Blossom Restaurant

Structural Calculations

Engineer's seal applies to this entire calculation packet.

This engineering report is valid only for the aforementioned building located at 2082 North Hillcrest Road, Saratoga Springs, Utah. This report is to be used only once and may not be copied or reproduced without the written consent of LEI Engineers and Surveyors, Inc.



- A Utah Corporation -

ENGINEERS

SURVEYORS

PLANNERS

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LEI Project #:

2020-2072

Location:

Saratoga Springs, Utah

Date:

2/24/2020

Engineered by:

J. Miller

Reviewed by:



APPLIES TO PAGES 1-38

Structural Review for:

Blossom Restaurant

Location:

Saratoga Springs, Utah

Job #:

2020-2072

Engineered by: Code:

J. Miller 2018 IBC

Loadings

Risk Category:

П

Ground Snow Load:

Elevation =

4642 ft

 $p_g = 33.0 \text{ psf}$

Roof Snow Load:

 $C_t = 1.0$

Roof Exposure C_e = 1.0 Partially

l_s = 1.0 p_f = 23.1 psf

Roof Dead Load:

DL = 15 psf

Wind Loading:

Roofing Material = Shingle/Tile

Roof Pitch = 0.25 /12

Roof Angle = 1.2 degrees

C

Exposure Category =

Mean Roof Height = 25

Wind Speed V = 103

Height & Exposure Factor $\lambda = 1.35$

 p_{s30} Horizontal Pressures
 p_{net30}

 zone A
 zone B
 zone C
 zone D
 zone 4
 zone 5

 16.86
 -8.74
 11.16
 -5.20
 17.82
 23.88

p _s	Horizonta	p	net		
zone A	zone B	zone C	zone 4	zone 5	
22.8	0.0	15.1	0.0	24.1	32.2

Seismic Loading:

Number of Stories = 1

Roof diaphragm height h_r = 25 ft

I_e = 1.00

Fundamental Period $T_a = 0.224$ sec.

F = 1

Site Class = D (Assumed)

R factor = 6.5 Structural Sheathing

R factor = 6.5 Simpson Strong Wall

R factor = 6.5 Portal Frame

R factor = 2 Gypsum Sheathing

R factor = 5 Masonry Shear Wall

R factor = 4 Concrete Shear Wall

R factor = 2.5 Cantilever Steel Post

R factor = 4.5 Steel Moment Frame

 $S_S = 1.042$

 $S_1 = 0.377$

 $F_a = 1.2$ $F_v = 1.923$

 $S_{MS} = 1.2504$

 $S_{M1} = 0.724971$

 $S_{DS} = 0.834$

S_{D1} = 0.483

 $T_o = 0.115958$ sec.

 $T_s = 0.579791$ sec.

Seismic Design Category =

D

2500 psf

(Earthtec Project No. 131422 dated september 26, 2013)

2/21/2020 Ground Snow Load

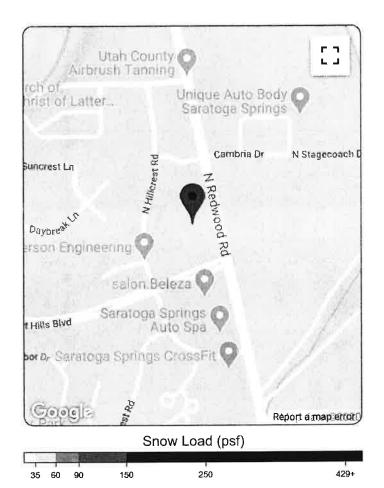
2018 Utah Ground Snow Load Map Blossom Restaurant





Latitude: 40.400 Longitude: -111.920 Elevation: 4,642 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.



Address:

2082 N Hillcrest Rd Saratoga Springs, Utah

84045

ASCE 7 Hazards Report

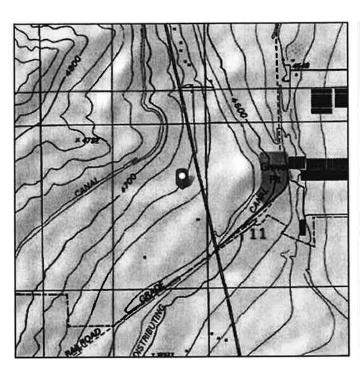
Standard: ASCE/SEI 7-16

Risk Category: ||

Soil Class: D - Stiff Soil

Elevation: 4657.63 ft (NAVD 88)

Latitude: 40.400272 **Longitude:** -111.920957





Wind

Results:

Wind Speed:

103 Vmph

10-year MRI

73 Vmph

25-year MRI

79 Vmph

50-year MRI

84 Vmph

100-year MRI

89 Vmph

Data Source:

ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1-CC.2-4

Date Accessed:

Fri Feb 21 2020

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

Mountainous terrain, gorges, ocean promontories, and special wind regions should be examined for unusual wind conditions.



Seismic

Site Soil Class: D -	Stiff Soil
----------------------	------------

Results:

S _s :	1.042	S _{D1} :	N/A
S ₁ :	0.377	T_L :	8
Fa:	1.083	PGA:	0.457
F _v :	N/A	PGA _M :	0.523
S _{MS} :	1.128	F _{PGA} :	1.143
S _{M1} :	N/A	l _e :	1
S _{DS} :	0.752	C _v :	1.308

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed:

Fri Feb 21 2020

Date Source:

USGS Seismic Design Maps

Snow Drift Calculations	Drift #1	Drift #2	Drift #3
Roofing Material =	Shingle/Tile	Shingle/Tile	Shingle/Tile
Ground Snow Load p_g (psf)=	33	33	33
Flat Roof Snow Load pf (psf)=	23	23	23
Roof Pitch =	0.25	0.25	0.25
Angle =	1	1	1
C _s =	1.00	1.00	1.00
Sloped Roof Snow Load ps (psf)=	23	23	23
λ (lb/ft ³)=	18.29	18.29	18.29
Height of normal Snow Load h _b (ft)=	1.26	1.26	1.26
Roof Height Difference h _c (ft)=	9	5	4
Does Drift Exist $(h_c/h_b > 0.2)$? =	Yes	Yes	Yes
Low Roof or Parapet =	Low Roof	Parapet	Parapet
Length of upper roof I _u (ft)=	42	52	24
Length of lower roof (ft)=	13		
Height of Drift h _d (ft)=	2.3	2.0	1.3
Drift tapers to zero @ w (ft)=	9	8	5
Drift Load p _d (psf)=	43	36	23
Total load (psf)=	66	59	46

Siesmic Weight

Additional Seismic Weight (psf)=	0.0
Total Seismic Weight (psf)=	15.0

Preface & Structural Notes

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

Blossom Restaurant

2082 North Hillcrest Road, Saratoga Springs, Utah

NOTE TO PLAN CHECKER AND BUILDING INSPECTOR:

If the above address does not match the intended building address, notify LEI immediately @ 801-798-0555. This engineering packet is to be used only once for the above mentioned location and is not to be copied or reproduced without written consent of LEI Consulting Engineers and Surveyors, Inc.

Structural Notes:

General Notes

- 1 If values and assumptions stated in this report are incorrect, or if changes in the field are noticed which are different from those stated in this report, the engineer must be notified in order for the necessary corrections to be made.
- 2 If there are any discrepancies between the calculations and the drawings, these calculations shall govern.
- 3 This engineering report deals only with the structural parts of the building and does not apply to the non-structural parts.
- 4 If drawings are stamped in conjunction with this engineering report, certification pertains only to the structural elements of the drawings.
- 5 The general contractor is responsible for the method, means, and sequence of all structural erection except when specifically noted otherwise on the drawings. General contractor shall provide temporary shoring and bracing as his method of erection requires to provide adequate vertical and lateral support during erection. This shoring and bracing shall remain in place until all permanent members are placed and all final connections are completed including all roof and floor attachments.

Site Preparation

- 1 Do not place footings or foundations on disturbed soils, undocumented fill, debris, frozen soil, or in ponded water.
- 2 All slabs on grade shall be underlain by 4 in. of free-draining granular material such as "pea" gravel or 3/4 1 in. minus clean gravel.
- 3 Footings, foundations, excavations, grading and fill shall comply with the geotechnical report.

Concrete

- 1 All concrete footings and slabs on grade shall have a 28 day minimum strength = 2500 psi.
- 2 All concrete foundation walls and retaining walls shall have a 28 day minimum strength = 3000 psi.
- 3 Concrete shall be thoroughly consolidated by suitable means during placement.
- 4 Footings shall be centered below the wall and/or column above, typical unless noted otherwise.
- 5 Exterior footings shall bear below the effects of frost.
- 6 Stagger footing construction joints from wall construction joints above by at least 6 feet.
- 7 Reinforcing in continuous footings shall be continuous at corners and/or intersections by providing proper lap lengths and/or corner bars.
- 8 Interior slabs on grade shall be a min. of 4" thick.
- 9 Place vertical reinforcing in the center of the wall (except for retaining walls or when each face is specified).
- 10 Vertical reinforcing shall be dowelled to footing or structure below and to structure above with the same size bar and spacing, typical U.N.O.
- 11 Provide comer bars at all intersections and corners. Use same size bar and spacing as the horizontal reinforcing.
- 12 Horizontal reinforcing shall terminate at the ends of the walls and at openings with a standard hook.
- 13 Provide drainage at the base of retaining walls.

