Michael Butler Civil Engineer
PO Box 1520 Fort Bragg, CA 95437 (707) 961-1891

March 30, 2009

Michael Oliphant, Head Building Inspector
Mendocino County Planning and Building Services
790 South Franklin Street
Fort Bragg, CA 95437

RE: City of Fort Bragg Cottages
Engineering for pre-approved second-unit dwelling designs

Dear Mr. Oliphant:

In agreement with the City of Fort Bragg, it is permissible for construction drawings of the 2 pre-approved dwelling designs, and related structural engineering calculations, to be reproduced with my engineering seal, for projects within the City of Fort Bragg. Of course these projects must also meet your approval and that of the City Planning Department.

The site conditions for any such pre-engineered cottage design should be the minimum soil capacity of 1000 psf at the footing depths, and that the unit not be placed in a flood zone. The slab-on-grade foundation should not be used at a wet site, unless thorough moisture mitigation measures are taken. In any case the site must be graded to maintain drainage away from the structure. The wind and seismic engineering design covers all of Fort Bragg City, except at exposed coastal headlands within ¼ mile of the Pacific Ocean, or even some of the bluff top above Noyo Harbor, where the wind design is required to be of exposure "D".

Of course the cottage placement and all related site development must meet all local zoning and setback requirements. Please contact me anytime if you have any questions or concerns about this allowable reuse of my engineering seal.

Sincerely,

REGISTERED PROFESSIONAL ENGINEER
MICHAEL BUTLER
No. C048872
Exp. Sept. 30, 10
CIVIL
STATE OF CALIFORNIA

Michael Butler

Michael Butler Civil Engineer
PO Box 1520 Fort Bragg, CA 95437 (707) 961-1891

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COMPUTER CALCULATIONS:

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	SIMPLE SPAN BEAMS WITH UNIFORM AND CONCENTRATED LOAD		0818WC	WC 1	8
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REGISTERED PROFESSIONAL ENGINEER
MICHAEL BUTLER
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==========================================================================================
BUTLER DESIGN ENGINEERING            BEAMS WITH UNIFORM LOAD & LATERAL SUPPORT  Sheet  WU    1
Engineer: MB                                                                    File    0818 WU
FB UNIT 2                            WOOD BEAM DESIGN                           19-Oct  2008
==========================================================================================
LUMBER VALUES PER 2007 CBC:                    Fb   Fv   Fc FcPER  Ft   E
Douglas Fir:  2x & 4x        Select Str      1500  180 1700  625 1000  1900
                             No. 1           1000  180 1500  625  675  1700 Cf increases per 1991 NDS
                             No. 2            900  180 1350  625  575  1600 table 4A for 2x & 4x used
   6x Beams & Stringers      No. 1           1350  170  925  625  675  1600
                             No. 2            875  170  600  625  425  1300
   6x Posts & Timbers        No. 1           1200  170 1000  625  825  1600
                             No. 2            700  170  475  625  475  1300
Redwood:  2x & 4x            No. 1 Open Grain  775  160  900  425  450  1100 Cf increases per 1991 NDS
                             No. 2 Open Grain  725  160  700  425  425  1000 table 4A for 2x & 4x used
   6x:                       No. 1           1200  145 1050  650  800  1300
                             No. 2            975  145  900  650  650  1100
Versalam or Microlam:                        3080  285 3000  900 2100  2000
Glulam:                      24F-V4 DF/DF    2400  265 1650  650 1100  1700
Glulam for cantilevers:      24F-V8 DF/DF    2400  265 1650  650 1100  1600

RAFTERS
==============================================================================
 L    DUR   yTL   yLL MOIS REP M SIZE  NSIZE  Fv   Fb  Fb'    E  Fcp
 ft   FAC   LIM   LIM FAC   FAC   FAC   FAC  psi  psi  psi  ksi  psi
------------------------------------------------------------------------
11.8 1.25   240   360 0.86 1.15  1.00  1.20  180  900 1068 1600  625
------------------------------------------------------------------------
       TW    DL    LL   TL    w    V'   MOM   fv   fb  yTL  yLL  yDL
LOADS  ft   psf   psf  psf  plf    lb ft-lb  psi  psi   in   in   in
------------------------------------------------------------------------
ROOF 2.00    14    20   34   68   360  1184   50 1081 0.39 0.23 0.16
WALL    0     8     0    8    0 ----------------------------------------
BEAM    0    15     0   15    0       STRESS AND DEFLECTION RATIOS:
                                   ----------------------------------------
-------------------------------fv/Fv       fb/Fb     TL L/     LL L/
TOTAL (LB)   28    40   68   68  0.28 OK    1.01 OK    364 OK    618 OK
------------------------------------------------------ Bearing: in^2    in
USE: 1.50 " x    7.25 "net D.F. Grade 2      R =  401 lb        0.51  0.34                ERR
==========================================================================================

