

EXHIBIT D

STRUCTURAL CALCULATIONS

FOR

SINGLE FAMILY DWELLING
RE-ROOFING

21 REDONDO AVE.
LONG BEACH, CALIFORNIA

DATE: AUGUST 14, 2011



Manuel A. Espino

JOB NO. 11-213

ENGINEERINGDA@HOTMAIL.COM

OFFICE: (323) 527-7485

PROJECT:

37683.00

Based On : 2007 CBC
 Wood : Douglas-Fir/Larch
 $C_r = 1.15$ (repetitive member factor)
 $E = 1,500,000$ psi (Const Light Framing)
 $E = 1,600,000$ psi (#2 Joists & Planks, #1 Beams & Stringers, #1 Posts & Timbers)
 $F_v = 180$
 $F_v = 170$
 psi (for Light Framing and Joists & Planks)
 psi (for Beams & Stringers and Posts & Timbers)

MEMBER: Nominal Grade Type	SIZE:		(36 PCF) PLF	PROPERTIES:		BENDING STRESS:			FLOOR			ROOF				
	B (in)	D (in)		A (in ²)	S (in ³)	I (in ⁴)	F_b (psi)	C_f	Fb x C_F	V_{max}	M_{max}	(Lb-Rt & Lb)	M_{max}	V_{max}	(Lb-Rt & Lb)	M_{max}	$C_d = 1.25$ $M_{max}(rep)$
2x4 Const. LF	1.5	3.50	1.3	5.3	3.1	5.4	1000	1.00	1000	630	255	293	788	319	367	
2x6 #2 JP	1.5	5.50	2.0	8.3	7.6	20.8	900	1.30	1170	990	737	848	1238	922	1060	
2x8 #2 JP	1.5	7.25	2.6	10.9	13.1	47.6	900	1.20	1080	1305	1183	1360	1631	1478	1700	
2x10 #2 JP	1.5	9.25	3.4	13.9	21.4	98.9	900	1.10	990	1665	1765	2029	2081	2206	2537	
2x12 #2 JP	1.5	11.25	4.1	16.9	31.6	178.0	900	1.00	900	2025	2373	2729	2531	2966	3411	
2x14 #2 JP	1.5	13.25	4.8	19.9	43.9	290.8	900	0.90	810	2385	2963	3407	2981	3703	4259	
4x4 Const LF	3.5	3.50	3.0	12.3	7.1	12.5	1000	1.00	1000	1470	595	685	1838	744	856	
4x6 #2 JP	3.5	5.50	4.7	19.3	17.6	48.5	900	1.30	1170	2310	1720	1979	2888	2151	2473	
4x8 #2 JP	3.5	7.25	6.2	25.4	30.7	111.1	900	1.30	1170	3045	2989	3438	3806	3737	4297	
4x10 #2 JP	3.5	9.25	7.9	32.4	49.9	230.8	900	1.20	1080	3885	4492	5166	4856	5615	6457	
4x12 #2 JP	3.5	11.25	9.6	39.4	73.8	415.3	900	1.10	990	4725	6091	7004	5906	7614	8756	
4x14 #2 JP	3.5	13.25	11.3	46.4	102.4	678.5	900	1.00	900	5565	7681	8833	6956	9601	11041	
6x4 #2 JP	5.5	3.50	4.7	19.3	11.2	19.7	900	1.00	900	2310	842	N/A	2888	1053	N/A	
6x6 #1 PT	5.5	5.50	7.4	30.3	27.7	76.3	1200	1.00	1200	3428	2773	N/A	4285	3466	N/A	
6x8 #1 PT	5.5	7.50	10.0	41.3	51.6	193.4	1200	1.00	1200	4675	5156	N/A	5844	6445	N/A	
6x10 #1 BS	5.5	9.50	12.7	52.3	82.7	393.0	1350	1.00	1350	5922	9307	N/A	7402	11634	N/A	
6x12 #1 BS	5.5	11.50	15.4	63.3	121.2	697.1	1350	1.00	1350	7168	13638	N/A	8960	17048	N/A	
6x14 #1 BS	5.5	13.50	18.0	74.3	167.1	1127.7	1350	0.99	1332	8415	18550	N/A	10519	23188	N/A	

PARALLAM (PSL) BEAMS

Fv= psi
 Fb= psi
 E= psi (STOCK BEAMS)
 E= psi (COMMERCIAL)

