Reeve & Associates, Inc.

Structural Calculations

for

Spring Run 4-Plex Townhomes Building 12

Eagle Mountain, Utah

submitted to:

ARCFLO

Solutions you can build on for over 70 years

contact:
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Notice

Reeve & Associate's, Inc., has authorized this copy only if the seal is in **black** ink and the signature is in **red** or **blue** ink. We assume responsibility only for the items addressed herein and do not assume responsibility for the remainder of the structure. No site observations are scheduled to verify the understanding of the contractor or the proper installation of the items addressed herein.

March 2021
Ref: 4899-A95

Solutions you can build on

Project Information

Project Name: Spring Run 4-Plex Townhomes - Building 12
Project Location: Eagle Mountain, Utah

Design Criteria

Governing Building Code:	2018 IBC
Construction Type:	Wood Bearing Wall
Wind Zone and Exposure:	115mph. (3 sec. gust), Exp C
Seismic Design Category:	D
Soil Site Class:	D
Spectral Accelerations	S_S = 0.881g S_{DS} = 0.705g S_1 = 0.319g S_{D1} = 0.357g
Design Loads:	Roof Dead Load = 15 psf
	Ground Snow Load = 57 psf
	Roof Snow Load = 40 psf
	Floor Dead Load = 15 psf
	Floor Live Load = 40 psf

Construction Materials

Concrete 28-Day Compressive Strength

Foundations:	f'_c = 3000 psi (2500 psi design)
Exterior Slabs on Grade:	f'_c = 4000 psi
Reinforcing Grade:	ASTM A615 Grade 60
Structural Steel	ASTM A992 (f_y = 50000 psi)

Wood

Sawn Lumber:			
DF#2 or better	Fb=875 psi	Fv=180 psi	E=1.6·10^6 psi
Laminated Veneer Lumber:			
Microllam®	Fb=2600 psi	Fv=285 psi	E=1.9·10^6 psi
Parallel Strand Lumber:			
Parallam®	Fb=2900 psi	Fv=290 psi	E=2.0·10^6 psi
Glu-Laminated Beams:			
24F-V4 DF/DF	Fb=2400 psi	Fv=195 psi	E=1.8·10^6 psi

Roof Sheathing	15/32" OSB
Floor Sheathing	3/4" OSB
Wall Sheathing	7/16" OSB

Soil Criteria

Geotechnical Consultant:	None
Report Number:	N/A
Bearing Pressure:	1500 psf (Assumed)
Min. Bearing Depth:	30” to bottom of footing

(Contractor/Owner to verify proper bearing conditions are provided)

Latitude, Longitude: 40.38, -111.978

Date	7/17/2019, 3:35:40 PM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Default (See Section 11.4.3)

Type	Value	Description
S_S	0.881	MCE_R ground motion. (for 0.2 second period)
S_1	0.319	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.057	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	0.705	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1.2	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.385	MCE_G peak ground acceleration
F_{PGA}	1.215	Site amplification factor at PGA
PGA_M	0.468	Site modified peak ground acceleration
T_L	8	Long-period transition period in seconds
SsRT	0.881	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	0.994	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	1.5	Factored deterministic acceleration value. (0.2 second)
S1RT	0.319	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.359	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	0.6	Factored deterministic acceleration value. (1.0 second)
PGAd	0.574	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.887	Mapped value of the risk coefficient at short periods
C_{R1}	0.891	Mapped value of the risk coefficient at a period of 1 s

Reeve & Associates, Inc.	PROJECT	Spring Run 4-Plex Townhome	PROJ NO.	4899-A
			CALC NO.	
	SUBJECT	**Low Roof Snow Load per ASCE 7** **Leeward and Windward Snow Drift**	BY: JDL	DATE #######
			CHK	DATE
			SHEET	OF REV

Description: Exterior Townhome Units

GENERAL INPUT AND OUTPUT:

"Leeward" or "Windward":	1.00	*Leeward*	Snow Load Density:	21.42 pcf
Roof Slope:	0:12	*0.00 °*	h_b (Snow Depth):	1.87 feet
County (State of Utah)	UTAH		h_d (potential drift height):	-1.50 feet
Elevation at Site	5040 ft		h_c (Roof to Snow):	0.00 feet
p_g (SEAU Flat Roof Snow)	55 psf	57 psf *<---Manual Entry*	Maximum Drift Height:	0.00 feet
C_e (Exposure Factor):	1.0		Drift Width:	0.00 feet
C_t (Thermal Factor):	1.0			
I_s (Importance Factor):	1.0		Maximum Snow Load:	**40.0 psf**
L_u (Length of Roof):	0.00 feet	*Upper Roof*		
Elevation Difference:	0.00 feet		Maximum Drift Weight:	**0.00 psf**
P_f (Roof Snow):	**40.0 psf**		Drift Width:	**0.00 feet**
C_s (Roof Slope Factor):	1.0			
P_s (Sloped Roof Snow):	**40.0 psf**			

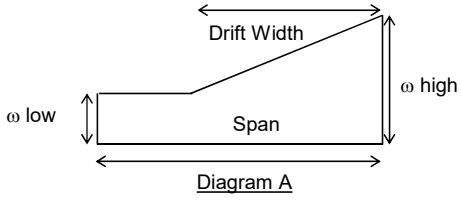

Diagram A

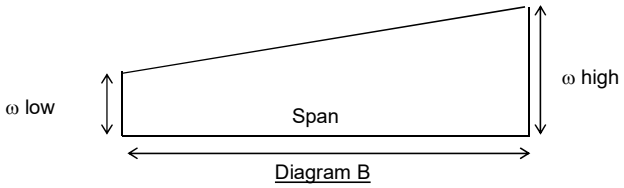

Diagram B

Reeve & Associates, Inc.

Land Planners · Civil Engineers · Land Surveyors
Traffic Engineers · Structural Engineers · Landscape Architects
5160 South 1500 West -- Riverdale, UT 84405
Phone: (801) 621-3100
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Date:	Sheet 1 Of 1
Designed By: JDL	Project Number:

Seismic Calculations

Earthquake Loads-Site Ground Motion

I=	1		h_n=	25.00 ft (Building Height)
R=	6.5	Wood Shear Wall	Structure Type =	Other
S_s=	0.881		C_t=	0.02
S_1=	0.319		x=	0.75
Site Class=	D			

Check Height for LFRS = 25.0ft > NP (per exception 12.2.5.6 where
DL = 6.5 psf (Estimated) DL <20psf allowed up to 65ft)

F_a= 1.15
S_{MS}= 1.011 S_{MS}= F_a*S_S
S_{DS}= 0.674 S_{DS}= 2*S_{MS}/3

F_v= 1.76
S_{M1}= 0.562 S_{M1}= F_v*S_1
S_{D1}= 0.375 S_{D1}= 2*S_{M1}/3

Earthquake Loads-Minimum Design Lateral Force

C_s= 0.104 T= 0.224 s
C_s= 0.258 Load Combinations that control lateral:
C_s= 0.03 D+0.75L+0.75S+0.75(0.7*E)
ASD Load Factor = 0.7 0.6D+0.7E
USE Rho = 1.3
C_s= 0.104
$V=C_S*W$ **V = ASD Load Factor*Rho*Cs*W = 0.09 *W**

Dead Load Effect

0.2*S_{DS}= 0.135
(+/-) 0.2*S_{DS}*D

Seismic Design Category

SDS => D

SD1 => D

Wind Design - ASCE 7

Risk Category =	II	
Basic Wind Speed V =	115	mph
Exposure Category =	C	
Wind Directionality Factor, Kd =	0.85	
Topographic Factor, K_{zt} =	1	
Gust Effect Factor, G =	0.85	
Total Stories =	1	(5 max)
Internal Pressure Coefficient, Gcpi =	0.18	
	-0.18	

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Enclosure Classification

	Length	Height	Ag	Ao	% open	Open	Partial 1	Partial 2	Partial Total
Wall 1 =	20	10	200	200	100.0	Y	N	Y	N
Wall 2 =	17	10	170	170	100.0	Y	N	N	N
Wall 3 =	20	10	200	200	100.0	Y	N	Y	N
Wall 4 =	17	10	170	0	0.0	N	N	N	N

Open Building: NO
Partially Open: NO
Enclosed: YES

Wall Pressure

	Front to Back	Side to Side
Windward Wall, Cp =	0.8	0.8
Windward Wall Width, B =	30 ft	52 ft
Side Wall Width, L =	52 ft	30 ft
L/B =	1.716667	0.582524
Leeward Wall, Cp =	-0.3	-0.5
Side Wall, Cp =	-0.7	-0.7

Roof Pressure

Roof Type =	Gable 2		Gable 1	
Roof Pitch =	5/12	22.6 °	8/12	33.7 °
Ridge Height =	29 ft		29 ft	
Eave Height =	19 ft		18 ft	
Mean Roof Height, h =	24.1 ft		23.6 ft	
h/L =	0.47		0.80	
h/2 =	12 ft		12 ft	
Kh =	0.94		0.93	
qh =	27.0 psf		26.9 psf	

Parapet Wall Pressure

Parapet Wall Height =	0 ft
Building Height to top of parapet=	10 ft
Kz =	0.85
qp =	24.4 psf
WW GCpn =	1.50
LW GCpn+	-1.00
Pp =	61.1 psf
Adj. Pp =	36.6 psf
Parapet Load per foot =	0.0 plf

Roof Pressure Coefficient, Cp

		Front to Back: WW Area: 152 ft²				LW Area: 152 ft²				Side to Side: WW Area: 1036 ft²				LW Area: 1036 ft²			
		Distance from Windward Edge, ft					Distance from Windward Edge, ft										
	Max/Min	0 ft	12 ft	24 ft	48 ft	Max/Min	0 ft	12 ft	24 ft	48 ft	Max/Min	0 ft	12 ft	24 ft	48 ft	Max/Min	0 ft	12 ft	24 ft	48 ft
Windward Normal to Ridge =	Max	0.12	0.12	0.12	0.12	Max	-0.01	-0.01	-0.01	-0.01	Max	-0.01	-0.01	-0.01	-0.01	Max	-0.01	-0.01	-0.01	-0.01
	Min	-0.33	-0.33	-0.33	-0.33	Min	-0.50	-0.50	-0.50	-0.50	Min	-0.50	-0.50	-0.50	-0.50	Min	-0.50	-0.50	-0.50	-0.50
Leeward Normal to Ridge =	Max	-0.60	-0.60	-0.60	-0.60	Max	-0.60	-0.60	-0.60	-0.60	Max	-0.60	-0.60	-0.60	-0.60	Max	-0.60	-0.60	-0.60	-0.60
	Min	-0.60	-0.60	-0.60	-0.60	Min	-0.60	-0.60	-0.60	-0.60	Min	-0.60	-0.60	-0.60	-0.60	Min	-0.60	-0.60	-0.60	-0.60
Parallel to Ridge =	Max	-0.18	-0.18	-0.18	-0.18	Max	-0.18	-0.18	-0.18	-0.18	Max	-0.18	-0.18	-0.18	-0.18	Max	-0.18	-0.18	-0.18	-0.18
	Min	-0.90	-0.90	-0.50	-0.30	Min	-1.14	-1.14	-0.62	-0.54	Min	-1.14	-1.14	-0.62	-0.54	Min	-1.14	-1.14	-0.62	-0.54

ASD Factor: 0.6

Load Description	Overall Height	Wall Trib	Kz	qz	Front to Back WW	LW	SW	Int +/-	Total WW+LW	Shear Force, lbs	Adj. Shear Force, lbs	Adj. Wall Force
Roof	24.1 ft	-	-	max-->	2.8 psf	-13.8 psf	varies	4.9 psf	16.6 psf	973 lbs	584 lbs	2207 lbs
				min-->	-7.7 psf	-13.8 psf	varies	-4.9 psf	6.1 psf	357 lbs	214 lbs	
Roof	18 ft	4.5	0.88	25.4 psf	17.3 psf	-6.9 psf	-16.1 psf	4.9 psf	24.1 psf	3259 lbs	1956 lbs	
Floor	9 ft	9	0.85	24.4 psf	16.6 psf	-6.9 psf	-16.1 psf	4.9 psf	23.5 psf	6343 lbs	3806 lbs	
			0.85	24.4 psf	16.6 psf	-6.9 psf	-16.1 psf	4.9 psf	23.5 psf	0 lbs	0 lbs	
			0.85	24.4 psf	16.6 psf	-6.9 psf	-16.1 psf	4.9 psf	23.5 psf	0 lbs	0 lbs	
			0.85	24.4 psf	16.6 psf	-6.9 psf	-16.1 psf	4.9 psf	23.5 psf	0 lbs	0 lbs	
Other												
									Front to Back Total Shear:	10576 lbs	7968 lbs	

		Side to Side WW	LW	SW	Int +/-	Total WW + LW	Shear Force, lbs	Adj. Shear Force, lbs	Adj. Wall Force
Roof	max-->	-0.2 psf	-13.8 psf	varies	4.9 psf	13.5 psf	7770 lbs	4662 lbs	
	min-->	-11.4 psf	-13.8 psf	varies	-4.9 psf	2.4 psf	1352 lbs	811 lbs	
Roof		17.3 psf	-11.5 psf	-16.1 psf	4.9 psf	28.7 psf	6659 lbs	3995 lbs	
Floor		16.6 psf	-11.5 psf	-16.1 psf	4.9 psf	28.1 psf	13016 lbs	7809 lbs	
		16.6 psf	-11.5 psf	-16.1 psf	4.9 psf	28.1 psf	0 lbs	0 lbs	
		16.6 psf	-11.5 psf	-16.1 psf	4.9 psf	28.1 psf	0 lbs	0 lbs	
		16.6 psf	-11.5 psf	-16.1 psf	4.9 psf	28.1 psf	0 lbs	0 lbs	
Other									
						Side to Side Total Shear:	27444 lbs	16467 lbs	

LATERAL ANALYSIS

Side-to-Side Dim:	30 ft		Roof Area = 1379 ft²
Front-to-Back Dim:	52 ft	Height	Floor Area = 1498 ft²
Roof Trib:	5 ft	19 ft	Floor Area =
Floor Trib:	9.0ft	10 ft	Floor Area =
Floor Trib:			
Floor Trib:			
Roof Seismic DL:	23 psf		
Floor Seismic DL:	15 psf		
Wall Seismic DL:	12 psf		