RIDGE  LONG SPAN
==============================================================================
 L    DUR   yTL   yLL MOIS REP M SIZE  NSIZE  Fv   Fb  Fb'    E  Fcp
 ft   FAC   LIM   LIM FAC   FAC   FAC   FAC  psi  psi  psi  ksi  psi
------------------------------------------------------------------------
19.4 1.25   240   360 1.00 1.00  1.00  1.00  170 1350 1350 1700  625
------------------------------------------------------------ ERR -----------
       TW    DL    LL   TL    w    V'   MOM   fv   fb  yTL  yLL  yDL
LOADS  ft   psf   psf  psf  plf    lb ft-lb  psi  psi   in   in   in
------------------------------------------------------------------------
ROOF 11.5    14    16   30  345  3147 16936   75 1676 0.97 0.49 0.47
WALL    0     8     0    8    0 ----------------------------------------
BEAM    1    15     0   15   15       STRESS AND DEFLECTION RATIOS:
                                   ----------------------------------------
-------------------------------fv/Fv       fb/Fb     TL L/     LL L/
TOTAL (LB)  176   184  360  360  0.44 OK    1.24 OK    240 OK    470 OK
------------------------------------------------------ Bearing: in^2    in
USE: 5.50 " x   11.50 "net D.F. Dense 1      R = 3492 lb        4.47  0.81
=====OR 6 x 14 #1 DF  ==================================================
```

CLOSET BEAM AT LOFT

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
7.4	1.00	240	360	0.86	1.00	1.00	1.30	180	900	1006	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
LOFT	7.0	14	30	44	308	1000	2211	59	863	0.12	0.08	0.04
WALL	0	10	0	10	0							
BEAM	1	15	0	15	15							
FLOOR	0.0	20	40	60	0							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 113 210 323 323	0.33 OK	0.86 OK	728 OK	1119 OK

Bearing: in^2 in

USE: 3.50 " x 7.26 "net D.F. Grade 2 R = 1195 lb 1.91 0.55

ERR

2x HEADERS

L ft eff	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
5.4	1.25	240	360	0.86	1.00	1.00	1.10	180	900	851	1600	625

ERR

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
ROOF	8.0	14	16	30	240	507	959	55	538	0.03	0.02	0.02
WALL	1	8	0	8	8							
BEAM	1	15	0	15	15							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 135 128 263 263	0.30 OK	0.63 OK	2039 OK	4189 OK

Bearing: in^2 in

USE: 1.50 " x 9.25 "net D.F. Grade 2 R = 710 lb 0.91 0.61

6x HEADERS

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
5.4	1.25	240	360	0.86	1.00	1.00	1.00	170	1200	1032	1600	625

ERR

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
ROOF	8.0	14	16	30	240	633	959	49	1024	0.16	0.08	0.08
WALL	1	8	0	8	8							
BEAM	1	15	0	15	15							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 135 128 263 263	0.29 OK	0.99 OK	405 OK	832 OK

Bearing: in^2 in

USE: 5.50 " x 3.50 "net D.F. Grade 1 R = 710 lb 0.91 0.17

3

RIDGE CONTINUOUS SPAN

L ft eff	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
18.0	1.25	240	360	1.00	1.00	1.00	1.00	285	3080	3080	2000	625

ERR

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
ROOF	11.5	14	16	30	345	2884	14580	104	2129	0.87	0.45	0.43
WALL	0	8	0	8	0							
BEAM	1	15	0	15	15							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 176 184 360 360	0.37 OK	0.69 OK	248 OK	485 OK

Bearing: in^2 in

USE: 3.50 " x 11.87 "net D.F. Grade VERSA R = 3240 lb 4.15 1.18

RIDGE CONTINUOUS SPAN

L ft eff	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
18.0	1.25	240	360	1.00	1.00	1.00	1.00	265	2400	2400	1700	625

ERR

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
ROOF	11.5	14	16	30	345	2880	14580	69	1389	0.66	0.34	0.32
WALL	0	8	0	8	0							
BEAM	1	15	0	15	15							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 176 184 360 360	0.26 OK	0.58 OK	326 OK	639 OK

Bearing: in^2 in

USE: 5.25 " x 12.00 "net D.F. Grade GLULAM R = 3240 lb 4.15 0.79

LOFT JOISTS

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
9.3	1.00	240	360	0.86	1.15	1.00	1.30	180	900	1157	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
LOFT	1.3	14	30	44	59	244	626	44	993	0.29	0.20	0.09
WALL	0	10	0	10	0							
BEAM	0	15	0	15	0							
FLOOR	0.0	20	40	60	0							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 19 40 59 59	0.25 OK	0.86 OK	383 OK	562 OK

Bearing: in^2 in

USE: 1.50 " x 5.50 "net D.F. Grade 2 R = 271 lb 0.43 0.29

ERR

FLOOR GIRDERS TYP

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
4.7	1.00	240	360	0.86	1.00	1.00	1.30	180	900	1006	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
FLOOR	7.0	14	40	54	378	904	1320	70	898	0.07	0.05	0.02
WALL	4	8	0	8	32							
BEAM	1	5	0	5	5							
LOFT	1.5	12	30	42	63							
TOTAL (LB)		153	325	478	478							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
	0.39 OK	0.89 OK	834 OK	1227 OK

Bearing: in^2 in

USE: 3.50 " x 5.50 "net D.F. Grade 2 R = 1123 lb 1.80 0.51

ERR

FLOOR GIRDERS AT WALLS

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
4.7	1.00	240	360	0.86	1.00	1.00	1.30	180	1000	1118	1700	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
FLOOR	6.0	14	40	54	324	1122	1637	87	1114	0.08	0.05	0.03
WALL	8	8	0	8	64							
BEAM	1	5	0	5	5							
LOFT	5.0	10	30	40	200							
TOTAL (LB)		203	390	593	593							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
	0.49 OK	1.00 OK	715 OK	1087 OK

Bearing: in^2 in

USE: 3.50 " x 5.50 "net D.F. Grade 1 R = 1394 lb 2.23 0.64

ERR

FLOOR JOISTS

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
6.8	1.00	240	360	0.86	1.15	1.00	1.30	180	900	1157	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
FLOOR	1.3	20	40	60	80	329	646	60	1025	0.16	0.08	0.08
WALL	4	8	0	8	32							
BEAM	0	15	0	15	0							
LOFT	0.0	14	30	44	0							
TOTAL (LB)		59	53	112	112							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
	0.33 OK	0.89 OK	505 OK	1061 OK

Bearing: in^2 in

USE: 1.50 " x 5.50 "net D.F. Grade 2 R = 380 lb 0.61 0.41

ERR

FLOOR JOISTS AT WALLS

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
6.8	1.00	240	360	0.86	1.15	1.00	1.30	180	1000	1286	1700	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
FLOOR	1.3	20	40	60	80	411	808	75	1282	0.19	0.11	0.08
WALL	2	8	0	8	16							
BEAM	0	15	0	15	0							
LOFT	1.0	14	30	44	44							
TOTAL (LB)		57	83	140	140							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
	0.42 OK	1.00 OK	429 OK	721 OK

Bearing: in^2 in

USE: 1.50 " x 5.50 "net D.F. Grade 1 R = 475 lb 0.76 0.51

ERR

PORCH DECK GIRDERS

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
5.5	1.25	240	360	0.86	1.00	1.00	1.30	180	900	1006	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
DECK	5.0	14	40	54	270	665	1097	52	746	0.08	0.05	0.02
WALL	2	10	0	10	20							
BEAM	0	15	0	15	0							
FLOOR	0.0	20	40	60	0							
TOTAL (LB)		90	200	290	290							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
	0.29 OK	0.74 OK	858 OK	1244 OK

Bearing: in^2 in

USE: 3.50 " x 5.50 "net D.F. Grade 2 R = 798 lb 1.02 0.29

ERR

PORCH RAFTERS

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
9.5	1.25	240	360	0.86	1.15	1.00	1.30	180	900	1157	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
ROOF	2.0	14	20	34	68	292	767	53	1217	0.37	0.22	0.15
WALL	0	10	0	10	0							
BEAM	0	15	0	15	0							
FLOOR	0.0	20	40	60	0							
TOTAL (LB)		28	40	68	68							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
	0.29 OK	1.05 OK	304 OK	517 OK

Bearing: in^2 in

USE: 1.50 " x 5.50 "net D.F. Grade 2 R = 323 lb 0.41 0.28

ERR

PORCH RIDGE

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
7.0	1.25	240	360	0.86	1.00	1.00	1.30	180	900	1006	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
ROOF	9.5	14	20	34	323	979	2070	58	810	0.10	0.06	0.04