Depth Factor=(12/D)^0.111

b	d	A	S	I	100%		125%		
					V	M	V	M	
3.50	x	9.50	33.3	53	250	6.43	12.7	8.04	15.9
3.50	x	11.875	41.6	82	488	8.04	19.9	10.04	24.8
3.50	x	14.0	49.0	114	800	9.47	27.2	11.84	34.0
3.50	x	16.0	56.0	149	1195	10.8	35.0	13.53	43.7
3.50	x	18.0	63.0	189	1701	12.2	43.7	15.2	54.6
3.50	x	20.0	70.0	233	2333	13.5	53.3	16.9	66.6
3.50	x	22.0	77.0	282	3106	14.9	63.8	18.6	79.7
3.50	x	24.0	84.0	336	4032	16.2	75.2	20.3	94.0
3.50	x	26.0	91.0	394	5126	17.6	87.5	22.0	109.3
3.50	x	28.0	98.0	457	6403	18.9	100.6	23.7	125.8
5.25	x	9.500	49.9	79.0	375	9.64	19.1	12.1	23.9
5.25	x	11.875	62.3	123	733	12.1	29.8	15.1	37.3
5.25	x	14.0	73.5	172	1201	14.2	40.7	17.8	50.9
5.25	x	16.0	84.0	224	1792	16.2	52.4	20.3	65.5
5.25	x	18.0	95	284	2552	18.3	65.5	22.8	81.9
5.25	x	20.0	105	350	3500	20.3	79.9	25.4	99.9
5.25	x	22.0	116	424	4659	22.3	95.7	27.9	120
5.25	x	24.0	126	504	6048	24.4	113	30.5	141
5.25	x	26.0	137	592	7690	26.4	131	33.0	164
5.25	x	28.0	147	686	9604	28.4	151	35.5	189
5.25	x	30.0	158	788	11813	30.5	172	38.1	215
5.25	x	32.0	168	896	14336	32.5	194	40.6	243
5.25	x	34.0	179	1012	17196	34.5	218	43.1	272
5.25	x	36.0	189	1134	20412	36.5	243	45.7	303
5.25	x	38.0	200	1264	24007	38.6	269	48.2	336
5.25	x	40.0	210	1400	28000	40.6	296	50.8	370
5.25	x	42.0	221	1544	32414	42.6	325	53.3	406
7.00	x	9.50	66.5	105	500	12.9	25.4	16.1	31.8
7.00	x	11.875	83.1	165	977	16.1	39.8	20.1	49.7
7.00	x	14.0	98.0	229	1601	18.9	54.3	23.7	67.9
7.00	x	16.0	112	299	2389	21.7	69.9	27.1	87.4
7.00	x	18.0	126	378	3402	24.4	87.3	30.5	109
7.00	x	20.0	140	467	4667	27.1	107	33.8	133
7.00	x	22.0	154	565	6211	29.8	128	37.2	159
7.00	x	24.0	168	672	8064	32.5	150	40.6	188
7.00	x	26.0	182	789	10253	35.2	175	44.0	219
7.00	x	28.0	196	915	12805	37.9	201	47.4	252
7.00	x	30.0	210	1050	15750	40.6	229	50.8	287
7.00	x	32.0	224	1195	19115	43.3	259	54.1	324
7.00	x	34.0	238	1349	22927	46.0	290	57.5	363
7.00	x	36.0	252	1512	27216	48.7	323	60.9	404
7.00	x	40.0	280	1867	37333	54.1	395	67.7	493
7.00	x	42.0	294	2058	43218	56.8	433	71.1	541

(1) MEMBERS IN BOLD ARE COMMERCIAL SPECIAL ORDER

== TYPICAL POST/STUD DESIGN TABLE ==

(12/15/03)

