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Structural Calculations

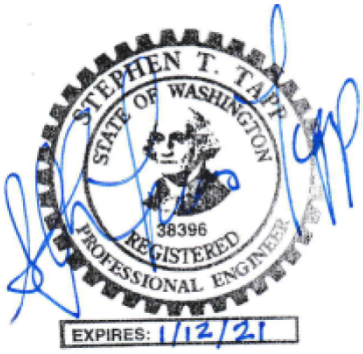
WIND LOAD GOVERNS LATERAL DESIGN

for

Petrie Garage/Assessory Dwelling Unit

2431 60th Avenue SE
Mercer Island, Washington 98040

Date: February 2020
Project: T20B3
Building Code Reference: 2015 IBC



Loading Requirements

ASCE 7-16

Codes

2015 IBC
AISC/ASD Sixteenth Edition
ACI 318-16
NDS 2015
SEAW Rapid Solutions Methodology for Wind Design

Wind Design

Wind Speed = 85 mph
Wind Exposure = 'B'

Soil Loads (assumed)

Passive pressure = 300 psf
Assumed Soil density = 130 pcf
Assumed soil Bearing Pressure = 2500 psf
Friction capacity is a coefficient of .4
Factor of safety = 1.5

Building Loads

Snow Load = 25 psf
Roof (DL) = 15 psf
Exterior Wall (DL) = 15 psf
Interior Wall (DL) = 7.5 psf
Main/Upper Floor(DL) = 12 psf, LL = 40 psf
Main Exterior Deck Load = 60 psf (if less than 100 square feet)
100 psf (if more than 100 square feet)
Corridors, Stairs,Exits (LL) = 100 psf

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(206) 320-0534

JOB _____

SHEET NO. _____ OF _____

CALCULATED BY STT DATE _____

CHECKED BY _____ DATE _____

SCALE _____

SHEAR WALL SCHEDULE - 2015 IBC

WALL SHEATHING TO BE ½" (C-D) STRUCTURAL 1, 24/0

ROOF SHEATHING TO BE ½" (C-D) STRUCTURAL 1, 32/16

USE 10d COMMON NAILS (.148"Ø X 3" LONG)

ALL FRAMING MEMBERS TO BE MAXIMUM 19% MOISTURE CONTENT

PLAN SYMBOL	WALL TYPE	NAIL SIZE	PANEL NAIL SPACING			BLK'G	REQUIRED ANCHORS		ALLOWABLE UNIT SHEAR (PLF)
			PANEL EDGES	FIELD STUDS	TOP/BTM PLATES		PR TR SILL	BTM PLATE	
6	P1-6"	10d	6"	12"	6"	2X6(4)	⅝"Ø @ 48"	16d @ 6"	262(HF), 320(DF)
4	P1-4"	10d	4"	12"	4"	3X6(4)	⅝"Ø @ 32"	(2) 16d @ 8"	348(HF), 425(DF)
3	P1-3"	10d	3"	12"	3"	3X6(4)	⅝"Ø @ 24"	(2) 16d @ 6"	525(HF), 640(DF)
2	P1-2"	10d	2"	12"	2"	3X6(4)	¾"Ø @ 24"	(2) 16d @ 5"	599(HF), 730(DF)
2-3	P2-3"	10d	3'	12"	3"	3X6(4)	¾"Ø @ 16"	(4) 16d @ 6"	1050(HF),1280(DF)

Shear Wall Notes

1. **P-1 INDICATES PLYWOOD ON ONE SIDE OF SHEAR WALL ONLY.**
2. **P-2 INDICATES PLYWOOD ON TWO SIDES OF SHEAR WALL. FRAMING MEMBES SHALL BE 3X. OFFSET PANEL JOINTS TO FALL ON DIFFERENT STUDS.**
3. **PLYWOOD MAY BE INSTALLED EITHER HORIZONTALLY OR VERTICALLY ON HEM-FIR, OR DOUG FIR STUDS.**
4. **FOR NAILING AT 4", 3", 2" ON CENTER, USE 3X FRAMING MEMBERS AT ALL PANEL EDGES. STAGGER FASTENERS AT ALL PANEL JOINTS.**
5. **FOR NAILING AT 4",3",2" ON CENTER USE P.T. 3X SILL AT FOUNDATION.**
6. **SOLID BLOCK ALL PANEL EDGES WITH FULL DEPTH BLOCKING.**
7. **USE 10d. COMMON NAILS FOR SHEAR WALL FASTENERS.**
8. **NAILS MUST BE FLUSH DRIVEN WITH THE DIAPHRAGM SURFACE.**
9. **ANCHOR BOLTS TO HAVE A MINIMUM 3"X3"X1/4" PLATE WASHERS.**
10. **FINGER JOINTED STUDS ARE NOT TO BE USED AT HOLDOWN LOCATIONS.**
11. **NAILS FOR PANEL EDGES SHALL BE 10d COMMON(0.148 X 3" LONG). NAILS FOR PLATES SHALL BE 12d COMMON(0.148X 3 1/4" LONG).**
12. **WHERE BOTTOM PLATE NAILING REQUIRES (4) NAILS AT A SPECIFIC SPACING, BLOCK FLOOR SPACE BELOW THE SOLE PLATE CONSISTING OF A MINIMUM OF TWO FRAMING MEMBERS. NAILING PATTERN SHALL CONSIST OF TWO ROWS IN EACH MEMBER OFFSET 1/2" AND STAGGERED.**
13. **DO NOT INSTALL FLOOR DIAPHRAGM NAILING OVER BOTTOM SILL NAILING.**
14. **ALL STUDS TO BE 2X HEM-FIR OR BETTER.**

Earthquake Design Data for New Expansion Only

1) **Occupancy Category = I** — **ASCE 7-10 Table 1-**
   Occupancy Importance Factor Ie = 1 — **ASCE 7-10 Table 11.5-1**
   Seismic Use Group = I

2) **Mapped Spectoral Response Accelerations** **ASCE 7-10 Fig 22-1, 22-2**
   Latitude = 47.59 deg North
   Longitude = -122.25 deg West
   Location = Mercer Island Wa. 98040
   Maximum Ground Motions, 5% Damping, from USGS Maps
   Ss = 1.378 g, 0.2 sec response
   S_1 = .531 g, 1.0 sec response

3) **Site Classification** — **ASCE 7-10 Table 20-3.1**
   Assumed
   D

4) **Site Coefficients** — **ASCE Table 7-10 11-4.1.**
   F_a = 1 — **Table 11-4.2**
   F_v =1.5

5) **Maximum Considered Earthquake Acceleration** **ASCE 7-10 11.4.3**
   $S_{MS} = F_a * S_s = 1.378$
   $S_{M1} = F_V * S_1 = .796$

6) **Design Spectral Acceleration** — **ASCE 7-10 11.4.4**
   $S_{DS} = S_{MS} * 2/3 = .919$
   $S_{D1} = S_{M!} * 2/3 = .531$

