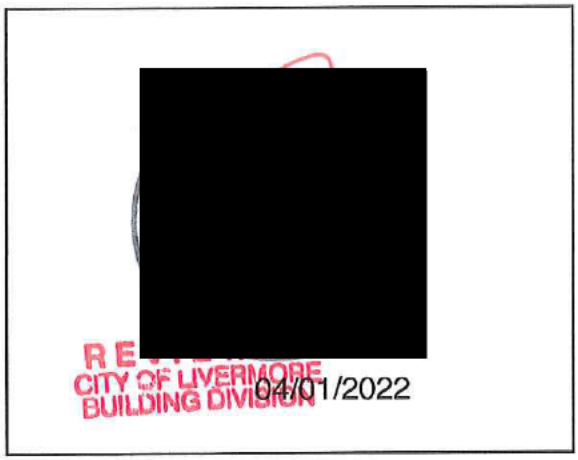
VECTOR ENGINEERS

STRUCTURAL CALCULATIONS
for
FORNWALD ADU

at
874 LAGUNA STREET
LIVERMORE, CA 94550
for
PRUSSO ARCHITECTURE



BY: MAY 18 2022 **JACOB S. PROCTOR, P.E.**
PRINCIPAL

BY: BLAKE WARMERDAM

PROJECT #: **U3794.014.221**

DATE: **April 1, 2022**

DESIGNED BY DBH; CHECKED BY JAB

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PROJECT #

PLANCHECK
PROJECT #

Note:
The calculations presented in this package are intended for a single use at the location indicated above, for the client listed above. These calculations shall not be reproduced, reused, "card filed", sold to a third party, or altered in any way without the written authorization of Vector Structural Engineering, LLC and Prusso Architecture.

PROJECT: Fornwald ADU **PROJECT NO.:** U3794.014.221 **SUBJECT:** CRITERIA

Design Criteria:

General:

Code: Structural design is based upon the International Building Code, 2018 Edition w/ Utah Amendments (20
Risk Category: II

Wind Criteria: ASCE7-16

Analysis Procedure: ASCE 7-16, Chapter 28 - Envelope Procedure - Part 2
Basic Wind Speed - Ultimate (mph): 92 (3-sec gust)
Wind Exposure: C

Seismic Criteria:

Analysis Procedure: ASCE 7-16, Equivalent Lateral Force Procedure
Site Class: D(efault)
Seismic Importance Factor, I_E: 1.0
Mapped Spectral Response Accelerations:
S_S = 1.580 S_1 = 0.600
S_{DS} = 1.264 S_{D1} = 0.680
Seismic Design Category: D
Seismic Force Resisting System: Wood Shearwalls
Seismic Response Coefficient, C_s: 0.194
Seismic Base Shear, V (k): 7.2

Live Loads:

Roof Live Load (psf): 20

General Notes:

- The contractor shall verify dimensions, conditions and elevations before starting work. The engineer shall be notified immediately if any discrepancies are found.
- The typical notes and details shall apply in all cases unless specifically detailed elsewhere. Where no detail is shown, the construction shall be as shown for other similar work and as required by the building code.
- These calculations are limited to the structural members shown in these calculations only. The connection of the members shown in these calculations to any existing structure shall be by others.
- The contractor shall be responsible for compliance with local construction safety orders. Approval of shop drawings by the architect or structural engineer shall not be construed as accepting this responsibility.
- All structural framing members shall be adequately shored and braced during erection and until full lateral and vertical support is provided by adjoining members.

Wood Construction:

- All dimensional lumber shall be Douglas Fir Larch #2 or equal
- All wood timbers shall be Douglas Fir Larch #1 5X & Larger Or Equal
- Wood construction code checks are per the National Design Specification for Wood Construction (NDS) and Standard for Design of Timber Frame Structures (TFEC 1)

Foundation / Concrete:

- All concrete mixing, placement, forming, and reinforcing installation shall be performed in accordance with the requirements of "Building Code Requirements for Reinforced Concrete", ACI 318, latest applicable edition.
- Foundation concrete shall have a minimum compressive strength of 3000 psi at 28 days.
- Cement for all concrete shall be Type I or II with a minimum of 6% entrained air. Maximum aggregate size shall be 3/4".
- Reinforcing steel shall be per ASTM A615 Gr. 60, U.N.O.
- Foundation design is based upon presumptive soil capacities. Vector Structural Engineering, LLC strongly recommends independent soils testing be performed by a licensed geotechnical engineer to verify soil capacites, slope stability, and any other related soil parameters.

PROJECT: Fornwald ADU **JOB NO.:** U3794.014.221 **SUBJECT:** GRAVITY LOADS

ROOF			Increase due to pitch	Original loading
ROOF PITCH/12		4		
ASPHALT SHINGLES		5.27	1.05	5.00
1/2" PLYWOOD		1.58	1.05	1.50
FRAMING		3.00		
INSULATION		2.00		
1/2" GYPSUM CLG.		2.20		
M, E & MISC		2.30		
OTHER		0.00		
	DL	16.35		
	LL	20.00		
	SNOW	0.00		
SNOW INCLUDED IN LATERAL		0.0		

2ND FLOOR (WHERE OCCURS)		
FLOOR COVERING		1.00
3/4" T&G PLYWOOD		2.30
MFG TRUSSES / FRAMING		2.00
INSULATION		1.00
1/2" GYPSUM CEILING		2.20
PARTITION		2.00
M, E & MISC.		1.50
OTHER		0.00
	DL	12.00
	LL	40.00

