vw =	(130plf)(5.5')+(130plf)(13.5') =	**2470** lb
	Vs =	(38plf)(5.5')+(56plf)(13.5') =	**965** lb
		W6 W5	
Line 7 :	Vw =	(130plf)(14.5') =	**1885** lb
	Vs =	(49plf)(14.5') =	**711** lb
		W4	
Line 8 :	Vw =	(130plf)(13.5') =	**1755** lb
	Vs =	(56plf)(13.5') =	**756** lb
		W5	

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	6

LATERAL

Line 1 :

V_{wind} = 975 lb

$V_{seismic}$ = 1292 + 0.07714[(15 psf)(9')(30')] = 1604 lb

$$v_{walls} = \frac{1604}{6+12+12} = 53 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood

[5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (6' Wall)

M_{OT} = (53plf)(6')(9') = 2862 ft-lb

M_{RES} = 0.9[(11.868922psf)(4')+(7.8429psf)(9')](6')(6'/2) = 1913 ft-lb

$$T_{up} = \frac{2862 - 1913}{6} = 158 \text{ lb}$$

No Holdowns Reqd

ON THE TENSION SIDE OF OVERTURNING, USE 12.4.3

E = rho Qe - (.6 - .14Sds)D

MODIFICATION FOR D = 0.52286

WHEN Vs GOVERNS

Line 2 :

V_{wind} = 2340 lb

$V_{seismic}$ = 815 + 0.07714[(15 psf)(9')(10')] = 919 lb

$$v_{walls} = \frac{2340}{10} = 234 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood

[5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (10' Wall)

M_{OT} = (234plf)(10')(9') = 21060 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](10')(10'/2) = 7527 ft-lb

$$T_{up} = \frac{21060 - 7527}{10} = 1353 \text{ lb}$$

Simpson HDU2
(3075 lb)

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	7

LATERAL

Line 3 :

V_{wind} = 1560 lb

$V_{seismic}$ = 1139 + 0.07714[(15 psf)(9')(7')] = 1212 lb

$$v_{walls} = \frac{1560}{7} = 223 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood

[5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (7' Wall)

M_{OT} = (223plf)(7')(9') = 14049 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](7')(7'/2) = 3688 ft-lb

$$T_{up} = \frac{14049 - 3688}{7} = 1480 \text{ lb}$$

Simpson HDU2
(3075 lb)

Line 4 :

V_{wind} = 715 lb

$V_{seismic}$ = 209 + 0.07714[(15 psf)(9')(8')] = 292 lb

$$v_{walls} = \frac{715}{8} = 89 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood

[5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (8' Wall)

M_{OT} = (89plf)(8')(9') = 6408 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](8')(8'/2) = 4817 ft-lb

$$T_{up} = \frac{6408 - 4817}{8} = 199 \text{ lb}$$

No Holdowns Reqd

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	8

LATERAL

Line 5 :

V_{wind} = 3250 lb

$V_{seismic}$ = 1225 + 0.07714[(15 psf)(9')(18')] = 1412 lb

$$v_{walls} = \frac{3250}{18} = 181 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood [5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (18' Wall)

M_{OT} = (181plf)(18')(9') = 29322 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](18')(18'/2) = 24386 ft-lb

$$T_{up} = \frac{29322 - 24386}{18} = 274 \text{ lb}$$

Simpson HDU2
(3075 lb)

Line 6 :

V_{wind} = 2470 lb

$V_{seismic}$ = 965 + 0.07714[(15 psf)(9')(18')] = 1152 lb

$$v_{walls} = \frac{2470}{18} = 137 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood [5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (18' Wall)

M_{OT} = (137plf)(18')(9') = 22194 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](18')(18'/2) = 24386 ft-lb

$$T_{up} = \frac{22194 - 24386}{18} = 0 \text{ lb}$$

No Holdowns Reqd

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	9

LATERAL

Line 7 :