Reinforcing Steel

- 1 Reinforcing steel shall be new stock deformed bars and shall conform to ASTM A615, grade 60, with a design yield strength = 60 ksi.
- 2 Reinforcing steel shall be free of loose, flaky rust, scale, grease, oil, dirt, and other materials which might affect or impair bond.
- 3 Splices in continuous reinforcing shall be made on areas of compression and/or at points of minimum stress, typical U.N.O.
- 4 Lap splices shall be 40 bar diameters or 24" long in concrete. Dowels shall have a minimum of 30 bar diameters embedment.
- 5 Bends shall be made cold; do not use heat. Do not un-bend or re-bend a previously bent bar.
- 6 Reinforcing steel in concrete shall be securely anchored and tied in place prior to placing concrete and shall be positioned with the following minimum cover:

concrete cast against and permanently exposed to earth = 3"

concrete exposed to earth or weather = 1 1/2"

slabs on grade = center of slab

Structural Steel

- 1 Structural steel W-shapes shall conform to ASTM A992 grade 50 enhanced steel. Structural steel plates shall conform to ASTM A36.
- 2 Structural steel HSS-shapes shall conform to ASTM A500, grade B, with a min. yield strength Fy = 46 ksi (rectangular) or Fy = 42 ksi (round).
- 3 Structural pipe shall conform to ASTM A53, with a min. yield strength Fy = 36 ksi.
- 4 High strength bolts shall conform to ASTM A325, all other bolts shall conform to ASTM A307 or better.
- 5 Welded anchor studs and deformed bar anchors shall conform to the manufacturer's specs.
- 6 Fabrication shall be done in an approved fabricator's shop.
- 7 Use high strength (8000 psi min. at 28 days), non shrink, liquid epoxy grout beneath all steel base plates and bearing plates.
- 8 Bolt shall be bearing type connections U.N.O.
- 9 Steel to steel bolted connections shall be made with ASTM A325 high strength bolts and nuts, U.N.O.
- 10 All other bolted connections shall be made with bolts and nuts conforming to ASTM A307 U.N.O., including anchor bolts.
- 11 Bolted connections shall be tightened and shall have washers as required by AISC U.N.O.
- 12 Enlarging of holes shall be accomplished by means of reaming. Do not use a torch on any bolt holes.
- 13 Welded connections shall be made using low hydrogen matching filler material electrodes, U.N.O.
- 14 Welders shall be currently certified according to AWS within the last year. All welding procedures shall be pre-qualified. Welders shall follow welding procedures.
- 15 Welding and gas cutting shall be done per AWS.
- 16 Welds shall have the slag removed.

Structural Notes (cont):

Masonry Veneer Anchor Ties

- 1 Masonry veneer ties shall be one of the following:
 - a. Dovetail anchors
 - b. DX-10 seismic clip interlock system by Hohmann & Barnard
 - c. Engineer approved 2 piece adjustable hot-dipped galvanized ties.
- 2 Maximum spacing shall be 16" o.c. horizontal and vertical.
- 3 Provide continuous horizontal galvanized #9 wire in center third of mortar joints at 16" o.c. Engage #9 wire with all anchor ties in seismic zone category E.

Wood Truss

- 1 Bottom chords of trusses, acting as ceiling members must be able to support a 10 psf live load per IBC requirements.
- 2 The truss manufacturer shall be responsible for the design and fabrication of the pre-engineered trusses.
- 3 The trusses shall be designed as per the attached engineering specs.
- 4 The trusses shall be designed to carry any additional loads due to mechanical units, overhead doors, roof overbuilds, etc.
- 5 The trusses shall be designed per the IBC and local ordinances.
- 6 All members shall be designed for combined stresses based on the worst loading condition.
- 7 The truss manufacturer shall indicate proper bracing of compression chord members @ 6' long (or longer), as well as bracing for truss erection.
- 8 All dimensions shall be field verified prior to fabrication.
- 9 General contractor shall be responsible for the installation of the trusses per the truss manufacturer's recommendations and specs.
- 10 No web or chord members shall be modified in the field without approval from the truss engineer.
- 11 The engineer is not responsible for the pre-engineered trusses, nor for the installation of the trusses.
- 12 General contractor is to verify truss layout is consistent with these plans and notify engineer of any deviations.

General Framing

- All joists, rafters, posts and headers shall be DF-L #2 or equal U.N.O. If TJI's or equal are used, they must be installed per manufacturer's specs.
- 2 All joists and rafters shall have solid blocking at their bearing points.
- 3 All wood/lumber placed onto concrete shall be pressure treated or redwood.
- 4 Verify all beam sizes on the drawings with this report.
- 5 All beams and headers over 6'-0" shall be supported by double trimmer studs U.N.O.
- 6 All headers over 8'-0" shall shall have double king studs at each end U.N.O.
- 7 All over frame areas are to have full roof sheathing below.
- 8 Provide solid blocking and continuous bearing to foundation at all bearing point loads from above.
- 9 Provide double floor joists below all parallel bearing walls above.
- 10 Glulam beams shall be 24F-V4 DF/DF for single spans and 24F-V8 DF/DF for multiple spans and cantilevered spans.
- 11 Microllam beams shall be Laminated Veneer Lumber (LVL) with the following minimum design values: E=1,900,000 psi, Fb=2,600 psi, Fv=285 psi.
- 12 Parallam beams shall be Parallel Strand Lumber (PSL) with the following minimum design values: E=2,000,000 psi, Fb=2,900 psi, Fv=290 psi.
- 13 TimberStrand beams shall be Laminated Strand Lumber (LSL) w/ the following minimum design values:
 - 1-1/4" wide (rim board): E=1,300,000 psi, Fb=1,700 psi, Fv=425 psi.
 - 1-3/4" wide: E=1,550,000 psi, Fb=2,325 psi, Fv=310 psi.
- 14 All rafters and joists over 3 ft long shall be hangered if not supported by bottom bearing.
- 15 All hangers and other wood connections must be designed to carry the capacity of the member that they are supporting.
- 16 No structural member shall be cut or notched unless specifically shown, noted or approved by engineer.
- 17 Lag screws shall be inserted in a drilled pilot hole 60 75% of the shank diameter by turning with a wrench, not by driving with a hammer.
- 18 Nails are to be common wire U.N.O.
- 19 All bolt holes shall be drilled with a bit 1/32" to 1/16" larger than the nominal bolt diameter.
- 20 All joints in wall sheathing shall occur in the middle of a plate or block and nailed on each side of the joint w/ edge nailing per the shearwall schedul
- 21 All over built roof rafters shall be braced vertically to the trusses below at 4' o.c. max.
- 22 Double top plates are to have a minimum 48" lap splice w/ (8) 16d nails U.N.O.
- 23 All fasteners and connectors in contact with treated lumber shall be galvanized G90 or better.

Summary

Roof:

RR1: 2x12 DF-L#2 @ 24" o.c. as noted on plans 2x10 DF-L#2 @ 16" o.c. as noted on plans RR2:

Trusses by others

Use 7/16" APA rated OSB sheathing w/ 8d nails @ 6" o.c. edge, 12" o.c. field

Overbuild to be 2" x 6" Timber @ 24" o.c.

Other:

All bearing headers to be (2) 2x10 (DF L #2 or better) unless noted otherwise All exterior sheathing to be Shear Wall #1 unless noted otherwise All glulam beams are to be 24F-V4 unless noted otherwise Strap end lengths for shear walls (see also Simpson Coiled strap specs.): CMSTC16 = 25" CS16 = 14" CMST14 = 34"

Beam Schedule

Desig.	Qty.	Size	Iype
RB1	2	2 x 8	DF-L#2
RB2	3	1 3/4" x 11 7/8"	Microllam
RB3	1	5 1/2" x 19 1/2"	Glulam
RB4	1	5 1/2" x 30"	Glulam
RB5	3	1 3/4" x 14"	Microllam
RB6	1	5 1/2" x 28 1/2"	Glulam
RB7	2	1 3/4" x 14"	Microllam
RB8	3	1 3/4" x 11 7/8"	Microllam
RB9	2	1 3/4" x 11 7/8"	Microllam
RB10	2	1 3/4" x 11 1/4"	Microllam
RB11	1	W 10x49	A992-50 - Steel
RB12	3	1 3/4" x 11 7/8"	Microllam
RB13	1	W 10x49	A992-50 - Steel
RB14	2	1 3/4" x 11 7/8"	Microllam

Project: 2018-2072 Location: RR1 Roof Rafter





StruCalc Version 10.0.1.6

LOADING DIAGRAM

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1.5 IN x 11.25 IN x 8.0 FT (4 + 4) @ 24 O.C.

