

1173 Shepard Creek Parkway

Structural Calculations

Project Address:

1173 Shepard Creek Parkway, Farmington, Utah

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6949 S High Tech Drive #200
Midvale, Utah 84047
(801) 352-0075

Focus Project #:

20-7357

Location:

Farmington, Utah

Date:

9/21/2020

Engineered by:

A. Eastman

Reviewed by:



Adam W. Eastman, P.E.

Project Name: 1173 Shepard Creek Parkway

Location: Farmington, Utah

Job #: 20-7357

Engineered by: A. Eastman

Reviewed by: Adam W. Eastman, P.E.

Code: 2018 IBC

Risk Category: II

Design Method ASD u.n.o.

LOADS

Gravity Loads:

Roof Snow Load:

Elevation (ft):	4300
County:	Davis
P _g (psf):	33.0
Min. Roof Pitch (x/12):	0
Exposure of Roof:	Partial
C _t :	1
C _e :	1
I _s :	1
P _f (psf):	25.0

Roof Dead Load:

Dead Load (psf):	20
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Floor Loads:

Live Load (psf):	50
Dead Load (psf):	25

Soil Bearing Capacity:

Soil Bearing Capacity (psf):	3500	AGRA E&E Job No. 8-817-001952
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Lateral Loads:

Wind Loads:

Roofing Material:	Shingle/Tile
Max Roof Pitch (x/12):	0 /12
Roof Angle (degrees):	0.0
Exposure Category:	B
Mean Roof Height (ft):	24
Wind Speed V (mph):	140
Height & Exposure Factor K:	1
h _L (ft):	45
2a (ft):	9

Seismic Loads:

Roof Diaphragm Height h _r (ft):	24	
I _c :	1	
T _a (sec):	0.217	
T _L (sec)	8	
Site Soil Class:	D-DEF	C _s :
(Structural Sheathing) R Value:	6.5	0.164
(Gypsum Sheathing) R Value:	2	0.532
(Masonry Shear Wall) R Value:	5	0.213
(Concrete Shear Wall) R Value:	4	0.266
(Cantilever Steel Post) R Value:	2.5	0.426
(Steel Moment Frame) R Value:	3.5	0.304
S _{ds} :	1.064	
S _{d1} :	0.591	
S ₁ :	0.49	
Seismic Design Category:	D	
k-value:	1	
Seismic Weight W _{total} (lbs):	136350	

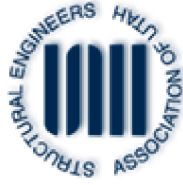
This engineering report is valid for the following plan and location:

1173 Shepard Creek Parkway
1173 Shepard Creek Parkway, Farmington, Utah

GENERAL NOTES:

1. THE LOADS AND DESIGNS FOUND WITHIN THIS STRUCTURAL PACKAGE ARE INTENDED FOR THE LOCATION ABOVE ONLY AND ARE NOT VALID FOR ANY LOCATION BESIDES THAT LISTED ABOVE.

2018 Utah Ground Snow Load Map



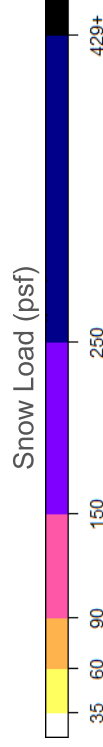
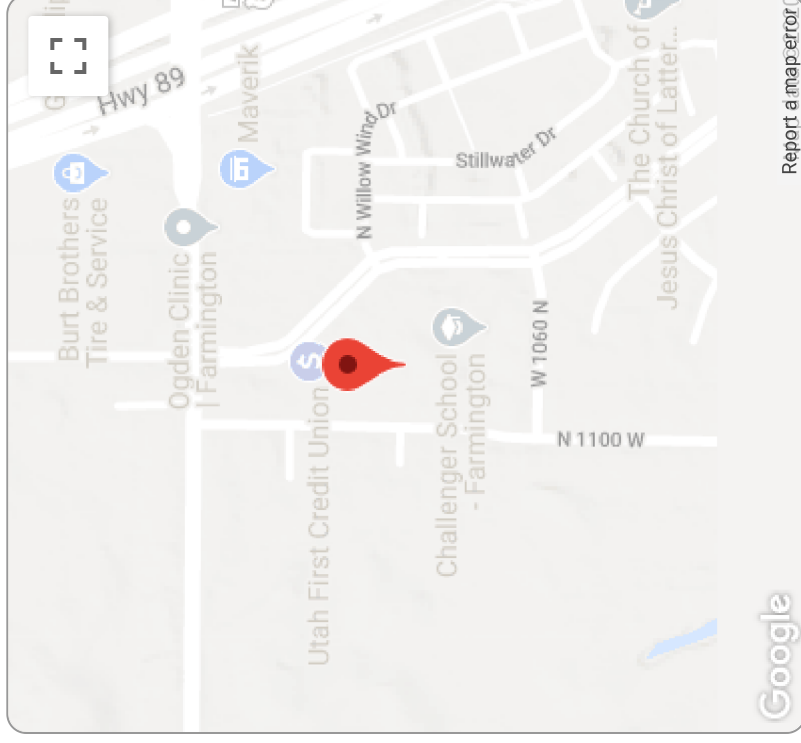
Latitude: 40.999

Longitude: -111.911

Elevation: 4,277 ft

Ground Snow Load:

33 psf / 1.59 kPa



***This document is not legally binding. The user is urged to verify ground snow load values with the local authority having jurisdiction.**

These ground snow load values represent 50-year ground snow load estimated value at a 2% probability of exceedance for the location given. The grid used in the map is 3350ft by 3350ft. Elevations for these grid cells were estimated by aggregating data from 100ft by 100ft USGS digital elevation models and may not coincide with the actual site elevation. These predictions are calculated using the process outlined in The Utah Snow Load Study.¹

Final predictions given are bounded at a lower limit for a minimum ground snow load of 21 psf to meet ASCE 7. Estimated values for snow loads at elevations significantly higher than all nearby stations lead to unreasonably high snow load estimates, therefore, the predictions in the map are not allowed to extend

beyond the highest 50-year station ground snow load of 429 psf. Elevations over 9,000 ft are also considered less accurate due to the limited number of stations at these elevations. The results shown in this report have included a warning if the results have reached or exceeded the upper limit.

While great efforts have been made to ensure these predictions are as accurate as possible, designers must use expert judgement to ensure that such predictions are appropriate for their particular project. The SEAU and the authors cannot accept responsibility for prediction errors or any consequences resulting therefrom.

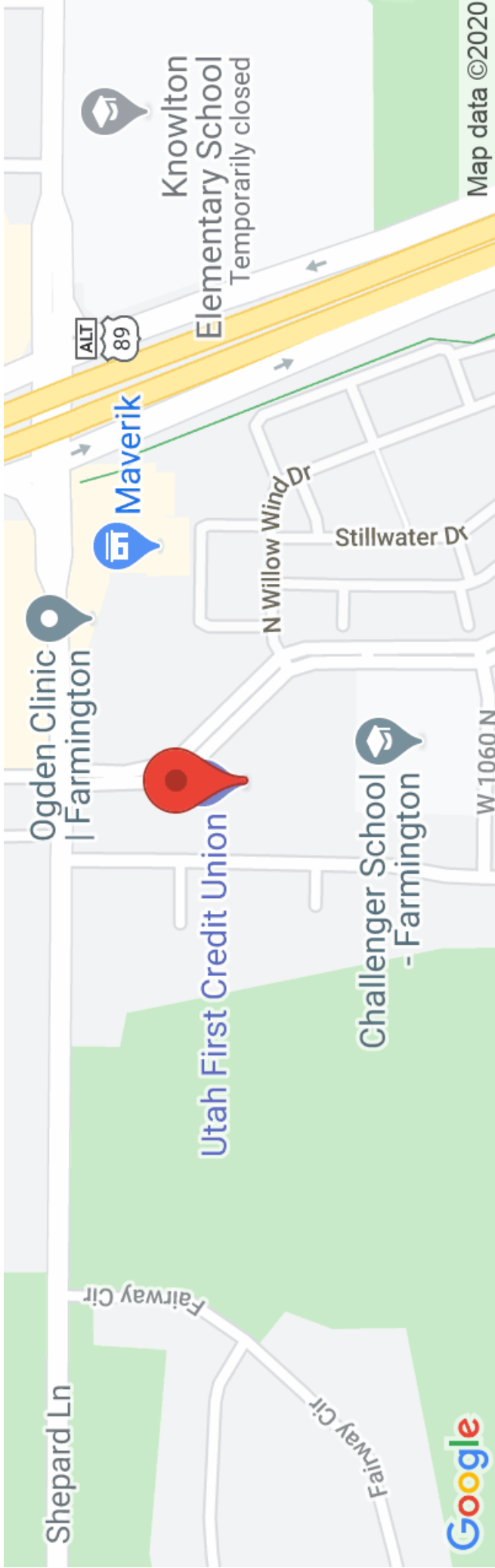
1 Bean, Brennan; Maguire, Marc; and Sun, Yan, "The Utah Snow Load Study" (2018). *Civil and Environmental Engineering Faculty Publications*. Paper 3589.

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1173 Shepard Creek Pkwy, Farmington, UT 84025, USA

Latitude, Longitude: 40.9994881, -111.9109585



Date	8/25/2020, 11:00:33 AM	
Design Code Reference Document	ASCE7-16	
Risk Category	II	
Site Class	D - Default (See Section 11.4.3)	

Type	Value	Description
S _S	1.33	MCE _R ground motion. (for 0.2 second period)
S ₁	0.49	MCE _R ground motion. (for 1.0s period)
S _{M/S}	1.596	Site-modified spectral acceleration value
S _{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S _{DS}	1.064	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

Type	Value	Description
F _v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.608	MCE _G peak ground acceleration
F _{PGA}	1.2	Site amplification factor at PGA
PGA _M	0.729	Site modified peak ground acceleration
T _L	8	Long-period transition period in seconds
SsRT	1.33	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.538	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	2.897	Factored deterministic acceleration value. (0.2 second)
S1RT	0.49	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.554	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.249	Factored deterministic acceleration value. (1.0 second)
PGAd	1.127	Factored deterministic acceleration value. (Peak Ground Acceleration)
C _{RS}	0.865	Mapped value of the risk coefficient at short periods
C _{R1}	0.883	Mapped value of the risk coefficient at a period of 1 s

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Snow Drift Calculations

Roofing Material: Shingle/Tile
Roof Pitch (x/12): 0
Angle (degrees) 0.0
P_g (psf): 33.0
P_f (psf): 25.0
C_s: 1.00
P_s (psf): 25.0
γ_s (pcf): 18.3
h_b (ft): 1.37

(@ Edge)

Mark	h _o (ft)	h _c (ft)	Required?	l _u (ft)	l _l (ft)	h _d (ft)	w (ft)	P _d (psf)	P _{f-total} (psf)	Factor of ↑
1	3	1.63	YES	0	22	1.19	4.7	21.7	46.7	1.87

Additional Seismic Weight Calculations:

A (ft/1000'): 4.3
W_s (psf): 0.00

Project Summary

ROOF BEAM SCHEDULE				
MARK	QTY.	SIZE	MATERIAL	GRADE
RB1	3	1 3/4" x 11 7/8"	LVL	1.9E
RB2	3	2 x 8	DIM. LUMBER	DF-L#2
RB3	2	2 x 6	DIM. LUMBER	DF-L#2
RB4	2	1 3/4" x 9 1/2"	LVL	1.9E
SECOND FLOOR BEAM SCHEDULE				
MARK	QTY.	SIZE	MATERIAL	GRADE
B201	1	6 3/4" x 19 1/2"	GLULAM	24F-V4 DF/DF
B202	2	1 3/4" x 9 1/2"	LVL	1.9E
B203	3	1 3/4" x 11 7/8"	LVL	1.9E
B204	3	1 3/4" x 11 7/8"	LVL	1.9E
B205	1	6 3/4" x 15"	GLULAM	24F-V4 DF/DF
B206	2	1 3/4" x 9 1/2"	LVL	1.9E
B207	2	2 x 6	DIM. LUMBER	DF-L#2
B208	3	2 x 10	DIM. LUMBER	DF-L#2
B209	2	1 3/4" x 7 1/4"	LVL	1.9E
B210	2	1 3/4" x 14"	LVL	1.9E
B211	3	1 3/4" x 16"	LVL	1.9E
B212	1	6 3/4" x 19 1/2"	GLULAM	24F-V4 DF/DF

MARK	LENGTH	WIDTH	HEIGHT	CONTINUOUS REINFORCEMENT				CROSSWISE REINFORCEMENT				NOTES
				QTY.	SIZE	LENGTH	SPACING	QTY.	SIZE	LENGTH	SPACING	
F1.5	CONT.	18"	12"	2	#4	CONT.	EQ.	-				
F2.0	CONT.	24"	12"	3	#4	CONT.	EQ.	-				
S2.0	24"	24"	12"	3	#4	18"	EQ.	3	#4	18"	EQ.	
S3.5	42"	42"	12"	5	#4	36"	EQ.	5	#4	36"	EQ.	
NOTES: <ol style="list-style-type: none"> 1. $f_c = 3,000$ PSI, $f_y = 60,000$ PSI 2. EXTEND ALL FOOTINGS BELOW THE FROST LINE OF THE LOCALITY. (30") 3. FOOTINGS SHALL BEAR ON NATIVE UNDISTURBED SOILS OR COMPACTED STRUCTURAL FILL AS APPROVED AND SPECIFIED BY A LICENSED GEOTECHNICAL ENGINEER. 4. NO PENETRATIONS SHALL BE ALLOWED THROUGH FOOTINGS. WHEN CONFLICTS ARISE THE FOOTING SHALL BE STEPPED BELOW THE CONFLICT AND THE FOUNDATION WALL SHALL EXTEND TO THE FOOTING AS REQUIRED AND THE PENETRATION CAN GO THROUGH THE FOUNDATION. 5. FOOTINGS SHALL BE CENTERED UNDER ALL WALLS & COLUMNS. U.N.O. 6. PLACE ALL REINFORCING STEEL ACCURATELY & SUPPORT AGAINST DISPLACEMENT PRIOR TO POURING CONCRETE. 7. LONGITUDINAL AND CROSSWISE REINFORCEMENT SHALL HAVE 3" OF CLEAR COVER FROM THE BASE OF THE FOOTING. 												

Project Summary

FOUNDATION WALL SCHEDULE								
MARK	THICKNESS	MAX HEIGHT	VERTICAL REINFORCEMENT		HORIZONTAL REINFORCEMENT			NOTES
			SIZE	SPACING	QTY.	SIZE	SPACING	
FW1	8"	3'-0"	#4	12" O.C.	-	#4	12" O.C.	
FW2	16"	3'-0"	#4	12" O.C.	-	#4	12" O.C.	2 MATS
NOTES: 1. $f_c = 3,000$ PSI, $f_y = 60,000$ PSI 2. PLACE VERTICAL AND HORIZONTAL REINFORCEMENT IN THE CENTER OF FOUNDATION WALL. 3. (1) HORIZONTAL BAR SHALL BE PLACED WITHIN 4" OF THE TOP AND BOTTOM OF THE FOUNDATION WALL. ALL OTHER BARS SHALL BE EQUALLY SPACED U.N.O. 4. PLACE (2) HORIZONTAL #4 BARS WITHIN 2" OF EACH OPENING AND EXTEND BARS 24" BEYOND THE EDGE OF OPENING. VERTICAL BARS MAY TERMINATE 3" FROM THE TOP OF THE CONCRETE. PLACE (1) #4 BARS AT EACH SIDE AND BELOW EACH OPENING. HEIGHT OF CONCRETE OVER OPENINGS SHALL BE A MINIMUM OF 12" U.N.O. 5. PROVIDE 24" LONG LAP SPLICES FOR CONTINUOUS REINFORCEMENT. 6. PROVIDE ANCHOR BOLTS EMBEDDED INTO FOUNDATION WALLS AT ALL EXTERIOR AND SHEAR WALLS U.N.O. SEE ANCHOR BOLT SCHEDULE AND PLANS FOR SIZE AND SPACING OF ANCHOR BOLTS.								

SHEAR WALL SCHEDULE						
MARK	MATERIAL	8d NAILS		1½" 16ga. STAPLES		NOTES
		EDGE	FIELD¹	EDGE	FIELD	
SW1	7/16" OSB OR CDX PLYWOOD	6"	12"	3"	12"	
SW2	7/16" OSB OR CDX PLYWOOD	4"	12"	-	-	
SW3	7/16" OSB OR CDX PLYWOOD	3"	12"	-	-	
SW4	7/16" OSB OR CDX PLYWOOD	2"	12"	-	-	5
NOTES: 1. ALL EXTERIOR SHEATHING NOT DESIGNATED ON THE PLANS AS A SPECIFIC SHEAR WALL (SW1-SW4) SHALL BE SHEATHED AND NAILED/STAPLED AS A SW1. 2. SHEAR WALLS FASTENED TO STUDS THAT ARE SPACED @ 24" O.C. REQUIRE FIELD NAILING @ 6" O.C. IN LIEU OF 12" O.C. AT INTERMEDIATE FRAMING MEMBERS. 3. SOLID BLOCK ALL PANEL EDGES BETWEEN THE BOTTOM PLATE AND DOUBLE TOP PLATE OF ALL WALLS W/ OSB PLYWOOD. 4. 1 1/2" 16ga. STAPLES (w/ 7/16" CROWN) ARE ONLY ALLOWED FOR SW1, SW5, SW6 (IF SW5 AND SW6 SHOWN) 5. FOR SW4 OR DOUBLE SIDED SW2 OR SW3 PANELS, THE WIDTH OF THE NAILED FACE OF FRAMING MEMBERS SHALL BE MINIMUM 3" NOMINAL OR DOUBLE 2x AT ADJOINING PANEL EDGES AND NAILS AT ALL PANEL EDGES SHALL BE STAGGERED. IF DOUBLE 2x IS USED, PANEL JOINTS SHALL BE OFFSET TO FALL ON DIFFERENT FRAMING 6. THE NAILING PATTERNS ABOVE AND BELOW OPENINGS THAT REQUIRE STRAPPED OPENINGS SHALL MATCH THE 7. SHEATHING NAILS SHALL BE COMMON WIRE OR BOX NAILS. THE HEAD OF THE NAIL MUST BE INSTALLED FLUSH WITH THE SURFACE OF THE SHEATHING.						

