



Structural Calculations

for

Autumn Sky 3-Plex Townhomes - Building 26 - Herriman, Utah

submitted to:

ARCFLO



Solutions you can build on for over 70 years

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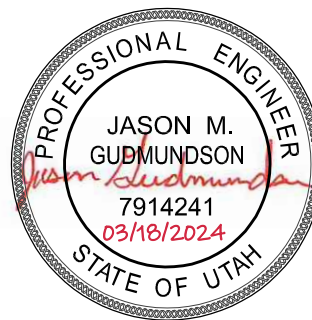
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March 2024
Ref: 4899-B15

Project Information

Project Name: Autumn Sky 3-Plex Townhomes – Building 26
 Project Location: Herriman, Utah

Design Criteria

Governing Building Code: 2021 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 $S_S = 1.024g$ $S_{DS} = 0.819g$
 $S_1 = 0.368g$ $S_{D1} = 0.474g$

Design Loads: Roof Dead Load = 15 psf
 Ground Snow Load = 45 psf
 Roof Snow Load = 35 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 $F_b=875$ psi $F_v=95$ psi $E=1.6 \cdot 10^6$ psi
 Laminated Veneer Lumber:
 Microllam® $F_b=2600$ psi $F_v=285$ psi $E=1.9 \cdot 10^6$ psi
 Parallel Strand Lumber:
 Parallam® $F_b=2900$ psi $F_v=290$ psi $E=2.0 \cdot 10^6$ psi
 Glu-Laminated Beams:
 24F-V4 DF/DF $F_b=2400$ psi $F_v=195$ psi $E=1.8 \cdot 10^6$ 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)

 This is a beta release of the new ATC Hazards by Location website. Please [contact us](#) with feedback.

 The ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

ATC Hazards by Location

Search Information

Address: 5309 W Autumn Moon Ln, Herriman, UT 84096, USA
Coordinates: 40.5308881, -112.0176467
Elevation: 4831 ft
Timestamp: 2024-03-18T16:59:30.114Z
Hazard Type: Seismic
Reference Document: ASCE7-16
Risk Category: II
Site Class: D-default



Basic Parameters

Name	Value	Description
S_S	1.024	MCE_R ground motion (period=0.2s)
S_1	0.368	MCE_R ground motion (period=1.0s)
S_{MS}	1.228	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	0.819	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.877	Coefficient of risk (0.2s)
CR_1	0.878	Coefficient of risk (1.0s)
PGA	0.448	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.538	Site modified peak ground acceleration
T_L	8	Long-period transition period (s)
$SsRT$	1.024	Probabilistic risk-targeted ground motion (0.2s)
$SsUH$	1.167	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	1.816	Factored deterministic acceleration value (0.2s)
$S1RT$	0.368	Probabilistic risk-targeted ground motion (1.0s)
$S1UH$	0.419	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
$S1D$	0.657	Factored deterministic acceleration value (1.0s)
PGAd	0.725	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

The results indicated here DO NOT reflect any state or local amendments to the values or any delineation lines made during the building code adoption process. Users should confirm any output obtained from this tool with the local Authority Having Jurisdiction before proceeding with design.

Please note that the ATC Hazards by Location website will not be updated to support ASCE 7-22. [Find out why.](#)

Disclaimer

Hazard loads are provided by the U.S. Geological Survey [Seismic Design Web Services](#).

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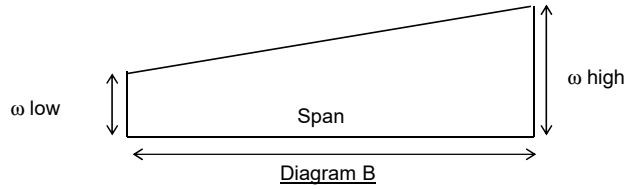
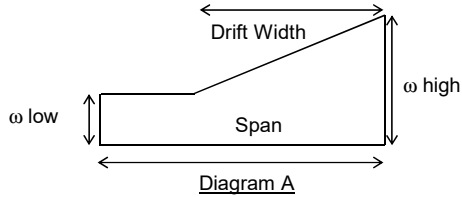


PROJECT			PROJ NO.	
			CALC NO.	
SUBJECT	Low Roof Snow Load per ASCE 7		BY JMT	DATE 7/9/19
	Leeward and Windward Snow Drift		CHK	DATE
			SHEET	OF REV

Description:

GENERAL INPUT AND OUTPUT:

"Leeward" or "Windward":	1.00	Leeward	Snow Load Density:	19.83 pcf
Roof Slope:	8:12	33.69 °	h _b (Snow Depth):	1.74 feet
County (State of Utah)	UTAH		h _d (potential drift height):	-1.50 feet
Elevation at Site	4700 ft		h _c (Roof to Snow):	0.00 feet
p _g (SEAU Flat Roof Snow)	45 psf	<---Manual Entry	Maximum Drift Height:	0.00 feet
C _e (Exposure Factor):	1.0		Drift Width:	0.00 feet
C _t (Thermal Factor):	1.1		Maximum Snow Load:	34.50 psf
I _s (Importance Factor):	1.0		Maximum Drift Weight:	0.00 psf
L _u (Length of Roof):	0.00 feet	Upper Roof	Drift Width:	0.00 feet
Elevation Difference:	0.00 feet			
P _f (Roof Snow):	34.5 psf			
C _s (Roof Slope Factor):	1.0			
P _s (Sloped Roof Snow):	34.5 psf			



	<h2 style="margin: 0;">Reeve & Associates, Inc.</h2> <p style="margin: 0; font-size: small;">Land Planners · Civil Engineers · Land Surveyors Traffic Engineers · Structural Engineers · Landscape Architects 920 Chambers Street, Suite 14 -- Ogden, UT 84403 Phone: (801) 621-3100 Fax: (801) 621-2666</p>			
	Date:	Sheet	Of	
	6/4/15	1	1	
Designed By:		Project Number:		
JMT				

Seismic Calculations

Earthquake Loads-Site Ground Motion

I= 1	h _n = 28.00 ft (Building Height)	
R= 6.5 Wood Brg Wall	Structure Type = Other	
S _s = 1.024	C _t = 0.02	
S ₁ = 0.368	x= 0.75	
Site Class= D		
	Check Height for LFRS = 28.0ft > NP (per exception 12.2.5.6 where	
	DL = 6.5 psf (Estimated) DL <20psf allowed up to 65ft)	
F _a = 1.20	S _{MS} = F _a *S _s	
S _{MS} = 1.229	S _{DS} = 2*S _{MS} /3	
S _{DS} = 0.819		
F _v = 1.93	S _{M1} = F _v *S ₁	
S _{M1} = 0.711	S _{D1} = 2*S _{M1} /3	
S _{D1} = 0.474		

Earthquake Loads-Minimum Design Lateral Force

C _s = 0.126	T= 0.243 s	
C _s = 0.3		Load Combinations that control lateral:
C _s = 0.036		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 = 0.126		
V=C _s *W	V = ASD Load Factor*Rho*C _s *W =	0.11 *W

Dead Load Effect

$$0.2 * S_{DS} = 0.164$$

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

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, K_d = 0.85
 Topographic Factor, K_t = 1
 Gust Effect Factor, G = 0.85
 Total Stories = 2 (5 max)
 Internal Pressure Coefficient, G_{cp} = 0.18
 -0.18

Enclosure Classification		Length	Height	Ag	Ao	% open	Open	Partial 1	Partial 2	Partial Total
Wall 1 =	100	10	1000	800	80.0	Y	Y	N	N	N
Wall 2 =	100	10	1000	200	20.0	N	N	Y	N	N
Wall 3 =	25	10	250	30	12.0	N	N	Y	N	N
Wall 4 =	25	10	250	50	20.0	N	N	Y	N	N