7) **Seismic Design Category** — **ASCE 7-10 Table11-6.1, Table 11-6.2**
   D

8) **Basic Seismic Force Resisting System** — **ASCE 7-10 Table 12-2.1**
   Bearing Wall Systems
   Light-framed walls sheathed w/wood structural panels rated for shear resistance

Response Modification Factor (R) =6.5

System Over Strength Factor 'Wo" = 3.00

Deflection Amplification factor 'Cd" = 4.00

9) Analysis Procedure — ASCE 7-10 12.6

The Equivalent Lateral Force Procedure — ASCE 7-10 12.8

10) Building Period — ASCE 7-10 12.8.2

Structure Type for Building Period Calculation
All Other Structural Systems

"Ct" value = .02 — ASCE 7-10 Table 12.8-2
"x" value = .75
'h_n' = 21'
"Ta" = Ct*(hn^x) Approx. Fundamental Period — ASCE 7-10 Eq. 12.8-7
.196
"Cu" = 1.4 — ASCE 7-10 Table 12.8-1
Per ASCE 7-05 12.8.2 True Fundamental Period < (1.4)(.196) = .27

11) "Cs" Response Coefficient — ASCE 7-10 12.8.1.1

S_{DS} = .919
S_{D1} = .531
S_1 = .531 g
'R' = 6.5
"I" = 1.00
'TL" = 6 — ASCE 7-10 Figure 22-15

(Eq. 12.8.2) $C_s = S_{DS}/(R/1)$ = .141 Preliminary C_s
(Eq. 12.8-3) $C_s = S_{D1}/T_a(R/1)$ = .30 Need Not Exceed
(Eq. 12.8-5) C_s = .01 Shall no be less than
(Eq. 12.8-6) $C_s = .5\ S_1/(R/1)$ = .0 Shall not be less than

Therefore C_s = .132

12) Building Weight "W" (from hand calculated sheet) = 47 K

13) Base Shear — ASCE 7-10 12.8-1

V = C_S *W
(.14) * 47K = 6.58 K

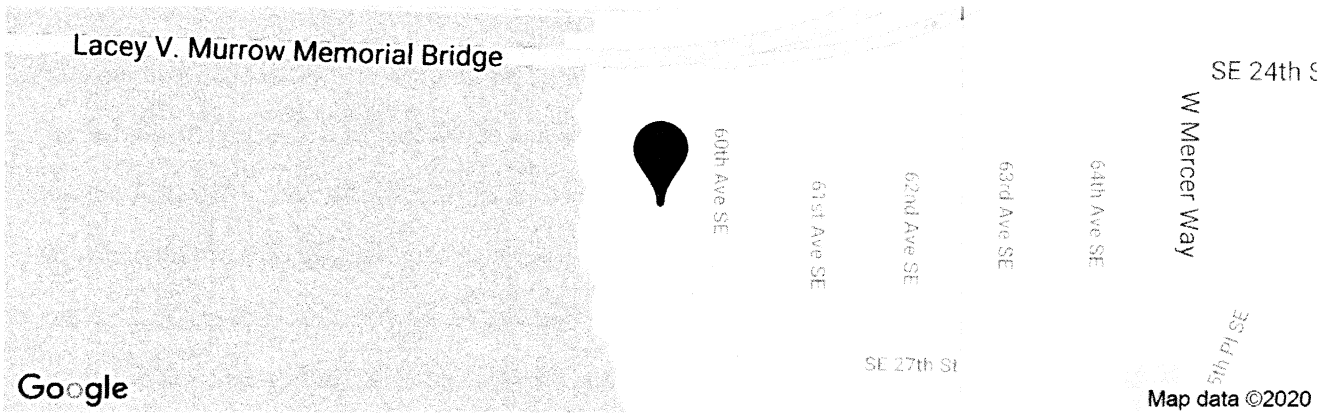
14) Vertical Distribution of Seismic Forces

See Spread Sheet

OSHPD

2431 60th Ave SE, Mercer Island, WA 98040, USA

Latitude, Longitude: 47.5881824, -122.2536294



Date	2/18/2020, 2:55:21 PM
Design Code Reference Document	ASCE7-10
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.378	MCE_R ground motion. (for 0.2 second period)
S_1	0.531	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.378	Site-modified spectral acceleration value
S_{M1}	0.796	Site-modified spectral acceleration value
S_{DS}	0.919	Numeric seismic design value at 0.2 second SA
S_{D1}	0.531	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	D	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	1.5	Site amplification factor at 1.0 second
PGA	0.567	MCE_G peak ground acceleration
F_{PGA}	1	Site amplification factor at PGA
PGA_M	0.567	Site modified peak ground acceleration
T_L	6	Long-period transition period in seconds
SsRT	1.378	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.431	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.449	Factored deterministic acceleration value. (0.2 second)
S1RT	0.531	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.567	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.004	Factored deterministic acceleration value. (1.0 second)
PGAd	0.933	Factored deterministic acceleration value. (Peak Ground Acceleration)
	0.963	Mapped value of the risk coefficient at short periods

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JOB PETRIE GARAGE /ADU

SHEET NO. _____ OF _____

CALCULATED BY STT DATE 2/17/20

CHECKED BY _____ DATE _____

SCALE _____

CHECK BUILDING WEIGHT GARAGE/ADU

UPPER ROOF	(597)(1.05)(15)	9403
UPPER EXT WALL	(110)(15)(8)	13200
UPPER INT WALL	[(11)(2)+(22)(2)](1.7)(7.5)(8)	6732
UPPER FLOOR	(534)(15)	8010
UPPER DECK	(45)(15)	675
MAIN ROOF	(127)(15)	1905
MAIN EXT. WALL	(105)(15)(9)(.5)	7088
MAIN INT WALL	(0)	

TOTAL = 47,013 #

Seismic Load Analysis

2015 IBC

Project: Petrie Garage/ADU
Architect: Leif Anderson
Job #: T20B3

$V = C_s * (W)$

V= (W)* 0.14
V = 6580.35
V=E*.7 4606.245
Des. Cat. D
I = 1
C_s = 0.14
R = 6.5
W = 47002.5 Dead weight of structure

Snow(DL)=	25 psf
Roof (DL)=	15 psf
Ext. Wall(DL)=	15 psf
Int Wall(DL)=	7.5 psf
Floor(DL)=	15 psf
Deck(DL)=	15 psf

	Area	Ln ft	Height	Weight	Total	
Upper Roof =	627			15	9405	lbs
Upper Floor Exterior Walls (wood)=		110	8	15	13200	
Upper Floor Exterior Walls (mas.)=				80	0	
Upper Floor Interior Walls =		112	8	7.5	6720	
Upper Floor =	534			15	8010	
Upper Exterior Deck =	45			15	675	
Upper Green Roof =				0	0	
Main Roof =	127			15	1905	
Main Exterior Walls (wood) =		105	4.5	15	7087.5	
Main Exterior Walls (mas.) =					0	
Main Interior Walls =				7.5	0	
Main Floor =				15	0	
Main Deck =				15	0	
Lower Floor Exterior Walls (wood) =			5	15	0	
Lower Floor Interior Walls =			5	7.5	0	
W(total) =					47002.5	