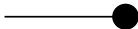
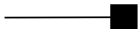
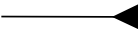
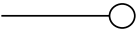
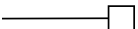
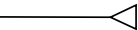
POST SCHEDULE	
MARK	SIZE
P1	(1) 2x
P2	(2) 2x
P3	(3) 2x
P4	(4) 2x
P5	(5) 2x
P6	4 x 4
P7	6 x 6
P8	3 1/2" x 3 1/2" PARALLAM POST
P9	3 1/2" x 5 1/4" PPARALLAM POST
P10	3 1/2" x 7" PARALLAM POST
P11	5 1/4" x 5 1/4" PARALLAM POST
P12	5 1/4" x 7" PARALLAM POST
P13	7" x 7" PARALLAM POST
NOTES: 1. INSTALL (1) TRIMMER AND (1) KING STUD ON BOTH SIDES OF EACH OPENING. U.N.O. 2. ATTACH 2x BUILT UP POST PLIES TOGETHER W/ 16d NAILS @ 6" O.C. STAGGERED. 3. POST CALLOUTS AT HEADERS INDICATE THE NUMBER OF TRIMMER STUDS REQUIRED. 4. PROVIDE SOLID 2x SQUASHING BLOCKING BELOW EACH POST AT FLOOR FRAMING. BLOCKING SHALL MATCH DIMENSIONS OF POST ABOVE. PROVIDE POSTS OF EQUAL DIMENSION OR GREATER BELOW SQUASHING BLOCKING AND POSTS ABOVE THROUGH TO FOUNDATION/FOOTING U.N.O. OR UNLESS POST ENDS OVER A BEAM. 5. BUILT-UP 2x POSTS (P2 - P5) SHALL MATCH THE WALL DIMENSION FOR WHICH THEY ARE PLACED. 6. BUILT UP POSTS SHALL BE DF-L #2 GRADE. PARALLAM POSTS SHALL BE 2.0E PSL 7. POSTS SHALL BE CENTERED BELOW THE BEAMS/POSTS ABOVE FOR WHICH LOADS THE POSTS ARE INTENDED TO CARRY.	

Project Summary

GENERAL FRAMING NOTES

1. REFER TO DETAIL SHEET SD.0 FOR GENERAL STRUCTURAL NOTES.
2. ALL DETAILS SHALL APPLY IN SIMILAR/TYPICAL SITUATIONS.
3. ALL STRUCTURAL PRODUCTS SHALL BE INSTALLED PER THE MANUFACTURER'S SPECIFICATIONS.
4. USE (9) 16d NAILS BETWEEN TOP PLATE LAP SPLICES SEE DET. 5/SD.1
5. INTERIOR STUD WALLS SHALL BE 2x4 OR 2x6 (AS PER PLANS) @ 16" O.C. U.N.O.
6. EXTERIOR STUD WALLS SHALL BE 2x6 @ 16" O.C. U.N.O.
7. ALL NAIL FASTENERS SHALL BE COMMON WIRE OR BOX NAILS.
8. SHEAR WALL HOLDDOWNS AND STRAPS INDICATED ON FLOOR PLANS PERTAIN TO THE BOTTOM OF THE WALLS ON THE PLAN.
9. ROOF FRAMING SHALL BE 24" PRE-MANUFACTURED OPEN WEB TRUSSES AS PER PLANS W/ APA RATED 5/8" OSB PLYWOOD W/ 8d NAILS @ 6" O.C. AT PANEL EDGES AND 12" O.C. IN PANEL FIELD.
10. FLOOR FRAMING SHALL BE PRE MANUFACTURED OPEN WEB TRUSSES AS PER PLANS w/APA RATED 3/4" T&G OSB PLYWOOD W/ 10d RING SHANK NAILS @ 6" O.C. AT PANEL EDGES AND 12" O.C. IN PANEL FIELD
11. ALL WOOD IN DIRECT CONTACT WITH CONCRETE, MASONRY AND/OR THAT IS NOT PERMANENTLY PROTECTED FROM THE ELEMENTS SHALL BE OF A NATURALLY DECAY RESISTANT SPECIES OR PRESERVATIVE TREATED LUMBER.
12. ANY TRUSS OR JOIST LABELED AS A DRAG TRUSS OR DRAG JOIST SHALL RECEIVE ROOF/FLOOR SHEATHING EDGE NAILING PER NOTES 9 & 10 ABOVE.

HOLDDOWN SCHEDULE

MARK	SIZE
	LSTD8/8RJ
	STHD10/10RJ
	HDU8-SDS2.5 w/ SB 7/8x24 CAST IN PLACE ANCHOR
	CS16 x 46" LONG STRAP
	MST37 STRAP
	MST48 STRAP
NOTES: 1. HOLDDOWNS SHALL BE INSTALLED ON A MINIMUM OF (2) FULL HEIGHT KING STUDS. 2. SEE DETAILS FOR TYPICAL HOLDDOWN INSTALLATION. 3. SEE DETAILS FOR TYPICAL FLOOR TO FLOOR STRAP INSTALLATION. 4. POST-INSTALLED HOLDDOWNS MAY BE INSTALLED IN LIEU OF CAST IN PLACE HOLDDOWNS PER DETAILS. 5. 16d SINKER NAILS MAY BE SUBSTITUTED WITH 10d COMMON NAILS. MINIMUM NAIL LENGTH = 2 1/2". 6. USE 'RJ' HOLDDOWN MODEL AT TYPICAL RIMJOIST APPLICATIONS. 7. FLOOR TO FLOOR STRAPS SHALL BE CENTERED OVER THE FLOOR CAVITY.	

ANCHOR BOLT SCHEDULE

MARK	DIAMETER	SPACING	DIAMETER	SPACING
AB-1	1/2"	32"	5/8"	32"
AB-2	1/2"	24"	5/8"	32"
AB-3	1/2"	18"	5/8"	24"
AB-4	1/2"	12"	5/8"	18"
NOTES: 1. PROVIDE ANCHOR BOLTS WITH 7" EMBEDMENT INTO FOUNDATION WALL W/ 3"x3"x0.229" PLATE WASHERS AT ALL EXTERIOR AND SHEAR WALLS. PLACE (1) ANCHOR BOLT WITHIN 4" OF THE EDGE OF EACH PLATE. GALVANIZED ANCHORS w/ TREATED PLATES REQUIRED. 2. ALL UNMARKED FOUNDATION WALLS SHALL BE ASSUMED TO BE AB-1.				

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Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

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Wood Beam

Lic. #: KW-06011038

File: 20-7357 1173 N Shepard Creek.ec6
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Focus Engineering & Surveying, LLC

DESCRIPTION: B204

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10

Load Combination Set : ASCE 7-16

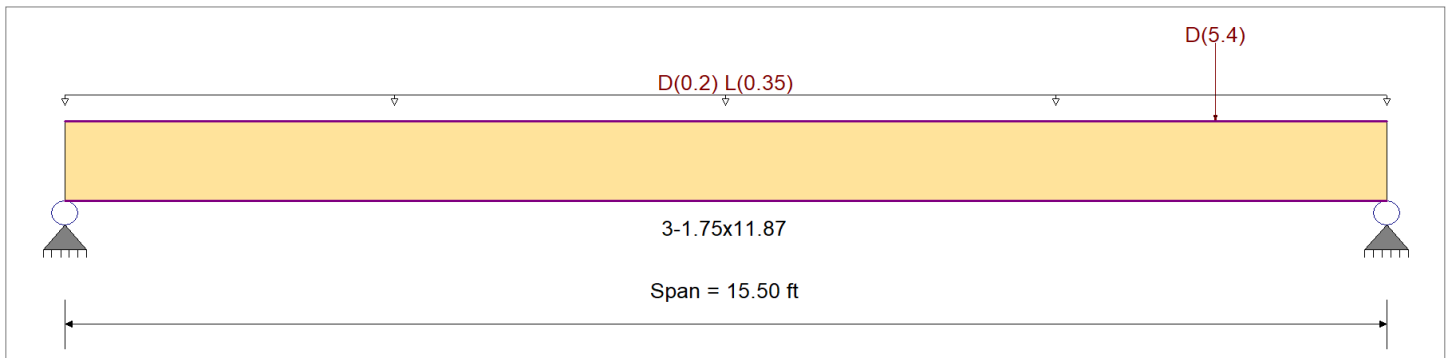
Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-16

Wood Species : DF/DF
Wood Grade : 24F-V8

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,400.0 psi	E : Modulus of Elasticity
Fb -	2,400.0 psi	Ebend- xx
Fc - Prll	1,650.0 psi	Eminbend - xx
Fc - Perp	650.0 psi	Ebend- yy
Fv	265.0 psi	Eminbend - yy
Ft	1,100.0 psi	Density
		31.210pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.20, L = 0.350, Tributary Width = 1.0 ft

Point Load : D = 5.40 k @ 13.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.906	1	Maximum Shear Stress Ratio	=	0.766	1
Section used for this span	=	3-1.75x11.87		Section used for this span	=	3-1.75x11.87	
fb: Actual	=	2,174.44psi		fv: Actual	=	202.99 psi	
Fb: Allowable	=	2,400.00psi		Fv: Allowable	=	265.00 psi	
Load Combination	=	+D+L+H		Load Combination	=	+D+L+H	
Location of maximum on span	=	8.995ft		Location of maximum on span	=	14.538 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.347 in	Ratio =	536	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.755 in	Ratio =	246	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Maximum Forces & Stresses for Load Combinations

Load Combination	Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values		
			M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L		M	fb	F'b	V	fv	F'v
+D+H	Length = 15.50 ft	1	0.568	0.611	0.90	1.000	1.00	1.00	1.00	1.00	1.00		12.62	1,227.33	2160.00	6.06	145.83	238.50
+D+L+H	Length = 15.50 ft	1	0.906	0.766	1.00	1.000	1.00	1.00	1.00	1.00	1.00		22.36	2,174.44	2400.00	8.44	202.99	265.00
+D+Lr+H	Length = 15.50 ft	1	0.409	0.440	1.25	1.000	1.00	1.00	1.00	1.00	1.00		12.62	1,227.33	3000.00	6.06	145.83	331.25
+D+S+H	Length = 15.50 ft	1	0.445	0.479	1.15	1.000	1.00	1.00	1.00	1.00	1.00		12.62	1,227.33	2760.00	6.06	145.83	304.75
+D+0.750Lr+0.750L+H	Length = 15.50 ft	1	0.642	0.570	1.25	1.000	1.00	1.00	1.00	1.00	1.00		19.81	1,927.00	3000.00	7.84	188.70	331.25
+D+0.750L+0.750S+H	Length = 15.50 ft	1	0.698	0.619	1.15	1.000	1.00	1.00	1.00	1.00	1.00		19.81	1,927.00	2760.00	7.84	188.70	304.75
+D+0.60W+H						1.000	1.00	1.00	1.00	1.00	1.00				0.00	0.00	0.00	0.00

Title Block Line 1
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 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

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Wood Beam

Lic. #: KW-06011038

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 Focus Engineering & Surveying, LLC

DESCRIPTION: B204

Load Combination	Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
			M	V								M	f _b	F _b	V	f _v	F _v
Length = 15.50 ft	1		0.320	0.344	1.60	1.000	1.00	1.00	1.00	1.00	1.00	12.62	1,227.33	3840.00	6.06	145.83	424.00
+D+0.750Lr+0.750L+0.450W+H						1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 15.50 ft	1		0.502	0.445	1.60	1.000	1.00	1.00	1.00	1.00	1.00	19.81	1,927.00	3840.00	7.84	188.70	424.00
+D+0.750L+0.750S+0.450W+H						1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 15.50 ft	1		0.502	0.445	1.60	1.000	1.00	1.00	1.00	1.00	1.00	19.81	1,927.00	3840.00	7.84	188.70	424.00
+0.60D+0.60W+0.60H						1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 15.50 ft	1		0.192	0.206	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.57	736.40	3840.00	3.64	87.50	424.00
+D+0.70E+0.60H						1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 15.50 ft	1		0.320	0.344	1.60	1.000	1.00	1.00	1.00	1.00	1.00	12.62	1,227.33	3840.00	6.06	145.83	424.00
+D+0.750L+0.750S+0.5250E+H						1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 15.50 ft	1		0.502	0.445	1.60	1.000	1.00	1.00	1.00	1.00	1.00	19.81	1,927.00	3840.00	7.84	188.70	424.00
+0.60D+0.70E+H						1.000	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 15.50 ft	1		0.192	0.206	1.60	1.000	1.00	1.00	1.00	1.00	1.00	7.57	736.40	3840.00	3.64	87.50	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.7549	8.089		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.959	8.966
Overall MINimum	2.713	2.713
+D+H	2.247	6.253
+D+L+H	4.959	8.966
+D+Lr+H	2.247	6.253
+D+S+H	2.247	6.253
+D+0.750Lr+0.750L+H	4.281	8.288
+D+0.750L+0.750S+H	4.281	8.288
+D+0.60W+H	2.247	6.253
+D+0.750Lr+0.750L+0.450W+H	4.281	8.288
+D+0.750L+0.750S+0.450W+H	4.281	8.288
+0.60D+0.60W+0.60H	1.348	3.752
+D+0.70E+0.60H	2.247	6.253
+D+0.750L+0.750S+0.5250E+H	4.281	8.288
+0.60D+0.70E+H	1.348	3.752
D Only	2.247	6.253
L Only	2.713	2.713
H Only		

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Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

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Wood Beam

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Focus Engineering & Surveying, LLC

DESCRIPTION: B211

CODE REFERENCES

Calculations per NDS 2012, IBC 2012, CBC 2013, ASCE 7-10

Load Combination Set : ASCE 7-16

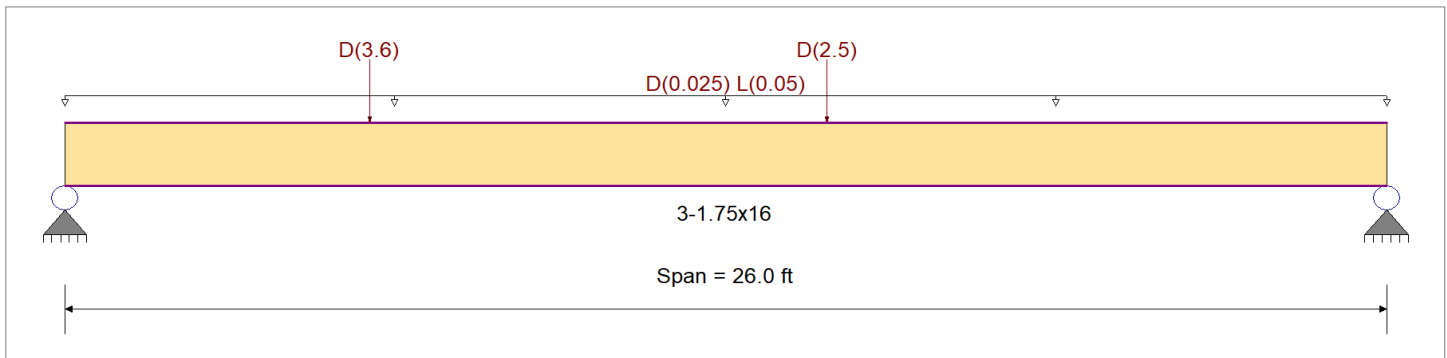
Material Properties

Analysis Method : Allowable Stress Design
Load Combination : ASCE 7-16

Wood Species : iLevel Truss Joist
Wood Grade : MicroLam LVL 1.9 E

Beam Bracing : Beam is Fully Braced against lateral-torsional buckling

Fb +	2,600.0 psi	E : Modulus of Elasticity	
Fb -	2,600.0 psi	Ebend- xx	1,900.0 ksi
Fc - Prll	2,510.0 psi	Eminbend - xx	965.71 ksi
Fc - Perp	750.0 psi		
Fv	285.0 psi		
Ft	1,555.0 psi	Density	42.010 pcf



Applied Loads

Service loads entered. Load Factors will be applied for calculations.