#2 - Douglas-Fir-Larch - Dry Use Section Adequate By: 420.2% Controlling Factor: Moment

DEFLECTIONS	2	enter		Right
Live Load	0.00	IN L/MAX	0.02	IN 2L/4606
Dead Load	0.00	in	0.01	in
Total Load	0.00	IN L/MAX	0.03	IN 2L/3354
Live Load Defler	tion C	ritoria: L/240	To	tal Load Deflection Criteria:

REACTIONS	Α		<u>B</u>	
Live Load	92	lb	368	lb
Dead Load	0	lb	160	lb
Total Load	92	lb	528	lb
Uplift (1.5 F.S)	-92	lb	0	lb
Bearing Length	0.10	in	0.56	in

SUPPORT LOADS	Α		<u>B</u>		
Live Load	46	plf	184	plf	
Dead Load	0	plf	80	plf	
Total Load	46	plf	264	plf	

A 4ft B 4ft

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

	Base	Values	Ad	ljusted	
Bending Stress:	Fb =	900 psi	Fb' =	1042	psi
_	Cd=1.1	5 CI=0.88 CI	==1.00 Cr	=1.15	
Shear Strees	Fv =	180 nsi	Fv' =	207	nsi

Shear Stress: Fv = 180 psi Fv' = 207 ps Cd=1.15

Modulus of Elasticity: E = 1600 ksi E' = 1600 ksi Comp. \perp to Grain: Fc $-\perp$ = 625 psi Fc $-\perp$ = 625 psi

Controlling Moment: -528 ft-lb 3.999 Ft from left support of span 2 (Center Span)

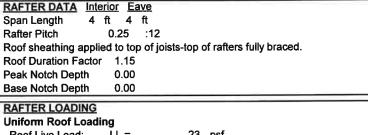
Created by combining all dead loads and live loads on span(s) 3

Controlling Shear: -203 lb

At a distance d from right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Comparisons with required sections:	Reg'd	Provided
Section Modulus:	6.08 in3	31.64 in3
Area (Shear):	1.47 in2	16.88 in2
Moment of Inertia (deflection):	9.55 in4	177.98 in4
Moment:	-528 ft-lb	2747 ft-lb
Shear:	-203 lb	2329 lb



KAPTER LOADING							
Uniform Roof Loadir	ng						
Roof Live Load:	LL =	23	psf				
Roof Dead Load:	DL =	10	psf				
Slope Adjusted Spans And Loads							
Interior Span:	L-adj =	4	ft				
Eave Span:	L-Eave-adj =	4	ft				
Interior Live Load:	wL-adj =	46	plf				
Eave Live Load:	wL-Eave-adj =	46	plf				
Interior Dead Load:	wD-adj =	20	plf				
Eave Dead Load:	wD-Eave-adj =	20	plf				
Interior Total Load:	wT-adj =	66	plf				
Eave Total Load:	wT-Eave-adj =	66	plf				

Location: RR1 - Check

Multi-Loaded Multi-Span Beam

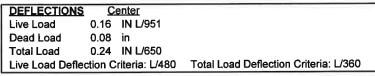
1.5 IN x 11.25 IN x 13.0 FT #2 - Douglas-Fir-Larch - Dry Use Section Adequate By: 21.0% Controlling Factor: Moment





StruCalc Version 10.0.1.6

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REACTIONS	Α		B	
Live Load	597	lb	388	lb
Dead Load	219	lb	219	lb
Total Load	816	lb	607	lb
Bearing Length	0.87	in	0.65	in

BEAM DATA	Center
Span Length	13 ft
Unbraced Length-Top	0 ft
Unbraced Length-Bottom	13 ft
Live Load Duration Factor	1.00
Notch Depth	0.00

MATERIAL PROPERTIES

#2 - Douglas-Fir-Larch

Base	Value:	2	<u>Adju</u>	ısted
Fb =	900	psi	Fb' =	1035 psi
Cd=1.00	CF=1	.00 Cr	=1.15	
Fv =	180	psi	Fv' =	180 psi
Cd=1.00	1			
E =	1600	ksi	E' =	1600 ksi
Fc-⊥=	625	psi	Fc - 上' =	625 psi
	Fb = Cd=1.00 Fv = Cd=1.00 E =	Fb = 900 Cd=1.00 CF=1 Fv = 180 Cd=1.00 E = 1600	Cd=1.00 CF=1.00 Cr Fv = 180 psi Cd=1.00	Fb = 900 psi Fb' = Cd=1.00 CF=1.00 Cr=1.15 Fv = 180 psi Fv' = Cd=1.00 E = 1600 ksi E' =

Controlling Moment: 2255 ft-lb

5.98 Ft from left support of span 2 (Center Span)

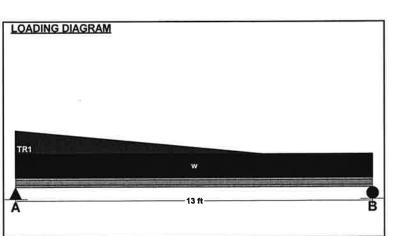
Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 669 lb

At a distance d from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	<u>Req'd</u>	<u>Provided</u>
Section Modulus:	26.15 in3	31.64 in3
Area (Shear):	5.57 in2	16.88 in2
Moment of Inertia (deflection):	98.58 in4	177.98 in4
Moment:	2255 ft-lb	2729 ft-lb
Shear:	669 lb	2025 lb



- MUNICIPAL - MARKET		
UNIFORM LOADS	<u>C</u>	enter
Uniform Live Load	46	plf
Uniform Dead Load	30	plf
Beam Self Weight	4	plf
Total Uniform Load	80	plf

TRAPEZOIDAL LO	ADS - CENTE	R SPAN		
Load Number	<u>One</u>			
Left Live Load	86 plf			
Left Dead Load	0 plf			
Right Live Load	0 plf			
Right Dead Load	0 plf			
Load Start	O ft			
Load End	9 ft			
Load Length	9 ft			

Shingle/Tile 0.25 1.2	1.000 1.988 46 46 1.33 6.5 0 0 0 0 0 0 0	0.665 0.665 0.665 1/180	265 88 1.10 1.00 1.15 4 9.25 1.5 Section OK Shear OK	16d 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4
Ledgers Roofing material = Roof Pitch= Angle=	C _S = Increase for DriftValley= Increase for DriftValley= Effective snow load (psf)= Roof dead load (psf)= Floor live load (psf)= Fastener spacing (ft)= Trib. Area noof= Trib. Area noof= w _S (pif) = w _L (pif) =	wearwein (pri) Point Load: Snow (it Live (lb): Dead (lb) Aft)= Add. uniform load (p Allowable Live Defie Allowable Total Defi	© V _{max} (lb)= M _{max} (ftb)= Size Factor (C _F)= Volume Factor (C _v)= Duration Factor (C _d) = Beam Type (t,t1,tss,g,m,p,ts,rb) d (in)= b (in)=	Fastener Options: Nails: Nails into rim (1.25" min.) = Nails into studs / beam >10D = Lag Botts: 3/8" lag botts into rim (1.25" min.) = 1/2" lag botts into rim (1.25" min.) =

Nails into rim (1.25" min.) =	S	2
Nails Into studs / beam >10D =	4	4
Lag Bolts:		
3/8" lag botts into rim (1.25" min.) =	7	7
1/2" lag boits into rim (1.25" min.) =	-	-
SDWS Screws:		
Through sheathing? (1/2" max.) =	Yes	S
Through 5/8" gypsum? (# of layers) =	0	
Screws into rim (1.125" mln.) =	2	2
	SDWS22400DB	2400DB
Screws into studs =	7	7
	SDWS22500DB	2500DB
Screws into beam / blocking =	N/A	N/A
	2	×

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A A

112 1.2 1.12 1.100 1.1000 2.100 1.0000 49 39 39 115 40 15 111 18.5 116.5 0 0 0 0 0 1.000 1.240 1.720 0 0 0 0 1.240 1.720 1.140 1.240 1.240			0	0 0 0	OII I ADIRI III D	O III SION III B	o line of the line	Similary ine	OIII AGAIIIIO	OIIII SPORTING	201308	
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one (lb)= 61 / 2 62 /	n: Factored (lb)=				10270 10270	14877 14877		15097 15097	2738 2738		1623 1623	
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Maintonin Main	Live (Ib)=				0 0	0 0 0		0 0	207		0 0	
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		100	1.00	1.00	0.95	0.87		0.89	0.98		1.00	
Harding Light Li	_ 	1.15	1,15	1.15	1,15	1.15		1,15	1,15		1,15	
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26.3 62.3 62.3 349.6 625.0 171.5 744.6 114.3 123.4 123.4 123.4 14.7 5 64 39 248 555 139 479 28 54 54 54 50 139 123.4 123.4 123.4 120.0 190000 1900000 1900000 190000 190000 190000 190000 190000 190000 190000 190000 190000 190000 190000 1900		1242	2994	2994	2611	2413		2460	2928		2994	
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Shear OK		207	327.75	327.75	304.75	304.75		304.75	327.75		327.75	
Sher OK Shear OK		3 C	240	76	144	135		144	84		59	
2.00 2.50 0.255 10.50 1.500 0.700 1.300 0.500 0.900		Sheer OK	Shear OK	Shear OK	Shear OK	Shear OK		Shear OK	Shear OK		Shear OK	
1.00 0.550 0.254 0.446 0.413 0.473 0.349 0.367 0.048 0.371 0.267 0.050 0.090 0.050 0.001		Sileal On	NO IBBIID	0.25	40.50	15.00		13.00	2.00		6.25	
0.200 0.530 0.546 0.446 0.473 0.693 1.733 0.667 0.557 0.033 0.376 0.651 0.730 0.811 0.524 0.625 0.081 0.557	Heriection=	2.00	0.50	67.9	0.00	2.00		1300	200		0.25	
0.021 0.284 0.446 0.413 0.473 0.349 0.350 0.040 0.311 0.257 0.033 0.667 0.700 0.811 0.524 0.625 0.081 0.567	/Nection (in)≖	0,200	0.550	0.925	050.1	0.00.1		1,300	0.300		0000	
0.267 0.733 1.233 1.400 2.000 0.933 1.733 0.667 1.200 0.033 0.057 0.067 0.700 0.811 0.524 0.625 0.081 0.567	#(c	0.021	0.284	0.446	0.413	0.473		0.367	0,048		0.000	
0.033 0.376 0.651 0.700 0.811 0.524 0.525 0.081	Jeflection (in)≖	0.267	0.733	1.233	1.400	2,000		1.733	/99'0		0.833	
	표(미)	0.033	0,376	0.651	0.700	0,811		c79'0	180.0		40.10	