Seismic: V = 0.09 *W

F-front-to-back:	V		W	WxHx	Cvx	Fx
Roof	3274 lbs	lb	34949	646551	0.70	4200 lbs
Floor	2712 lbs	lb	28950	275025	0.30	1787 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
	5987 lbs		63899	921576		5987 lbs
F-side-to-side:						
Roof	3497 lbs	lb	37324.73	690507	0.68	4547 lbs
Floor	3158 lbs	lb	33702	320169	0.32	2108 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
	6655 lbs		71027	1010676		6655 lbs

Wind:

F-front-to-back:	
Roof	4163 lbs
Floor	3806 lbs
Floor	0 lbs
Floor	0 lbs
F-side-to-side:	
Roof	8657 lbs
Floor	7809 lbs
Floor	0 lbs
Floor	0 lbs

Use for Design:

F-front-to-back:				
Roof	4200 lbs	**Seismic Governs**	1	0.99103
Floor	3806 lbs	**Wind Governs**	1.4	2.130234
Floor	0 lbs		1	
Floor	0 lbs		1	
F-side-to-side:				
Roof	8657 lbs	**Wind Governs**	1.4	1.904087
Floor	7809 lbs	**Wind Governs**	1.4	3.704498
Floor	0 lbs		1	
Floor	0 lbs		1	

SW capacities (plf):

	seismic	wind
SW-1	260	365
SW-2	380	532
SW-3	490	685
SW-4	640	896
SW-5	760	1065
SW-6	980	1370

Hold Down capacities (lb):

0	NONE		0	NONE	
500	LSTHD8	1610	1000	MST37	1725
1610	STHD10	2175	1725	MST48	3215
2175	STHD14	3500	3215	MST60	5240
3500	HDU4	4565	5240	MST72	6730
4565	HDU5	5645	6730	(2) MST60	10480
5645	HDU8	7870	10480	(2) MST72	13460
7870	HDU11	9535	13460	NG	
9535	HDU14	14445			

SHEAR WALLS 14445 NG

Resisting DL: 12 psf

ROOF

Front-to-Back SW:	**Shared**	**Front Side**	**Back Side**	**Line 4**	**Line 5**	**Line 6**	**Line 7**	**Line 8**	**Line 9**	**Line 10**
SW Height (ft):	8	8	8							
SW Trib (ft):	15	4.57	10.43							
SW Forces:	2100	640	1460	0	0	0	0	0	0	0
Total SW Length (ft):	38	14.667	20.333	0	0	0	0	0	0	0
Shear (lb/ft):	55	44	72	0	0	0	0	0	0	0
Uplift (lb):	442	349	575	0	0	0	0	0	0	0
SW Length (ft):	38	14.667	25.333							
Sum Perf Sgmts (ft):	38	14.667	20.333							
Area Openings (sf):	0	0	30							
Co:	1.00	1.00	0.80	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:	**SW-1**	**SW-1**	**SW-1**							
Trib DL (ft):	0	0	5							
0.6*resisting DL (lb):	0	0	455.994	0	0	0	0	0	0	0
Net Uplift (lb):	442	349	260	0	0	0	0	0	0	0
Hold Down:	**NONE**	**NONE**	**NONE**							
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):										
Hold Down:										
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):										
Hold Down:										
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):										
Hold Down:										
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):										
Hold Down:										

FLOOR

Front-to-Back SW:	Shared	Side	Line 3	Line 4	Line 5	Line 6	Line 7	Line 8	Line 9	Line 10
SW Height (ft):	9	9								
SW Trib (ft):	15	15								
SW Forces:	1903	1903	0	0	0	0	0	0	0	0
Total SW Length (ft):	38	0	0	0	0	0	0	0	0	0
Shear (lb/ft):	105	0	0	0	0	0	0	0	0	0
Uplift (lb):	1390	0	0	0	0	0	0	0	0	0
SW Length (ft):	38									
Sum Perf Sgmts (ft):	38									
Area Openings (sf):	0	0								
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:	**SW-1**									
Trib DL (ft):	10	12								
0.6*resisting DL (lb):	1368	0	455.994	0	0	0	0	0	0	0
Net Uplift (lb):	22	0	-456	0	0	0	0	0	0	0
Hold Down:	**NONE**									
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	1390	0	0	0	0	0	0	0	0	0
Hold Down:										
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	1390	0	0	0	0	0	0	0	0	0
Hold Down:										
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	1390	0	0	0	0	0	0	0	0	0
Hold Down:										
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	1390	0	0	0	0	0	0	0	0	0
Hold Down:										

ROOF

Side-to-Side SW:	Front	Back	Line C	Line D	Line E	Line F	Line G	Line H	Line J	Line K
SW Height (ft):	8	8								
SW Trib (ft):	26	26								
SW Forces:	4329	4329	0	0	0	0	0	0	0	0
Total SW Length (ft):	15.9997	1	0	0	0	0	0	0	0	0
Shear (lb/ft):	271	4329	0	0	0	0	0	0	0	0
Uplift (lb):	2164	34628	0	0	0	0	0	0	0	0
SW Length (ft):	13.1667	1								
Sum Perf Sgmts (ft):	8.333	1								
Area Openings (sf):	25									
Co:	0.74	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:	**SW-1**	**NG**								
Trib DL (ft):	8									
0.6*resisting DL (lb):	379.201	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	2532	34628	0	0	0	0	0	0	0	0
Hold Down:	**MST48**	**NG**								
SW Length (ft):	12.667									
Sum Perf Sgmts (ft):	7.6667									
Area Openings (sf):	25									
Co:	0.74	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:	**SW-1**									
Trib DL (ft):	8									
0.6*resisting DL (lb):	364.8096	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	2547	34628	0	0	0	0	0	0	0	0
Hold Down:	**MST48**									
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
2/3 resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	2164	34628	0	0	0	0	0	0	0	0
Hold Down:	**MST48**									
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	2164	34628	0	0	0	0	0	0	0	0
Hold Down:										
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	2164	34628	0	0	0	0	0	0	0	0
Hold Down:										

FLOOR

Side-to-Side SW:	Front	Back	Line C	Line D	Line E	Line F	Line G	Line H	Line J	Line K
SW Height (ft):	9	9								
SW Trib (ft):	26	26								
SW Forces:	3905	3905	0	0	0	0	0	0	0	0
Total SW Length (ft):	10.75	1	0	0	0	0	0	0	0	0
Shear (lb/ft):	766	8233	0	0	0	0	0	0	0	0
Uplift (lb):	10114	108727	0	0	0	0	0	0	0	0
SW Length (ft):	3	1								
Sum Perf Sgmts (ft):	3	1								
Area Openings (sf):	0									
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:	**SW-4**	**NG**								
Trib DL (ft):	21									
0.6*resisting DL (lb):	606.001	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	9508	108727	0	0	0	0	0	0	0	0
Hold Down:	**HDU11**	**NG**								
SW Length (ft):	3									
Sum Perf Sgmts (ft):	3									
Area Openings (sf):	0									
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:	**SW-4**									
Trib DL (ft):	20									
0.6*resisting DL (lb):	580.8096	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	9533	108727	0	0	0	0	0	0	0	0
Hold Down:	**HDU11**									
SW Length (ft):	4.75									
Sum Perf Sgmts (ft):	4.75									
Area Openings (sf):	0									
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:	**SW-4**									
Trib DL (ft):	9									
0.6*resisting DL (lb):	153.9	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	9960	108727	0	0	0	0	0	0	0	0
Hold Down:	**HDU14**									
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	10114	108727	0	0	0	0	0	0	0	0
Hold Down:										
SW Length (ft):										
Sum Perf Sgmts (ft):										
Area Openings (sf):										
Co:	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SW Designation:										
Trib DL (ft):										
0.6*resisting DL (lb):	0	0	0	0	0	0	0	0	0	0
Net Uplift (lb):	10114	108727	0	0	0	0	0	0	0	0
Hold Down:										

Simple Span Beam Calculation

Adjustment Factors - ASD

Cd:	1.15	Cfu:	NA	
Cm:	1.00	Ci:	1.00	
Ct:	1.00	Cr:	1.00	
Cl:	1.00	Cv:	-	Glu-Lam & LVL Only
Cf:	-	Cc:	1.00	Glu-Lam Only

Roof DL 15 psf Include Self Wt?
Floor DL 15 psf Yes
Live 40 psf
Snow 39.97 psf

--->> Point Load distance must be >= midspan distance!

Active Member for Deflection Calc and Shear Diagram: RB-6

member ID	span ft	roof trib ft	floor trib ft	wall load plf	point load dead lbs	point load live lbs	point load snow lbs	dist from left, ft	left reaction dead lbs	left reaction live lbs	left reaction snow lbs	right reaction dead lbs	right reaction live lbs	right reaction snow lbs	applied moment lb-ft	% Str	applied shear lbs	% Str	Selected Member	Live/Total Deflection	actual Δ, in.	Δ limit, L/	Δ act, L/	check	Max Defl Location, ft	Min Bearing Length, in
RB-1	5	2		50					220	0	200	220	0	200	525	12.9	420	9.3	(3) 2x8	Live	0.01	L/360	L/7542	Pass	4.0	0.1
RB-2	3	15		50					424	0	899	424	0	899	993	24.3	1324	29.4	(3) 2x8	Live	0.00	L/360	L/7533	Pass	1.5	0.5
RB-3	6	4							196	0	480	196	0	480	1013	37.3	675	22.5	(2) 2x8	Live	0.03	L/360	L/2354	Pass	3.0	0.4
RB-4	5			50	570		1687	2.5	440	0	844	440	0	844	3015	14.7	1284	14.1	(2) 1-3/4"x11-7/8" LVL	Live	0.01	L/360	L/7720	Pass	2.5	0.5
RB-5	5.5	8		50					495	0	879	495	0	879	1890	31.0	1375	23.9	(3) 2x10	Live	0.01	L/360	L/4945	Pass	2.5	0.5
RB-6	4	25.5							781	0	2038	781	0	2038	2819	69.1	2819	62.6	(3) 2x8	Live	0.03	L/360	L/1869	Pass	2.0	1.0
RB-7									0	0	0	0	0	0	0		0			Live		L/360				
RB-8									0	0	0	0	0	0	0		0			Live		L/360				
RB-9									0	0	0	0	0	0	0		0			Live		L/360				
RB-10									0	0	0	0	0	0	0		0			Live		L/360				
RB-11									0	0	0	0	0	0	0		0			Live		L/360				
RB-12									0	0	0	0	0	0	0		0			Live		L/360				
RB-13									0	0	0	0	0	0	0		0			Live		L/360				
RB-14									0	0	0	0	0	0	0		0			Live		L/360				
RB-15									0	0	0	0	0	0	0		0			Live		L/360				
RB-16									0	0	0	0	0	0	0		0			Live		L/360				
RB-17									0	0	0	0	0	0	0		0			Live		L/360				
RB-18									0	0	0	0	0	0	0		0			Live		L/360				
RB-19									0	0	0	0	0	0	0		0			Live		L/360				
RB-20									0	0	0	0	0	0	0		0			Live		L/360				
RB-21									0	0	0	0	0	0	0		0			Live		L/360				
RB-22									0	0	0	0	0	0	0		0			Live		L/360				
RB-23									0	0	0	0	0	0	0		0			Live		L/360				
RB-24									0	0	0	0	0	0	0		0			Live		L/360				
RB-25									0	0	0	0	0	0	0		0			Live		L/360				
RB-26									0	0	0	0	0	0	0		0			Live		L/360				
RB-27									0	0	0	0	0	0	0		0			Live		L/360				

Simple Span Beam Calculation

Adjustment Factors - ASD

Cd:	1.00	Cfu:	NA	
Cm:	1.00	Ci:	1.00	
Ct:	1.00	Cr:	1.15	
Cl:	1.00	Cv:	-	Glu-Lam & LVL Only
Cf:	-	Cc:	1.00	Glu-Lam Only

Roof DL	15	psf	Include Self Wt?
Floor DL	15	psf	No
Live	40	psf	
Snow	40	psf	

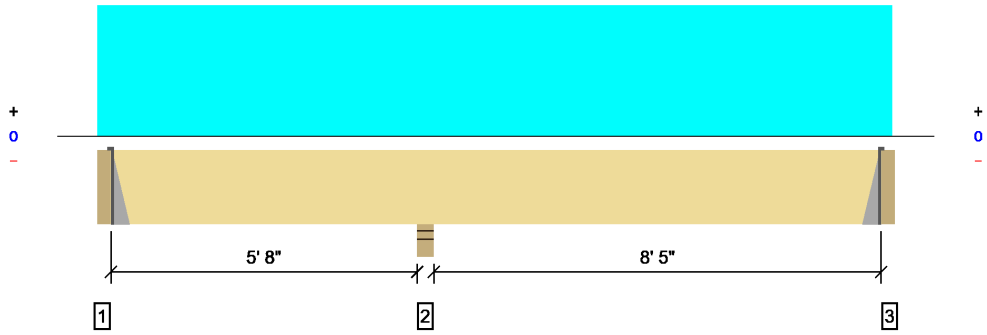
--->> Point Load distance must be >= midspan distance!