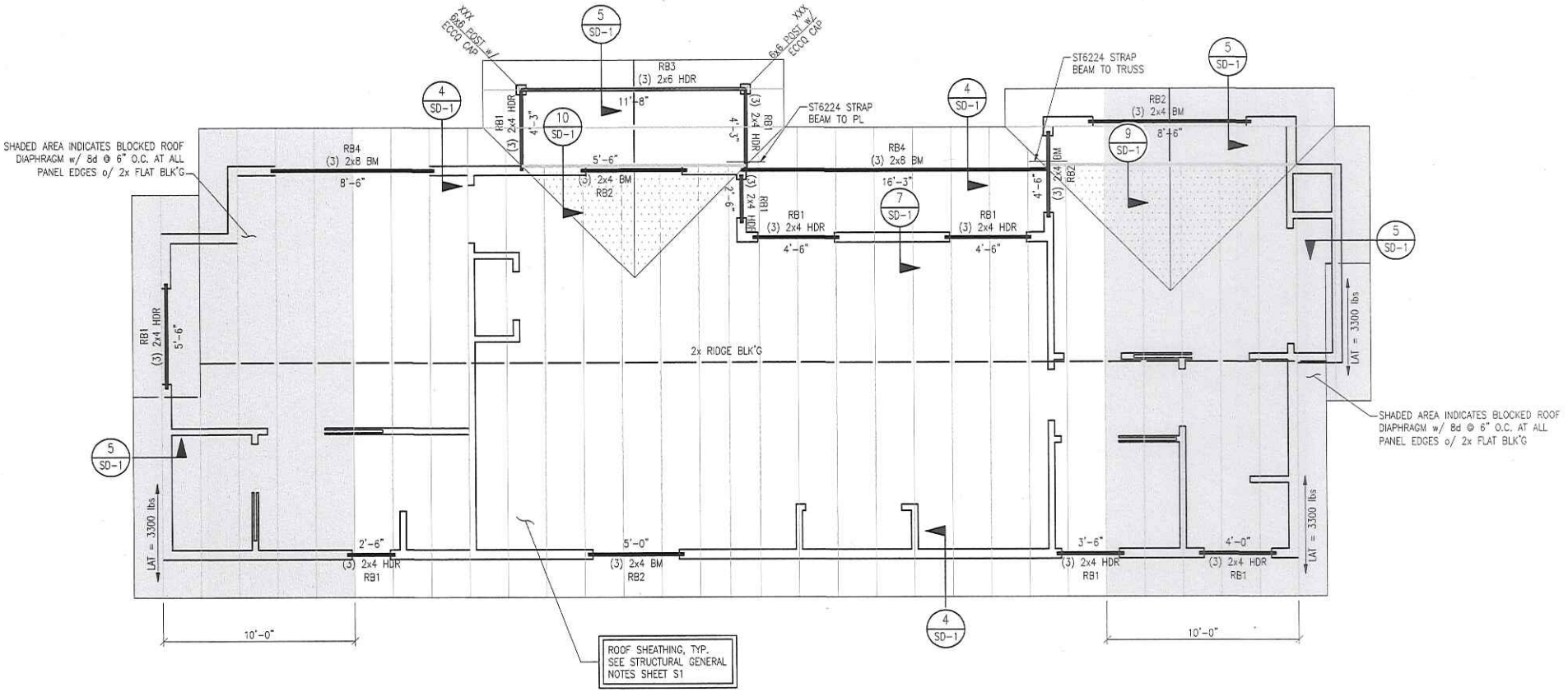
EXTERIOR WALLS		
STUCCO/SIDING		3.50
2x6 FRAMING W/3 PLATES		1.30
INSULATION		1.00
1/2" GYPSUM		2.20
1/2" PLYWOOD		1.50
OTHER		0.50
	DL	10.00

OVERFILL		
ASPHALT SHINGLES		4.00
1/2" PLYWOOD		1.50
RAFTERS & MISC		3.50
OTHER		0.00
	DL	9.00
	LL	20.00

TYPICAL ROOF OVERBUILD MAX SPAN TABLE

Grade	Size	Spacing (ft)	L_{max} (ft)
DFL#2	2X4	2	6.30
DFL#2	2X6	2	10.00
DFL#2	2X8	2	13.20
DFL#2	2X10	2	16.40

C_r	C_D	$C_{F,V}$	M_{allow} (ft-lb)	V_{allow} (lb)	Ctrl'g factor
1.15	1.25	1.50	482	382	TL def
1.15	1.25	1.30	1030	601	TL def
1.15	1.25	1.20	1653	792	TL def
1.15	1.25	1.10	2466	1011	Moment



ROOF FRAMING PLAN

VECTOR ENGINEERS

Abbrev	GRADES		F_{bxx} (psi)	F_{vxx} (psi)	E_{xx} (psi)		g (lb/ft³)
DFL#2	DOUGLAS FIR LARCH #2		875	180	1600000		31.2
DF1 (5x)	Douglas Fir Larch #1 5x & La		1,350	170	1700000		31.2
DFL#1	DOUGLAS FIR LARCH #1		1,000	180	1700000		31.2
24F-V4	Glue Laminated Timber 24F-		2,400	265	1800000		39.9
24F-V8	Glue Laminated Timber 24F-		2,400	265	1800000		39.9
LVL (1.9)	MICROLLAM LVL (1.9E)		2,600	285	1900000		41.8
LVL (2.0)	VERSA-LAM (2.0E)		2,800	285	2000000		41.8
LSL	TIMBERSTRAND LSL (1.3E)		1,700	400	1300000		41.8
PSL	PARALLAM PSL (2.0E)		2,900	290	2000000		41.8
STL36	GRADE 36 STEEL		21,600	14,400	29,000,000		490
STL46	GRADE 46 STEEL		27,700	16,500	29,000,000		490
STL50	GRADE 50 STEEL		30,000	20,000	29,000,000		490

PROJECT: Fornwald ADU **JOB NO.:** U3794.014.221 **SUBJECT:** BEAMS

DESIGN LOADS:	Load Types:	Snow*I_s	Live	Dead
	Roof		20	20
	Floor		40	15
	Wall			13
	Add .2*S_{DS} to dead load?		Yes	0.253 =.2*S_{DS}

Load Combinations:

LC 2: D+L

LC 3: D+(Lr or S)

LC 4: D+.75L+.75(Lr or S)