WALL	0	10	0	10	0							
BEAM	1	15	0	15	15							
FLOOR	0.0	20	40	60	0							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 148 190 338 338	0.32 OK	0.81 OK	818 OK	1455 OK

Bearing: in^2 in

USE: 3.50 " x 7.25 "net D.F. Grade 2 R = 1183 lb 1.51 0.43

ERR

PORCH PURLINS

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
7.0	1.25	240	360	0.86	1.00	1.00	1.30	180	900	1006	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
ROOF	7.0	14	20	34	238	770	1550	60	1054	0.18	0.10	0.08
WALL	0	10	0	10	0							
BEAM	1	15	0	15	15							
FLOOR	0.0	20	40	60	0							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 113 140 253 253	0.33 OK	1.05 OK	477 OK	862 OK

Bearing: in^2 in

USE: 3.50 " x 5.50 "net D.F. Grade 2 R = 886 lb 1.13 0.32

ERR

PORCH CEILING

L ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb' psi	E ksi	Fcp psi
6.8	1.25	240	360	0.86	1.15	1.00	1.50	180	900	1335	1600	625

LOADS	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM ft-lb	fv psi	fb psi	yTL in	yLL in	yDL in
CEIL	1.3	10	30	40	53	165	307	47	1205	0.30	0.22	0.07
WALL	0	10	0	10	0							
BEAM	0	15	0	15	0							
FLOOR	0.0	20	40	60	0							

STRESS AND DEFLECTION RATIOS:

	fv/Fv	fb/Fb	TL L/	LL L/
TOTAL (LB) 13 40 53 53	0.26 OK	0.90 OK	273 OK	365 OK

Bearing: in^2 in

USE: 1.50 " x 3.50 "net D.F. Grade 2 R = 181 lb 0.23 0.15

=====OR 2X6 AT 24" O.C. ========== ERR

BUTLER DESIGN ENGINEERING | BEAMS WITH UNIFORM & CONCENTRATED LOADS | Sheet WC 1
Engineer: MB | | File 0818 WC
FB UNIT 2 | WOOD BEAM DESIGN | 19-Oct 2008

LUMBER VALUES PER 2007 CBC:		Fb	Fv	Fc	FcPERP	Ft	E	
Douglas Fir: 2x & 4x	Select Str	1500	180	1700	625	1000	1900	
Douglas Fir: 2x & 4x	No. 1	1000	180	1500	625	675	1700	Cf increases per 1991 NDS
	No. 2	900	180	1350	625	575	1600	table 4A for 2x & 4x used
6x Beams & Stringers	No. 1	1350	170	925	625	675	1600	
	No. 2	875	170	600	625	425	1300	
6x Posts & Timbers	No. 1	1200	170	1000	625	825	1600	
	No. 2	700	170	475	625	475	1300	
Redwood: 2x & 4x	No. 1 Open Grain	775	160	900	425	450	1100	Cf increases per 1991 NDS
	No. 2 Open Grain	725	160	700	425	425	1000	table 4A for 2x & 4x used
6x:	No. 1	1200	145	1050	650	800	1300	
	No. 2	975	145	900	650	650	1100	
Versalam or Microlam:		3080	285	3000	900	2100	2000	
Glulam:	24F-V4 DF/DF	2400	265	1650	650	1100	1700	
Glulam for cantilevers:	24F-V8 DF/DF	2400	265	1650	650	1100	1600	

Calculations begin on the next page.

EXT PORCH BEAM 1.021 CONT BEAM ASSUMED Sheet WC 2

L ft	lu ft	x ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC *	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb'' psi	Fb''' psi	E ksi	I in^4	Fcp PSI
8.0	1	4.0	1.25	240	480	0.86	1.00	1.00	1.00	170	1200	1032	1032	1600	193	625
		ERR					1.00									

le in	Cs	Ck	Fb''': Cs<10 psi	Cs<Ck psi	Cs>Ck psi	Cs>50 psi	Fb'lu psi	Fb'sz psi	Fb' psi
23	2.4	28.6	1032	1032	0	0	1032	1032	1032

======CONCENTRATED LOAD #1

LOADS:	TA sf	DL psf	LL psf	TL lb	a1 ft	b1 ft	Vmax lb	MOM@a ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@xTL IFx<a	y@xTL IFx>a	y@xTL in	y@xLL in	y@xDL in
ROOF	50	14	20	1683	4.0	4.0	842	3366	3366	31	783	0.10	0.10	0.10	0.06	0.04
WALL	0	20	0	0												
TOTAL (lb):		693	990	1683												

======CONCENTRATED LOAD #2

LOADS:	TA sf	DL psf	LL psf	TL lb	a2 ft	b2 ft	Vmax lb	MOM@a ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@xTL IFx<a	y@xTL IFx>a	y@xTL in	y@xLL in	y@xDL in
ROOF	0	14	20	0	5.2	2.8	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
WALL	0	9	0	0												
TOTAL (lb):		0	0	0												

======UNIFORM LOAD

LOADS:	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM@CL ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@cTL psi	y@xTL in	y@xLL in	y@xDL in
CEIL	3.70	10	20	30	111	489	1160	1160	18	270	0.04	0.04	0.02	0.02
WALL	3	8	0	8	24									
BEAM	1	10	0	10	10									
TOTAL (plf):		71	74	145	145									

AREA: 30
TOTAL: 79

DEFLECTION TOTALS:

y@xTL in	y@xLL in	y@xDL in
0.14	0.08	0.06

TOTAL STRESS AND DEFLECTION RATIOS:

fv/Fv	fb/Fb'	TL L/	LL L/
0.28 OK	1.02 OK	669 OK	1185 OK

USE: D.F. Grade 1 Ra= 1422 lb BEARING: 2.8 in^2 5.5 in x 0.5 in
Net : 5.50 " x 7.50 " Rb= 1422 lb BEARING: 2.8 in^2 5.5 in x 0.5 in

HEADER TAKING RIDG1.192 Sheet WC 3

L ft	lu ft *	x ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC *	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb'' psi	Fb''' psi	E ksi	I in^4	Fcp PSI
3.4	3	1.7	1.25	240	480	0.86	1.00	1.00	1.00	170	1200	1032	1032	1600	193	625
		ERR					1.00									

le in	Cs	Ck	Fb''': Cs<10 psi	Cs<Ck psi	Cs>Ck psi	Cs>50 psi	Fb'lu psi	Fb'sz psi	Fb' psi
69	4.1	28.6	1032	1032	0	0	1032	1032	1032

======CONCENTRATED LOAD #1

LOADS:	TA sf	DL psf	LL psf	TL lb	a1 ft	b1 ft	Vmax lb	MOM@a ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@xTL IFx<a	y@xTL IFx>a	y@xTL in	y@xLL in	y@xDL in
ROOF	132	16	20	4761	1.7	1.7	3027	5145	5145	110	1197	0.03	0.03	0.03	0.02	0.01
PORCH	38	14	20	1292												
TOTAL (lb):		2648	3405	6053												

======CONCENTRATED LOAD #2

LOADS:	TA sf	DL psf	LL psf	TL lb	a2 ft	b2 ft	Vmax lb	MOM@a ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@xTL IFx<a	y@xTL IFx>a	y@xTL in	y@xLL in	y@xDL in
ROOF	0	16	16	0	0.7	2.7	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
WALL	0	9	0	0												
TOTAL (lb):		0	0	0												

======UNIFORM LOAD

LOADS:	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM@CL ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@cTL psi	y@xTL in	y@xLL in	y@xDL in
ROOF	0.50	16	16	32	16	103	139	139	4	32	0.00	0.00	0.00	0.00
WALL	6	10	0	10	60									
BEAM	1	20	0	20	20									
TOTAL (plf):		88	8	96	96									

AREA: 2

TOTAL: 134

DEFLECTION TOTALS:

y@xTL in	y@xLL in	y@xDL in
0.03	0.02	0.01

TOTAL STRESS AND DEFLECTION RATIOS:

fv/Fv	fb/Fb'	TL L/	LL L/
0.67 OK	1.19 OK	1426 OK	2607 OK

USE: D.F. Grade 1 Ra= 3190 lb BEARING: 6.4 in^2 5.5 in x 1.2 in

Net : 5.50 " x 7.50 " Rb= 3190 lb BEARING: 6.4 in^2 5.5 in x 1.2 in

JOISTS TAKING INT WALL Sheet WC 4

L ft	lu ft	x ft	DUR FAC	yTL LIM	yLL LIM	MOIS FAC	REP M FAC *	SIZE FAC	NSIZE FAC	Fv psi	Fb psi	Fb'' psi	Fb''' psi	E ksi	I in^4	Fcp PSI
6.8	1	3.0	1.00	240	360	0.86	1.15	1.00	1.30	180	900	890	1157	1600	21	625
							1.15									

le in	Cs	Ck	Fb''': Cs<10 psi	Cs<Ck psi	Cs>Ck psi	Cs>50 psi	Fb'lu psi	Fb'sz psi	Fb' psi
23	7.5	36.9	1157	1156	0	0	1157	1157	1157

======CONCENTRATED LOAD #1

LOADS:	TA sf	DL psf	LL psf	TL lb	a1 ft	b1 ft	Vmax lb	MOM@a ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@xTL IFx<a	y@xTL IFx>a	y@xTL in	y@xLL in	y@xDL in
LOFT	2	20	20	80	3.0	3.8	56	167	167	10	265	0.03	0.03	0.03	0.01	0.02
WALL	3	8	0	20												
TOTAL (lb):		60	40	100												

======CONCENTRATED LOAD #2

LOADS:	TA sf	DL psf	LL psf	TL lb	a2 ft	b2 ft	Vmax lb	MOM@a ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@xTL IFx<a	y@xTL IFx>a	y@xTL in	y@xLL in	y@xDL in
FLOOR	0	1	1	0	7.0	-0.2	0	0	0	0	0	0.00	0.00	0.00	0.00	0.00
WALL	0	9	0	0												
TOTAL (lb):		0	0	0												

======UNIFORM LOAD

LOADS:	TW ft	DL psf	LL psf	TL psf	w plf	V' lb	MOM@CL ft*lb	MOM@x ft*lb	fv psi	fb@x psi	y@cTL psi	y@xTL in	y@xLL in	y@xDL in
FLOOR	1.33	20	40	60	80	235	461	455	43	722	0.12	0.11	0.08	0.04
WALL	0	8	0	8	0									
BEAM	0	10	0	10	0									
TOTAL (plf):		27	53	80	80									
AREA:		9												
TOTAL:		11												

DEFLECTION TOTALS:

TOTAL STRESS AND DEFLECTION RATIOS:

fv/Fv	fb/Fb'	TL L/	LL L/	y@xTL in	y@xLL in	y@xDL in
0.29 OK	0.85 OK	557 OK	918 OK	0.15	0.09	0.06

USE: D.F. Grade 2 Ra= 327 lb BEARING: 0.5 in^2 1.5 in x 0.3 in

Net : 1.50 " x 5.50 " Rb= 315 lb BEARING: 0.5 in^2 1.5 in x 0.3 in

