Structural Calculations

For

Brown Residence

Valley County, Idaho

Prepared by

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2019-07235
March 19, 2019

Design Criteria

Project Name: Brown Residence
Job Number: 2019-07235
Location: Valley County, Idaho

Engineer: ***ARA***
Checker: ***KJ***

Governing Code: *2015 IBC*

Snow Criteria

Roof Load (P_f)	150 psf	
Ground Load (P_g)	150 psf	
Exposure Factor (C_e)	1.0	Partially
Thermal Factor (C_t)	1.0	Typical
Importance (I_s)	1.0	

Wind Criteria

Wind Speed (V_3)	115 mph	
Wind Exposure	B	Urban / wooded
Wind Importance (I_w)	1.0	
Building Category	II	

Seismic Criteria

Site Class	D	Stiff Soil	
S_s	0.51	Fa	1.39
S_1	0.15	Fv	2.19
S_{DS}	0.47	S_{D1}	0.22
Risk Category	II	Other	
Seismic Importance (I_E)	1.0		
Seismic Design Category (SDC)	D		

Wall Material	Design Base Shear	Seismic Response Coefficient, R	
OSB	.07Wp	6.5	Typ @ Ext
GYP	.24Wp	2	Typ @ Int

Live Loads

Typ Residential	40 psf
	-
	-

Soil Bearing

Typical	1500 psf

Roof Dead Loads:

Deck	*1.5*
Insulation	*2.0*
Roofing	*3.0*
Joist	*2.5*
Ceiling	*3.0*
Misc	*4.5*
TOTAL	**17 psf**

Floor Dead Loads:

Deck	2.0
Joist	2.0
Ceiling	0.0
Flooring	1.0
Misc	5.0
TOTAL	**10 psf**

Exterior Wall Dead Loads:

Studs	*2.0*
Siding	*2.5*
Insulation	*0.5*
Gyp. Board	*2.5*
Sheating	*1.5*
Misc	*3.0*
TOTAL	**12 psf**

Interior Wall Dead Loads:

Studs	*2.0*
Gyp. Board	*2.5*
-	-
-	-
-	-
Misc	*3.0*
TOTAL	**8 psf**

Project # : *2019-07235*
Project: *Brown Residence*

OSB Seismic Loading Analysis

S_s =	*0.507*	C_T =	*0.020*	
S_1 =	*0.152*	h_n =	*26.83*	ft
F_a =	*1.4*			
F_v =	*2.2*			
R =	*6.5*			
I_E =	*1.0*			

$S_{MS} = F_a S_s$ =	0.7068	
$S_{M1} = F_v S_1$ =	0.3332	
		Seismic Design Category
$S_{DS} = 2/3\ S_{MS}$ =	0.4712	*C*
$S_{D1} = 2/3\ S_{M1}$ =	0.2221	*D*
$C_s = 1.2*S_{DS}/(R/I_E)$ =	0.0725	**Controls**
$T_a = C_T h_n^{3/4}$ =	0.2358	
$C_s < S_{D1}/[(R/I_E)T]$ =	0.1449	
$C_s > 0.044 S_{DS} I_E$ =	0.0207	
$C_s > 0.5 S_1/(R/I_E)$ =	0.0117	

$V = C_s W$ = **0.0725** W

0.7*V = **0.0507** W

Project # : *2019-07235*
Project: *Brown Residence*

OSB Seismic Component Loading

w_p =	*1*	psf	weight of element
V_{px} =	*0*	plf	Portion of seismic shear load at the level of the diaphragm, required to be transferred to the components of the vertical seismic-force-resisting system beacause of the offsets or changes in the stiffness of the vertical components above of below the diaphragm.
w_w =	*1*	psf	weight of wall
L_b =	*66*	ft	length of the building

NOTE: Use 1 for unit weight to achieve an answer per element unit weight

Connections

$F_p = 0.133\ S_{DS}\ w_p$ =	**0.06**	psf		
or				
$F_p = 0.05\ w_p$ =	**0.05**	psf		

Diaphragm

$F_p = 0.2\ I_E\ S_{DS}\ w_p + V_{px}$ =	**0.09**	psf		
$F_{p,max} = 0.4\ I_E\ S_{DS}\ w_p + V_{px}$ =	**0.19**	psf		

Bearing Walls & Shear Walls

Out of Plane Forces

$F_p = 0.40\ I_E\ S_{DS}\ w_w$ =	**0.19**	psf	**Controls**	*12.11.1*
$F_p = 0.10\ w_w$ =	**0.10**	psf		*12.11.1*

Anchorage

$F_p = 0.40\ I_E\ S_{DS}\ w_w\ k_a$ =	**0.3**	psf		*12.11-1*
$F_p = 0.2\ I_E\ k_a\ w_w$ =	**0.3320**	psf	**Controls**	
$k_a = 1.0 + L_b / 100$ =	**1.6600**			*12.11-2*

Note: *12.11.2.2.2* The strength design forces for steel elements of the structural wall anchorage system, with exception of anchor bolts and reinforcing steel, shall be increased by 1.4 times the forces otherwise noted above.

WIND LOADING ANALYSIS - Main Wind-Force Resisting System

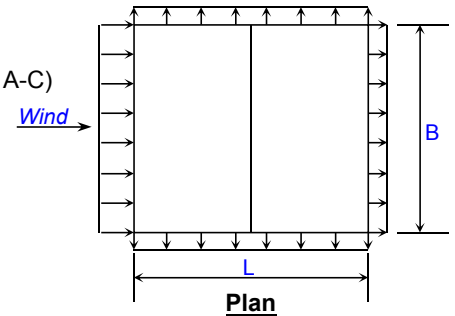
Per ASCE 7-10 Code for Enclosed or Partially Enclosed Buildings

Using Method 2: Analytical Procedure (Section 27 & 28) for Low-Rise Buildings

Job Name:	Brown Residence	Location:	Valley County, Idaho		
Job Number:	2019-07235	Engineer:	ARA	Checker:	KJ

Input Data:

Wind Speed, V =	115	mph (Wind Map, Figure 26.5-1A-C)
Bldg. Classification =	II	(Table 1.5-1 Risk Category)
Exposure Category =	B	(Sect. 26.7)
Ridge Height, hr =	26.83	ft. (hr >= he)
Eave Height, he =	18.83	ft. (he <= hr)
Building Width =	32.00	ft. (Normal to Building Ridge)
Building Length =	66.00	ft. (Parallel to Building Ridge)
Roof Type =	Gable	(Gable or Monoslope)
Topo. Factor, Kzt =	1.00	(Sect. 26.8 & Figure 26.8-1)
Direct. Factor, Kd =	0.85	(Table 26.6)
Enclosed? (Y/N)	Y	(Sect. 26.2 & Table 26.11-1)
Hurricane Region?	N	



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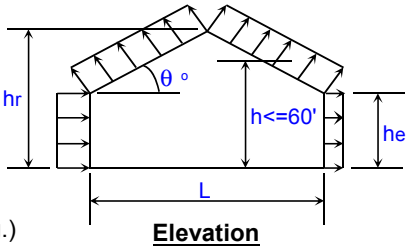


Elevation

Resulting Parameters and Coefficients:

Roof Angle, θ =	26.57	deg.
Mean Roof Ht., h =	22.83	ft. (h = (hr+he)/2, for angle >10 deg.)

Check Criteria for a Low-Rise Building:

1. Is h <= 60' ? Yes, O.K.
2. Is h <= Lesser of L or B? Yes, O.K.

External Pressure Coeff's., GCpf (Fig. 28.4-1):
(For values, see following wind load tabulations.)
Positive & Negative Internal Pressure Coefficients, GCpi (Table 26.11-1):

+GCpi Coef. =	0.18	(positive internal pressure)
-GCpi Coef. =	-0.18	(negative internal pressure)

If h < 15 then: Kh = 2.01*(15/zg)^(2/α) (Table 28.3-1)
If h >= 15 then: Kh = 2.01*(z/zg)^(2/α) (Table 28.3-1) (Note: z not < 30' for Exp. B)

α =	7.00	(Table 26.9-1)
zg =	1200	(Table 26.9-1)
Kh =	0.70	(Kh = Kz evaluated at z = h)

Velocity Pressure: qz = 0.00256*Kz*Kzt*Kd*V^2 (Sect. 28.3.2, Eq. 28.3-1)
qh = 20.16 psf qh = 0.00256*Kh*Kzt*Kd*V^2 (qz evaluated at z = h)
Design Net External Wind Pressures (Sect. 28.4.1):
p = qh*[(GCpf) - (+/-GCpi)] (psf, Eq. 28.4-1)

Wall and Roof End Zone Widths 'a' and '2*a' (Fig. 28.4-1):

a =	3.20	ft.
2*a =	6.40	ft.

MWFRS Wind Load for Load Case A				MWFRS Wind Load for Load Case B			
Surface	GCpf	p = Net Pressures (psf)		Surface	*GCpf	p = Net Pressures (psf)	
		(w/ +GCpi)	(w/ -GCpi)			(w/ +GCpi)	(w/ -GCpi)
Zone 1	0.55	7.45	14.71	Zone 1	0.40	4.44	11.69
Zone 2	-0.10	-5.63	1.63	Zone 2	-0.69	-17.54	-10.28
Zone 3	-0.45	-12.64	-5.39	Zone 3	-0.37	-11.09	-3.83
Zone 4	-0.39	-11.50	-4.25	Zone 4	-0.29	-9.48	-2.22
Zone 5	---	---	---	Zone 5	-0.45	-12.70	-5.44
Zone 6	---	---	---	Zone 6	-0.45	-12.70	-5.44
Zone 1E	0.73	11.04	18.30	Zone 1E	0.61	8.67	15.93
Zone 2E	-0.19	-7.47	-0.21	Zone 2E	-1.07	-25.20	-17.94
Zone 3E	-0.58	-15.42	-8.16	Zone 3E	-0.53	-14.31	-7.06
Zone 4E	-0.53	-14.41	-7.16	Zone 4E	-0.43	-12.30	-5.04
Zone 5E	---	---	---	Zone 5E	0.61	8.67	15.93
Zone 6E	---	---	---	Zone 6E	-0.43	-12.30	-5.04

*Note: Use roof angle θ = 0 degrees for Longitudinal Direction.

For Case A when GCpf is neg. in Zones 2/2E:
Zones 2/2E dist. = 16.00 ft.

For Case B when GCpf is neg. in Zones 2/2E:
Zones 2/2E dist. = 33.00 ft.

Remainder of roof Zones 2/2E extending to ridge line shall use roof Zones 3/3E pressure coefficients.

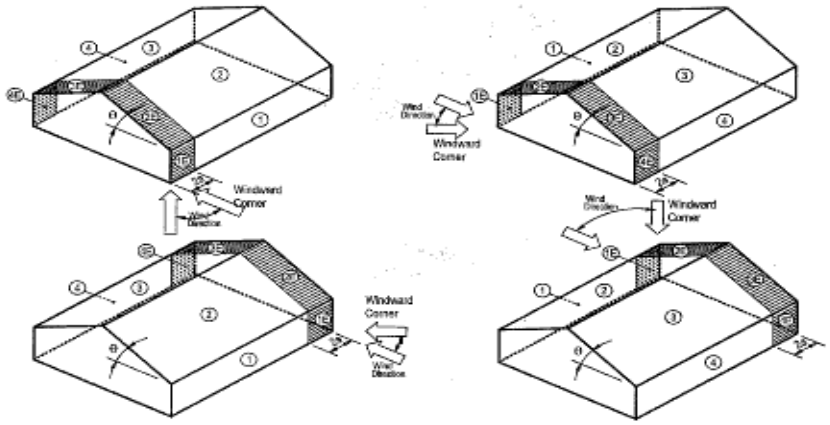
MWFRS Wind Load for Load Case A, Torsional Case				MWFRS Wind Load for Case B, Torsional Case			
Surface	GCpf	p = Net Pressure (psf)		Surface	GCpf	p = Net Pressure (psf)	
		(w/ +GCpi)	(w/ -GCpi)			(w/ +GCpi)	(w/ -GCpi)
Zone 1T	---	1.86	3.68	Zone 1T	---	1.11	2.92
Zone 2T	---	-1.41	0.41	Zone 2T	---	-4.39	-2.57
Zone 3T	---	-3.16	-1.35	Zone 3T	---	-2.77	-0.96
Zone 4T	---	-2.88	-1.06	Zone 4T	---	-2.37	-0.55
Zone 5T	---	---	---	Zone 5T	---	-3.18	-1.36
Zone 6T	---	---	---	Zone 6T	---	-3.18	-1.36

Notes: 1. For Load Case A (Transverse), Load Case B (Longitudinal), and Torsional Cases:

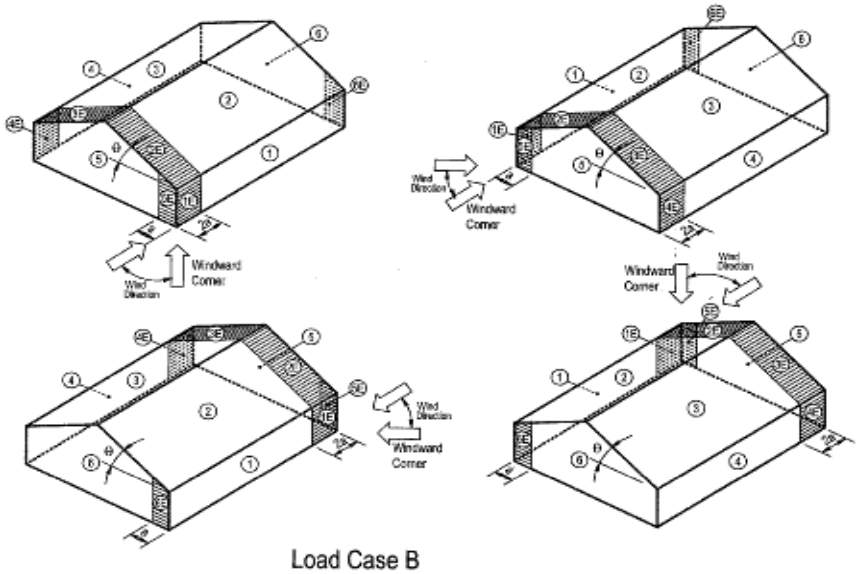
Zone 1 is windward wall for interior zone.
Zone 1E is windward wall for end zone.
Zone 2 is windward roof for interior zone.
Zone 2E is windward roof for end zone.
Zone 3 is leeward roof for interior zone.
Zone 3E is leeward roof for end zone.
Zone 4 is leeward wall for interior zone.
Zone 4E is leeward wall for end zone.
Zones 5 and 6 are sidewalls.
Zone 5E & 6E is sidewalls for end zone.
Zone 1T is windward wall for torsional case
Zone 2T is windward roof for torsional case.
Zone 3T is leeward roof for torsional case
Zone 4T is leeward wall for torsional case.
Zones 5T and 6T are sidewalls for torsional case.