CRITERIA (L/)	D_{TL}	D_{LL}	D_{DL}	$D_{Lr/S}$
$A_{(BLANK)}$	240	360		240
B	240	480		240
C	600		800	240

Label	Length 'L' (ft)	Roof Trib (ft)	Floor Trib (ft)	Wall Trib (ft)	Add'l Live Load (plf)	Add'l Lr/S Load (plf)	Add'l Dead Load (plf)	Point Load From	React (A,B)	Dist 'a' (ft)	Point Live Load 'P_{LL}' (lb)	Point Roof Load '$P_{Lr/S}$' (lb)	Point Dead Load 'P_{DL}' (lb)	# PLIES	Grade	Size	"BM/HDR"	D CRITERIA	C_r	C_D	$C_{F,V,}C_L$	R_a (lb)	R_b (lb)	M_{max} (ft-lb)	M_{allow} (ft-lb)	V_{max} (lb)	V_{allow} (lb)	D_{TL} (in)	$D_{TLallow}$ (in)	D_{LL} (in)	$D_{LLallow}$ (in)	$D_{Lr/S}$ (in)	$D_{Lr/Sallow}$ (in)	1.5DL GLB Camb	Check
RB1	4.25	12.25		2										(3)	DFL#2	2X4	H		1.00	1.25	1.50	1103	1103	1172	1256	952	2363	0.148	0.213		0.142	0.070	0.213		0.93 M
	4.75	10.13		2										(3)	DFL#2	2X4	H		1.00	1.25	1.50	1031	1031	1224	1256	904	2363	0.193	0.238		0.158	0.090	0.238		0.97 M
	5.75	3		2										(3)	DFL#2	2X4	H		1.00	1.25	1.50	427	427	614	1256	384	2363	0.142	0.288		0.192	0.057	0.288		0.49 D
RB2	4.5	8												(3)	DFL#2	2X4	B		1.00	1.25	1.50	728	728	820	1256	634	2363	0.116	0.225		0.150	0.057	0.225		0.65 M
RB3	5.75	12.25		2										(3)	DFL#2	2X6	H		1.00	1.25	1.30	1498	1498	2153	2688	1259	3713	0.128	0.288		0.192	0.060	0.288		0.80 M
	8.75	3		2										(3)	DFL#2	2X6	H		1.00	1.25	1.30	659	659	1441	2688	590	3713	0.199	0.438		0.292	0.079	0.438		0.54 M
	4.75	2		2				RB5	A	2.5		495	571	(3)	DFL#2	2X6	H		1.00	1.00	1.30	767	823	1573	2151	773	2970	0.054	0.238		0.158	0.024	0.238		0.73 M
RB4	12	3												(3)	DFL#2	2X8	B		1.00	1.25	1.20	763	763	2290	4312	686	4894	0.260	0.600		0.400	0.122	0.600		0.53 M
RB5	16.5	3												(3)	DFL#2	2X10	B		1.00	1.25	1.10	1066	1066	4395	6434	966	6244	0.454	0.825		0.550	0.211	0.825		0.68 M
RB6	8.75	12.25		2										(3)	DFL#2	2X10	H		1.00	1.25	1.10	2295	2295	5021	6434	1891	6244	0.146	0.438		0.292	0.068	0.438		0.78 M
																			1.00	1.00	1.00														
																			1.00	1.00	1.00														
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																			1.00	1.00	1.00														

PROJECT: Fornwald ADU **JOB NO.:** U3794.014.221 **SUBJECT:** COLUMNS

NOTE: COLUMN CAPACITIES LISTED ARE INTENDED AS GENERAL REFERENCE ONLY AND MAY NOT CORRELATE WITH SPECIFIC CALL-OUTS ON PLANS.

GRADES		c	COV_E	F_c (psi)	E_{xx} (psi)
DF1 (5x)	Douglas Fir Larch	0.8	0.25	1,000	1,700,000
DFL#1	DOUGLAS FIR LA	0.8	0.25	1,450	1,700,000
DFL#2	DOUGLAS FIR LA	0.8	0.25	1,300	1,600,000
DFLSTUD	Douglas Fir Larch	0.8	0.25	825	1,400,000
24F-V4		0.9	0.10	1,650	1,800,000
24F-V8		0.9	0.10	1,650	1,800,000
LSL		0.9	0.10	1,400	1,300,000
LVL (1.9)		0.9	0.10	2,510	1,900,000
PSL		0.9	0.10	2,500	2,000,000
LVL (2.0)		0.9	0.10	2,510	2,000,000