Active Member for Deflection Calc and Shear Diagram: FB-8

member ID	span ft	roof trib ft	floor trib ft	wall load plf	point load dead lbs	point load live lbs	point load snow lbs	dist from left, ft	left reaction dead lbs	left reaction live lbs	left reaction snow lbs	right reaction dead lbs	right reaction live lbs	right reaction snow lbs	applied moment lb-ft	% Str	applied shear lbs	% Str	Selected Member	Live/Total Deflection	actual Δ, in.	Δ limit L/	Δ act L/	check	Max Defl Location, ft	Min Bearing Length, in
FB-1	16	2	12.5	50					2140	4000	640	2140	4000	640	24560	58.7	6140	44.0	(3) 1-3/4"x14" LVL	Live	0.31	L/480	L/625	Pass	8.0	1.7
FB-2									0	0	0	0	0	0	0		0			Live		L/360				
FB-3									0	0	0	0	0	0	0		0			Live		L/360				
FB-4									0	0	0	0	0	0	0		0			Live		L/480				
FB-5	3.5		13	50					429	910	0	429	910	0	1171	28.7	1339	34.2	(3) 2x8	Live	0.01	L/480	L/5470	Pass	1.7	0.5
FB-6	8.5		10.75	50					898	1828	0	898	1828	0	5791	42.8	2725	43.1	(2) 1-3/4"x9-1/2" LVL	Live	0.10	L/480	L/1010	Pass	4.2	1.0
FB-7	5		7.725	50					415	773	0	415	773	0	1484	14.5	1187	30.1	1-3/4"x11-7/8" LVL	Live	0.01	L/480	L/6744	Pass	2.5	0.9
FB-8	3.5		13.5	50					442	945	0	442	945	0	1214	44.6	1387	53.1	(2) 2x8	Live	0.01	L/480	L/3511	Pass	1.7	0.7
FB-9									0	0	0	0	0	0	0		0			Live		L/480				
FB-10									0	0	0	0	0	0	0		0			Live		L/480				
FB-11									0	0	0	0	0	0	0		0			Live		L/480				
FB-12									0	0	0	0	0	0	0		0			Live		L/480				
FB-13									0	0	0	0	0	0	0		0			Live		L/480				
FB-14									0	0	0	0	0	0	0		0			Live		L/480				
FB-15									0	0	0	0	0	0	0		0			Live		L/480				
FB-16									0	0	0	0	0	0	0		0			Live		L/480				
FB-17									0	0	0	0	0	0	0		0			Live		L/480				
FB-18									0	0	0	0	0	0	0		0			Live		L/480				
FB-19									0	0	0	0	0	0	0		0			Live		L/480				
FB-20									0	0	0	0	0	0	0		0			Live		L/480				
FB-21									0	0	0	0	0	0	0		0			Live		L/480				
FB-22									0	0	0	0	0	0	0		0			Live		L/480				
FB-23									0	0	0	0	0	0	0		0			Live		L/480				
FB-24									0	0	0	0	0	0	0		0			Live		L/480				
FB-25									0	0	0	0	0	0	0		0			Live		L/480				
FB-26									0	0	0	0	0	0	0		0			Live		L/480				
FB-27									0	0	0	0	0	0	0		0			Live		L/480				

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

Overall Length: 15' 1/2"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	8792 @ 6' 1 3/4"	10041 (4.50")	Passed (88%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3747 @ 7' 3 7/8"	13622	Passed (28%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	-6840 @ 6' 1 3/4"	30788	Passed (22%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.044 @ 10' 9 7/16"	0.215	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)
Total Load Defl. (in)	0.062 @ 10' 9 11/16"	0.430	Passed (L/999+)	--	1.0 D + 1.0 S (Alt Spans)

System : Floor
Member Type : Flush Beam
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 14' 6" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 14' 6" o/c unless detailed otherwise.

Supports	Bearing			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Roof Live	Snow	Total	
1 - Hanger on 11 7/8" LVL beam	3.50"	Hanger[1]	1.50"	549	815	1631	2995	See note [1]
2 - Stud wall - SPF	4.50"	4.50"	3.94"	2602	3095	6190	11887	None
3 - Hanger on 11 7/8" LVL beam	3.50"	Hanger[1]	1.50"	1044	1281	2562	4887	See note [1]

- 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 Connectors

Support	Model	Seat Length	Top Nails	Face Nails	Member Nails	Accessories
1 - Top Mount Hanger	HB5.50/11.88	3.50"	6-16d	16-16d	10-16d	None
3 - Top Mount Hanger	HB5.50/11.88	3.50"	6-16d	16-16d	10-16d	None

Loads	Location (Side)	Tributary Width	Dead (0.90)	Roof Live (non-snow: 1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	3 1/2" to 14' 9"	N/A	18.2			
1 - Uniform (PSF)	0 to 15' 1/2" (Front)	3' 7 1/2"	15.0	20.0	40.0	Residential - Living Areas
2 - Uniform (PSF)	0 to 15' 1/2" (Front)	13'	15.0	20.0	40.0	
3 - Uniform (PLF)	0 to 15' 1/2" (Front)	N/A	12.0	-	-	

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

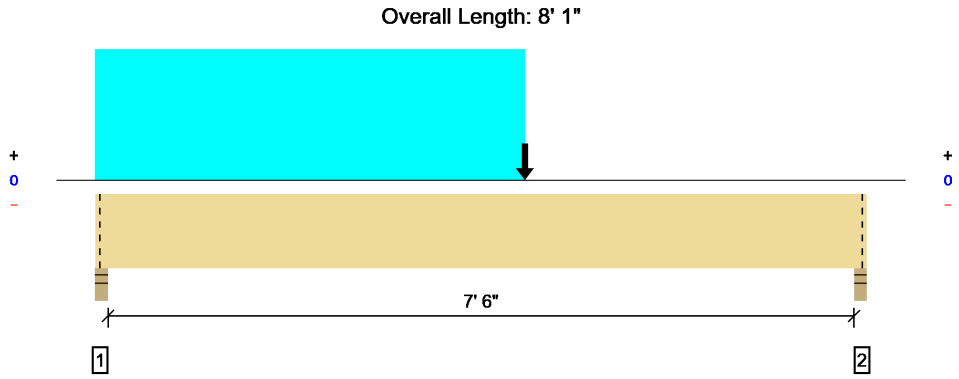
SUSTAINABLE FORESTRY INITIATIVE

FORTE

MEMBER REPORT *Level, FB-4*

PASSED

2 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.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2960 @ 2"	5206 (3.50")	Passed (57%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	2319 @ 1' 3 3/8"	9081	Passed (26%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	7773 @ 4' 6"	20525	Passed (38%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.062 @ 4' 3/8"	0.258	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.095 @ 4' 3/8"	0.387	Passed (L/975)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 8' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 1" o/c unless detailed otherwise.

Supports	Bearing			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Total	
1 - Stud wall - SPF	3.50"	3.50"	1.99"	1044	1425	550	1129	4148	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.54"	830	525	697	1433	3485	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)	Roof Live (non-snow: 1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 8' 1"	N/A	12.1				
1 - Uniform (PSF)	0 to 4' 6" (Top)	10' 10"	15.0	40.0	-	-	Residential - Living Areas
2 - Point (lb)	4' 6" (Front)	N/A	1044	-	1247	2562	

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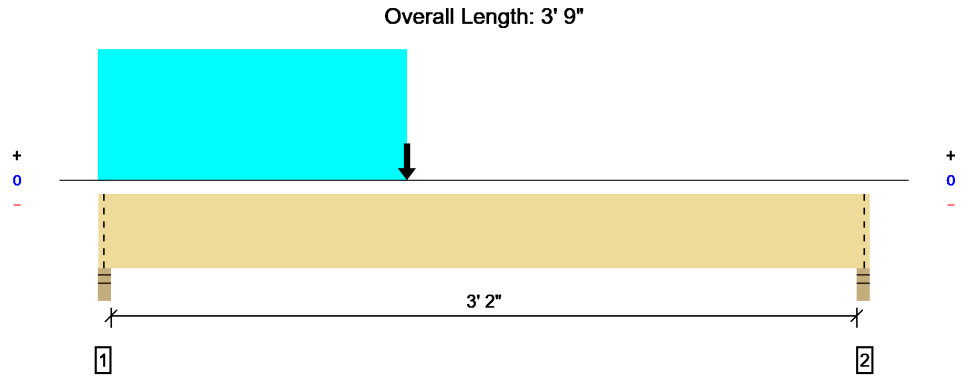
The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

PASSED

3 piece(s) 2 x 8 Douglas Fir-Larch No. 2



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	1807 @ 2"	9844 (3.50")	Passed (18%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1518 @ 10 3/4"	4502	Passed (34%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Moment (Ft-lbs)	2050 @ 1' 6"	4080	Passed (50%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Live Load Defl. (in)	0.010 @ 1' 9 7/8"	0.114	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.015 @ 1' 9 15/16"	0.171	Passed (L/999+)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 3' 9" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 3' 9" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Roof Live	Snow	Total	
1 - Stud wall - DF	3.50"	3.50"	1.50"	652	667	425	873	2617	Blocking
2 - Stud wall - DF	3.50"	3.50"	1.50"	367	278	272	559	1476	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)	Roof Live (non-snow: 1.25)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 3' 9"	N/A	8.3				
1 - Uniform (PSF)	0 to 1' 6" (Front)	7'	15.0	40.0	-	-	Residential - Living Areas
2 - Point (lb)	1' 6" (Front)	N/A	830	525	697	1432	

Weyerhaeuser Notes

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

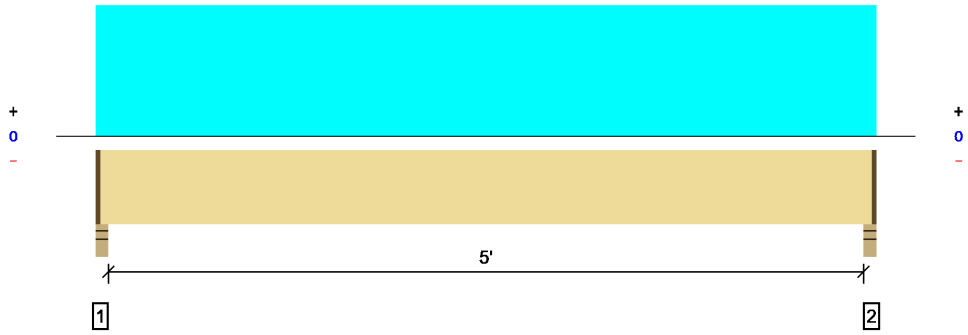
SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

PASSED

1 piece(s) 2 x 6 Douglas Fir-Larch No. 2 @ 16" OC

Overall Length: 5' 7"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	466 @ 2 1/2"	2109 (2.25")	Passed (22%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	354 @ 9"	990	Passed (36%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	578 @ 2' 9 1/2"	848	Passed (68%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.026 @ 2' 9 1/2"	0.129	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.084 @ 2' 9 1/2"	0.258	Passed (L/742)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	N/A	N/A	--	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 5' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 5' 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			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	3.50"	2.25"	1.50"	335	149	484	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.50"	335	149	484	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)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 5' 7"	16"	90.0	40.0	Residential - Living Areas

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

SUSTAINABLE FORESTRY INITIATIVE

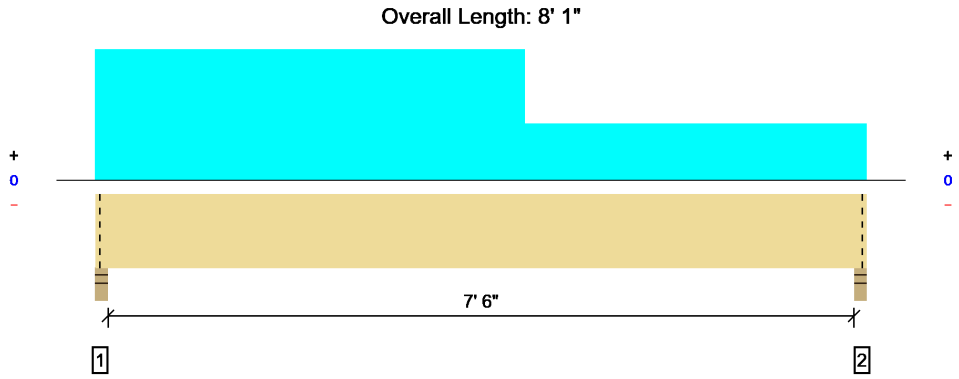
Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

FORTE

MEMBER REPORT *Level, FB-9*

PASSED

2 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.;Drawing is Conceptual

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2336 @ 2"	5206 (3.50")	Passed (45%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	1510 @ 1' 3 3/8"	7897	Passed (19%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	3853 @ 3' 7 1/2"	17848	Passed (22%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.037 @ 3' 11 1/4"	0.258	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.052 @ 3' 11 5/16"	0.387	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 8' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 8' 1" o/c unless detailed otherwise.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - SPF	3.50"	3.50"	1.57"	673	1663	2336	Blocking
2 - Stud wall - SPF	3.50"	3.50"	1.50"	470	1123	1593	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 8' 1"	N/A	12.1		
1 - Uniform (PSF)	0 to 4' 6" (Top)	6' 6"	15.0	40.0	Residential - Living Areas
2 - Uniform (PSF)	0 to 8' 1" (Front)	5'	15.0	40.0	

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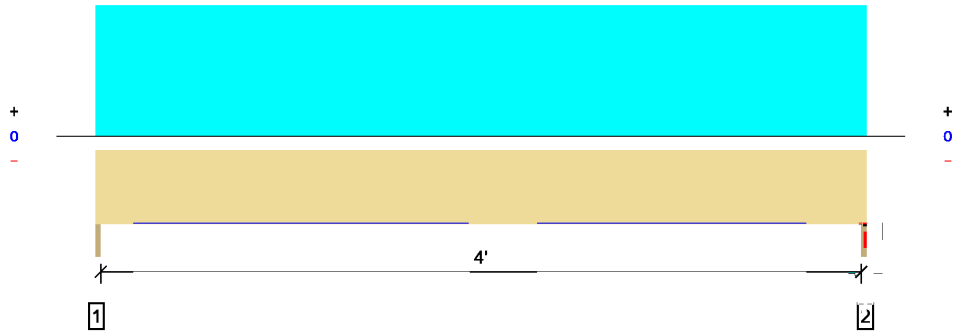
SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

PASSED

3 piece(s) 2 x 8 Douglas Fir-Larch No. 2

Overall Length: 4' 3"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	846 @ 0	4219 (1.50")	Passed (20%)	--	1.0 D + 1.0 L (All Spans)
Shear (lbs)	556 @ 8 3/4"	3915	Passed (14%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	899 @ 2' 1 1/2"	3548	Passed (25%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.010 @ 2' 1 1/2"	0.142	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.013 @ 2' 1 1/2"	0.213	Passed (L/999+)	--	1.0 D + 1.0 L (All Spans)

System : Wall
Member Type : Header
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 4' 3" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 4' 3" o/c unless detailed otherwise.
- Applicable calculations are based on NDS.