Open Building: NO
 Partially Open: NO
 Enclosed: YES

Wall Pressure	Front to Back	Side to Side
Windward Wall, C _p =	0.8	0.8
Windward Wall Width, B =	28 ft	48 ft
Exposure Category =	C	C
Side Wall Width, L =	48 ft	28 ft
L/B =	1.714286	0.583333
Leeward Wall, C _p =	-0.3	-0.5
Side Wall, C _p =	-0.7	-0.7

Parapet Wall Pressure
 Parapet Wall Height = 0 ft
 Building Height to top of parapet = 0 ft
 K_z = 0.85
 q_p = 24.4 psf
 WW GC_p = 1.50
 LW GC_p = -1.00
 P_p = 61.1 psf
 Adj. P_p = 36.6 psf
 Parapet Load per foot = 0.0 plf

Roof Pressure Coefficient, C _p	WW Area: 480 ft ² LW Area: 480 ft ²				WW Area: 228 ft ² LW Area: 228 ft ²					
	Front to Back				Side to Side					
	Distance from Windward Edge, ft				Distance from Windward Edge, ft					
Windward Normal to Ridge =	Max/Min	0 ft	11 ft	23 ft	46 ft	Max/Min	0 ft	11 ft	23 ft	46 ft
	Max	0.28	0.28	0.28	0.28	Max	0.23	0.23	0.23	0.23
	Min	-0.18	-0.18	-0.18	-0.18	Min	-0.22	-0.22	-0.22	-0.22
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	-1.15	-1.15	-0.63	-0.55

Load Description	Overall Height	Wall Trib	K _z	q _z	Front to Back				Total	Shear Force, lbs	Adj. Shear Force, lbs	ASD Factor
					WW	LW	SW	Int +/-				
Roof	22.8 ft	-	-	max-->	6.4 psf	-13.6 psf	varies	4.8 psf	20.0 psf	5331 lbs	3199 lbs	0.6
				min-->	-4.2 psf	-13.6 psf	varies	-4.8 psf	9.4 psf	2505 lbs	1503 lbs	
Wall 2	8 ft	4.5	0.85	24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	2950 lbs	1770 lbs	
Wall 1	9 ft	8.5	0.85	24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	5572 lbs	3343 lbs	
			0.85	24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	0 lbs	0 lbs	
			0.85	24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	0 lbs	0 lbs	
Other			0.85	24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	0 lbs	0 lbs	

Front to Back Total Shear: 13853 lbs 8312 lbs

Roof	max-->	Side to Side				Total	Shear Force, lbs	Adj. Shear Force, lbs	Adj. Wall Force
		WW	LW	SW	Int +/-				
		5.2 psf	-13.6 psf	varies	4.8 psf	18.8 psf	2373 lbs	1424 lbs	3823 lbs
		-4.9 psf	-13.6 psf	varies	-4.8 psf	8.7 psf	1100 lbs	660 lbs	
Wall 2		16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	6036 lbs	3622 lbs	
Wall 1		16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	11402 lbs	6841 lbs	
		16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	0 lbs	0 lbs	
		16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	0 lbs	0 lbs	
Other		16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	0 lbs	0 lbs	

Side to Side Total Shear: 19811 lbs 14286 lbs

LATERAL ANALYSIS

Side-to-Side Dim:	28 ft	Height	Roof Area =	1344 ft ²	
Front-to-Back Dim:	48 ft		Floor Area =	1344	
Roof Trib:	4.5 ft		18 ft	Floor Area =	
Floor Trib:	8.5 ft		9 ft	Floor Area =	
Floor Trib:				Floor Area =	
Floor Trib:					
Roof Seismic DL:	15 psf				
Floor Seismic DL:	15 psf				
Wall Seismic DL:	12 psf				

Seismic: V = 0.11 *W

F-front-to-back:	<u>V</u>		<u>W</u>	<u>WxHx</u>	<u>Cvx</u>	<u>Fx</u>
Roof	2659 lbs	lb	23184	417312	0.64	3611 lbs
Floor	2967 lbs	lb	25872	232848	0.36	2015 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
	5626 lbs		49056	650160		5626 lbs
F-side-to-side:						
Roof	2907 lbs	lb	25344	456192	0.63	3986 lbs
Floor	3435 lbs	lb	29952	269568	0.37	2356 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
	6342 lbs		55296	725760		6342 lbs

Wind:

F-front-to-back:	
Roof	4969 lbs
Floor	3343 lbs
Floor	0 lbs
Floor	0 lbs
F-side-to-side:	
Roof	7445 lbs
Floor	6841 lbs
Floor	0 lbs
Floor	0 lbs

Use for Design:

F-front-to-back:			
Roof	4969 lbs	Wind Governs	1.4
Floor	3343 lbs	Wind Governs	1.4
Floor	0 lbs		1
Floor	0 lbs		1
F-side-to-side:			
Roof	7445 lbs	Wind Governs	1.4
Floor	6841 lbs	Wind Governs	1.4
Floor	0 lbs		1
Floor	0 lbs		1

	SW capacities (plf):		Hold Down capacities (lb):					
	seismic	wind	0	NONE	0	NONE		
SW-1	260	365	200	LSTD8	1610	200	MST37	1725
SW-2	380	532	1610	STHD10	2175	1725	MST48	3215
SW-3	490	685	2175	STHD14	3500	3215	MST60	5240
SW-4	640	896	3500	HDU4	4565	5240	MST72	6730
SW-5	760	1065	4565	HDU5	5645	6730	(2) MST60	10480
SW-6	980	1370	5645	HDU8	7870	10480	(2) MST72	13460
			7870	HDU11	9535	13460	NG	

FOOTINGS:

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

Frame Line	GRAVITY										Required FTG	Specified FTG	
	DL	LL	SL	Trib _{DL}	Trib _{LL}	Trib _{SL}	Wall	Trib _{Wall}	DL	LL			
mid bear	15.0 psf	40.0 psf	35.0 psf	22.0ft	22.0ft	0.0ft	12.0 psf	25.0ft	0.6 k	0.9k	12.1 in	FC- 18	
mid rear	15.0 psf	40.0 psf	35.0 psf	39.0ft	16.0ft	23.0ft	40.0 psf	25.0ft	1.6 k	1.4k	24.2 in	FC- 30	
end rear	15.0 psf	40.0 psf	35.0 psf	21.0ft	18.0ft	3.0ft	40.0 psf	25.0ft	1.3 k	0.8k	17.1 in	FC- 20	
side	15.0 psf	40.0 psf	35.0 psf	20.0ft	4.0ft	16.0ft	40.0 psf	25.0ft	1.3 k	0.7k	16.2 in	FC- 20	
marriage	15.0 psf	40.0 psf	35.0 psf	21.0ft	4.0ft	17.0ft	15.0 psf	50.0ft	1.1 k	0.8k	14.6 in	FC- 20	
									0.0 k	0.0k	0.0 in	FC- 22	
									1.0 k	1.9k	22.9 in	FC- 24	
SPOT FTGS													
R porch	B	15.0 psf	40.0 psf	35.0 psf	315.0sf	0.0sf	195.0sf	0.0 psf	0.0sf	4.7 k	6.8k	33.3 in	FS- 36
F porch	C	15.0 psf	40.0 psf	35.0 psf	50.0sf	0.0sf	25.0sf	0.0 psf	0.0sf	0.8 k	0.9k	12.5 in	FS- 24
1	D	15.0 psf	0.0 psf	35.0 psf	0.0sf	0.0sf	0.0sf	0.0 psf	0.0sf	0.0 k	0.0k	0.0 in	FS- 0