```
==================================================================================================
Butler Engineering                LATERAL DESIGN   LONGITUDINAL DIRECTION              Sheet  LL       1
Engineer: MB                                                                          File     0818 LL
FB UNIT 2                         FLEXIBLE DIAPHRAGM SHEARWALL ANALYSIS               16-Oct   2008
==================================================================================================
Loads per 2007 CBC.               FLOOR DIAPHRAGM            See lateral resistance diagram for this job.

This calculation checks Allowable Load Combinations controling stability and lateral strength per 1605.3
16-17: D + L + wW
16-18: D + L + wW + S/2                 (E is factored at p*Cs/1.4 during calc to compare seismic with wind)
16-20: D + L + S + E/1.4                (For footing strength check, W and E/1.4 are multiplied by 1.7)
16-21: D + E/1.4

Allowable loads for materials and hardware:       Materials allowable stress increase factor:     1.33
--------------------------------------------------------------------------------------------------
Stress Values:                 Allowable Loads (for DF-L N):
#2 DF:       Ft=     575 psi       ( at 1.33 increase)
             Fcp=    625 psi       A35    450 lb
A36 steel:   Fa=    21.6 ksi       L90    650 lb
Concrete:    fc'=   2500 psi       CS150 1685 lb
Rebar:primaryFy=      40 ksi
    secondaryFy=      40 ksi
Soil:        q'=    1500 psf @ ftg depth
             alpha   0.3 (friction)
             Kp=     300 pcf
Anchor Bolts:          p    q      Nails in 2x DF-L (N):
5/8" in 2x4 sill:    780  275 lb        Sinker  Com
3/4" in 2x6 sill:   1080  409 lb    16d=   116   139
5/8" in 3x4 sill:    957  348 lb
3/4" in 3x6 sill:   1290  600 lb