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Trimmer - SPF	1.50"	1.50"	1.50"	209	638	847	None
2 - Trimmer - SPF	1.50"	1.50"	1.50"	209	638	847	None

Loads	Location (Side)	Tributary Width	Dead (0.90)	Floor Live (1.00)	Comments
0 - Self Weight (PLF)	0 to 4' 3"	N/A	8.3		
1 - Uniform (PSF)	0 to 4' 3"	7' 6"	12.0	40.0	Residential - Living Areas

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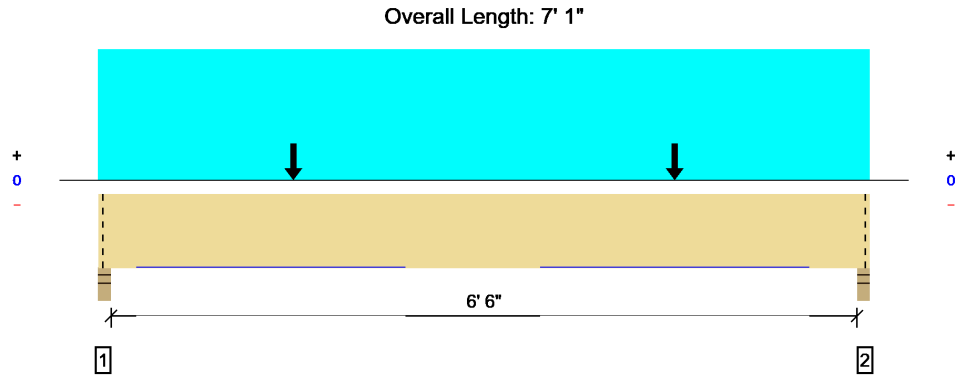
The product application, input design loads, dimensions and support information have been provided by Forte Software Operator

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

PASSED

2 piece(s) 1 3/4" x 9 1/2" 2.0E Microllam® LVL



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	3092 @ 2"	5206 (3.50")	Passed (59%)	--	1.0 D + 1.0 S (All Spans)
Shear (lbs)	3009 @ 1' 1"	7265	Passed (41%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	5021 @ 3' 6 1/2"	13541	Passed (37%)	1.15	1.0 D + 1.0 S (All Spans)
Live Load Defl. (in)	0.072 @ 3' 6 1/2"	0.225	Passed (L/999+)	--	1.0 D + 1.0 S (All Spans)
Total Load Defl. (in)	0.108 @ 3' 6 1/2"	0.338	Passed (L/752)	--	1.0 D + 1.0 S (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/360) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 7' 1" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 7' 1" o/c unless detailed otherwise.

Supports	Bearing			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - SPF	3.50"	3.50"	2.08"	1054	638	2038	3730	Blocking
2 - Stud wall - SPF	3.50"	3.50"	2.08"	1054	638	2038	3730	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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 7' 1"	N/A	9.7			
1 - Uniform (PSF)	0 to 7' 1" (Front)	4' 6"	15.0	40.0	-	Residential - Living Areas
2 - Point (lb)	1' 9 1/2" (Front)	N/A	781	-	2038	
3 - Point (lb)	5' 3 1/2" (Front)	N/A	781	-	2038	

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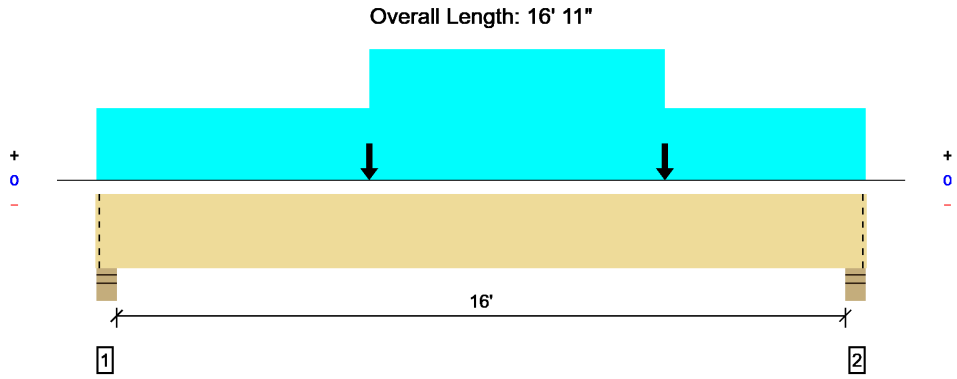
SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

3 piece(s) 1 3/4" x 14" 2.0E Microllam® LVL

PASSED



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	7918 @ 16' 7"	18047 (5.50")	Passed (44%)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	6244 @ 15' 3 1/2"	13965	Passed (45%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	30811 @ 8' 6 5/16"	36387	Passed (85%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.436 @ 8' 6"	0.542	Passed (L/447)	--	1.0 D + 0.75 L + 0.75 S (All Spans)
Total Load Defl. (in)	0.737 @ 8' 6 1/16"	0.813	Passed (L/265)	--	1.0 D + 0.75 L + 0.75 S (All Spans)

System : Floor
Member Type : Drop Beam
Building Use : Residential
Building Code : IBC 2012
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 16' 11" o/c unless detailed otherwise.

Supports	Bearing			Loads to Supports (lbs)				Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Total	
1 - Stud wall - DF	5.50"	5.50"	2.25"	2918	4229	1732	8879	Blocking
2 - Stud wall - DF	5.50"	5.50"	2.41"	3166	4229	2106	9501	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)	Snow (1.15)	Comments
0 - Self Weight (PLF)	0 to 16' 11"	N/A	21.5			
1 - Uniform (PSF)	0 to 16' 11" (Front)	11' 6"	15.0	40.0	-	Residential - Living Areas
2 - Uniform (PSF)	0 to 16' 11" (Front)	1'	15.0	40.0	-	
3 - Uniform (PLF)	6' to 12' 6" (Front)	N/A	120.0	-	-	
4 - Point (lb)	6' (Front)	N/A	495	-	879	
5 - Point (lb)	12' 6" (Front)	N/A	495	-	879	
6 - Uniform (PSF)	6' to 12' 6" (Front)	8'	15.0	-	40.0	

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SUSTAINABLE FORESTRY INITIATIVE

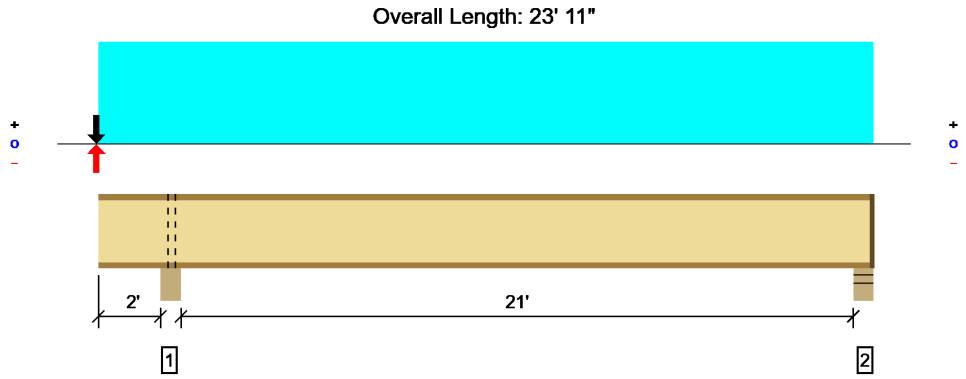
Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

FORTE

MEMBER REPORT *Level, Floor: Joist*

PASSED

2 piece(s) 11 7/8" TJI® 560 @ 16" OC



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Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	2055 @ 2' 2 3/4"	7947 (5.25")	Passed (26%)	1.15	1.0 D + 0.75 L + 0.75 S (All Spans)
Shear (lbs)	1414 @ 2'	4715	Passed (30%)	1.15	1.0 D + 1.0 S (All Spans)
Moment (Ft-lbs)	3607 @ 13' 7 1/2"	19000	Passed (19%)	1.00	1.0 D + 1.0 L (Alt Spans)
Live Load Defl. (in)	0.204 @ 12' 10 5/8"	0.533	Passed (L/999+)	--	1.0 D + 1.0 L (Alt Spans)
Total Load Defl. (in)	0.088 @ 0	0.223	Passed (2L/610)	--	1.0 D + 0.525 E + 0.75 L + 0.75 S (Alt Spans)
TJ-Pro™ Rating	51	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Overhang deflection criteria: LL (2L/480) and TL (2L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 13' 5" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 13' 3" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing			Loads to Supports (lbs)					Accessories
	Total	Available	Required	Dead	Floor Live	Snow	Seismic	Total	
1 - Beam - DF	5.50"	5.50"	3.50"	807	693	971	932/-932	3403/-932	Blocking
2 - Stud wall - DF	5.50"	4.25"	1.75"	167	588/-1	-92	88/-88	843/-181	1 1/4" Rim Board

- 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)	Spacing	Dead (0.90)	Floor Live (1.00)	Snow (1.15)	Seismic (1.60)	Comments
1 - Uniform (PSF)	0 to 23' 11"	16"	15.0	40.0	-	-	Residential - Living Areas
2 - Point (lb)	0	N/A	495	-	879	-	
3 - Point (lb)	0	N/A	-	-	-	-2532	
4 - Point (PLF)	0	16"	-	-	-	2532.0	Seismic taken by Strap at Support

Weyerhaeuser Notes

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SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

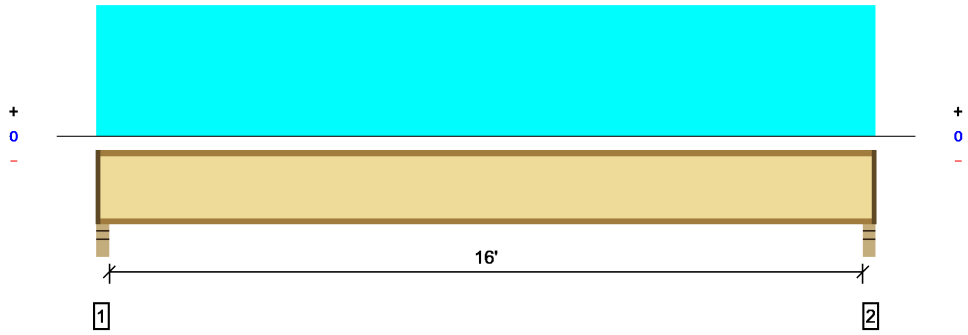
FORTE

MEMBER REPORT *Level, Floor: Joist*

PASSED

1 piece(s) 11 7/8" TJI® 210 @ 16" OC

Overall Length: 16' 7"



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

Design Results	Actual @ Location	Allowed	Result	LDF	Load: Combination (Pattern)
Member Reaction (lbs)	600 @ 2 1/2"	1134 (2.25")	Passed (53%)	1.00	1.0 D + 1.0 L (All Spans)
Shear (lbs)	587 @ 3 1/2"	1655	Passed (35%)	1.00	1.0 D + 1.0 L (All Spans)
Moment (Ft-lbs)	2396 @ 8' 3 1/2"	3795	Passed (63%)	1.00	1.0 D + 1.0 L (All Spans)
Live Load Defl. (in)	0.243 @ 8' 3 1/2"	0.404	Passed (L/798)	--	1.0 D + 1.0 L (All Spans)
Total Load Defl. (in)	0.334 @ 8' 3 1/2"	0.808	Passed (L/581)	--	1.0 D + 1.0 L (All Spans)
TJ-Pro™ Rating	45	40	Passed	--	--

System : Floor
Member Type : Joist
Building Use : Residential
Building Code : IBC 2012
Design Methodology : ASD

- Deflection criteria: LL (L/480) and TL (L/240).
- Top Edge Bracing (Lu): Top compression edge must be braced at 4' 8" o/c unless detailed otherwise.
- Bottom Edge Bracing (Lu): Bottom compression edge must be braced at 16' 5" o/c unless detailed otherwise.
- A structural analysis of the deck has not been performed.
- Deflection analysis is based on composite action with a single layer of 23/32" Weyerhaeuser Edge™ Panel (24" Span Rating) that is glued and nailed down.
- Additional considerations for the TJ-Pro™ Rating include: None

Supports	Bearing			Loads to Supports (lbs)			Accessories
	Total	Available	Required	Dead	Floor Live	Total	
1 - Stud wall - DF	3.50"	2.25"	1.75"	166	442	608	1 1/4" Rim Board
2 - Stud wall - DF	3.50"	2.25"	1.75"	166	442	608	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)	Floor Live (1.00)	Comments
1 - Uniform (PSF)	0 to 16' 7"	16"	15.0	40.0	Residential - Living Areas

Weyerhaeuser Notes

Weyerhaeuser warrants that the sizing of its products will be in accordance with Weyerhaeuser product design criteria and published design values. Weyerhaeuser expressly disclaims any other warranties related to the software. Use of this software is not intended to circumvent the need for a design professional as determined by the authority having jurisdiction. The designer of record, builder or framer is responsible to assure that this calculation is compatible with the overall project. Accessories (Rim Board, Blocking Panels and Squash Blocks) are not designed by this software. Products manufactured at Weyerhaeuser facilities are third-party certified to sustainable forestry standards. Weyerhaeuser Engineered Lumber Products have been evaluated by ICC ES under technical reports ESR-1153 and ESR-1387 and/or tested in accordance with applicable ASTM standards. For current code evaluation reports, Weyerhaeuser product literature and installation details refer to www.weyerhaeuser.com/woodproducts/document-library.