2. (+) and (-) signs signify wind pressures acting toward & away from respective surfaces.
3. Building must be designed for all wind directions using the 8 load cases shown below. The load cases are applied to each building corner in turn as the reference corner.
4. Wind loads for torsional cases are 25% of respective transverse or longitudinal zone load values. Torsional loading shall apply to all 8 basic load cases applied at each reference corner.
   Exception: One-story buildings with "h" <= 30', buildings <= 2 stories framed with light frame construction, and buildings <=2 stories designed with flexible diaphragms need not be designed for torsional load cases.
5. Per Code Section 28.4.4, the minimum wind load for MWFRS shall not be less than 16 psf.

Low-Rise Buildings h <= 60'

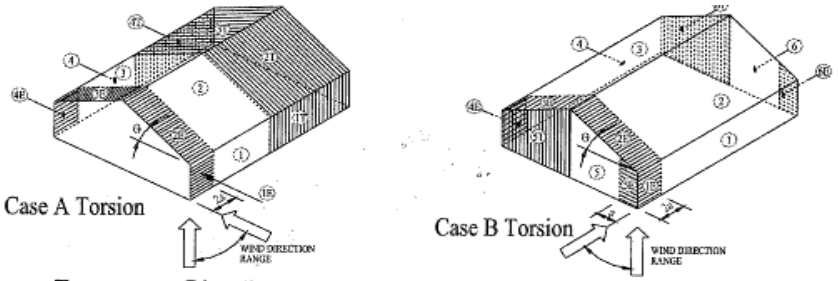


Load Case A



Load Case B

Basic Load Cases



Transverse Direction

Longitudinal Direction

Torsional Load Cases

WIND LOADING ANALYSIS - Wall Components and Cladding

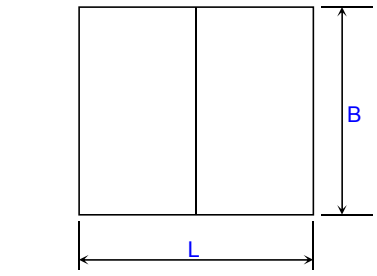
Per ASCE 7-10 Code for Buildings of Any Height

Using Part 1 & 3: Analytical Procedure (Section 30.4 & 30.6)

Job Name:	Brown Residence	Location:	Valley County, Idaho		
Job Number:	2019-07235	Engineer:	ARA	Checker:	KJ

Input Data:

Wind Speed, V =	115	mph (Wind Map, Figure 26.5-1A-C)
Bldg. Classification =	II	(Table 1.5-1 Risk Category)
Exposure Category =	B	(Sect. 26.7)
Ridge Height, hr =	26.83	ft. (hr >= he)
Eave Height, he =	18.83	ft. (he <= hr)
Building Width =	32	ft. (Normal to Building Ridge)
Building Length =	66	ft. (Parallel to Building Ridge)
Roof Type =	Gable	(Gable or Monoslope)
Topo. Factor, Kzt =	1	(Sect. 26.8 & Figure 26.8-1)
Direct. Factor, Kd =	0.85	(Table 26.6)
Enclosed? (Y/N)	Y	(Sect. 28.6-1 & Figure 26.11-1)
Hurricane Region?	N	
Component Name =	Wall	(Girt, Siding, Wall, or Fastener)
Effective Area, Ae =	27	ft.^2 (Area Tributary to C&C)



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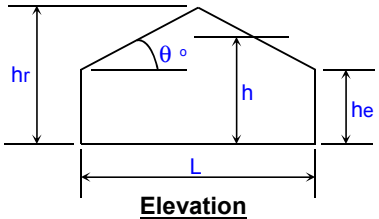


Elevation

Resulting Parameters and Coefficients:

Roof Angle, θ =	26.57	deg.
Mean Roof Ht., h =	22.83	ft. (h = (hr+he)/2, for roof angle >10 deg.)

Wall External Pressure Coefficients, GCp:

GCp Zone 4 Pos. =	0.92	(Fig. 30.4-1)
GCp Zone 5 Pos. =	0.92	(Fig. 30.4-1)
GCp Zone 4 Neg. =	-1.02	(Fig. 30.4-1)
GCp Zone 5 Neg. =	-1.25	(Fig. 30.4-1)

Positive & Negative Internal Pressure Coefficients, GCpi (Figure 26.11-1):

+GCpi Coef. =	0.18	(positive internal pressure)
-GCpi Coef. =	-0.18	(negative internal pressure)

If z <= 15 then: Kz = 2.01*(15/zg)^(2/α) , If z > 15 then: Kz = 2.01*(z/zg)^(2/α) (Table 30.3-1)

α =	7.00	(Table 26.9-1) (Note: z not < 30' for Exp. B, Case 1)
zg =	1200	(Table 26.9-1)
Kh =	0.70	(Kh = Kz evaluated at z = h)

Velocity Pressure: qz = 0.00256*Kz*Kzt*Kd*V^2 (Sect. 30.3.2, Eq. 30.3-1)

qh = 20.16 psf qh = 0.00256*Kh*Kzt*Kd*V^2 (qz evaluated at z = h)

Design Net External Wind Pressures (Sect. 30.4 & 30.6):

For h <= 60 ft.: p = qh*((GCp) - (+/-GCpi)) (psf)

For h > 60 ft.: p = q*(GCp) - qi*(+/-GCpi) (psf)

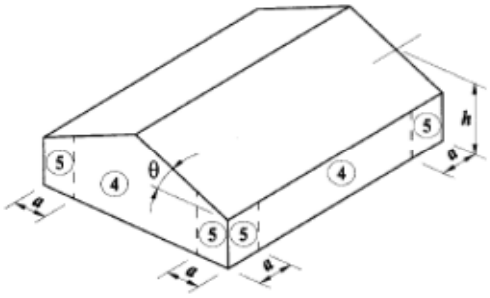
where: q = qz for windward walls, q = qh for leeward walls and side walls

qi = qh for all walls (conservatively assumed per Sect. 30.6)

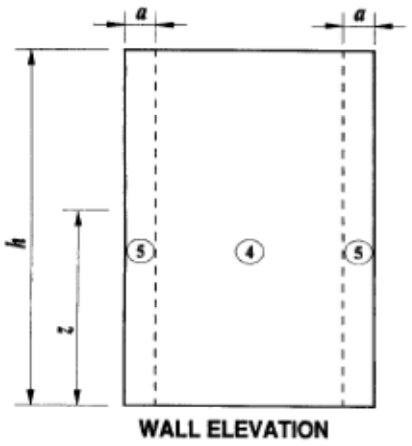
Wind Load Tabulation for Wall Components & Cladding							
Component	z (ft.)	Kh	qh (psf)	p = Net Design Pressures (psf)			
				Zone 4 (+)	Zone 4 (-)	Zone 5 (+)	Zone 5 (-)
Wall	0	0.70	20.16	22.25	-24.27	22.25	-28.78
	15.00	0.70	20.16	22.25	-24.27	22.25	-28.78
	20.00	0.70	20.16	22.25	-24.27	22.25	-28.78
	25.00	0.70	20.16	22.25	-24.27	22.25	-28.78
For z = hr:	26.83	0.70	20.16	22.25	-24.27	22.25	-28.78
For z = he:	18.83	0.70	20.16	22.25	-24.27	22.25	-28.78
For z = h:	22.83	0.70	20.16	22.25	-24.27	22.25	-28.78

Notes: 1. (+) and (-) signs signify wind pressures acting toward & away from respective surfaces.
2. Width of Zone 5 (end zones), 'a' = 3.20 ft.
3. Per Code Section 30.2.2, the minimum wind load for C&C shall not be less than 16 psf.
4. References : a. ASCE 7-10, "Minimum Design Loads for Buildings and Other Structures".
b. "Guide to the Use of the Wind Load Provisions of ASCE 7-02"
by: Kishor C. Mehta and James M. Delahay (2004).

Wall Components and Cladding:



Wall Zones for Buildings with h <= 60 ft.



Wall Zones for Buildings with h > 60 ft.

WIND LOADING ANALYSIS - Roof Components and Cladding

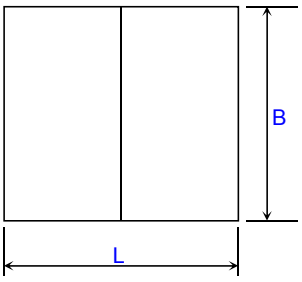
Per ASCE 7-10 Code for Bldgs. of Any Height with Gable Roof θ <= 45˚ or Monoslope Roof θ <= 3˚

Using Part 1 & 3: Analytical Procedure (Section 30.4 & 30.6)

Job Name:	Brown Residence	Location:	Valley County, Idaho		
Job Number:	2019-07235	Engineer:	ARA	Checker:	KJ

Input Data:

Wind Speed, V =	115	mph (Wind Map, Figure 26.5-1A-C)
Bldg. Classification =	II	(Table 1-1 Occupancy Category)
Exposure Category =	B	(Sect. 26.7)
Ridge Height, hr =	26.83	ft. (hr >= he)
Eave Height, he =	18.83	ft. (he <= hr)
Building Width =	32	ft. (Normal to Building Ridge)
Building Length =	66	ft. (Parallel to Building Ridge)
Roof Type =	Gable	(Gable or Monoslope)
Topo. Factor, Kzt =	1	(Sect. 26.8 & Figure 26.8-1)
Direct. Factor, Kd =	0.85	(Table 26.6)
Enclosed? (Y/N)	Y	(Sect. 28.6-1 & Figure 26.11-1)
Hurricane Region?	N	
Component Name =	Joist	(Purlin, Joist, Decking, or Fastener)
Effective Area, Ae =	341.3333	ft.^2 (Area Tributary to C&C)
Overhangs? (Y/N)	Y	(if used, overhangs on all sides)



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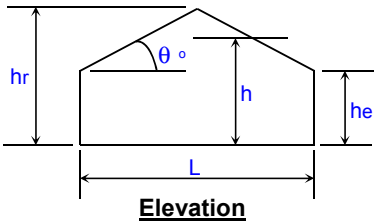


Elevation

Resulting Parameters and Coefficients:

Roof Angle, θ =	26.57	deg.
Mean Roof Ht., h =	22.83	ft. (h = (hr+he)/2, for roof angle >10 deg.)

Roof External Pressure Coefficients, GCp:

GCp Zone 1-3 Pos. =	0.30	(Fig. 30.4-2A, 30.4-2B, and 30.4-2C)
GCp Zone 1 Neg. =	-0.80	(Fig. 30.4-2A, 30.4-2B, and 30.4-2C)
GCp Zone 2 Neg. =	-2.20	(Fig. 30.4-2A, 30.4-2B, and 30.4-2C)
GCp Zone 3 Neg. =	-2.50	(Fig. 30.4-2A, 30.4-2B, and 30.4-2C)

Positive & Negative Internal Pressure Coefficients, GCpi (Figure 26.11-1):

+GCpi Coef. =	0.18	(positive internal pressure)
-GCpi Coef. =	-0.18	(negative internal pressure)

If z <= 15 then: Kz = 2.01*(15/zg)^(2/α) , If z > 15 then: Kz = 2.01*(z/zg)^(2/α) (Table 30.3-1)

α =	7.00	(Table 26.9-1)
zg =	1200	(Table 26.9-1) (Note: z not < 30, Exp. B, Case 1)
Kh =	0.70	(Kh = Kz evaluated at z = h)

Velocity Pressure: qz = 0.00256*Kz*Kzt*Kd*V^2 (Sect. 30.3.2, Eq. 30.3-1)

qh = 20.16 psf qh = 0.00256*Kh*Kzt*Kd*V^2 (qz evaluated at z = h)

Design Net External Wind Pressures (Sect. 30.4 & 30.6):

For h <= 60 ft.: p = qh*((GCp) - (+/-GCpi)) (psf)

For h > 60 ft.: p = q*(GCp) - qi*(+/-GCpi) (psf)

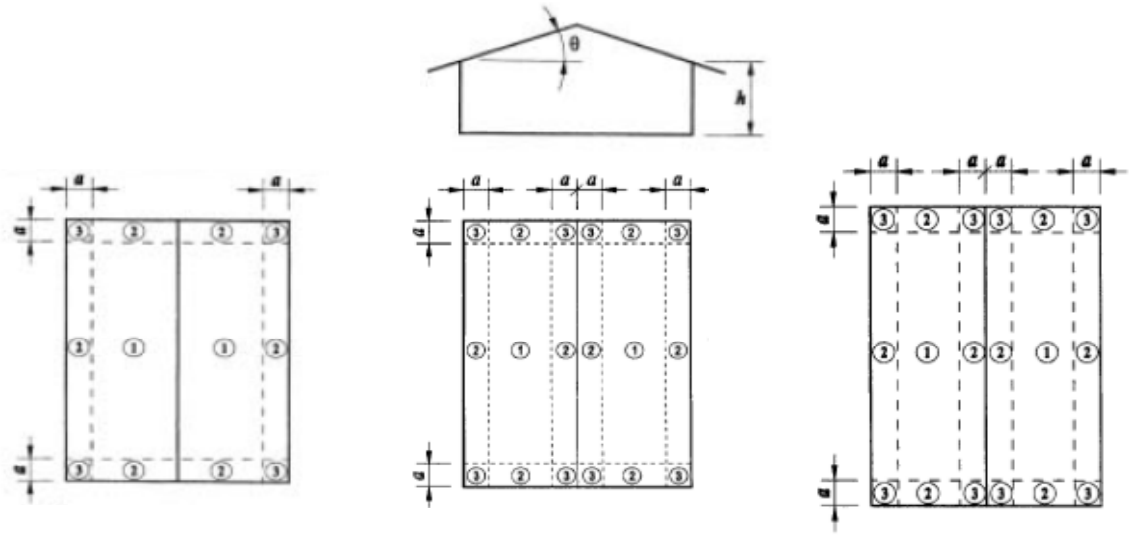
where: q = qh for roof

qi = qh for roof (conservatively assumed per Sect. 30.6)

Wind Load Tabulation for Roof Components & Cladding							
Component	z (ft.)	Kh	qh (psf)	p = Net Design Pressures (psf)			
				Zone 1,2,3 (+)	Zone 1 (-)	Zone 2 (-)	Zone 3 (-)
Joist	0	0.70	20.16	9.68	-19.76	-47.98	-54.03
	15.00	0.70	20.16	9.68	-19.76	-47.98	-54.03
	20.00	0.70	20.16	9.68	-19.76	-47.98	-54.03
	25.00	0.70	20.16	9.68	-19.76	-47.98	-54.03
For z = hr:	26.83	0.70	20.16	9.68	-19.76	-47.98	-54.03
For z = he:	18.83	0.70	20.16	9.68	-19.76	-47.98	-54.03
For z = h:	22.83	0.70	20.16	9.68	-19.76	-47.98	-54.03

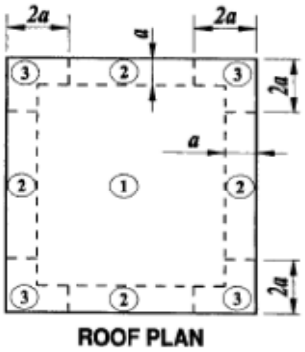
Notes: 1. (+) and (-) signs signify wind pressures acting toward & away from respective surfaces.
2. Width of Zone 2 (edge), 'a' = 3.20 ft.
3. Width of Zone 3 (corner), 'a' = 3.20 ft.
4. For monoslope roofs with θ <= 3 degrees, use Fig. 30.4-2A for 'GCp' values with 'qh'.
5. For buildings with h > 60' and θ > 10 degrees, use Fig. 30.6-1 for 'GCpi' values with 'qh'.
6. For all buildings with overhangs, use Fig. 30.4-2B for 'GCp' values per Sect. 30.10.
7. If a parapet >= 3' in height is provided around perimeter of roof with θ <= 10 degrees, Zone 3 shall be treated as Zone 2.
8. Per Code Section 30.2.2, the minimum wind load for C&C shall not be less than 16 psf.
9. References : a. ASCE 7-02, "Minimum Design Loads for Buildings and Other Structures".
b. "Guide to the Use of the Wind Load Provisions of ASCE 7-02" by: Kishor C. Mehta and James M. Delahay (2004).