PROJECT: _____

JOB NO. _____

GRADE	POST SIZE	AREA IN ²	ALLOWABLE LOAD (KIPS)-UNSUPPORTED HEIGHT IN FT. (LOAD TABLE 133%)																			
			6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22			
Const	2X4	5.25	1.01	3.74	2.94	2.36	1.93	1.61	1.36	1.16	1.01											
	2X4 X	5.25	4.87	3.74	2.94	2.36	1.93	1.61	1.36	1.16	1.01											
	2X4	5.25	1.07																			
	2X4 X	5.25	5.07	3.93	3.10	2.50	2.05	1.71	1.44	1.24	1.07											
No. 2	2X6	8.25	1.68																			
	2X6 X	8.25	12.99	11.50	9.92	8.45	7.19	6.14	5.27	4.57	3.99	3.51	3.10	2.77	2.48	2.23	2.02	1.84	1.68			
	2X8	10.88	2.21																			
	2X8 X	10.88	18.6	17.6	16.5	15.1	13.7	12.2	10.8	9.6	8.52	7.59	6.78	6.08	5.48	4.96	4.51	4.12	3.77			
No. 2	3X4	8.75	4.73	3.55	2.75	2.19	1.78															
	3X4 X	8.75	8.45	6.55	5.17	4.16	3.41	2.85	2.41	2.06	1.78											
	3X6	13.75	7.40	5.56	4.31	3.44	2.80															
	3X6 X	13.75	21.7	19.2	16.5	14.1	12.0	10.2	8.79	7.61	6.64	5.84	5.17	4.61	4.13	3.72	3.37	3.07	2.80			
No. 2	3X8	18.13	9.72	7.31	5.68	4.53	3.69															
	3X8 X	18.13	30.9	29.4	27.5	25.2	22.8	20.3	18.0	16.0	14.2	12.6	11.3	10.1	9.14	8.27	7.52	6.86	6.28			
	4X4	12.25	11.8	9.17	7.24	5.83	4.78	3.99	3.37	2.89	2.50											
	4X6	19.25	18.4	14.3	11.3	9.13	7.49	6.25	5.29	4.53	3.92											
No. 2	4X6 X	19.25	30.3	26.8	23.2	19.7	16.8	14.3	12.3	10.7	9.30	8.18	7.24	6.45	5.78	5.21	4.72	4.29	3.92			
	4X8	25.38	24.0	18.7	14.9	12.0	9.9	8.22	6.96	5.96	5.16											
	4X8 X	25.38	43.3	41.1	38.4	35.3	31.9	28.5	25.3	22.4	19.9	17.7	15.8	14.2	12.8	11.6	10.5	9.6	8.79			
	6X6	30.25	35.3	32.9	30.1	26.9	23.7	20.8	18.2	16.0	14.1	12.4	11.1	9.91	8.91	8.05	7.30	6.65	6.09			
No. 1	6X8	41.25	48.1	44.9	41.0	36.7	32.3	28.3	24.8	21.8	19.2	17.0	15.1	13.5	12.1	11.0	10.0	9.1	8.3			
	6X8 X	41.25	51.4	49.9	47.9	45.5	42.7	39.5	36.2	32.9	29.8	26.9	24.4	22.1	20.0	18.2	16.6	15.2	14.0			
	6X10	52.25	57.1	53.7	49.5	44.7	39.8	35.1	30.9	27.2	24.0	21.3	19.0	17.0	15.3	13.8	12.6	11.5	10.5			
	6X10 X	52.25	62.3	61.5	60.5	59.2	57.7	56.0	53.9	51.6	49.0	46.3	43.4	40.6	37.8	35.1	32.6	30.3	28.1			
8X8	56.25	70.5	68.6	66.1	63.1	59.5	55.5	51.2	46.8	42.6	38.7	35.0	31.8	28.9	26.4	24.1	22.1	20.3				

X INDICATES BRACED IN WEAK DIRECTION
ALL VALUES BASED ON DOUGLAS FIR-LARCH

ROOF LOADS

Lt. Wt. Conc. Tile	6.0 psf	
(E)Composite Shingles 2 layers	4.5 psf	
1/2" plywood	1.5 psf	
joist	2.0 psf	
insulation	0.5 psf	
ceiling	3.5 psf	
beams/headers	1.0 psf	
MP&E/ misc.	0.5 psf	
	D= 19.5 psf	
	Lr= 20.0 psf	REDUCIBLE

FLOOR LOADS

flooring	1.0 psf	
3/4" plywood	2.3 psf	
joist	3.0 psf	
ceiling	4.0 psf	
beams/headers	2.0 psf	
MP&E/ misc.	2.7 psf	
	D= 15.0 psf	
	L= 40.0 psf	

EXTERIOR WALL LOADS

7/8" stucco	10.0 psf	
1/2" plywood	1.5 psf	
2x6 studs at 16"oc	1.5 psf	
insulation	0.5 psf	
1/2" gyp board	2.3 psf	
MP&E/ misc.	0.2 psf	
	D= 16.0 psf	

INTERIOR WALL LOADS

1/2" gyp board	2.3 psf	
1/2" plywood	1.5 psf	
2x6 studs at 16"oc	1.5 psf	
insulation	0.5 psf	
1/2" gyp board	2.3 psf	
MP&E/ misc.	1.9 psf	
	D= 10.0 psf	