Uniform Load : D = 0.0250, L = 0.050, Tributary Width = 1.0 ft

Point Load : D = 3.60 k @ 6.0 ft

Point Load : D = 2.50 k @ 15.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.643	1	Maximum Shear Stress Ratio	=	0.295	1
Section used for this span	=	3-1.75x16		Section used for this span	=	3-1.75x16	
fb: Actual	=	1,670.93 psi		fv: Actual	=	83.97 psi	
Fb: Allowable	=	2,600.00 psi		Fv: Allowable	=	285.00 psi	
Load Combination	=	+D+L+H		Load Combination	=	+D+L+H	
Location of maximum on span	=	14.993 ft		Location of maximum on span	=	0.000 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.152 in	Ratio =	2054		>=360	
Max Upward Transient Deflection		0.000 in	Ratio =	0		<360	
Max Downward Total Deflection		1.113 in	Ratio =	280		>=240	
Max Upward Total Deflection		0.000 in	Ratio =	0		<240	

Maximum Forces & Stresses for Load Combinations

Load Combination Segment Length	Span #	Max Stress Ratios										Moment Values			Shear Values		
		M	V	C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L		M	fb	F'b	V	fv	F'v
+D+H Length = 26.0 ft	1	0.620	0.287	0.90	1.000	1.00	1.00	1.00	1.00	1.00		27.07	1,449.91	2340.00	0.00	0.00	0.00
+D+L+H Length = 26.0 ft	1	0.643	0.295	1.00	1.000	1.00	1.00	1.00	1.00	1.00		31.19	1,670.93	2600.00	0.00	0.00	0.00
+D+Lr+H Length = 26.0 ft	1	0.446	0.206	1.25	1.000	1.00	1.00	1.00	1.00	1.00		27.07	1,449.91	3250.00	4.12	73.55	356.25
+D+S+H Length = 26.0 ft	1	0.485	0.224	1.15	1.000	1.00	1.00	1.00	1.00	1.00		27.07	1,449.91	2990.00	4.12	73.55	327.75
+D+0.750Lr+0.750L+H Length = 26.0 ft	1	0.497	0.228	1.25	1.000	1.00	1.00	1.00	1.00	1.00		30.16	1,615.68	3250.00	4.56	81.36	356.25
+D+0.750L+0.750S+H Length = 26.0 ft	1	0.540	0.248	1.15	1.000	1.00	1.00	1.00	1.00	1.00		30.16	1,615.68	2990.00	4.56	81.36	327.75

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Project Title:
 Engineer:
 Project ID:
 Project Descr:

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DESCRIPTION: B211

Load Combination Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
		M	V								M	f _b	F _b	V	f _v	F _v
+D+0.60W+H Length = 26.0 ft	1	0.349	0.161	1.60	1.000	1.00	1.00	1.00	1.00	1.00	27.07	1,449.91	4160.00	4.12	73.55	456.00
+D+0.750Lr+0.750L+0.450W+H Length = 26.0 ft	1	0.388	0.178	1.60	1.000	1.00	1.00	1.00	1.00	1.00	30.16	1,615.68	4160.00	4.56	81.36	456.00
+D+0.750L+0.750S+0.450W+H Length = 26.0 ft	1	0.388	0.178	1.60	1.000	1.00	1.00	1.00	1.00	1.00	30.16	1,615.68	4160.00	4.56	81.36	456.00
+0.60D+0.60W+0.60H Length = 26.0 ft	1	0.209	0.097	1.60	1.000	1.00	1.00	1.00	1.00	1.00	16.24	869.95	4160.00	2.47	44.13	456.00
+D+0.70E+0.60H Length = 26.0 ft	1	0.349	0.161	1.60	1.000	1.00	1.00	1.00	1.00	1.00	27.07	1,449.91	4160.00	4.12	73.55	456.00
+D+0.750L+0.750S+0.5250E+H Length = 26.0 ft	1	0.388	0.178	1.60	1.000	1.00	1.00	1.00	1.00	1.00	30.16	1,615.68	4160.00	4.56	81.36	456.00
+0.60D+0.70E+H Length = 26.0 ft	1	0.209	0.097	1.60	1.000	1.00	1.00	1.00	1.00	1.00	16.24	869.95	4160.00	2.47	44.13	456.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	1.1133	12.715		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.802	3.248
Overall MINimum	0.650	0.650
+D+H	4.152	2.598
+D+L+H	4.802	3.248
+D+Lr+H	4.152	2.598
+D+S+H	4.152	2.598
+D+0.750Lr+0.750L+H	4.639	3.086
+D+0.750L+0.750S+H	4.639	3.086
+D+0.60W+H	4.152	2.598
+D+0.750Lr+0.750L+0.450W+H	4.639	3.086
+D+0.750L+0.750S+0.450W+H	4.639	3.086
+0.60D+0.60W+0.60H	2.491	1.559
+D+0.70E+0.60H	4.152	2.598
+D+0.750L+0.750S+0.5250E+H	4.639	3.086
+0.60D+0.70E+H	2.491	1.559
D Only	4.152	2.598
L Only	0.650	0.650
H Only		

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Project Title:
 Engineer:
 Project ID:
 Project Descr:

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Wood Beam

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DESCRIPTION: B212

Load Combination Segment Length	Span #	Max Stress Ratios		C _d	C _{F/V}	C _i	C _r	C _m	C _t	C _L	Moment Values			Shear Values		
		M	V								M	fb	F'b	V	fv	Fv
+D+Lr+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.311	0.251	1.25	0.936	1.00	1.00	1.00	1.00	1.00	23.99	673.01	2164.62	7.31	83.27	331.25
Length = 11.0 ft	2	0.294	0.251	1.25	0.989	1.00	1.00	1.00	1.00	1.00	23.99	673.01	2286.22	4.15	83.27	331.25
+D+S+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.338	0.273	1.15	0.936	1.00	1.00	1.00	1.00	1.00	23.99	673.01	1991.45	7.31	83.27	304.75
Length = 11.0 ft	2	0.320	0.273	1.15	0.989	1.00	1.00	1.00	1.00	1.00	23.99	673.01	2103.32	4.15	83.27	304.75
+D+0.750Lr+0.750L+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.578	0.454	1.25	0.936	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2164.62	13.21	150.55	331.25
Length = 11.0 ft	2	0.547	0.454	1.25	0.989	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2286.22	8.80	150.55	331.25
+D+0.750L+0.750S+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.628	0.494	1.15	0.936	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	1991.45	13.21	150.55	304.75
Length = 11.0 ft	2	0.595	0.494	1.15	0.989	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2103.32	8.80	150.55	304.75
+D+0.60W+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.243	0.196	1.60	0.936	1.00	1.00	1.00	1.00	1.00	23.99	673.01	2770.72	7.31	83.27	424.00
Length = 11.0 ft	2	0.230	0.196	1.60	0.989	1.00	1.00	1.00	1.00	1.00	23.99	673.01	2926.36	4.15	83.27	424.00
+D+0.750Lr+0.750L+0.450W+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.451	0.355	1.60	0.936	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2770.72	13.21	150.55	424.00
Length = 11.0 ft	2	0.427	0.355	1.60	0.989	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2926.36	8.80	150.55	424.00
+D+0.750L+0.750S+0.450W+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.451	0.355	1.60	0.936	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2770.72	13.21	150.55	424.00
Length = 11.0 ft	2	0.427	0.355	1.60	0.989	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2926.36	8.80	150.55	424.00
+0.60D+0.60W+0.60H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.146	0.118	1.60	0.936	1.00	1.00	1.00	1.00	1.00	14.40	403.81	2770.72	4.38	49.96	424.00
Length = 11.0 ft	2	0.138	0.118	1.60	0.989	1.00	1.00	1.00	1.00	1.00	14.40	403.81	2926.36	2.49	49.96	424.00
+D+0.70E+0.60H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.243	0.196	1.60	0.936	1.00	1.00	1.00	1.00	1.00	23.99	673.01	2770.72	7.31	83.27	424.00
Length = 11.0 ft	2	0.230	0.196	1.60	0.989	1.00	1.00	1.00	1.00	1.00	23.99	673.01	2926.36	4.15	83.27	424.00
+D+0.750L+0.750S+0.5250E+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.451	0.355	1.60	0.936	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2770.72	13.21	150.55	424.00
Length = 11.0 ft	2	0.427	0.355	1.60	0.989	1.00	1.00	1.00	1.00	1.00	44.58	1,250.58	2926.36	8.80	150.55	424.00
+0.60D+0.70E+H					0.989	1.00	1.00	1.00	1.00	1.00			0.00	0.00	0.00	0.00
Length = 19.0 ft	1	0.146	0.118	1.60	0.936	1.00	1.00	1.00	1.00	1.00	14.40	403.81	2770.72	4.38	49.96	424.00
Length = 11.0 ft	2	0.138	0.118	1.60	0.989	1.00	1.00	1.00	1.00	1.00	14.40	403.81	2926.36	2.49	49.96	424.00

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L+H	1	0.3198	8.704		0.0000	0.000
	2	0.0000	8.704	+D+L+H	-0.0342	3.257

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	12.599	30.164	3.318
Overall MINimum	5.916	17.105	2.729
+D+H	6.683	13.059	0.588
+D+L+H	12.599	30.164	3.318
+D+Lr+H	6.683	13.059	0.588
+D+S+H	6.683	13.059	0.588
+D+0.750Lr+0.750L+H	11.120	25.888	2.635
+D+0.750L+0.750S+H	11.120	25.888	2.635
+D+0.60W+H	6.683	13.059	0.588
+D+0.750Lr+0.750L+0.450W+H	11.120	25.888	2.635
+D+0.750L+0.750S+0.450W+H	11.120	25.888	2.635
+0.60D+0.60W+0.60H	4.010	7.836	0.353
+D+0.70E+0.60H	6.683	13.059	0.588
+D+0.750L+0.750S+0.5250E+H	11.120	25.888	2.635
+0.60D+0.70E+H	4.010	7.836	0.353
D Only	6.683	13.059	0.588
L Only	5.916	17.105	2.729
H Only			

Stud Wall

Stud Wall 1:

Stud Wall 1 Design Summary:

Use 2x6 DF-L Stud Grade @ 16" o.c.

Wall Information

Material:	DF-L Stud
Exterior/Interior:	Exterior
b_{stud} (in):	1.5
d_{stud} (in):	5.5
l_c (ft):	12
Stud Spacing (in):	16
Stud Spacing (ft):	1.33
F_b (psi):	700
F_c^\perp (psi):	625
F_c (psi):	850
E (psi):	1400000
E_{min} (psi):	510000
A (in ²):	8.25
S (in ³):	7.56

Adjustments For Reference Design Values

(For F'_b) C_F :	1.00
(For F'_c) C_F :	1.00
Axial Only C_D :	1.15
Axial+Bending C_D :	1.6
C_b :	1.25
C_r :	1.35

Determining (C_p) Column Stability factor

E'_{min} (psi):	510000
c :	0.8
F_{cE} :	611.6
(Axial) F^*_c (psi):	977.5
(Axial+Bend) F^*_c (psi):	1360
(Axial) C_p :	0.516
(Axial+Bend) C_p :	0.397

Wall Loads

Roof Material:	Shingle/Tile
Roof Pitch (x/12):	0
Roof Angle (degrees):	0.0
C_s :	1.00
P_{drift} factor \uparrow :	1.00
P_s (psf):	25.0
D_{roof} (psf):	20
D_{floor} (psf):	25
L_{floor} (psf):	50
width _{trib-roof} (ft):	22
width _{trib-floor} (ft):	9
Load _{add'l} (plf):	0
P_{net} (psf):	33.7

Distributed Wall Loads

D_{roof} (plf):	440
D_{floor} (plf):	225
L_{floor} (plf):	450
Snow P_s (plf):	550.0
Factored w_u (plf):	1415.0
P_u (lbs):	1886.7
w_u -wind (plf):	27.0

Required Strengths

f_b (psi):	770.0
f_c (psi):	228.7

Unity Equation

Axial and Bending

F_{cEx} (psi):	611.6
LC-5 Unity Equation:	0.66
LC-6 Unity Equation:	0.79

Stud Wall Design Checks

Bending Only	Axial Only	Axial+Bending	Unity Equation	Bearing
f_b (psi): 770.0	f_c (psi): 228.7	f_c (psi): 228.7	Required: 1	f_c^\perp (psi): 228.7
F'_b (psi): 1512	F'_c (psi): 504.2	F'_c (psi): 540.3	Equation: 0.79	F'_c^\perp (psi): 781.3
Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK

King Stud

King Stud 1:

King Stud 1 Design Summary:

Use (2) 2x6 DF-L Stud Grade Full Height King Studs

Wall Information

Material:	DF-L Stud
Exterior/Interior:	Exterior
b_{stud} (in):	6
d_{stud} (in):	5.5
l_c (ft):	11
Wall Stud Spacing (in):	16
Width of Opening (ft):	14.00
# of King Studs:	2
F_b (psi):	700
F_c^\perp (psi):	625
F_c (psi):	850
E (psi):	1400000
E_{min} (psi):	510000
A (in ²):	33
S (in ³):	30.25

Adjustments For Reference Design Values

(For F'_b) C_F :	1.00
(For F'_c) C_F :	1.00
Axial Only C_D :	1.15
Axial+Bending C_D :	1.6
C_b :	1.0625
C_r :	1
Determining (C_p) Column Stability factor	
E'_{min} (psi):	510000
c :	0.8
F_{cE} :	727.8
(Axial) F^*_c (psi):	977.5
(Axial+Bend) F^*_c (psi):	1360
(Axial) C_p :	0.582
(Axial+Bend) C_p :	0.458

Wall Loads

Roof Material:	Shingle/Tile
Roof Pitch (x/12):	0
Roof Angle (degrees):	0.0
C_s :	1.00
P_{drift} factor \uparrow :	1
P_s (psf):	25.0
D_{roof} (psf):	20
D_{floor} (psf):	25
L_{floor} (psf):	50
width _{trib-roof} (ft):	16
width _{trib-floor} (ft):	0
Load _{add'l} (plf):	0
P_{net} (psf):	33.7

Distributed Wall Loads

D_{roof} (plf):	320
D_{floor} (plf):	0
L_{floor} (plf):	0
Snow P_s (plf):	400.0
Factored w_u (plf):	720.0
P_u (lbs):	5520.0
w_{u-wind} (plf):	155.0

Required Strengths

f_b (psi):	930.1
f_c (psi):	167.3

Unity Equation

Axial and Bending

F_{cEx} (psi):	727.8
LC-5 Unity Equation:	0.94
LC-6 Unity Equation:	0.88

Stud Wall Design Checks

Bending Only	Axial Only	Axial+Bending	Unity Equation	Bearing
f_b (psi): 930.1	f_c (psi): 167.3	f_c (psi): 167.3	Required: 1	f_c^\perp (psi): 167.3
F'_b (psi): 1120	F'_c (psi): 569.2	F'_c (psi): 622.7	Equation: 0.94	F'_c^\perp (psi): 664.1
Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK

King Stud

King Stud 2:

King Stud 2 Design Summary:

Use (1) 2x6 DF-L Stud Grade Full Height King Studs

Wall Information

Material:	DF-L Stud
Exterior/Interior:	Exterior
b_{stud} (in):	4.5
d_{stud} (in):	5.5
l_c (ft):	11
Wall Stud Spacing (in):	16
Width of Opening (ft):	9.50
# of King Studs:	1
F_b (psi):	700
F_c^\perp (psi):	625
F_c (psi):	850
E (psi):	1400000
E_{min} (psi):	510000
A (in ²):	24.75
S (in ³):	22.69

Adjustments For Reference Design Values

(For F'_b) C_F :	1.00
(For F'_c) C_F :	1.00
Axial Only C_D :	1.15
Axial+Bending C_D :	1.6
C_b :	1.0833333
C_r :	1
Determining (C_p) Column Stability factor	
E'_{min} (psi):	510000
c :	0.8
F_{cE} :	727.8
(Axial) F^*_c (psi):	977.5
(Axial+Bend) F^*_c (psi):	1360
(Axial) C_p :	0.582
(Axial+Bend) C_p :	0.458

Wall Loads

Roof Material:	Shingle/Tile
Roof Pitch (x/12):	0
Roof Angle (degrees):	0.0
C_s :	1.00
P_{drift} factor \uparrow :	1
P_s (psf):	25.0
D_{roof} (psf):	20
D_{floor} (psf):	25
L_{floor} (psf):	50
width _{trib-roof} (ft):	22
width _{trib-floor} (ft):	0
Load _{add'l} (plf):	0
P_{net} (psf):	33.7

Distributed Wall Loads

D_{roof} (plf):	440
D_{floor} (plf):	0
L_{floor} (plf):	0
Snow P_s (plf):	550.0
Factored w_u (plf):	990.0
P_u (lbs):	5362.5
w_{u-wind} (plf):	109.5

Required Strengths

f_b (psi):	876.2
f_c (psi):	216.7

Unity Equation

Axial and Bending

F_{cEx} (psi):	727.8
LC-5 Unity Equation:	0.93
LC-6 Unity Equation:	0.96

Stud Wall Design Checks

Bending Only	Axial Only	Axial+Bending	Unity Equation	Bearing
f_b (psi): 876.2	f_c (psi): 216.7	f_c (psi): 216.7	Required: 1	f_c^\perp (psi): 216.7
F'_b (psi): 1120	F'_c (psi): 569.2	F'_c (psi): 622.7	Equation: 0.96	F'_c^\perp (psi): 677.1
Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK	Check: DESIGN OK

Post (Trimmer) Calculations & Post Chart

Wood Values Based on Tables 2015 NDS Code

Material:	F_b (psi)	$F_{b\perp}$ (psi)	F_c (psi)	E (psi)	E_{min} (psi)
DF-L#2 2"x4"	900	625	1350	1600000	580000
DF-L #2 5x5 & ↑	750	625	700	1300000	470000
PSL-1.8E	2400	425	2500	1800000	914880
LSL-1.3E	1700	710	1835	1300000	660750

Max Post Capacities:

Max Post Capacities:										(d _y)		(d _x)		(x & y)		check						
Post	Type	No. Posts	b (in)	d (in)	P (lb)	I (ft)	I _{xx} (ft)	I _{yy} (ft)	e _x (in)	e _y (in)	(I _x /d) _x	(I _y /d) _y	A (in ²)	S _x (in ³)	S _y (in ³)		f _c (psi)	C _d	F _r (psi)	F _r (psi)	F _r (psi)	F _r (psi)
(2) 2x4	DF-L #2	2	3	3.5	5597	7	7	1	0.61	0.00	24.0	4.0	10.5	6.1	5.3	533.0	1	709	1349.2	1485	0.99	PASS
(2) 2x6	DF-L #2	2	3	5.5	9729	7	7	1	0.96	0.00	15.3	4.0	16.5	15.1	8.3	589.6	1	882	1168.8	1346	0.99	PASS
(3) 2x4	DF-L #2	3	4.5	3.5	8726	7	7	1	0.61	0.00	24.0	2.7	15.8	9.2	11.8	554.0	1	709	1552.1	1708	0.99	PASS
(3) 2x6	DF-L #2	3	4.5	5.5	15466	7	7	1	0.96	0.00	15.3	2.7	24.8	22.7	18.6	624.9	1	887	1344.9	1547	0.99	PASS
(4) 2x4	DF-L #2	4	6	3.5	11647	7	7	1	0.61	0.00	24.0	2.0	21.0	12.3	21.0	554.6	1	709	1552.3	1708	0.99	PASS
(4) 2x6	DF-L #2	4	6	5.5	20684	7	7	1	0.96	0.00	15.3	2.0	33.0	30.3	33.0	626.8	1	889	1345.2	1547	0.99	PASS
(5) 2x4	DF-L #2	5	7.5	3.5	14566	7	7	1	0.61	0.00	24.0	1.6	26.3	15.3	32.8	554.9	1	709	1552.3	1708	0.99	PASS
(5) 2x6	DF-L #2	5	7.5	5.5	25892	7	7	1	0.96	0.00	15.3	1.6	41.3	37.8	51.6	627.7	1	890	1345.3	1547	0.99	PASS
4x4	DF-L #2	1	3.5	3.5	6540	7	7	1	0.61	0.00	24.0	3.4	12.3	7.1	7.1	533.9	1	709	1349.4	1418	0.99	PASS
	DF-L #2	1	5.5	5.5	12242	7	7	1	0.96	0.00	15.3	2.2	30.3	27.7	27.7	404.7	1	624	749.8	750	0.99	PASS
3 1/2" x 3 1/2" PSL	PSL-1.8E	1	3.5	3.5	8214	7	1	7	0.00	0.61	3.4	24.0	12.3	7.1	7.1	670.6	1	1196	2398.1	2400	0.99	PASS
	PSL-1.8E	1	3.5	5.25	12321	7	1	7	0.00	0.61	2.3	24.0	18.4	16.1	10.7	670.6	1	1196	2397.2	2400	0.99	PASS
3 1/2" x 7" PSL	PSL-1.8E	1	3.5	7	16428	7	1	7	0.00	0.61	1.7	24.0	24.5	28.6	14.3	670.6	1	1196	2396.2	2400	0.99	PASS
	PSL-1.8E	1	5.25	5.25	28136	7	1	7	0.00	0.92	2.3	16.0	27.6	24.1	24.1	1020.8	1	2038	2398.8	2400	0.99	PASS
5 1/4" x 7" PSL	PSL-1.8E	1	5.25	7	37514	7	1	7	0.00	0.92	1.7	16.0	36.8	42.9	32.2	1020.8	1	2038	2398.3	2400	0.99	PASS
	PSL-1.8E	1	7	7	58922	7	1	7	0.00	1.23	1.7	12.0	49.0	57.2	57.2	1202.5	1	2316	2399.1	2400	0.99	PASS

Post Chart - Maximum Allowable Axial Loads (lbs) For Posts Supporting Floors/Roof

UNIAxIAL BENDING															
Post Length →	7 ft	8 ft	9 ft	10 ft	11 ft	12 ft	13 ft	14 ft	15 ft	16 ft	17 ft	18 ft	19 ft	20 ft	
(1) 2x4	2746	2340	1992	1701	1461	1265	1102	968	856	761	681	612	553	502	
(2) 2x4	5597	4743	4019	3423	2936	2538	2211	1940	1714	1523	1363	1225	1107	1005	
(3) 2x4	8726	7336	6181	5241	4480	3862	3357	2941	2596	2305	2059	1850	1670	1515	
(4) 2x4	11647	9789	8245	6991	5975	5151	4477	3921	3461	3073	2745	2466	2227	2020	
(5) 2x4	14566	12240	10309	8740	7470	6439	5596	4902	4326	3842	3432	3083	2784	2525	
(1) 2x6	4627	4627	4627	4487	4104	3734	3387	3071	2787	2532	2306	2105	1927	1768	
(2) 2x6	9728	9728	9729	9210	8382	7594	6866	6208	5622	5099	4638	4229	3868	3546	
(3) 2x6	15466	15466	15466	14523	13136	11833	10648	9589	8652	7826	7100	6461	5897	5400	
(4) 2x6	20684	20684	20684	19393	17535	15793	14209	12794	11542	10439	9470	8617	7865	7201	
(5) 2x6	25892	25892	25892	24258	21931	19749	17767	15996	14430	13051	11839	10772	9832	9002	

Post Length →	7 ft	8 ft	9 ft	10 ft	11 ft	12 ft	13 ft	14 ft	15 ft	16 ft	17 ft	18 ft	19 ft	20 ft
	2695	2208	1834	1542	1312	1128	979	857	756	671	600	539	487	442
(2) 2x4	6862	5953	5145	4455	3875	3390	2984	2642	2351	2107	1896	1714	1556	1419
(4) 2x4	10799	9126	7740	6607	5683	4926	4303	3783	3351	2986	2675	2408	2179	1981
(5) 2x4	13913	11737	9931	8456	7256	6277	5471	4804	4248	3780	3382	3042	2750	2498
(2) 2x6	4090	3372	2812	2372	2024	1743	1516	1329	1174	1044	933	839	758	689
(3) 2x6	10246	8952	7782	6771	5913	5190	4581	4066	3629	3254	2932	2654	2414	4458
(4) 2x6	16674	15430	14107	12786	11531	10375	9347	8432	7627	6920	6298	5750	5266	4838
(5) 2x6	22733	21699	20547	19291	17971	16639	15342	14113	12825	11675	10658	9757	8958	8250
4x4	4896	4139	3527	3032	2629	2298	2024	1795	1602	1438	1297	1176	1071	980
6x6	10747	10099	9416	8720	8035	7380	6769	6208	5699	5241	4828	4457	4125	3826
3 1/2" x 3 1/2" PSL	8214	6881	5822	4975	4296	3742	3286	2908	2589	2320	2090	1892	1721	2381
3 1/2" x 5 1/4" PSL	12321	10322	8734	7463	6443	5613	4930	4361	3884	3480	3135	2839	2582	3572
3 1/2" x 7" PSL	16428	13763	11645	9951	8591	7484	6573	5815	5179	4640	4180	3785	3443	4762
5 1/4" x 5 1/4" PSL	28135	25090	22215	19642	17405	15483	13840	12418	11199	10143	9224	8421	7716	7094
5 1/4" x 7" PSL	37514	33454	29620	26189	23207	20644	18454	16557	14932	13524	12299	11228	10288	9459
7" x 7" PSL	58922	55251	51328	47280	43276	39481	35992	32843	30038	27525	25286	23289	21506	19910

Footings

	F1.5	F2.0
Width (in):	18	24
Height (in):	12	12
Height of Stem Wall (in):	36	0
Width of Stem Wall (in):	8	0
Roofing Material:	Shingle/Tile	Shingle/Tile
Roof Pitch (x/12):	0/12	0/12
Roof Angle (degree):	0.0	0.0
C _s :	1.000	1.000
Increase for Drift:	1.000	1.000
Snow Load P _s (psf):	25	25
Roof Dead Load D _R (psf):	20	20
Floor Live Load L (psf):	50	50
Floor Dead Load D (psf):	25	25
Roof Trib. Width (ft):	23	0
Upper Floor Trib. Width:	8.5	19
Main Floor Trib. Width:	0	0
Weight Snow w _s (plf):	575	0
Weight Live w _L (plf):	425	950
Weight Dead w _D (plf):	672.5	475
Concrete Weight w _c (plf):	525	300
Additional Uniform Load (plf):	250	120
Total Weight (plf):	2448	1845
Required Soil Bearing (psf):	1632	923
Allowable Soil Bearing (psf):	3500	3500
Check:	PASS	PASS
Continuous Reinforcement:	(2) #4 bars cont.	(3) #4 bars cont.
Transverse Reinforcement:	None	None

Title Block Line 1
 You can change this area
 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

Printed: 7 SEP 2020, 12:58PM

Wall Footing

Lic. #: KW-06011038

File: 20-7357 1173 N Shepard Creek.ec6
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 Focus Engineering & Surveying, LLC

DESCRIPTION: F1.50

Code References

Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10

Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'_c : Concrete 28 day strength = 2.5 ksi
 f_y : Rebar Yield = 60.0 ksi
 E_c : Concrete Elastic Modulus = 3,122.0 ksi
 Concrete Density = 145.0 pcf
 ϕ Values Flexure = 0.90
 Shear = 0.750

Analysis Settings

Min Steel % Bending Reinf. =
 Min Allow % Temp Reinf. = 0.00180
 Min. Overturning Safety Factor = 1.0 : 1
 Min. Sliding Safety Factor = 1.0 : 1
 AutoCalc Footing Weight as DL : Yes

Soil Design Values

Allowable Soil Bearing = 3.50 ksf
 Increase Bearing By Footing Weight = No
 Soil Passive Resistance (for Sliding) = 250.0 pcf
 Soil/Concrete Friction Coeff. = 0.30

Increases based on footing Depth

Reference Depth below Surface = ft
 Allow. Pressure Increase per foot of depth = ksf
 when base footing is below = ft

Increases based on footing Width

Allow. Pressure Increase per foot of width = ksf
 when footing is wider than = ft

Adjusted Allowable Bearing Pressure

= 3.50 ksf

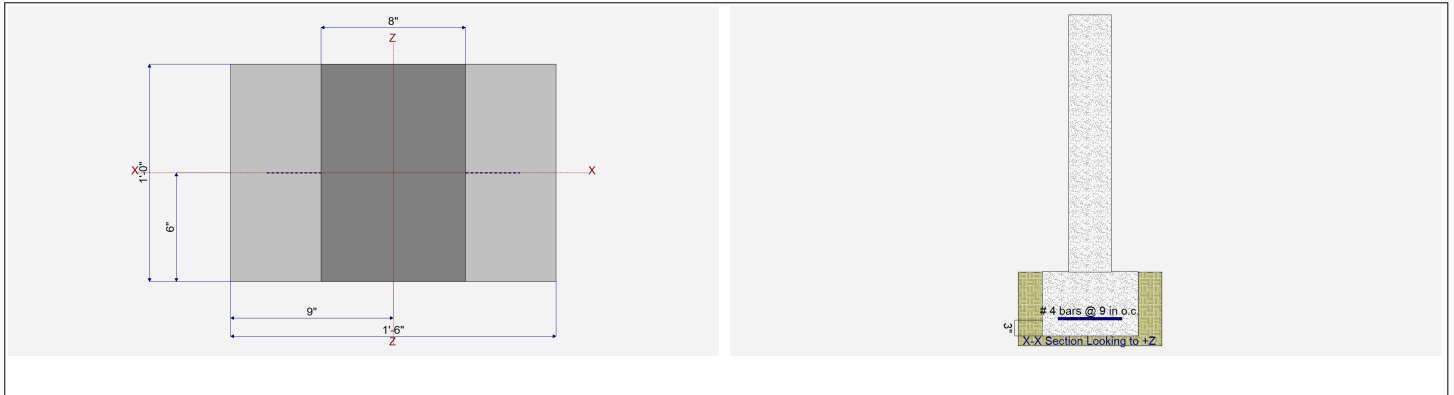
Dimensions

Footing Width = 1.5 ft
 Wall Thickness = 8.0 in
 Wall center offset
 from center of footing = 0 in

Footing Thickness = 12.0 in
 Rebar Centerline to Edge of Concrete...
 at Bottom of footing = 3.0 in

Reinforcing

Bars along X-X Axis
 Bar spacing = 9.00
 Reinforcing Bar Size = # 4



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	0.9250		0.4250	0.5750			k
OB : Overburden							ksf
V-x							k
M-zz							k-ft
Vx applied							in above top of footing

Title Block Line 1
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 using the "Settings" menu item
 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

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Wall Footing

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 Focus Engineering & Surveying, LLC

DESCRIPTION: F1.50

DESIGN SUMMARY

Design OK

Factor of Safety	Item	Applied	Capacity	Governing Load Combination
PASS	n/a	Overturning - Z-Z	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	No Uplift
Utilization Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.3605	Soil Bearing	1.262 ksf	+D+0.750L+0.750S+0.5
PASS	0.01508	Z Flexure (+X)	0.1572 k-ft	+1.20D+L+1.60S+1.60H
PASS	0.005708	Z Flexure (-X)	0.05950 k-ft	+0.90D+E+0.90H
PASS	n/a	1-way Shear (+X)	0.0 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	n/a

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress -X	+X	Actual / Allowable Ratio
, +D+H	3.50 ksf	0.0 in	0.7617 ksf	0.7617 ksf	0.218
, +D+L+H	3.50 ksf	0.0 in	1.045 ksf	1.045 ksf	0.299
, +D+Lr+H	3.50 ksf	0.0 in	0.7617 ksf	0.7617 ksf	0.218
, +D+S+H	3.50 ksf	0.0 in	1.145 ksf	1.145 ksf	0.327
, +D+0.750Lr+0.750L+H	3.50 ksf	0.0 in	0.9742 ksf	0.9742 ksf	0.278
, +D+0.750L+0.750S+H	3.50 ksf	0.0 in	1.262 ksf	1.262 ksf	0.361
, +D+0.60W+H	3.50 ksf	0.0 in	0.7617 ksf	0.7617 ksf	0.218
, +D+0.750Lr+0.750L+0.450W+H	3.50 ksf	0.0 in	0.9742 ksf	0.9742 ksf	0.278
, +D+0.750L+0.750S+0.450W+H	3.50 ksf	0.0 in	1.262 ksf	1.262 ksf	0.361
, +0.60D+0.60W+0.60H	3.50 ksf	0.0 in	0.4570 ksf	0.4570 ksf	0.131
, +D+0.70E+0.60H	3.50 ksf	0.0 in	0.7617 ksf	0.7617 ksf	0.218
, +D+0.750L+0.750S+0.5250E+H	3.50 ksf	0.0 in	1.262 ksf	1.262 ksf	0.361
, +0.60D+0.70E+H	3.50 ksf	0.0 in	0.4570 ksf	0.4570 ksf	0.131

Overturning Stability

Units : k-ft

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
--	--------------------	------------------	-----------------	--------

Footing Has NO Overturning

Sliding Stability

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Sliding SafetyRatio	Status
---	---------------	-----------------	---------------------	--------

Footing Has NO Sliding

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.40D+1.60H	0.09256	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.40D+1.60H	0.09256	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+0.50Lr+1.60L+1.60H	0.1187	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+0.50Lr+1.60L+1.60H	0.1187	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+1.60L+0.50S+1.60H	0.1353	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+1.60L+0.50S+1.60H	0.1353	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+L+1.60S+L+1.60H	0.1039	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+1.60Lr+L+1.60H	0.1039	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+1.60Lr+0.50W+1.60H	0.07934	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+1.60Lr+0.50W+1.60H	0.07934	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+L+1.60S+1.60H	0.1572	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+L+1.60S+1.60H	0.1572	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+1.60S+0.50W+1.60H	0.1326	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+1.60S+0.50W+1.60H	0.1326	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+0.50Lr+L+W+1.60H	0.1039	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+0.50Lr+L+W+1.60H	0.1039	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+L+0.50S+W+1.60H	0.1206	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+L+0.50S+W+1.60H	0.1206	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK

Title Block Line 1
You can change this area
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and then using the "Printing &
Title Block" selection.
Title Block Line 6

Project Title:
Engineer:
Project ID:
Project Descr:

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Wall Footing

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Focus Engineering & Surveying, LLC

DESCRIPTION: F1.50

, +0.90D+W+1.60H	0.0595	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +0.90D+W+1.60H	0.0595	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK

Title Block Line 1
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 Title Block Line 6

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DESCRIPTION: F1.50

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.20D+L+0.20S+E+1.60H	0.1106	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +1.20D+L+0.20S+E+1.60H	0.1106	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +0.90D+E+0.90H	0.0595	-X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK
, +0.90D+E+0.90H	0.0595	+X	Bottom	0.2592	Min Temp %	0.2667	10.424	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50Lr+1.60L+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+1.60L+0.50S+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+1.60Lr+L+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+1.60Lr+0.50W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+L+1.60S+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+1.60S+0.50W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+0.50Lr+L+W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+L+0.50S+W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+0.90D+W+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+1.20D+L+0.20S+E+1.60H	0 psi	0 psi	0 psi	75 psi	0	OK
+0.90D+E+0.90H	0 psi	0 psi	0 psi	75 psi	0	OK

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 Title Block Line 6

Project Title:
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General Footing

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DESCRIPTION: S3.5

Code References

Calculations per ACI 318-11, IBC 2012, CBC 2013, ASCE 7-10

Load Combinations Used : ASCE 7-16

General Information

Material Properties

f _c : Concrete 28 day strength	=	2.50	ksi
f _y : Rebar Yield	=	60.0	ksi
E _c : Concrete Elastic Modulus	=	3,122.0	ksi
Concrete Density	=	145.0	pcf
φ Values Flexure	=	0.90	
Shear	=	0.750	