Roof Components and Cladding:



θ <= 7 deg. | 7 deg. < θ <= 27 deg. | 27 deg. < θ <= 45 deg.

Roof Zones for Buildings with h <= 60 ft.
(for Gable Roofs <= 45° and Monoslope Roofs <= 3°)



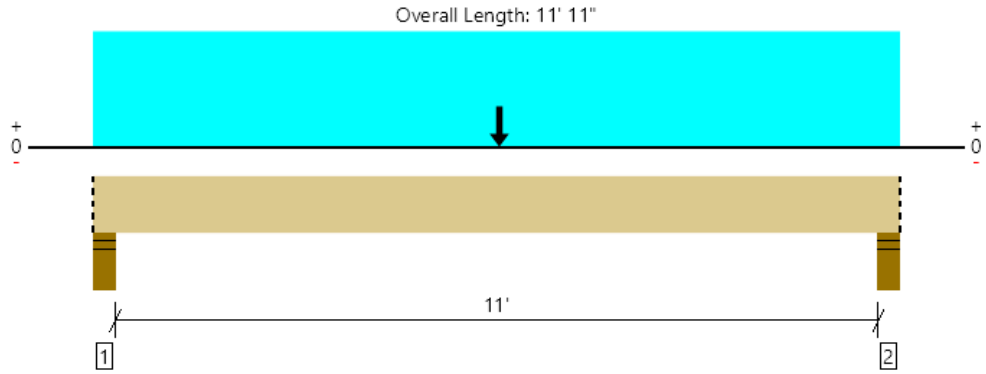
ROOF PLAN

Roof Zones for Buildings with h > 60 ft.
(for Gable Roofs <= 10° and Monoslope Roofs <= 3°)

Level			
Member Name	Results	Current Solution	Comments
B14	Passed	3 piece(s) 1 3/4" x 16" 2.0E Microllam® LVL	
B2	Passed	1 piece(s) 5 1/8" x 15" 24F-V4 DF Glulam	
Dining Upper Exterior Beam	Passed	1 piece(s) 5 1/8" x 10 1/2" 24F-V4 DF Glulam	
B10	Passed	4 piece(s) 1 3/4" x 9 1/4" 2.0E Microllam® LVL	
B11	Passed	3 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL	
Deck Joist	Passed	1 piece(s) 2 x 8 Douglas Fir-Larch No. 2 @ 16" OC	
B7	Passed	1 piece(s) 5 1/8" x 10 1/2" 24F-V4 DF Glulam	
Deck Floor: Joist	Passed	1 piece(s) 2 x 10 Douglas Fir-Larch No. 2 @ 16" OC	
B16	Passed	1 piece(s) 6 x 12 Douglas Fir-Larch No. 2	
B17	Passed	1 piece(s) 4 x 12 Douglas Fir-Larch No. 2	

Level, B14

3 piece(s) 1 3/4" x 16" 2.0E Microllam® LVL



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	14797 @ 11' 7"	18047 (5.50")	Passed (82%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	11312 @ 10' 1 1/2"	18354	Passed (62%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	48678 @ 6'	53672	Passed (91%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.314 @ 6'	0.563	Passed (L/430)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.353 @ 6'	0.750	Passed (L/382)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Top Edge Bracing (Lu): Top compression edge must be braced at 4' 10" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 11' 11" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - DF	5.50"	5.50"	4.50"	1658	13092	14750	Blocking
2 - Stud wall - DF	5.50"	5.50"	4.51"	1663	13134	14797	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 11' 11"	N/A	24.5	--	
1 - Uniform (PSF)	0 to 11' 11" (Front)	11' 6"	17.0	150.0	Default Load
2 - Point (lb)	6' (Front)	N/A	699	5669	Linked from: B7, Support 1

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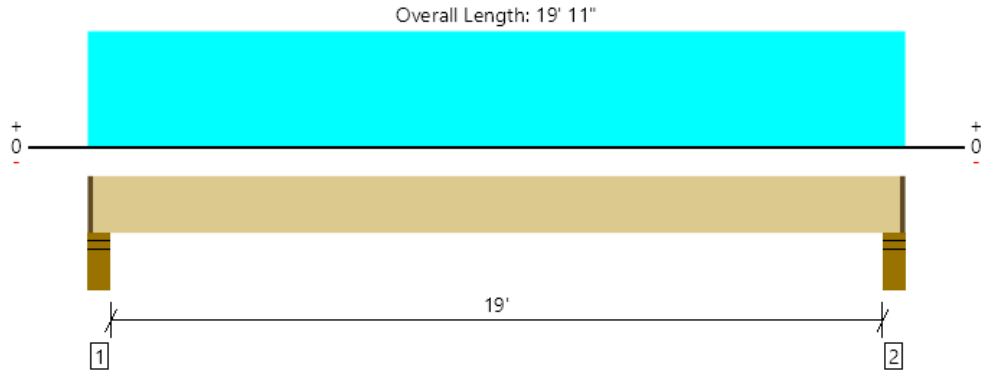
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Weyerhaeuser

SUSTAINABLE FORESTRY INITIATIVE

Level, B2

1 piece(s) 5 1/8" x 15" 24F-V4 DF Glulam



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8412 @ 4"	13613 (4.25")	Passed (62%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	7043 @ 1' 8 1/2"	15618	Passed (45%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	39543 @ 9' 11 1/2"	43605	Passed (91%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.893 @ 9' 11 1/2"	0.962	Passed (L/259)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	1.017 @ 9' 11 1/2"	1.283	Passed (L/227)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Top Edge Bracing (Lu): Top compression edge must be braced at 19' 9" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 19' 9" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 0.99 that was calculated using length L = 19' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - DF	5.50"	4.25"	2.63"	1031	7469	8500	1 1/4" Rim Board
2 - Stud wall - DF	5.50"	4.25"	2.63"	1031	7469	8500	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 19' 9 3/4"	N/A	18.7	--	
1 - Uniform (PSF)	0 to 19' 11" (Front)	5'	17.0	150.0	Default Load

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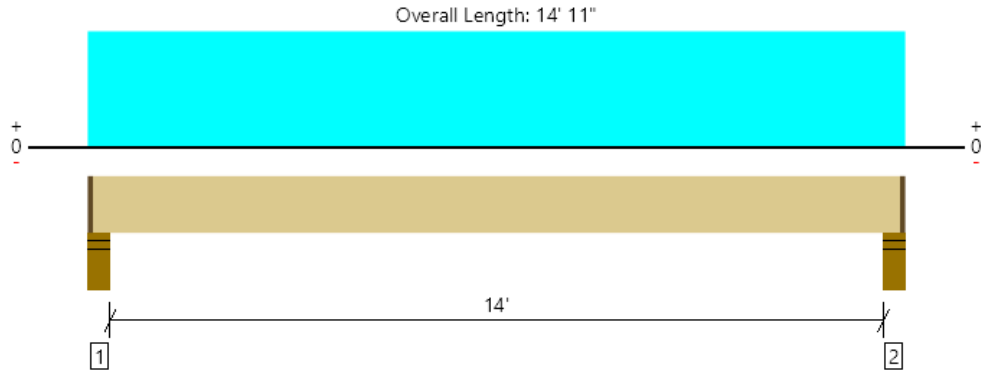
Weyerhaeuser SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Andrew Aitchison Performance Engineers (208) 440-7836 andrewa@inteframe.com	

Level, Dining Upper Exterior Beam
1 piece(s) 5 1/8" x 10 1/2" 24F-V4 DF Glulam



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5009 @ 4"	13613 (4.25")	Passed (37%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	4172 @ 1' 4"	10933	Passed (38%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	17288 @ 7' 5 1/2"	21660	Passed (80%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.626 @ 7' 5 1/2"	0.712	Passed (L/273)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.710 @ 7' 5 1/2"	0.950	Passed (L/241)	--	1.0 D + 1.0 S (All Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Top Edge Bracing (Lu): Top compression edge must be braced at 14' 9" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 14' 9" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 14' 3".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - DF	5.50"	4.25"	1.56"	603	4475	5078	1 1/4" Rim Board
2 - Stud wall - DF	5.50"	4.25"	1.56"	603	4475	5078	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 14' 9 3/4"	N/A	13.1	--	
1 - Uniform (PSF)	0 to 14' 11" (Front)	4'	17.0	150.0	Default Load

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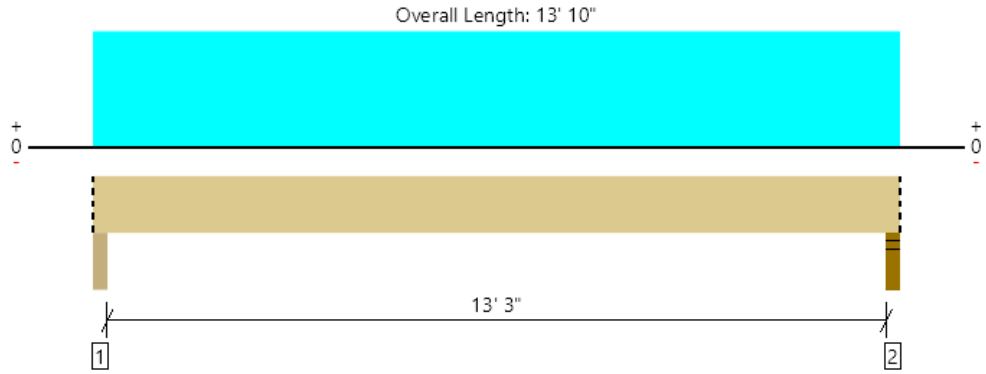
Andrew Aitchison Performance Engineers (208) 440-7836 andrewa@inteframe.com	

Level, B10

4 piece(s) 1 3/4" x 9 1/4" 2.0E Microllam® LVL



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	4447 @ 13' 8"	15313 (3.50")	Passed (29%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	3764 @ 1' 3/4"	12303	Passed (31%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	14646 @ 6' 11"	22408	Passed (65%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.408 @ 6' 11"	0.450	Passed (L/397)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.546 @ 6' 11"	0.675	Passed (L/296)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 13' 10" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 13' 10" o/c unless detailed otherwise.
- Member should be side-loaded from both sides of the member or braced to prevent rotation.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	3.50"	1.50"	1127	3320	4447	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	1127	3320	4447	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 13' 10"	N/A	18.9	--	
1 - Uniform (PSF)	0 to 13' 10" (Front)	12'	12.0	40.0	Default Load

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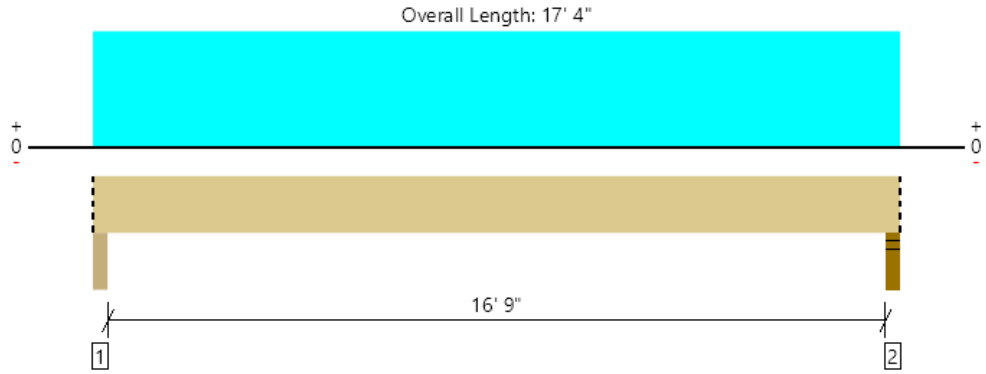
Level, B11

3 piece(s) 1 3/4" x 11 7/8" 2.0E Microllam® LVL



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3312 @ 17' 2"	11484 (3.50")	Passed (29%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	2823 @ 1' 3 3/8"	11845	Passed (24%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	13806 @ 8' 8"	26772	Passed (52%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.378 @ 8' 8"	0.567	Passed (L/540)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.516 @ 8' 8"	0.850	Passed (L/396)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 17' 4" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 17' 4" o/c unless detailed otherwise.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Column - DF	3.50"	3.50"	1.50"	886	2427	3313	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	886	2427	3313	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 17' 4"	N/A	18.2	--	
1 - Uniform (PSF)	0 to 17' 4" (Front)	7'	12.0	40.0	Default Load

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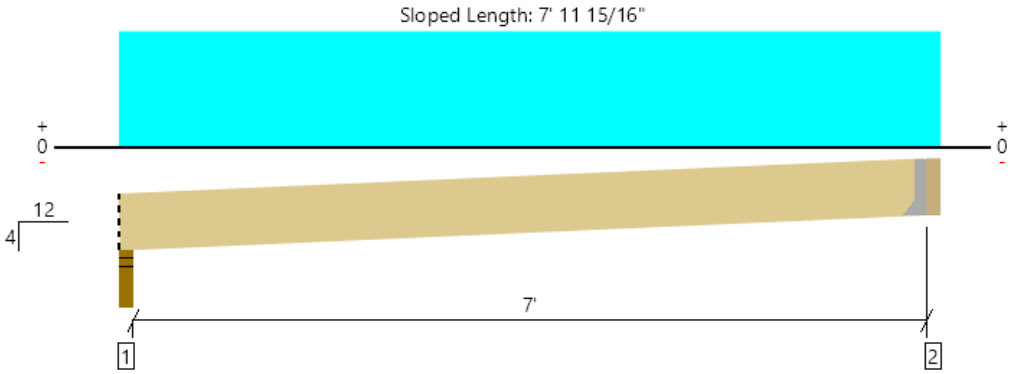
ForteWEB Software Operator	Job Notes
Andrew Aitchison Performance Engineers (208) 440-7836 andrewa@inteframe.com	

Level, Deck Joist

1 piece(s) 2 x 8 Douglas Fir-Larch No. 2 @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Member Length : 7' 10 5/8"

System : Roof
Member Type : Joist
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD
Member Pitch : 4/12

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	793 @ 7' 3 1/2"	1406 (1.50")	Passed (56%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	665 @ 6' 8 5/8"	1501	Passed (44%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1404 @ 3' 9"	1564	Passed (90%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.165 @ 3' 9"	0.373	Passed (L/543)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.185 @ 3' 9"	0.498	Passed (L/485)	--	1.0 D + 1.0 S (All Spans)

- Deflection criteria: LL (L/240) and TL (L/180).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 7' 8" o/c unless detailed otherwise.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - DF	3.50"	3.50"	1.50"	90	750	840	Blocking
2 - Hanger on 7 1/4" DF beam	3.50"	Hanger[1]	1.50"	91	767	858	See note [1]

- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.
- At hanger supports, the Total Bearing dimension is equal to the width of the material that is supporting the hanger
- [1] See Connector grid below for additional information and/or requirements.