Tag **B1**

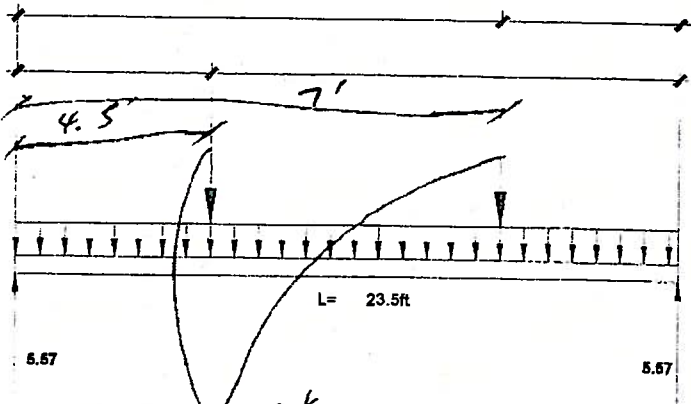
Beam

Member= 6x12

No. of members= 2
 CD= 1.25
 CF= 1.00
 CV= 1.00
 Cr= 1.00

Total Load L/n= 180
 Live Load L/n= 240

L = 23.5 ft
 A = 63.25 in²
 S = 121.2 in³
 I = 697.1 in⁴
 E = 1,600,000 psi
 Va = 7.590 kips
 Ma = 13.638 k-ft



Uniform load (W1)

	D	L	Trib				
w1,1	(19.5	+	20)	x	12	=	234
w1,2	(	+	)	x	0	=	0
w1,3	(	+	)	x	0	=	0
w1,4	(	+	)	x	0	=	0
w1,5	(	+	)	x	0	=	0
W1						=	234

= 240 = **0.474 klf**

CHECK CALC'S FOR PT. LOAD 23.5 4x12

$\Delta = 2.175''$

Point Load (P1)

	D	L	Trib.1	Trib.2			
p1,1	(	+	)	x	0	x	0
p1,2	(	+	)	x	0	x	0
p1,3	(	+	)	x	0	x	0
p1,4	(	+	)	x	0	x	0
p1,5	(	+	)	x	0	x	0
P1						=	0.00 kips

X1 (ft) X2 (ft)
 0 23.5

Point Load (P2)

	D	L	Trib.1	Trib.2			
p2,1	(	+	)	x	0	x	0
p2,2	(	+	)	x	0	x	0
p2,4	(	+	)	x	0	x	0
p2,4	(	+	)	x	0	x	0
p2,5	(	+	)	x	0	x	0
P2						=	0.00 kips

X3 (ft) X4 (ft)
 0 23.5

Shear

R1= 6.570 kips
 R2= -5.570 kips
 Vmax= 5.57 kips

Vallow.= 9.49 x 2 = 18.975 kips

Stress Ratio shear: .29

Flexure

M= 32.72 k-ft

Mallow.= 17.05 x 2 = 34.095 k-ft

flexure: .96

Deflection

D (D+L) = 1.458

+ D p1 + D p2 = 0.000 + 0.000 = 1.46 = $\frac{L}{193} < \frac{L}{180}$

deflection: .93

D (L Only) = 0.738

+ 0 + 0 = 0.74 = $\frac{L}{382} < \frac{L}{240}$

deflection: .63

USE: **2- 6X12**

Engr. _____ Date: _____

Job No. 11-213

Sheet

C8

Tag **E2**

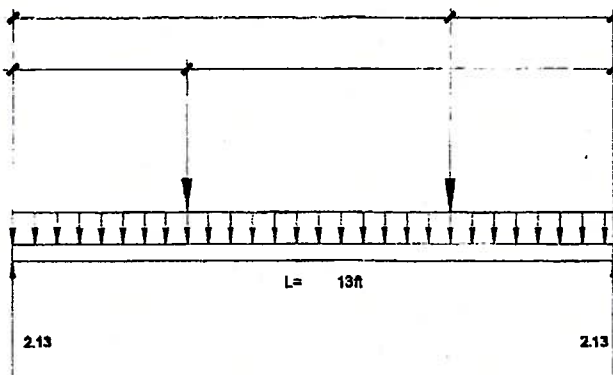
Beam

Member= 4x10

No. of members= 2
 CD= 1.25
 CF= 1.20
 CV= 1.00
 Cr= 1.00

L = 13 ft
 A = 32.38 in²
 S = 49.9 in³
 I = 230.8 in⁴
 E = 1,800,000 psi
 V_a = 3.885 kips
 M_a = 3.743 k-ft