Project: 2018-2072 Location: RB09 - Check Multi-Loaded Multi-Span Beam





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(2) 1.75 IN x 11.875 IN x 12.5 FT 1.9E Microllam - iLevel Trus Joist Section Adequate By: 326.4% Controlling Factor: Deflection

CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS		<u>Center</u>	
Live Load	0.05	IN L/2752	
Dead Load	0.04	in	
Total Load	0.10	IN L/1535	
Live Load Defle	ction C	riteria: L/480	Total Load Deflection Criteria: L/360

REACTIONS	Α		<u>B</u>	
Live Load	719	lb	431	Ιb
Dead Load	550	lb	362	lb
Total Load	1269	lb	793	lb
Bearing Length	0.48	in	0.30	in

BEAM DATA	Çe	enter
Span Length	12.5	ft
Unbraced Length-Top	0) ft
Unbraced Length-Bottom	12.5	; ft
Live Load Duration Factor	1.00	0
Notch Depth	0.00	0

MATERIAL PROPERTIES

1.9E Microllam - iLevel Trus Joist

<u>Base</u>	<u>Values</u>	<u>Adj</u>	<u>usted</u>
Fb =	2600 psi	Fb' =	2604 psi
Cd=1.00) CF=1.00		
Fv =	285 psi	Fv' =	285 psi
Cd=1.00)		
E =	1900 ksi	E' =	1900 ksi
Fc-⊥=	750 psi	Fc - 上' =	750 psi
	Fb = Cd=1.00 Fv = Cd=1.00 E =	Cd=1.00 CF=1.00 Fv = 285 psi Cd=1.00 E = 1900 ksi	Fb = 2600 psi Fb' = Cd=1.00 CF=1.00 Fv = 285 psi Fv' = Cd=1.00 E = 1900 ksi E' =

Controlling Moment: 3264 ft-lb 5.5 Ft from left support of span 2 (Center Span)

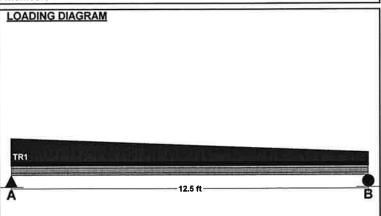
Created by combining all dead loads and live loads on span(s) 2

1032 lb

Controlling Shear:

At a distance d from left support of span 2 (Center Span) Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	<u>Reg'd</u>	Provided
Section Modulus:	15.04 in3	82.26 in3
Area (Shear):	5.43 in2	41.56 in2
Moment of Inertia (deflection):	114.56 in4	488.41 in4
Moment:	3264 ft-lb	17848 ft-lb
Shear:	1032 lb	7897 lb



UNIFORM LOADS	<u>C</u>	<u>enter</u>		
Uniform Live Load	0	plf		
Uniform Dead Load	0	plf		
Beam Self Weight	13	plf		
Total Uniform Load	13	plf		

TRAPEZOIDAL L	OADS - CEN	TER SPAN
Load Number	One	
Left Live Load	161 plf	
Left Dead Load	105 plf	
Right Live Load	23 plf	
Right Dead Load	15 plf	
Load Start	0 ft	
Load End	12.5 ft	
Load Length	12.5 ft	

Location: RB10

Multi-Loaded Multi-Span Beam





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(2) 1.75 IN x 11.25 IN x 17.0 FT 1.9E Microllam - iLevel Trus Joist Section Adequate By: 89.8% Controlling Factor: Deflection

CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

DEFLECTIONS	<u>C</u> e	nte	1		
Live Load	0.34	IN I	J 594		
Dead Load	0.25	in			
Total Load	0.60	IN I	_/342		
Live Load Defle	ction Cr	iteri	a: L/24	0	Total Load Deflection Criteria: L/180
REACTIONS	Α		В		
Live Load	1632	lb	816	lb	
Dead Load	1170	lb	637	lb	
Total Load	2802	lb	1453	lb	
Bearing Length	1.07	in	0.55	in	

BEAM DATA	<u>Center</u>	
Span Length	17 ft	
Unbraced Length-Top	O ft	
Unbraced Length-Bottom	17 ft	
Live Load Duration Factor	1.15	
Notch Depth	0.00	

MATERIAL PROPERTIES

1.9E Microllam - iLevel Trus Joist

	Base	Values	<u>Adj</u>	<u>usted</u>
Bending Stress:	Fb =	2600 psi	Fb' =	3016 psi
	Cd=1.1	5 CF=1.01		
Shear Stress:	Fv =	285 psi	Fv' =	328 psi
	Cd=1.1	5		
Modulus of Elasticity:	E =	1900 ksi	E' =	1900 ksi
Comp. [⊥] to Grain:	Fc-⊥=	750 psi	Fc - 上 =	750 psi

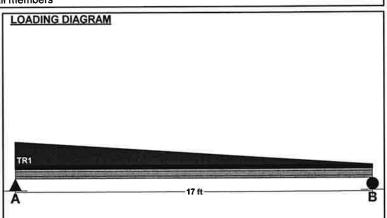
Controlling Moment: 9258 ft-lb 7.31 Ft from left support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2

Controlling Shear: 2397 lb

At a distance d from left support of span 2 (Center Span)
Created by combining all dead loads and live loads on span(s) 2

Comparisons with required sections:	Rega	Provided
Section Modulus:	36.83 in3	73.83 in3
Area (Shear):	10.97 in2	39.38 in2
Moment of Inertia (deflection):	218.76 in4	415.28 in4
Moment:	9258 ft-lb	18558 ft-lb
Shear:	2397 lb	8603 lb



UNIFORM LOADS	- C	enter
Uniform Live Load	0	plf
Uniform Dead Load	0	plf
Beam Self Weight	12	plf
Total Uniform Load	12	plf

TRAPEZOIDAL LO	DADS - CENT	ER SPAN
Load Number	One	
Left Live Load	288 plf	
Left Dead Load	188 plf	
Right Live Load	0 plf	
Right Dead Load	0 plf	
Load Start	0 ft	
Load End	17 ft	
Load Length	17 ft	

Location: RB11

Multi-Loaded Multi-Span Beam

A992-50 W10x49 x 29.0 FT (17 + 12) Section Adequate By: 18.2% Controlling Factor: Deflection

Live Load Deflection Criteria: L/480

Total Load Deflection Criteria: L/360

Fy =

__

50 ksi

REACTIONS	Α	В
Live Load	196 lb	4892 lt
Dead Load	431 lb	4175 lt
Total Load	627 lb	9067 lb
Bearing Length	1.06 in	1.06 ir

BEAM DATA	C€	nter	R	ight
BEAM DATA Span Length	17	ft	12	ft
Unbraced Length-Top	0	ft	0	ft
Unbraced Length-Bottom	17	ft	12	ft

STEEL PROPERTIES

Madulus of Clasticity

W10x49 - A992-50

Properties: Yield Stress:

	Modulus of Elasticity:	E =	29000	KSI
	Depth:	d =	10	in
	Web Thickness:	tw =	0.34	in
	Flange Width:	bf =	10	in
	Flange Thickness:	tf =	0.56	in
	Distance to Web Toe of Fillet:	k =	1.06	in
	Moment of Inertia About X-X Axis:	lx =	272	in4
	Section Modulus About X-X Axis:	Sx =	54.6	in3
	Plastic Section Modulus About X-X Axis:	Zx =	60.4	in3
C	Design Properties per AISC 14th Edition Stee	l Manual:		
	Flange Buckling Ratio:	FBR =	8.93	
	Allowable Flange Buckling Ratio:	AFBR =	9.15	
	Web Buckling Ratio:	WBR =	23.18	
	Allowable Web Buckling Ratio:	AWBR =	90.55	
	Controlling Unbraced Length:	Lb =	17	ft
	Limiting Unbraced Length -			
	for lateral-torsional buckling:	Lp =	8.97	ft
	for Eqn. F2-2:	Lr =	31.63	ft
	Nominal Flexural Strength w/ safety factor:	Mn =	131094	ft-lb
	Controlling Equation:	F2-2		
	Web height to thickness ratio:	h/tw =	23.18	
	Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	

Controlling Moment: -34860 ft-lb

Over right support of span 2 (Center Span)

Nominal Shear Strength w/ safety factor:

Controlling Equation:

Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear:

Cv Factor:

-4728 lb

Cv =

G2-2

Vn =

68000 lb

At right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s

 Comparisons with required sections:
 Req'd
 Provided

 Moment of Inertia (deflection):
 230.13 in4
 272 in4

 Moment:
 -34860 ft-lb
 131094 ft-lb

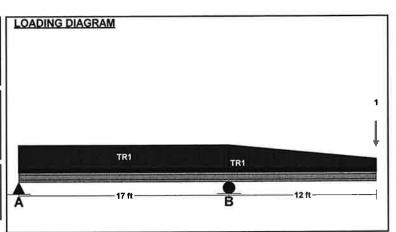
 Shear:
 -4728 lb
 68000 lb



page

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UNIFORM LOADS	Ç	enter	i a	Right
Uniform Live Load	0	plf	0	plf
Uniform Dead Load	0	plf	0	plf
Beam Self Weight	49	plf	49	plf
Total Uniform Load	49	plf	49	plf

Total Ciliania Boda 10 pm 10 pm
POINT LOADS - RIGHT SPAN
Load Number One *
Live Load 1247 lb
Dead Load 680 lb
Location 12 ft
* Load obtained from Load Tracker. See Summary Report for details.