WIND  per ASCE7-05 Method 2:       SEISMIC  per ASCE7-05 12.8 (Equivalent Force Method)
(Mod for horiz and vert compnts)   Wood Frame Construction, I=1, Ct=0.02, x=0.75
Vel Pres q=0.00256*Kz*Kzt*Kd*V^2   Ss and S1 Determined from NEHRP Data (ASCE7-05)
Wind Velocity:        85 mph       ACCELLERATION: Cs=Sds/R (And if S1>0.6g: Min Cs=0.5S1/r)
--------------------------------------------------------------------------------------------------
Site Exposure:     C                 Bldg Ht:    17 ft.     Ss: 1.500 This valid only for site classes B-E.
Enclosure GCp+/- :  0.18 Roof Only  SiteClass: D            S1: 0.660 This Sds calc is not valid for Ss<1.0
Topo Factor Kzt:    1.00                  R:    6.5                   This Sd1 calc is not valid for S1<0.4
Directn Fact Kd:    0.85            (Sds)SDC=  D           Sds= 1.000 (At site D w Ss<1.25, Sds can be lower
Exposure Fact Kz=   0.85            (Sd1)SDC=  D           Sd1= 0.660 (At site D w S1<0.5, Sd1 can be lower)
Load Combo Fact, w: 1.30                 Ta=  0.167                  (At site C w S1<0.5, Sd1 can be lower)
                                    (Sds) Cs=  0.154  (SD1) Cs = 0.051
                                       Cs max= 0.606        Cs = 0.154   (Controlling)
Velocity Press=    17.37 psf           Cs min= 0.100    Cs/1.4 = 0.110   (E/1.4, to compare with wind loads)
                                                              p =   1.3   (Inc "p", Rho, factor here. Reduce
WIND LOAD DISTRIBUTION   Bldg Dims: Max   Perp        p*Cs/1.4 = 0.143   it at shear walls later if allowed)
Determination of Load Components:    40    24         Pressures adjusted to ave values inc edge zones etc.
--------------------------------------------------------------------- (This is for roof slopes to 45 degs)
             Wall  Roof   #  Load  Diaph Roof  "a"   Roof  Averaged Wind Load Factors:
             Ave   Rise Perp Width Depth Ohng  dist Slope ------------(Roof loads are out unless neg)  -----
Load Line    Ht ft  ft  Edges  ft   ft    ft    ft   tan    1     2     3     4     1E    2E    3E    4E
-------------------------------------------------------------------------------------------------------
WA  A   B    13.0   0.0    2    24   32   1.5   3.0  0.00  0.40  0.87  0.55  0.29  0.61  1.25  0.71 0.43
```

WIND LOADS, Continued: Sheet LL 2

Load	1=Roof 0=Floor	LATERAL LOAD: Wall Ajst Pres Sum psf	Roof Horz Pres Sum psf	Total Horiz Load plf	UPLIFT LOAD: Windward Roof Vert psf	0.6 DL (seis)	Net Vert plf	Leeward Roof Vert psf	0.6 DL (seis)	Net Vert plf	Total Up plf (negative is down)
WA	1	15.03	0.00	98	18.4	10.8	133	10.9	10.8	3	136
0	1	0.00	0.00	0	0.0	9.0	0	0.0	9.0	0	0
0	1	0.00	0.00	0	0.0	10.8	0	0.0	10.8	0	0
0	1	0.00	0.00	0	0.0	10.8	0	0.0	10.8	0	0

SEISMIC LOADS p*Cs/1.4 for this level = 0.143 Loads not constant over entire width are averaged.

WA	Item	psf	x Depth =	Weight		0	Item	psf	x Depth =	Weight	
	ROOF	18	44	792			ROOF	15	0	0	
	EXTW	10	13	130			EXTWL	20	0	0	
	INTW	8	20	160			INTWL	8	3	24	
	LOFT	20	16	320				0	0	0	
	TOTAL=			1402	V= 200 plf		TOTAL=			24	V= 3 plf

0	Item	psf	x Depth =	Weight		0	Item	psf	x Depth =	Weight	
	ROOF	18	0	0			ROOF	18	0	0	
	EXTW	10	0	0			EXTWL	10	0	0	
	INTW	8	0	0			INTW	8	10	80	
		0	0	0				0	0	0	
	TOTAL=			0	V= 0 plf		TOTAL=			80	V= 11 plf

Horizontal diaphragm stress calculation: Diaphragm depths may be understated to be safe.

Load	No. Rea	Widt ft	Depth ft	WIND: wPLF	V lb	v PLF	Up lb	SEIS: wPLF	V lb	v PLF	CONTROL:	V lb	v PLF
WA	2	24.0	32	98	1172	37	1629	200	2403	75	SEIS	2403	75
0	2	0.0	0	0	0	0	0	0	0	0	SEIS	0	0
0	2	0.0	0	0	0	0	0	0	0	0	SEIS	0	0
0	2	0.0	0	0	0	0	0	0	0	0	SEIS	0	0

Chord stress calculation: Area Req'd: Total # 16d Sinker Req'd at splices- half ea side. See drag force calcs also Plate Splice Class:

Load	From	To	Control	wPLF	F lb	Fir	Steel		Use:		
WA	A	B	SEIS	200	451	0.58	0.02	2.9	Use:	16 -16d	I
0	0	0	SEIS	0	0	0	0.00	0.0	Use:	16 -16d	I
0	0	0	SEIS	0	0	0	0.00	0.0	Use:	16 -16d	I
0	0	0	SEIS	0	0	0	0.00	0.0	Use:	16 -16d	I

Drag force calculation: Seis p is set at 1.3 (above); Assumes a missing element reduces strength by > 33%

With 3.0 Overstrength Factor for Seis Load

Reactions:			ROOF	Wall	Open	Wall	Begin	End	Drag-force		Area req'd:		#16d	#16d	Splice
p corr: 1.0			WIND	Line:	ft	ft	Sum	at	at	Beg	End	Fir:	Steel:	Req	Use:	Class
	SEIS	WIND	UP													
WA	2403	1172	1629	1	4		4	0	4	0	1155	1.51	0.04	7	16	I
						5	4	4	9	1155	289	1.51	0.04	7	16	I
ADDL			Net UP		4		8	9	13	289	1444	1.89	0.05	9	16	I
W sum =	2403	1172	1629			5	8	13	18	1444	578	1.89	0.05	9	16	I
R' A						6.5	8	18	24.5	578	549	0.76	0.02	4	16	I
						3.5	8	24.5	28	549	1155	1.51	0.04	7	16	I
V=	2403	1172			4		12	28	32	1155	0	1.51	0.04	7	16	I
Control=	2403	SEIS					12	32	32	0	0	0.00	0.00	0	16	I
Drag Overstrength=	2.307		2				12	32	32	0	0	0.00	0.00	0	16	I

SHEAR WALL STRESS vWIND= 98 plf Drag Length= 32 ft
TotalSW= 12 ft vSEIS= 200 plf vDRAG= 75 plf

Plate Nails:								
Drag L =	32 FT	Sill=	2 x	SPACING	16d	25 " oc max or	5/8AB@	166 " o.c. max
Wall trib w =	5 FT	w=	75.1 plf		16d	25 " oc max or	5/8AB@	58 " o.c. max
				USE:	16d	16 " oc max or	5/8AB@	58 " o.c. max

Shear Wall Overturning: Line A WIND: V lb OT Mom SEIS: V lb OT Mom

H: 10 ft	Weight:psf	T.W.	plf	Net DL R MOM	LATERAL= 1172	11721	TOTAL= 2403	24034
L= 4 ft	WALL 10	10	100	lb lb*ft				
	ROOF 14	6	84	----------				
	FLOOR		0	.6DL> 442 883 SEIS				
	----------			36 73 WIND	Line length	32 FT	Wall 352	1758
	TOTAL:		184 plf					

For entire line: Total= WIND: 1172 11721 lb*ft SEIS: 2755 25793 lb*ft
WIND SEIS

For this wall only: OT Mom - R Mom = 3834 lb*ft 7714 lb*ft
" Net Uplift = 959 lb 1929 lb
" Add uplift above: lb lb
" Total Net Uplift = 959 lb 1929 lb

GRADE BEAM: Line A Use 100% Seis (inc p) at soil per 1605.3.2. qALL= 1995 psf @ footing depth

Leq: 32 ft + 0 ft = 32 ft	Lateral:	Overturning:	Pressure:	Sliding:
Have 10 ft + 1.5 ft = 11.5 ft	Vdia= 2403 LB	Mdia= 27639 lb*ft	AREA= 32 ft^2	P= 14333 lb
@CG wall: 6.5 ft = 6.5 ft	Vwal= 352 LB	Mwal= 2286 lb*ft	qDL= 448 psf	alpha= 0.3
Weight to Grade Beam:	V= 2755 LB	Mseis=29925 lb*ft	qLAT= 175 psf	Kp= 300 lb
DL lowest flr & ponywl: 450 plf	v= 86 PLF	0.6DL=14333 lb (inc. wall wt.)		Passive h= 1.5 ft
FTG:Depth: Width:	v= 1.195 PSI	Resultant eccentricity & F.S.		x W= 15 ft
Stem 6 " x 6 " = 38 plf	OK	Leq/6= 5.3 ft F.S. = 3.0		Max Reaction= 9362 lb
Foot 6 " x 12 " = 75 plf		Leq/4= 8.0 ft F.S. = 2.0		V Control 2755 lb
Dept 12 " Total = 563 plf		Leq/3=10.66 ft F.S. = 1.5		(SEIS) OK

Net Uplift= 1929 lb Use: e< 10.7 ft e= 2.1 ft OK qMAX= 623 psf OK
Add Uplift lb
Total = 1929 lb Fc'= 2500 psi Fv= 100.0 psi Fy= 40 ksi

---- 0.75 Factored Loads to Concrete Footing:

Gr Beam	2 Side(s):	Lreq= 1.7 ft	No. Moments 2	Shear:Vup= 964 lb	Smax= 4 in
Bar size 4		d= 8.5 in	Beam Moment= 0.8 k*ft	Ac= 51 in^2	Av min= 0.03 in^2
No. Bars 1 T&B		b= 6 in	0.75 Mu= 1.1 k*ft	vu= 32.14 psi	Use#3 @ 0 "oc
As= 0.19 IN^2		a= 0.61 in	Mn x phi= 4.8 k*ft OK	fv*phi= 100 psi	Over L= 0.0 ft

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==================================================================================================
Butler Engineering                LATERAL DESIGN   TRANSVERSE DIRECTION                Sheet  LT       1
Engineer: MB                                                                          File     0818 LT
FB UNIT 2                         FLEXIBLE DIAPHRAGM SHEARWALL ANALYSIS               16-Oct   2008
==================================================================================================
Loads per 2007 CBC.               FLOOR DIAPHRAGM            See lateral resistance diagram for this job.

This calculation checks Allowable Load Combinations controling stability and lateral strength per 1605.3
16-17: D + L + wW
16-18: D + L + wW + S/2                 (E is factored at p*Cs/1.4 during calc to compare seismic with wind)
16-20: D + L + S + E/1.4                (For footing strength check, W and E/1.4 are multiplied by 1.7)
16-21: D + E/1.4

Allowable loads for materials and hardware:       Materials allowable stress increase factor:     1.33
--------------------------------------------------------------------------------------------------
Stress Values:                 Allowable Loads (for DF-L N):
#2 DF:        Ft=     575 psi        ( at 1.33 increase)
              Fcp=    625 psi        A35    450 lb
A36 steel:    Fa=    21.6 ksi        L90    650 lb
Concrete:     fc'=  2500 psi         CS150 1685 lb
Rebar:primaryFy=      40 ksi
    secondaryFy=      40 ksi
Soil:         q'=   1500 psf @ ftg depth
              alpha   0.3 (friction)
              Kp=     300 pcf
Anchor Bolts:           p    q       Nails in 2x DF-L (N):
5/8" in 2x4 sill:     780  275 lb         Sinker  Com
3/4" in 2x6 sill:    1080  409 lb    16d=   116   139
5/8" in 3x4 sill:     957  348 lb
3/4" in 3x6 sill:    1290  600 lb


WIND  per ASCE7-05 Method 2:        SEISMIC  per ASCE7-05 12.8 (Equivalent Force Method)
(Mod for horiz and vert compnts)    Wood Frame Construction, I=1, Ct=0.02, x=0.75
Vel Pres q=0.00256*Kz*Kzt*Kd*V^2    Ss and S1 Determined from NEHRP Data (ASCE7-05)
Wind Velocity:        85 mph        ACCELLERATION: Cs=Sds/R (And if S1>0.6g: Min Cs=0.5S1/r)
--------------------------------------------------------------------------------------------------
Site Exposure:     C                  Bldg Ht:    17 ft.     Ss: 1.500 This valid only for site classes B-E.
Enclosure GCp+/- :  0.18 Roof Only  SiteClass: D             S1: 0.660 This Sds calc is not valid for Ss<1.0
Topo Factor Kzt:    1.00                  R:    6.5                   This Sd1 calc is not valid for S1<0.4
Directn Fact Kd:    0.85            (Sds)SDC=  D            Sds= 1.000 (At site D w Ss<1.25, Sds can be lower
Exposure Fact Kz=   0.85            (Sd1)SDC=  D            Sd1= 0.660 (At site D w S1<0.5, Sd1 can be lower)
Load Combo Fact, w: 1.30                 Ta=  0.167                   (At site C w S1<0.5, Sd1 can be lower)
                                    (Sds) Cs=  0.154  (SD1) Cs = 0.051
                                       Cs max= 0.606        Cs = 0.154   (Controlling)
Velocity Press=    17.37 psf           Cs min= 0.100    Cs/1.4 = 0.110   (E/1.4, to compare with wind loads)
                                                              p =   1.3   (Inc "p", Rho, factor here. Reduce
WIND LOAD DISTRIBUTION    Bldg Dims: Max   Perp       p*Cs/1.4 = 0.143   it at shear walls later if allowed)
Determination of Load Components:     40    24        Pressures adjusted to ave values inc edge zones etc.
--------------------------------------------------------------------- (This is for roof slopes to 45 degs)
              Wall  Roof   #  Load  Diaph Roof  "a"   Roof  Averaged Wind Load Factors:
              Ave   Rise Perp Width Depth Ohng  dist Slope ------------(Roof loads are out unless neg)  -----
Load Line    Ht ft   ft  Edges  ft   ft    ft    ft   tan    1     2      3     4     1E    2E    3E    4E
--------------------------------------------------------------------------------------------------------
W1  1   2    10.0   6.0    2    32   24   1.5   3.0  0.50  0.55  0.18   0.63  0.39  0.73   0.28   0.77 0.54
```