Analysis Settings

Min Steel % Bending Reinf.	=		
Min Allow % Temp Reinf.	=	0.00180	
Min. Overturning Safety Factor	=	1.0	:
Min. Sliding Safety Factor	=	1.0	:
Add Ftg Wt for Soil Pressure	:	Yes	
Use ftg wt for stability, moments & shears	:	Yes	
Add Pedestal Wt for Soil Pressure	:	No	
Use Pedestal wt for stability, mom & shear	:	No	

Soil Design Values

Allowable Soil Bearing	=	3.50	ksf
Increase Bearing By Footing Weight	=	No	
Soil Passive Resistance (for Sliding)	=	250.0	pcf
Soil/Concrete Friction Coeff.	=	0.30	

Increases based on footing Depth

Footing base depth below soil surface	=	1.250	ft
Allow press. increase per foot of depth when footing base is below	=		ksf

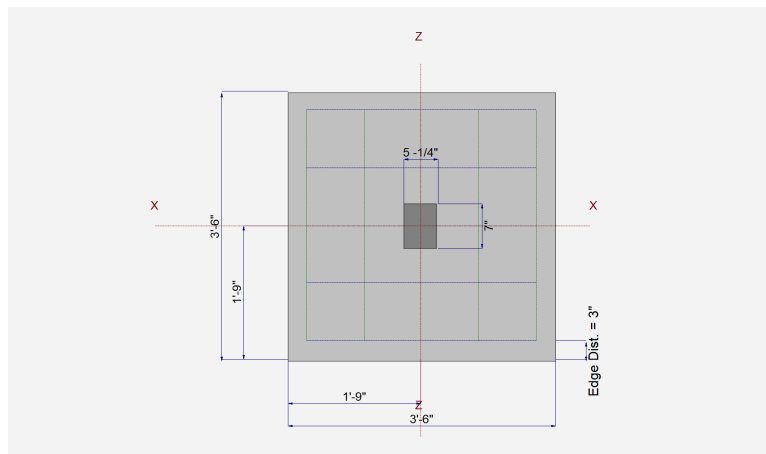
Increases based on footing plan dimension

Allowable pressure increase per foot of depth when max. length or width is greater than	=		ksf
	=		ft

Dimensions

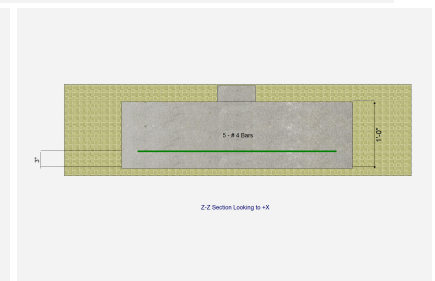
Width parallel to X-X Axis	=	3.5	ft
Length parallel to Z-Z Axis	=	3.50	ft
Footing Thickness	=	12.0	in

Pedestal dimensions...			
px : parallel to X-X Axis	=	5.250	in
pz : parallel to Z-Z Axis	=	7.0	in
Height	=	3.0	in
Rebar Centerline to Edge of Concrete... at Bottom of footing	=	3.0	in



Reinforcing

Bars parallel to X-X Axis	=		
Number of Bars	=	5	
Reinforcing Bar Size	=	# 4	
Bars parallel to Z-Z Axis	=		
Number of Bars	=	5	
Reinforcing Bar Size	=	# 4	
Bandwidth Distribution Check (ACI 15.4.4.2)			
Direction Requiring Closer Separation			
# Bars required within zone		n/a	
# Bars required on each side of zone		n/a	



Applied Loads

		D	L _r	L	S	W	E	H	
P : Column Load	=	10.0		21.0					k
OB : Overburden	=								ksf
M-xx	=								k-ft
M-zz	=								k-ft
V-x	=								k
V-z	=								k

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General Footing

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DESCRIPTION: S3.5

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7723	Soil Bearing	2.703 ksf	3.50 ksf	+D+L+H about Z-Z axis
PASS	n/a	Overturning - X-X	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Overturning - Z-Z	0.0 k-ft	0.0 k-ft	No Overturning
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.3917	Z Flexure (+X)	4.363 k-ft/ft	11.139 k-ft/ft	+1.20D+1.60L+0.50S+1.60H
PASS	0.3917	Z Flexure (-X)	4.363 k-ft/ft	11.139 k-ft/ft	+1.20D+1.60L+0.50S+1.60H
PASS	0.3553	X Flexure (+Z)	3.957 k-ft/ft	11.139 k-ft/ft	+1.20D+1.60L+0.50S+1.60H
PASS	0.3553	X Flexure (-Z)	3.957 k-ft/ft	11.139 k-ft/ft	+1.20D+1.60L+0.50S+1.60H
PASS	0.3538	1-way Shear (+X)	26.535 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3538	1-way Shear (-X)	26.535 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3216	1-way Shear (+Z)	24.123 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.3216	1-way Shear (-Z)	24.123 psi	75.0 psi	+1.20D+0.50Lr+1.60L+1.60H
PASS	0.4861	2-way Punching	72.913 psi	150.0 psi	+1.20D+0.50Lr+1.60L+1.60H

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Zecc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, +D+H	3.50	n/a	0.0	0.9883	0.9883	n/a	n/a	0.282
X-X, +D+L+H	3.50	n/a	0.0	2.703	2.703	n/a	n/a	0.772
X-X, +D+Lr+H	3.50	n/a	0.0	0.9883	0.9883	n/a	n/a	0.282
X-X, +D+S+H	3.50	n/a	0.0	0.9883	0.9883	n/a	n/a	0.282
X-X, +D+0.750Lr+0.750L+H	3.50	n/a	0.0	2.274	2.274	n/a	n/a	0.650
X-X, +D+0.750L+0.750S+H	3.50	n/a	0.0	2.274	2.274	n/a	n/a	0.650
X-X, +D+0.60W+H	3.50	n/a	0.0	0.9883	0.9883	n/a	n/a	0.282
X-X, +D+0.750Lr+0.750L+0.450W+H	3.50	n/a	0.0	2.274	2.274	n/a	n/a	0.650
X-X, +D+0.750L+0.750S+0.450W+H	3.50	n/a	0.0	2.274	2.274	n/a	n/a	0.650
X-X, +0.60D+0.60W+0.60H	3.50	n/a	0.0	0.5930	0.5930	n/a	n/a	0.169
X-X, +D+0.70E+0.60H	3.50	n/a	0.0	0.9883	0.9883	n/a	n/a	0.282
X-X, +D+0.750L+0.750S+0.5250E+H	3.50	n/a	0.0	2.274	2.274	n/a	n/a	0.650
X-X, +0.60D+0.70E+H	3.50	n/a	0.0	0.5930	0.5930	n/a	n/a	0.169
Z-Z, +D+H	3.50	0.0	n/a	n/a	n/a	0.9883	0.9883	0.282
Z-Z, +D+L+H	3.50	0.0	n/a	n/a	n/a	2.703	2.703	0.772
Z-Z, +D+Lr+H	3.50	0.0	n/a	n/a	n/a	0.9883	0.9883	0.282
Z-Z, +D+S+H	3.50	0.0	n/a	n/a	n/a	0.9883	0.9883	0.282
Z-Z, +D+0.750Lr+0.750L+H	3.50	0.0	n/a	n/a	n/a	2.274	2.274	0.650
Z-Z, +D+0.750L+0.750S+H	3.50	0.0	n/a	n/a	n/a	2.274	2.274	0.650
Z-Z, +D+0.60W+H	3.50	0.0	n/a	n/a	n/a	0.9883	0.9883	0.282
Z-Z, +D+0.750Lr+0.750L+0.450W+H	3.50	0.0	n/a	n/a	n/a	2.274	2.274	0.650
Z-Z, +D+0.750L+0.750S+0.450W+H	3.50	0.0	n/a	n/a	n/a	2.274	2.274	0.650
Z-Z, +0.60D+0.60W+0.60H	3.50	0.0	n/a	n/a	n/a	0.5930	0.5930	0.169
Z-Z, +D+0.70E+0.60H	3.50	0.0	n/a	n/a	n/a	0.9883	0.9883	0.282
Z-Z, +D+0.750L+0.750S+0.5250E+H	3.50	0.0	n/a	n/a	n/a	2.274	2.274	0.650
Z-Z, +0.60D+0.70E+H	3.50	0.0	n/a	n/a	n/a	0.5930	0.5930	0.169

Overturning Stability

Rotation Axis & Load Combination...	Overturning Moment	Resisting Moment	Stability Ratio	Status
Footing Has NO Overturning				

Sliding Stability

All units k

Force Application Axis Load Combination...	Sliding Force	Resisting Force	Stability Ratio	Status
Footing Has NO Sliding				

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General Footing

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 Focus Engineering & Surveying, LLC

DESCRIPTION: S3.5

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Side	Tension Surface	As Req'd in ²	Gvrn. As in ²	Actual As in ²	Phi*Mn k-ft	Status
X-X, +1.40D+1.60H	1.214	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.40D+1.60H	1.214	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	3.957	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+0.50Lr+1.60L+1.60H	3.957	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+1.60L+0.50S+1.60H	3.957	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+1.60L+0.50S+1.60H	3.957	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+1.60Lr+L+1.60H	2.864	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+1.60Lr+L+1.60H	2.864	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	1.041	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+1.60Lr+0.50W+1.60H	1.041	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+L+1.60S+1.60H	2.864	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+L+1.60S+1.60H	2.864	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+1.60S+0.50W+1.60H	1.041	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+1.60S+0.50W+1.60H	1.041	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	2.864	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+0.50Lr+L+W+1.60H	2.864	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+L+0.50S+W+1.60H	2.864	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+L+0.50S+W+1.60H	2.864	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +0.90D+W+1.60H	0.7807	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +0.90D+W+1.60H	0.7807	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+L+0.20S+E+1.60H	2.864	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +1.20D+L+0.20S+E+1.60H	2.864	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +0.90D+E+0.90H	0.7807	+Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
X-X, +0.90D+E+0.90H	0.7807	-Z	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.40D+1.60H	1.339	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.40D+1.60H	1.339	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	4.363	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+0.50Lr+1.60L+1.60H	4.363	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	4.363	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+1.60L+0.50S+1.60H	4.363	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	3.157	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+1.60Lr+L+1.60H	3.157	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	1.148	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+1.60Lr+0.50W+1.60H	1.148	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+L+1.60S+1.60H	3.157	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+L+1.60S+1.60H	3.157	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	1.148	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+1.60S+0.50W+1.60H	1.148	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	3.157	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+0.50Lr+L+W+1.60H	3.157	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	3.157	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+L+0.50S+W+1.60H	3.157	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +0.90D+W+1.60H	0.8607	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +0.90D+W+1.60H	0.8607	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	3.157	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +1.20D+L+0.20S+E+1.60H	3.157	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +0.90D+E+0.90H	0.8607	-X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK
Z-Z, +0.90D+E+0.90H	0.8607	+X	Bottom	0.2592	Min Temp %	0.2857	11.139	OK

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	8.14 psi	8.14 psi	7.40 psi	7.40 psi	8.14 psi	75.00 psi	0.11	OK
+1.20D+0.50Lr+1.60L+1.60H	26.54 psi	26.54 psi	24.12 psi	24.12 psi	26.54 psi	75.00 psi	0.35	OK
+1.20D+1.60L+0.50S+1.60H	26.54 psi	26.54 psi	24.12 psi	24.12 psi	26.54 psi	75.00 psi	0.35	OK
+1.20D+1.60Lr+L+1.60H	19.20 psi	19.20 psi	17.46 psi	17.46 psi	19.20 psi	75.00 psi	0.26	OK
+1.20D+1.60Lr+0.50W+1.60H	6.98 psi	6.98 psi	6.35 psi	6.35 psi	6.98 psi	75.00 psi	0.09	OK
+1.20D+L+1.60S+1.60H	19.20 psi	19.20 psi	17.46 psi	17.46 psi	19.20 psi	75.00 psi	0.26	OK
+1.20D+1.60S+0.50W+1.60H	6.98 psi	6.98 psi	6.35 psi	6.35 psi	6.98 psi	75.00 psi	0.09	OK
+1.20D+0.50Lr+L+W+1.60H	19.20 psi	19.20 psi	17.46 psi	17.46 psi	19.20 psi	75.00 psi	0.26	OK
+1.20D+L+0.50S+W+1.60H	19.20 psi	19.20 psi	17.46 psi	17.46 psi	19.20 psi	75.00 psi	0.26	OK
+0.90D+W+1.60H	5.23 psi	5.23 psi	4.76 psi	4.76 psi	5.23 psi	75.00 psi	0.07	OK
+1.20D+L+0.20S+E+1.60H	19.20 psi	19.20 psi	17.46 psi	17.46 psi	19.20 psi	75.00 psi	0.26	OK

Title Block Line 1
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 and then using the "Printing &
 Title Block" selection.
 Title Block Line 6

Project Title:
 Engineer:
 Project ID:
 Project Descr:

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General Footing

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DESCRIPTION: S3.5

One Way Shear

Load Combination...	Vu @ -X	Vu @ +X	Vu @ -Z	Vu @ +Z	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+0.90D+E+0.90H	5.23 psi	5.23 psi	4.76 psi	4.76 psi	5.23 psi	75.00 psi	0.07	OK
Two-Way "Punching" Shear								All units k

Load Combination...	Vu	Phi*Vn	Vu / Phi*Vn	Status
+1.40D+1.60H	22.37 psi	150.00psi	0.1492	OK
+1.20D+0.50Lr+1.60L+1.60H	72.91 psi	150.00psi	0.4861	OK
+1.20D+1.60L+0.50S+1.60H	72.91 psi	150.00psi	0.4861	OK
+1.20D+1.60Lr+L+1.60H	52.76 psi	150.00psi	0.3517	OK
+1.20D+1.60Lr+0.50W+1.60H	19.18 psi	150.00psi	0.1279	OK
+1.20D+L+1.60S+1.60H	52.76 psi	150.00psi	0.3517	OK
+1.20D+1.60S+0.50W+1.60H	19.18 psi	150.00psi	0.1279	OK
+1.20D+0.50Lr+L+W+1.60H	52.76 psi	150.00psi	0.3517	OK
+1.20D+L+0.50S+W+1.60H	52.76 psi	150.00psi	0.3517	OK
+0.90D+W+1.60H	14.38 psi	150.00psi	0.09589	OK
+1.20D+L+0.20S+E+1.60H	52.76 psi	150.00psi	0.3517	OK
+0.90D+E+0.90H	14.38 psi	150.00psi	0.09589	OK

Shear Walls

SL 1: Gridline 1 Level 2

Material: Structural Sheathing

Diaphragm Level: 3rd

Anchor Bolts: NONE

Shear Line 1 Design Summary:

USE SW2 - UPGRADE SW3 PER FTO

USE MST37 Straps EACH SIDE OF PANEL AS PER PLANS

Design:	W_{total} (lbs)	V (lbs)	k
	136350	22319	1

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th			0	0	0.0	0.0	0.0	0.0	0	0.0
4	5th			0	0	0.0	0.0	0.0	0.0	0	0.0
3	4th			0	0.000	0.0	0.0	0.0	0.0	0	0.0
2	3rd	23	51840	1192320	0.520	11616.1	11616.1	116161.1	11616.1	51840	11616.1
1	2nd	13	84510	1098630	0.480	10703.3	22319.4	290152.8	22319.4	136350	17983.7
Ground											
Totals: Σ =						136350	2290950	1			

Wind:	A_A (ft²)	A_B (ft²)	A_C (ft²)	A_D (ft²)	V_{add} (lb)	V_{w-grdln} (lb)
	81	0	162	0		3514

Seismic:	A_{level} (ft²)	A_{trgrdln} (ft²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_x (lb)	V_{add} (lb)	V_{s-grdln} (lb)
	2136	1068	51840	25920	1	11616.1		4066

Individual Full-Height Shear Wall Design

Design.:	Panel 1:	Panel 2:	Panel 3:	Panel 4:	Panel 5:	Panel 6:	Panel 7:	Panel 8:	Panel 9:	Panel 10:
L _{ext} (ft):	4	4	4							
L _{in} (ft):										
h/b _s :	1.50	1.50	1.50							
2b _s /h:	1.00	1.00	1.00							
V _s (plf):	338.8	338.8	338.8							
V _w (plf):	292.8	292.8	292.8							
DL (plf):	100	100	100	100	100	100	100	100	100	100
h (ft):	10	10	10							
h' (ft):	6	6	6							
uplift _s (lb):	1833.0	1833.0	1833.0							
uplift _w (lb):	1557.0	1557.0	1557.0							

Perforated Shear Wall Design:

Design.:	PSW1					PSW2				
L _{total} (ft)										
DL (plf)	100					100				
h (ft)										
A _o (ft ²)										
r:										
C _o :										
Design.:	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)
L _{i-ext} (ft):										
L _{i-in} (ft):										
h/b _s :										
2b _s /h:										
V _s (lb):										
V _w (lb):										
V _{s-max} (plf)										
uplift _s (lb):										
uplift _w (lb):										

Shear Walls

SL 2: Gridline 1 level 1

Material: Structural Sheathing

Diaphragm Level: 2nd

Anchor Bolts: 1/2" ANCHOR BOLTS

Shear Line 2 Design Summary:

USE SW3 - UPGRADE TO SW4 PER FTO

USE HDU8-SDS2.5 EACH SIDE OF PANEL AS PER PLANS

USE 1/2" ANCHOR BOLTS @ 24" O.C.