Effect Length strong dir 'l_1' (ft)	Effect Length weak dir 'l_2' (ft)	Grade	Size	C_m	C_D	C_F	l_1/d	l_2/b	l/d control	K_f	K_{cE}	F_{cE} (psi)	F_c* (psi)	c	C_P	Column Area 'A' (in^2)	F_c' (psi)	Max allowable load 'P' (lb)	notes
9	2	DFLSTUD	(2)2X4	1.00	1.00	1.15	30.86	8.00	30.86	1	0.3	441	949	0.8	0.41	10.5	387.84	4,072	
9	2	DFLSTUD	(3)2X4	1.00	1.00	1.15	30.86	5.33	30.86	1	0.3	441	949	0.8	0.41	15.75	387.84	6,108	
9	2	DFLSTUD	(4)2X4	1.00	1.00	1.15	30.86	4.00	30.86	1	0.3	441	949	0.8	0.41	21	387.84	8,145	
9	2	DFLSTUD	(5)2X4	1.00	1.00	1.15	30.86	3.20	30.86	1	0.3	441	949	0.8	0.41	26.25	387.84	10,181	
9	2	DFLSTUD	(2)2X6	1.00	1.00	1.10	19.64	8.00	19.64	1	0.3	1090	908	0.8	0.75	16.5	680.91	11,235	
9	2	DFLSTUD	(3)2X6	1.00	1.00	1.10	19.64	5.33	19.64	1	0.3	1090	908	0.8	0.75	24.75	680.91	16,853	
9	2	DFLSTUD	(4)2X6	1.00	1.00	1.10	19.64	4.00	19.64	1	0.3	1090	908	0.8	0.75	33	680.91	22,470	
9	2	DFLSTUD	(5)2X6	1.00	1.00	1.10	19.64	3.20	19.64	1	0.3	1090	908	0.8	0.75	41.25	680.91	28,088	
9	9	DFL#2	4X4	1.00	1.00	1.15	30.86	30.86	30.86	1	0.3	505	1495	0.8	0.31	12.25	462.99	5,672	
9	9	DFL#2	4X6	1.00	1.00	1.10	19.64	30.86	30.86	1	0.3	505	1430	0.8	0.32	19.25	460.73	8,869	
9	9	DFL#2	4X8	1.00	1.00	1.05	14.90	30.86	30.86	1	0.3	505	1365	0.8	0.34	25.375	458.22	11,627	
9	9	DFL#2	4X10	1.00	1.00	1.00	11.68	30.86	30.86	1	0.3	505	1300	0.8	0.35	32.375	455.42	14,744	
9	9	DFL#2	4X12	1.00	1.00	1.00	9.60	30.86	30.86	1	0.3	505	1300	0.8	0.35	39.375	455.42	17,932	
9	9	DF1 (5x)	6X4	1.00	1.00	1.00	30.86	19.64	30.86	1	0.3	536	1000	0.8	0.46	19.25	458.45	8,825	
9	9	DF1 (5x)	6X6	1.00	1.00	1.00	19.64	19.64	19.64	1	0.3	1324	1000	0.8	0.78	30.25	778.09	23,537	
9	9	DF1 (5x)	6X8	1.00	1.00	1.00	14.40	19.64	19.64	1	0.3	1324	1000	0.8	0.78	41.25	778.09	32,096	
9	9	DF1 (5x)	6X10	1.00	1.00	1.00	11.37	19.64	19.64	1	0.3	1324	1000	0.8	0.78	52.25	778.09	40,655	
9	9	DF1 (5x)	6X12	1.00	1.00	1.00	9.39	19.64	19.64	1	0.3	1324	1000	0.8	0.78	63.25	778.09	49,214	

PROJECT: Fornwald ADU **JOB NO.:** U3794.014.221 **SUBJECT:** FOOTINGS AND FOUNDATIONS

EFP	35	psf
f'c	2500	psi
f_y	60000	psi

FOOTINGS

Assumed Soil Bearing Pressure

q= 1500 psf

Continuous Footings:

Title	Width (in)	Depth (in)	Loads (plf)	#4 Bars
CF1.5	18	10	2250	2
CF1.8	20	10	2500	2
CF2.0	24	12	3000	3
CF2.5	30	12	3750	4
CF3.0	36	12	4500	4
CF3.5	42	12	5250	5
CF4.0	48	12	6000	6
CF1.0	12	12	1500	2
CF1.25	15	12	1875	2

Spread Footings

Title	Width (in)	Depth (in)	Loads (lb)	#4 Bars
F1.5	18	12	3375	2
F2.0	24	12	6000	3
F2.5	30	12	9375	4
F3.0	36	12	13500	4
F3.5	42	12	18375	5
F4.0	48	12	24000	6
F4.5	54	12	30375	6
F5.0	60	12	37500	7
F5.5	66	12	45375	8

PROJECT: Fornwald ADU **JOB NO.:** U3794.014.221 **SUBJECT:** LATERAL LOADS

DESIGN OF ENCLOSED SIMPLE DIAPHRAGM LOW-RISE BUILDINGS FOR LATERAL LOADS

Seismic Parameters (ASCE 7-16 Chapters 11, 12, & 22)

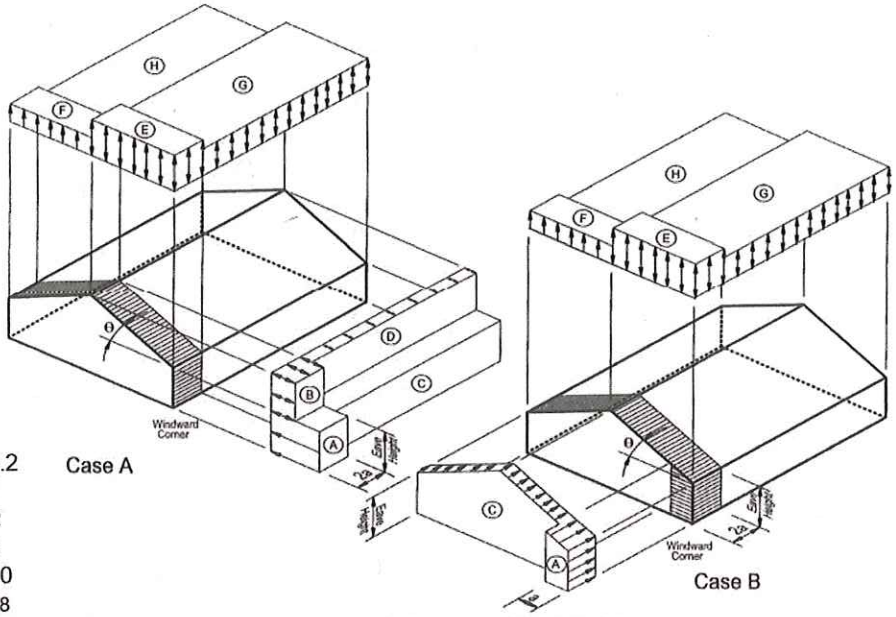
Site Class:	D	S. 11.4.2	N =	1	S. 12.8.2.1
R =	6.5	T. 12.2-1	C_t =	0.02	T. 12.8-2
S_s =	1.58	F. 22-1	h_n (ft) =	15	S. 12.8.2.1
S_1 =	0.6	F. 22-2	x =	0.75	T. 12.8-2
F_a =	1.2	T. 11.4-1	T_a =	0.15	E. 12.8-7
F_v =	1.7	T. 11.4-2	T_0=	0.11	S. 11.4.5
S_{MS} =	1.90	E. 11.4-1	T_S=	0.54	S. 11.4.5
S_{M1} =	1.02	E. 11.4-2	C_U=	1.40	T. 12.8-1
S_{DS} =	1.264	E. 11.4-3	T_L=	8	F. 22-12
S_{DI} =	0.680	E. 11.4-4	S_a=	1.264	S. 11.4.5