TRAPEZOIDAL LO	ADS - CEN	TER SPAN
Load Number	One	
Left Live Load	161 plf	
Left Dead Load	105 plf	
Right Live Load	161 pif	
Right Dead Load	105 plf	
Load Start	O ft	
Load End	17 ft	
Load Length	17 ft	
RIGHT SPAN		
Load Number	<u>One</u>	
Left Live Load	161 plf	
Left Dead Load	105 plf	
Right Live Load	23 plf	
Right Dead Load	15 plf	
Load Start	O ft	
Load End	12 ft	
Load Length	12 ft	

Location: RB12

Multi-Loaded Multi-Span Beam





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(3) 1.75 IN x 11.875 IN x 21.0 FT (8.5 + 12.5)

1.9E Microllam - iLevel Trus Joist Section Adequate By: 84.6% Controlling Factor: Deflection

CAUTIONS

* Laminations are to be fully connected to provide uniform transfer of loads to all members

1	DEFLECTIONS	<u> </u>	Left	<u>C</u>	<u>Center</u>
١	DEFLECTIONS Live Load	0.39	IN 2L/528	-0.07	IN L/2073
			in	-0.03	
ı	Total Load	0.61	IN 2L/332	-0.10	IN L/1533
	Live Load Defle	ction C	riteria: L/240) Tota	al Load Deflection Criteria: L/180

REACTIONS	A		<u>B</u>		
Live Load	2553	lb	431	lb	
Dead Load	2008	lb	43	lb	
Total Load	4561	lb	474	lb	
Uplift (1.5 F.S)	0	lb	-436	lb	
Bearing Length	1.16	in	0.12	in	

BEAM DATA	Ţ	.eft	<u>C</u> e	nter	
Span Length	8.5	ft	12.5	ft	
Unbraced Length-Top	0	ft	0	ft	
Unbraced Length-Bottom	8.5	ft	12.5	ft	
Live Load Duration Factor	1.1	5			
Notch Depth	0.0	0			

MATERIAL PROPERTIES

1.9E Microllam - iLevel Trus Joist

	Base	e Values	<u>Adjusted</u>		
Bending Stress:	Fb =	2600 psi	Fb' =	2930 psi	
	Cd=1 1	5 CI=0 98 CI	=1 00		

Shear Stress: Fv = 285 psi Fv' = 328 psi

Cd=1.15

Modulus of Elasticity: E = 1900 ksi E' = 1900 ksi Comp. $^{\perp}$ to Grain: Fc $^{\perp}$ = 750 psi Fc $^{\perp}$ = 750 psi

Controlling Moment: -10313 ft-lb Over left support of span 2 (Center Span)

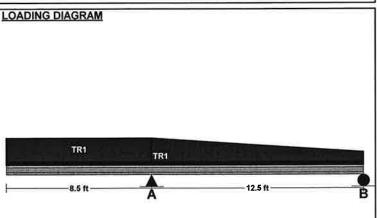
Created by combining all dead loads and live loads on span(s) 1, 2

Controlling Shear: -2160 lb

At a distance d from the right support of span 1 (Left Span)

Created by combining all dead loads and live loads on span(s) 1, 2

Comparisons with required sections:	Reg'd	<u>Provided</u>
Section Modulus:	42.24 in3	123.39 in3
Area (Shear):	9.88 in2	62.34 in2
Moment of Inertia (deflection):	396.8 in4	732.62 in4
Moment:	-10313 ft-lb	30127 ft-lb
Shear:	-2160 lb	13622 lb



UNIFORM LOADS		Left	<u>C</u>	enter		
Uniform Live Load	0	plf	0	plf		
Uniform Dead Load	0	plf	0	plf		
Beam Self Weight	19	plf	19	plf		
Total Uniform Load	19	plf	19	plf		

135			
1	TRAPEZOIDAL LO	ADS - LEF	T SPAN
	Load Number	<u>One</u>	
	Left Live Load	161 plf	
1	Left Dead Load	105 plf	
	Right Live Load	161 plf	
	Right Dead Load	105 plf	
	Load Start	0 ft	
	Load End	8.5 ft	
	Load Length	8.5 ft	
	CENTER SPAN		
	Load Number	<u>One</u>	
	Left Live Load	161 plf	
	Left Dead Load	105 plf	
	Right Live Load	23 plf	
ì	Right Dead Load	15 plf	
	Load Start	0 ft	
	Load End	12.5 ft	
	Load Length	12.5 ft	

Location: RB13

Multi-Loaded Multi-Span Beam

A992-50 W10x49 x 29.0 FT (17 + 12) Section Adequate By: 109.6% Controlling Factor: Deflection



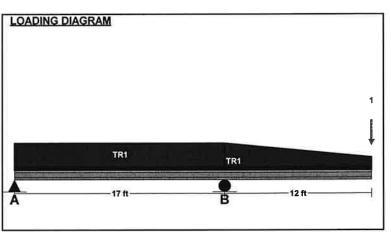
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DEFLECTIONS	Center			Right
Live Load	-0.08	IN L/2520	0.49	IN 2L/590
Dead Load	-0.03	in	0.28	in
Total Load	-0.11	IN L/1919	0.76	IN 2L/378
Live Load Deflec	ction Cr	iteria: L/240	Tota	al Load Deflection Criteria: L/180

REACTIONS	Α		<u>B</u>	
Live Load	1369	lb	4892	lb
Dead Load	431	lb	4175	lb
Total Load	1800	lb	9067	lb
Uplift (1.5 F.S)	-885	lb	0	lb
Bearing Length	1.06	in	1.06	in

BEAM DATA	Ce	nter	Ri	ght
Span Length	17	ft	12	ft
Unbraced Length-Top	0	ft	0	ft
Unbraced Length-Bottom	17	ft	12	ft



UNIFORM LOADS	<u></u>	<u>Center</u>		Right
Uniform Live Load	0	plf	0	plf
Uniform Dead Load	0	plf	0	plf
Beam Self Weight	49	plf	49	plf
Total Uniform Load	49	plf	49	plf

STEEL PROPERTIES W10x49 - A992-50

Properties:

	roperties.			
	Yield Stress:	Fy=	50	ksi
	Modulus of Elasticity:	E =	29000	ksi
	Depth:	d =	10	in
	Web Thickness:	tw =	0.34	in
	Flange Width:	bf =	10	in
	Flange Thickness:	tf =	0.56	in
	Distance to Web Toe of Fillet:	k =	1.06	in
	Moment of Inertia About X-X Axis:	lx =	272	in4
	Section Modulus About X-X Axis:	Sx =	54.6	in3
	Plastic Section Modulus About X-X Axis:	Zx =	60.4	in3
0	Design Properties per AISC 14th Edition Stee	l Manual:		
	Flange Buckling Ratio:	FBR =	8.93	
	Allowable Flange Buckling Ratio:	AFBR =	9.15	
	Web Buckling Ratio:	WBR =	23.18	
	Allowable Web Buckling Ratio:	AWBR =	90.55	
	Controlling Unbraced Length:	Lb =	17	ft
	Limiting Unbraced Length -			
	for lateral-torsional buckling:	Lp =	8.97	ft
	for Eqn. F2-2:	Lr=	31.63	ft
	Nominal Flexural Strength w/ safety factor:	Mn =	131094	ft-lb
	Controlling Equation:	F2-2		
	Web height to thickness ratio:	h/tw =	23.18	
	Limiting height to thickness ratio for eqn. G2-2:	h/tw-limit =	53.95	
	Cv Factor:	Cv =	1	
	Controlling Equation:	G2-2		
	Nominal Shear Strength w/ safety factor:	Vn =	68000	lb

Total Uniform Load 49 plf 49	plf
POINT LOADS - RIGHT SPAN	
Load Number One *	
Live Load 1247 lb	
Dead Load 680 lb	
Location 12 ft	
* Load obtained from Load Tracker. S	See Summary Report for details.

TRAPEZOIDAL LO	DADS - CEN	TER SPAN
Load Number	One	
Left Live Load	161 plf	
Left Dead Load	105 plf	
Right Live Load	161 plf	
Right Dead Load	105 plf	
Load Start	O ft	
Load End	17 ft	
Load Length	17 ft	
RIGHT SPAN		
Load Number	<u>One</u>	
Left Live Load	161 plf	
Left Dead Load	105 plf	
Right Live Load	23 plf	
Right Dead Load	15 plf	
Load Start	O ft	
Load End	12 ft	
Load Length	12 ft	

Controlling Moment: -34860 ft-lb

Over right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear: -4728 lb

At right support of span 2 (Center Span)

Created by combining all dead loads and live loads on span(s

Comparisons with required sections: Reg'd **Provided** Moment of Inertia (deflection): 129.79 in4 272 in4 Moment: -34860 ft-lb 131094 ft-lb -4728 lb 68000 lb Shear:

Shear Walls		ı	ļ	ŀ			V		>	ď	144						i			
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Simpson Strong Wall No anchor bolts	panel 4 panel 5						SW1 360 plf		SW3	SW4 895 pff	SW1 260 plf	SW2 350 plf	SW3 490 plf	SW4 640 plf						
	panel 7 panel 8 panel 9						0	Total R	Total Resistance, mid	0		Total Resistance	stance _{sess}	0						
	panel 10 ASW _{1,2} = 0	-	₽	Total= 0.00	8		7	Seet	See the attached Simpson Strong Wall calculations	ed Sim	oson Sti	rong Wa	ıll calcul	lations		_				
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	Total Length = Height =		>	Vwind Vee	.2	upliff		erforated	Perforated Shearwall 2:		NOT USED	<i>t</i> = <i>t</i> =	0	Perfo	Perforated Shearwall 3:	rwall 3:	NOT USED) = 1	l u	
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	segment 3	_					segment 1					_	୕ଊ	segment 1						
	segment 4	-					segment 2	2 5					vs vš	segment 2 segment 3						
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Simpson Strong Wall	panel 4	_						>"	٠., -	-	<= Parapet Load									
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SIMPSON STRONG-TIE COMPANY INC.