V_{wind} = 1885 lb

$V_{seismic}$ = 711 + 0.07714[(15 psf)(9')(14')] = 857 lb

$$v_{walls} = \frac{1885}{14} = 135 \text{ plf}$$

3/8" CDX Plywood	
w / 8d @ 6"oc	(260 plf)

Use 1/2" values for 3/8" plywood [5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (14' Wall)

M_{OT} = (135plf)(14')(9') = 17010 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](14')(14'/2) = 14752 ft-lb

$$T_{up} = \frac{17010 - 14752}{14} = 161 \text{ lb}$$

No Holdowns Reqd

Line 8 :

V_{wind} = 1755 lb

$V_{seismic}$ = 756 + 0.07714[(15 psf)(9')(12')] = 881 lb

$$v_{walls} = \frac{1755}{12} = 146 \text{ plf}$$

3/8" CDX Plywood	
w / 8d @ 6"oc	(260 plf)

Use 1/2" values for 3/8" plywood [5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (12' Wall)

M_{OT} = (146plf)(12')(9') = 15768 ft-lb

M_{RES} = 2/3[(22.7psf)(14')+(15psf)(9')](12')(12'/2) = 21734 ft-lb

$$T_{up} = \frac{15768 - 21734}{12} = 0 \text{ lb}$$

No Holdowns Reqd

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	10

LATERAL

East / West

W(1): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(15')+15(4.5')(2)] = 37 plf

W(2): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(37')+15(4.5')(2)] = 75 plf

W(3): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(24')+15(4.5')(2)] = 52 plf

W(4): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(33')+15(4.5')(2)] = 68 plf

W(5): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(27')+15(4.5')(2)] = 58 plf

W(6): Wind = (10.8)(12')= 130 plf
Seismic = 0.07714[22.7(11')+15(4.5')(2)] = 30 plf

Line A :
Vw = (130plf)(8.5') = **1105** lb
Vs = (37plf)(8.5') = **315** lb
W1

Line B :
Vw = (130plf)(8.5')+(130plf)(11') = **2535** lb
Vs = (37plf)(8.5')+(75plf)(11') = **1140** lb
W1 W2

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	11

LATERAL

Line C :

Vw = (130plf)(7') = **910** lb

Vs = (68plf)(7') = **476** lb
W4

Line D :

Vw = (130plf)(11') = **1430** lb

Vs = (75plf)(11')+(68plf)(7')+(58plf)(13')+(52plf)(12') = **2679** lb
W2 W4 W5 W3

Line F :

Vw = (130plf)(12') = **1560** lb

Vs = (52plf)(12') = **624** lb
W3

Line G :

Vw = (130plf)(13') = **1690** lb

Vs = (58plf)(13') = **754** lb
W5

Line A :

V_{wind} = 1105 lb

$V_{seismic}$ = 315 + 0.07714[(15 psf)(9')(8')] = 398 lb

$$v_{walls} = \frac{1105}{4+4} = 138 \text{ plf}$$

3/8" CDX Plywood	
w / 8d @ 6"oc	(260 plf)

Use 1/2" values for 3/8" plywood

[5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (4' Wall)

M_{OT} = (138plf)(4')(9') = 4968 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](4')(4'/2) = 1204 ft-lb

$$T_{up} = \frac{4968 - 1204}{4} = 941 \text{ lb}$$

Simpson HDU2
(3075 lb)

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no. 12
	date	9/18/19	

LATERAL

Line B :