Seismic Load Distribution

Level	Weight	Height	Wt*ht	F	F * .7
Upper Roof			0	0	0
Main Roof	24093.75	22	530062.5	2162.076	1513.453
Main Floor	135400	8	1083200	4418.274	3092.792
Total	159493.8		1613263	6580.35	4606.245

Shear Wall Analysis

Job :	Petrie Residence
Architect:	Leif Anderson
Job #:	T20B3
Date:	Feb-20

Seismic Loading Only

Garage

Level:	Upper Roof Diaphragm
Direction:	Side - Side
Vseismic @ Level=	1513
Vseismic total=	1513
Vseismic with redundancy=	
Total Load to be resolved (#)=	1513

Grid	C	A.2						
Span(FT.)	24							
Wind load(#/LF)								
Seismic load(#/LF)	63.04167	63.04167	63.04167	63.04167	63.04167	63.04167	63.04167	63.04167
Load#1(LB)								
Load#2(LB)								
Load#3(LB)								
P(wind+L1,L2,L3)=	0	0	0	0	0	0	0	0
P(seismic+L1,L2,L3)=	756.5	756.5	0	0	0	0	0	0
Wall Length(FT.)	8.16	20						
Unit Shear(#/LF)	92.70833	37.825	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Wall Type	P1-6"	P1-6"						
Area Ab(sq.ft.)	500	500						
shear ratio r=	0.612745	0.25	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Redundancy factor	0.540295	-1.57771	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Section Length(FT)	2.11	10						
Panel Height(FT)	6.7	9						
(M)from upper level	0	0						
OTM(#')	1310.618	3404.25	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Panel Length(LF)	2.11	10						
Panel Wt.(#/LF)	135	135						
Wt. on Panel(#/LF)	100	100						
Reduction(%)	40	40	40	40	40	40	40	40
RM(#')	-313.8731	-7050	0	0	0	0	0	0
Resultant(#')	996.7447	-3645.75	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Uplift @ Panel	472.3908	-364.575	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Edge(#)								
Simpson'	cmstc16	n/a						
Restraint	strap							

Shear Wall Analysis

Job :	Petrie Residence
Architect:	Leif Anderson
Job #:	T20B3
Date:	Feb-20

Seismic Loading Only

Garage

Level:	Upper Roof Diaphragm							
Direction:	Front - Rear							
Vseismic @ Level=		1513						
Vseismic total=		1513						
Vseismic with redundancy=								
Total Load to be resolved (#)=		1513						
Grid	1.2	2						
Span(FT.)	23							
Wind load(#/LF)								
Seismic load(#/LF)	65.78261	65.78261	65.78261	65.78261	65.78261	65.78261	65.78261	65.78261
Load#1(LB)								
Load#2(LB)								
Load#3(LB)								
P(wind+L1,L2,L3)=	0	0	0	0	0	0	0	0
P(seismic+L1,L2,L3)=	756.5	756.5	0	0	0	0	0	0
Wall Length(FT.)	18.5	16.33						
Unit Shear(#/LF)	40.89189	46.32578	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Wall Type	P1-6"	P1-6"						
Area Ab(sq.ft.)	500	500						
shear ratio r=	0.27027	0.306185	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Redundancy factor	-1.309381	-0.9212	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Section Length(FT)	18.5	16.33						
Panel Height(FT)	9	9						
(M)from upper level	0	0						
OTM(#')	6808.5	6808.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Panel Length(LF)	18.5	16.33						
Panel Wt.(#/LF)	135	135						
Wt. on Panel(#/LF)	100	100						
Reduction(%)	40	40	40	40	40	40	40	40
RM(#')	-24128.63	-18800.2	0	0	0	0	0	0
Resultant(#')	-17320.13	-11991.7	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Uplift @ Panel	-936.223	-734.333	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Edge(#)								
Simpson' Restraint	n/a	n/a						

Shear Wall Analysis

Job :	Petrie Residence
Architect:	Leif Anderson
Job #:	T20B3
Date:	Feb-20

Seismic Loading Only

Garage

Level:	Upper Fl'r/Main Roof Diaphragm							
Direction:	Side - Side							
Vseismic @ Level=		3093						
Vseismic total=		4606						
Vseismic with redundancy=								
Total Load to be resolved (#)=		4625						
Grid	B	A						
Span(FT.)	20							
Wind load(#/LF)								
Seismic load(#/LF)	154.65	154.65	154.65	154.65	154.65	154.65	154.65	154.65
Load#1(LB)	766	766						
Load#2(LB)								
Load#3(LB)								
P(wind+L1,L2,L3)=	766	766	0	0	0	0	0	0
P(seismic+L1,L2,L3)=	2312.5	2312.5	0	0	0	0	0	0
Wall Length(FT.)	5.2	24.5						
Unit Shear(#/LF)	444.7115	94.38776	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Wall Type	P1-3"	P1-6"						
Area Ab(sq.ft.)								
shear ratio r=	0.965505	0.204923	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Redundancy factor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Section Length(FT)	2.3	24.5						
Panel Height(FT)	5	9						
(M)from upper level	3851	-7292						
OTM(#')	8965.183	13520.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Panel Length(LF)	2.3	24.5						
Panel Wt.(#/LF)	55	135						
Wt. on Panel(#/LF)	100	100						
Reduction(%)	40	40	40	40	40	40	40	40
RM(#')	-245.985	-42317.6	0	0	0	0	0	0
Resultant(#')	8719.198	-28797.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Uplift @ Panel	3790.956	-1175.39	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Edge(#)								
Simpson'	hdu5 w/	n/a						
Restraint	4x post							

Shear Wall Analysis

Job :	Petrie Residence
Architect:	Leif Anderson
Job #:	T20B3
Date:	Feb-20

Seismic Loading Only

Garage

Level:	Upper Fl'r/Main Roof Diaphragm							
Direction:	Front - Rear							
Vseismic @ Level=	3092							
Vseismic total=	4606							
Vseismic with redundancy=								
Total Load to be resolved (#)=	4604							
Grid	1	2						
Span(FT.)	24.5							
Wind load(#/LF)								
Seismic load(#/LF)	126.2041	126.2041	126.2041	126.2041	126.2041	126.2041	126.2041	126.2041
Load#1(LB)	756	756						
Load#2(LB)								
Load#3(LB)								
P(wind+L1,L2,L3)=	756	756	0	0	0	0	0	0
P(seismic+L1,L2,L3)=	2302	2302	0	0	0	0	0	0
Wall Length(FT.)	12.71	20						
Unit Shear(#/LF)	181.1172	115.1	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Wall Type	P1-6"	P1-6"						
Area Ab(sq.ft.)	500	500						
shear ratio r=	0.39322	0.249891	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Redundancy factor	-0.274622	-1.57926	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Section Length(FT)	6.33	20						
Panel Height(FT)	9	9						
(M)from upper level	-8660	-11992						
OTM(#')	1658.249	8726	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Panel Length(LF)	6.33	20						
Panel Wt.(#/LF)	135	135						
Wt. on Panel(#/LF)	100	100						
Reduction(%)	40	40	40	40	40	40	40	40
RM(#')	-2824.857	-28200	0	0	0	0	0	0
Resultant(#')	-1166.609	-19474	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Uplift @ Panel Edge(#)	-184.2984	-973.7	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Simpson' Restraint	n/a	n/a						