Connector: Simpson Strong-Tie						
Support	Model	Seat Length	Top Fasteners	Face Fasteners	Member Fasteners	Accessories
2 - Face Mount Hanger	LRU26Z	1.94"	N/A	4-10d	5-10d	

Loads	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 7' 7"	16"	17.0	150.0	Default Load

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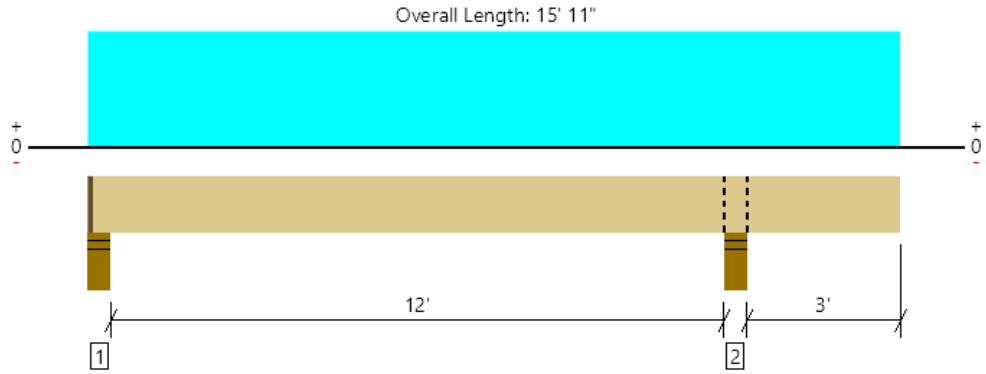
SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Andrew Aitchison Performance Engineers (208) 440-7836 andrewa@inteframe.com	

Level, B7

1 piece(s) 5 1/8" x 10 1/2" 24F-V4 DF Glulam



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	9976 @ 12' 8 1/4"	17617 (5.50")	Passed (57%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	5578 @ 11' 7"	10933	Passed (51%)	1.15	1.0 D + 1.0 S (All Spans)
Pos Moment (Ft-lbs)	17921 @ 6' 3 5/16"	21660	Passed (83%)	1.15	1.0 D + 1.0 S (Alt Spans)
Neg Moment (Ft-lbs)	-5292 @ 12' 8 1/4"	16696	Passed (32%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.487 @ 6' 5 1/4"	0.618	Passed (L/305)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.543 @ 6' 5 3/16"	0.824	Passed (L/273)	--	1.0 D + 1.0 S (Alt Spans)

System : Roof
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD
Member Pitch : 0/12

- Deflection criteria: LL (L/240) and TL (L/180).
- Overhang deflection criteria: LL (2L/240) and TL (2L/180). Upward deflection on right cantilever exceeds overhang deflection criteria.
- Top Edge Bracing (Lu): Top compression edge must be braced at 15' 10" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 15' 10" o/c unless detailed otherwise.
- Critical positive moment adjusted by a volume factor of 1.00 that was calculated using length L = 11' 10 5/8".
- Critical negative moment adjusted by a volume factor of 1.00 that was calculated using length L = 4' 7/8".
- Upward deflection on right cantilever exceeds 0.4".
- The effects of positive or negative camber have not been accounted for when calculating deflection.
- The specified glulam is assumed to have its strong laminations at the bottom of the beam. Install with proper side up as indicated by the manufacturer.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - DF	5.50"	4.25"	1.96"	699	5669	6368	1 1/4" Rim Board
2 - Stud wall - DF	5.50"	5.50"	3.11"	1131	8845	9976	Blocking

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.
- Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	1 1/4" to 15' 11"	N/A	13.1	--	
1 - Uniform (PSF)	0 to 15' 11" (Front)	6'	17.0	150.0	Default Load

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The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

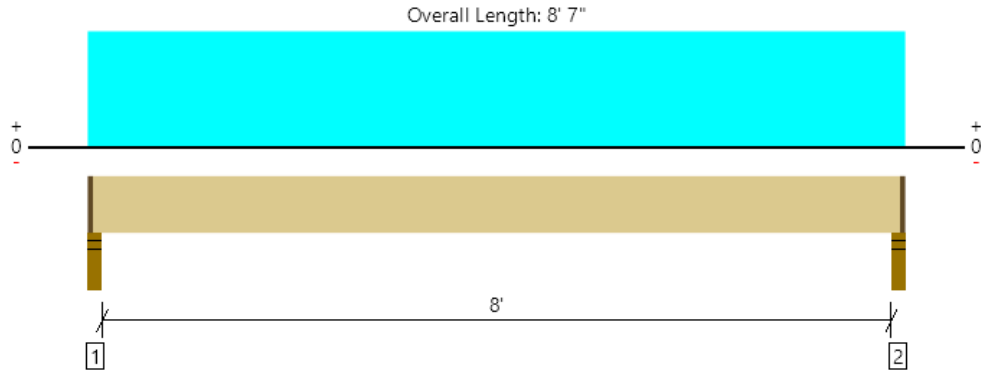
Weyerhaeuser

SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Andrew Aitchison Performance Engineers (208) 440-7836 andrewa@inteframe.com	

Level, Deck Floor: Joist

1 piece(s) 2 x 10 Douglas Fir-Larch No. 2 @ 16" OC



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	893 @ 2 1/2"	1434 (2.25")	Passed (62%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	689 @ 1' 3/4"	1915	Passed (36%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	1779 @ 4' 3 1/2"	2334	Passed (76%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.126 @ 4' 3 1/2"	0.204	Passed (L/775)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.135 @ 4' 3 1/2"	0.408	Passed (L/727)	--	1.0 D + 1.0 S (All Spans)
TJ-Pro™ Rating	N/A	N/A	--	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6' 10" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 5" o/c unless detailed otherwise.
- A 15% increase in the moment capacity has been added to account for repetitive member usage.
- Applicable calculations are based on NDS.
- No composite action between deck and joist was considered in analysis.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - SPF	3.50"	2.25"	1.50"	57	858	915	1 1/4" Rim Board
2 - Stud wall - SPF	3.50"	2.25"	1.50"	57	858	915	1 1/4" Rim Board

- Rim Board is assumed to carry all loads applied directly above it, bypassing the member being designed.

Loads	Location (Side)	Spacing	Dead (0.90)	Snow (1.15)	Comments
1 - Uniform (PSF)	0 to 8' 7"	16"	10.0	150.0	Default Load

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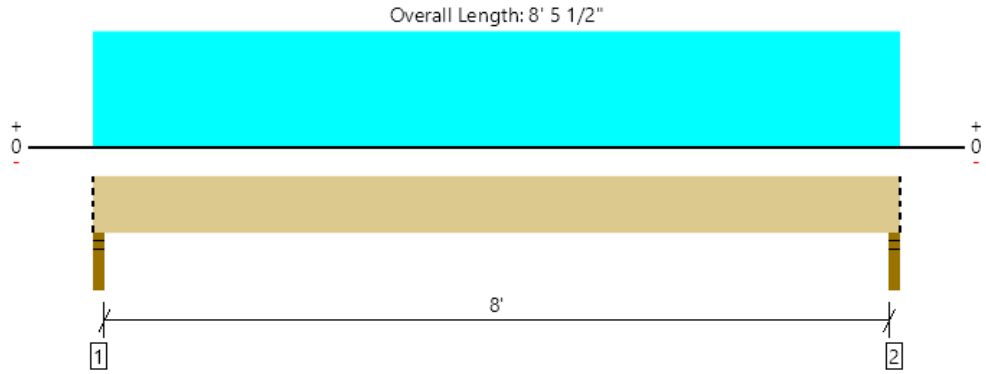
Weyerhaeuser

SUSTAINABLE FORESTRY INITIATIVE

Level, B16

1 piece(s) 6 x 12 Douglas Fir-Larch No. 2



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	5143 @ 1 1/4"	9453 (2.75")	Passed (54%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3699 @ 1' 2 1/4"	8244	Passed (45%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	10346 @ 4' 2 3/4"	10166	Passed (102%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.129 @ 4' 2 3/4"	0.275	Passed (L/765)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.140 @ 4' 2 3/4"	0.412	Passed (L/708)	--	1.0 D + 1.0 S (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 6" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - DF	2.75"	2.75"	1.50"	385	4758	5143	Blocking
2 - Stud wall - DF	2.75"	2.75"	1.50"	385	4758	5143	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 5 1/2"	N/A	16.0	--	
1 - Uniform (PSF)	0 to 8' 5 1/2" (Front)	7' 6"	10.0	150.0	Default Load

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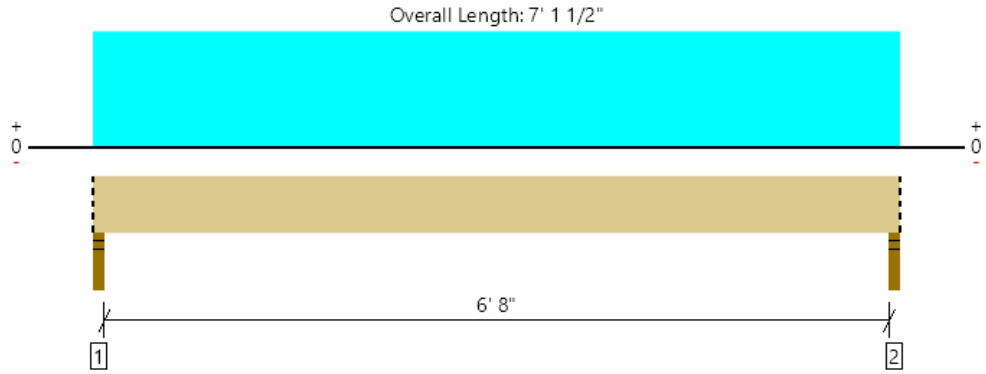
The product application, input design loads, dimensions and support information have been provided by ForteWEB Software Operator

Weyerhaeuser SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Andrew Aitchison Performance Engineers (208) 440-7836 andrewa@inteframe.com	

Level, B17

1 piece(s) 4 x 12 Douglas Fir-Larch No. 2



All locations are measured from the outside face of left support (or left cantilever end). All dimensions are horizontal.

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3456 @ 1 1/4"	6016 (2.75")	Passed (57%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	2324 @ 1' 2"	5434	Passed (43%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5800 @ 3' 6 3/4"	7004	Passed (83%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.070 @ 3' 6 3/4"	0.231	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.075 @ 3' 6 3/4"	0.346	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2015
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 7' 2" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 7' 2" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing Length			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Snow	Total	
1 - Stud wall - DF	2.75"	2.75"	1.58"	249	3206	3455	Blocking
2 - Stud wall - DF	2.75"	2.75"	1.58"	249	3206	3455	Blocking

• Blocking Panels are assumed to carry no loads applied directly above them and the full load is applied to the member being designed.

Loads	Location (Side)	Tributary Width	Dead (0.90)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 7' 1 1/2"	N/A	10.0	--	
1 - Uniform (PSF)	0 to 7' 1 1/2" (Front)	6'	10.0	150.0	Default Load

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Weyerhaeuser SUSTAINABLE FORESTRY INITIATIVE

ForteWEB Software Operator	Job Notes
Andrew Aitchison Performance Engineers (208) 440-7836 andrewa@inteframe.com	

Wood Header Allowable Loads kip/ft

Project Name: Brown Residence
Job Number: 2019-07235
Location: Valley County, Idaho

Governing Code: *2015 IBC*
Load Duration Factor: *1.00*
LVL Grade *1.9E*
Top Chord Bracing *2'-0" O.C.*
Max TL Deflection *L/240, 0.75in*
Repetitive Stress Increase *No*

	Header Span										
Header Type	***2'***	***3'***	***4'***	***5'***	***6'***	***8'***	***10'***	***12'***	***14'***	***16'***	***18'***
(2) 2x4 DF Stud	1.00	0.60	0.25	0.22	0.10	NA	NA	NA	NA	NA	NA
(3) 2x4 DF Stud	1.60	0.90	0.40	0.35	0.16	NA	NA	NA	NA	NA	NA
(2) 2x6 DF #2	2.90	1.25	0.72	0.48	0.31	0.17	0.10	NA	NA	NA	NA
(3) 2x6 DF #2	4.40	1.90	1.10	0.72	0.48	0.26	0.16	0.11	NA	NA	NA
(2) 2x8 DF #2	4.70	2.00	1.10	0.80	0.51	0.28	0.17	0.12	0.08	NA	NA
(3) 2x8 DF #2	7.60	2.95	1.90	1.18	0.84	0.46	0.29	0.20	0.14	0.10	NA
(2) 2x10 DF #2	7.00	2.95	1.70	1.18	0.77	0.42	0.27	0.18	0.13	0.09	NA
(3) 2x10 DF #2	11.50	4.50	2.80	1.80	1.20	0.71	0.45	0.31	0.22	0.17	0.13
(2) 2x12 DF #2	9.40	4.20	2.30	1.60	1.00	0.58	0.36	0.25	0.18	0.13	0.10
(3) 2x12 DF #2	15.60	6.10	3.90	2.40	1.70	0.96	0.61	0.42	0.30	0.23	0.18
(2) 1-3/4x7-1/4 LVL	12.00	5.90	3.30	2.40	1.40	0.82	0.45	0.26	0.16	0.10	NA
(3) 1-3/4x7-1/4 LVL	18.00	9.10	4.90	3.50	2.20	1.20	0.69	0.39	0.24	0.15	NA
(2) 1-3/4x9-1/2 LVL	21.50	9.10	4.90	3.75	2.30	1.30	0.80	0.55	0.34	0.21	0.13
(3) 1-3/4x9-1/2 LVL	32.30	15.00	7.40	6.00	3.50	2.00	1.20	0.83	0.52	0.32	0.19
(2) 1-3/4x11-7/8 LVL	35.40	15.00	7.70	6.00	3.90	2.20	1.40	0.97	0.71	0.46	0.28
(3) 1-3/4x11-7/8 LVL	53.30	21.00	11.50	8.75	5.80	3.30	2.10	1.40	1.00	0.69	0.42
(2) 1-3/4x14 LVL	49.10	21.00	10.90	8.00	5.00	3.00	1.90	1.30	0.98	0.75	0.47
(3) 1-3/4x14 LVL	74.00	25.00	16.40	12.00	7.50	4.60	2.90	2.00	1.40	1.10	0.70

Stud Wall - Combined Bending and Compression

PERFORMANCE ENGINEERS

Project Name: *Brown Residence*
Job Number: *2019-07235*
Location: *Valley County, Idaho*
Engineer: *ARA*
Checker: *KJ*

This spreadsheet is used for designing a stud wall according to the NDS.
Inputs are in *ITALICS* and outputs are in **BOLDFACE**.