Total Load L_n= 180
 Live Load L_n= 240



Uniform load (W1)

	D	L	Trib			
w1,1	(21 + 20)	x	8	=	168	+ 160
w1,2	(+)	x	0	=	0	+ 0
w1,3	(+)	x	0	=	0	+ 0
w1,4	(+)	x	0	=	0	+ 0
w1,5	(+)	x	0	=	0	+ 0
W1				=	168	+ 160 = 0.328 k/ft

Point Load (P1)

	D	L	Trib.1	Trib.2			
p1,1	(+)	x	0	x 0	=	0	+ 0
p1,2	(+)	x	0	x 0	=	0	+ 0
p1,3	(+)	x	0	x 0	=	0	+ 0
p1,4	(+)	x	0	x 0	=	0	+ 0
p1,5	(+)	x	0	x 0	=	0	+ 0
P1					=	0.00	kips

X1 (ft) X2 (ft)
0 13

Point Load (P2)

	D	L	Trib.1	Trib.2			
p2,1	(+)	x	0	x 0	=	0	+ 0
p2,2	(+)	x	0	x 0	=	0	+ 0
p2,4	(+)	x	0	x 0	=	0	+ 0
p2,4	(+)	x	0	x 0	=	0	+ 0
p2,5	(+)	x	0	x 0	=	0	+ 0
P2					=	0.00	kips

X3 (ft) X4 (ft)
0 13

Shear

R1= 2.132 kips
 R2= -2.132 kips
 V_{max}= 2.13 kips
 V_{allow}= 4.88 x 2 = 9.7125 kips OK
 Stress Ratio shear: .22

Flexure

M= 8.93 k-ft
 M_{allow}= 5.62 x 2 = 11.23 k-ft OK
 flexure: .62

Deflection

D = D w1 + D p1 + D p2 = 0.285 + 0.000 + 0.000 = 0.29 = $\frac{L}{547}$ < $\frac{L}{180}$ OK deflection: .33
 D (allow) = 0.139 + 0 + 0 = 0.139 = $\frac{L}{1121}$ < $\frac{L}{240}$ OK deflection: .21

USE: **2- 4X10 24" O.C.**

TYPICAL SQUARE PAD FOOTING DESIGN TABLE ==
(2/99)

PROJECT:

Soil Bearing Pressure:

q = 1500 psf
 $q_u = q \times 1.6 = 2400$ psf

Material Strengths:

concrete = 2500 psi
 $f_y = 60$ ksi

Miscellaneous:

column footprint = 4 in
 steel spacing factor = 10
 (for selection of steel spacing vs. size only)

Notes:

Assumes $P_u = 1.6$ (DL + LL)

Bar #	Area (in ²)
3	0.11
4	0.20
5	0.31
6	0.44
7	0.60
8	0.78
9	1.00
10	1.23
11	1.56

Mark:	Size (ft) -SQ.	Thick (in)	P _{max} (k)	Depth (in)	ONE WAY SHEAR:		TWO WAY SHEAR:		M _u (k-in)	a (in)	A _s (Req'd)	A _s (200/F _y)	A _s min (.0018)	A _s Use	USE:
					V _{act} (k)	V _{all} (k)	V _{act} (k)	V _{all} (k)								OK?	OK?
	2.0	12	5.40	8	0.7	16.3	6.5	65.3	Y	0.05	0.04	0.96	0.52	0.52	3 # 4
	2.5	12	8.44	8	2.3	20.4	11.3	65.3	Y	0.08	0.09	1.20	0.65	0.65	4 # 4
	3.0	12	12.15	8	4.3	24.5	17.3	65.3	Y	0.13	0.16	1.44	0.78	0.78	4 # 4
	3.5	12	16.5	8	6.9	28.6	24.3	65.3	Y	0.18	0.27	1.68	0.91	0.91	5 # 4
	4.0	12	21.6	8	10.1	32.6	32.4	65.3	Y	0.24	0.41	1.92	1.04	1.04	6 # 4
	4.5	12	27.3	8	13.8	36.7	41.6	65.3	Y	0.31	0.60	2.16	1.17	1.17	4 # 5
	5.0	12	33.8	8	18.0	40.8	51.8	65.3	Y	0.39	0.84	2.40	1.30	1.30	5 # 5
	5.5	12	40.8	8	22.8	44.9	63.2	65.3	Y	0.49	1.14	2.64	1.43	1.43	5 # 5
	6.0	15	47.3	11	24.2	67.3	72.3	112.2	Y	0.41	1.04	3.60	1.94	1.94	7 # 5