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

SUSTAINABLE FORESTRY INITIATIVE

Forte Software Operator	Job Notes
Jeff Lundgreen Reeve & Associates (801) 621-3100 jlundgreen@reeve-assoc.com	

Force Transfer Around Openings Calculator

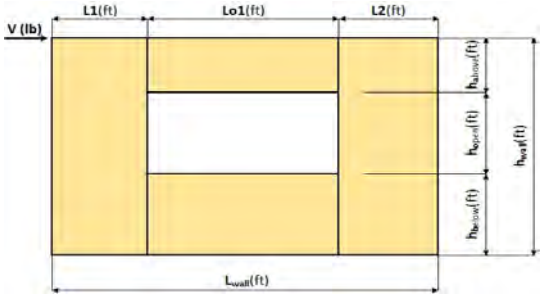
ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

Code:	2018 IBC
Designer:	JDL
Client:	ARCFLO
Project:	Spring Run Townhome
Wall Line:	Exterior Unit - Line P

Date: 11/13/2018



Shear Wall Calculation Variables

V	2589 lbf		Opening 1	Wall Pier Aspect Ratio	Adj. Factor
L1	2.25 ft	ha1	0.75 ft	P1=ho1/L1= 2.22	0.9722
L2	3.75 ft	ho1	5.00 ft	P2=ho1/L2= 1.33	N/A
h_{wall}	8.00 ft	hb1	2.25 ft		
L_{wall}	16.00 ft	Lo1	10.00 ft		

1. Hold-down forces: H = Vh_{wall}/L_{wall} 1295 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) = 432 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 4315 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 1618 lbf

F2 = O1(L2)/(L1+L2) = 2697 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 3.75 ft

T2 = (L2*Lo1)/(L1+L2) = 6.25 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 = 432 plf

V2 = (V/L)(T2+L2)/L2 = 432 plf

Check V1*L1+V2*L2=V? 2589 lbf **OK**

7. Resistance to corner forces

R1 = V1*L1 = 971 lbf

R2 = V2*L2 = 1618 lbf

8. Difference corner force + resistance

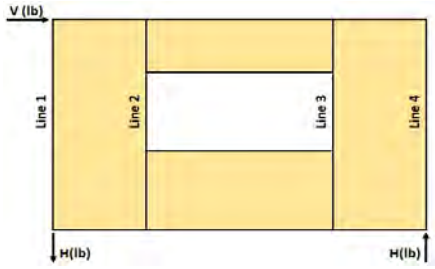
R1-F1 = -647 lbf

R2-F2 = -1079 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = -288 plf

vc2 = (R2-F2)/L2 = -288 plf



Check Summary of Shear Values for One Opening

Line 1: vc1(ha1+hb1)+V1(ho1)=H?		-863	2158	1295 lbf
Line 2: va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?	1295	-863	2158	0
Line 3: vc2(ha1+hb1)+V2(ho1)=H?		-863	2158	1295 lbf

Design Summary

Req. Sheathing Capacity	444 plf	**4-Term Deflection**	0.976 in.	**3-Term Deflection**	0.930 in.
Req. Strap Force	2697 lbf	**4-Term Story Drift %**	0.041 %	**3-Term Story Drift %**	0.039 %
Req. HD Force (H)	1295 lbf		See Page 2		See Page 3

Req. Sheathing Capacity has been adjusted per the Aspect Ratio Factor in SDPWS 4.3.4.2

Project Information

Code:	2018 IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Exterior Unit - Line P		

Shear Wall Deflection Calculation Variables

Sheathing:		Wood End Post Values:			Nail Type:	8d common	(penny weight)
OSB	Sheathing Material	Species:					
7/16	Performance Category	E:	1.60E+06	(psi)		Pier 1	Pier 2
APA Rated Sheathing	Grade		Qty	Stud Size	Nail Spacing:	4	4 (in.)
		Dimensions:	2	2x6	HD Capacity:	2175	2175 (lbf)
	Gt Override	A:	16.5	(in.^{2})	HD Deflection:	0.146	0.146 (in.)
	Ga Overide	A Override:		(in.^{2})			

Four-Term Equation Deflection Check

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_a + d_a\frac{h}{b} \qquad \text{(Equation 23-2)}$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	432	432	432	432	(plf)
$v_{strength}$:	616	616	616	616	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	5.75	5.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	(in.^{2})
Gt:	83,500	83,500	83,500	83,500	(lbf/in.)
Nail Spacing:	4	4	4	4	(in.)
Vn:	205	205	205	205	(plf)
e:	0.0364	0.0364	0.0364	0.0364	(in.)
b:	2.25	2.25	3.75	3.75	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)				Pier 1 (right)			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.043	0.059	0.218	1.177	0.016	0.042	0.157	0.608
		Sum	1.497			Sum	0.823
Pier 2 (left)				**Pier 2 (right)**			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.009	0.042	0.157	0.365	0.026	0.059	0.218	0.706
		Sum	0.574			Sum	1.009

Total Defl.	
0.976	(in.)
0.0407	%drift

Project Information

Code:	2018 IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Exterior Unit - Line P		

Three-Term Equation Deflection Check

$$\delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b} \qquad (4.3\text{-}1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	432	432	432	432	(plf)
$v_{strength}$:	616	616	616	616	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	5.75	5.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	($in.^2$)
Ga:	22.0	22.0	22.0	22.0	(kips/in.)
b:	2.25	2.25	3.75	3.75	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)			Pier 1 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.043	0.224	1.177	0.016	0.161	0.608
	Sum	1.444		Sum	0.785
Pier 2 (left)			Pier 2 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.009	0.161	0.365	0.026	0.224	0.706
	Sum	0.535		Sum	0.956

Total Defl.	
0.930	(in.)
0.0387	%drift

Comment: The 3-term equation is calibrated to be approximately equal to 4-term equation at 1.4*ASD capacity.

Force Transfer Around Openings Calculator

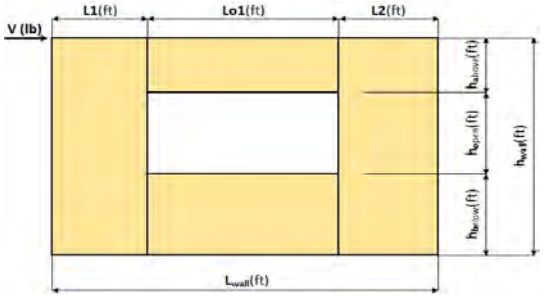
ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

Code:	2018 IBC
Designer:	JDL
Client:	ARCFLO
Project:	Spring Run Townhome
Wall Line:	Exterior Unit - Line U

Date: 11/13/2018



Shear Wall Calculation Variables

V	1740 lbf		Opening 1	Wall Pier Aspect Ratio		Adj. Factor
L1	2.00 ft	ha1	0.75 ft	P1=ho1/L1=	2.50	0.9375
L2	2.00 ft	ho1	5.00 ft	P2=ho1/L2=	2.50	0.9375
h_{wall}	8.00 ft	hb1	2.25 ft			
L_{wall}	14.00 ft	Lo1	10.00 ft			

1. Hold-down forces: H = Vh_{wall}/L_{wall} 994 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) = 331 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 3314 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 1657 lbf

F2 = O1(L2)/(L1+L2) = 1657 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 5.00 ft

T2 = (L2*Lo1)/(L1+L2) = 5.00 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 = 435 plf

V2 = (V/L)(T2+L2)/L2 = 435 plf

Check V1*L1+V2*L2=V? 1740 lbf **OK**

7. Resistance to corner forces

R1 = V1*L1 = 870 lbf

R2 = V2*L2 = 870 lbf

8. Difference corner force + resistance

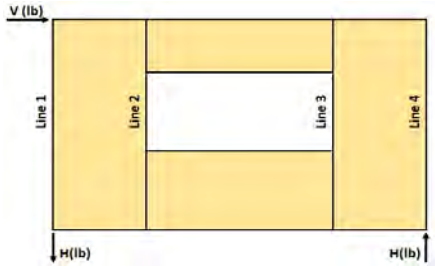
R1-F1 = -787 lbf

R2-F2 = -787 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = -394 plf

vc2 = (R2-F2)/L2 = -394 plf



Check Summary of Shear Values for One Opening

Line 1: vc1(ha1+hb1)+V1(ho1)=H?		-1181	2175	994 lbf
Line 2: va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?	994	-1181	2175	0
Line 3: vc2(ha1+hb1)+V2(ho1)=H?		-1181	2175	994 lbf

Design Summary

Req. Sheathing Capacity	464 plf	**4-Term Deflection**	1.289 in.	**3-Term Deflection**	1.239 in.
Req. Strap Force	1657 lbf	**4-Term Story Drift %**	0.054 %	**3-Term Story Drift %**	0.052 %
Req. HD Force (H)	994 lbf		See Page 2		See Page 3

Req. Sheathing Capacity has been adjusted per the Aspect Ratio Factor in SDPWS 4.3.4.2

Project Information

Code:	2018 IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Exterior Unit - Line U		

Shear Wall Deflection Calculation Variables

Sheathing:		Wood End Post Values:			Nail Type:	8d common	(penny weight)
OSB	Sheathing Material	Species:					
7/16	Performance Category	E:	1.60E+06	(psi)		Pier 1	Pier 2
APA Rated Sheathing	Grade		Qty	Stud Size	Nail Spacing:	4	4 (in.)
		Dimensions:	2	2x6	HD Capacity:	2175	2175 (lbf)
	Gt Override	A:	16.5	($in.^2$)	HD Deflection:	0.146	0.146 (in.)
	Ga Overide	A Override:		($in.^2$)			

Four-Term Equation Deflection Check

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_a + d_a\frac{h}{b} \qquad \text{(Equation 23-2)}$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	435	435	435	435	(plf)
$v_{strength}$:	621	621	621	621	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	5.75	5.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	($in.^2$)
Gt:	83,500	83,500	83,500	83,500	(lbf/in.)
Nail Spacing:	4	4	4	4	(in.)
Vn:	207	207	207	207	(plf)
e:	0.0373	0.0373	0.0373	0.0373	(in.)
b:	2.00	2.00	2.00	2.00	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)				Pier 1 (right)			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.048	0.060	0.224	1.335	0.018	0.043	0.161	0.690
		Sum	1.666			Sum	0.911
Pier 2 (left)				**Pier 2 (right)**			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.018	0.043	0.161	0.690	0.048	0.060	0.224	1.335
		Sum	0.911			Sum	1.666

Total Defl.	
1.289	(in.)
0.0537	%drift

APA Disclaimer

Project Information

Code:	2018IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Exterior Unit - Line U		

Three-Term Equation Deflection Check

$$\delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b} \qquad (4.3\text{-}1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	435	435	435	435	(plf)
$v_{strength}$:	621	621	621	621	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	5.75	5.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	($in.^2$)
Ga:	22.0	22.0	22.0	22.0	(kips/in.)
b:	2.00	2.00	2.00	2.00	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)			Pier 1 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.048	0.226	1.335	0.018	0.162	0.690
	Sum	1.609		Sum	0.870
Pier 2 (left)			Pier 2 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.018	0.162	0.690	0.048	0.226	1.335
	Sum	0.870		Sum	1.609

Total Defl.	
1.239	(in.)
0.0516	%drift

Comment: The 3-term equation is calibrated to be approximately equal to 4-term equation at 1.4*ASD capacity.

Reeve & Associates, Inc.	PROJECT	Spring Run 4-Plex Townhome	PROJ NO.	4899-A	
			CALC NO.		
	SUBJECT	**Low Roof Snow Load per ASCE 7** **Leeward and Windward Snow Drift**	BY: JDL	DATE	#######
			CHK	DATE	
			SHEET	OF	REV

Description: Interior Townhome

GENERAL INPUT AND OUTPUT:

"Leeward" or "Windward":	1.00	*Leeward*	Snow Load Density:	21.42 pcf
Roof Slope:	0:12	*0.00 °*	h_b (Snow Depth):	1.87 feet
County (State of Utah)	UTAH		h_d (potential drift height):	-1.50 feet
Elevation at Site	5040 ft		h_c (Roof to Snow):	0.00 feet
p_g (SEAU Flat Roof Snow)	55 psf	57 psf *<---Manual Entry*	Maximum Drift Height:	0.00 feet
C_e (Exposure Factor):	1.0		Drift Width:	0.00 feet
C_t (Thermal Factor):	1.0			
I_s (Importance Factor):	1.0		Maximum Snow Load:	**40.0 psf**
L_u (Length of Roof):	0.00 feet	*Upper Roof*		
Elevation Difference:	0.00 feet		Maximum Drift Weight:	**0.00 psf**
P_f (Roof Snow):	**40.0 psf**		Drift Width:	**0.00 feet**
C_s (Roof Slope Factor):	1.0			
P_s (Sloped Roof Snow):	**40.0 psf**			

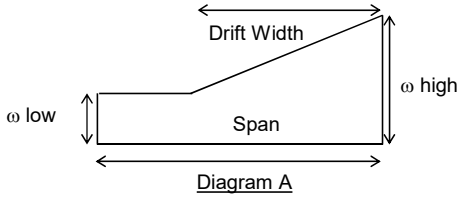


Diagram A

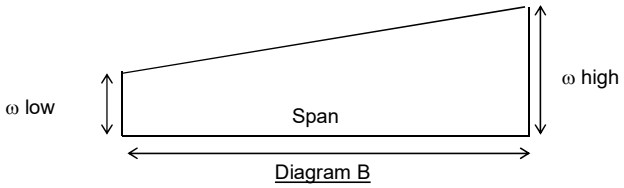


Diagram B

Reeve & Associates, Inc.