Description:	**9' Tall Wall**				**King Stud (10' Max Opening)**			
	Species / Grade	*DF-L Stud*			Species / Grade	*DF-L Stud*		
nominal width	t =	*2*	in	1.50 in	t =	*2*	in	1.50 in
nominal depth	d =	*6*	in	5.50 in	d =	*6*	in	5.50 in
Span	L =	*9*	ft	8.750 ft	L =	*9*	ft	8.750 ft
stud spacing	s =	*16*	in	w/o Plates	s =	*70.25*	in	w/o Plates
Lateral pressure	w_{wind} =	14.56	psf		w_{wind} =	14.56	psf	
axial load	P =	*4560*	lbs		P =	*50*	lbs	
eccentricity	e =	*0*	in		e =	*0*	in	
	K_{cE} =	*0.3*			K_{cE} =	*0.3*		
Buckling and crushing	c =	*0.8*			c =	*0.8*		
interaction factor for	w =	19.4	plf		w =	85.3	plf	

	F_b 700 psi	F_v 190 psi	F_c 850 psi	$F_{c\text{-}perp}$ 625 psi	F_b 700 psi	F_v 190 psi	F_c 850 psi	$F_{c\text{-}perp}$ 625 psi
C_d =	*1.60*	*1.60*	*1.60*		*1.60*	*1.60*	*1.60*	
C_F =	*1.30*		*1.10*		*1.30*		*1.10*	
C_r =	*1.15*				*1.00*			
C_p =			0.60				0.60	
C_H =		*1.00*				*1.00*		
C_b =				*1.07*				*1.07*

	E 1,400,000 psi	E_{min} 510,000 psi	E 1,400,000 psi	E_{min} 510,000 psi

Allowable Stress:

F'_b =	$F_b C_d C_F C_r$ =	**1,674**	psi		$F_b C_d C_F C_r$ =	**1,456**	psi	
F'_v =	$F'_v C_d C_H$ =	**304**	psi		$F'_v C_d C_H$ =	**304**	psi	
F^*_c =	$F_c C_d C_F$ =	1,496	psi		$F_c C_d C_F$ =	1,496	psi	
F_{cE} =	$(K_{cE} E')/(l_e/d)2$ =	1,152	psi		$(K_{cE} E')/(l_e/d)2$ =	1,152	psi	
F'_c =	$F_c C_d C_F C_p$ =	**890**	psi		$F_c C_d C_F C_p$ =	**890**	psi	
$F'_{c\,perp}$ =	$F_{c\,perp}$ Cb =	**668**	psi		$F_{c\,perp}$ Cb =	**668**	psi	
E' =	E =	**1,400,000**	psi		E =	**1,400,000**	psi	
R_B =		**16 < 50 OK**				**16 < 50 OK**		
F_{bE} =		**2384**	psi			**2384**	psi	

Bending:

M =	$w L^2/8 + P e/12$ =	186	lb ft		$w L^2/8 + P e/12$ =	816	lb ft	
f_b =	M/S =	**295**	psi	< F'b OK	M/S =	**1295**	psi	< F'b OK
	S =	7.56	in^3		S =	7.56	in^3	

Shear:

V =	w L/2 =	64	lbs		w L/2 =	64	lbs	
f_v =	1.5 V/A =	**11.58**	psi	< F'v OK	1.5 V/A =	**11.58**	psi	< F'v OK
	A =	8.25	in^2		A =	8.25	in^2	

Compression:

f_c =	P/A =	**552.7**	psi	< F'c OK	P/A =	**6.1**	psi	< F'c OK
$f_{c\,perp}$ =	P/A =	**552.7**	psi	< F'c OK	P/A =	**6.1**	psi	< F'c OK

Combined:

	(fc/Fc)2 + {fb/[Fb(1-(fc/FcE)]} =	0.72		< 1.0 OK	(fc/Fc)2 + {fb/[Fb(1-(fc/FcE)]} =	0.89		< 1.0 OK

Deflection:

Δ =	$22.5 w L^4/E' I$ =	**0.09**	in	= SPAN	$22.5 w L^4/E' I$ =	**0.39**	in	= SPAN
	I =	20.80	in^4	1194	I =	20.80	in^4	272
				> 180 OK				> 180 OK

Stud Wall - Combined Bending and Compression

PERFORMANCE ENGINEERS

Project Name: *Brown Residence*
Job Number: *2019-07235*
Location: *Valley County, Idaho*
Engineer: *ARA*
Checker: *KJ*

This spreadsheet is used for designing a stud wall according to the NDS.
Inputs are in *ITALICS* and outputs are in **BOLDFACE**.

Description:	**18' Tall Wall**	**King Stud (14.5' Max Opening)**	**18' Trimmer**
Species / Grade	*DF-L No. 2*	*DF-L No. 2*	*DF-L No. 2*
nominal width	t = *2* in — 1.50 in	t = *(3) 2* in — 4.50 in	t = *(2) 2* in — 3.00 in
nominal depth	d = *8* in — 7.25 in	d = *8* in — 7.25 in	d = *8* in — 7.25 in
Span	L = *18* ft — 17.750 ft	L = *18* ft — 17.750 ft	L = *18* ft — 17.750 ft
stud spacing	s = *16* in — w/o Plates	s = *97.25* in — w/o Plates	s = *16* in — w/o Plates
Lateral pressure	w_{wind} = 14.56 psf	w_{wind} = 14.56 psf	w_{wind} = 5.00 psf
axial load	P = *2895* lbs	P = *50* lbs	P = *4885* lbs
eccentricity	e = *0* in	e = *0* in	e = *0* in
	K_{cE} = *0.3*	K_{cE} = *0.3*	K_{cE} = *0.3*
Buckling and crushing	c = *0.8*	c = *0.8*	c = *0.8*
interaction factor for	w = 19.4 plf	w = 118.0 plf	w = 6.7 plf

	F_b 900 psi	F_v 190 psi	F_c 1,350 psi	$F_{c\text{-}perp}$ 625 psi
18' Tall Wall				
C_d =	*1.60*	*1.60*	*1.60*	
C_F =	*1.20*		*1.05*	
C_r =	*1.15*			
C_p =			0.23	
C_H =		*1.00*		
C_b =				*1.00*
King Stud (14.5' Max Opening)				
C_d =	*1.60*	*1.60*	*1.60*	
C_F =	*1.20*		*1.05*	
C_r =	*1.00*			
C_p =			0.23	
C_H =		*1.00*		
C_b =				*1.00*
18' Trimmer				
C_d =	*1.60*	*1.60*	*1.60*	
C_F =	*1.20*		*1.05*	
C_r =	*1.00*			
C_p =			0.23	
C_H =		*1.00*		
C_b =				*1.00*

	E	E_{min}
18' Tall Wall	1,600,000 psi	580,000 psi
King Stud (14.5' Max Opening)	1,600,000 psi	580,000 psi
18' Trimmer	1,600,000 psi	580,000 psi

Allowable Stress:	**18' Tall Wall**	**King Stud (14.5' Max Opening)**	**18' Trimmer**
F'_b =	$F_b C_d C_F C_r$ = **1,987** psi	$F_b C_d C_F C_r$ = **1,728** psi	$F_b C_d C_F C_r$ = **1,728** psi
F'_v =	$F'_v C_d C_H$ = **304** psi	$F'_v C_d C_H$ = **304** psi	$F'_v C_d C_H$ = **304** psi
F^*_c =	$F_c C_d C_F$ = 2,268 psi	$F_c C_d C_F$ = 2,268 psi	$F_c C_d C_F$ = 2,268 psi
F_{cE} =	$(K_{cE} E')/(l_e/d)2$ = 556 psi	$(K_{cE} E')/(l_e/d)2$ = 556 psi	$(K_{cE} E')/(l_e/d)2$ = 556 psi
F'_c =	$F_c C_d C_F C_p$ = **525** psi	$F_c C_d C_F C_p$ = **525** psi	$F_c C_d C_F C_p$ = **525** psi
$F'_{c\,perp}$ =	$F_{c\,perp}$ Cb = **625** psi	$F_{c\,perp}$ Cb = **625** psi	$F_{c\,perp}$ Cb = **625** psi
E' =	E = **1,600,000** psi	E = **1,600,000** psi	E = **1,600,000** psi
R_B =	**26 < 50 OK**	**9 < 50 OK**	**13 < 50 OK**
F_{bE} =	**1014** psi	**9127** psi	**4056** psi
Bending:			
M =	$wL^2/8 + P e/12$ = 765 lb ft	$wL^2/8 + P e/12$ = 4648 lb ft	$wL^2/8 + P e/12$ = 263 lb ft
f_b =	M/S = **698** psi — **< F'b OK**	M/S = **1415** psi — **< F'b OK**	M/S = **120** psi — **< F'b OK**
	S = 13.14 in^3	S = 39.42 in^3	S = 26.28 in^3
Shear:			
V =	w L/2 = 129 lbs	w L/2 = 129 lbs	w L/2 = 44 lbs
f_v =	1.5 V/A = **17.83** psi — **< F'v OK**	1.5 V/A = **5.94** psi — **< F'v OK**	1.5 V/A = **3.06** psi — **< F'v OK**
	A = 10.88 in^2	A = 32.63 in^2	A = 21.75 in^2
Compression:			
f_c =	P/A = **266.2** psi — **< F'c OK**	P/A = **1.5** psi — **< F'c OK**	P/A = **224.6** psi — **< F'c OK**
$f_{c\,perp}$ =	P/A = **266.2** psi — **< F'c OK**	P/A = **1.5** psi — **< F'c OK**	P/A = **224.6** psi — **< F'c OK**
Combined:	(fc/Fc)2 + {fb/[Fb(1-(fc/FcE)]} = 0.93 — **< 1.0 OK**	(fc/Fc)2 + {fb/[Fb(1-(fc/FcE)]} = 0.82 — **< 1.0 OK**	(fc/Fc)2 + {fb/[Fb(1-(fc/FcE)]} = 0.30 — **< 1.0 OK**
Deflection:			
Δ =	$22.5\ w\ L^4/E'\ I$ = **0.57** in = **SPAN 374**	$22.5\ w\ L^4/E'\ I$ = **1.15** in = **SPAN 185**	$22.5\ w\ L^4/E'\ I$ = **0.10** in = **SPAN 2181**
	I = 47.63 in^4 — **> 180 OK**	I = 142.90 in^4 — **> 180 OK**	I = 95.27 in^4 — **> 180 OK**

Stud Wall - Combined Bending and Compression

PERFORMANCE ENGINEERS

Project Name: *Brown Residence*
Job Number: *2019-07235*
Location: *Valley County, Idaho*
Engineer: *ARA*
Checker: *KJ*

This spreadsheet is used for designing a stud wall according to the NDS.
Inputs are in *ITALICS* and outputs are in **BOLDFACE**.

Description:	**13' Tall Wall**	**King Stud (6' Max Opening)**	**13' Trimmer**
Species / Grade	*DF-L No. 2*	*DF-L No. 2*	*DF-L No. 2*
nominal width	t = *2* in — 1.50 in	t = *(2) 2* in — 3.00 in	t = *2* in — 1.50 in
nominal depth	d = *6* in — 5.50 in	d = *6* in — 5.50 in	d = *6* in — 5.50 in
Span	L = *13* ft — 12.750 ft	L = *13* ft — 12.750 ft	L = *13* ft — 12.750 ft
stud spacing	s = *12* in — w/o Plates	s = *46.25* in — w/o Plates	s = *16* in — w/o Plates
Lateral pressure	w_{wind} = 14.56 psf	w_{wind} = 14.56 psf	w_{wind} = 5.00 psf
axial load	P = *2672* lbs	P = *50* lbs	P = *626* lbs
eccentricity	e = *0* in	e = *0* in	e = *0* in
	K_{cE} = *0.3*	K_{cE} = *0.3*	K_{cE} = *0.3*
Buckling and crushing	c = *0.8*	c = *0.8*	c = *0.8*
interaction factor for	w = 14.6 plf	w = 56.1 plf	w = 6.7 plf

	F_b 900 psi	F_v 190 psi	F_c 1,350 psi	$F_{c\text{-}perp}$ 625 psi
C_d =	*1.60*	*1.60*	*1.60*	
C_F =	*1.30*		*1.10*	
C_r =	*1.15*			
C_p =			0.25	
C_H =		*1.00*		
C_b =				*1.07*

	F_b 900 psi	F_v 190 psi	F_c 1,350 psi	$F_{c\text{-}perp}$ 625 psi
C_d =	*1.60*	*1.60*	*1.60*	
C_F =	*1.30*		*1.10*	
C_r =	*1.00*			
C_p =			0.25	
C_H =		*1.00*		
C_b =				*1.07*

	F_b 900 psi	F_v 190 psi	F_c 1,350 psi	$F_{c\text{-}perp}$ 625 psi
C_d =	*1.60*	*1.60*	*1.60*	
C_F =	*1.30*		*1.10*	
C_r =	*1.00*			
C_p =			0.25	
C_H =		*1.00*		
C_b =				*1.07*

	E 1,600,000 psi	E_{min} 580,000 psi
	E 1,600,000 psi	E_{min} 580,000 psi
	E 1,600,000 psi	E_{min} 580,000 psi