Design:	W_{total} (lbs)	V (lbs)	k
	136350	22319	1

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
4	5th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
3	4th	0	0	0	0.000	0.0	0.0	0.0	0.0	0	0.0
2	3rd	23	51840	1192320	0.520	11616.1	11616.1	116161.1	11616.1	51840	11616.1
1	2nd	13	84510	1098630	0.480	10703.3	22319.4	290152.8	22319.4	136350	17983.7
Ground											
Totals: Σ =			136350	2290950	1						

Wind:	A_A (ft²)	A_B (ft²)	A_C (ft²)	A_D (ft²)	V_{add} (lb)	V_{w-grdln} (lb)
	108		216		3514	8199

Seismic:	A_{level} (ft²)	A_{trgrdln} (ft²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_x (lb)	V_{add} (lb)	V_{s-grdln} (lb)
	2430	1215	84510	42255	1	10703.3	4066	7812

Individual Full-Height Shear Wall Design

Design.:	Panel 1:	Panel 2:	Panel 3:	Panel 4:	Panel 5:	Panel 6:	Panel 7:	Panel 8:	Panel 9:	Panel 10:
L _{ext} (ft):	13.5	4	4							
L _{in} (ft):										
h/b _s :	0.74	2.50	2.50							
2b _s /h:	1.00	0.80	0.80							
v _s (plf):	392.6	392.6	392.6							
v _w (plf):	381.3	381.3	381.3							
DL (plf):	100	100	100	100	100	100	100	100	100	100
h (ft):	12	12	12							
h' (ft):	10	10	10							
uplift _s (lb):	5083.6	1558.6	5558.6							
uplift _w (lb):	4695.5	1170.5	5170.5							

Perforated Shear Wall Design:

Design.:	PSW1					PSW2				
L _{total} (ft)										
DL (plf)	100					100				
h (ft)										
A _o (ft ²)										
r:										
C _o :										
Design.:	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)
L _{i-ext} (ft):										
L _{i-in} (ft):										
h/b _s :										
2b _s /h:										
V _s (lb):										
V _w (lb):										
v _{s-max} (plf)										
uplift _s (lb):										
uplift _w (lb):										

Shear Walls

SL 3: Gridline 7 Level 2

Material: Structural Sheathing

Diaphragm Level: 3rd

Anchor Bolts: NONE

Shear Line 3 Design Summary:

USE SW1 - UPGRADE TO SW2 PER FTO

USE CS16 Straps EACH SIDE OF PANEL AS PER PLANS

Design:	W_{total} (lbs)	V (lbs)	k
	136350	22319	1

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
4	5th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
3	4th	0	0	0	0.000	0.0	0.0	0.0	0.0	0	0.0
2	3rd	23	51840	1192320	0.520	11616.1	11616.1	116161.1	11616.1	51840	11616.1
1	2nd	13	84510	1098630	0.480	10703.3	22319.4	290152.8	22319.4	136350	17983.7
Ground		Totals: Σ =									
				136350	2290950	1					

Wind:	A_A (ft²)	A_B (ft²)	A_C (ft²)	A_D (ft²)	V_{add} (lb)	V_{w-grdln} (lb)
	81		162			3514

Seismic:	A_{level} (ft²)	A_{trgrdln} (ft²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_x (lb)	V_{add} (lb)	V_{s-grdln} (lb)
	2136	1068	51840	25920	1	11616.1		4066

Individual Full-Height Shear Wall Design

Design.:	Panel 1:	Panel 2:	Panel 3:	Panel 4:	Panel 5:	Panel 6:	Panel 7:	Panel 8:	Panel 9:	Panel 10:
L _{ext} (ft):	3.5	3.5	3.5	3.5	3.5					
L _{in} (ft):										
h/b _s :	1.71	1.71	1.71	1.71	1.71					
2b _s /h:	1.00	1.00	1.00	1.00	1.00					
v _s (plf):	232.3	232.3	232.3	232.3	232.3					
v _w (plf):	200.8	200.8	200.8	200.8	200.8					
DL (plf):	100	100	100	100	100	100	100	100	100	100
h (ft):	10	10	10	10	10					
h' (ft):	6	6	6	6	6					
uplift _s (lb):	1219.1	1219.1	1219.1	1219.1	1219.1					
uplift _w (lb):	1029.8	1029.8	1029.8	1029.8	1029.8					

Perforated Shear Wall Design:

Design.:	PSW1					PSW2				
L _{total} (ft)										
DL (plf)	100					100				
h (ft)										
A _o (ft ²)										
r:										
C _o :										
Design.:	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)
L _{i-ext} (ft):										
L _{i-in} (ft):										
h/b _s :										
2b _s /h:										
V _s (lb):										
V _w (lb):										
v _{s-max} (plf)										
uplift _s (lb):										
uplift _w (lb):										

Shear Walls

SL 4: Gridline 7 Level 1

Material: Structural Sheathing

Diaphragm Level: 2nd

Anchor Bolts: 1/2" ANCHOR BOLTS

Shear Line 4 Design Summary:

USE SW2 - UPGRADE TO SW4 PER FTO

USE HDU8-SDS2.5 EACH SIDE OF PANEL AS PER PLANS

USE 1/2" ANCHOR BOLTS @ 32" O.C.

Design:	W_{total} (lbs)	V (lbs)	k
	136350	22319	1

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
4	5th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
3	4th	0	0	0	0.000	0.0	0.0	0.0	0.0	0	0.0
2	3rd	23	51840	1192320	0.520	11616.1	11616.1	116161.1	11616.1	51840	11616.1
1	2nd	13	84510	1098630	0.480	10703.3	22319.4	290152.8	22319.4	136350	17983.7
Ground		Totals: Σ =									
			136350	2290950	1						

Wind:	A_A (ft²)	A_B (ft²)	A_C (ft²)	A_D (ft²)	V_{add} (lb)	V_{w-grdln} (lb)
	108		216		3514	8199

Seismic:	A_{level} (ft²)	A_{trgrdln} (ft²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_x (lb)	V_{add} (lb)	V_{s-grdln} (lb)
	2430	1215	84510	42255	1	10703.3	4066	7812

Individual Full-Height Shear Wall Design

Design.:	Panel 1:	Panel 2:	Panel 3:	Panel 4	Panel 5:	Panel 6:	Panel 7:	Panel 8:	Panel 9:	Panel 10:
L _{ext} (ft):	3.5	3.5	3.5	3.5	19					
L _{in} (ft):										
h/b _s :	2.86	2.86	2.86	2.86	0.53					
2b _s /h:	0.70	0.70	0.70	0.70	1.00					
v _s (plf):	271.3	271.3	271.3	271.3	271.3					
v _w (plf):	248.5	248.5	248.5	248.5	248.5					
DL (plf):	100	100	100	100	100	100	100	100	100	100
h (ft):	12	12	12	12	12					
h' (ft):	10	10	10	10	10					
uplift _s (lb):	3756.6	1756.6	1756.6	1756.6	2981.6					
uplift _w (lb):	3339.3	1339.3	1339.3	1339.3	2564.3					

Perforated Shear Wall Design:

Design.:	PSW1					PSW2				
L _{total} (ft)										
DL (plf)	100					100				
h (ft)										
A _o (ft ²)										
r:										
C _o :										
Design.:	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)
L _{i-ext} (ft):										
L _{i-in} (ft):										
h/b _s :										
2b _s /h:										
V _s (lb):										
V _w (lb):										
v _{s-max} (plf)										
uplift _s (lb):										
uplift _w (lb):										

Shear Walls

SL 5: Gridline B.5 Level 2

Material: Structural Sheathing

Diaphragm Level: 3rd

Anchor Bolts: NONE

Shear Line 5 Design Summary:

USE SW1 - UPGRADE TO SW3 PER FTO

USE CS16 Straps EACH SIDE OF PANEL AS PER PLANS

Design:	W_{total} (lbs)	V (lbs)	k
	136350	22319	1

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
4	5th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
3	4th	0	0	0	0.000	0.0	0.0	0.0	0.0	0	0.0
2	3rd	23	51840	1192320	0.520	11616.1	11616.1	116161.1	11616.1	51840	11616.1
1	2nd	13	84510	1098630	0.480	10703.3	22319.4	290152.8	22319.4	136350	17983.7
Ground		Totals: Σ =									
				136350	2290950	1					

Wind:	A_A (ft²)	A_B (ft²)	A_C (ft²)	A_D (ft²)	V_{add} (lb)	V_{w-grdln} (lb)
	81		122	0		3019

Seismic:	A_{level} (ft²)	A_{trgrdln} (ft²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_x (lb)	V_{add} (lb)	V_{s-grdln} (lb)
	2136	1068	51840	25920	1	11616.1		4066

Individual Full-Height Shear Wall Design

Design.:	Panel 1:	Panel 2:	Panel 3:	Panel 4	Panel 5:	Panel 6:	Panel 7:	Panel 8:	Panel 9:	Panel 10:
L _{ext} (ft):	4	5.5	6.25							
L _{in} (ft):										
h/b _s :	1.50	1.09	0.96							
2b _s /h:	1.00	1.00	1.00							
v _s (plf):	258.2	258.2	258.2							
v _w (plf):	191.7	191.7	191.7							
DL (plf):	100	100	100	100	100	100	100	100	100	100
h (ft):	10	10	10							
h' (ft):	6	6	6							
uplift _s (lb):	1349.0	1274.0	1236.5							
uplift _w (lb):	950.1	875.1	837.6							

Perforated Shear Wall Design:

Design.:	PSW1					PSW2				
L _{total} (ft)										
DL (plf)	100					100				
h (ft)										
A _o (ft ²)										
r:										
C _o :										
Design.:	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)
L _{i-ext} (ft):										
L _{i-in} (ft):										
h/b _s :										
2b _s /h:										
V _s (lb):										
V _w (lb):										
v _{s-max} (plf)										
uplift _s (lb):										
uplift _w (lb):										

Shear Walls

SL 6: Gridline B.5 Level 1

Material: Structural Sheathing

Diaphragm Level: 2nd

Anchor Bolts: 1/2" ANCHOR BOLTS

Shear Line 6 Design Summary:

USE SW4

USE HDU8-SDS2.5 EACH SIDE OF PANEL AS PER PLANS

USE 1/2" ANCHOR BOLTS @ 18" O.C.

Design:	W_{total} (lbs)	V (lbs)	k
	136350	22319	1

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
4	5th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
3	4th	0	0	0	0.000	0.0	0.0	0.0	0.0	0	0.0
2	3rd	23	51840	1192320	0.520	11616.1	11616.1	116161.1	11616.1	51840	11616.1
1	2nd	13	84510	1098630	0.480	10703.3	22319.4	290152.8	22319.4	136350	17983.7
Ground		Totals: Σ =									
				136350	2290950	1					

Wind:	A_A (ft²)	A_B (ft²)	A_C (ft²)	A_D (ft²)	V_{add} (lb)	V_{w-grdln} (lb)
	108		162		3019	7037

Seismic:	A_{level} (ft²)	A_{trgrdln} (ft²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_x (lb)	V_{add} (lb)	V_{s-grdln} (lb)
	2430	1215	84510	42255	1	10703.3	4066	7812

Individual Full-Height Shear Wall Design

Design.:	Panel 1:	Panel 2:	Panel 3:	Panel 4	Panel 5:	Panel 6:	Panel 7:	Panel 8:	Panel 9:	Panel 10:
L _{ext} (ft):	4	5.5	6.25							
L _{in} (ft):										
h/b _s :	2.50	0.91	0.80							
2b _s /h:	0.80	1.00	1.00							
v _s (plf):	522.5	522.5	522.5							
v _w (plf):	446.8	446.8	446.8							
DL (plf):	100	100	100	100	100	100	100	100	100	100
h (ft):	12	12	12							
h' (ft):	10	5	5							
uplift _s (lb):	6374.4	3611.7	3536.7							
uplift _w (lb):	5218.0	2834.1	2759.1							

Perforated Shear Wall Design:

Design.:	PSW1					PSW2				
L _{total} (ft)										
DL (plf)	100					100				
h (ft)										
A _o (ft ²)										
r:										
C _o :										
Design.:	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)
L _{i-ext} (ft):										
L _{i-in} (ft):										
h/b _s :										
2b _s /h:										
V _s (lb):										
V _w (lb):										
v _{s-max} (plf)										
uplift _s (lb):										
uplift _w (lb):										

Shear Walls

SL 7: Gridline F Level 2

Material: Structural Sheathing

Diaphragm Level: 3rd

Anchor Bolts: NONE

Shear Line 7 Design Summary:

USE SW1

NO STRAPS NEEDED

Design:	W_{total} (lbs)	V (lbs)	k
	136350	22319	1

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
4	5th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
3	4th	0	0	0	0.000	0.0	0.0	0.0	0.0	0	0.0
2	3rd	23	51840	1192320	0.520	11616.1	11616.1	116161.1	11616.1	51840	11616.1
1	2nd	13	84510	1098630	0.480	10703.3	22319.4	290152.8	22319.4	136350	17983.7
Ground		Totals: Σ =									
				136350	2290950	1					

Wind:	A_A (ft²)	A_B (ft²)	A_C (ft²)	A_D (ft²)	V_{add} (lb)	V_{w-grdln} (lb)
	81		122			3019

Seismic:	A_{level} (ft²)	A_{trgrdln} (ft²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_x (lb)	V_{add} (lb)	V_{s-grdln} (lb)
	2136	1068	51840	25920	1	11616.1		4066

Individual Full-Height Shear Wall Design

Design.:	Panel 1:	Panel 2:	Panel 3:	Panel 4:	Panel 5:	Panel 6:	Panel 7:	Panel 8:	Panel 9:	Panel 10:
L _{ext} (ft):	54									
L _{in} (ft):										
h/b _s :	0.19									
2b _s /h:	1.00									
v _s (plf):	75.3									
v _w (plf):	55.9									
DL (plf):	100	100	100	100	100	100	100	100	100	100
h (ft):	10									
h' (ft):	10									
uplift _s (lb):	-1947.0									
uplift _w (lb):	-2140.9									

Perforated Shear Wall Design:

Design.:	PSW1					PSW2				
L _{total} (ft)										
DL (plf)	100					100				
h (ft)										
A _o (ft ²)										
r:										
C _o :										
Design.:	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)
L _{i-ext} (ft):										
L _{i-in} (ft):										
h/b _s :										
2b _s /h:										
V _s (lb):										
V _w (lb):										
v _{s-max} (plf)										
uplift _s (lb):										
uplift _w (lb):										

Shear Walls

SL 8: Gridline F Level 1

Material: Structural Sheathing

Diaphragm Level: 2nd

Anchor Bolts: 1/2" ANCHOR BOLTS

Shear Line 8 Design Summary:

USE SW1

USE LSTHD8/8RJ Holdowns EACH SIDE OF PANEL AS PER PLANS

USE 1/2" ANCHOR BOLTS @ 32" O.C.

Design:	W_{total} (lbs)	V (lbs)	k
	136350	22319	1

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
4	5th	0	0	0	0	0.0	0.0	0.0	0.0	0	0.0
3	4th	0	0	0	0.000	0.0	0.0	0.0	0.0	0	0.0
2	3rd	23	51840	1192320	0.520	11616.1	11616.1	116161.1	11616.1	51840	11616.1
1	2nd	13	84510	1098630	0.480	10703.3	22319.4	290152.8	22319.4	136350	17983.7
Ground		Totals: Σ =									
				136350	2290950	1					

Wind:	A_A (ft²)	A_B (ft²)	A_C (ft²)	A_D (ft²)	V_{add} (lb)	V_{w-grdln} (lb)
	108		162		3019	7037

Seismic:	A_{level} (ft²)	A_{trgrdln} (ft²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_x (lb)	V_{add} (lb)	V_{s-grdln} (lb)
	2430	1215	84510	42255	1	10703.3	4066	7812

Individual Full-Height Shear Wall Design

Design.:	Panel 1:	Panel 2:	Panel 3:	Panel 4:	Panel 5:	Panel 6:	Panel 7:	Panel 8:	Panel 9:	Panel 10:
L _{ext} (ft):	17	17								
L _{in} (ft):										
h/b _s :	0.71	0.71								
2b _s /h:	1.00	1.00								
v _s (plf):	229.8	229.8								
v _w (plf):	207.0	207.0								
DL (plf):	150	150	100	100	100	100	100	100	100	100
h (ft):	12	12								
h' (ft):	12	12								
uplift _s (lb):	1482.2	1482.2								
uplift _w (lb):	1208.6	1208.6								

Perforated Shear Wall Design:

Design.:	PSW1					PSW2				
L _{total} (ft)										
DL (plf)	100					100				
h (ft)										
A _o (ft ²)										
r:										
C _o :										
Design.:	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)	L ₁ (ft)	L ₂ (ft)	L ₃ (ft)	L ₄ (ft)	L ₅ (ft)
L _{i-ext} (ft):										
L _{i-in} (ft):										
h/b _s :										
2b _s /h:										
V _s (lb):										
V _w (lb):										
v _{s-max} (plf)										
uplift _s (lb):										
uplift _w (lb):										



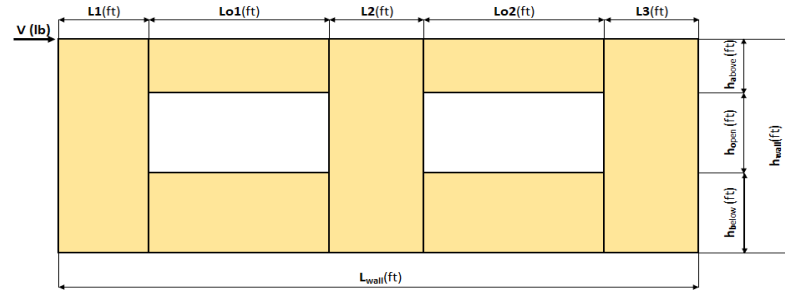
Force Transfer Around Openings Calculator