Land Planners · Civil Engineers · Land Surveyors
Traffic Engineers · Structural Engineers · Landscape Architects
5160 South 1500 West -- Riverdale, UT 84405
Phone: (801) 621-3100
Fax: (801) 621-2666

Date:	Sheet 1 Of 1
Designed By: JDL	Project Number:

Seismic Calculations

Earthquake Loads-Site Ground Motion

I=	1		h_n=	25.00 ft	(Building Height)
R=	6.5	Wood Shear Wall	Structure Type =	Other	
S_s=	0.872		C_t=	0.02	
S_1=	0.296		x=	0.75	
Site Class=	D				

Check Height for LFRS = 25.0ft > NP (per exception 12.2.5.6 where
DL = 6.5 psf (Estimated) DL <20psf allowed up to 65ft)

F_a= 1.15
S_{MS}= 1.004 S_{MS}= F_a*S_S
S_{DS}= 0.669 S_{DS}= 2*S_{MS}/3

F_v= 1.81
S_{M1}= 0.535 S_{M1}= F_v*S_1
S_{D1}= 0.357 S_{D1}= 2*S_{M1}/3

Earthquake Loads-Minimum Design Lateral Force

C_s= 0.103 T= 0.224 s
C_s= 0.245 Load Combinations that control lateral:
C_s= 0.029 D+0.75L+0.75S+0.75(0.7*E)

ASD Load Factor = 0.7 0.6D+0.7E
Rho = 1.3

USE
C_s= 0.103
$V=C_S*W$ **V = ASD Load Factor*Rho*Cs*W = 0.09 *W**

Dead Load Effect

0.2*S_{DS}= 0.134
(+/-) 0.2*S_{DS}*D

Seismic Design Category

SDS => D

SD1 => D

Wind Design - ASCE 7-10 Chp 27

Risk Category =	II	
Basic Wind Speed V =	115	mph
Exposure Category =	C	
Wind Directionality Factor, Kd =	0.85	
Topographic Factor, K_{zt} =	1	
Gust Effect Factor, G =	0.85	
Total Stories =	1	(5 max)
Internal Pressure Coefficient, Gcpi =	0.18	
	-0.18	

Enclosure Classification

	Length	Height	Ag	Ao	% open	Open	Partial 1	Partial 2	Partial Total
Wall 1 =	20	10	200	200	100.0	Y	N	Y	N
Wall 2 =	17	10	170	170	100.0	Y	N	N	N
Wall 3 =	20	10	200	200	100.0	Y	N	Y	N
Wall 4 =	17	10	170	0	0.0	N	N	N	N

Open Building:	NO
Partially Open:	NO
Enclosed:	YES

Wall Pressure

	Front to Back	Side to Side
Windward Wall, Cp =	0.8	0.8
Windward Wall Width, B =	28 ft	52 ft
Side Wall Width, L =	52 ft	28 ft
L/B =	1.839286	0.543689
Leeward Wall, Cp =	-0.3	-0.5
Side Wall, Cp =	-0.7	-0.7

Roof Pressure

Roof Type =	Gable 2		Gable 1	
Roof Pitch =	5/12	22.6 °	8/12	33.7 °
Ridge Height =	29 ft		29 ft	
Eave Height =	19 ft		18 ft	
Mean Roof Height, h =	24.1 ft		23.6 ft	
h/L =	0.47		0.86	
h/2 =	12 ft		12 ft	
Kh =	0.94		0.93	
qh =	27.0 psf		26.9 psf	

Parapet Wall Pressure

Parapet Wall Height =	0 ft
Building Height to top of parapet=	10 ft
Kz =	0.85
qp =	24.4 psf
WW GCpn =	1.50
LW GCpn+	-1.00
Pp =	61.1 psf
Adj. Pp =	36.6 psf
Parapet Load per foot =	0.0 plf

Roof Pressure Coefficient, Cp

		WW Area: 142 ft²	LW Area: 142 ft²				WW Area: 1036 ft²	LW Area: 1036 ft²		
		Front to Back					Side to Side			
		Distance from Windward Edge, ft					Distance from Windward Edge, ft			
	Max/Min	0 ft	12 ft	24 ft	48 ft	Max/Min	0 ft	12 ft	24 ft	48 ft
Windward Normal to Ridge =	Max	0.12	0.12	0.12	0.12	Max	-0.03	-0.03	-0.03	-0.03
	Min	-0.33	-0.33	-0.33	-0.33	Min	-0.53	-0.53	-0.53	-0.53
Leeward Normal to Ridge =	Max	-0.60	-0.60	-0.60	-0.60	Max	-0.60	-0.60	-0.60	-0.60
	Min	-0.60	-0.60	-0.60	-0.60	Min	-0.60	-0.60	-0.60	-0.60
Parallel to Ridge =	Max	-0.18	-0.18	-0.18	-0.18	Max	-0.18	-0.18	-0.18	-0.18
	Min	-0.90	-0.90	-0.50	-0.30	Min	-1.19	-1.19	-0.64	-0.59

ASD Factor 0.6

					Front to Back				Total	Shear	Adj. Shear	Adj. Wall
Load Description	Overall Height	Wall Trib	Kz	qz	WW	LW	SW	Int +/-	WW+LW	Force, lbs	Force, lbs	Force
Roof	24.1 ft	-	-	max-->	2.8 psf	-13.8 psf	varies	4.9 psf	16.6 psf	908 lbs	545 lbs	2060 lbs
				min-->	-7.7 psf	-13.8 psf	varies	-4.9 psf	6.1 psf	333 lbs	200 lbs	
Roof	18 ft	4.5	0.88	25.4 psf	17.3 psf	-6.9 psf	-16.1 psf	4.9 psf	24.1 psf	3042 lbs	1825 lbs	
Floor	9 ft	9	0.85	24.4 psf	16.6 psf	-6.9 psf	-16.1 psf	4.9 psf	23.5 psf	5920 lbs	3552 lbs	
			0.85	24.4 psf	16.6 psf	-6.9 psf	-16.1 psf	4.9 psf	23.5 psf	0 lbs	0 lbs	
			0.85	24.4 psf	16.6 psf	-6.9 psf	-16.1 psf	4.9 psf	23.5 psf	0 lbs	0 lbs	
			0.85	24.4 psf	16.6 psf	-6.9 psf	-16.1 psf	4.9 psf	23.5 psf	0 lbs	0 lbs	
Other												
									Front to Back Total Shear:	9871 lbs	7437 lbs	

			Side to Side				Total	Shear	Adj. Shear	Adj. Wall
			WW	LW	SW	Int +/-	WW + LW	Force, lbs	Force, lbs	Force
Roof		max-->	-0.7 psf	-13.8 psf	varies	4.9 psf	13.0 psf	7482 lbs	4489 lbs	
		min-->	-12.1 psf	-13.8 psf	varies	-4.9 psf	1.7 psf	977 lbs	586 lbs	
Roof			17.3 psf	-11.5 psf	-16.1 psf	4.9 psf	28.7 psf	6659 lbs	3995 lbs	
Floor			16.6 psf	-11.5 psf	-16.1 psf	4.9 psf	28.1 psf	13016 lbs	7809 lbs	
			16.6 psf	-11.5 psf	-16.1 psf	4.9 psf	28.1 psf	0 lbs	0 lbs	
			16.6 psf	-11.5 psf	-16.1 psf	4.9 psf	28.1 psf	0 lbs	0 lbs	
			16.6 psf	-11.5 psf	-16.1 psf	4.9 psf	28.1 psf	0 lbs	0 lbs	
Other										
							Side to Side Total Shear:	27156 lbs	16294 lbs	

Force Transfer Around Openings Calculator

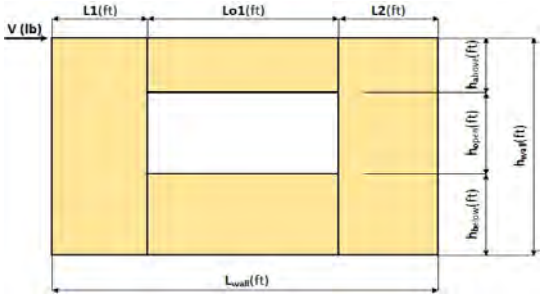
ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

Code:	2018 IBC
Designer:	JDL
Client:	ARCFLO
Project:	Spring Run Townhome
Wall Line:	Interior Unit - Line C Lower Level

Date: 11/13/2018



Shear Wall Calculation Variables

V	8147 lbf		Opening 1	Wall Pier Aspect Ratio		Adj. Factor
L1	2.75 ft	ha1	1.00 ft	P1=ho1/L1=	2.55	0.9318
L2	2.75 ft	ho1	7.00 ft	P2=ho1/L2=	2.55	0.9318
h_{wall}	8.00 ft	hb1	0.00 ft			
L_{wall}	8.50 ft	Lo1	3.00 ft			

1. Hold-down forces: H = Vh_{wall}/L_{wall} 7668 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) = N/A

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) =

4. Corner forces

F1 = O1(L1)/(L1+L2) =

F2 = O1(L2)/(L1+L2) =

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 1.50 ft

T2 = (L2*Lo1)/(L1+L2) = 1.50 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 = 1481 plf

V2 = (V/L)(T2+L2)/L2 = 1481 plf

Check V1*L1+V2*L2=V? 8147 lbf **OK**

7. Resistance to corner forces

R1 = V1*L1 = 4074 lbf

R2 = V2*L2 = 4074 lbf

8. Difference corner force + resistance

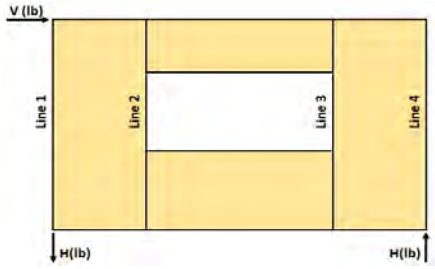
R1-F1 =

R2-F2 =

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 =

vc2 = (R2-F2)/L2 =



Check Summary of Shear Values for One Opening

Line 1: vc1(ha1+hb1)+V1(ho1)=H?	10369
Line 2: va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?	10369
Line 3: vc2(ha1+hb1)+V2(ho1)=H?	10369

Design Summary

Req. Sheathing Capacity	N/A	**4-Term Deflection**	12.659 in.	**3-Term Deflection**	4.195 in.
Req. Strap Force	0 lbf	**4-Term Story Drift %**	0.527 %	**3-Term Story Drift %**	0.175 %
Req. HD Force (H)	7668 lbf		See Page 2		See Page 3

Req. Sheathing Capacity has been adjusted per the Aspect Ratio Factor in SDPWS 4.3.4.2

Project Information

Code:	2018IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Interior Unit - Line C Lower Level		

Shear Wall Deflection Calculation Variables

Sheathing:		Wood End Post Values:			Nail Type:	8d common	(penny weight)
OSB	Sheathing Material	Species:					
7/16	Performance Category	E:	1.60E+06	(psi)		Pier 1	Pier 2
APA Rated Sheathing	Grade		Qty	Stud Size	Nail Spacing:	4	4 (in.)
		Dimensions:	2	2x6	HD Capacity:	2175	2175 (lbf)
	Gt Override	A:	16.5	(in.^{2})	HD Deflection:	0.146	0.146 (in.)
	Ga Overide	A Override:		(in.^{2})			

Four-Term Equation Deflection Check

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_a + d_a\frac{h}{b} \qquad \text{(Equation 23-2)}$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	1481	1481	1481	1481	(plf)
$v_{strength}$:	2116	2116	2116	2116	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	8.00	8.00	8.00	(ft)
A:	16.5	16.5	16.5	16.5	(in.^{2})
Gt:	83,500	83,500	83,500	83,500	(lbf/in.)
Nail Spacing:	4	4	4	4	(in.)
Vn:	705	705	705	705	(plf)
e:	1.5051	1.5051	1.5051	1.5051	(in.)
b:	2.75	2.75	2.75	2.75	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)				Pier 1 (right)			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.119	0.203	9.031	3.306	0.119	0.203	9.031	3.306
		Sum	12.659			Sum	12.659
Pier 2 (left)				**Pier 2 (right)**			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.119	0.203	9.031	3.306	0.119	0.203	9.031	3.306
		Sum	12.659			Sum	12.659

Total Defl.	
12.659	(in.)
0.5274	%drift

Project Information

Code:	2018 IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Interior Unit - Line C Lower Level		

Three-Term Equation Deflection Check

$$\delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b} \qquad (4.3\text{-}1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	1481	1481	1481	1481	(plf)
$v_{strength}$:	2116	2116	2116	2116	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	8.00	8.00	8.00	(ft)
A:	16.5	16.5	16.5	16.5	($in.^2$)
Ga:	22.0	22.0	22.0	22.0	(kips/in.)
b:	2.75	2.75	2.75	2.75	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)			Pier 1 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.119	0.769	3.306	0.119	0.769	3.306
	Sum	4.195		Sum	4.195
Pier 2 (left)			Pier 2 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.119	0.769	3.306	0.119	0.769	3.306
	Sum	4.195		Sum	4.195

Total Defl.	
4.195	(in.)
0.1748	%drift

Comment: The 3-term equation is calibrated to be approximately equal to 4-term equation at 1.4*ASD capacity.