Allowable Stress:	**13' Tall Wall**	**King Stud (6' Max Opening)**	**13' Trimmer**
F'_b =	$F_b C_d C_F C_r$ = **2,153** psi	$F_b C_d C_F C_r$ = **1,872** psi	$F_b C_d C_F C_r$ = **1,872** psi
F'_v =	$F'_v C_d C_H$ = **304** psi	$F'_v C_d C_H$ = **304** psi	$F'_v C_d C_H$ = **304** psi
F^*_c =	$F_c C_d C_F$ = 2,376 psi	$F_c C_d C_F$ = 2,376 psi	$F_c C_d C_F$ = 2,376 psi
F_{cE} =	$(K_{cE} E')/(l_e/d)2$ = 620 psi	$(K_{cE} E')/(l_e/d)2$ = 620 psi	$(K_{cE} E')/(l_e/d)2$ = 620 psi
F'_c =	$F_c C_d C_F C_p$ = **582** psi	$F_c C_d C_F C_p$ = **582** psi	$F_c C_d C_F C_p$ = **582** psi
$F'_{c\,perp}$ =	$F_{c\,perp}$ Cb = **668** psi	$F_{c\,perp}$ Cb = **668** psi	$F_{c\,perp}$ Cb = **668** psi
E' =	E = **1,600,000** psi	E = **1,600,000** psi	E = **1,600,000** psi
R_B =	**19 < 50 OK**	**10 < 50 OK**	**19 < 50 OK**
F_{bE} =	**1861** psi	**7444** psi	**1861** psi
Bending:			
M =	$wL^2/8 + P e/12$ = 296 lb ft	$wL^2/8 + P e/12$ = 1140 lb ft	$wL^2/8 + P e/12$ = 135 lb ft
f_b =	M/S = **470** psi — < F'b OK	M/S = **905** psi — < F'b OK	M/S = **215** psi — < F'b OK
	S = 7.56 in^3	S = 15.13 in^3	S = 7.56 in^3
Shear:			
V =	w L/2 = 93 lbs	w L/2 = 93 lbs	w L/2 = 32 lbs
f_v =	1.5 V/A = **16.88** psi — < F'v OK	1.5 V/A = **8.44** psi — < F'v OK	1.5 V/A = **5.80** psi — < F'v OK
	A = 8.25 in^2	A = 16.50 in^2	A = 8.25 in^2
Compression:			
f_c =	P/A = **323.9** psi — < F'c OK	P/A = **3.0** psi — < F'c OK	P/A = **75.9** psi — < F'c OK
$f_{c\,perp}$ =	P/A = **323.9** psi — < F'c OK	P/A = **3.0** psi — < F'c OK	P/A = **75.9** psi — < F'c OK
Combined:	(fc/Fc)2 + {fb/[Fb(1-(fc/FcE)]} = 0.77 — < 1.0 OK	(fc/Fc)2 + {fb/[Fb(1-(fc/FcE)]} = 0.49 — < 1.0 OK	(fc/Fc)2 + {fb/[Fb(1-(fc/FcE)]} = 0.15 — < 1.0 OK
Deflection:			
Δ =	$22.5\ w\ L^4/E'\ I$ = **0.26** in = SPAN 588	$22.5\ w\ L^4/E'\ I$ = **0.50** in = SPAN 305	$22.5\ w\ L^4/E'\ I$ = **0.12** in = SPAN 1284
	I = 20.80 in^4 — > 180 OK	I = 41.59 in^4 — > 180 OK	I = 20.80 in^4 — > 180 OK

Wood Trimmer Allowable Loads, kips

Project Name: Brown Residence
Job Number: 2019-07235
Location: Valley County, Idaho

Governing Code: *2015 IBC*
Load Duration Factor: *1.0*
Eccentricity *0"*
Weak Axis Braced *Y*

Height

Trimmer Type	***8'***	***10'***	***12'***	***14'***	***16'***	***18'***	***20'***	***Max Allow Compression Wood Header***
(1) 2x4 Stud	2.4	1.7	1.2	NA	NA	NA	NA	3.2
(2) 2x4 Stud	4.9	3.4	2.4	NA	NA	NA	NA	6.5
(3) 2x4 Stud	7.1	5.0	3.6	NA	NA	NA	NA	9.8
(1) 2x6 DF #2	5.1	5.1	5.0	3.8	3.0	NA	NA	5.1
(2) 2x6 DF #2	10.3	10.3	10.1	7.7	6.0	NA	NA	10.3
(3) 2x6 DF #2	15.4	15.4	15.1	11.6	9.1	NA	NA	15.4
(1) 2x8 DF #2	6.7	6.7	6.7	6.7	6.4	5.3	4.4	6.7
(2) 2x8 DF #2	13.5	13.5	13.5	13.5	12.9	10.6	8.8	13.5
(3) 2x8 DF #2	20.3	20.3	20.3	20.3	19.4	15.9	13.2	20.3

Project # : *2019-07235*
Project: *Brown Residence*

Individual Footing Design

Program: ***(Calc).xlsx]F1 Footing Design***

Description:

Inputs are in *ITALICS* and outputs are in **BOLDFACE**.

Soil Bearing Pressure: *1500psf*

Roof					
Dead Load:	*(17psf)*	*(2.0ft)*		=	**34plf**
Live/Snow Load:	*(150psf)*	*(2.0ft)*		=	**300plf**
Upper Floor					
Dead Load:	*(10psf)*	*(12.0ft)*		=	**120plf**
Live Load:	*(40psf)*	*(12.0ft)*		=	**480plf**
Main Floor					
Dead Load:	*(10psf)*	*(2.0ft)*		=	**20plf**
Live Load:	*(40psf)*	*(2.0ft)*		=	**80plf**
Basement					
Dead Load:	*(10psf)*	*(.0ft)*		=	**plf**
Live Load:	*(40psf)*	*(.0ft)*		=	**plf**
Misc					
Wall Load:	*(12psf)*	*(10.0ft)*		=	**120plf**
Conc Stem:	*(145pcf)*	*(2 x .5ft)*		=	**145plf**
Misc Load:	*(.0ft)*	*(.0ft)*	*(.0ft)*	=	**plf**
					1299plf

Use Footing Width:	**12 x 8**	**in**
W/	**(2) #4**	**Cont.**

Project # : *2019-07235*
Project: *Brown Residence*

Individual Footing Design

Program: ***(Calc).xlsx]F2.5 Footing Design***

Description:

Inputs are in *ITALICS* and outputs are in **BOLDFACE**.

Soil Bearing Pressure: *1500psf*

Roof				
Dead Load:	*(17psf)*	*(17.0ft)*	=	**289plf**
Live/Snow Load:	*(150psf)*	*(17.0ft)*	=	**2550plf**
Upper Floor				
Dead Load:	*(10psf)*	*(2.0ft)*	=	**20plf**
Live Load:	*(40psf)*	*(2.0ft)*	=	**80plf**
Main Floor				
Dead Load:	*(10psf)*	*(2.0ft)*	=	**20plf**
Live Load:	*(40psf)*	*(2.0ft)*	=	**80plf**
Basement				
Dead Load:	*(10psf)*	*(.0ft)*	=	**plf**
Live Load:	*(40psf)*	*(.0ft)*	=	**plf**
Misc				
Wall Load:	*(12psf)*	*(9.0ft)*	=	**108plf**
Conc Stem:	*(145pcf)*	*(2 x .5ft)*	=	**145plf**
Misc Load:	*(.0ft)*	*(.0ft)* *(.0ft)*	=	**plf**
				3292plf

Use Footing Width:	**30 x 10**	**in**
W/	**(3) #4**	**Cont.**

Project # : *2019-07235*
Project: *Brown Residence*

Individual Footing Design

Program: ***(Calc).xlsx]F3 Footing Design***

Description:

Inputs are in *ITALICS* and outputs are in **BOLDFACE**.

Soil Bearing Pressure: *1500psf*

Roof

Dead Load:	*(17psf)*	*(19.0ft)*	=	**323plf**
Live/Snow Load:	*(150psf)*	*(19.0ft)*	=	**2850plf**

Upper Floor

Dead Load:	*(10psf)*	*(2.0ft)*	=	**20plf**
Live Load:	*(40psf)*	*(2.0ft)*	=	**80plf**

Main Floor

Dead Load:	*(10psf)*	*(2.0ft)*	=	**20plf**
Live Load:	*(40psf)*	*(2.0ft)*	=	**80plf**

Basement

Dead Load:	*(10psf)*	*(.0ft)*	=	**plf**
Live Load:	*(40psf)*	*(.0ft)*	=	**plf**

Misc

Wall Load:	*(12psf)*	*(9.0ft)*	=	**108plf**
Conc Stem:	*(145pcf)*	*(2 x .5ft)*	=	**145plf**
Misc Load:	*(.0ft)*	*(.0ft)* *(.0ft)*	=	**plf**
				3626plf

Use Footing Width:	**36 x 10**	**in**
W/	**(3) #4**	**Cont.**

Project # : *2019-07235*
Project: *Brown Residence*

Individual Footing Design

Program: ***(Calc).xlsx]F3.5 Footing Design***

Description:

Inputs are in *ITALICS* and outputs are in **BOLDFACE**.

Soil Bearing Pressure: *1500psf*

Roof

Dead Load:	*(17psf)*	*(19.0ft)*	=	**323plf**
Live/Snow Load:	*(150psf)*	*(19.0ft)*	=	**2850plf**

Upper Floor

Dead Load:	*(10psf)*	*(.0ft)*	=	**plf**
Live Load:	*(40psf)*	*(.0ft)*	=	**plf**

Main Floor

Dead Load:	*(10psf)*	*(5.0ft)*	=	**50plf**
Live Load:	*(40psf)*	*(5.0ft)*	=	**200plf**

Deck

Dead Load:	*(10psf)*	*(4.0ft)*	=	**40plf**
Live Load:	*(150psf)*	*(4.0ft)*	=	**600plf**

Misc

Wall Load:	*(12psf)*	*(18.0ft)*		=	**216plf**
Conc Stem:	*(145pcf)*	*(2 x .5ft)*		=	**145plf**
Misc Load:	*(.0ft)*	*(.0ft)*	*(.0ft)*	=	**plf**
					4424plf

Use Footing Width:	**42 x 10**	**in**
W/	**(4) #4**	**Cont.**

Project # : *2019-07235*
Project: *Brown Residence*

Point Load Footing Design

Square Concrete Footing Pads for Soil Bearing =1500 psf				
size (")	max magnitude (kip)	number of #4 Rebar	Thickness (")	min column size (")
18	2.90	2	8	3.5
24	5.30			3.5
30	8.35	3		3.5
36	12.00			3.5
42	16.50	4		3.5
48	21.50			3.5
54	27.00	5		3.5
60	33.45	6		3.5
66	39.75	7	10	5.5
72	47.50	8		5.5

Bars to be 3 1/2" from bottom of pad. Evenly space in both directions.

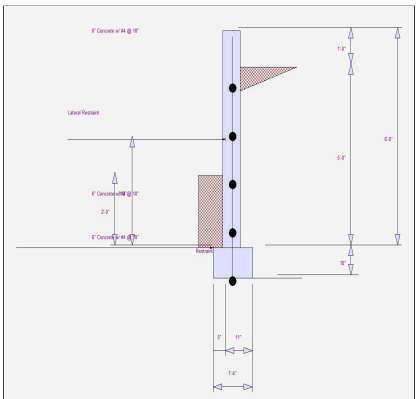
Restrained Retaining Wall Design

Criteria

Retained Height	=	5.00 ft
Wall height above soil	=	1.00 ft
Total Wall Height	=	6.00 ft
Top Support Height	=	3.00 ft
Slope Behind Wall	=	0.00
Height of Soil over Toe	=	24.00 in

Soil Data

Allow Soil Bearing	=	1,500.0 psf
Equivalent Fluid Pressure Method		
Heel Active Pressure	=	32.0 psf/ft
	=	
Passive Pressure	=	250.0 psf/ft
Soil Density	=	110.00 pcf
Footing||Soil Frictior	=	0.400
Soil height to ignore for passive pressure	=	12.00 in



Thumbnail

Surcharge Loads

Surcharge Over Heel	=	0.0 psf
>>>Used To Resist Sliding & Overturning		
Surcharge Over Toe	=	0.0 psf
Used for Sliding & Overturning		

Axial Load Applied to Stem

Axial Dead Load	=	668.0 lbs
Axial Live Load	=	0.0 lbs
Axial Load Eccentricity	=	0.0 in

Earth Pressure Seismic Load

Stem Weight Seismic Load

Uniform Lateral Load Applied to Stem

Lateral Load	=	0.0 #/ft
...Height to Top	=	0.00 ft
...Height to Bottom	=	0.00 ft
The above lateral load has been increased by a factor of		1.00
Wind on Exposed Stem	=	20.0 psf

Adjacent Footing Load

Adjacent Footing Load	=	0.0 lbs
Footing Width	=	0.00 ft
Eccentricity	=	0.00 in
Wall to Ftg CL Dist	=	0.00 ft
Footing Type		Line Load
Base Above/Below Soil at Back of Wall	=	0.0 ft
Poisson's Ratio	=	0.300

K_h	Soil Density Multiplier	=	0.200 g	Added seismic per unit area	= 0.0 psf
F_p / W_p	Weight Multiplier	=	0.000 g	Added seismic per unit area	= 0.0 psf

Design Summary

Total Bearing Load	=	1,605 lbs
...resultant ecc.	=	0.37 in
Soil Pressure @ Toe	=	1,372 psf OK
Soil Pressure @ Heel	=	1,036 psf OK
Allowable	=	1,500 psf
Soil Pressure Less Than Allowable		
ACI Factored @ Toe	=	0 psf
ACI Factored @ Heel	=	0 psf
Footing Shear @ Toe	=	0.0 psi OK
Footing Shear @ Heel	=	0.0 psi OK
Allowable	=	75.0 psi
Reaction at Top	=	199.4 lbs
Reaction at Bottom	=	363.3 lbs

Sliding Calcs

Lateral Sliding Force	=	363.3 lbs

Vertical component of active lateral soil pressure IS considered in the calculation of soil bearing pressures.