(800) 999-5099

5956 W. Las Positas Blvd., Pleasanton, CA 94588.

www.strongtie.com



Job Name: 2020-2072
Wall Name: Gridlines 10
Application: Garage Front

Design Criteria:

- * 2018 International Bldg Code
- * Seismic R=6.5
- * 2500 psi concrete
- * ASD Design Shear = 965 lbs
- * Shearwall Height = 12' to underside of top plates

Selected Strong-Wall® Panel Solution:

Model	Туре	W (in)	H (in)	T (in)	Sill Anchor	End Anchor Bolts	Total Axial Load (lbs)	Actual Uplift (lbs)
WSW12x12	Wood	12	141.25	3.5	N/A	2 - 7/8"	4500	6206 lb
WSW12x12	Wood	12	141.25	3.5	N/A	2 - 7/8"	4500	6206 lb

Actual Shear & Drift Distribution:

Model	RR Relative Rigidity	Actual Shear (lbs)		Allowable Shear (lbs)	Actual / Allow Shear	Actual Drift (in)	Drift Limit (in)
WSW12x12	0.50	483	≤	485 OK	0.99	0.62	0.63
WSW12x12	0.50	483	\leq	485 OK	0.99	0.62	0.63

Notes:

- Strong-Wall Wood Shearwalls have been evaluated to the 2018 IBC/IRC.
 See www.strongtie.com for additional design and installation information.
- 2. Anchor templates are recommended for proper anchor bolt placement, and are required in some jurisdictions.
- 3. Check that wall height "H" plus curb height (above slab) will attain overall rough header opening height (top of driveway slab to bottom of header).
- 4. The applied vertical load shall be a concentric point load or a uniformly distributed load not exceeding the allowable vertical load. Alternatively, the load may be applied anywhere along the width of the panel if imposed by a continuous bearing vertical load transfer element such as a rimboard or beam.
 For eccentric axial loads applied directly to the panel, the allowable vertical load shall be divided by two.
- 5. Panels may be trimmed to a minimum height of 74 1/2".
- 6. 2 ply headers may be used with Strong-Wall Wood Shearwalls. Minimum 9 1/4 inch deep nominal header is required with header design by others.

Disclaimer:

It is the Designer's responsibility to verify product suitability under applicable building codes. In order to verify code listed applications please refer to the appropriate product code reports at www.strongtie.com or contact Simpson Strong-Tie Company Inc. at 1-800-999-5099.

SIMPSON STRONG-TIE COMPANY INC.

(800) 999-5099

5956 W. Las Positas Blvd., Pleasanton, CA 94588.

www.strongtie.com



Job Name: 2020-2072
Wall Name: Gridlines 9
Application: Garage Front

Design Criteria:

- * 2018 International Bldg Code
- * Seismic R=6.5
- * 2500 psi concrete
- * ASD Design Shear = 1949 lbs
- * Shearwall Height = 12' to underside of top plates

Selected Strong-Wall® Panel Solution:

Model	Туре	W (in)	H (in)	T (in)	Sill Anchor	End Anchor Bolts	Total Axial Load (lbs)	Actual Uplift (lbs)
WSW18x12	Wood	18	141.25	3.5	N/A	2 - 7/8"	4600	7574 lb
WSW18x12	Wood	18	141.25	3.5	N/A	2 - 7/8"	4600	7574 lb

Actual Shear & Drift Distribution:

Model	RR Relative Rigidity	Actual Shear (lbs)		Allowable Shear (lbs)	Actual / Allow Shear	Actual Drift (in)	Drift Limit (in)
WSW18x12	0.50	974	≤	1340 OK	0.73	0.42	0.63
WSW18x12	0.50	974	≤	1340 OK	0.73	0.42	0.63

Notes:

- 1. Strong-Wall Wood Shearwalls have been evaluated to the 2018 IBC/IRC. See www.strongtie.com for additional design and installation information.
- 2. Anchor templates are recommended for proper anchor bolt placement, and are required in some jurisdictions.
- Check that wall height "H" plus curb height (above slab) will attain overall rough header opening height (top of driveway slab to bottom of header).
- 4. The applied vertical load shall be a concentric point load or a uniformly distributed load not exceeding the allowable vertical load. Alternatively, the load may be applied anywhere along the width of the panel if imposed by a continuous bearing vertical load transfer element such as a rimboard or beam.
 For eccentric axial loads applied directly to the panel, the allowable vertical load shall be divided by two.
- 5. Panels may be trimmed to a minimum height of 74 1/2".
- 6. 2 ply headers may be used with Strong-Wall Wood Shearwalls. Minimum 9 1/4 inch deep nominal header is required with header design by others.

Disclaimer:

It is the Designer's responsibility to verify product suitability under applicable building codes. In order to verify code listed applications please refer to the appropriate product code reports at www.strongtie.com or contact Simpson Strong-Tie Company Inc. at 1-800-999-5099.

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	اء	end A	s >	₹	'n	<u>.</u>	٥	<u>~</u>	×		>	fiaphragm	- 1	1
	L= 13	0	574	876	8270	1.000	1.300	6.5	1061	962	574			Wind
	p = 78	TAwall-end TAwall-int	V _{s min}					>"	Vadditional =		965	12 170	o OK	Seismic
	brollector= 78	42 0	574									Deflection	uo	¥ 1
	0 = 18	Vadditional =						= Z	141 lb	مِ		ð		ì
	O _{Perf.} = 18							= ,Z	248 lb	۾				
	Diaphragm	Diaphragm Chord Force		Diag	Diaphragm Collector Force	llector For	S S			Top Plate Splice	e Splice		П	
	M = 3136.7 ft-lb	ft-tb			<u>-</u>	223 lb	۵	"Z	0.9	nails				
	T = 40 lb	q			T _{Perf.} =	Q 0		nse	· ∞	16d nails	s betwe	16d nails between splice points	ints	
	Use (4) 16d common toenail	mmon toenails a	at full vthing	height w/8d	s at full height truss blocking leathing w/ 8d nails @ 6" o.c. edge, 12" o.c. field (Unblocked)	ocking 5" o.c. e	dge, 12	" o.c. fi	eld (Un	block	(pg		ii:	
		Wind					Seismic	nic				Diaphragm	mg	1
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Simpson Strong Wall	0= 26	Vadditional =	1620	ŝ				= Z	141 lb	Q		Ş		
	O _{Perf.} = 26							Z.=	248 lb	q			[
	Diaphragm	Diaphragm Chord Force		Dia	Diaphragm Collector Force	llector Fo	rce			Top Plate Splice	e Splice			
	M = 7928 ft-lb	ft-lb			" ⊢	813 lb	q	II Z	3.3	nails				
	T= 102 lb	Q			T _{Perf.} =		0 fb	Use	8	16d nail:	s betwe	16d nails between splice points	ints	
	Use (4) 16d common toenail Use 7/16" APA rated OSB sh	mmon toenails	at full athing	height w/8d	s at full height truss blocking neathing w/ 8d nails @ 6" o.c. edge, 12" o.c. field (Unblocked)	ocking 6" o.c. e	dge, 12	" o.c. fi	ield (Ur	ıblock	(pe		6	
		Wind					Seismic	nic				Diaphragm	gm	ì
	Length	TAgoof-and TAgoof-int	>	ď	w	ш	d	œ	ц×	Vinat	^	Vdiaphragm Val	Vallow Check	
	L= 24	0	1537	2822	28185	1.000	1.000	6.5	3615	2530	7140	162 238		Wind
	b= 44	TAwall-end TAwall-int	V _{s min}					>	Vadditional =		2530	58 17	170 OK	Seismic
	b _{Collector} = 44	0 170	7140									Deflection	lon	
		Vadditional	5508	8				= Z	141 lb	ي م		ð		
	O = C								♀	Ton Diate Calice	- California			
	Diaphragm	Diaphragm Chord Force		E C	Diaphragm collector Force	JIECTOL FO			1	do l	olido a		Τ	
	42	ft-lb :			 - -		<u>۔</u> ي و	= <u>-</u>	හ ග	nails	1			
	T = 974 lb	-			Part II		<u>∩</u>	OSe	×	Ted nall	S Detwe	Ted nails between spilce points		