TYPICAL FOOTINGS AND REINFORCING

Soil Bearing Pressure = 1500 psf Footing Parameters f_c = 2500 psi Note: Not all footings were used on this project
 f_y steel = 60 ksi
 p_{max} = 0.016

Continuous Footings						Trial Reinf				
Callout	Typ Eccent	Allowable Load	Ftg Req'd	Nom Ftg	Asmin/ft	As Req'd/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 Req'd	Nom Ftg	Mu	p	/ p	Asmin	As Req'd	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	(2)	5	0.62	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

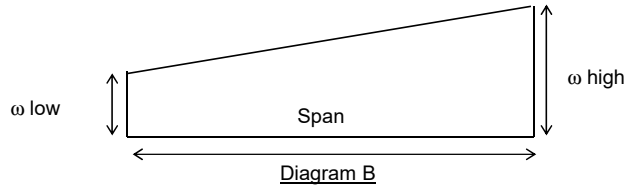
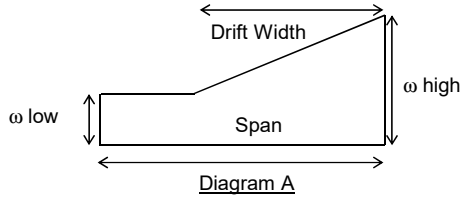


PROJECT			PROJ NO.	
			CALC NO.	
SUBJECT	Low Roof Snow Load per ASCE 7 Leeward and Windward Snow Drift		BY JMT	DATE 7/9/19
			CHK	DATE
			SHEET	OF REV

Description:

GENERAL INPUT AND OUTPUT:

"Leeward" or "Windward":	1.00	Leeward	Snow Load Density:	19.83 pcf
Roof Slope:	8:12	33.69 °	h _b (Snow Depth):	1.74 feet
County (State of Utah)	UTAH		h _d (potential drift height):	-1.50 feet
Elevation at Site	4700 ft		h _c (Roof to Snow):	0.00 feet
p _g (SEAU Flat Roof Snow)	45 psf	<---Manual Entry	Maximum Drift Height:	0.00 feet
C _e (Exposure Factor):	1.0		Drift Width:	0.00 feet
C _t (Thermal Factor):	1.1		Maximum Snow Load:	34.50 psf
I _s (Importance Factor):	1.0		Maximum Drift Weight:	0.00 psf
L _u (Length of Roof):	0.00 feet	Upper Roof	Drift Width:	0.00 feet
Elevation Difference:	0.00 feet			
P _f (Roof Snow):	34.5 psf			
C _s (Roof Slope Factor):	1.0			
P _s (Sloped Roof Snow):	34.5 psf			



	Reeve & Associates, Inc. Land Planners · Civil Engineers · Land Surveyors Traffic Engineers · Structural Engineers · Landscape Architects 920 Chambers Street, Suite 14 -- Ogden, UT 84403 Phone: (801) 621-3100 Fax: (801) 621-2666			
	Date:	Sheet	Of	
	6/4/15	1	1	
Designed By:	Project Number:			
JMT				

Seismic Calculations

Earthquake Loads-Site Ground Motion

$I =$	1	$h_n =$	28.00 ft (Building Height)
$R =$	6.5 Wood Brg Wall	Structure Type =	Other
$S_s =$	1.024	$C_t =$	0.02
$S_1 =$	0.368	$x =$	0.75
Site Class =	D		
		Check Height for LFRS =	28.0ft > NP (per exception 12.2.5.6 where
$F_a =$	1.20	DL =	6.5 psf (Estimated) DL < 20psf allowed up to 65ft)
$S_{MS} =$	1.229	$S_{MS} =$	$F_a * S_s$
$S_{DS} =$	0.819	$S_{DS} =$	$2 * S_{MS} / 3$
$F_v =$	1.93		
$S_{M1} =$	0.711	$S_{M1} =$	$F_v * S_1$
$S_{D1} =$	0.474	$S_{D1} =$	$2 * S_{M1} / 3$

Earthquake Loads-Minimum Design Lateral Force

$C_s =$	0.126	$T =$	0.243 s
$C_s =$	0.3		
$C_s =$	0.036		
			Load Combinations that control lateral:
			D+0.75L+0.75S+0.75(0.7*E)
		ASD Load Factor =	0.7
		Rho =	1.3
USE			0.6D+0.7E
$C_s =$	0.126		
$V = C_s * W$		$V = \text{ASD Load Factor} * \text{Rho} * C_s * W =$	0.11 * W

Dead Load Effect

$$0.2 * S_{DS} = 0.164$$

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

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, K_d = 0.85
 Topographic Factor, K_z = 1
 Gust Effect Factor, G = 0.85
 Total Stories = 2 (5 max)
 Internal Pressure Coefficient, G_{cp} = 0.18
 -0.18

Enclosure Classification
 Length Height Ag Ao % open Open Partial 1 Partial 2 Partial Total
 Wall 1 = 100 10 1000 800 80.0 Y Y N N
 Wall 2 = 100 10 1000 200 20.0 N N Y N
 Wall 3 = 25 10 250 30 12.0 N N Y N
 Wall 4 = 25 10 250 50 20.0 N N Y N
 Open Building: NO
 Partially Open: NO
 Enclosed: YES

Wall Pressure
 Front to Back Side to Side
 Windward Wall, C_p = 0.8 0.8
 Windward Wall Width, B = 32 ft 49 ft
 Side Wall Width, L = 49 ft 32 ft
 L/B = 1.53125 0.653061
 Leeward Wall, C_p = -0.3 -0.5
 Side Wall, C_p = -0.7 -0.7
 Roof Pressure
 Roof Type = Gable 1 Gable 1
 Roof Pitch = 8/12 33.7 ° 8/12 33.7 °
 Ridge Height = 28 ft 28 ft
 Eave Height = 18 ft 18 ft
 Mean Roof Height, h = 22.8 ft 22.8 ft
 h/L = 0.46 0.71
 h/2 = 11 ft 11 ft
 Kh = 0.93 0.93
 qh = 26.7 psf 26.7 psf

Parapet Wall Pressure
 Parapet Wall Height = 0 ft
 Building Height to top of parapet = 0 ft
 K_z = 0.85
 q_p = 24.4 psf
 WW GC_p = 1.50
 LW GC_p = -1.00
 P_p = 61.1 psf
 Adj. P_p = 36.6 psf
 Parapet Load per foot = 0.0 plf

Roof Pressure Coefficient, C _p	WW Area: 548 ft ² LW Area: 548 ft ²				WW Area: 839 ft ² LW Area: 839 ft ²				
	Front to Back				Side to Side				
	Distance from Windward Edge, ft				Distance from Windward Edge, ft				
Max/Min	0 ft	11 ft	23 ft	46 ft	Max/Min	0 ft	11 ft	23 ft	46 ft
Windward Normal to Ridge = Max	0.29	0.29	0.29	0.29	Max	0.24	0.24	0.24	0.24
Min	-0.18	-0.18	-0.18	-0.18	Min	-0.21	-0.21	-0.21	-0.21
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	-1.07	-1.07	-0.58	-0.47