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:		Date:	
Designer:			
Client:			
Project:			
Wall Line:	Gridline 1 Level 2		



Shear Wall Calculation Variables

V	4135 lbf	Opening 1	Opening 2	Adj. Factor Method =	2bs/h
L1	4.00 ft	ha1	2.00 ft	Wall Pier Aspect Ratio	Adj. Factor
L2	4.00 ft	ho1	6.00 ft	P1=ho1/L1=	1.50
L3	4.00 ft	hb1	2.00 ft	P2=ho2/L2=	1.50
h_wall	10.00 ft	Lo1	12.00 ft	P3=ho3/L3=	1.50
L_wall	31.00 ft	Lo2	7.00 ft		

1. Hold-down forces: $H = V_{h_wall}/L_{wall}$ 1334 lbf

2. Unit shear above + below opening

First opening: $va1 = vb1 = H/(ha1+hb1) = 333$ plf
Second opening: $va2 = vb2 = H/(ha2+hb2) = 333$ plf

3. Total boundary force above + below openings

First opening: $O1 = va1 \times (Lo1) = 4002$ lbf
Second opening: $O2 = va2 \times (Lo2) = 2334$ lbf

4. Corner forces

$F1 = O1(L1)/(L1+L2) = 2001$ lbf
 $F2 = O1(L2)/(L1+L2) = 2001$ lbf
 $F3 = O2(L2)/(L2+L3) = 1167$ lbf
 $F4 = O2(L3)/(L2+L3) = 1167$ lbf

5. Tributary length of openings

$T1 = (L1*Lo1)/(L1+L2) = 6.00$ ft
 $T2 = (L2*Lo1)/(L1+L2) = 6.00$ ft
 $T3 = (L2*Lo2)/(L2+L3) = 3.50$ ft
 $T4 = (L3*Lo2)/(L2+L3) = 3.50$ ft

6. Unit shear beside opening

$V1 = (V/L)(L1+T1)/L1 = 333$ plf
 $V2 = (V/L)(T2+L2+T3)/L2 = 450$ plf
 $V3 = (V/L)(T4+L3)/L3 = 250$ plf
Check $V1*L1+V2*L2+V3*L3=V?$ 4135 lbf OK

7. Resistance to corner forces

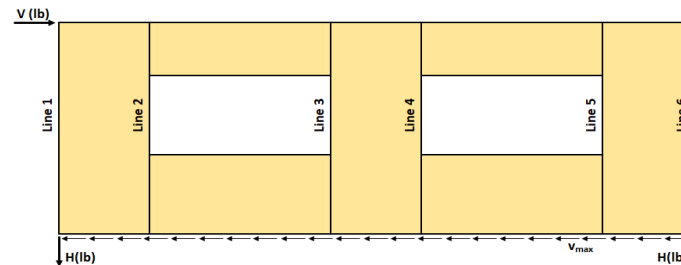
$R1 = V1*L1 = 1334$ lbf
 $R2 = V2*L2 = 1801$ lbf
 $R3 = V3*L3 = 1000$ lbf

8. Difference corner force + resistance

$R1-F1 = -667$ lbf
 $R2-F2-F3 = -1367$ lbf
 $R3-F4 = -167$ lbf

9. Unit shear in corner zones

$vc1 = (R1-F1)/L1 = -167$ plf
 $vc2 = (R2-F2-F3)/L2 = -342$ plf
 $vc3 = (R3-F4)/L3 = -42$ plf



Check Summary of Shear Values for Two Openings

Line 1: $vc1(ha1+hb1)+V1(ho1)=H?$	-667	2001	1334 lbf
Line 2: $va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?$	1334	-667	0
Line 3: $vc2(ha1+hb1)+V2(ho1)-va1(ha1+hb1)=0?$	-1367	2701	0
Line 4: $va2(ha2+hb2)-V2(ho2)-vc2(ha2+hb2)=0?$	1334	2701	0
Line 5: $va2(ha2+hb2)-vc3(ha2+hb2)-V3(ho2)=0?$	1334	-167	0
Line 6: $vc3(ha2+hb2)+V3(ho2)=H?$	-167	1501	1334 lbf

Design Summary

Req. Sheathing Capacity	450 plf
Req. Strap Force	2001 lbf
Req. HD Force	1334 lbf
Req. Shear Wall Anchorage Force	133 plf

4-Term Deflection	
4-Term Story Drift %	

See Page 2

3-Term Deflection	
3-Term Story Drift %	

See Page 3

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Project Information:	
Code:	Date:
Designer:	
Client:	
Project:	
Wall Line:	Gridline 1 Level 2

Sheathing:		Wood End Post Values:		Nail Type: (penny weight)	
	Sheathing Material	Species: 			
	Performance Category	E: (psi)			
	Grade				
		Qty	Stud Size		
	Gt Override	Dimensions: 		Nail Spacing: 	 (in.)
	Ga Override	A: (in. ²)		HD Capacity: 	 (lbf)
		A Override: (in. ²)		HD Deflection: 	 (in.)

$$\Delta = \frac{5w^3}{64b^3} + \frac{w^3}{Gt} + 0.75k_s + d_s \frac{h}{b} \quad \text{(Equation 23-2)}$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	Pier 3-L	Pier 3-R	
Sheathing:							
Nail:	0	0	0	0	0	0	
V_{asd} :	333	333	450	450	250	250	(plf)
$V_{strength}$:	476	476	643	643	357	357	(plf)
E:							(psi)
h:	10.00	8.00	8.00	8.00	8.00	10.00	(ft)
A:							(in. ²)
Gt:							(lb/in.)
Nail Spacing:							(in.)
Vn:							(plf)
e:							(in.)
b:	4.00	4.00	4.00	4.00	4.00	4.00	(ft)
HD Capacity:							(lb)
HD Defl:							(in.)

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
Sum			0.000	Sum			0.000
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
Sum			0.000	Sum			0.000
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
Sum			0.000	Sum			0.000

Total Defl.	(in.) %drift
----------------	-----------------

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Project Information

Code:	Date:
Designer:	
Client:	
Project:	
Wall Line:	Gridline 1 Level 2

Three-Term Equation Deflection Check

$$\delta_w = \frac{8vh^3}{EAB} + \frac{vh}{1000G_s} + \frac{h\Delta_s}{b} \quad (4.3-1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	Pier 3-L	Pier 3-R	
Sheathing:							
Nail:	0	0	0	0	0	0	
V _{asd} :	333	333	450	450	250	250	(plf)
V _{strength} :	476	476	643	643	357	357	(plf)
E:							(psi)
h:	10.00	8.00	8.00	8.00	8.00	10.00	(ft)
A:							(in. ²)
G _s :							(kips/in.)
b:	4.00	4.00	4.00	4.00	4.00	4.00	(ft)
HD Capacity:							(lbf)
HD Defl:							(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
Sum		0.000	Sum		0.000
Pier 2 (left)			Pier 2 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
Sum		0.000	Sum		0.000
Pier 3 (left)			Pier 3 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
Sum		0.000	Sum		0.000

Total Defl.	(in.)
	%drift

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

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Force Transfer Around Openings Calculator

THREE 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

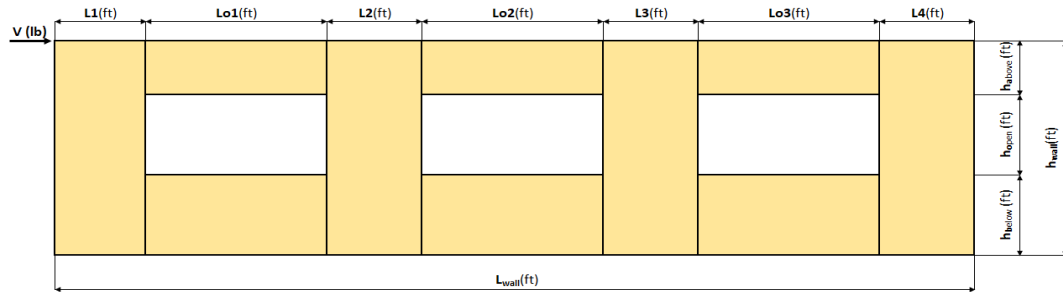
Code: _____ Date: _____

Designer: _____

Client: _____

Project: _____

Wall Line: shear line 7 level 2



Shear Wall Calculation Variables

V	3308 lbf	Opening 1		Opening 2		Opening 3		Adj. Factor Method = 2bs/h	
L1	3.50 ft	ha1	2.00 ft	ha2	2.00 ft	ha3	2.00 ft	Wall Pier Aspect Ratio	Adj. Factor
L2	3.50 ft	ho1	6.00 ft	ho2	6.00 ft	ho3	6.00 ft	P1=ho1/L1=	1.71
L3	3.50 ft	hb1	2.00 ft	hb2	2.00 ft	hb3	2.00 ft	P2=ho2/L2=	1.71
L4	3.50 ft	Lo1	7.00 ft	Lo2	7.00 ft	Lo3	7.00 ft	P3=ho3/L3=	1.71
h_wall	10.00 ft							P4=ho3/L4=	1.71
L_wall	35.00 ft								N/A

1. Hold-down forces: $H = Vh_{wall}/L_{wall}$ = 945 lbf

2. Unit shear above + below opening

First opening: $va1 = vb1 = H/(ha1+hb1) = 236$ plf

Second opening: $va2 = vb2 = H/(ha2+hb2) = 236$ plf

Third opening: $va3 = vb3 = H/(ha3+hb3) = 236$ plf

3. Total boundary force above + below openings

First opening: $O1 = va1 \times (Lo1) = 1654$ lbf

Second opening: $O2 = va2 \times (Lo2) = 1654$ lbf

Third opening: $O3 = va3 \times (Lo3) = 1654$ lbf

4. Corner forces

$F1 = O1(L1)/(L1+L2) = 827$ lbf

$F2 = O1(L2)/(L1+L2) = 827$ lbf

$F3 = O2(L2)/(L2+L3) = 827$ lbf

$F4 = O2(L3)/(L2+L3) = 827$ lbf

$F5 = O3(L3)/(L3+L4) = 827$ lbf

$F6 = O3(L4)/(L3+L4) = 827$ lbf

5. Tributary length of openings

$T1 = (L1*Lo1)/(L1+L2) = 3.50$ ft

$T2 = (L2*Lo1)/(L1+L2) = 3.50$ ft

$T3 = (L2*Lo2)/(L2+L3) = 3.50$ ft

$T4 = (L3*Lo2)/(L2+L3) = 3.50$ ft

$T5 = (L3*Lo3)/(L3+L4) = 3.50$ ft

$T6 = (L4*Lo3)/(L3+L4) = 3.50$ ft

6. Unit shear beside opening

$V1 = (V/L)/(L1+T1)/L1 = 189$ plf

$V2 = (V/L)/(T2+L2+T3)/L2 = 284$ plf

$V3 = (V/L)/(T4+L3+T5)/L3 = 284$ plf

$V4 = (V/L)/(T6+L4)/L4 = 189$ plf

Check $V1*L1+V2*L2+V3*L3+V4*L4=V?$ = 3308 lbf OK

7. Resistance to corner forces

$R1 = V1*L1 = 662$ lbf

$R2 = V2*L2 = 992$ lbf

$R3 = V3*L3 = 992$ lbf

$R4 = V4*L4 = 662$ lbf

8. Difference corner force + resistance

$R1-F1 = -165$ lbf

$R2-F2-F3 = -662$ lbf

$R3-F4-F5 = -662$ lbf

$R4-F6 = -165$ lbf

9. Unit shear in corner zones

$vc1 = (R1-F1)/L1 = -47$ plf

$vc2 = (R2-F2-F3)/L2 = -189$ plf

$vc3 = (R3-F4-F5)/L3 = -189$ plf

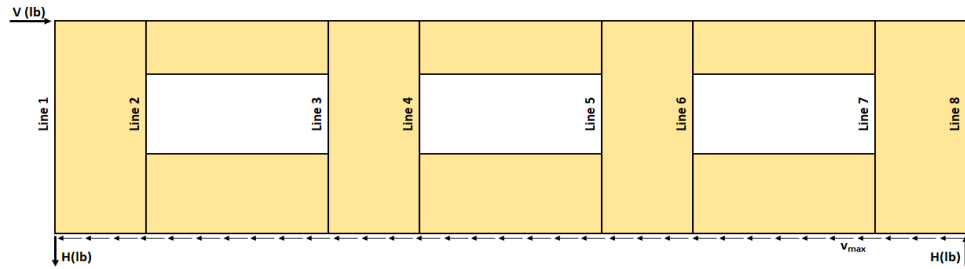
$vc4 = (R4-F6)/L4 = -47$ plf

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Project Information

Code:	Date:
Designer:	
Client:	
Project:	
Wall Line: shear line 7 level 2	


Check Summary of Shear Values for Three Openings

Line 1: $vc1(ha1+hb1)+V1(ho1)=H?$		-189	1134	945 lbf
Line 2: $va1(ha1+hb1)-vc1(ha1+hb1)-V1(ho1)=0?$	945	-189	1134	0
Line 3: $vc2(ha1+hb1)+V2(ho1)-va1(ha1+hb1)=0?$	-756	1701	945	0
Line 4: $va2(ha2+hb2)-V2(ho2)-vc2(ha2+hb2)=0?$	945	1701	-756	0
Line 5: $va2(ha2+hb2)-vc3(ha2+hb2)-V3(ho2)=0?$	945	-756	1701	0
Line 6: $va3(ha3+hb3)-V3(ho3)-vc3(ha3+hb3)=0?$	945	1701	-756	0
Line 7: $va3(ha3+hb3)-vc4(ha3+hb3)-V4(ho3)=0?$	945	-189	1134	0
Line 8: $vc4(ha3+hb3)+V4(ho3)=H?$		-189	1134	945 lbf

Design Summary

Req. Sheathing Capacity	284 plf	4-Term Deflection		3-Term Deflection	
Req. Strap Force	827 lbf	4-Term Story Drift %		3-Term Story Drift %	
Req. HD Force (H)	945 lbf	See Page 3		See Page 4	
Req. Shear Wall Anchorage Force (V_{max})	95 plf				

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Project Information

Code: _____	Date: _____
Designer: _____	
Client: _____	
Project: _____	
Wall Line: shear line 7 level 2	

Shear Wall Deflection Calculation Variables

Sheathing:	Wood End Post Values:	Nail Type: _____ (penny weight)								
_____ Sheathing Material	Species: _____									
_____ Performance Category	E: _____ (psi)									
_____ Grade	Qty: _____									
	Stud Size: _____									
	A: _____ (in. ²)									
_____ Gt Override	A Override: _____ (in. ²)									
_____ Ga Override										
		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 50%;">Pier 1</th> <th style="width: 50%;">Pier 4</th> </tr> <tr> <td>Nail Spacing: _____ (in.)</td> <td>_____ (in.)</td> </tr> <tr> <td>HD Capacity: _____ (lbf)</td> <td>_____ (lbf)</td> </tr> <tr> <td>HD Deflection: _____ (in.)</td> <td>_____ (in.)</td> </tr> </table>	Pier 1	Pier 4	Nail Spacing: _____ (in.)	_____ (in.)	HD Capacity: _____ (lbf)	_____ (lbf)	HD Deflection: _____ (in.)	_____ (in.)
Pier 1	Pier 4									
Nail Spacing: _____ (in.)	_____ (in.)									
HD Capacity: _____ (lbf)	_____ (lbf)									
HD Deflection: _____ (in.)	_____ (in.)									

Four-Term Equation Deflection Check

$$\Delta = \frac{8vt^3}{EAB} + \frac{vt}{Gt} + 0.75\frac{h}{b} + d + \frac{h}{b} \quad (\text{Equation 23-2})$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	Pier 3-L	Pier 3-R	Pier 4-L	Pier 4-R	
Sheathing:									
Nail:	0	0	0	0	0	0	0	0	
V _{asd} :	189	189	284	284	284	284	189	189	(plf)
V _{strength} :	270	270	405	405	405	405	270	270	(plf)
E:									(psi)
h:	10.00	8.00	8.00	8.00	8.00	8.00	8.00	10.00	(ft)
A:									(in. ²)
Gt:									(lbf/in.)
Nail Spacing:									(in.)
Vn:									(plf)
e:	Fix	Fix	Fix	Fix	Fix	Fix	Fix	Fix	(in.)
b:	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	(ft)
HD Capacity:									(lbf)
HD Defl:									(in.)