V_{wind} = 2535 lb

$V_{seismic}$ = 1140 + 0.07714[(15 psf)(9')(4')] = 1182 lb

	AXIAL LOAD	Vs	Vw
SSW18 X 9 IS GOOD FOR	1000	1990	2090

REQ'D NUMBER: $Vw \quad \frac{2535}{2090} = 1.21292$

$Vs \quad \frac{1182}{1990} = 0.59397$

2 - 1" SSWAB BOLTS

MIN EMBEDMENT IN FIRST POUR 19 IN

2 PROVIDED

LINE B FOOTING

L_{WALL} = **4.0** ft $L_{FOOTING}$ = **21.0** ft

Width = 12.0 in

Depth = 18.0 in

F_{TOP} = 2535 lb @ 9.00 ft

w_{RES} = (22.7D)(4') = 91 plf

P_{TOTAL} = (91 plf)(4') + (150 pcf)((12" x 18")/144)(21') = 5,089 lb

M_{RES} = (5089 lb)(21'/2) = 53,435 ft-lb

M_{OT} = (2535 lb)(9') + (42 lb)(0') = 22,815 ft-lb

$$a = \frac{53435 - 22815}{5{,}089} = 6.02 \text{ ft}, \quad \frac{L}{3} = \frac{21'}{3} = 7 \text{ ft}$$

(Resultant is outside the middle 1 / 3)

$$p_{MAX} = \frac{2(5089 \text{ lb})}{3(6.02')(1')} = 564 \text{ psf} < 1995 \text{ psf}$$ **O.K.**

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	13

LATERAL

Line C :

V_{wind} = 910 lb

$V_{seismic}$ = 476 + 0.07714[(15 psf)(9')(19')] = 674 lb

$$v_{walls} = \frac{910}{5+5+9} = 48 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood [5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (5' Wall)

M_{OT} = (48plf)(5')(9') = 2160 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](5')(5'/2) = 1882 ft-lb

$$T_{up} = \frac{2160 - 1882}{5} = 56 \text{ lb}$$

No Holdowns Reqd

Line D :

V_{wind} = 1430 lb

$V_{seismic}$ = 2679 + 0.07714[(15 psf)(9')(20')] = 2887 lb

$$v_{walls} = \frac{2887}{20} = 144 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood [5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (20' Wall)

M_{OT} = (144plf)(20')(9') = 25920 ft-lb

M_{RES} = 0.9[(11.868922psf)(4')+(7.8429psf)(9')](20')(20'/2) 21251 ft-lb

$$T_{up} = \frac{25920 - 21251}{20} = 233 \text{ lb}$$

No Holdowns Reqd

ON THE TENSION SIDE OF OVERTURNING, USE 12.4.3

E = rho Qe - (.6 - .14Sds)D

MODIFICATION FOR D = 0.52286

WHEN Vs GOVERNS

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	14

LATERAL

Line F :

V_{wind} = 1560 lb

$V_{seismic}$ = 624 + 0.07714[(15 psf)(9')(8')] = 707 lb

$$v_{walls} = \frac{1560}{8} = 195 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood [5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (8' Wall)

M_{OT} = (195plf)(8')(9') = 14040 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](8')(8'/2) = 4817 ft-lb

$$T_{up} = \frac{14040 - 4817}{8} = 1153 \text{ lb}$$

Simpson HDU2
(3075 lb)

Line G :

V_{wind} = 1690 lb

$V_{seismic}$ = 754 + 0.07714[(15 psf)(9')(8')] = 837 lb

$$v_{walls} = \frac{1690}{4+4} = 211 \text{ plf}$$

3/8" CDX Plywood
w / 8d @ 6"oc (260 plf)

Use 1/2" values for 3/8" plywood [5/8 dia AB @ 60"oc (298 plf)]

Uplift Analysis (4' Wall)

M_{OT} = (211plf)(4')(9') = 7596 ft-lb

M_{RES} = 2/3[(22.7psf)(4')+(15psf)(9')](4')(4'/2) = 1204 ft-lb

$$T_{up} = \frac{7596 - 1204}{4} = 1598 \text{ lb}$$

Simpson HDU2
(3075 lb)