Load Description	Overall Height	Wall Trib	K _z	q _z	Front to Back				Total WW+LW	Shear Force, lbs	Adj. Shear Force, lbs	ASD Factor 0.6 Adj. Wall Force
					WW	LW	SW	Int +/-				
Roof	22.8 ft	-	-	max-->	6.5 psf	-13.6 psf	varies	4.8 psf	20.1 psf	6120 lbs	3672 lbs	
				min-->	-4.1 psf	-13.6 psf	varies	-4.8 psf	9.5 psf	2902 lbs	1741 lbs	
Wall 2	8 ft	4.5	0.85		24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	3371 lbs	2023 lbs
Wall 1	9 ft	8.5	0.85		24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	6368 lbs	3821 lbs
			0.85		24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	0 lbs	0 lbs
			0.85		24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	0 lbs	0 lbs
Other			0.85		24.4 psf	16.6 psf	-6.8 psf	-15.9 psf	4.8 psf	23.4 psf	0 lbs	0 lbs
Front to Back Total Shear:										15859 lbs	9515 lbs	

Load Description	Overall Height	Wall Trib	K _z	q _z	Side to Side				Total WW+LW	Shear Force, lbs	Adj. Shear Force, lbs	Adj. Wall Force
					WW	LW	SW	Int +/-				
Roof				max-->	5.5 psf	-13.6 psf	varies	4.8 psf	19.1 psf	8892 lbs	5335 lbs	
				min-->	-4.8 psf	-13.6 psf	varies	-4.8 psf	8.8 psf	4104 lbs	2462 lbs	
Wall 2					16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	6162 lbs	3697 lbs	
Wall 1					16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	11639 lbs	6984 lbs	
					16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	0 lbs	0 lbs	
					16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	0 lbs	0 lbs	
Other					16.6 psf	-11.3 psf	-15.9 psf	4.8 psf	27.9 psf	0 lbs	0 lbs	
Side to Side Total Shear:										26693 lbs	16016 lbs	

LATERAL ANALYSIS

Side-to-Side Dim:	32 ft	Height	Roof Area =	1568 ft ²	
Front-to-Back Dim:	49 ft		Floor Area =	1568	
Roof Trib:	4.5 ft		18 ft	Floor Area =	
Floor Trib:	8.5 ft		9 ft	Floor Area =	
Floor Trib:				Floor Area =	
Floor Trib:					
Roof Seismic DL:	15 psf				
Floor Seismic DL:	15 psf				
Wall Seismic DL:	12 psf				

Seismic: V = 0.11 *W

F-front-to-back:	<u>V</u>		<u>W</u>	<u>WxHx</u>	<u>Cvx</u>	<u>Fx</u>
Roof	3094 lbs	lb	26976	485568	0.64	4201 lbs
Floor	3446 lbs	lb	30048	270432	0.36	2339 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
	6540 lbs		57024	756000		6540 lbs
<hr/>						
F-side-to-side:						
Roof	3304 lbs	lb	28812	518616	0.63	4520 lbs
Floor	3844 lbs	lb	33516	301644	0.37	2629 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
Floor	0 lbs	lb	0	0	0.00	0 lbs
	7148 lbs		62328	820260		7148 lbs

Wind:

F-front-to-back:	
Roof	5695 lbs
Floor	3821 lbs
Floor	0 lbs
Floor	0 lbs

F-side-to-side:	
Roof	9032 lbs
Floor	6984 lbs
Floor	0 lbs
Floor	0 lbs

Use for Design:

F-front-to-back:			
Roof	5695 lbs	Wind Governs	1.4
Floor	3821 lbs	Wind Governs	1.4
Floor	0 lbs		1
Floor	0 lbs		1

F-side-to-side:			
Roof	9032 lbs	Wind Governs	1.4
Floor	6984 lbs	Wind Governs	1.4
Floor	0 lbs		1
Floor	0 lbs		1

	SW capacities (plf):		Hold Down capacities (lb):					
	seismic	wind	0	NONE		0	NONE	
SW-1	260	365	200	LSTD8	1610	200	MST37	1725
SW-2	380	532	1610	STHD10	2175	1725	MST48	3215
SW-3	490	685	2175	STHD14	5345	3215	MST60	5240
SW-4	640	896	5345	HDU4	4565	5240	MST72	6730
SW-5	760	1065	4565	HDU5	5645	6730	(2) MST60	10480
SW-6	980	1370	5645	HDU8	7870	10480	(2) MST72	13460
			7870	HDU11	9535	13460	NG	

Simple Span Beam Calculation

Adjustment Factors - ASD

Cd: 1.15	Cfu: NA
Cr: 1.00	Ci: 1.00
Ct: 1.00	Cr: 1.00
Cv: 1.00	Cy: -
Cf: -	Cc: 1.00

Glue-Lam & LVL Only
Glue-Lam Only

Roof DL	10 psf	Include Self Wt?	No
Floor DL	15 psf		
Live	40 psf		
Snow	35 psf		

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

Active Member for Deflection Calc and Shear Diagram: RB-9

member ID	span ft	trib ft	roof ft	floor ft	wall load plf	point load			dist from left, ft	left reaction			right reaction			applied moment lb-ft	applied shear lbs	Selected Member	Live/Total Deflection	actual Δ, in.	Δ limit, L/	Δ act, L/	check	Max Defl Location, ft	Min Bearing Length, in
						dead lbs	live lbs	snow lbs		dead lbs	live lbs	snow lbs	dead lbs	live lbs	snow lbs										
RB-1	4.5	21							473	0	1654	473	0	1654	2392	87.9	2126	(2) 2x8	Live	0.04	L/240	L/1214	Pass	2.2	1.1
RB-2	6	5							150	0	525	150	0	525	1013	37.2	675	(2) 2x8	Live	0.03	L/240	L/2151	Pass	3.0	0.4
RB-3	6	26							780	0	2730	780	0	2730	5265	64.4	3510	(2) 1-3/4"x7-1/4" LVL	Live	0.12	L/240	L/603	Pass	3.0	1.3
RB-4	8	8							320	0	1120	320	0	1120	2880	70.6	1440	(3) 2x8	Live	0.11	L/240	L/851	Pass	4.0	0.5
RB-5	10.5	19						8.5	1131	0	3806	1564	0	4827	14250	73.7	6391	(3) 1-3/4"x9-1/4" LVL	Live	0.32	L/360	L/393	Pass	5.4	1.6
RB-6	14	5			100				1050	0	1225	1050	0	1225	7963	41.2	2275	(3) 1-3/4"x9-1/4" LVL	Live	0.22	L/360	L/769	Pass	7.0	0.6
RB-7	2.5	21							1833	0	1359	776	0	2129	1727	63.5	2904	(2) 2x8	Live	0.01	L/360	L/3398	Pass	1.3	1.5
RB-8	2.5	21							1833	0	2272	1325	0	4637	3766	30.7	5962	(3) 1-3/4"x7-1/4" LVL	Live	0.01	L/360	L/3614	Pass	1.4	1.5
RB-9	6	21						4.5	992	0	3473	1717	0	6008	10524	85.8	7725	(3) 1-3/4"x7-1/4" LVL	Live	0.15	L/360	L/484	Pass	3.2	2.0
RB-10									0	0	0	0	0	0	0	0	0		Live						
RB-11									0	0	0	0	0	0	0	0	0		Live						
RB-12									0	0	0	0	0	0	0	0	0		Live						
RB-13									0	0	0	0	0	0	0	0	0		Live						
RB-14									0	0	0	0	0	0	0	0	0		Live						
RB-15									0	0	0	0	0	0	0	0	0		Live						
RB-16									0	0	0	0	0	0	0	0	0		Live						
RB-17									0	0	0	0	0	0	0	0	0		Live						
RB-18									0	0	0	0	0	0	0	0	0		Live						
RB-19									0	0	0	0	0	0	0	0	0		Live						
RB-20									0	0	0	0	0	0	0	0	0		Live						
RB-21									0	0	0	0	0	0	0	0	0		Live						
RB-22									0	0	0	0	0	0	0	0	0		Live						
RB-23									0	0	0	0	0	0	0	0	0		Live						
RB-24									0	0	0	0	0	0	0	0	0		Live						
RB-25									0	0	0	0	0	0	0	0	0		Live						
RB-26									0	0	0	0	0	0	0	0	0		Live						
RB-27	15.25	19							1449	0	5071	1449	0	5071	24855	#N/A	6519	#N/A		Live					