Horiz. Diaphragm	:	Wind					Seismic	G				Diaphragm	_	1
	Length TA _F	TARoof-end TARoof-int.	>	Ą	Wi	ц	Ь	2	ı.×	V _{final} V		Vdiaphragm Vallow	Check	1
Gridline 6	L= 54.5		3281	5016	47560	1.000	1.000	6.5	6609	4270 1	13205 220	238	ð	Wind
Rear Dining	b = 60 TA _w	TAwall-end TAwall-int	V _{s min}					V _{ad}	Vadditional =	V	4270 71	170	ð	Seismic
	b _{Collector} = 60	0 363	13205				,					Deflection	١	
Structural Sheathing	0 = 0	Vadditional =	9720					= Z	141 lb			ş		
	O _{Perf.} = 0		ĺ					z, =	248 lb				Ī	
Roof	Diaphragm Chord Force	ord Force		Diaphı	Diaphragm Collector Force	ector For	e,		Ţ	Top Plate Splice	Splice			
(Unblocked)	M = 179915 ft-lb				= ⊢	qı o		II Z	12.1 na	nails				
Load Case 3	T = 2999 lb				T _{Perf.} ≖	Q		Use	13 10	d nails	s ueeween s	16d nails between splice points	t)	
	Use (4) 16d common toenails at full height truss blocking Use 7/16" APA rated OSB sheathing w/ 8d nails @ 6" o.c.	mon toenails a	at full h athing v	eight tr v/ 8d na	s at full height truss blocking eathing w/ 8d nails @ 6" o.c. edge, 12" o.c. field (Unblocked)	cking o.c. ed	ge, 12"	o.c. fie	id (Unk	olocke	_		ľ	
		Wind	-				Seismic	v		· ·		Diaphragm	£	Í
	Length TA	TARoof-end TARoof-int	>"	₹	w	L	۵	œ	ι×	Vfinal		Vdiaphragm Vallow	Check	
Gridline 2	1		2764	3024	29280	1.000	1.000	6.5	3755	2629	9298 295		ş	Wind
Rear Kitchen	b = 31.5 TA	TAwall-end TAwall-int	Vs min					V _{ad}	Vadditional =		2629 83	230	ě	Seismic
Pá	b _{Collector} = 31.5	117 129	9538									Deflection	_	1 1
Structural Sheathing	0 = 0	Vadditional =	6534					= Z	141 lb			ð		
26	O _{Perf.} = 0							Z .=	248 lb				ı	
of 3	Diaphragm Chord Force	ord Force		Diaph	Diaphragm Collector Force	ector For	90		Ţ	Top Plate Splice	Splice			
(Unblocked)	M = 126684 ft-lb	۵			-	q 0		" Z	16.2 n	nails				
Load Case 1	T = 4022 lb				T _{Perf.} =	이 0		Use	17 1	3d nails	between s	16d nails between splice points	क्ष	
	Use (4) 16d common toenail	mon toenails	at full h	eight tr // 8d na	ls at full height truss blocking peathing w/ 8d nails @ 6" o c. edge 12" o c. field (Unblocked)	cking 'oceed	ne 12"	o c	ld (the	Jocke	=			
			a de la companya de l				. ()				•			
		Wind					Seismic	ပ				Diaphragm	ı.	
	Length TA	TARoof-end TARoof-int.	٧s	Ą	Wį	Ŧ	д	æ	т×	Vfinal	, V _{diag}	Vdiaphragm Vallow	Check	1
Gridline B	L= 13.5		888	069	8835	1.000	1.300	6.5	1133	1031	1968 74	322	ò	Wind
Left Dining	b = 26.5 TA	TAwall-and TAwall-int	V _{s min}					>	Vedditional =	Ì	1031 39	230	Q	Seismic
	b _{Collector} = 26.5	0 9	1968				1					Deflection	_	
Structural Sheathing		Vadditional =	1080					= Z	141 lb			š		
	O _{Perf.} = 18.5							17	240 ID	1			ſ	

Use (4) 16d common toenails at full height truss blocking Use 7/16" APA rated OSB sheathing w/ 8d nails @ 6" o.c. edge, 12" o.c. field (Unblocked)

8 16d nails between splice points

⊩ N Nse

1374 lb 0 lb

Top Plate Splice 5.5 nails

Diaphragm Collector Force

Diaphragm Chord Force
M = 6640.9 ft-lb

(Unblocked) Load Case 1

Roof

Use (4) 10d commission to the commission of the control of the con

Horiz. Diaphragm		Wi	Wind	-				Seismic	ပ				Diap	Diaphragm		
	Length	Length TAgoofend TAgoofin	oof-int.	, ,	Ą	w	ш	ф	æ	F×	V _{final}	>	Vdiaphragm Vallow Check	Vallow	Check	
Gridline H	L= 14	0	-	888	476	6450	1.000	1.300	6.5	827	753	1968	80	238	Š	Wind
Right Dining	b = 24.5	b = 24.5 TAwatt-end TAwatt-int		Vs min					>	Vadditional =		753	31	170	š	Seismic
	b _{Collector} = 24.5	65		1968									Def	Deflection		
Structural Sheathing	0 = 12.5	Vadditional		1080					= Z	141 lb	_			o K		6
•	O _{perf} = 12.5			[(,					= ,Z	248 lb					74	
Roof	Diaphrag	Diaphragm Chord Force			Diaphi	ragm Col	Diaphragm Collector Force	95		Ė	Top Plate Splice	Splice				
(Unblocked)	M = 6886.9 ft-lb	:9 ft-lb				Ξ_	1004 lb	_	II Z	14.9 nails	ails					
Load Case 3	T = 281 lb	81 lb				T _{Perf.} =	3688 lb	_	Use	Use 15 16d nails between splice points	6d nails	betwee	en splice	points		

Use (4) 16d common toenails at full height truss blocking Use 7/16" APA rated OSB sheathing w/ 8d nails @ 6" o.c. edge, 12" o.c. field (Unblocked)

STUD WALL CALCU	I ATION I	Dining			
Wall Location =	Exterior	Jiiiiig	Loadings		
Species =	DF-L #2		Roofing Material =	Shingle/Tile	
Stud Width =	1.5 i	in	Roof Pitch =	0.25	
*	5.5 i		Angle =	1.2	
Stud Depth (d _x) =	14 f		C _s =	1.000	
L =	1.33 f		Increase for Drift=	1.000	
stud spacing =			Effective snow load =	23 p	ef
F _b =	900 p	_	Roof dead load =	15 p	_
F _c =	1350 p		Floor live load =	40 p	_
F _o ⊥ =	625 p		Floor fload =	· · · · · · · · · · · · · · · · · · ·	_
E =	1600000 p			15 p	
E _{min} =	580000 p		Trib. Area _{roof} =	14 ft	
C _F =		for bending	Trib. Area _{floor} =	0 fi	_
C _F =		for comp. II to grain	Add. Uniform Load =	140 p	VII
A =	8.25 i		Leteral Lood =	14.43 p	of
S =	7.56 i		Lateral Load =	14.43 p	151
I =	20.80 i	in⁴			.
Dead Loads:			Use: 2x6 DF-L #2	Z Grade @ 1	6" O.C.
Roof DL =	210	plf			
Floor DL =	0	plf	Deflection:		
w _{DL} =	350	plf	Allowable Deflection =	L/360	
Live Loads:			Allowable Deflection =	0.45 ii	
Roof LL =	323.4	plf	Deflection =	0.26 ii	n
Floor LL =	0 1	plf	Check =	OK	
W _{LL} =	323.40				
Load Case 1: Gravity Loa	ds Only		Load Case 2: Gravity	Loads + Latera	l Loads
Load Combinations:			C _D =	1.6	
D =	466 (lbs	$C_r =$	1.35	
D+L =	466	lbs	w =	19.2 p	olf
D+S =	896	lbs	M =	5345.7 i	n.lb
D+0.75(L)+0.75(S) =	788	lbs	$f_b =$	706.9 p	si
$C_D(D) =$	0.9		F' _b =	1944.00 p	osi
C _D (D+L) =	1		Check =	OK	
C _D (D+S) =	1.15		Axial:		
$C_D(D+0.75(L)+0.75(S)) =$	1.15		$(l_e/d_x) =$	29.7 i	n
$f_c = f_{c\perp} =$	108.6	psi	E' _{min} =	580000 p	osi
$(I_e/d)_x =$	29.7	in	C =	0.8	
E'min =	580000	psi	F _{cE} =	539.5 p	osi
C =	0.8	•	F*_=	2160 բ	osi
F _{cF} =	539.5		F _{cE} /F [*] _c =	0.250	
F°c=	1553	psi	(1+F _{cE} /F [*] c)/2c =	0.781	
F _{cE} /F c =	0.348		C _p =	0.235	
(1+F _{cE} /F [*] _c)/2c =	0.842	F	F' _c =	508.2 p	osi
$C_p =$	0.318			75(L)+0.75(S)	D+W
ο _ρ – F' _c =	493.5		f _c =	95.5	56.4 psi
Check =	-35.5 OK	nsi	Check =	ок	ОК
Bearing of stud on wall p		F	Combined Stress:		
C _b =	1.25		F _{cEx} =	539.5	539.5 psi
C _b - F' _c ⊥ =	781		Interaction Formula =		0.42
Check =	OK	nsi	Check =	ок	ОК
CHECK -	ŲΛ	p31	Jiloux		•