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	15

LATERAL

ROOF DIAPHRAGM W2

$w = 130$ plf

$$v_{diaph} = \frac{(130 \text{ plf})(37'/2)}{22'} = 109 \text{ plf}$$

1/2" CDX Plywood
w / 8d @ 6"oc (240 plf)
(Case 1 w / 2x Framing)

$$F_{chord} = \frac{(130 \text{ plf})(37')^2}{8(22')} = 1011 \text{ lb}$$

say 15

10 - 16d Plate Splice
(1050 lb)

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	16

VERTICAL

BM 1 L = 18.0 ft C(D) = 1.00

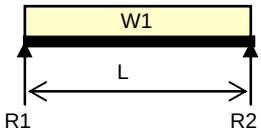
C(F) = 0.98

(0'-18') w_1 = (22.7D + 30L)(8') + 23 = **445** plf

R(L) = 4005 lb

R(R) = 4005 lb

M(Max) = 18023 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 4005 lb M = 18023 ft-lb w_{eq} = 445 plf

$$A_{req} = \frac{1.5V}{F'_v} = 20.7 \text{ in}^2$$

$$S_{req} = \frac{M(12"/')}{F'_b} = 75.9 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 876 \text{ in}^4$$

Parallam

F_v =	290	F'_v =	290
F_b =	2900	F'_b =	2851
E =	2000000	Δ: L /	360

5 1/4" x 14" PSL Parallam
A = 73.5, S = 171.5, I = 1201

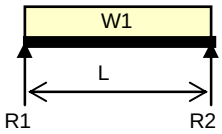
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	17

VERTICAL

BM 2 L = 12.0 ft C(D) = 1.00 C(F) = 1.00

(0'-12') w_1 = (22.7D + 30L)(6') + 13 = **329** plf

R(L) = 1974 lb
R(R) = 1974 lb
M(Max) = 5922 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 1974 lb M = 5922 ft-lb w_{eq} = 329 plf

$$A_{req} = \frac{1.5V}{F'_v} = 34.8 \text{ in}^2$$

$$S_{req} = \frac{M(12"/')}{F'_b} = 52.6 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 240 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ: L / 360	

6x10 DF No. 1
A = 52.3, S = 82.7, I = 393

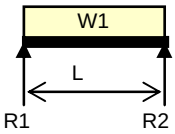
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	18

VERTICAL

BM 3 L = 5.0 ft C(D) = 1.00 C(F) = 1.00

(0'-5') w_1 = (22.7D + 30L)(6') + 13 = **329** plf

R(L) = 823 lb
R(R) = 823 lb
M(Max) = 1028 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 823 lb M = 1028 ft-lb w_{eq} = 329 plf

$$A_{req} = \frac{1.5V}{F'_v} = 14.5 \text{ in}^2$$

$$S_{req} = \frac{M(12"/')}{F'_b} = 9.1 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 17 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ : L / 360	

6x10 DF No. 1
A = 52.3, S = 82.7, I = 393

Spread Footing BM 2 AND 3

P = [](') = 2797 lb

$$A_{REQ} = \frac{2797 \text{ lb}}{1500 \text{ psf}} = 1.86 \text{ ft}^2$$

2'-0" square x 18" deep
w / 3 - #4 Bars Each Way

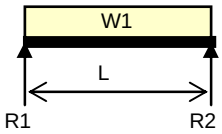
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	19

VERTICAL

BM 4 L = 12.0 ft C(D) = 1.00 C(F) = 1.00

(0'-12') w_1 = (22.7D + 30L)(8') + 13 = **435** plf

R(L) = 2610 lb
R(R) = 2610 lb
M(Max) = 7830 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 2610 lb M = 7830 ft-lb w_{eq} = 435 plf

$$A_{req} = \frac{1.5V}{F'_v} = 46.1 \text{ in}^2$$

$$S_{req} = \frac{M(12''/')}{F'_b} = 69.6 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 317 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ : L / 360	