Simple Span Beam Calculation

Adjustment Factors - ASD

Cd: 1.00	Cfu: NA
Cr: 1.00	Cr: 1.00
Ct: 1.00	Cv: 1.15
Cf: 1.00	Cc: 1.00
	1.00
	Glue-Lam & LVL Only
	Glue-Lam Only

Roof DL 15 psf
 Floor DL 40 psf
 Live 40 psf
 Snow 35 psf

Include Self Wt? No

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

Active Member for Deflection Calc and Shear Diagram: FB-15

member ID	span ft	trib ft	floor ft	trib ft	wall load plf	point load			dist from left, ft	left reaction			right reaction			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
						dead lbs	live lbs	snow lbs		dead lbs	live lbs	snow lbs	dead lbs	live lbs	snow lbs												
FB-1	4		16							480	1280	0	480	1280	0	1760	64.7	1760	67.4	(2) 2x8	Live	0.04	L/360	L/1227	Pass	3.2	0.9
FB-2	6		13							585	1560	0	585	1560	0	3218	78.9	2145	54.8	(3) 2x8	Live	0.07	L/360	L/1086	Pass	3.0	0.8
FB-3	6		13							585	1560	0	585	1560	0	3218	79.3	2145	64.4	(2) 2x10	Live	0.05	L/360	L/1503	Pass	3.0	1.1
FB-4	3		7							210	560	0	210	560	0	770	3.8	770	9.8	(2) 1-3/4"x1-7/8" LVL	Live	0.00	L/480	L/29072	Pass	2.0	0.3
FB-5	4	22	6							630	360	1155	630	360	1155	1339	49.2	1785	68.4	(2) 2x8	Live	0.01	L/480	L/3910	Pass	1.5	1.1
FB-6	10	5	8		100					1475	1600	875	1475	1600	875	8328	40.6	3331	42.2	(2) 1-3/4"x1-7/8" LVL	Live	0.09	L/480	L/1403	Pass	5.0	1.5
FB-7	5.5	18	5		100					1224	550	1733	1224	550	1733	4065	19.8	2956	37.4	(2) 1-3/4"x1-7/8" LVL	Live	0.01	L/480	L/14970	Pass	2.7	1.3
FB-8	4.5	8	7		100					731	630	630	731	630	630	1886	9.2	1676	21.2	(2) 1-3/4"x1-7/8" LVL	Live	0.00	L/480	L/13612	Pass	2.2	0.8
FB-9	20									0	0	0	0	0	0	0	#N/A	0	#N/A	see calc	Live						
FB-10	20									0	0	0	0	0	0	0	#N/A	0	#N/A	see calc	Live						
FB-11	16									0	0	0	0	0	0	0	#N/A	0	#N/A	see calc	Live						
FB-12										0	0	0	0	0	0	0	#N/A	0	#N/A	not used	Live						
FB-13	15		14							1575	4200	0	1575	4200	0	21656	70.3	5775	48.8	(3) 1-3/4"x1-7/8" LVL	Live	0.44	L/360	L/413	Pass	7.5	1.5
FB-14	3		28		100					780	1680	0	780	1680	0	1945	45.5	2460	73.9	(2) 2x10	Live	0.01	L/480	L/5833	Pass	1.5	1.3
FB-15	8		18		100					1480	2880	0	1480	2880	0	8720	71.1	4360	60.3	(3) 1-3/4"x7-1/4" LVL	Live	0.20	L/480	L/482	Pass	4.0	1.1
FB-16										0	0	0	0	0	0	0		0			Live						
FB-17										0	0	0	0	0	0	0		0			Live						
FB-18										0	0	0	0	0	0	0		0			Live						
FB-19										0	0	0	0	0	0	0		0			Live						
FB-20										0	0	0	0	0	0	0		0			Live						
FB-21										0	0	0	0	0	0	0		0			Live						
FB-22										0	0	0	0	0	0	0		0			Live						
FB-23										0	0	0	0	0	0	0		0			Live						
FB-24										0	0	0	0	0	0	0		0			Live						
FB-25										0	0	0	0	0	0	0		0			Live						
FB-26										0	0	0	0	0	0	0		0			Live						
FB-27										0	0	0	0	0	0	0		0			Live						

FOOTINGS:

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

Frame Line	GRAVITY									Factored			Required	Specified
	DL	LL	SL	Trib _{DL}	Trib _{LL}	Trib _{SL}	Wall	Trib _{Wall}	DL	LL	SL	FTG	FTG	
Grid L	L	15.0 psf	40.0 psf	35.0 psf	28.0ft	28.0ft	0.0ft	53.0 psf	17.0ft	1.3 k	1.1k	19.5 in	FC- 24	
rear left	T	15.0 psf	40.0 psf	35.0 psf	28.0ft	7.0ft	21.0ft	45.0 psf	21.0ft	1.4 k	0.8k	17.0 in	FC- 20	
rear right	T	15.0 psf	40.0 psf	35.0 psf	19.0ft	14.0ft	5.0ft	40.0 psf	25.0ft	1.3 k	0.6k	14.8 in	FC- 20	
side	1	15.0 psf	40.0 psf	35.0 psf	10.0ft	5.0ft	5.0ft	40.0 psf	25.0ft	1.2 k	0.3k	11.5 in	FC- 20	
marriage	2	15.0 psf	40.0 psf	35.0 psf	21.0ft	4.0ft	17.0ft	15.0 psf	50.0ft	1.1 k	0.6k	13.3 in	FC- 20	
Grid P	P	15.0 psf	40.0 psf	35.0 psf	28.0ft	28.0ft	0.0ft	12.0 psf	17.0ft	0.6 k	1.1k	14.0 in	FC- 18	
Grid 1.4	1.4	15.0 psf	40.0 psf	35.0 psf	14.0ft	5.0ft	9.0ft	12.0 psf	17.0ft	0.4 k	0.4k	6.4 in	FC- 18	
SPOT FTGS														
	B	0.0 psf	0.0 psf	0.0 psf	0.0sf	0.0sf	0.0sf	0.0 psf	0.0sf	0.0 k	0.0k	0.0 in	FS- 0	
F porch	C	15.0 psf	40.0 psf	35.0 psf	50.0sf	0.0sf	25.0sf	0.0 psf	0.0sf	0.8 k	0.9k	12.5 in	FS- 24	
1.4 - P	D	15.0 psf	40.0 psf	35.0 psf	205.0sf	105.0sf	100.0sf	0.0 psf	0.0sf	3.1 k	5.8k	29.1 in	FS- 36	

TYPICAL FOOTINGS AND REINFORCING

Footing Parameters			
Soil Bearing Pressure = 1500 psf	f _c = 2500 psi	Note: Not all footings were used on this project	
	f _y steel = 60 ksi		
	p _{max} = 0.016		

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

Spot Footings							Trial Reinf						
Callout	Typ Eccent	Allowable Load	Ftg Req'd	Nom Ftg	Mu	p	/ p	Asmin	As Req'd	Num Bar	Bar #	As Prov	/ As
FS-2.0	0.1%	<u>5.9 k</u>	1.99'	<u>2.0'</u>	1.02 k-ft	0.000	OK	0.43 in ²	0.05 in ²	(2)	5	0.62	OK
FS-2.5	0.1%	<u>9.2 k</u>	2.49'	<u>2.5'</u>	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%	<u>13.3 k</u>	2.99'	<u>3.0'</u>	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%	<u>18.2 k</u>	3.49'	<u>3.5'</u>	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%	<u>23.8 k</u>	3.99'	<u>4.0'</u>	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%	<u>30.1 k</u>	4.49'	<u>4.5'</u>	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%	<u>37.2 k</u>	4.99'	<u>5.0'</u>	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%	<u>45.0 k</u>	5.50'	<u>5.5'</u>	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%	<u>53.5 k</u>	5.99'	<u>6.0'</u>	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



Reeve & Associates, Inc.