Load Factors

Building Code	Other
Dead Load	1.200
Live Load	1.600
Earth, H	1.600
Wind, W	1.000
Seismic, E	1.000

Concrete Stem Construction

Thickness	=	6.00 in	Fy	=	60,000 psi
Wall Weight	=	75.0 psf	f'c	=	2,500 psi

Stem is FIXED to top of footing

	@ Top Support	Mmax Between Top & Base	@ Base of Wall
	Stem OK	Stem OK	Stem OK
Design Height Above Ftg =	3.00 ft	0.00 ft	0.00 ft
Rebar Size =	# 4	# 4	# 4
Rebar Spacing =	18.00 in	18.00 in	18.00 in
Rebar Placed at =	Center	Center	Center
Rebar Depth 'd' =	3.00 in	3.00 in	3.00 in
Design Data			
fb/FB + fa/Fa =	0.000	0.000	0.000
Mu....Actual =	0.0 ft-#	0.0 ft-#	0.0 ft-#
Mn * Phi.....Allowable =	1,705.6 ft-#	1,705.6 ft-#	1,705.6 ft-#
Shear Force @ this height =	0.0 lbs		0.0 lbs
Shear.....Actual =	0.00 psi		0.00 psi
Shear.....Allowable =	75.00 psi		75.00 psi

Other Acceptable Sizes & Spacings:

Toe: None Spec'd	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Heel: None Spec'd	-or-	Not req'd: Mu < phi*5*lambda*sqrt(f'c)*Sm
Key: Slab Resists Sliding	-or-	Slab Resists Sliding - No Force on

Footing Strengths & Dimensions

Toe Width	=	0.42 ft
Heel Width	=	0.92
Total Footing Width	=	1.33
Footing Thickness	=	10.00 in
Key Width	=	12.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	2.00 ft

f'c = 2,500 psi Fy = 60,000 psi
Footing Concrete Density = 150.00 pcf
Min. As % = 0.0018
Cover @ Top = 2.00 in @ Btm.= 3.00 in

Footing Design Results

		Toe	Heel	
Factored Pressure	=	0	0	psf
Mu' : Upward	=	0	0	ft-#
Mu' : Downward	=	0	0	ft-#
Mu: Design	=	0	0	ft-#
Actual 1-Way Shear	=	0.00	0.00	psi
Allow 1-Way Shear	=	75.00	75.00	psi

Summary of Forces on Footing : Slab RESISTS sliding, stem is FIXED at footing

Forces acting on footing for soil pressure

>>> Sliding Forces are restrained by the adjacent slab

Load & Moment Summary For Footing : For Soil Pressure Calcs

Moment @ Top of Footing Applied from Stem			=		-113.3	ft-#
Surcharge Over Heel	=	lbs		ft		ft-#
Adjacent Footing Load	=	lbs		ft		ft-#
Axial Dead Load on Stem	=	668.0 lbs		0.67 ft	445.2	ft-#
Soil Over Toe	=	91.6 lbs		0.21 ft	19.1	ft-#
Surcharge Over Toe	=	lbs		ft		ft-#
Stem Weight	=	450.0 lbs		0.67 ft	299.9	ft-#
Soil Over Heel	=	229.1 lbs		1.12 ft	257.7	ft-#
Footing Weight	=	166.6 lbs		0.67 ft	111.6	ft-#
Total Vertical Force	=	1,605.3 lbs	Base Moment	=	1,020.2	ft-#

Soil Pressure Resulting Moment = 49.8 ft-#

Vertical component of active lateral soil pressure IS considered in the calculation of Sliding Resistance.

PERFORMANCE ENGINEERS

Project: *Brown Residence*
Project # : *2019-07235*
Location: *Valley County, Idaho*
Engineer: *ARA*
Checker: *KJ*

Wind Shear Force Calculations

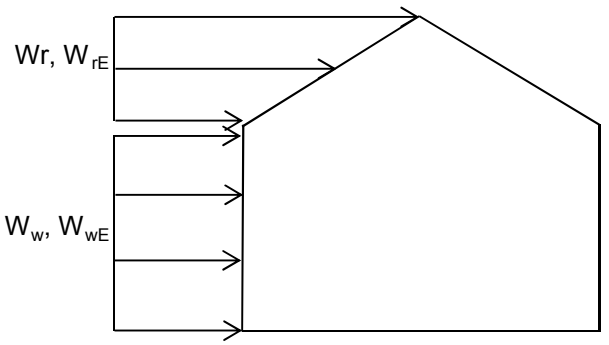
From 'ASCE 7-10 Wind Loading Analysis':

LOAD CASE 'A'	
a = 3.20 feet	2a = 6.40 feet
Z1 = 7.45 psf	Z1E = 11.04 psf
Z2 = -5.63 psf	Z2E = -7.47 psf
Z3 = -12.64 psf	Z3E = -15.42 psf
Z4 = -11.50 psf	Z4E = -14.41 psf

LOAD CASE 'B'	
a = 3.20 psf	2a = 6.40 feet
Z1 = 4.44 psf	Z1E = 8.67 psf
Z2 = -17.54 psf	Z2E = -25.20 psf
Z3 = -11.09 psf	Z3E = -14.31 psf
Z4 = -9.48 psf	Z4E = -12.30 psf

'A' FACTORED LOADS	
$0.6*W_r = (Z_2 + Z_3) * 0.6 =$	**4.2 psf**
$0.6*W_{rE} = (Z_{2E} + Z_{3E}) * 0.6 =$	**4.8 psf**
$0.6*W_w = (Z_1 + Z_4) * 0.6 =$	**11.4 psf**
$0.6*W_{wE} = (Z_{1E} + Z_{4E}) * 0.6 =$	**15.3 psf**

'B' FACTORED LOADS	
$0.6*W_r = (Z_2 + Z_3) * 0.6 =$	**3.9 psf**
$0.6*W_{rE} = (Z_{2E} + Z_{3E}) * 0.6 =$	**6.5 psf**
$0.6*W_w = (Z_1 + Z_4) * 0.6 =$	**8.3 psf**
$0.6*W_{wE} = (Z_{1E} + Z_{4E}) * 0.6 =$	**12.6 psf**



Wall Line	Wind Force (psf)	Wall ht (ft)	Upr. Flr Wall ht (ft)	wall line dist. (ft)	+	Wind Force (psf)	wall ht (ft)	Wr, We truss trib (ft)	wall line dist (ft)	+	Shear, Upper (#)	=	**Wind Force (kips)**
X1-2	#####	8	0	0.00	+	#DIV/0!		4.00	0	+		=	**-**
X2-2	11.97	8	0	42.00	+	9.60		4.00	42	+		=	**1.81**
X3-2	12.27	8	0	28.00	+	9.60		4.00	28	+		=	**1.22**
X4-2	12.27	8	0	28.00	+	9.60		4.00	28	+		=	**1.22**
Y1-2	11.97	8	0	42.00	+	9.60		8.00	42	+		=	**2.62**
Y2-2	11.76	8	0	64.00	+	9.60		8.00	64	+		=	**3.96**
Y3-2	12.33	8	0	26.00	+	9.60		8.00	26	+		=	**1.64**
X1-1	12.62	9	0	20.00	+	9.60		8.00	20	+		=	**1.34**
X2-1	12.62	9	4	20.00	+	9.60		0.00	20	+	1.81	=	**2.88**
X3-1	12.62	9	4	20.00	+	9.60		0.00	20	+	1.22	=	**2.30**
X4-1	12.62	9	4	20.00	+	9.60		0.00	20	+	1.22	=	**2.30**
Y1-1	12.33	9	0	26.00	+	9.60		4.00	26	+		=	**1.22**
Y2-1	11.97	9	4	42.00	+	9.60		4.00	26	+	2.62	=	**5.25**
Y3-1	11.76	9	4	64.00	+	9.60		0.00	64	+	3.96	=	**7.16**
Y4-1	12.33	9	4	26.00	+	9.60		0.00	26	+	1.64	=	**3.00**

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***X1-2 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	20.00	ft	Total length of wall
L =	*20.00*	ft	Total length of shear wall
L_w =	*20.00*	ft	Total length of full height segments
H =	*8.00*	ft	height of shear wall
H' =	*0.00*	ft	Maximum opening height
V_1 =	*#VALUE!*	lbs	#VALUE!
$w_{DL\ self}$ =	*95.84*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	N	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	N	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments: 20

Unit Base Shear

$\%_{fh}$ = L_w/L =	1.000		Percent of full height segments
$\%_{oh}$ = H'/H =	0.000		Percent of maximum opening height
SCAF =	*1.00*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	#VALUE!	plf	Unit base shear
v_{req} = v_{base}/SCAF	**#VALUE!**	plf	Effective unit base shear
OTM =	**#VALUE!**	lb ft	#VALUE!

#VALUE!

Shear wall adjustment factor

RM =	**#VALUE!**	lb ft	#VALUE!
r=	1.0000		
C_O=	1.0000		
	#VALUE!		Blocking Unit Shear
	#VALUE!		Force Calculated
	2.29 ft		Min Shear Wall Segment

#VALUE! #VALUE!

T = **#VALUE!** #VALUE! ##### **#VALUE!** **#VALUE!**

IE!

Three Sided Diaphragm transfers all load to X2-2

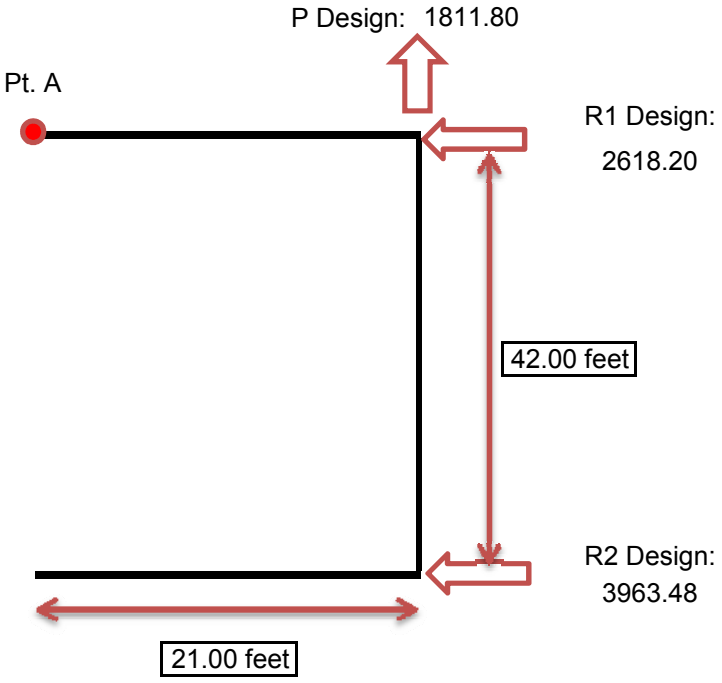
Project: *Brown Residence*
Project # : *2019-07235*
Location: *Valley County, Idaho*
Engineer: *ARA*
Checker: *KJ*

Three Sided Diaphragm Calculations

From NDS Wind & Seismic 'Special Design Provisions for Wind & Seismic " Section 4.2.5.2

Design Criteria	
Diaphragm Length	Diaphragm Width
L 21.00 feet	W 42.00 feet
Check For Length<35'	**OK**
Length To Width Ratio	0.5
Check For <1:1 Length Ratio	**OK**

Forces in R1 & R2 Due to Rotation		
P Design	=	1812 #
R1 Due to Rotation	=	453 #
R1 Due to Transverse Load	=	2618 #
Governing Inplane Load R1	=	**2618** #
R2 Due to Rotation	=	453 #
R2 Due to Transverse Load	=	3963 #
Governing Inplane Load R2	=	**3963** #



Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***X2-2 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	33.00	ft	Total length of wall
L =	*14.00*	ft	Total length of shear wall
L_w =	*8.58*	ft	Total length of full height segments
H =	*8.00*	ft	height of shear wall
H' =	*4.00*	ft	Maximum opening height
V_1 =	*1812*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*95.84*	plf	Self weight
$w_{DL\ above}$ =	*221.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	N	y/n	Wall Connected to Concrete
	y	y/n	Wall Connected to Truss Heel
	N	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

5
3.58

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.613		Percent of full height segments
$\%_{oh}$ = H'/H =	0.500		Percent of maximum opening height
SCAF =	*0.84*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	211	plf	Unit base shear
v_{req} = v_{base}/SCAF	**252**	plf	Effective unit base shear
OTM =	**17,300**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**31,050**	lb ft	Resisting moment of total length of wall
r=	0.7600		
C_O=	0.8378		
	55 plf		Blocking Unit Shear
	252.04		Force Calculated
	2.29 ft		Min Shear Wall Segment

T = **Not Req'd** lbs

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 4" O.C. Va= 322

W1

Blocking / Gable Truss Attachment

"No Blocking Required"

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***X3-2 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	24.00	ft	Total length of wall
L =	*24.00*	ft	Total length of shear wall
L_w =	*16.00*	ft	Total length of full height segments
H =	*8.00*	ft	height of shear wall
H' =	*3.00*	ft	Maximum opening height
V_1 =	*1225*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*95.84*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	N	y/n	Wall Connected to Concrete
	y	y/n	Wall Connected to Truss Heel
	n	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

3
5
5
3

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.667		Percent of full height segments
$\%_{oh}$ = H'/H =	0.375		Percent of maximum opening height
SCAF =	*0.96*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	77	plf	Unit base shear
v_{req} = v_{base}/SCAF	**80**	plf	Effective unit base shear
OTM =	**10,204**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**47,186**	lb ft	Resisting moment of total length of wall
r=	0.8421		
C_O=	0.9600		
	51	plf	Blocking Unit Shear
	79.72		Force Calculated
	2.29 ft		Min Shear Wall Segment

T = **Not Req'd** lbs

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 6" O.C. Va= 217

W1

Blocking / Gable Truss Attachment

"No Blocking Required"

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***X4-2 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	24.00	ft	Total length of wall
L =	*24.00*	ft	Total length of shear wall
L_w =	*14.75*	ft	Total length of full height segments
H =	*8.00*	ft	height of shear wall
H' =	*4.00*	ft	Maximum opening height
V_1 =	*1225*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*95.84*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	N	y/n	Wall Connected to Concrete
	y	y/n	Wall Connected to Truss Heel
	n	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

3.75
7.33
3.67

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.615		Percent of full height segments
$\%_{oh}$ = H'/H =	0.500		Percent of maximum opening height
SCAF =	*0.84*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	83	plf	Unit base shear
v_{req} = v_{base}/SCAF	**99**	plf	Effective unit base shear
OTM =	**11,684**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**47,186**	lb ft	Resisting moment of total length of wall
r=	0.7613		
C_O=	0.8384		
	51 plf		Blocking Unit Shear
	99.02		Force Calculated
	2.29 ft		Min Shear Wall Segment

T = **Not Req'd** lbs

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 6" O.C. Va= 217

W1

Blocking / Gable Truss Attachment

"No Blocking Required"

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***Y1-2 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	22.00	ft	Total length of wall
L =	*22.00*	ft	Total length of shear wall
L_w =	*16.58*	ft	Total length of full height segments
H =	*8.00*	ft	height of shear wall
H' =	*4.00*	ft	Maximum opening height
V_1 =	*2618*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*95.84*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	N	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	y	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

9.33
7.25

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.754		Percent of full height segments
$\%_{oh}$ = H'/H =	0.500		Percent of maximum opening height
SCAF =	*0.89*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	158	plf	Unit base shear
v_{req} = v_{base}/SCAF	**177**	plf	Effective unit base shear
OTM =	**23,526**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**39,649**	lb ft	Resisting moment of total length of wall
r=	0.8595		
C_O=	0.8903		
	119	plf	Blocking Unit Shear
	177.37		Force Calculated
	2.29 ft		Min Shear Wall Segment