6x10 DF No. 1
A = 52.3, S = 82.7, I = 393

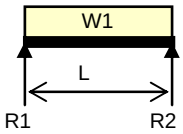
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	20

VERTICAL

BM 5 L = 6.0 ft C(D) = 1.00 C(F) = 1.00

(0'-6') w_1 = (22.7D + 30L)(6') + 13 = **329** plf

R(L) = 987 lb
R(R) = 987 lb
M(Max) = 1481 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 987 lb M = 1481 ft-lb w_{eq} = 329 plf

$$A_{req} = \frac{1.5V}{F'_v} = 17.4 \text{ in}^2$$

$$S_{req} = \frac{M(12"/')}{F'_b} = 13.2 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 30 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ : L /	360

6x10 DF No. 1
A = 52.3, S = 82.7, I = 393

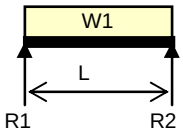
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	21

VERTICAL

BM 6 L = 6.0 ft C(D) = 1.00 C(F) = 1.00

(0'-6') w_1 = (22.7D + 30L)(16') + 13 = **856** plf

R(L) = 2568 lb
R(R) = 2568 lb
M(Max) = 3852 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 2568 lb M = 3852 ft-lb w_{eq} = 856 plf

$$A_{req} = \frac{1.5V}{F'_v} = 45.3 \text{ in}^2$$

$$S_{req} = \frac{M(12"/')}{F'_b} = 34.2 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 78 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ : L /	360

6x10 DF No. 1
A = 52.3, S = 82.7, I = 393

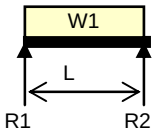
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	22

VERTICAL

BM 7 $L =$ 2.0 ft $C(D) =$ 1.00 $C(F) =$ 1.00

(0'-2') $w_1 = (22.7D + 30L)(11') + 16 =$ **596** plf

$R(L) =$ 596 lb
$R(R) =$ 596 lb
$M(Max) =$ 298 ft-lb



Support Conditions: (Pinned - Pinned)

Check: $V =$ 596 lb $M =$ 298 ft-lb $w_{eq} =$ 596 plf

$$A_{req} = \frac{1.5V}{F'_v} = 10.5 \text{ in}^2$$

$$S_{req} = \frac{M(12''/')}{F'_b} = 2.6 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 2 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ	: L / 360

6x12 DF No. 1
A = 63.3, S = 121.2, I = 697

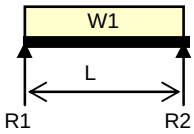
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	23

VERTICAL

BM 8 L = 8.0 ft C(D) = 1.00 C(F) = 1.00

(0'-8') w_1 = (22.7D + 30L)(11') + 16 = **596** plf

R(L) = 2384 lb
R(R) = 2384 lb
M(Max) = 4768 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 2384 lb M = 4768 ft-lb w_{eq} = 596 plf

$A_{req} = \frac{1.5V}{F'_v} =$ 42.1 in^2

$S_{req} = \frac{M(12"/')}{F'_b} =$ 42.4 in^3

$I_{req} = \frac{5\ wL^4}{384\ E\Delta} =$ 129 in^4

DF No. 1

F_v =	85	F'_v =	85
F_b =	1350	F'_b =	1350
E =	1600000	Δ: L /	360

6x12 DF No. 1
A = 63.3, S = 121.2, I = 697

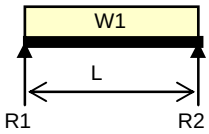
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	24

VERTICAL

BM 9 L = 10.0 ft C(D) = 1.00 C(F) = 1.00

(0'-10') w_1 = (22.7D + 30L)(11') + 16 = **596** plf

R(L) = 2980 lb
R(R) = 2980 lb
M(Max) = 7450 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 2980 lb M = 7450 ft-lb w_{eq} = 596 plf

$$A_{req} = \frac{1.5V}{F'_v} = 52.6 \text{ in}^2$$

$$S_{req} = \frac{M(12"/')}{F'_b} = 66.2 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 251 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ : L /	360