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 Traffic Engineers · Structural Engineers · Landscape Architects
 5160 South 1500 West -- Riverdale, Utah 84405
 Phone: (801) 621-3100
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Autumn Sky 3-plex

Lehi, Utah

Date:
4/23/18

Sheet Of
 1 1

Designed By:
JMT

Project Number:
4899-A47

Force Transfer Around Openings - Diekmann Technique

Shear Line: Grid T main level - ASPEN

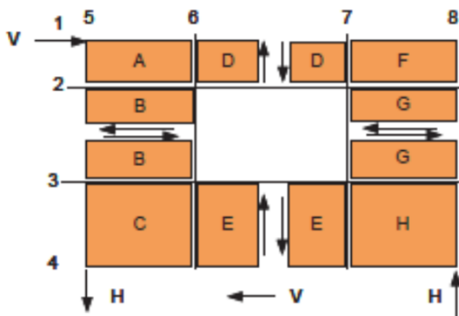
Horizontal Shear, V = 6050 lbs
 Total Wall Length = 16 ft
 Number of Openings = 1
 Wall Height = 9 ft
 Total Pier Length = 10.0 ft
 Controlling Lateral Force = Wind

Holdown Force, H = 3403 lbs
 D,E Shear = 850.8 lb/ft
 B,G Shear = 605 lb/ft
 Total Tension, F = 5105 lbs
 Min Strap = 2552 lbs
 Max Strap = 2552 lbs
 Check 1 510.5 lb/ft
 Check 2 510.5 lb/ft
 A,C,F,H Shear = 94.5 lb/ft

		Seismic										
		Pier		Opening		Top	Bot	Min	Red.	D-E	B-G	Max
#		Left	Right	W	H	Dist	Dist	H/W	%	Sum	Sum	Strap
1	1	5	5	6	5	2	2	1.0	100	4	10	2552
		5	5									10

Results Summary

Level	Ht	V	Vt	SW	Adj.	SW'
-	ft	lbs	lbs	-	%	-
5	8	851	851	4	100	4
4			851			
3			851			
2			851			
1			851			