Wind Load Design Data

Design Based on IBC 2015
ASCE 7-10
SEAW Rapid Solutions Methodology (RSM-03)

Basic Wind Speed

$V_{3.5}$ =110 mph
V_{fm} = 85 mph

Exposure

C

Roof Pitch

4:12

Mean Roof Height

21 feet

Least Horizontal Dimension

21 feet

Low Rise Building Criteria (h = 21')

1) **h ≤ 60 feet**

2) **h ≤least horizontal dimension**

Topographic Factors (Figure 3-3A, SEAW RSM)

K_1 = 0

K_2 = 0

K_3 = 0

$K_t = (1+(K_1*K_2* K_3))^2$

K_t = 1

Importance Factor

$I_w = 1$

Building Envelope

Enclosed

Design Wind Pressures

$P_{rsm} = q_s * K_{zt} * C_{rsm} * (I_w)$

$q_s = 20.7$ #/sq ft **(Figure 3-1 SEAW RSM)**

$K_{zt} =$ 1.67 **(Wind Load Factors)**

$I_w =$ 1

Crsm Factors See Below

Ballooning Case (Figure 3-5 EB, SEAW RSM)

Roof

Windward Roof = -.08(Up)
Windward Roof (O.H.) = -.8+-.58 = -1.38 (Up)
Leeward Roof = -.6(Up)

Walls

Windward Wall = .42(Inward)
Leeward Wall = -.5(Outward)

Deflating Case (Figure 3-5 ED, SEAW RSM)

Roof

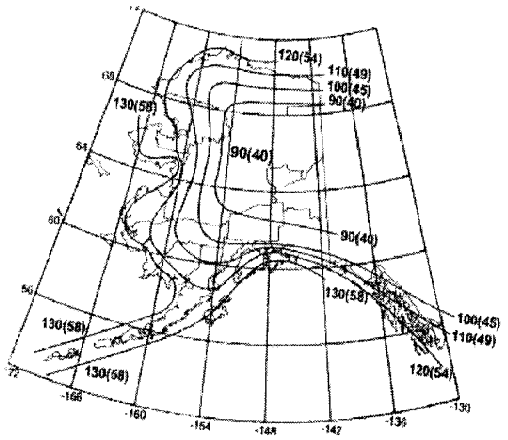
Windward Roof = .48(Up)
Windward Roof (O.H.) = .48+-.58 = -1.06(Up)
Leeward Roof = -.3(Up)

Walls

Windward Wall = .73(Inward)
Leeward Wall) = -.14(Outward)

Figure 3-1 Basic Wind Speeds, q_s

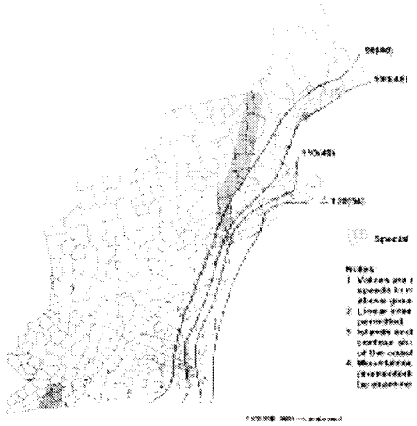
(These notes and excerpts of maps are reprinted with permission by the International Code Council. See IBC Figure 1609 for larger scale maps)



Basic Wind Speeds Are Typically 90 mph, Three Second Gust Wind Speed Everywhere, **Except**:

California, Oregon & Washington	85 mph
Alaska	90 – 130 mph
Hurricane Coastal Areas	90 – 150 mph
Hawaii	105 mph
American Samoa	125 mph
Puerto Rico & Virgin Islands	145 mph
Guam	170 mph

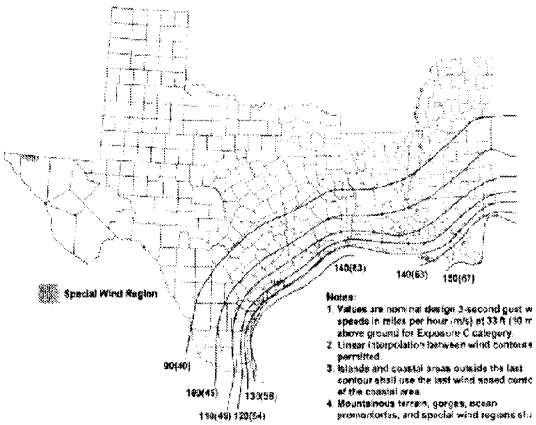
Special Wind Regions in map Shaded Areas



ALASKA **Wind Velocity Pressure (q_s) at Standard Height of 33 Feet** **NORTHEAST COAST**

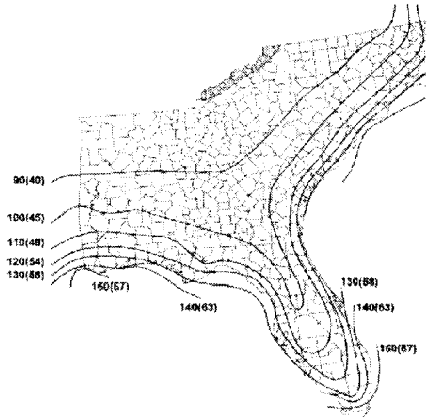
Basic Wind Speed, V (mph)	85	90	100	105	110	120	125	130	140	150	160	170
Pressure q_s (psf)	18.5	20.7	25.6	28.2	31.0	36.9	40.0	43.3	50.2	57.6	65.5	74.0