6x12 DF No. 1
A = 63.3, S = 121.2, I = 697

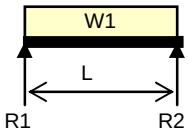
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	25

VERTICAL

BM 10 L = 7.0 ft C(D) = 1.00 C(F) = 1.00

(0'-7') w_1 = (22.7D + 30L)(10') + 16 = **543** plf

R(L) = 1901 lb
R(R) = 1901 lb
M(Max) = 3326 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 1901 lb M = 3326 ft-lb w_{eq} = 543 plf

$$A_{req} = \frac{1.5V}{F'_v} = 33.5 \text{ in}^2$$

$$S_{req} = \frac{M(12"/')}{F'_b} = 29.6 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 79 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ : L /	360

6x12 DF No. 1
A = 63.3, S = 121.2, I = 697

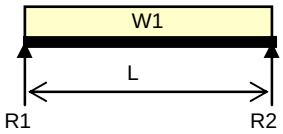
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	26

VERTICAL

BM 11 L = 21.0 ft C(D) = 1.00 C(F) = 0.97

(0'-21') w_1 = (22.7D + 30L)(9') + 27 = **501** plf

R(L) = 5261 lb
R(R) = 5261 lb
M(Max) = 27618 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 5261 lb M = 27618 ft-lb w_{eq} = 501 plf

$$A_{req} = \frac{1.5V}{F'_v} = 27.2 \text{ in}^2$$

$$S_{req} = \frac{M(12"/')}{F'_b} = 118.0 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 1566 \text{ in}^4$$

Parallam

F_v	= 290	F'_v	= 290
F_b	= 2900	F'_b	= 2809
E	= 2000000	Δ : L / 360	

5 1/4" x 16" PSL Parallam
A = 84, S = 224, I = 1792

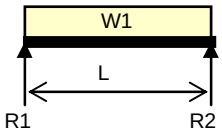
CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	27

VERTICAL

BM 12 L = 12.0 ft C(D) = 1.00 C(F) = 1.00

(0'-12') w_1 = (22.7D + 30L)(8') + 16 = **438** plf

R(L) = 2628 lb
R(R) = 2628 lb
M(Max) = 7884 ft-lb



Support Conditions: (Pinned - Pinned)