WIND LOADS, Continued: Sheet LT 2

Load	1=Roof 0=Floor	LATERAL LOAD: Wall Ajst Pres Sum psf	Roof Horz Pres Sum psf	Total Horiz Load plf	UPLIFT LOAD: Windward Roof Vert psf	0.6 DL (seis)	Net Vert plf	Leeward Roof Vert psf	0.6 DL (seis)	Net Vert plf	Total Up plf (negative is down)
W1	1	18.48	4.01	116	3.3	10.8	-101	10.2	10.8	-8	-109
0	1	0.00	0.00	0	0.0	9.0	0	0.0	9.0	0	0
0	1	0.00	0.00	0	0.0	10.8	0	0.0	10.8	0	0
0	1	0.00	0.00	0	0.0	10.8	0	0.0	10.8	0	0

SEISMIC LOADS p*Cs/1.4 for this level = 0.143 Loads not constant over entire width are averaged.

W1	Item	psf	x Depth =	Weight		0	Item	psf	x Depth =	Weight	
	ROOF	18	30	540			ROOF	15	0	0	
	EXTW	10	10	100			EXTWL	20	0	0	
	INTW	8	15	120			INTWL	8	3	24	
	LOFT	20	12	240				0	0	0	
	TOTAL=			1000	V= 143 plf		TOTAL=			24	V= 3 plf

0	Item	psf	x Depth =	Weight		0	Item	psf	x Depth =	Weight	
	ROOF	18	0	0			ROOF	18	0	0	
	EXTW	10	0	0			EXTWL	10	0	0	
	INTW	8	0	0			INTW	8	10	80	
		0	0	0				0	0	0	
	TOTAL=			0	V= 0 plf		TOTAL=			80	V= 11 plf

Horizontal diaphragm stress calculation: Diaphragm depths may be understated to be safe.

Load	No. Rea	Widt ft	Depth ft	WIND: V wPLF	V lb	v PLF	Up lb	SEIS: V wPLF	V lb	v PLF	CONTROL:	V lb	v PLF
W1	2	32.0	24	116	1863	78	-1743	143	2286	95	SEIS	2286	95
0	2	0.0	0	0	0	0	0	0	0	0	SEIS	0	0
0	2	0.0	0	0	0	0	0	0	0	0	SEIS	0	0
0	2	0.0	0	0	0	0	0	0	0	0	SEIS	0	0

Chord stress calculation: Area Req'd: Total # 16d Sinker Req'd at splices- half ea side. See drag force calcs also Plate Splice Class:

Load	From	To	Control	wPLF	F lb	Fir	Steel		Use:	16 -16d	
W1	1	2	SEIS	143	762	0.99	0.03	4.9	Use:	16 -16d	I
0	0	0	SEIS	0	0	0	0.00	0.0	Use:	16 -16d	I
0	0	0	SEIS	0	0	0	0.00	0.0	Use:	16 -16d	I
0	0	0	SEIS	0	0	0	0.00	0.0	Use:	16 -16d	I

CALCULATIONS FOR SHEARWALLS Line 1 Sheet LT 3

Drag force calculation: Seis p is set at 1.3 (above); Assumes a missing element reduces strength by > 33%

With 3.0 Overstrength Factor for Seis Load

Reactions: p corr: 1.0	SEIS	WIND	ROOF WIND UP	Line:	Wall ft	Open ft	Wall Sum	Begin at	End at	Drag-force Beg	Drag-force End	Area req'd: Fir:	Area req'd: Steel:	#16d Req	#16d Use:	Splice Class
W1	2286	1863	-1743	A	4		4	0	4	0	893	1.17	0.03	6	16	I
						3.5	4	4	7.5	893	112	1.17	0.03	6	16	I
ADDL	700	500	Net UP		3		7	7.5	10.5	112	558	0.73	0.02	4	16	I
W sum =	2986	2363	0			3.5	7	10.5	14	558	447	0.73	0.02	4	16	I
R' 1					2.5		9.5	14	16.5	447	112	0.58	0.02	3	16	I
						3.5	9.5	16.5	20	112	893	1.17	0.03	6	16	I
V=	2986	2363			4		13.5	20	24	893	0	1.17	0.03	6	16	I
Control=		2986	SEIS				13.5	24	24	0	0	0.00	0.00	0	16	I
Drag Overstrength=		2.307		B			13.5	24	24	0	0	0.00	0.00	0	16	I