For Wind Speeds, V, not shown, use $q_s = 0.00256\ V^2$



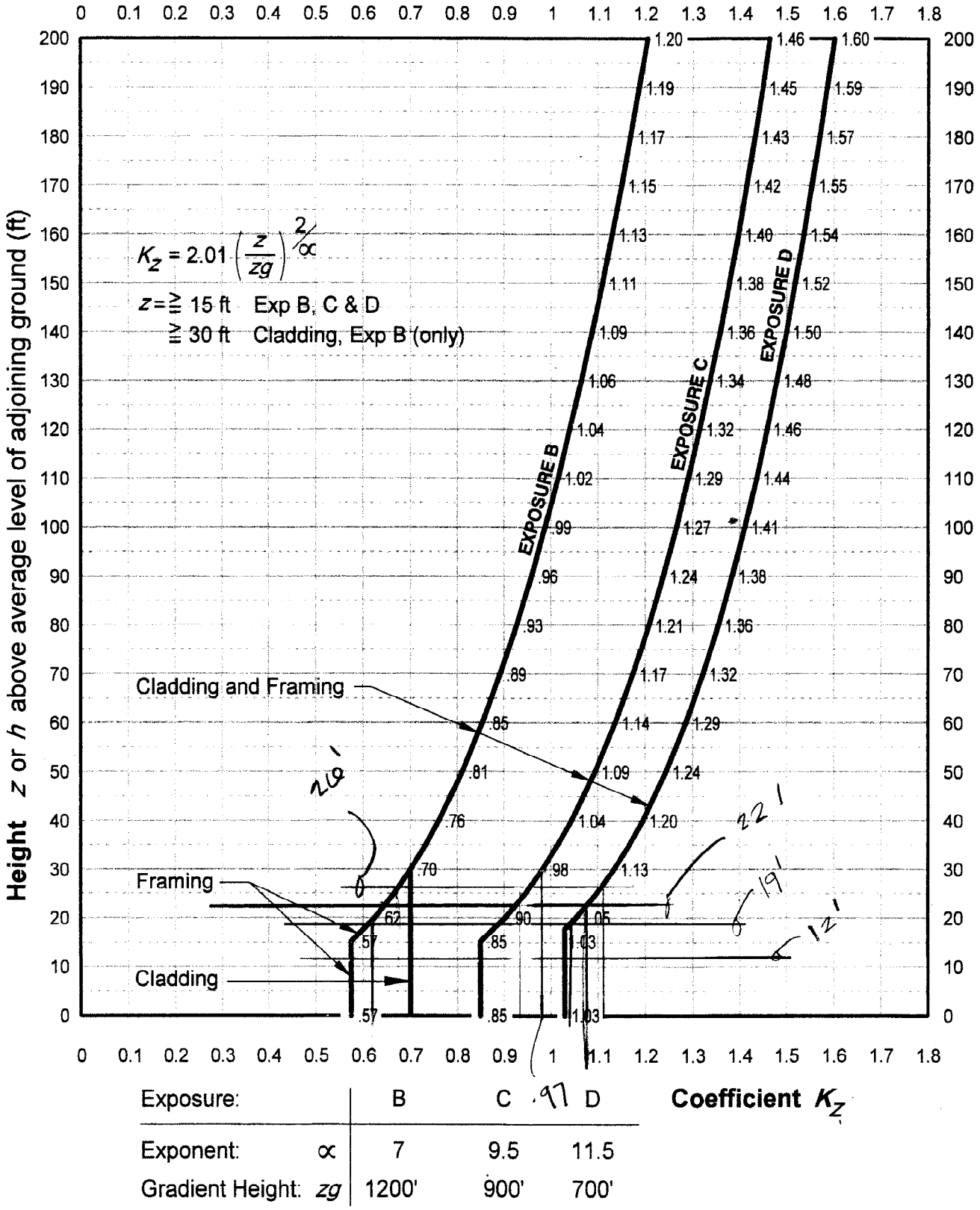
Notes:

1. Values are nominal design 3-second gust wind speeds in miles per hour (m/s) at 33 ft (10 m) above ground for Exposure C category.
2. Linear interpolation between wind contours is permitted.
3. Islands and coastal areas outside the last contour shall use the last wind speed contour of the coastal area.
4. Mountainous terrain, gorges, ocean promontories, and special wind regions shall be examined for unusual wind conditions.