T = **Not Req'd** lbs

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 6" O.C. Va= 217

W1

Blocking / Gable Truss Attachment

Nail Gable Truss to Top Plate With: W/ 10d's @ 12" O.C. to Top Plate

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***Y2-2 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	36.00	ft	Total length of wall
L =	*36.00*	ft	Total length of shear wall
L_w =	*31.58*	ft	Total length of full height segments
H =	*8.00*	ft	height of shear wall
H' =	*8.00*	ft	Maximum opening height
V_1 =	*3963*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*95.84*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	N	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	y	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

17.25
14.33

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.877		Percent of full height segments
$\%_{oh}$ = H'/H =	1.000		Percent of maximum opening height
SCAF =	*0.80*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	126	plf	Unit base shear
v_{req} = v_{base}/SCAF	**156**	plf	Effective unit base shear
OTM =	**39,494**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**106,168**	lb ft	Resisting moment of total length of wall
r=	0.8772		
C_O=	0.8029		
	110 plf		Blocking Unit Shear
	156.32		Force Calculated
	2.29 ft		Min Shear Wall Segment

T = **Not Req'd** lbs

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 6" O.C. Va= 217

W1

Blocking / Gable Truss Attachment

Nail Gable Truss to Top Plate With: W/ 10d's @ 12" O.C. to Top Plate

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***Y3-2 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	28.00	ft	Total length of wall
L =	*28.00*	ft	Total length of shear wall
L_w =	*17.08*	ft	Total length of full height segments
H =	*8.00*	ft	height of shear wall
H' =	*2.00*	ft	Maximum opening height
V_1 =	*1640*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*95.84*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	N	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	N	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

2.83
7.75
3.167
3.33

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.610		Percent of full height segments
$\%_{oh}$ = H'/H =	0.250		Percent of maximum opening height
SCAF =	*1.00*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	96	plf	Unit base shear
v_{req} = v_{base}/SCAF	**96**	plf	Effective unit base shear
OTM =	**13,118**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**64,225**	lb ft	Resisting moment of total length of wall
r=	0.8621		
C_O=	1.1081		
	59 plf		Blocking Unit Shear
	96.02		Force Calculated
	2.29 ft		Min Shear Wall Segment

T = **Not Req'd** lbs

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 6" O.C. Va= 217

W1

Blocking / Gable Truss Attachment

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***X1-1 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	26.00	ft	Total length of wall
L =	*17.00*	ft	Total length of shear wall
L_w =	*8.75*	ft	Total length of full height segments
H =	*9.00*	ft	height of shear wall
H' =	*9.00*	ft	Maximum opening height
V_1 =	*1336*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*107.82*	plf	Self weight
$w_{DL\ above}$ =	*136.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	Y	y/n	Wall Connected to Concrete
	y	y/n	Wall Connected to Truss Heel
	N	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

2.75
6

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.515		Percent of full height segments
$\%_{oh}$ = H'/H =	1.000		Percent of maximum opening height
SCAF =	*0.51*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	153	plf	Unit base shear
v_{req} = v_{base}/SCAF	**301**	plf	Effective unit base shear
OTM =	**23,695**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**35,232**	lb ft	Resisting moment of total length of wall
r=	0.5147		
C_O=	0.5075		
	51 plf		Blocking Unit Shear
	300.89		Force Calculated
	2.57 ft		Min Shear Wall Segment

Holdown	Ta	Type
T = **292** lbs	**Intersecting wall**	**500**	**Misc**

Shear Transfer to Concrete:

1/2 Anchor Bolts @ 72 " O.C. (2) Minimum

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 4" O.C. Va= 322

W1

Blocking / Gable Truss Attachment

"No Blocking Required"

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***X2-1 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	59.00	ft	Total length of wall
L =	*59.00*	ft	Total length of shear wall
L_w =	*39.50*	ft	Total length of full height segments
H =	*9.00*	ft	height of shear wall
H' =	*9.00*	ft	Maximum opening height
V_1 =	*2885*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*107.82*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	Y	y/n	Wall Connected to Concrete
	y	y/n	Wall Connected to Truss Heel
	y	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

3.5
6
6
13
5.5
5.5

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.669		Percent of full height segments
$\%_{oh}$ = H'/H =	1.000		Percent of maximum opening height
SCAF =	*0.60*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	73	plf	Unit base shear
v_{req} = v_{base}/SCAF	**121**	plf	Effective unit base shear
OTM =	**43,124**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**306,015**	lb ft	Resisting moment of total length of wall
r=	0.6695		
C_O=	0.6020		
	49 plf		Blocking Unit Shear
	121.31		Force Calculated
	2.57 ft		Min Shear Wall Segment

T = **Not Req'd** lbs

Shear Transfer to Concrete:

1/2 Anchor Bolts @ 72 " O.C. (3) Minimum

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 6" O.C. Va= 217

W1

Blocking / Gable Truss Attachment

"No Blocking Required"

Nail Gable Truss to Top Plate With: W/ 10d's @ 12" O.C. to Top Plate

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***X3-1 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	26.00	ft	Total length of wall
L =	*26.00*	ft	Total length of shear wall
L_w =	*18.17*	ft	Total length of full height segments
H =	*9.00*	ft	height of shear wall
H' =	*2.00*	ft	Maximum opening height
V_1 =	*2297*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*107.82*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	Y	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	y	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

4.5
7
6.67

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.699		Percent of full height segments
$\%_{oh}$ = H'/H =	0.222		Percent of maximum opening height
SCAF =	*1.00*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	126	plf	Unit base shear
v_{req} = v_{base}/SCAF	**126**	plf	Effective unit base shear
OTM =	**20,677**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**59,427**	lb ft	Resisting moment of total length of wall
r=	0.9126		
C_O=	1.1116		
	88	plf	Blocking Unit Shear
	126.44		Force Calculated
	2.57	*ft*	Min Shear Wall Segment

T = **Not Req'd** lbs

Shear Transfer to Concrete:

1/2 Anchor Bolts @ 72 " O.C. (3) Minimum

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 6" O.C. Va= 217

W1

Blocking / Gable Truss Attachment

Nail Gable Truss to Top Plate With: W/ 10d's @ 12" O.C. to Top Plate

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***X4-1 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

				Shearwall segments
	24.50	ft	Total length of wall	4
L =	*24.50*	ft	Total length of shear wall	4
L_w =	*16.00*	ft	Total length of full height segments	4
H =	*9.00*	ft	height of shear wall	4
H' =	*9.00*	ft	Maximum opening height	
V_1 =	*2297*	lbs	Total Wind force at top of wall	
$w_{DL\ self}$ =	*107.82*	plf	Self weight	
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load	
	7/16	in	Prefered OSB thickness	
	Y	y/n	Wall Connected to Concrete	
	N	y/n	Wall Connected to Truss Heel	
	y	y/n	Wall Connected to Gable / Drag Truss or Rim	

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.653		Percent of full height segments
$\%_{oh}$ = H'/H =	1.000		Percent of maximum opening height
SCAF =	*0.59*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	144	plf	Unit base shear
v_{req} = v_{base}/SCAF	**243**	plf	Effective unit base shear
OTM =	**35,024**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**52,768**	lb ft	Resisting moment of total length of wall
r=	0.6531		
C_O=	0.5904		
	94 plf		Blocking Unit Shear
	243.22		Force Calculated
	2.57 ft		Min Shear Wall Segment

		Holdown	Ta	Type
T =	**210** lbs	**Intersecting wall**	**500**	**Misc**

Shear Transfer to Concrete:

1/2 Anchor Bolts @ 72 " O.C. (3) Minimum

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 4" O.C. Va= 322

W1

Blocking / Gable Truss Attachment

Nail Gable Truss to Top Plate With: W/ 10d's @ 12" O.C. to Top Plate

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***Y1-1 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

Shearwall segments: 10

	22.00	ft	Total length of wall
L =	*10.00*	ft	Total length of shear wall
L_w =	*10.00*	ft	Total length of full height segments
H =	*9.00*	ft	height of shear wall
H' =	*0.00*	ft	Maximum opening height
V_1 =	*1221*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*107.82*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	Y	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	N	y/n	Wall Connected to Gable / Drag Truss or Rim

Unit Base Shear

$\%_{fh}$ = L_w/L =	1.000		Percent of full height segments
$\%_{oh}$ = H'/H =	0.000		Percent of maximum opening height
SCAF =	*1.00*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	122	plf	Unit base shear
v_{req} = v_{base}/SCAF	**122**	plf	Effective unit base shear
OTM =	**10,987**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**8,791**	lb ft	Resisting moment of total length of wall
r=	1.0000		
C_O=	1.0000		
	55 plf		Blocking Unit Shear
	122.08		Force Calculated
	2.57 ft		Min Shear Wall Segment

			Holdown	Ta	Type
T =	**571**	lbs	**Simpson DTT1Z**	**910**	**Holdown**
			OR:		
			Simpson LSTHD8	**1950**	**Strap Tie**

Shear Transfer to Concrete:

1/2 Anchor Bolts @ 72 " O.C. (2) Minimum

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 6" O.C. Va= 217

W1

Blocking / Gable Truss Attachment

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***Y2-1 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

Shearwall segments: 14

	20.00	ft	Total length of wall
L =	*20.00*	ft	Total length of shear wall
L_w =	*14.00*	ft	Total length of full height segments
H =	*9.00*	ft	height of shear wall
H' =	*0.00*	ft	Maximum opening height
V_1 =	*5254*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*107.82*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	Y	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	N	y/n	Wall Connected to Gable / Drag Truss or Rim

Unit Base Shear

$\%_{fh}$ = L_w/L =	0.700		Percent of full height segments
$\%_{oh}$ = H'/H =	0.000		Percent of maximum opening height
SCAF =	*1.00*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	375	plf	Unit base shear
v_{req} = v_{base}/SCAF	**375**	plf	Effective unit base shear
OTM =	**47,285**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**35,164**	lb ft	Resisting moment of total length of wall
r=	1.0000		
C_O=	1.4286		
	263 plf		Blocking Unit Shear
	375.28		Force Calculated
	2.57 ft		Min Shear Wall Segment

		Holdown	Ta	Type
T =	**1870** lbs	**Simpson DTT2Z**	**2145**	**Holdown**
		OR:		
		Simpson LSTHD8	**1950**	**Strap Tie**

Shear Transfer to Concrete:

1/2 Anchor Bolts @ 48 " O.C. (6) Minimum

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 4" O.C. Va= 490

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 3" O.C. Va= 434

W2

Blocking / Gable Truss Attachment

PERFORMANCE ENGINEERS

Project: *Brown Residence*
Project # : *2019-07235*
Location: *Valley County, Idaho*
Engineer: *ARA*
Checker: *KJ*

Description: ***Y3-1 Shear Wall***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

	35.60	ft	Total length of wall
L =	*35.60*	ft	Total length of shear wall
L_w =	*31.67*	ft	Total length of full height segments
H =	*9.00*	ft	height of shear wall
H' =	*6.67*	ft	Maximum opening height
V_1 =	*7163*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*107.82*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	Y	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	y	y/n	Wall Connected to Gable / Drag Truss or Rim

Shearwall segments

12.67
11
8

Unit Base Shear

$\%_{fh} = L_w/L$ =	0.890		Percent of full height segments
$\%_{oh}$ = H'/H =	0.741		Percent of maximum opening height
SCAF =	*0.88*		Shear capacity adjustment factors (NDS SDPWS Table)
$v_{base} = V_1/L_w$ =	226	plf	Unit base shear
$v_{req} = v_{base}$/SCAF	**257**	plf	Effective unit base shear
OTM =	**73,178**	lb ft	Overturning moment of total length of wall

Shear wall adjustment factor

RM =	**111,414**	lb ft	Resisting moment of total length of wall
r=	0.9158		
C_O=	0.8810		
	201 plf		Blocking Unit Shear
	256.74		Force Calculated
	2.57 ft		Min Shear Wall Segment

			Holdown	Ta	Type
T =	**200**	lbs	**Intersecting wall**	**500**	**Misc**

Shear Transfer to Concrete:

1/2 Anchor Bolts @ 72 " O.C. (7) Minimum

OSB Wall Sheathing attachment

Provide: 7/16" OSB W/ 8d Nails @ 6" O.C. Va= 336

Provide: 7/16" OSB W/ 1½ 16 Gage Staples @ 4" O.C. Va= 322

W1

Gyp Board Wall Sheathing attachment

Provide: 1/2" GYP Board W/ 5d Cooler Nails or Screws, Blocked @ 4" O.C. (BOTH SIDES) Va= 300

W6

Blocking / Gable Truss Attachment

Nail Gable Truss to Top Plate With: W/ 10d's @ 6" O.C. to Top Plate

Project:	*Brown Residence*
Project # :	*2019-07235*
Location:	*Valley County, Idaho*
Engineer:	*ARA*
Checker:	*KJ*

Description: ***Y4-1 Shear Wall*** ***(2 PANELS)***

Perforated Shear Wall Calculation Sheet:
This spreadsheet is made in conformance to the IBC Chapters 2305-2308 and AFPA's "SDPWS: Lateral Force Resisting Systems".

Shear Wall Forces

Shearwall segments: 2

	14.00	ft	Total length of wall
L =	*2.00*	ft	Total length of shear wall
L_w =	*2.00*	ft	Total length of full height segments
H =	*9.00*	ft	height of shear wall
H' =	*0.00*	ft	Maximum opening height
V_1 =	*1501*	lbs	Total Wind force at top of wall
$w_{DL\ self}$ =	*107.82*	plf	Self weight
$w_{DL\ above}$ =	*68.00*	plf	Applied dead load
	7/16	in	Prefered OSB thickness
	Y	y/n	Wall Connected to Concrete
	N	y/n	Wall Connected to Truss Heel
	y	y/n	Wall Connected to Gable / Drag Truss or Rim

Unit Base Shear

$\%_{fh}$ = L_w/L =	1.000		Percent of full height segments
$\%_{oh}$ = H'/H =	0.000		Percent of maximum opening height
SCAF =	*1.00*		Shear capacity adjustment factors (NDS SDPWS Table)
v_{base} = V_1/L_w =	751	plf	Unit base shear
v_{req} = v_{base}/SCAF	**751**	plf	Effective unit base shear
OTM =	**13,513**	lb ft	Overturning moment of shortest panel

Shear wall adjustment factor

RM =	**352**	lb ft	Resisting moment of shortest panel
r=	1.0000		
C_O=	1.0000		
	214 plf		Blocking Unit Shear
	750.70		Force Calculated
	1.33 ft		Min Shear Wall Segment

			Holdown	Ta	Type
T =	**3500**	lbs	**Simpson HDU5**	**5645**	**Holdown**
			OR:		
			Simpson STHD14	**3695**	**Strap Tie**

Portal Frame

Provide: (2) Eng. APA Portal Frame Va = 2254# EA. 4508# Total

Blocking / Gable Truss Attachment

Nail Gable Truss to Top Plate With: W/ 10d's @ 6" O.C. to Top Plate