Shear Wall Capacities

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

Sht Number:	
Job Number:	--
Date:	7/9/2019
By:	JMT

Blue Cells Must be Entered Manually

WOOD COLUMNS Species & Grade Designation	WOOD (1) 2x6 DF #2 Column 1		WOOD (1) 2x6 DF #2 Column 2		WOOD (1) 2x6 DF #2 Column 3		WOOD (2) 2x6 DF #2 Column 4		WOOD (2) 2x6 DF #2 Column 5		STEEL COLUMNS Species & Grade Designation
Description	9' King Studs 16"oc - 25' - 40 lb roof		9' King Studs 16" oc - 25' - 40lb roof + 10' floor		9' King Studs - Openings to 4'		9' King Studs - Openings to 6'		9' King Studs - Openings to 8'		Description
L_{ux} (ft)	9.0		9.0		9.0		9.0		9.0		L_{ux} (ft)
L_{uy} (ft)	1.0		1.0		1.0		1.0		1.0		L_{uy} (ft)
P or T DL LL(kip)	0.50	1.33	0.70	1.86	0.35	0.93	0.35	0.93	0.35	0.93	P or T DL LL(kip)
P_u or T_u (kip)	1.83		2.56		1.28		1.28		1.28		P_u or T_u (kip)
e_x e_y											e_x e_y
Column γ (pcf) SW (plf)	34.0	1.9	34.0	1.9	34.0	1.9	34.0	3.9	34.0	3.9	Column γ (pcf) SW (plf)
w_x w_y (plf)	26.60		26.60		53.30		73.30		93.30		w_x w_y (plf)
$w_{u,x}$ $w_{u,y}$ (plf)	26.60		26.60		53.30		73.30		93.30		$w_{u,x}$ $w_{u,y}$ (plf)
$w_{part,x}$ $w_{part,y}$ (plf)											$w_{part,x}$ $w_{part,y}$ (plf)
Strt Dist From Bot											Strt Dist From Bot
End Dist From Bot											End Dist From Bot
$w_{part,x}$ $w_{part,y}$ (plf)											$w_{part,x}$ $w_{part,y}$ (plf)
$P_{L1,x}$ $P_{L1,y}$ (lbs)											$P_{L1,x}$ $P_{L1,y}$ (lbs)
Location x-x y-y (ft)											Location x-x y-y (ft)
$P_{L1,x}$ $P_{L1,y}$ (lbs)											$P_{L1,x}$ $P_{L1,y}$ (lbs)
$P_{L2,x}$ $P_{L2,y}$ (lbs)											$P_{L2,x}$ $P_{L2,y}$ (lbs)
Location x-x y-y (ft)											Location x-x y-y (ft)
$P_{L2,x}$ $P_{L2,y}$ (lbs)											$P_{L2,x}$ $P_{L2,y}$ (lbs)
$C_{p,vert}$ $C_{p,lat}$	1.00	1.60	1.00	1.60	1.00	1.60	1.00	1.60	1.00	1.60	C_b D.N.A.
C_r Wet Use (Y/N)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	U A_g - A_n (in ²)
C_t C_i	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	D.N.A.
C_T C_{Fu}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	K_z D.N.A.
K_{ex} K_{ey}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	K_x K_y
% W_{cc} for Δ											% W_{cc} for Δ
b d (in)	1.5	5.5	1.5	5.5	1.5	5.5	1.5	5.5	1.5	5.5	b_f d (in)
E_x E_y (psi)	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	A_g A_n (in)
E'_x E'_y (psi)	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	E_x E_y (psi)
E_{min-x} E_{min-y} (psi)	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	r_x r_y (in)
E_{min-x} E_{min-y} (psi)	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	T_{ny} T_{nr} (kips)
C_{M-E} C_{M-Fc}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	$\lambda_{p-c,FL}$ $\lambda_{r-c,FL}$
C_{M-b} $C_{M-Fc,Perp}$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	$\lambda_{p-c,WEB}$ $\lambda_{r-c,WEB}$
C_{M-t} C_{F-c}	1.00	1.10	1.00	1.10	1.00	1.10	1.00	1.10	1.00	1.10	$b_p/2t_f$ or b/t h/t_w or h/t
C_v C_i	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	Q_{s-c} Q_{a-c}
L_{ex}/d L_{ey}/b	19.6	8.0	19.6	8.0	19.6	8.0	19.6	8.0	19.6	8.0	KL_x/r_x KL_y/r_y
$L_y/(d$ or $b)$ Max c	50	0.80	50	0.80	50	0.80	50	0.80	50	0.80	KL/r Max $4.71(E/F_y)^{1/2}$
f_t f_c (psi)	221.7	0.0	310.3	0.0	155.2	0.0	77.6	0.0	77.6	0.0	F_{cr} $F_{cr,FTB}$ (ksi)
F_c F_T (psi)	1350.00	575.00	1350.00	575.00	1350.00	575.00	1350.00	575.00	1350.00	575.00	Ω_{TV} Ω_{TR}
F_c F_T (psi)	928	632.50	928	632.50	928	632.50	928	632.50	928	632.50	P_n (Kips) Ω_c
$P_{TL,ALL}$ $T_{TL,ALL}$ (kip)	P = 7.65	T = 5.22	P = 7.65	T = 5.22	P = 7.65	T = 5.22	P = 15.31	T = 10.44	P = 15.31	T = 10.44	$P_u/2$ $T_u/2$ (kip)
Comp or Tension	23.9% Stressed		33.5% Stressed		16.7% Stressed		8.4% Stressed		8.4% Stressed		Comp or Tension
e_x (in) e_y (in)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	e_x (in) e_y (in)
C_{F-b} D.N.A.	1.30		1.30		1.30		1.30		1.30		M_{px} M_{py} (k*ft)
F_{bx} F_{by} (psi)	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	M_n LTB or WLB (k*ft)
D.N.A. D.N.A.											M_n FLB (k*ft)
I_x I_y (in ⁴)	20.80	1.55	20.80	1.55	20.80	1.55	41.59	3.09	41.59	3.09	I_x I_y (in ⁴)
Lateral Rxn (lbs) x y	119.7	0.0	119.7	0.0	239.8	0.0	329.9	0.0	419.9	0.0	Lateral Rxn (lbs) x y
Z_{nail} - PLT C_{eg}/C_{tn} (lbs)	97.00	0.67	97.00	0.67	97.00	0.67	97.00	0.67	97.00	0.67	$\lambda_{p,FL-B}$ $\lambda_{r,FL-B}$
Plate Nails/Mmbr	1.2	0.0	1.2	0.0	2.3	0.0	1.6	0.0	2.0	0.0	$\lambda_{p,WEB-B}$ $\lambda_{r,WEB-B}$
A34 or A35 Req'd	1 A34		1 A34		1 A34		1 A34		1 A35		L_p L_r (ft)
F_{bx}^* F_{by}^*	1872.00	1854.21	1872.00	1854.21	1872.00	1854.21	1872.00	1854.21	1872.00	1854.21	F_y (ksi) Ω_b
F_{bx}^* F_{by}^*	1872.00	1854.21	1872.00	1854.21	1872.00	1854.21	1872.00	1854.21	1872.00	1854.21	Z_x (in ³) Z_y (in ³)
f_{bx} f_{by} (psi)	427.36	0.00	427.36	0.00	856.32	0.00	588.82	0.00	749.48	0.00	f_{bx} f_{by} (ksi)
S_x S_y (in ³)	7.56	2.06	7.56	2.06	7.56	2.06	15.13	4.13	15.13	4.13	S_x S_y (in ³)
$M_{TL,Max}$ (k-ft)	0.27	0.00	0.27	0.00	0.54	0.00	0.74	0.00	0.94	0.00	$M_{TL,Max}$ (k-ft)
$M_{TL,ALL}$ (k-ft)	1.2	0.3	1.2	0.3	1.2	0.3	2.3	0.6	2.3	0.6	M_n/Ω (k*ft)
Bending	23.05%		23.05%		46.18%		31.76%		40.42%		Bending
Max TL Δ Ratio	L/ 150		L/ 150		L/ 150		L/ 240		L/ 180		Max TL Δ Ratio
Allowable TL Δ											Allowable TL Δ
$\Delta_{TL,Max}$ (in)	0.121	0.000	0.119	0.000	0.238	0.000	0.170	0.000	0.217	0.000	$\Delta_{TL,Max}$ (in)
$\Delta_{TL,ALL}$ (in)	0.72	0.72	0.72	0.72	0.72	0.72	0.45	0.45	0.60	0.60	$\Delta_{TL,ALL}$ (in)
Actual TL Δ	L/ 890		L/ 907		L/ 453		L/ 634		L/ 498		Actual TL Δ
Plate Material	DF #2		DF #2		DF #2		DF #2		DF #2		D.N.A.
$F_{c,Perp}$ $F'_{c,Perp}$ (psi)	625.0	625.00	625.0	625.00	625.0	625.00	625.0	625.00	625.0	625.00	F_{cr} (ksi) $J_c/S_y h_0$
P_{ALL} (kip) $f_{c,Perp}$ (psi)	P = 5.16	221.70	P = 5.16	310.33	P = 5.16	155.15	P = 10.31	77.58	P = 10.31	77.58	D.N.A.
Plate Bearing	35.47%		49.65%		24.82%		12.41%		12.41%		D.N.A.
L_e Bending (ft)	2.06	16.56	2.06	16.56	2.06	16.56	2.06	16.56	2.06	16.56	L_u Bending (ft)
R_B D.N.A.	7.77		7.77		7.77		7.77		7.77		Max (H1-1a) or (H1-1b)
F_{BE} (psi)	11518.1		11518.1		11518.1		11518.1		11518.1		Tension or Compression
Comp OR Tens & Bend Interaction	33.79%		41.96%		55.61%		34.58%		43.83%		Comp OR Tens & Bend Interaction
Adequate	Adequate		Adequate		Adequate		Adequate		Adequate		Adequate
Grade Class	DIM		DIM		DIM		DIM		DIM		Shape



ASD Design

Design of Wood Columns Based on the NDS
(With P-Δ Effects on Displacement)