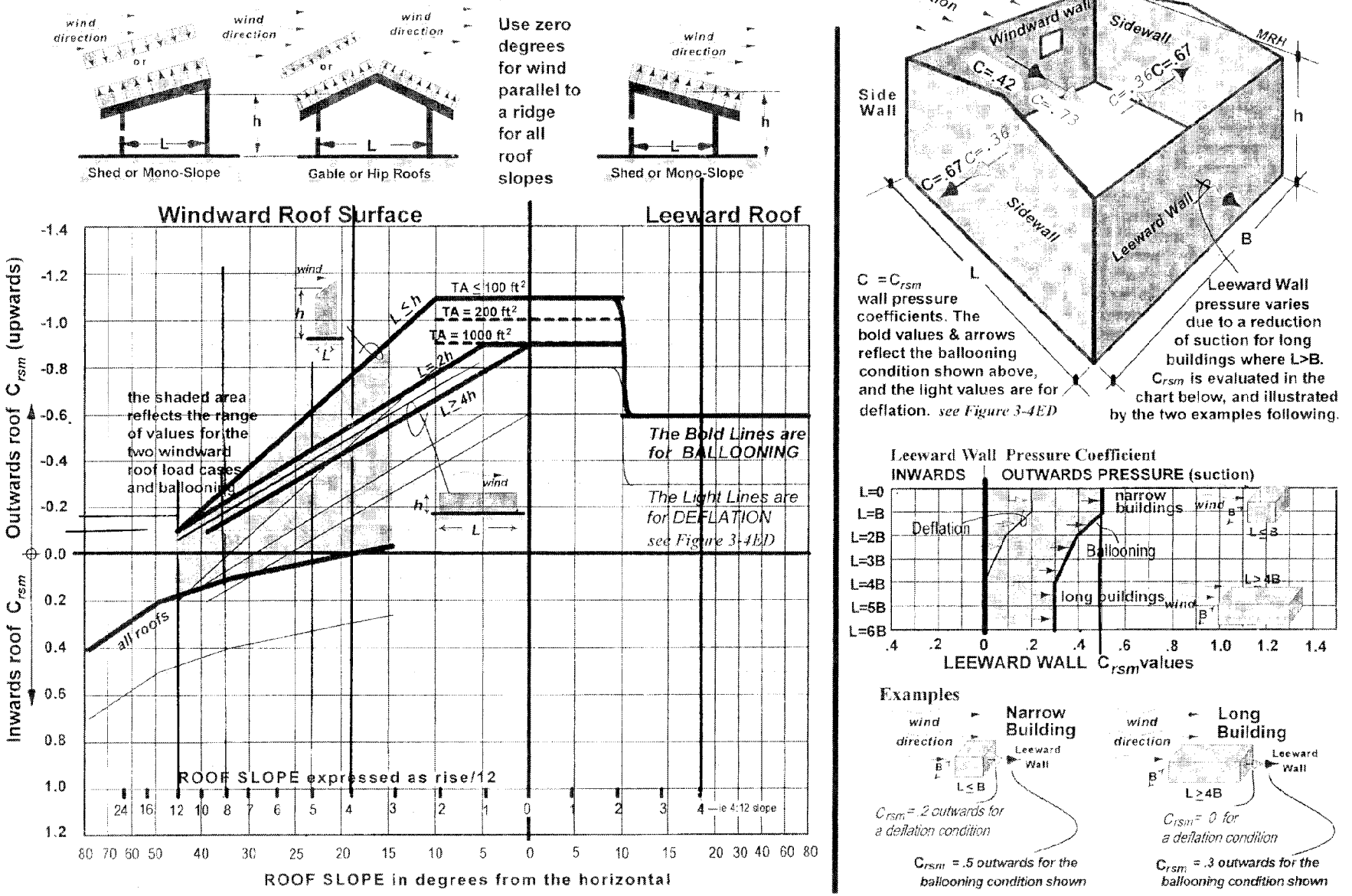
GULF COAST **SOUTHEAST COAST**

Figure 3-2 Velocity Exposure Coefficient K_z



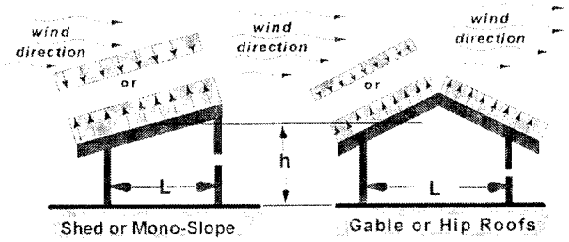
Exposure:		B	C	D
Exponent:	α	7	9.5	11.5
Gradient Height:	zg	1200'	900'	700'

Figure 3-4EB SEAW *Rapid Solution Method*© Pressure Coefficients for LFRS of ENCLOSED BUILDINGS with BALLOONING

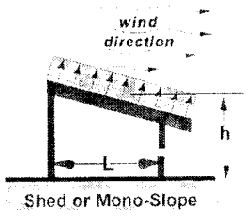


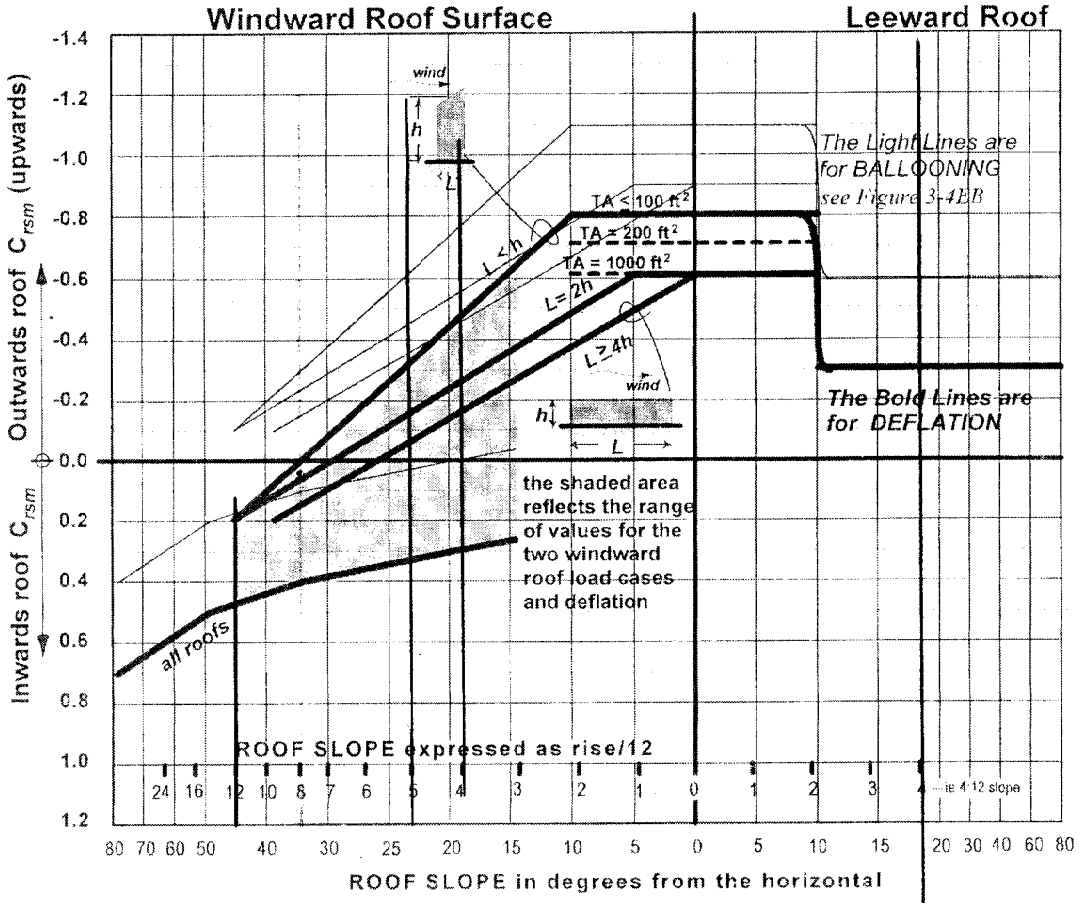
For roof pressure coefficient in the shaded area, where both are inward and outward, C_{rsm} are indicated, both values should be used for assessing load effects

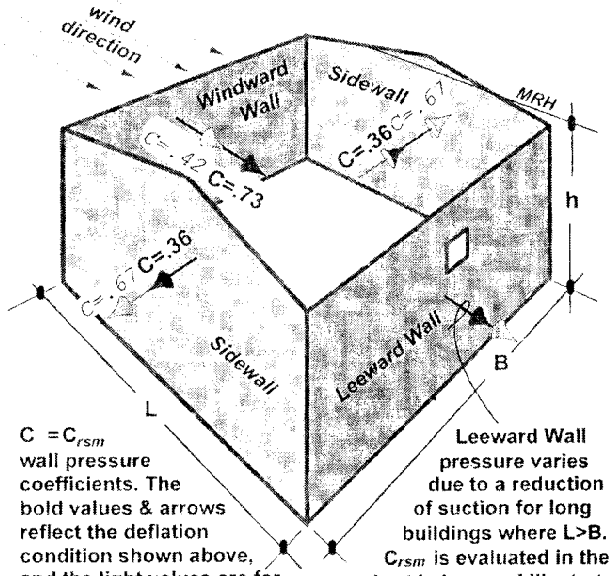
Figure 3-4ED SEAW *Rapid Solution Method*© Pressure Coefficients for LFRS of ENCLOSED BUILDINGS with DEFLATION



Use zero degrees for wind parallel to a ridge for all roof slopes

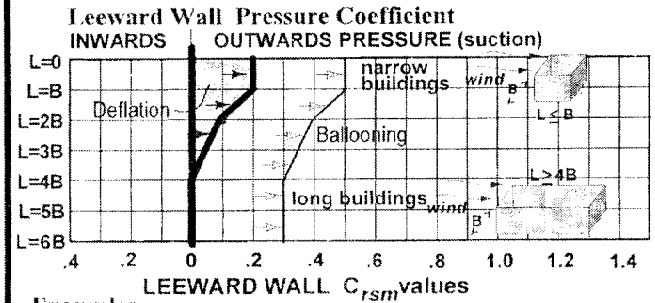




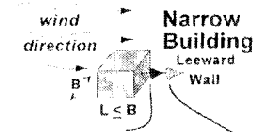


$C = C_{rsm}$ wall pressure coefficients. The bold values & arrows reflect the deflation condition shown above, and the light values are for ballooning. *see Figure 3-4EB*

Leeward Wall pressure varies due to a reduction of suction for long buildings where L>B. C_{rsm} is evaluated in the chart below, and illustrated by the two examples following.