Determination of SDC:

Per Table 11.6-1:	D	
Per Table 11.6-2:	D	
SDC:	D	S. 11.6
I_E =	1.00	T. 1.5-2
C_{SMAX}=	0.686	E. 12.8-3,4
C_S=	0.194	E. 12.8-2
C_{SMIN}=	0.056	E. 12.8-5,6
$C_{SCONTROL}$=	0.194	S. 12.8.1.1
$C_{SCONTROL}$*.7=	0.136	S. 2.4.1
Seismic Analysis Req'd?	Yes	IBC 1613.1
Perform Seismic Analysis?	Yes	

Wind Parameters (ASCE 7-16 Chapter 26)

Wind areas labeled C and D are used for calculating line loads on the following sheet.

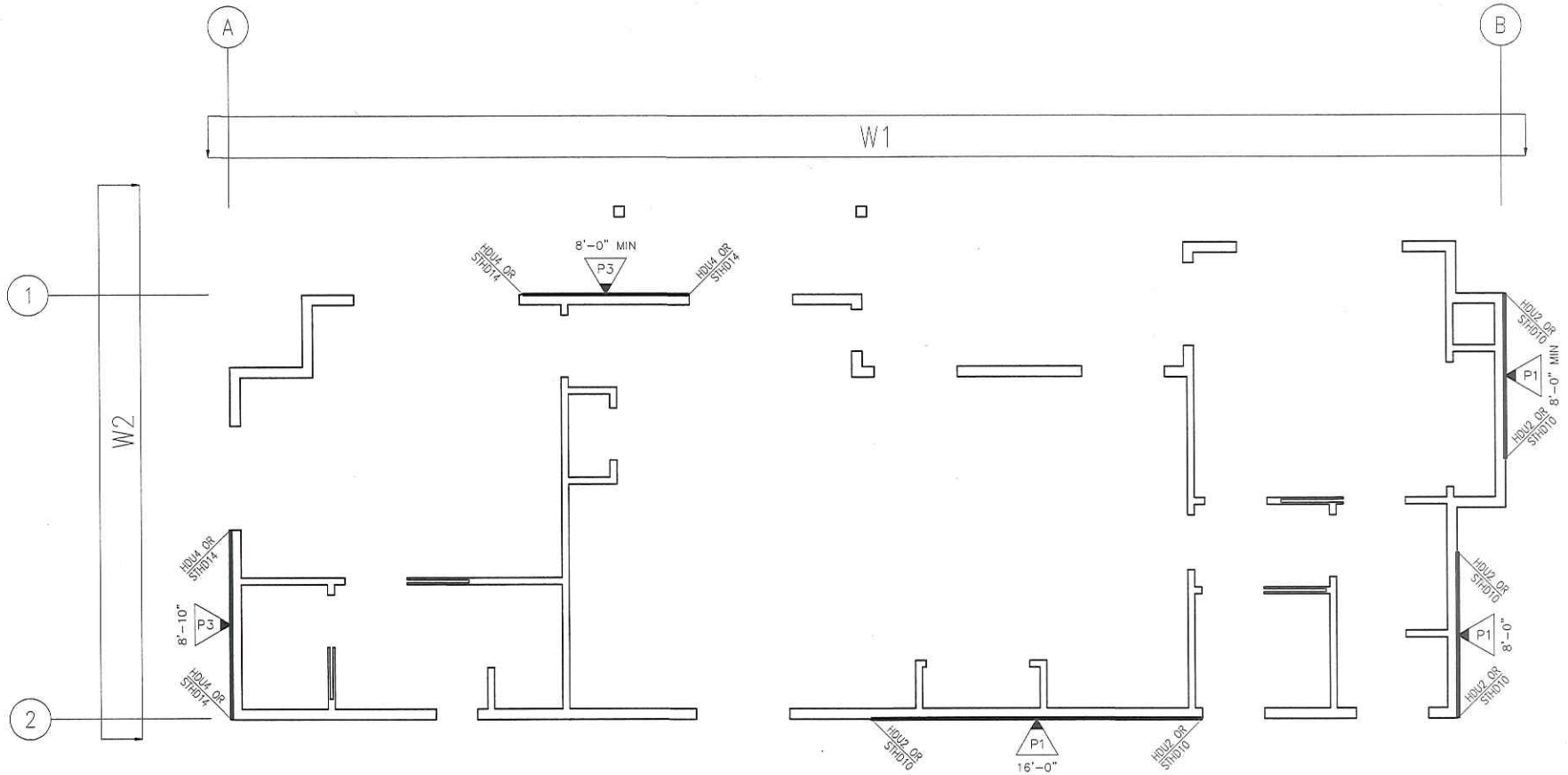


Elevation (ft):	436.2
Risk Category:	II
Basic Wind Speed (mph):	92
Exposure Category:	C
K_{zt}:	1.00
Ke:	0.98