Sht Number:	
Job Number:	--
Date:	7/9/2019
By:	JMT

Blue Cells Must be Entered Manually

WOOD COLUMNS Species & Grade Designation	WOOD (2) 2x6 DF #2 Column 1		WOOD (4) 2x4 DF #2 Column 2		WOOD (2) 2x6 DF #2 Column 3		WOOD (2) 2x6 DF #2 Column 4		WOOD (2) 2x6 DF #2 Column 5		STEEL COLUMNS Species & Grade Designation
Description	Girder load 2x6		Grider Load 2x4		basement column Grid P and 1.4						Description
L_{ux} (ft)	9.0		9.0		9.0		9.0		9.0		L_{ux} (ft)
L_{uy} (ft)	1.0		1.0		1.0		1.0		1.0		L_{uy} (ft)
P or T DL LL(kip)	2.14	5.00	2.14	5.00	3.10	5.80	0.35	0.93	0.35	0.93	P or T DL LL(kip)
P_u or T_u (kip)	7.14		7.14		8.90		1.28		1.28		P_u or T_u (kip)
e_x e_y											e_x e_y
Column γ (pcf) SW (plf)	34.0	3.9	34.0	5.0	34.0	3.9	34.0	3.9	34.0	3.9	Column γ (pcf) SW (plf)
w_x w_y (plf)	5.00		5.00		5.00		5.00		5.00		w_x w_y (plf)
$w_{u,x}$ $w_{u,y}$ (plf)	5.00		5.00		5.00		5.00		5.00		$w_{u,x}$ $w_{u,y}$ (plf)
$w_{part,x}$ $w_{part,y}$ (plf)											$w_{part,x}$ $w_{part,y}$ (plf)
Strt Dist From Bot											Strt Dist From Bot
End Dist From Bot											End Dist From Bot
$P_{L1,x}$ $P_{L1,y}$ (lbs)											$P_{L1,x}$ $P_{L1,y}$ (lbs)
Location x-x y-y (ft)											Location x-x y-y (ft)
$P_{L1,x}$ $P_{L1,y}$ (lbs)											$P_{L1,x}$ $P_{L1,y}$ (lbs)
$P_{L2,x}$ $P_{L2,y}$ (lbs)											$P_{L2,x}$ $P_{L2,y}$ (lbs)
Location x-x y-y (ft)											Location x-x y-y (ft)
$P_{L2,x}$ $P_{L2,y}$ (lbs)											$P_{L2,x}$ $P_{L2,y}$ (lbs)
$C_{p,vert}$ $C_{p,lat}$	1.00	1.60	1.00	1.60	1.00	1.60	1.00	1.60	1.00	1.60	C_b D.N.A.
C_r Wet Use (Y/N)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	U A_g - A_n (in ²)
C_t C_i	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	D.N.A.
C_T C_{Fu}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	K_z D.N.A.
K_{ex} K_{ey}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	K_x K_y
% W_{cc} for Δ											% W_{cc} for Δ
b d (in)	1.5	5.5	1.5	3.5	1.5	5.5	1.5	5.5	1.5	5.5	b_f d (in)
E_x E_y (psi)	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	1,600,000.0	A_g A_n (in)
E'_x E'_y (psi)	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	1,600,000	E_x E_y (psi)
E_{min-x} E_{min-y} (psi)	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	r_x r_y (in)
E_{min-x} E_{min-y} (psi)	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	580,000.0	T_{ny} T_{nr} (kips)
C_{M-E} C_{M-Fc}	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	$\lambda_{p-c,FL}$ $\lambda_{r-c,FL}$
C_{M-b} $C_{M-Fc,Perp}$	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	$\lambda_{p-c,WEB}$ $\lambda_{r-c,WEB}$
C_{M-t} C_{F-c}	1.00	1.10	1.00	1.15	1.00	1.10	1.00	1.10	1.00	1.10	$b_p/2t_f$ or b/t h/t_w or h/t
C_v C_i	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	1.00	0.99	Q_{s-c} Q_{a-c}
L_{ex}/d L_{ey}/b	19.6	8.0	30.9	8.0	19.6	8.0	19.6	8.0	19.6	8.0	KL_x/r_x KL_y/r_y
$L_y/(d$ or $b)$ Max c	50	0.80	50	0.80	50	0.80	50	0.80	50	0.80	KL/r Max $4.71(E/F_y)^{1/2}$
f_t f_c (psi)	432.7	0.0	340.0	0.0	539.4	0.0	77.6	0.0	77.6	0.0	F_{cr} $F_{cr,FTB}$ (ksi)
F_c F_T (psi)	1350.00	575.00	1350.00	575.00	1350.00	575.00	1350.00	575.00	1350.00	575.00	Ω_{TY} Ω_{TR}
F_c F_T (psi)	928	632.50	462	661.25	928	632.50	928	632.50	928	632.50	P_n (Kips) Ω_c
$P_{TL,ALL}$ $T_{TL,ALL}$ (kip)	P = 15.31	T = 10.44	P = 9.69	T = 13.89	P = 15.31	T = 10.44	P = 15.31	T = 10.44	P = 15.31	T = 10.44	$P_u/2$ T_u/Ω (kip)
Comp or Tension	46.6% Stressed		73.7% Stressed		58.1% Stressed		8.4% Stressed		8.4% Stressed		Comp or Tension
e_x (in) e_y (in)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	e_x (in) e_y (in)
C_{F-b} D.N.A.	1.30		1.50		1.30		1.30		1.30		M_{px} M_{py} (k*ft)
F_{bx} F_{by} (psi)	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	900.00	M_n LTB or WLB (k*ft)
D.N.A. D.N.A.											M_n FLB (k*ft)
I_x I_y (in ⁴)	41.59	3.09	21.44	3.94	41.59	3.09	41.59	3.09	41.59	3.09	I_x I_y (in ⁴)
Lateral Rxn (lbs) x y	22.5	0.0	22.5	0.0	22.5	0.0	22.5	0.0	22.5	0.0	Lateral Rxn (lbs) x y
Z_{nail} - PLT C_{eg}/C_{tn} (lbs)	97.00	0.67	97.00	0.67	97.00	0.67	97.00	0.67	97.00	0.67	$\lambda_{p,FL-B}$ $\lambda_{r,FL-B}$
Plate Nails/Mmbr	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.1	0.0	$\lambda_{p,WEB-B}$ $\lambda_{r,WEB-B}$
A34 or A35 Req'd	1 A34		1 A34		1 A34		1 A34		1 A34		L_p L_r (ft)
F_{bx}^* F_{by}^*	1872.00	1854.21	2160.00	2145.57	1872.00	1854.21	1872.00	1854.21	1872.00	1854.21	F_y (ksi) Ω_b
F_{bx}^* F_{by}^*	1872.00	1854.21	2160.00	2145.57	1872.00	1854.21	1872.00	1854.21	1872.00	1854.21	Z_x (in ³) Z_y (in ³)
f_{bx} f_{by} (psi)	40.17	0.00	49.59	0.00	40.17	0.00	40.17	0.00	40.17	0.00	f_{bx} f_{by} (ksi)
S_x S_y (in ³)	15.13	4.13	12.25	5.25	15.13	4.13	15.13	4.13	15.13	4.13	S_x S_y (in ³)
$M_{TL,Max}$ (k-ft)	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00	0.05	0.00	$M_{TL,Max}$ (k-ft)
$M_{TL,ALL}$ (k-ft)	2.3	0.6	2.2	0.9	2.3	0.6	2.3	0.6	2.3	0.6	M_{ny}/Ω (k*ft)
Bending	2.17%		2.31%		2.17%		2.17%		2.17%		Bending
Max TL Δ Ratio	L/ 150		L/ 150		L/ 150		L/ 240		L/ 180		Max TL Δ Ratio
Allowable TL Δ											Allowable TL Δ
$\Delta_{TL,Max}$ (in)	0.013	0.000	0.023	0.000	0.012	0.000	0.019	0.000	0.021	0.000	$\Delta_{TL,Max}$ (in)
$\Delta_{TL,ALL}$ (in)	0.72	0.72	0.72	0.72	0.72	0.72	0.45	0.45	0.60	0.60	$\Delta_{TL,ALL}$ (in)
Actual TL Δ	L/ 8471		L/ 4795		L/ 8973		L/ 5718		L/ 5187		Actual TL Δ
Plate Material	DF #2		DF #2		DF #2		DF #2		DF #2		D.N.A.
$F_{c,Perp}$ $F'_{c,Perp}$ (psi)	625.0	625.00	625.0	625.00	625.0	625.00	625.0	625.00	625.0	625.00	F_{cr} (ksi) $J_c/S_y h_o$
P_{ALL} (kip) $f_{c,Perp}$ (psi)	P = 10.31	432.73	P = 13.13	340.00	P = 10.31	539.39	P = 10.31	77.58	P = 10.31	77.58	D.N.A.
Plate Bearing	69.24%		54.40%		86.30%		12.41%		12.41%		D.N.A.
L_e Bending (ft)	2.06	16.56	2.06	16.56	2.06	16.56	2.06	16.56	2.06	16.56	L_u Bending (ft)
R_g D.N.A.	7.77		6.20		7.77		7.77		7.77		Max (H1-1a) or (H1-1b)
F_{BE} (psi)	11518.1		18099.9		11518.1		11518.1		11518.1		Tension or Compression
Comp OR Tens & Bend	46.65%		73.65%		58.15%		8.36%		8.36%		Comp OR Tens & Bend
Interaction	Adequate		Adequate		Adequate		Adequate		Adequate		Interaction
Grade Class	DIM		DIM		DIM		DIM		DIM		Shape



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