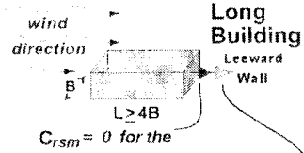


Examples



C_{rsm} = .2 outwards for the deflation condition shown

C_{rsm} = .5 outwards for a ballooning condition



C_{rsm} = 0 for the deflation condition shown

C_{rsm} = .3 outwards for a ballooning condition

For roof pressure coefficient in the shaded area, where both are inward and outward, C_{rsm} are indicated, both values should be used for assessing load effects

Factored Wind Pressures P_{rsm} =

Ballooning Case

	h	q_s	K_{zt}	C_{rsm}	I_w	K_t		**P_{rsm}**
Windward Wall =	0'-10'		20.7	1.67	0.42	1	1	14.51898
Leeward Wall	0'-10'		20.7	1.67	-0.5	1	1	-17.2845
Side Wall			20.7	1.67	0.67	1	1	23.16123
Windward Roof			20.7	1.67	-0.67	1	1	-23.1612
Windward Roof Overhang			20.7	1.67	-1.3	1	1	-44.9397
Leeward Roof			20.7	1.67	-1.1	1	1	-38.0259

Deflating Case

Windward Wall =	0'-10'		20.7	1.67	0.73	1	1	25.23537
Leeward Wall	0'-10'		20.7	1.67	-0.2	1	1	-6.9138
Side Wall			20.7	1.67	-0.36	1	1	-12.4448
Windward Roof			20.7	1.67	-0.28	1	1	-9.67932
Windward Roof Overhang			20.7	1.67	-0.86	1	1	-29.7293
Leeward Roof			20.7	1.67	-0.8	1	1	-27.6552

STEPHEN TAPP
ARCHITECT/P.E.
2330 East Madison Street
SEATTLE, WA 98112
(206) 320-0534

JOB

SHEET NO. OF

CALCULATED BY STT DATE

CHECKED BY DATE

SCALE

Load	P_{RSM}	Height	Trib Area	V_W
P_1	14.5 psf	9'	22'	2871#
P_2	14.5 psf	6'	22'	1914#
P_3	17.2 psf	6'	22'	2270#
P_4	17.2 psf	9'	22'	3406#
TOTAL =				10461#

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JOB

SHEET NO. OF

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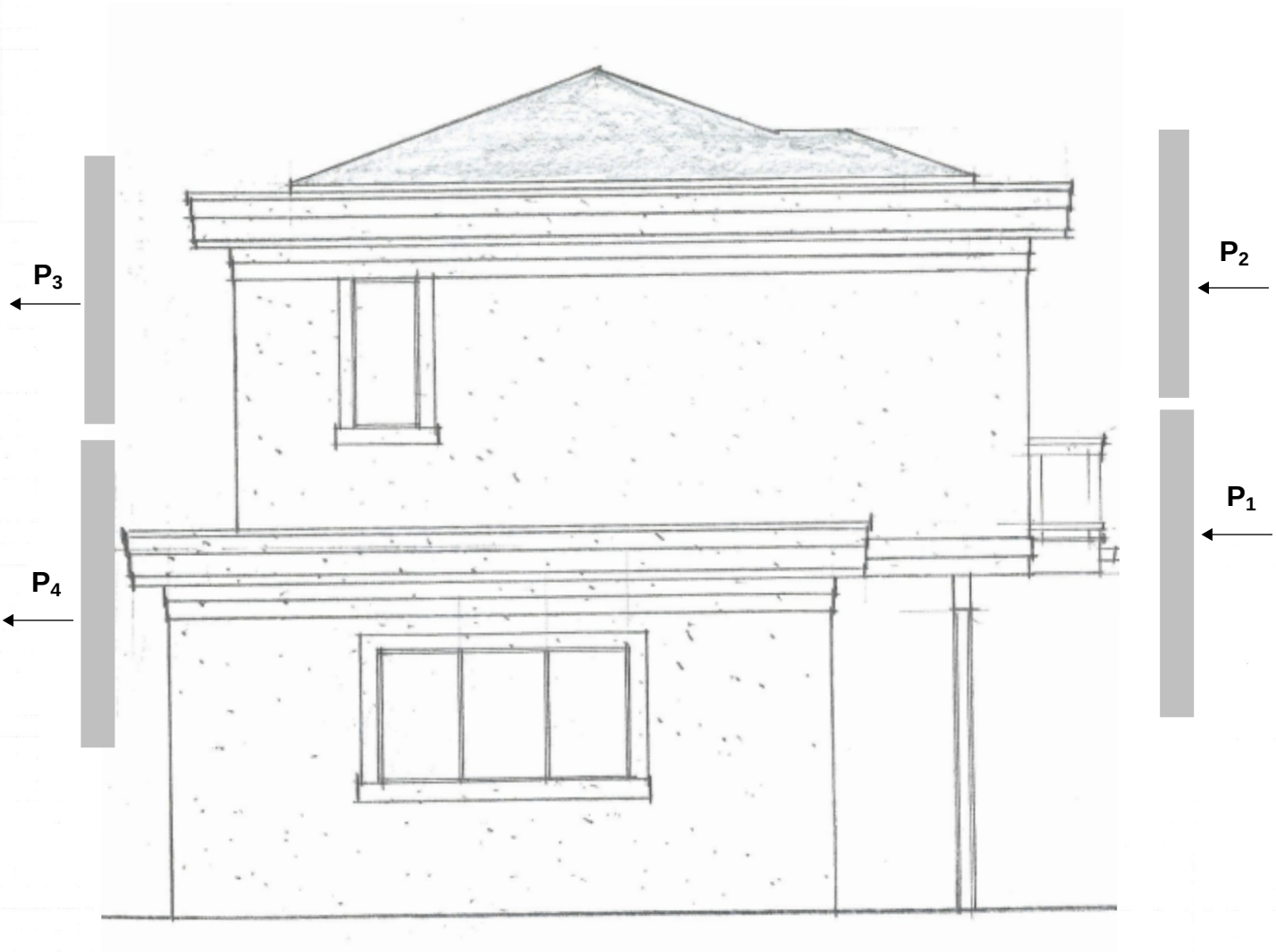
SCALE