MAIN WIND FORCE RESISTING SYSTEM - METHOD 2 FIGURE 28.6-1

SIMPLIFIED DESIGN WIND PRESSURE, P_{s30} (psf) *(Exposure B at h=30 feet)*

BASIC WIND SPEED (mph)	ROOF ANGLE (degrees)	LOAD CASE	Note: Wind load determined from pressures below will be multiplied by 0.6 (ASD load factor on wind loads) ZONES									
			HORIZONTAL PRESSURES				VERTICAL PRESSURES				OVERHANGS	
			A	B	C	D	E	F	G	H	E_{OH}	G_{OH}
92	0 to 5°	1	13.5	-6.9	8.9	-4.1	-16.2	-9.1	-11.2	-7.1	-22.6	-17.7
	10°	1	15.1	-6.3	10.1	-3.6	-16.2	-9.8	-11.2	-7.6	-22.6	-17.7
	15°	1	16.9	-5.6	11.2	-3.2	-16.2	-10.5	-11.2	-8.1	-22.6	-17.7
	20°	1	18.6	-4.9	12.4	-2.7	-16.2	-11.2	-11.2	-8.6	-22.6	-17.7
	25°	1	16.9	2.7	12.2	2.8	-7.5	-10.2	-5.4	-8.2	-13.9	-11.8
		2					-2.8	-5.5	-0.8	-3.5		
	30° to 45°	1	15.1	10.3	11.9	8.2	1.2	-9.1	0.4	-7.8	-5.3	-6.1
		2	15.1	10.3	11.9	8.2	5.9	-4.6	5.0	-3.3	-5.3	-6.1



SHEAR WALL PLAN

PROJECT: Fornwald ADU **JOB NO.:** U3794.014.221 **SUBJECT:** LINE LOADS

Roof DL	16	psf
Seismic		
Snow	0	psf
Floor DL	12	psf
Wall DL	10	psf
Period, T	0.15	sec

Level Descriptions

Label	Height (ft)	$W_{control}$ (lb)	V_{norm} (lb)	V_{redist} (lb)	Redist Fact
Roof	15	37221	7238	7238	1.00
		0	0	0	1.00
		0	0	0	1.00
		0	0	0	1.00

k= 1

$\Sigma w_i h_i^k$= 558315

Total Weight (lb) 37221

Total Base Shear (lb) 7238

Estimated Total Weight in Longitudinal Direction 37221

Estimated Total Weight in Transverse Direction 37221

Percent difference in estimated weights 0.0%

Seismic Line Loads

Label	Width	Level	Direction	Number of times to include	Roof Trib (ft)	Floor Trib (ft)	Wall Trib Height (ft)	Ext Wall Length (ft)	Other Weight (lb/ft)	Total Weight (lb/ft)	Total Force (lb/ft)	Cvx - Redist Factor	Revised Force (lb/ft)	Force Redist to 1
ω1	64.5	Roof	TRANS	1	28		4.5	185		577	112	1.00	112	NO
ω2	28	Roof	LONG	1	64.5		4.5	185		1329	259	1.00	259	NO
ω3				1				0		0	0	1.00	0	NO
ω4				1				0		0	0	1.00	0	NO
ω5				1				0		0	0	1.00	0	NO
ω6				1				0		0	0	1.00	0	NO
ω7				1				0		0	0	1.00	0	NO
ω8				1				0		0	0	1.00	0	NO
ω9				1				0		0	0	1.00	0	NO
ω10				1				0		0	0	1.00	0	NO
ω11				1				0		0	0	1.00	0	NO
ω12				1				0		0	0	1.00	0	NO
ω13				1				0		0	0	1.00	0	NO
ω14				1				0		0	0	1.00	0	NO
ω15				1				0		0	0	1.00	0	NO
ω16				1				0		0	0	1.00	0	NO
ω17				1				0		0	0	1.00	0	NO
ω18				1				0		0	0	1.00	0	NO
ω19				1				0		0	0	1.00	0	NO
ω20				1				0		0	0	1.00	0	NO

Wind Line Loads *Surface type 'C' is flat wall and 'D' is sloped roof, 'CP1' and 'CP2' represent parapets on only one side and both sides of the structure, respectively*

Label	Roof Pitch /12	Mean Roof Height (ft)	Surface Type 1	Equiv Height Exposed (ft)	Surface Type 2	Equiv Height Exposed (ft)	Roof Angle (°)	Applied Interior Press 1 (psf)	Applied Interior Press 2 (psf)	Applied End Zone Press 1 (psf)	Applied End Zone Press 2 (psf)	Height & Exp Coeff, λ	Total Int Unif Load (plf)	Total End Zone Unif Load (plf)
ω1	4	15	D	4			18.4	0.00	0.00	0.00	0.00	1.21	32.00	32.00
ω2	4	15	D	4			18.4	0.00	0.00	0.00	0.00	1.21	32.00	32.00
ω3							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω4							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω5							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω6							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω7							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω8							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω9							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω10							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω11							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω12							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω13							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω14							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω15							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω16							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω17							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω18							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω19							0.0	0.00	0.00	0.00	0.00		0.00	0.00
ω20							0.0	0.00	0.00	0.00	0.00		0.00	0.00

VECTOR ENGINEERS

PROJECT: PROJECT NAME

JOB NO.: V3[illegible]

SUBJECT: SHEAR WALL SHEET EXPLANATION

Global ρ value applied

Calculated ρ values and controlling locations

Aspect ratio limits

Loads applied along line, as calculated previously

Diaphragm shear calculations

PERF/ FTAO wall calcs where applicable

Total seismic shear applied at level, for calculating ρ

Type of wind zone reaction, see below

Selection of wall type, 'No' for both means a segmented wall

Information on individual wall piers

Applied unit shears and unit shear capacities (reduced where appropriate)

Perforated or FTAO calculations

Co factor when applicable

Hold down information for global wall overturning

Required only for FTAO method

Maximum unit shear and strap forces calculated by Diekmann method for FTAO walls

$\rho_{Applied}$ =	1
Min Diaphragm Width (ft) =	20
Allowable Seismic Aspect Ratio =	3.5
Allowable Wind Aspect Ratio =	3.5
Comb. Overstrength Factors: (Ω-0.5)/1.2 =	2.08

ρi	Loc
1.00	A-1ST
1.00	A-2ND

ρ calculated in acc[illegible] Section 12.3.4.1

Roof DL (psf) = 44 (includes seismic snow where occurs)