Force Transfer Around Openings Calculator

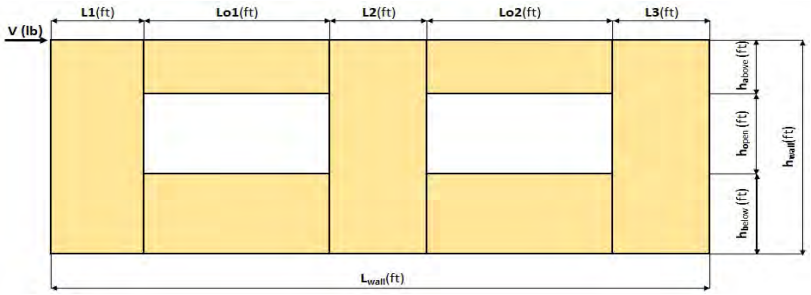
TWO OPENINGS

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

Code:	2018NDS
Designer:	JDL
Client:	Arcflo
Project:	Spring Run Townhomes
Wall Line:	Front LVL 2

Date: 11/13/2018



Shear Wall Calculation Variables

V	2346 lbf		Opening 1		Opening 2	Wall Pier Aspect Ratio		Adj. Factor
L1	2.67 ft	ha1	0.75 ft	ha2	0.75 ft	P1=ho1/L1=	1.50	N/A
L2	2.50 ft	ho1	4.00 ft	ho2	4.00 ft	P2=ho2/L2=	1.60	N/A
L3	2.00 ft	hb1	3.25 ft	hb2	3.25 ft	P3=ho2/L3=	2.00	N/A
h_{wall}	8.00 ft	Lo1	3.00 ft	Lo2	5.00 ft			
L_{wall}	15.17 ft							

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ 1237 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) =	309 plf
Second opening: va2 = vb2 = H/(ha2+hb2) =	309 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) =	928 lbf
Second opening: O2 = va2 x (Lo2) =	1547 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) =	479 lbf
F2 = O1(L2)/(L1+L2) =	449 lbf
F3 = O2(L2)/(L2+L3) =	859 lbf
F4 = O2(L3)/(L2+L3) =	687 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) =	1.55 ft
T2 = (L2*Lo1)/(L1+L2) =	1.45 ft
T3 = (L2*Lo2)/(L2+L3) =	2.78 ft
T4 = (L3*Lo2)/(L2+L3) =	2.22 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 =	244 plf
V2 = (V/L)(T2+L2+T3)/L2 =	416 plf
V3 = (V/L)(T4+L3)/L3 =	327 plf
Check V1*L1+V2*L2+V3*L3=V?	2346 lbf **OK**

7. Resistance to corner forces

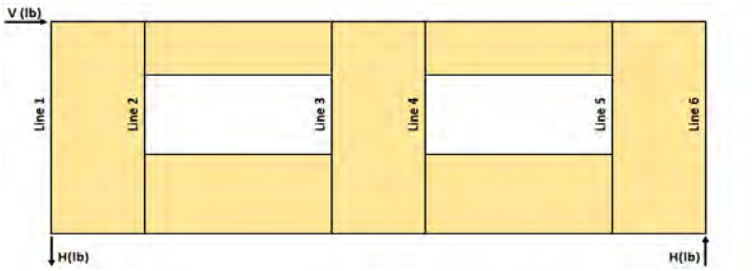
R1 = V1*L1 =	652 lbf
R2 = V2*L2 =	1041 lbf
R3 = V3*L3 =	653 lbf

8. Difference corner force + resistance

R1-F1 =	173 lbf
R2-F2-F3 =	-267 lbf
R3-F4 =	-34 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 =	65 plf
vc2 = (R2-F2-F3)/L2 =	-107 plf
vc3 = (R3-F4)/L3 =	-17 plf



Check Summary of Shear Values for Two Openings

Line 1: vc1(ha1+hb1)+V1(ho1)=H?		259	978	1237 lbf
Line 2: va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?	1237	259	978	0
Line 3: vc2(ha1+hb1)+V2(ho1)-va1(ha1+hb1)=0?	-428	1665	1237	0
Line 4: va2(ha2+hb2)-V2(ho2)-vc2(ha2+hb2)=0?	1237	1665	-428	0
Line 5: va2(ha2+hb2)-vc3(ha2+hb2)-V3(ho2)=0?	1237	-69	1306	0
Line 6: vc3(ha2+hb2)+ V3(ho2) = H?		-69	1306	1237 lbf

Design Summary

Req. Sheathing Capacity	416 plf	**4-Term Deflection**		**3-Term Deflection**	
Req. Strap Force	859 lbf	**4-Term Story Drift %**		**3-Term Story Drift %**	
Req. HD Force	1237 lbf				
		See Page 2		See Page 3	

Project Information

Code:	2018NDS	**Date:**	11/13/2018
Designer:	JDL		
Client:	Arcflo		
Project:	Spring Run Townhomes		
Wall Line:	Front LVL 2		

Shear Wall Deflection Calculation Variables

Sheathing:		Wood End Post Values:			Nail Type:	8d common	(penny weight)
Material	Sheathing Material	Species:					
	Performance Category	E:	1.60E+06	(psi)		Pier 1	Pier 3
APA Rated Sheathing	Grade		Qty	Stud Size	Nail Spacing:	2	2 (in.)
		Dimensions:	2	2x6	HD Capacity:		0 (lbf)
	Gt Override	A:	16.5	($in.^2$)	HD Deflection:		0 (in.)
	Ga Overide	A Override:		($in.^2$)			

Four-Term Equation Deflection Check

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_a + d_a\frac{h}{b} \qquad \text{(Equation 23-2)}$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	Pier 3-L	Pier 3-R	
Sheathing:							
Nail:	8d common	8d common	8d common	8d common	8d common	8d common	
v_{asd}:	244	244	416	416	327	327	(plf)
$v_{strength}$:	349	349	595	595	466	466	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	4.75	4.75	4.75	4.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	16.5	16.5	($in.^2$)
Gt:							(lbf/in.)
Nail Spacing:	2	2	2	2	2	2	(in.)
Vn:	58	58	99	99	78	78	(plf)
e:	0.0008	0.0008	0.0040	0.0040	0.0019	0.0019	(in.)
b:	2.67	2.67	2.50	2.50	2.00	2.00	(ft)
HD Capacity:	0	0	0	0	0	0	(lbf)
HD Defl:	0	0	0	0	0	0	(in.)

Check Total Deflection of Wall System

Pier 1 (left)				Pier 1 (right)			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.020		0.005		0.004		0.003	
		Sum	0.025			Sum	0.007
Pier 2 (left)				Pier 2 (right)			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.008		0.014		0.008		0.014	
		Sum	0.022			Sum	0.022
Pier 3 (left)				Pier 3 (right)			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.008		0.007		0.036		0.012	
		Sum	0.014			Sum	0.048

Total Defl.
(in.)
%drift

Project Information

Code:	2018 NDS	**Date:**	11/13/2018
Designer:	JDL		
Client:	Arcflo		
Project:	Spring Run Townhomes		
Wall Line:	Front LVL 2		

Three-Term Equation Deflection Check

$$\delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b} \qquad (4.3\text{-}1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	Pier 3-L	Pier 3-R	
Sheathing:							
Nail:	8d common	8d common	8d common	8d common	8d common	8d common	
v_{asd}:	244	244	416	416	327	327	(plf)
$v_{strength}$:	349	349	595	595	466	466	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	4.75	4.75	4.75	4.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	16.5	16.5	($in.^2$)
Ga:							(kips/in.)
b:	2.67	2.67	2.50	2.50	2.00	2.00	(ft)
HD Capacity:	0	0	0	0	0	0	(lbf)
HD Defl:	0	0	0	0	0	0	(in.)

Check Total Deflection of Wall System

Pier 1 (left)			Pier 1 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.020			0.004		
	Sum	0.020		Sum	0.004
Pier 2 (left)			Pier 2 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.008			0.008		
	Sum	0.008		Sum	0.008
Pier 3 (left)			Pier 3 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.008			0.036		
	Sum	0.008		Sum	0.036

Total Defl.	
	(in.)
	%drift

Comment: The 3-term equation is calibrated to be approximately equal to 4-term equation at 1.4*ASD capacity.

Force Transfer Around Openings Calculator

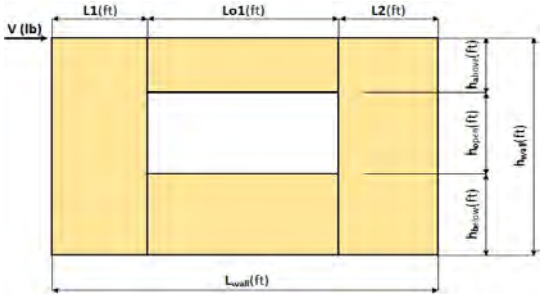
ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

Code:	2018IBC
Designer:	JDL
Client:	ARCFLO
Project:	Spring Run Townhome
Wall Line:	Interior Unit - Line P

Date: 11/13/2018



Shear Wall Calculation Variables

V	1580 lbf		Opening 1	Wall Pier Aspect Ratio		Adj. Factor
L1	2.50 ft	ha1	0.75 ft	P1=ho1/L1=	2.00	N/A
L2	2.25 ft	ho1	5.00 ft	P2=ho1/L2=	2.22	0.9722
h_{wall}	8.00 ft	hb1	2.25 ft			
L_{wall}	14.75 ft	Lo1	10.00 ft			

1. Hold-down forces: H = Vh_{wall}/L_{wall} 857 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) = 286 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 2857 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 1504 lbf

F2 = O1(L2)/(L1+L2) = 1353 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 5.26 ft

T2 = (L2*Lo1)/(L1+L2) = 4.74 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 = 333 plf

V2 = (V/L)(T2+L2)/L2 = 333 plf

Check V1*L1+V2*L2=V? 1580 lbf **OK**

7. Resistance to corner forces

R1 = V1*L1 = 832 lbf

R2 = V2*L2 = 749 lbf

8. Difference corner force + resistance

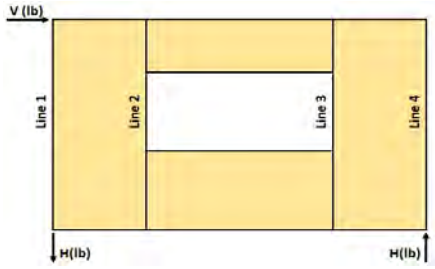
R1-F1 = -672 lbf

R2-F2 = -605 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = -269 plf

vc2 = (R2-F2)/L2 = -269 plf



Check Summary of Shear Values for One Opening

Line 1: vc1(ha1+hb1)+V1(ho1)=H?		-806	1664	857 lbf
Line 2: va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?	857	-806	1664	0
Line 3: vc2(ha1+hb1)+V2(ho1)=H?		-806	1664	857 lbf

Design Summary

Req. Sheathing Capacity	342 plf	**4-Term Deflection**	0.800 in.	**3-Term Deflection**	0.824 in.
Req. Strap Force	1504 lbf	**4-Term Story Drift %**	0.033 %	**3-Term Story Drift %**	0.034 %
Req. HD Force (H)	857 lbf		See Page 2		See Page 3

Req. Sheathing Capacity has been adjusted per the Aspect Ratio Factor in SDPWS 4.3.4.2

Project Information

Code:	2018 IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Interior Unit - Line P		

Shear Wall Deflection Calculation Variables

Sheathing:		Wood End Post Values:			Nail Type:	8d common	(penny weight)
OSB	Sheathing Material	Species:					
7/16	Performance Category	E:	1.60E+06	(psi)		Pier 1	Pier 2
APA Rated Sheathing	Grade		Qty	Stud Size	Nail Spacing:	4	4 (in.)
		Dimensions:	2	2x6	HD Capacity:	2175	2175 (lbf)
	Gt Override	A:	16.5	($in.^2$)	HD Deflection:	0.146	0.146 (in.)
	Ga Overide	A Override:		($in.^2$)			

Four-Term Equation Deflection Check

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_a + d_a\frac{h}{b} \qquad \text{(Equation 23-2)}$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	333	333	333	333	(plf)
$v_{strength}$:	475	475	475	475	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	5.75	5.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	($in.^2$)
Gt:	83,500	83,500	83,500	83,500	(lbf/in.)
Nail Spacing:	4	4	4	4	(in.)
Vn:	158	158	158	158	(plf)
e:	0.0166	0.0166	0.0166	0.0166	(in.)
b:	2.50	2.50	2.25	2.25	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)				Pier 1 (right)			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.029	0.046	0.100	0.817	0.011	0.033	0.072	0.422
		Sum	0.991			Sum	0.537
Pier 2 (left)				**Pier 2 (right)**			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.012	0.033	0.072	0.469	0.033	0.046	0.100	0.908
		Sum	0.585			Sum	1.085

Total Defl.	
0.800	(in.)
0.0333	%drift

APA Disclaimer

Project Information

Code:	2018 IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Interior Unit - Line P		

Three-Term Equation Deflection Check

$$\delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b} \qquad (4.3\text{-}1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	333	333	333	333	(plf)
$v_{strength}$:	475	475	475	475	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	5.75	5.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	($in.^2$)
Ga:	22.0	22.0	22.0	22.0	(kips/in.)
b:	2.50	2.50	2.25	2.25	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)			Pier 1 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.029	0.173	0.817	0.011	0.124	0.422
	Sum	1.019		Sum	0.557
Pier 2 (left)			Pier 2 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.012	0.124	0.469	0.033	0.173	0.908
	Sum	0.605		Sum	1.113

Total Defl.	
0.824	(in.)
0.0343	%drift

Comment: The 3-term equation is calibrated to be approximately equal to 4-term equation at 1.4*ASD capacity.

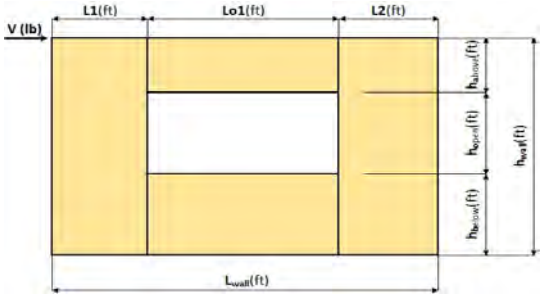
Force Transfer Around Openings Calculator

ONE OPENING

The force transfer around openings (FTAO) method of shear wall analysis is an approach that aims to reinforce the wall such that it performs as if there was no opening. This approach lends certain advantages over segmented shear walls: more versatility, because it allows for narrower wall segments while still meeting the height-to-width ratios and, often, fewer required hold-downs.