Check Total Deflection of Wall System

Pier 1 (left)				Pier 1 (right)			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Bending	Shear	Fastener	HD-1	Bending	Shear	Fastener	HD-2
Sum			0.000	Sum			0.000
Pier 2 (left)				Pier 2 (right)			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Bending	Shear	Fastener	HD-1	Bending	Shear	Fastener	HD-2
Sum			0.000	Sum			0.000
Pier 3 (left)				Pier 3 (right)			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Bending	Shear	Fastener	HD-1	Bending	Shear	Fastener	HD-2
Sum			0.000	Sum			0.000
Pier 4 (left)				Pier 4 (right)			
Term 1	Term 2	Term 3	Term 4	Term 1	Term 2	Term 3	Term 4
Bending	Shear	Fastener	HD-1	Bending	Shear	Fastener	HD-2
Sum			0.000	Sum			0.000

Total Defl.	
	(in.)
	%drift

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Project Information

Code:	Date:
Designer:	
Client:	
Project:	
Wall Line: shear line 7 level 2	

Three-Term Equation Deflection Check

$$\delta_w = \frac{8v_n^2}{EAD} + \frac{v_n}{1000G_b} + \frac{hA_b}{b} \quad (4.3-1)$$

	Pier 1-L	Pier 1-R	Pier 2-L	Pier 2-R	Pier 3-L	Pier 3-R	Pier 4-L	Pier 4-R	
Sheathing:									
Nail:	0	0	0	0	0	0	0	0	
V _{asd} :	189	189	284	284	284	284	189	189	(plf)
V _{strength} :	270	270	405	405	405	405	270	270	(plf)
E:									(psi)
h:	10.00	8.00	8.00	8.00	8.00	8.00	8.00	10.00	(ft)
A:									(in. ²)
G _a :									(kips/in.)
b:	3.50	3.50	3.50	3.50	3.50	3.50	3.50	3.50	(ft)
HD Capacity:									(lbf)
HD Defl:									(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
Sum		0.000	Sum		0.000
Pier 2 (left)			Pier 2 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
Sum		0.000	Sum		0.000
Pier 3 (left)			Pier 3 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
Sum		0.000	Sum		0.000
Pier 4 (left)			Pier 4 (right)		
Term 1 Bending	Term 2 Shear	Term 3 Fastener	Term 1 Bending	Term 2 Shear	Term 3 Fastener
Sum		0.000	Sum		0.000

Total Defl.	
	(in.) %drift

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

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Diaphragm

SL 1: Gridline 1 Level 2

Material: Structural Sheathing

Diaphragm Level/Type:	3rd	Roof
Blocking:	Unblocked	
Wall L (ft):	54	
Wall b (ft):	45	
Wall Opening (ft):	5	

SL 1 Design Summary:

Use 5/8" APA Rated OSB Sheathing w/ 10d Nails @ 6" o.c. Edge, 12" o.c. Field, Unblocked
Use (4) 16d Common Toenails at Full Height Blocking
Use (8) 16d Nails Between Splice Points

Vertical Distribution of Lateral Forces											
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force		
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)
5	6th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	5th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	4th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	3rd	23	51840	1192320.0	0.5	11616.1	11616.1	116161.1	11616.1	51840.0	11616.1
1	2nd	13	84510	1098630.0	0.5	10703.3	22319.4	290152.8	22319.4	136350.0	17983.7
									Diaphragm Design:		
									V _{diaph} (plf)	v _{allow} (plf)	Check:
Wind:			A _A (ft ²)	A _B (ft ²)	A _C (ft ²)	A _D (ft ²)	V _{add} (lb)	V _{w-grdln} (lb)	78.1	399	DESIGN OK
			81	0	162	0	0	3514.0			
Seismic:	A _{level} (ft ²)	A _{trgrdln} (ft ²)	W _{level} (lb)	W _{grdln} (lb)	ρ	F _{px} (lb)	V _{add} (lb)	V _{s-grdln} (lb)	90.3	285	DESIGN OK
	2136	1068	51840	25920	1.0	11616.1	0	4065.6			
									Deflection: DESIGN OK		
Diaphragm Chord Forces:			w _u (plf)	M _{max} (lbft)	T/C (lb)						
			150.6	54886.1	1219.7						
Diaphragm Collector Forces:			v _{max} (plf)	b _{open} (ft)	T/C (lb)						
			90.3	5	451.7						
Top Plate Splice:			Z (lb)	Z' (lb)	N						
			141	225.6	5.4						

SL 2: Gridline 1 level 1

Material: Structural Sheathing

Diaphragm Level/Type:	2nd	Floor
Blocking:	Unblocked	
Wall L (ft):	54	
Wall b (ft):	45	
Wall Opening (ft):	5	

SL 2 Design Summary:

Use 3/4" APA Rated OSB Sheathing w/ 10d Nails @ 6" o.c. Edge, 12" o.c. Field, Unblocked
Use (4) 16d Common Toenails at Full Height Blocking
Use (9) 16d Nails Between Splice Points

Vertical Distribution of Lateral Forces												
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force			
		h_x (ft)	w_x (lb)	$w_x h_x^k$	C_{vx}	F_x	V_x	O.M (lb-ft)	ΣF_i (lbs)	ΣW_i (lbs)	F_{px} (lb)	
5	6th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
4	5th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3	4th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	3rd	23	51840	1192320.0	0.5	11616.1	11616.1	116161.1	11616.1	51840.0	11616.1	
1	2nd	13	84510	1098630.0	0.5	10703.3	22319.4	290152.8	22319.4	136350.0	17983.7	
									Diaphragm Design:			
									v_{diaph} (plf)	v_{allow} (plf)	Check:	
			Wind:	A_A (ft ²)	A_B (ft ²)	A_C (ft ²)	A_D (ft ²)	V_{add} (lb)	$V_{w-grdln}$ (lb)	104.1	399	DESIGN OK
				108	0	216	0	0	4685.0			
Seismic:	A_{level} (ft ²)	$A_{trgrdln}$ (ft ²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_{px} (lb)	V_{add} (lb)	$V_{s-grdln}$ (lb)	139.9	285	DESIGN OK	
	2430	1215	84510	42255	1.0	17983.7	0	6294.3				
									Deflection: DESIGN OK			
Diaphragm Chord Forces:			w_u (plf)	M_{max} (lbft)	T/C (lb)							
			233.1	84973.1	1888.3							
Diaphragm Collector Forces:			v_{max} (plf)	b_{open} (ft)	T/C (lb)							
			139.9	5	699.4							
Top Plate Splice:			Z (lb)	Z' (lb)	N							
			141	225.6	8.4							

Diaphragm

SL 3: Gridline 7 Level 2

Material: Structural Sheathing

Diaphragm Level/Type:	3rd	Roof
Blocking:	Unblocked	
Wall L (ft):	54	
Wall b (ft):	45	
Wall Opening (ft):	5	

SL 3 Design Summary:

Use 5/8" APA Rated OSB Sheathing w/ 10d Nails @ 6" o.c. Edge, 12" o.c. Field, Unblocked
Use (4) 16d Common Toenails at Full Height Blocking
Use (8) 16d Nails Between Splice Points

Vertical Distribution of Lateral Forces												
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force			
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)	
5	6th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
4	5th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3	4th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	3rd	23	51840	1192320.0	0.5	11616.1	11616.1	116161.1	11616.1	51840.0	11616.1	
1	2nd	13	84510	1098630.0	0.5	10703.3	22319.4	290152.8	22319.4	136350.0	17983.7	
									Diaphragm Design:			
									V _{diaph} (plf)	v _{allow} (plf)	Check:	
			Wind:	A _A (ft ²)	A _B (ft ²)	A _C (ft ²)	A _D (ft ²)	V _{add} (lb)	V _{w-grdln} (lb)	78.1	399	DESIGN OK
				81	0	162	0	0	3514.0			
Seismic:	A _{level} (ft ²)	A _{trgdln} (ft ²)	W _{level} (lb)	W _{grdln} (lb)	ρ	F _{px} (lb)	V _{add} (lb)	V _{s-grdln} (lb)	90.3	285	DESIGN OK	
	2136	1068	51840	25920	1.0	11616.1	0	4065.6				
Diaphragm Chord Forces:									Deflection:		DESIGN OK	
									Diaphragm Collector Forces:			
Top Plate Splice:												

SL 4: 0

Material: Structural Sheathing

Diaphragm Level/Type:	2nd	Floor
Blocking:	Unblocked	
Wall L (ft):	54	
Wall b (ft):	45	
Wall Opening (ft):	5	

SL 4 Design Summary:

Use 3/4" APA Rated OSB Sheathing w/ 10d Nails @ 6" o.c. Edge, 12" o.c. Field, Unblocked
Use (4) 16d Common Toenails at Full Height Blocking
Use (9) 16d Nails Between Splice Points

Vertical Distribution of Lateral Forces															
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force						
		h_x (ft)	w_x (lb)	$w_x h_x^k$	C_{vx}	F_x	V_x	O.M (lb-ft)	ΣF_i (lbs)	ΣW_i (lbs)	F_{px} (lb)				
5	6th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
4	5th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
3	4th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0				
2	3rd	23	51840	1192320.0	0.5	11616.1	11616.1	116161.1	11616.1	51840.0	11616.1				
1	2nd	13	84510	1098630.0	0.5	10703.3	22319.4	290152.8	22319.4	136350.0	17983.7				
									Diaphragm Design:						
									v_{diaph} (plf)	v_{allow} (plf)	Check:				
		Wind:	A_A (ft ²)	A_B (ft ²)	A_C (ft ²)	A_D (ft ²)	V_{add} (lb)	$V_{w-grdln}$ (lb)	104.1	399	DESIGN OK				
			108	0	216	0	0	4685.0							
Seismic:	A_{level} (ft ²)	$A_{trgrdln}$ (ft ²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_{px} (lb)	V_{add} (lb)	$V_{s-grdln}$ (lb)	139.9	285	DESIGN OK				
	2430	1215	84510	42255	1.0	17983.7	0	6294.3							
									Deflection:		DESIGN OK				
									Diaphragm Chord Forces:		w_u (plf)	M_{max} (lbft)	T/C (lb)		
											233.1	84973.1	1888.3		
									Diaphragm Collector Forces:		v_{max} (plf)	b_{open} (ft)	T/C (lb)		
		139.9	5	699.4											
Top Plate Splice:		Z (lb)	Z' (lb)	N											
		141	225.6	8.4											

Diaphragm

SL 5: Gridline B.5 Level 2

Material: Structural Sheathing

Diaphragm Level/Type: 3rd Roof

Blocking: Unblocked

Wall L (ft): 45

Wall b (ft): 54

Wall Opening (ft): 5

SL 5 Design Summary:

Use 5/8" APA Rated OSB Sheathing w/ 10d Nails @ 6" o.c. Edge, 12" o.c. Field, Unblocked
Use (4) 16d Common Toenails at Full Height Blocking
Use (8) 16d Nails Between Splice Points

Vertical Distribution of Lateral Forces																	
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force								
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)						
5	6th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
4	5th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
3	4th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
2	3rd	23	51840	1192320.0	0.5	11616.1	11616.1	116161.1	11616.1	51840.0	11616.1						
1	2nd	13	84510	1098630.0	0.5	10703.3	22319.4	290152.8	22319.4	136350.0	17983.7						
									Diaphragm Design:								
									V _{diaph} (plf)	v _{allow} (plf)	Check:						
			Wind:	A _A (ft ²)	A _B (ft ²)	A _C (ft ²)	A _D (ft ²)	V _{add} (lb)	V _{w-grdln} (lb)	55.9	399	DESIGN OK					
				81	0	122	0	0	3019.0								
Seismic:	A _{level} (ft ²)	A _{trgdln} (ft ²)	W _{level} (lb)	W _{grdln} (lb)	ρ	F _{px} (lb)	V _{add} (lb)	V _{s-grdln} (lb)	75.3	285	DESIGN OK						
	2136	1068	51840	25920	1.0	11616.1	0	4065.6									
									Deflection:		DESIGN OK						
												Diaphragm Chord Forces:			w _u (plf)	M _{max} (lbft)	T/C (lb)
															180.7	45738.4	847.0
												Diaphragm Collector Forces:			v _{max} (plf)	b _{open} (ft)	T/C (lb)
															75.3	5	376.4
Top Plate Splice:			Z (lb)	Z' (lb)	N												
			141	225.6	3.8												

SL 6: Gridline B.5 Level 1

Material: Structural Sheathing

Diaphragm Level/Type: 2nd Floor

Blocking: Unblocked

Wall L (ft): 45

Wall b (ft): 54

Wall Opening (ft): 5

SL 6 Design Summary:

Use 3/4" APA Rated OSB Sheathing w/ 10d Nails @ 6" o.c. Edge, 12" o.c. Field, Unblocked
Use (4) 16d Common Toenails at Full Height Blocking
Use (8) 16d Nails Between Splice Points

Vertical Distribution of Lateral Forces													
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force				
		h_x (ft)	w_x (lb)	$w_x h_x^k$	C_{vx}	F_x	V_x	O.M (lb-ft)	ΣF_i (lbs)	ΣW_i (lbs)	F_{px} (lb)		
5	6th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
4	5th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
3	4th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		
2	3rd	23	51840	1192320.0	0.5	11616.1	11616.1	116161.1	11616.1	51840.0	11616.1		
1	2nd	13	84510	1098630.0	0.5	10703.3	22319.4	290152.8	22319.4	136350.0	17983.7		
									Diaphragm Design:				
									v_{diaph} (plf)	v_{allow} (plf)	Check:		
			Wind:	A_A (ft ²)	A_B (ft ²)	A_C (ft ²)	A_D (ft ²)	V_{add} (lb)	$V_{w-grdln}$ (lb)	74.4	399	DESIGN OK	
				108	0	162	0	0	4018.0				
Seismic:	A_{level} (ft ²)	$A_{trgrdln}$ (ft ²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_{px} (lb)	V_{add} (lb)	$V_{s-grdln}$ (lb)	116.6	285	DESIGN OK		
	2430	1215	84510	42255	1.0	17983.7	0	6294.3					
									Deflection:		DESIGN OK		
Diaphragm Chord Forces:			w_u (plf)	M_{max} (lbft)	T/C (lb)								
			279.7	70810.9	1311.3								
Diaphragm Collector Forces:			v_{max} (plf)	b_{open} (ft)	T/C (lb)								
			116.6	5	582.8								
Top Plate Splice:			Z (lb)	Z' (lb)	N								
			141	225.6	5.8								

Diaphragm

SL 7: Gridline F Level 2

Material: Structural Sheathing

Diaphragm Level/Type:	3rd	Roof
Blocking:	Unblocked	
Wall L (ft):	45	
Wall b (ft):	54	
Wall Opening (ft):	5	

SL 7 Design Summary:

Use 5/8" APA Rated OSB Sheathing w/ 10d Nails @ 6" o.c. Edge, 12" o.c. Field, Unblocked
Use (4) 16d Common Toenails at Full Height Blocking
Use (8) 16d Nails Between Splice Points

Vertical Distribution of Lateral Forces												
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force			
		h _x (ft)	w _x (lb)	w _x h _x ^k	C _{vx}	F _x	V _x	O.M (lb-ft)	ΣF _i (lbs)	ΣW _i (lbs)	F _{px} (lb)	
5	6th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
4	5th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3	4th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	3rd	23	51840	1192320.0	0.5	11616.1	11616.1	116161.1	11616.1	51840.0	11616.1	
1	2nd	13	84510	1098630.0	0.5	10703.3	22319.4	290152.8	22319.4	136350.0	17983.7	
									Diaphragm Design:			
									V _{diaph} (plf)	v _{allow} (plf)	Check:	
			Wind:	A _A (ft ²)	A _B (ft ²)	A _C (ft ²)	A _D (ft ²)	V _{add} (lb)	V _{w-grdln} (lb)	55.9	399	DESIGN OK
				81	0	122	0	0	3019.0			
Seismic:	A _{level} (ft ²)	A _{trgrdln} (ft ²)	W _{level} (lb)	W _{grdln} (lb)	ρ	F _{px} (lb)	V _{add} (lb)	V _{s-grdln} (lb)	75.3	285	DESIGN OK	
	2136	1068	51840	25920	1.0	11616.1	0	4065.6				
									Deflection:			DESIGN OK
Diaphragm Chord Forces:			w _u (plf)	M _{max} (lbft)	T/C (lb)							
			180.7	45738.4	847.0							
Diaphragm Collector Forces:			v _{max} (plf)	b _{open} (ft)	T/C (lb)							
			75.3	5	376.4							
Top Plate Splice:			Z (lb)	Z' (lb)	N							
			141	225.6	3.8							

SL 8: Gridline F Level 1

Material: Structural Sheathing

Diaphragm Level/Type:	2nd	Floor
Blocking:	Unblocked	
Wall L (ft):	45	
Wall b (ft):	54	
Wall Opening (ft):	5	

SL 8 Design Summary:

Use 3/4" APA Rated OSB Sheathing w/ 10d Nails @ 6" o.c. Edge, 12" o.c. Field, Unblocked
Use (4) 16d Common Toenails at Full Height Blocking
Use (8) 16d Nails Between Splice Points

Vertical Distribution of Lateral Forces												
Level Number	Level Name	height	Weight			Lateral Force @ each level			Diaphragm Force			
		h_x (ft)	w_x (lb)	$w_x h_x^k$	C_{vx}	F_x	V_x	O.M (lb-ft)	ΣF_i (lbs)	ΣW_i (lbs)	F_{px} (lb)	
5	6th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
4	5th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
3	4th	0	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
2	3rd	23	51840	1192320.0	0.5	11616.1	11616.1	116161.1	11616.1	51840.0	11616.1	
1	2nd	13	84510	1098630.0	0.5	10703.3	22319.4	290152.8	22319.4	136350.0	17983.7	
									Diaphragm Design:			
									v_{diaph} (plf)	v_{allow} (plf)	Check:	
			Wind:	A_A (ft ²)	A_B (ft ²)	A_C (ft ²)	A_D (ft ²)	V_{add} (lb)	$V_{w-grdln}$ (lb)	74.4	399	DESIGN OK
				108	0	162	0	0	4018.0			
Seismic:	A_{level} (ft ²)	$A_{trgrdln}$ (ft ²)	W_{level} (lb)	W_{grdln} (lb)	ρ	F_{px} (lb)	V_{add} (lb)	$V_{s-grdln}$ (lb)	116.6	285	DESIGN OK	
	2430	1215	84510	42255	1.0	17983.7	0	6294.3				
									Deflection:			DESIGN OK
Diaphragm Chord Forces:			w_u (plf)	M_{max} (lbft)	T/C (lb)							
			279.7	70810.9	1311.3							
Diaphragm Collector Forces:			v_{max} (plf)	b_{open} (ft)	T/C (lb)							
			116.6	5	582.8							
Top Plate Splice:			Z (lb)	Z' (lb)	N							
			141	225.6	5.8							