Floor DL (psf) = 12

LINE: A 2ND STORY

Line Loads (plf)				Loads from above					Actual Applied Loads (plf unless noted otherwise)					Diaphragm Shear (plf)			Perf/FTAO Wall Info
Load	Trib w (ft)	E.Z. Appl*	Span (ft)	Line	%	Location	Seis (lbs)	Wind (lbs)	ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)	Dreg (ft)	Seis (Load vs. Allow.)		(Not Applicable)
ω1	10	Major	20		1.00	Offset			91.6	113.0	145.5	6	166	8	114	166	
		None			1.00	Offset								8	Wind (Load vs. Allow.)		
					1.00	Above									162	232	
						Total	916	1296									

Plate h (ft)= 10
Max opening height (ft)= 10
Apply 2w/l reduction? Yes
Opening elevation

100% Perforated SW? No
Force Transfer @ Openings? No

Shear Length (ft)= 8
Wall DL (psf)= 10

Include Ω for irregularities (above)?

Story V (K)= 1631
Max allow. drift (in) 3

Shear-Wall Length (ft)	Roof$_{DL}$ 'w' (ft)	Floor$_{DL}$ 'w' (ft)	Other$_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem 'w'-edge dist)	OTM (wind, seismic) (ft-lb)	.6*RM (ft-lb)	Aspect Ratio	2w/l Reduct.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall Δ (in)
3	2				P1	S1	CS16		4859	351	3.33	0.60	114	156	162	365	372	1502	1705	0.19
5	2				P1	S1	CS16		8098	976	2.00	1.00	114	260	162	365	372	1424	1705	0.18

Add'l Comments:

Max: 0.19

LINE: A 1ST STORY

Line Loads (plf)				Loads from above					Actual Applied Loads (plf unless noted o				Perf/FTAO Wall Info		
Load	Trib w (ft)	E.Z. Appl*	Span (ft)	Line	%	Location	Seis (lbs)	Wind (lbs)	ρ*Seis	Wind	E.Z. Wind	2a (ft)	Ltotal (ft)	12	Rdl (ft)	
ω3	10	Major	20		1.00	Offset			99.9	100.9	152.5	6			Fdl (ft)	5
		None			1.00	Offset								198	DL (plf)	160
				A-2ND	1.00	Above	916	1296					Wall type	P2	Opening (ft)	4
						Total	1915	2305					oad vs. Allow.)		HD	STHD10	8"-Corner	
														126	T (lb)	1345	HD cap	2940
														276	Seis (plf)	367	Cap (plf)	380
															Wind (plf)	442	Cap (plf)	520
															Strap (lb)	884		

Plate h (ft)= 10
Max opening height (ft)= 4
Apply 2w/l reduction? Yes
Opening elevation 2

50% Perforated SW? No
Force Transfer @ Openings? Yes

Shear Length (ft)= 8
Wall DL (psf)= 10

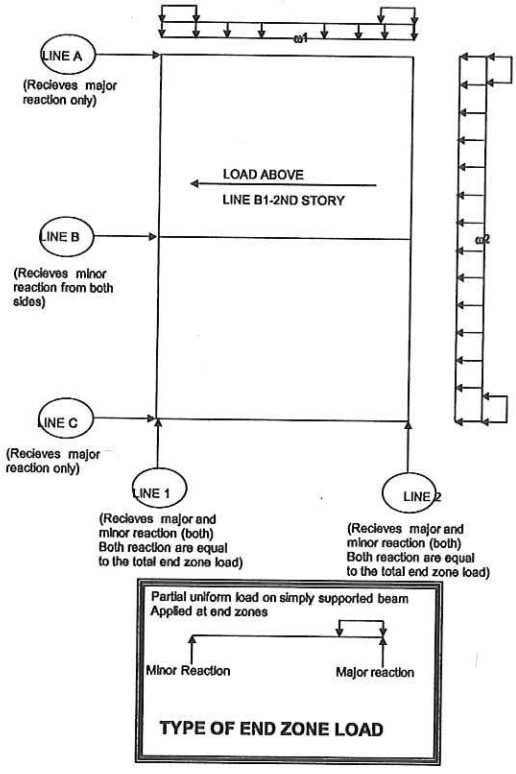
Include Ω for irregularities (above)?

Story V (K)= 361
Max allow. drift (in) 3

Shear-Wall Length (ft)	Roof$_{DL}$ 'w' (ft)	Floor$_{DL}$ 'w' (ft)	Other$_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Strap	HD Capacity (Stem 'w'-edge dist)	OTM (wind, seismic) (ft-lb)	.6*RM (ft-lb)	Aspect Ratio	2w/l Reduct.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Ten (lb)		
3		PERF/FTAO SHEAR-WALL CALCULATIONS APPLY - SEE ABOVE									1.33	1.00								
5											0.80	1.00								

Add'l Comments:

Max: 0.00



VECTOR ENGINEERS

PROJECT: Fornwald ADU **JOB NO.:** U3794.014.221 **SUBJECT:** SHEAR WALLS

$\rho_{Applied}$ =	1.3
Min Diaphragm Width (ft) =	28
Allowable Seismic Aspect Ratio =	3.5
Allowable Wind Aspect Ratio =	3.5
Comb. Overstrength Factors: (Ω-0.5)=	2.50

ρ_i	Loc	Fp/Fx
1.30	1-1ST	1.00
		1.00
		1.00
		1.00

ρ calculated in accordance with: ASCE7-16 Section 12.3.4.2
No Exception in ASCE 7 12.3.4.2b met?