Project Information

Code:	2018 IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Interior Unit - Line U		



Shear Wall Calculation Variables

			Opening 1
V	2662 lbf	ha1	0.75 ft
L1	4.00 ft	ho1	5.00 ft
L2	4.00 ft	hb1	2.25 ft
h_{wall}	8.00 ft	Lo1	6.00 ft
L_{wall}	14.00 ft		

Wall Pier Aspect Ratio		Adj. Factor
P1=ho1/L1=	1.25	N/A
P2=ho1/L2=	1.25	N/A

1. Hold-down forces: H = Vh_{wall}/L_{wall} 1521 lbf

2. Unit shear above + below opening

First opening: va1 = vb1 = H/(ha1+hb1) = 507 plf

3. Total boundary force above + below openings

First opening: O1 = va1 x (Lo1) = 3042 lbf

4. Corner forces

F1 = O1(L1)/(L1+L2) = 1521 lbf
F2 = O1(L2)/(L1+L2) = 1521 lbf

5. Tributary length of openings

T1 = (L1*Lo1)/(L1+L2) = 3.00 ft
T2 = (L2*Lo1)/(L1+L2) = 3.00 ft

6. Unit shear beside opening

V1 = (V/L)(L1+T1)/L1 = 333 plf
V2 = (V/L)(T2+L2)/L2 = 333 plf
Check V1*L1+V2*L2=V? 2662 lbf **OK**

7. Resistance to corner forces

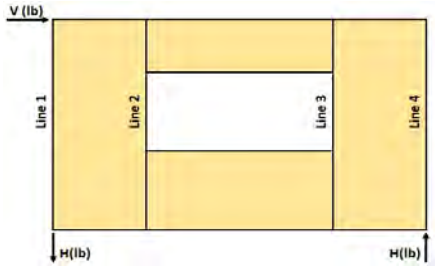
R1 = V1*L1 = 1331 lbf
R2 = V2*L2 = 1331 lbf

8. Difference corner force + resistance

R1-F1 = -190 lbf
R2-F2 = -190 lbf

9. Unit shear in corner zones

vc1 = (R1-F1)/L1 = -48 plf
vc2 = (R2-F2)/L2 = -48 plf



Check Summary of Shear Values for One Opening

Line 1: vc1(ha1+hb1)+V1(ho1)=H?		-143	1664	1521 lbf
Line 2: va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?	1521	-143	1664	0
Line 3: vc2(ha1+hb1)+V2(ho1)=H?		-143	1664	1521 lbf

Design Summary

Req. Sheathing Capacity	507 plf	**4-Term Deflection**	0.524 in.	**3-Term Deflection**	0.548 in.
Req. Strap Force	1521 lbf	**4-Term Story Drift %**	0.022 %	**3-Term Story Drift %**	0.023 %
Req. HD Force (H)	1521 lbf		See Page 2		See Page 3

Project Information

Code:	2018IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Interior Unit - Line U		

Shear Wall Deflection Calculation Variables

Sheathing:		Wood End Post Values:			Nail Type:	8d common	(penny weight)
OSB	Sheathing Material	Species:					
7/16	Performance Category	E:	1.60E+06	(psi)		Pier 1	Pier 2
APA Rated Sheathing	Grade		Qty	Stud Size	Nail Spacing:	4	4 (in.)
		Dimensions:	2	2x6	HD Capacity:	2175	2175 (lbf)
	Gt Override	A:	16.5	($in.^2$)	HD Deflection:	0.146	0.146 (in.)
	Ga Overide	A Override:		($in.^2$)			

Four-Term Equation Deflection Check

$$\Delta = \frac{8vh^3}{EAb} + \frac{vh}{Gt} + 0.75he_a + d_a\frac{h}{b} \qquad \text{(Equation 23-2)}$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	333	333	333	333	(plf)
$v_{strength}$:	475	475	475	475	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	5.75	5.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	($in.^2$)
Gt:	83,500	83,500	83,500	83,500	(lbf/in.)
Nail Spacing:	4	4	4	4	(in.)
Vn:	158	158	158	158	(plf)
e:	0.0166	0.0166	0.0166	0.0166	(in.)
b:	4.00	4.00	4.00	4.00	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)				Pier 1 (right)			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.018	0.046	0.100	0.510	0.007	0.033	0.072	0.264
		Sum	0.674			Sum	0.375
Pier 2 (left)				**Pier 2 (right)**			
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-1	Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 4 HD-2
0.007	0.033	0.072	0.264	0.018	0.046	0.100	0.510
		Sum	0.375			Sum	0.674

Total Defl.	
0.524	(in.)
0.0219	%drift

Project Information

Code:	2018 IBC	**Date:**	11/13/2018
Designer:	JDL		
Client:	ARCFLO		
Project:	Spring Run Townhome		
Wall Line:	Interior Unit - Line U		

Three-Term Equation Deflection Check

$$\delta_{sw} = \frac{8vh^3}{EAb} + \frac{vh}{1000G_a} + \frac{h\Delta_a}{b} \qquad (4.3\text{-}1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	
Sheathing:	7/16	7/16	7/16	7/16	
Nail:	8d common	8d common	8d common	8d common	
v_{asd}:	333	333	333	333	(plf)
$v_{strength}$:	475	475	475	475	(plf)
E:	1.60E+06	1.60E+06	1.60E+06	1.60E+06	(psi)
h:	8.00	5.75	5.75	8.00	(ft)
A:	16.5	16.5	16.5	16.5	($in.^2$)
Ga:	22.0	22.0	22.0	22.0	(kips/in.)
b:	4.00	4.00	4.00	4.00	(ft)
HD Capacity:	2175	2175	2175	2175	(lbf)
HD Defl:	0.146	0.146	0.146	0.146	(in.)

Check Total Deflection of Wall System

Pier 1 (left)			Pier 1 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.018	0.173	0.510	0.007	0.124	0.264
	Sum	0.702		Sum	0.395
Pier 2 (left)			Pier 2 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
0.007	0.124	0.264	0.018	0.173	0.510
	Sum	0.395		Sum	0.702

Total Defl.	
0.548	(in.)
0.0228	%drift

Comment: The 3-term equation is calibrated to be approximately equal to 4-term equation at 1.4*ASD capacity.

Deflection Comparison Calculation

Portal Frame Comparison

	Force	Deflection
24	1515.5	0.4177
16	784.75	0.3619
Actual	1515.5	0.4177
Actual 1.4	2121.7	

Wpanel =	24	in
H =	8.58	ft
Vcap =	2121.7	lbs
Deflection =	0.4177	in

Shear Wall Comparison

Vtotal =	2121.7	lb
v =	795.5381	lb/ft
h =	8.614	ft
E =	1600000	psi
A Post =	16.5	in^2
b =	2.667	ft
Ga =	39	kips/in
del.a =	0.12152	in (Elong)

Post	0.0048	in
Wall	0.002	in
Anch.	0.392	in
Total	0.399	in

Deflection Comparison

96%	Similar with Same Load

Reeve & Associates, Inc.

Land Planners · Civil Engineers · Land Surveyors

Traffic Engineers · Structural Engineers · Landscape Architects

5160 South 1500 West - Riverdale, Utah 84405

Phone: (801) 621-3100

Fax: (801) 621-2666

Date:	Sheet 1
Designed By: JDL	Project Num

Concrete Wall Reinforcing:

f'c = 3000 (psi)

ϕ = 0.75 (Strength Reduction Factor)

λ = 1

L = 10 (ft) (Length of wall, Enter one if looking at values per foot)

V= 4.4 (kip/klf) (Value of shear foundation wall. Use the load per foot if designing per foot, ULT)

h_w= 8.8

l_w=

Minimum Reinforcing:

	Horizontal Reinforcement:				Vertical Reinforcement:			
Width:	$0.5\phi V_c$:	ρ (in^2):	Bar #:	S_{req}:	ρ (in^2):	Bar #:	S_{req}:	**Notes:**
8 ''	3286.3	0.192	4	13 ''	0.1152	4	18 ''	
10 ''	4107.9	0.24	5	16 ''	0.144	4	17 ''	
14 ''	5751.1	0.168	4	15 ''	0.1008	4	18 ''	2 Curtains of Reinforcement Required
16 ''	6572.7	0.192	4	13 ''	0.1152	4	18 ''	2 Curtains of Reinforcement Required

FOOTINGS:

ALLOWABLE BEARING PRESSURE = 1.5 KSF
Assumed Coefficient of Friction Soil to Foundation = 0.3

	Frame Line	GRAVITY DL	LL	SL	$Trib_{DL}$	$Trib_{LL}$	$Trib_{SL}$	Wall	$Trib_{Wall}$	DL	LL	Required FTG	Specified FTG
rear	1	15.0 psf	40.0 psf	40.0 psf	19.0ft	2.0ft	17.0ft	38.0 psf	26.0ft	1.3 k	0.8k	16.3 in	FC- 20
front	2	15.0 psf	40.0 psf	40.0 psf	15.0ft	15.0ft	0.0ft	15.0 psf	10.0ft	0.4 k	0.6k	7.8 in	FC- 20
side	3	15.0 psf	40.0 psf	35.3 psf	33.0ft	16.0ft	0.0ft	15.0 psf	10.0ft	0.6 k	0.6k	10.3 in	FC- 20
	4	15.0 psf	40.0 psf	35.3 psf	33.0ft	28.0ft	21.0ft	51.0 psf	10.0ft	1.0 k	1.9k	22.9 in	FC- 24
SPOT FTGS													
1	B	15.0 psf	40.0 psf	35.3 psf	205.0sf	0.0sf	205.0sf	0.0 psf	0.0sf	3.1 k	7.2k	31.5 in	FS- 36
1	C	15.0 psf	0.0 psf	35.3 psf	39.6sf	0.0sf	39.6sf	0.0 psf	0.0sf	0.6 k	1.4k	13.8 in	FS- 36
1	D	15.0 psf	0.0 psf	35.3 psf	39.6sf	0.0sf	39.6sf	0.0 psf	0.0sf	0.6 k	1.4k	13.8 in	FS- 36

TYPICAL FOOTINGS AND REINFORCING

Soil Bearing Pressure = 1500 psf

Footing Parameters

f'c = 2500 psi
fy steel = 60 ksi
pmax = 0.016

Note: Not all footings were used on this project

Continuous Footings							Trial Reinf			
Callout	Typ Eccent	Allowable Load	Ftg Reqd	Nom Ftg	Asmin/ft	As Reqd/ft	Num Bar	Bar #	As Prov	·/ As
FC-1.5	0.1%	2.2 klf	1.48'	1.5'	0.18 in^2	0.36 in^2	(2)	4	0.4	OK
FC-2.0	0.1%	3.0 klf	1.98'	2.0'	0.24 in^2	0.48 in^2	(3)	4	0.6	OK
FC-2.5	0.1%	3.7 klf	2.48'	2.5'	0.30 in^2	0.60 in^2	(3)	5	0.93	OK
FC-3.0	0.1%	4.5 klf	2.98'	3.0'	0.36 in^2	0.72 in^2	(3)	5	0.93	OK
FC-3.5	0.1%	5.2 klf	3.48'	3.5'	0.42 in^2	0.84 in^2	(3)	5	0.93	OK
FC-4.0	0.1%	6.0 klf	3.98'	4.0'	0.48 in^2	0.96 in^2	(4)	5	1.24	OK
FC-4.5	0.1%	6.7 klf	4.48'	4.5'	0.54 in^2	1.08 in^2	(4)	5	1.24	OK
FC-5.0	0.1%	7.5 klf	4.98'	5.0'	0.60 in^2	1.20 in^2	(5)	5	1.55	OK
FTS-1.5	0.1%	2.2 klf	1.48'	1.5'	0.18 in^2	0.36 in^2	(2)	4	0.4	OK
FTS-2.0	0.1%	3.0 klf	1.98'	2.0'	0.24 in^2	0.48 in^2	(3)	4	0.6	OK
FTS-2.5	0.1%	3.7 klf	2.48'	2.5'	0.30 in^2	0.60 in^2	(3)	5	0.93	OK
FTS-3.0	0.1%	4.5 klf	2.98'	3.0'	0.36 in^2	0.72 in^2	(3)	5	0.93	OK
FTS-3.5	0.1%	5.2 klf	3.48'	3.5'	0.42 in^2	0.84 in^2	(3)	5	0.93	OK

Spot Footings										Trial Reinf			
Callout	Typ Eccent	Allowable Load	Ftg Reqd	Nom Ftg	Mu	p	·/ p	Asmin	As Reqd	Num Bar	Bar #	As Prov	·/ As
FS-2.0	0.1%	5.9 k	1.99'	2.0'	1.02 k-ft	0.000	OK	0.43 in^2	0.05 in^2	(3)	5	0.93	OK
FS-2.5	0.1%	9.2 k	2.49'	2.5'	2.16 k-ft	0.000	OK	0.54 in^2	0.10 in^2	(3)	5	0.93	OK
FS-3.0	0.1%	13.3 k	2.99'	3.0'	3.95 k-ft	0.001	OK	0.65 in^2	0.18 in^2	(3)	5	0.93	OK
FS-3.5	0.1%	18.2 k	3.49'	3.5'	6.52 k-ft	0.000	OK	0.90 in^2	0.22 in^2	(3)	5	0.93	OK
FS-4.0	0.1%	23.8 k	3.99'	4.0'	10.02 k-ft	0.001	OK	1.03 in^2	0.33 in^2	(4)	5	1.24	OK
FS-4.5	0.1%	30.1 k	4.49'	4.5'	14.58 k-ft	0.001	OK	1.16 in^2	0.48 in^2	(4)	5	1.24	OK
FS-5.0	0.1%	37.2 k	4.99'	5.0'	19.63 k-ft	0.001	OK	1.29 in^2	0.65 in^2	(5)	5	1.55	OK
FS-5.5	0.1%	45.0 k	5.50'	5.5'	26.59 k-ft	0.001	OK	1.42 in^2	0.89 in^2	(5)	5	1.55	OK
FS-6.0	0.1%	53.5 k	5.99'	6.0'	33.81 k-ft	0.001	OK	1.60 in^2	1.07 in^2	(6)	5	1.86	OK

PUNCHING SHEAR CHECK

Note: Not all footings were used on this project

Callout	Factored Load	Min Col. Dim	factored qu		Assumed depth	d	bo	Vu	Vc	·/ Capacity
FS-2.0	8.5 k	4"	2.12 ksf		10"	7.0"	44"	6.7 k	52.4 k	OK
FS-2.5	13.3 k	4"	2.13 ksf		10"	7.0"	44"	11.5 k	52.4 k	OK
FS-3.0	19.2 k	4"	2.13 ksf		10"	7.0"	44"	17.4 k	52.4 k	OK
FS-3.5	26.2 k	4"	2.14 ksf		12"	9.0"	52"	23.7 k	79.6 k	OK
FS-4.0	34.2 k	4"	2.14 ksf		12"	9.0"	52"	31.7 k	79.6 k	OK
FS-4.5	43.4 k	4"	2.14 ksf		12"	9.0"	52"	40.8 k	79.6 k	OK
FS-5.0	53.6 k	5"	2.14 ksf		12"	9.0"	56"	50.7 k	85.7 k	OK
FS-5.5	64.9 k	5"	2.14 ksf		12"	9.0"	56"	61.9 k	85.7 k	OK
FS-6.0	77.0 k	6"	2.14 ksf		12"	9.4"	62"	73.5 k	98.4 k	OK

Solutions you can build on

Reeve & Associates, Inc.

contact:
Jeff Turville, PE
5160 South 1500 West
Riverdale, Utah 84405
801.621.3100