SHEAR WALL STRESS vWIND= 175 plf Drag Length= 24 ft
TotalSW=13.5 ft vSEIS= 221 plf vDRAG= 124 plf

Plate Nails: Drag L = 24 FT Sill= 2 x SPACING 16d 15 " oc max or 5/8AB@ 100 " o.c. max
Wall trib w = 6 FT w= 110.9 plf 16d 17 " oc max or 5/8AB@ 40 " o.c. max
USE: 16d 15 " oc max or 5/8AB@ 40 " o.c. max

Shear Wall Overturning: Line 1 WIND: V lb OT Mom SEIS: V lb OT Mom

H: 12 ft Weight:psf T.W. plf Net DL R MOM LATERAL= 2363 28357 TOTAL= 2986 35829
L= 2.5 ft WALL 10 12 120 lb lb*ft
ROOF 14 4 56 ----------
FLOOR 0 .6DL> 264 330 SEIS
---------- 180 225 WIND Line length 24 FT Wall 316 1899
TOTAL: 176 plf

For entire line: Total= WIND: 2363 28357 lb*ft SEIS: 3302 37727 lb*ft
WIND SEIS
For this wall only: OT Mom - R Mom = 5026 lb*ft 6657 lb*ft
" Net Uplift = 2011 lb 2663 lb
" Add uplift above: lb lb
" Total Net Uplift = 2011 lb 2663 lb

GRADE BEAM: Line 1 Use 100% Seis (inc p) at soil per 1605.3.2. qALL= 1995 psf @ footing depth

Leq: 24 ft + 0 ft = 24 ft Lateral: Overturning: Pressure: Sliding:
Have 12 ft + 1.5 ft = 13.5 ft Vdia= 2986 LB Mdia= 40307 lb*ft AREA= 24 ft^2 P= 10634 lb
@CG wall: 7.5 ft = 7.5 ft Vwal= 316 LB Mwal= 2374 lb*ft qDL= 443 psf alpha= 0.3
Weight to Grade Beam: V= 3302 LB Mseis=42681 lb*ft qLAT= 888 psf Kp= 300 lb
DL lowest flr & ponywl: 450 plf v= 138 PLF 0.6DL=10634 lb (inc. wall wt.) Passive h= 1.5 ft
FTG:Depth: Width: v= 1,910 PSI Resultant eccentricity & F.S. x W= 15 ft
Stem 6 " x 6 " = 38 plf OK Leq/6= 4.0 ft F.S. = 3.0 Max Reaction= 8253 lb
Foot 6 " x 12 " = 75 plf Leq/4= 6.0 ft F.S. = 2.0 V Control 3302 lb
Dept 12 " Total = 563 plf Leq/3= 8 ft F.S. = 1.5 (SEIS) OK

Net Uplift= 2663 lb Use: e< 8.0 ft e= 4.0 ft OK qMAX= 1331 psf OK
Add Uplift lb
Total = 2663 lb Fc'= 2500 psi Fv= 100.0 psi Fy= 40 ksi

---- 0.75 Factored Loads to Concrete Footing:

Gr Beam 2 Side(s): Lreq= 2.4 ft No. Moments 2 Shear:Vup= 1331 lb Smax= 4 in
Bar size 4 d= 8.5 in Beam Moment= 1.6 k*ft Ac= 51 in^2 Av min= 0.03 in^2
No. Bars 1 T&B b= 6 in 0.75 Mu= 2.0 k*ft vu= 44.37 psi Use#3 @ 0 "oc
As= 0.19 IN^2 a= 0.61 in Mn x phi= 4.8 k*ft OK fv*phi= 100 psi Over L= 0.0 ft

CALCULATIONS FOR SHEARWALLS Line 2 Sheet LT 4

Drag force calculation: Seis p is set at 1.3 (above); Assumes a missing element reduces strength by > 33%

With 3.0 Overstrength Factor for Seis Load

Reactions:		ROOF	Wall	Open	Wall	Begin	End	Drag-force		Area req'd:		#16d	#16d	Splice
p corr: 1.0		WIND Line:	ft	ft	Sum	at	at	Beg	End	Fir:	Steel:	Req	Use:	Class
SEIS	WIND	UP												
W1 2286	1863	-1743	A	4.5	0	0	4.5	0	989	1.29	0.03	6	16	I
0 0	0	0	3.5		3.5	4.5	8	989	338	1.29	0.03	6	16	I
ADDL		Net UP		3	3.5	8	11	338	997	1.30	0.03	6	16	I
W sum = 2286	1863	0	5.5		9	11	16.5	997	25	1.30	0.03	6	16	I
R' 2				3.5	9	16.5	20	25	744	0.97	0.03	5	16	I
			4		13	20	24	744	0	0.97	0.03	5	16	I
V= 2286	1863				13	24	24	0	0	0.00	0.00	0	16	I
Control=	2286 SEIS				13	24	24	0	0	0.00	0.00	0	16	I
Drag Overstrength= 2.307		B			13	24	24	0	0	0.00	0.00	0	16	I

SHEAR WALL STRESS vWIND= 143 plf Drag Length= 24 ft
TotalSW= 13 ft vSEIS= 176 plf vDRAG= 95 plf

Plate Nails: Drag L = 24 FT Sill= 2 x SPACING 16d 19 " oc max or 5/8AB@ 131 " o.c. max
Wall trib w = 5 FT w= 92.4 plf 16d 20 " oc max or 5/8AB@ 48 " o.c. max
USE: 16d 16 " oc max or 5/8AB@ 48 " o.c. max

Shear Wall Overturning: Line 2 WIND: V lb OT Mom SEIS: V lb OT Mom

H: 10 ft Weight:psf T.W. plf Net DL R MOM LATERAL= 1863 18631 TOTAL= 2286 22857
L= 3.5 ft WALL 10 10 100 lb lb*ft
ROOF 14 4 56
FLOOR 0 .6DL> 328 573 SEIS
210 368 WIND Line length 24 FT Wall 264 1319
TOTAL: 156 plf

For entire line: Total= WIND: 1863 18631 lb*ft SEIS: 2549 24176 lb*ft
WIND SEIS
For this wall only: OT Mom - R Mom = 4649 lb*ft 5936 lb*ft
" Net Uplift = 1328 lb 1696 lb
" Add uplift above: lb lb
" Total Net Uplift = 1328 lb 1696 lb

GRADE BEAM: Line 2 Use 100% Seis (inc p) at soil per 1605.3.2. qALL= 1995 psf @ footing depth

Leq: 24 ft +	0 ft =	24 ft	Lateral:	Overturning:		Pressure:		Sliding:	
Have 10 ft +	1.5 ft =	11.5 ft	Vdia= 2286 LB	Mdia= 26286 lb*ft		AREA=	24 ft^2	P=	10346 lb
@CG wall:	6.5 ft =	6.5 ft	Vwal= 264 LB	Mwal= 1714 lb*ft		qDL=	431 psf	alpha=	0.3
Weight to Grade Beam:			V= 2549 LB	Mseis=28000 lb*ft		qLAT=	292 psf	Kp=	300 lb
DL lowest flr & ponywl:		450 plf	v= 106 PLF	0.6DL=10346 lb (inc. wall wt.)				Passive h=	1.5 ft
FTG:Depth:	Width:		v= 1.475 PSI	Resultant eccentricity & F.S.				x W=	15 ft
Stem 6 " x	6 " =	38 plf	OK	Leq/6= 4.0 ft	F.S. = 3.0		Max Reaction=		8166 lb
Foot 6 " x	12 " =	75 plf		Leq/4= 6.0 ft	F.S. = 2.0		V Control		2549 lb
Dept 12 "	Total =	563 plf		Leq/3= 8 ft	F.S. = 1.5		(SEIS)		OK