Roof DL (psf) =	16
Floor DL (psf) =	12

(includes seismic snow where occurs)

LINE: A 1ST STORY — Timber Framed Shearwall Calculations

Line Loads (plf) Load	Trib w (ft)	E.Z. Appl*	Span (ft)
ω1	32.25	None	64.5
		None	

Loads from above Line	%	Location	0.7E (lbs)	0.6W (lbs)
	1.00	Offset		
	1.00	Offset		
	1.00	Above		
		Total	3293	619

Actual Applied Loads (plf unless noted otherwise) ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)
102.1	19.2	19.2	12	

Diaphragm Shear (plf) Drag (ft)	Seis (Load vs. Allow.)	
17	194	248
17		

Perf/FTAO Wall Info (Not Applicable)			

Include Ω for irregularities (above)? No

Wind (Load vs. Allow.)	
36	347

Plate h (ft)= 9
Max opening height (ft)= 9
Apply aspect ratio reduction? Yes
Opening elevation

100% Perforated SW? No
Force Transfer @ Openings? No

Shear Length (ft)= 9
Wall DL (psf)= 10

Story V (K)= 6587
Max allow. drift (in) 2.16

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem/floor config)	OTM (wind, seismic) (ft-lb)	(0.6-.2SDs) *RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall Δ 1.0E (in)
9	3				P3	S3	STHD14	8"-Corner	29640	2364	1.00	1.00	366	490	69	685	744	3031	3815	1.83

Add'l Comments:

Max: 1.83

LINE: B 1ST STORY — Timber Framed Shearwall Calculations

Line Loads (plf) Load	Trib w (ft)	E.Z. Appl*	Span (ft)
ω1	32.25	None	64.5
		None	

Loads from above Line	%	Location	0.7E (lbs)	0.6W (lbs)
	1.00	Offset		
	1.00	Offset		
	1.00	Above		
		Total	3293	619

Actual Applied Loads (plf unless noted otherwise) ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)
102.1	19.2	19.2	12	

Diaphragm Shear (plf) Drag (ft)	Seis (Load vs. Allow.)	
18	183	248
18		

Perf/FTAO Wall Info (Not Applicable)			

Include Ω for irregularities (above)? No

Wind (Load vs. Allow.)	
34	347

Plate h (ft)= 9
Max opening height (ft)= 9
Apply aspect ratio reduction? Yes
Opening elevation

100% Perforated SW? No
Force Transfer @ Openings? No

Shear Length (ft)= 16
Wall DL (psf)= 10

Story V (K)= 6587
Max allow. drift (in) 2.16

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem/floor config)	OTM (wind, seismic) (ft-lb)	(0.6-.2SDs) *RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall Δ 1.0E (in)
8	3				P1	S1	STHD10	8"-Corner	14820	1868	1.13	1.00	206	260	39	365	372	1619	2940	1.45
8	3				P1	S1	STHD10	8"-Corner	14820	1868	1.13	1.00	206	260	39	365	372	1619	2940	1.45

Add'l Comments:

Max: 1.45

LINE: 1 1ST STORY — Timber Framed Shearwall Calculations

Line Loads (plf) Load	Trib w (ft)	E.Z. Appl*	Span (ft)
ω2	14	None	28
		None	

Loads from above Line	%	Location	0.7E (lbs)	0.6W (lbs)
	1.00	Offset		
	1.00	Offset		
	1.00	Above		
		Total	3293	269

Actual Applied Loads (plf unless noted otherwise) ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)
235.2	19.2	19.2	6	

Diaphragm Shear (plf) Drag (ft)	Seis (Load vs. Allow.)	
27	122	166
27		

Perf/FTAO Wall Info (Not Applicable)			

Include Ω for irregularities (above)? No

Wind (Load vs. Allow.)	
10	232

Plate h (ft)= 9
Max opening height (ft)= 9
Apply aspect ratio reduction? Yes
Opening elevation

100% Perforated SW? No
Force Transfer @ Openings? No

Shear Length (ft)= 8
Wall DL (psf)= 10

Story V (K)= 6587
Max allow. drift (in) 2.16

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem/floor config)	OTM (wind, seismic) (ft-lb)	(0.6-.2SDs) *RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall Δ 1.0E (in)
8	12.25				P3	S3	STHD14	8"-Corner	29640	3872	1.13	1.00	412	490	34	685	744	3221	3815	2.10

Add'l Comments:

Max: 2.10

LINE: 2 1ST STORY — Timber Framed Shearwall Calculations

Line Loads (plf) Load	Trib w (ft)	E.Z. Appl*	Span (ft)
ω2	14	None	28
		None	

Loads from above Line	%	Location	0.7E (lbs)	0.6W (lbs)
	1.00	Offset		
	1.00	Offset		
	1.00	Above		
		Total	3293	269

Actual Applied Loads (plf unless noted otherwise) ρ*Seis	Wind	E.Z. Wind	2a (ft)	E.Z. P (lb)
235.2	19.2	19.2	6	

Diaphragm Shear (plf) Drag (ft)	Seis (Load vs. Allow.)	
59	56	166
59		

Perf/FTAO Wall Info (Not Applicable)			

Include Ω for irregularities (above)? No

Wind (Load vs. Allow.)	
5	232

Plate h (ft)= 9
Max opening height (ft)= 9
Apply aspect ratio reduction? Yes
Opening elevation

100% Perforated SW? No
Force Transfer @ Openings? No

Shear Length (ft)= 16
Wall DL (psf)= 10

Story V (K)= 6587
Max allow. drift (in) 2.16

Shear-Wall Length (ft)	$Roof_{DL}$ 'w' (ft)	$Floor_{DL}$ 'w' (ft)	$Other_{DL}$ 'w' (plf)	Tension From Above (lb)	Wall Type	Sill Type	Holdown Strap	HD Capacity (Stem/floor config)	OTM (wind, seismic) (ft-lb)	(0.6-.2SDs) *RM (ft-lb)	Aspect Ratio	Aspect Ratio Reduc.	Seis. Shear (plf)	Seis. Wall Cap. (plf)	Wind Shear (plf)	Wind Wall Cap. (plf)	Sill Plate Cap. (plf)	Tension (lb)	HD Capacity	Max Shear-Wall Δ 1.0E (in)
16	12.25				P1	S1	STHD10	8"-Corner	29640	15487	0.56	1.00	206	260	17	365	372	885	2940	1.17

Add'l Comments:

Max: 1.17