Load	P_{RSM}	Height	Trib Area	V_W
P_1	14.5 psf	9'	24.6'	3210#
P_2	14.5 psf	6'	24.6'	2131#
P_3	17.2 psf	6'	24.6'	2528#
P_4	17.2 psf	9'	24.6'	3792#
TOTAL =				11661#

Shear Wall Analysis

Job :	Petrie Residence
Architect:	Leif Anderson
Job #:	T20B3
Date:	Feb-20

Wind Loading Only

Garage

Level:	Upper Roof Diaphragm
Direction:	Side - Side
Vseismic @ Level=	
Vseismic total=	
Vseismic with redundancy=	
Total Load to be resolved (#)=	4200

Grid	C	A.2						
Span(FT.)	24							
Wind load(#/LF)	175	175						
Seismic load(#/LF)	0	0	0	0	0	0	0	0
Load#1(LB)								
Load#2(LB)								
Load#3(LB)								
P(wind+L1,L2,L3)=	2100	2100	0	0	0	0	0	0
P(seismic+L1,L2,L3)=	0	0	0	0	0	0	0	0
Wall Length(FT.)	8.16	20						
Unit Shear(#/LF)	257.3529	105	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Wall Type	P1-6"	P1-6"						
Area Ab(sq.ft.)								
shear ratio r=	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Redundancy factor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Section Length(FT)	2.11	10						
Panel Height(FT)	6.7	9						
(M)from upper level	0	0						
OTM(#')	3638.199	9450	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Panel Length(LF)	2.11	10						
Panel Wt.(#/LF)	122	135						
Wt. on Panel(#/LF)	100	100						
Reduction(%)	40	40	40	40	40	40	40	40
RM(#')	-296.5099	-7050	0	0	0	0	0	0
Resultant(#')	3341.689	2400	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Uplift @ Panel	1583.739	240	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Edge(#)								
Simpson'	cmstc16	n/a						
Restraint	strap							

Shear Wall Analysis

Job :	Petrie Residence
Architect:	Leif Anderson
Job #:	T20B3
Date:	Feb-20

Wind Loading Only
Garage

Level:	Upper Fl'r/Main Roof Diaphragm
Direction:	Side - Side
Vseismic @ Level=	
Vseismic total=	
Vseismic with redundancy=	
Total Load to be resolved (#)=	10200

Grid	B	B A						
Span(FT.)	20							
Wind load(#/LF)	300		300					
Seismic load(#/LF)	0	0	0	0	0	0	0	0
Load#1(LB)	2100	2100						
Load#2(LB)								
Load#3(LB)								
P(wind+L1,L2,L3)=	5100	5100	0	0	0	0	0	0
P(seismic+L1,L2,L3)=	2100	2100	0	0	0	0	0	0
Wall Length(FT.)	5.23	24.5						
Unit Shear(#/LF)	975.1434	208.1633	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Wall Type	P2-3"	P1-6"						
Area Ab(sq.ft.)								
shear ratio r=	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Redundancy factor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Section Length(FT)	2.3	24.5						
Panel Height(FT)	5	9						
(M)from upper level	12920	4800						
OTM(#')	24134.15	50700	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Panel Length(LF)	2.3	24.5						
Panel Wt.(#/LF)	55	135						
Wt. on Panel(#/LF)	150	100						
Reduction(%)	40	40	40	40	40	40	40	40
RM(#')	-325.335	-42317.6	0	0	0	0	0	0
Resultant(#')	23808.81	8382.375	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Uplift @ Panel	10351.66	342.1378	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Edge(#)								
Simpson'	hdu14 w/	hdu5 w/						
Restraint	4x6 post	dbl studs						

Shear Wall Analysis

Job :	Petrie Residence
Architect:	Leif Anderson
Job #:	T20B3
Date:	Feb-20

Wind Loading Only

Garage

Level:	Upper Roof Diaphragm							
Direction:	Front - Rear							
Vseismic @ Level=								
Vseismic total=								
Vseismic with redundancy=								
Total Load to be resolved (#)=		4485						
Grid	1.2	2						
Span(FT.)	23							
Wind load(#/LF)	195	195						
Seismic load(#/LF)	0	0	0	0	0	0	0	0
Load#1(LB)								
Load#2(LB)								
Load#3(LB)								
P(wind+L1,L2,L3)=	2242.5	2242.5	0	0	0	0	0	0
P(seismic+L1,L2,L3)=	0	0	0	0	0	0	0	0
Wall Length(FT.)	18.5	16.33						
Unit Shear(#/LF)	121.2162	137.3239	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Wall Type	P1-6"	P1-6"						
Area Ab(sq.ft.)								
shear ratio r=	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Redundancy factor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Section Length(FT)	18.5	16.33						
Panel Height(FT)	9	9						
(M)from upper level	0	0						
OTM(#')	20182.5	20182.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Panel Length(LF)	18.5	16.33						
Panel Wt.(#/LF)	135	135						
Wt. on Panel(#/LF)	100	100						
Reduction(%)	40	40	40	40	40	40	40	40
RM(#')	-24128.63	-18800.2	0	0	0	0	0	0
Resultant(#')	-3946.125	1382.343	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Uplift @ Panel Edge(#)	-213.3041	84.65049	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Simpson' Restraint	n/a	n/a						

Shear Wall Analysis

Job :	Petrie Residence
Architect:	Leif Anderson
Job #:	T20B3
Date:	Feb-20

Wind Loading Only

Garage

Level:	Upper Fl'r/Main Roof Diaphragm							
Direction:	Front - Rear							
Vseismic @ Level=								
Vseismic total=								
Vseismic with redundancy=								
Total Load to be resolved (#)=		11785						
Grid	1	2						
Span(FT.)	24.5							
Wind load(#/LF)	286	286						
Seismic load(#/LF)	0	0	0	0	0	0	0	0
Load#1(LB)	2389	2389						
Load#2(LB)								
Load#3(LB)								
P(wind+L1,L2,L3)=	5892.5	5892.5	0	0	0	0	0	0
P(seismic+L1,L2,L3)=	2389	2389	0	0	0	0	0	0
Wall Length(FT.)	12.71	20						
Unit Shear(#/LF)	463.6113	294.625	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Wall Type	P1-3"	P1-4"						
Area Ab(sq.ft.)								
shear ratio r=	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Redundancy factor	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Section Length(FT)	6.33	20						
Panel Height(FT)	9	9						
(M)from upper level	-1314	2800						
OTM(#')	25097.94	55832.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Panel Length(LF)	6.33	20						
Panel Wt.(#/LF)	135	135						
Wt. on Panel(#/LF)	100	100						
Reduction(%)	40	40	40	40	40	40	40	40
RM(#')	-2824.857	-28200	0	0	0	0	0	0
Resultant(#')	22273.08	27632.5	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Uplift @ Panel	3518.654	1381.625	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
Edge(#)								
Simpson'	hdu5 w/	hdu5 w/						
Restraint	3X post	dbl studs						