Check: V = 2628 lb M = 7884 ft-lb w_{eq} = 438 plf

$$A_{req} = \frac{1.5V}{F'_v} = 46.4 \text{ in}^2$$

$$S_{req} = \frac{M(12''/')}{F'_b} = 70.1 \text{ in}^3$$

$$I_{req} = \frac{5\ wL^4}{384\ E\Delta} = 319 \text{ in}^4$$

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000	Δ : L /	360

6x12 DF No. 1
A = 63.3, S = 121.2, I = 697

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	28

VERTICAL

BEAM 13 L = 25.0 ft C(D) = 1.00

w = (22.7D + 30L)(6') + 18 = **334** plf

V= wL/2 = 4175 lb M= $\frac{wL^2}{8}$ = 26094 ft-lb

$A_{req} = \frac{1.5V}{F'_v}$ = 38.0 in^2

$S_{req} = \frac{M(12"/')}{F'_b}$ = 135.9 in^3

$I_{req} = \frac{5\ wL^4}{384\ E\Delta}$ = 1304.7 in^4

GL 24F-V4

F_v = 165 F'_v = 165

F_b = 2400 F'_b = 2304

E = 1800000 Δ: L / 240

5 1/8 x 15 GL 24F-V4
A = 76.9, S = 192.2, I = 1441

$C_V = K(5.125 / b)^{1/x}(12 / d)^{1/x}(21 / L)^{1/x}$ = 0.96 K = 1.00 x = 10

Camber: w_{DL} = 154 plf 2000' R = 0.469 in

Δ_{DL} = 0.522 in x 1.5 = 0.783 in **Use 1" Camber**

BEAM 14 L = 10.0 ft C(D) = 1.00

w = (22.7D + 30L)(6') + 18 = **334** plf

V= wL/2 = 1670 lb M= $\frac{wL^2}{8}$ = 4175 ft-lb

$A_{req} = \frac{1.5V}{F'_v}$ = 15.2 in^2

$S_{req} = \frac{M(12"/')}{F'_b}$ = 20.9 in^3

$I_{req} = \frac{5\ wL^4}{384\ E\Delta}$ = 83.5 in^4

GL 24F-V4

F_v = 165 F'_v = 165

F_b = 2400 F'_b = 2400

E = 1800000 Δ: L / 240

5 1/8 x 15 GL 24F-V4
A = 76.9, S = 192.2, I = 1441

$C_V = K(5.125 / b)^{1/x}(12 / d)^{1/x}(21 / L)^{1/x}$ = 1.00 K = 1.00 x = 10

Camber: w_{DL} = 154 plf 2000' R = 0.075 in

Δ_{DL} = 0.013 in x 1.5 = 0.020 in **Use 0.25" Camber**

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	29

VERTICAL

TYPICAL HEADER **2 FT** $L =$ 2.0 ft $C(D) =$ 1.00 $C(F) =$ 1.00

$w = (22.7D + 30L)(10') + 8 =$ **535** plf

$V = wL/2 =$ 535 lb $M = \frac{wL^2}{8} =$ 268 ft-lb

$A_{req} = \frac{1.5V}{F'_v} =$ 9.4 in^2

$S_{req} = \frac{M(12"/')}{F'_b} =$ 2.7 in^3

$I_{req} = \frac{5\ wL^4}{384\ E\Delta} =$ 1.8 in^4

DF No. 1

F_v	=	85	F'_v	=	85
F_b	=	1200	F'_b	=	1200
E	=	1600000	Δ: L / 360		

6x6 DF No. 1
A = 30.3, S = 27.7, I = 76.3

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	30

VERTICAL

TYPICAL HEADER **3 FT** L = 3.0 ft C(D) = 1.00 C(F) = 1.00

w = (22.7D + 30L)(10') + 10 = **537** plf

V = wL/2 = 806 lb M = $\frac{wL^2}{8}$ = 604 ft-lb

$A_{req} = \frac{1.5V}{F'_v}$ = 14.2 in^2

$S_{req} = \frac{M(12"/')}{F'_b}$ = 6.0 in^3

$I_{req} = \frac{5\ wL^4}{384\ E\Delta}$ = 6.1 in^4

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1200	F'_b	= 1200
E	= 1600000		Δ: L / 360