Net Uplift= 1696 lb Use: e< 8.0 ft e= 2.7 ft OK qMAX= 723 psf OK
Add Uplift lb
Total = 1696 lb Fc'= 2500 psi Fv= 100.0 psi Fy= 40 ksi

---- 0.75 Factored Loads to Concrete Footing:

Gr Beam	2 Side(s):	Lreq= 1.5 ft	No. Moments	2	Shear:Vup=	848 lb	Smax=	4 in
Bar size	4	d= 8.5 in	Beam Moment=	0.6 k*ft	Ac=	51 in^2	Av min=	0.03 in^2
No. Bars	1 T&B	b= 6 in	0.75 Mu=	0.8 k*ft	vu=	28.26 psi	Use#3 @	0 "oc
As=	0.19 IN^2	a= 0.61 in	Mn x phi=	4.8 k*ft OK	fv*phi=	100 psi	Over L=	0.0 ft

CHECK OF 6" FDN. WALLS

MOMEMT MAGNIFICATION FOR NON-SWAY FRAMES

ACI 318-05

PROJECT -
MEMBER -
SECTION -
BY -
DATE -

NOTE : This worksheet calculates magnified moments for reinforced concrete columns and walls. Σk_c is the sum of the flexural stiffness of compression members at joint, Σk_b is the sum of the flexural stiffness of beams at joint (EI / L). Column or wall is assumed cracked. Input fields are in yellow, output is red.

$l_u := 2ft$

$h := 6in$

$b := 12in$

$f'_c := 2500psi$

$I_g := \frac{b \cdot h^3}{12} = 216\,in^4$

$E_c := 57000psi \cdot \sqrt{\frac{f'_c}{psi}} = 2850 \cdot ksi$

$I_c := 0.35 \cdot I_g = 75.6\,in^4$ *ACI 318-05 - eq. 10.11.1*

$r := 0.3 \cdot h = 1.8\,in$

TOP OF COLUMN

$P_{dead} := 2kip$

$P_u := 7.2kip$

$M_{top} := 0ft \cdot kip$

$\Sigma k_{ctop} := 1$

$\Sigma k_{btop} := 2$

- ○ STIFF
- ◉ PINNED
- ○ FREE

Transverse Loads Between Supports ?
- ◉ NO
- ○ YES

BOTTOM OF COLUMN

$M_{bot} := .05ft \cdot kip$

$\Sigma k_{cbot} := 1$

$\Sigma k_{bbot} := 2$

$I_f := 31104in^4$ *Footing I*

$k_f := 200 \frac{psi}{in}$ *Subgrade Modulus*

- ○ STIFF
- ◉ FOOTING
- ○ PINNED

$$\Psi_{top} := \begin{cases} \frac{\Sigma k_{ctop}}{\Sigma k_{btop}} & \text{if TOP} = 0 \\ 10 & \text{otherwise} \end{cases} = \blacksquare$$

$$\Psi_{bot} := \begin{cases} \frac{\Sigma k_{ctop}}{\Sigma k_{btop}} & \text{if BOTTOM} = 0 \\ \frac{\frac{4E_c \cdot I_c}{l_u}}{I_f \cdot k_f} & \text{if BOTTOM} = 1 \\ 10 & \text{otherwise} \end{cases} = \blacksquare$$

$\Psi_{min} := \min(\Psi_{top}, \Psi_{bot}) = \blacksquare$

TOP = ■

$$k := \begin{cases} (2 + 0.3 \cdot \Psi_{bot}) & \text{if TOP} = 2 \\ \max[0.6, \min[1, 0.7 + 0.05(\Psi_{top} + \Psi_{bot}), 0.85 + 0.05\Psi_{min}]] & \text{otherwise} \end{cases} = \blacksquare$$ *ACI 318-05 - R10.2.1*

$M_1 := \min(M_{top}, M_{bot})$

$M_2 := \max[M_{top}, M_{bot}, P_u \cdot (0.6in + 0.03 \cdot h)] = 0.47 \cdot ft \cdot kip$ *ACI 318-05 - eq. 10-14*

$$\text{ConsiderSlendernessEffects} := \begin{cases} \text{"NO"} & \text{if } \dfrac{k \cdot l_u}{r} \le \max\left[34 - 12\left(\dfrac{M_1}{M_2}\right), 40\right] \\ \text{"YES"} & \text{otherwise} \end{cases} = \blacksquare$$

ACI 318-05 - eq. 10-7

$$\beta_d := \frac{P_{dead}}{P_u} = 0.28$$

$$EI := \frac{0.4 \cdot E_c \cdot I_g}{1 + \beta_d} = 192709.57 \cdot ksi \cdot in^4$$

ACI 318-05 - eq. 10-12

$$P_c := \frac{\pi^2 \cdot EI}{(k \cdot l_u)^2} = \blacksquare \cdot kip$$

ACI 318-05 - eq. 10-10

$$C_m := \begin{cases} 1 & \text{if LoadsBetweenSup} = 1 \\ \max\left(0.6 + 0.4\dfrac{M_1}{M_2}, 0.4\right) & \text{otherwise} \end{cases} = \blacksquare$$

ACI 318-05 - eq. 10-13

$$\delta_{ns} := \max\left(1, \frac{C_m}{1 - \dfrac{P_u}{0.75 P_c}}\right) = \blacksquare$$

ACI 318-05 - eq. 10-9

$C_m = 1.0 \Rightarrow \delta_{ns} = \dfrac{1}{1 - \dfrac{1.6(2k)}{0.75(2.5 \cdot 6 \cdot 12)}} = 1.02 \simeq 1.0$

$$M_c := \delta_{ns} \cdot M_2 = \blacksquare \cdot ft \cdot kip$$

ACI 318-05 - eq. 10-8

$\delta_{ns} = 1.0 \Rightarrow$ COLUMN BUCKLING IS NOT AN ISSUE

$\therefore$ 6" THICK STEM WALLS ARE OK ✓

$$\frac{f_v}{0.85 f_c'} = \frac{1.6(2k)}{0.85 \; 2.5ksi \; 6'' \times 12''} = 0.021$$ ✓ STRESS IS OK

USE #4 BARS @ 18" O.C FOR MIN REINF.

UNIT #2 FOOTING SIZES

LOAD AT POST FOR INT GIRDER @ STORAGE LOFT.

LOFT $\frac{13'}{2} \times \frac{7'}{2} = 22.75$ ft @ (10+20) psf = $\frac{682}{2}$ lb = 341 lb

FLOOR OVER 2 PADS w/ $\frac{5'+7'}{2} \times 5'$ @ (40+10) psf = 1500 lb

WALL 8' x 5' @ 8 psf = 320 lb

2161 lb

$\frac{2161}{1000 psf}$ => 17.6" SQ ∴ USE 18" SQ PADS

TYP INT PAD

FLOOR 5' x 6.75' AVE @ (10+40) psf = 1687

$\frac{1687}{1000}$ => 15" SQ PADS

FLOOR w/ WALL: 5' x 4.25' AVE (10+40) psf = 1187
5' x 8' @ 8 psf = 320
1507 => 15" SQ.

RIDGE BEAM PAD:

$\frac{32'}{2} \times \frac{24'}{2}$ (15+20) psf = 6720

$\frac{6720}{1000}$ => 31.1" USE 32" SQ.

PORCH PADS 5' x 5' @ (10+40) psf = 1250

ROOF: $(\frac{15'}{2} \times 6')$ @ (15+20) psf = $\frac{1575}{2825}$ => 20" SQ.