6x8 DF No. 1
A = 41.3, S = 51.6, I = 193

TYPICAL HEADER **4 FT** L = 4.0 ft C(D) = 1.00 C(F) = 1.00

w = (22.7D + 30L)(10') + 13 = **540** plf

V = wL/2 = 1080 lb M = $\frac{wL^2}{8}$ = 1080 ft-lb

$A_{req} = \frac{1.5V}{F'_v}$ = 19.1 in^2

$S_{req} = \frac{M(12"/')}{F'_b}$ = 9.6 in^3

$I_{req} = \frac{5\ wL^4}{384\ E\Delta}$ = 14.6 in^4

DF No. 1

F_v	= 85	F'_v	= 85
F_b	= 1350	F'_b	= 1350
E	= 1600000		Δ: L / 360

6x10 DF No. 1
A = 52.3, S = 82.7, I = 393

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	31

VERTICAL

TYPICAL HEADER **5 FT** L = 5.0 ft $C(D)$ = 1.00 $C(F)$ = 1.00

w = (22.7D + 30L)(10') + 16 = **543** plf

$V = wL/2$ = 1358 lb $M = \frac{wL^2}{8}$ = 1697 ft-lb

$A_{req} = \frac{1.5V}{F'_v}$ = 24.0 in^2

$S_{req} = \frac{M(12"/')}{F'_b}$ = 15.1 in^3

$I_{req} = \frac{5\ wL^4}{384\ E\Delta}$ = 28.6 in^4

DF No. 1

F_v	=	85	F'_v	= 85
F_b	=	1350	F'_b	= 1350
E	=	1600000		Δ: L / 360

6x12 DF No. 1
A = 63.3, S = 121.2, I = 697

TYPICAL HEADER **6 FT** L = 6.0 ft $C(D)$ = 1.00 $C(F)$ = 1.00

w = (22.7D + 30L)(15') + 16 = **807** plf

$V = wL/2$ = 2421 lb $M = \frac{wL^2}{8}$ = 3632 ft-lb

$A_{req} = \frac{1.5V}{F'_v}$ = 42.7 in^2

$S_{req} = \frac{M(12"/')}{F'_b}$ = 32.3 in^3

$I_{req} = \frac{5\ wL^4}{384\ E\Delta}$ = 73.5 in^4

DF No. 1

F_v	=	85	F'_v	= 85
F_b	=	1350	F'_b	= 1350
E	=	1600000		Δ: L / 360

6x12 DF No. 1
A = 63.3, S = 121.2, I = 697

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	32

VERTICAL

TYPICAL FOOTING

$w = (22.7D + 30L)(20') =$ 1054 plf

$$W_{REQ} = \frac{1054\ plf}{1500\ psf} = 0.70\ ft$$

1054 plf
12" wide x 18" deep
Continuous Footing

PIPE BOLLARD

HORIZONTAL LOAD: 6000 LBS - (4.4.3 PAGE 9)

q = 100 PSF - LDF = 1.33: NET = 133 PSF

APPLY LOAD AT 2.25 FT

PIER

q FOR THE SOIL = 100 TABLE 1806.2
INCREASE FOR 4 FT OF DEPTH - 1806.3.3

NET LATERAL RESISTANCE = 400

LDF = 1.33

q ALLOWABLE = 532

CHRIS OLIVEIRA AND ASSOCIATES	project	Espinoza residence	
	by	CO	no.
	date	9/18/19	33

VERTICAL

Drilled Pier Load: P = 6000 lb Pier: Diameter = 12 in
Restrained h = 2.25 ft Depth = 4.50 ft
Soil: q = 532 psf / ft S_3 = d x q = 2394 psf

$$d = \sqrt{4.25 \frac{P\,h}{S_3\,b}} = 4.9 \text{ ft}$$

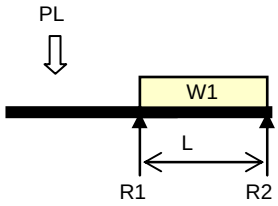
12" dia. X 4.5' deep Drilled Pier

POST L = 3.0 ft

(0'-3') w_1 = + 19 = **19** plf

Left Cantilever L = 4.0 ft
w_1 = + 19 = **19** plf
(@ 2') P_1 = [](') = **6000** lb

R(L) = 10155 lb
R(R) = -4022 lb
M(Max) = -604 ft-lb
M(L) = -12152 ft-lb



Support Conditions: (Pinned - Pinned)
Check Left Cantilever: V = 6076 lb M = 12152 ft-lb w_{eq} = 1519 plf

$$S_{req} = \frac{M(12"/')}{F_b} = 6.1 \text{ in}^3$$

$$I_{req} = \frac{1\ wL^4}{8\ E\Delta} = 14.0 \text{ in}^4$$

F_v = 0.40 (36) = 14.4 ksi
F_b = 0.66 (36) = 23.8 ksi
E = 29000 ksi Δ: L / 240

P6
S = 8.5, I = 28.1