STUD WALL CALCUL		Kitchen					
Wall Location =	Exterior		<u>Loadings</u>	***			
Species =	DF-L #2		Roofing Material =	Shingle/Tile			
Stud Width =	1.5		Roof Pitch =	0.25			
Stud Depth (d _x) =	5.5		Angle =	1.2			
L=	12		C _s =	1.000			
stud spacing =	1.33	ft	Increase for Drift=	1.453			
F _b =	900	psi	Effective snow load =	34	psf		
F _c =	1350	psi	Roof dead load =		psf		
F _c ⊥ =	625	psi	Floor live load =	40	psf		
E=	1600000	psi	Floor dead load =	15	psf		
E _{min} =	580000	psi	Trib. Area _{roof} =	20.5	ft		
C _F =	1.00	for bending	Trib. Area floor=	0	ft		
C _F =	1.00	for comp. II to grain	Add. Uniform Load =	140	plf		
A =	8.25	in ²					
S =	7.56	in ³	Lateral Load =	14.43	psf		
I =	20.80	in ⁴					
Dead Loads:			Use: 2x6 DF-L #	2 Grade @ <i>'</i>	16" o.c		
Roof DL =	307.5	plf					
Floor DL =	0	plf	Deflection:				
w _{DL} =	447.5	plf	Allowable Deflection =	L/360			
Live Loads:			Allowable Deflection =	0.39	in		
Roof LL =	688.2	plf	Deflection =	0.14	in		
Floor LL =	0	plf	Check =	OK			
W _{LL} =	688.17						
Load Case 1: Gravity Load	ls Only		Load Case 2: Gravity	Loads + Later	al Loads	•	
Load Combinations:			C _D =	1.6			
D =	595	lbs	C _r =	1.35			
D+L =	595	lbs	w =	19.2	plf		
D+S =	1510	lbs	M =	3891.5	in.lb		
D+0.75(L)+0.75(S) =	1282	lbs	f _b =	514.6	psi		
$C_D(D) =$	0.9		F' _b =	1944.00	psi		
$C_D(D+L) =$	1		Check =	OK			
$C_D(D+S) =$	1.15		Axial:				
$C_D(D+0.75(L)+0.75(S)) =$	1.15		$(l_e/d_x) =$	25.4	in		
$f_c = f_{c\perp} =$	183.1	psi	E' _{min} =	580000	psi		
(l _e /d) _x =	25.4	in	c =	0.8			
E'min =	580000	psi	F _{cE} =	741.1	psi		
c =	0.8	•	F c =	2160	psi		
F _{cE} =	741.1		F _{cE} /F* _c =	0.343			
F. =	1553	psi	(1+F _{cE} /F [*] _c)/2c =	0.839			
F _{cF} /F [*] _c =	0.477	•	C _p =	0.314			
(1+F _{cE} /F [*] _c)/2c =	0.923	•	F' _c =	678.9	psi		
C ₀ =	0.418			.75(L)+0.75(S)	·	D+W	
О _р F' _c =	648.2		f _c =	155.3		72.1	osi
Check =	OK	psi	Check =	ок		ок	
····	3	F		2		-	

Bearing of stud on wall plates:

1.25 781

OK psi

 $C_b = F'_{c\perp} = Check =$

Combined Stress:

Check =

F_{cEx} = Interaction Formula = 741.1 psi 0.30

OK

0.30

STUD WALL CALCU	II ATION CO	rridor			
Wall Location =	Interior	indoi	Loadings		
	DF-L #2		Roofing Material =	Shingle/Tile	
Species = Stud Width =	1,5 in		Roof Pitch =	0.25	
	5.5 in		Angle =	1.2	
Stud Depth (d _x) =	14 ft		C _s =	1.000	
L =	1.33 ft		Increase for Drift=	1.213	
stud spacing =	900 psi	ì	Effective snow load =	28	nef
F _b =			Roof dead load =	15	_
F _c =	1350 psi		Floor live load =	40	
F _o _ =	625 psi 1600000 psi		Floor dead load =	15	
E =	•		Trib. Area more	29	•'
E _{min} =	580000 psi			0	
C _F =		bending	Trib. Area _{floor} = Add. Uniform Load =	140	
C _F =		comp. Il to grain	Add. Official Load -	140	ρii
A =	8.25 in ²		Lateral Load =	5.00	nef
S = .	7.56 in ³		Lateral Load -	3.00	poi
=	20.80 in⁴		Harris Out DE Life	2 Cd- @ 6	16"
Dead Loads:			Use: 2x6 DF-L #	2 Grade @	6 O.C.
Roof DL =	435 plf				
Floor DL =	0 plf		Deflection:		
w _{DL} =	575 plf		Allowable Deflection =		
Live Loads:			Allowable Deflection =		
Roof LL =	812.3 plf		Deflection =	0.11	in
Floor LL =	0 plf		Check =	OK	
W _{LL} =	812.33				
Load Case 1: Gravity Loa	ads Only		Load Case 2: Gravity		al Loads
Load Combinations:			$C_D =$	1.6	
D =	765 lbs	3	$C_r =$	1.15	
D+L =	765 lbs	3	w =	6.7	
D+S =	1845 lbs	3	M =	1851.8	
D+0.75(L)+0.75(S) =	1575 lbs	S	f _b =	244.9	•
$C_D(D) =$	0.9		F' _b =	1656.00	psi
$C_D(D+L) =$	1		Check =	OK	
$C_D(D+S) =$	1.15		Axial:		
$C_D (D+0.75(L)+0.75(S)) =$	1.15		$(l_e/d_x) =$	29.7	in
$f_c = f_{c\perp} =$	223.7 psi	i	E' _{min} =	580000	psi
$(l_e/d)_x =$	29.7 in		c =	8.0	
E' _{min} =	580000 ps	i	F _{cE} =	539.5	psi
c =	0.8		F * _c =	2160	psi
F _{cE} =	539.5		F _{cE} /F [*] c =	0.250	
F c =	1553 ps	i	(1+F _{cE} /F [*] _c)/2c =	0.781	
F _{cE} /F [*] _c =	0.348 ps	i	C _p =	0.235	
$(1+F_{cE}/F_{c})/2c =$	0.842		F' _c =	508.2	
C _p =	0.318		D+0.75(W)+0	.75(L)+0.75(S)	D+W
F'c =	493.5		f _c =	190.9	92.7 psi
Check =	OK ps	i	Check =	ok	ОК
Bearing of stud on wall	•		Combined Stress:		
C _b =	1.25		F _{cEx} =	539.5	539.5 psi
F' _o _ =	781		Interaction Formula =	0.31	0.21
-	701		IIILEI ACLIOII I OIIIIUIA -	0.51	0.2.
Check =	OK ps	si	Check =	ok	OK

KING	CTI	ın	CAL	CIII	AT	ION
NING	210	u	CAL	LUUL	- 1	IUI

Species =	DF-L #2	Loadings	
Stud Width =	6 in	Roofing Material =	Shingle/Tile
Stud Depth (d _x) =	5.5 in	Roof Pitch =	0.25
L=	14 ft	Angle =	1.2
opening width (OOP) =	18 ft	C _s =	1.000
max. gravity span	18 ft	Increase for Drift=	1.000
F _b =	900 psi	Effective snow load =	23 psf
F _c =	1350 psi	Roof dead load =	15 psf
F _c L =	625 psi	Floor live load =	40 psf
E=	1600000 psi	Floor dead load =	15 psf
E _{min} =	580000 psi	Trib. Area _{roof} =	3 ft
C _F =	1.00 for bending	Trib. Area _{floor} =	0 ft
C _F =	1.00 for comp. Il to gra	in Add. Uniform Load =	0 pif
A =	33 _{in} ²		
S =	30.25 _{in} 3	Lateral Load =	14.43 psf
=	83.19 in ⁴		
Dead Loads:		Use: (2) 2x6 Full	l Height King S
Roof DL =	45 plf		

45 plf
0 plf
45 plf
69.3 plf
0 plf
69.30

Load Case 1: Gravity Loads Only Load Combinations:

Load Combinations:		
D =	435	lbs
D+L =	435	lbs
D+S =	1105	lbs
D+0.75(L)+0.75(S) =	938	lbs
$C_D(D) =$	0.9	
$C_D(D+L) =$	1	
$C_D(D+S) =$	1.15	
$C_D (D+0.75(L)+0.75(S)) =$	1.15	
$f_c = f_{c\perp} =$	33.5	psi
$(I_e/d)_x =$	29.7	in
E' _{min} =	580000	psi
c =	0.8	
F _{cE} =	539.5	
F [*] _c =	1553	psi
F _{cE} /F [*] _c =	0.348	psi
(1+F _{cE} /F [*] _c)/2c =	0.842	
C _p =	0.318	
F'c =	493.5	
Check =	OK	psi
Bearing of stud on wall pla	tes:	

Doging of other off harries	
C _b =	1.06
F'o1 =	664
Check =	OK psi

g Studs

Deflection:

Allowable Deflection =	∐ 175
Allowable Deflection =	0.93 in
Deflection =	0.47 in
Check =	OK

Load Case 2: Gravity Loads + Lateral Loads

C _D =	1.6	
C _r =	1.15	
w =	139.6 plf	
M =	38867.2 in.lb	
f _b =	1284.9 psi	
F' _b =	1656.00 psi	
Check =	OK	
Axial:		
$(I_e/d_x) =$	29.7 in	
E'min =	580000 psi	
c =	0.8	
F _{cE} =	539.5 psi	
F _c =	2160 psi	
$F_{cE}/F_{c}^{\dagger} =$	0.250	
(1+F _{cE} /F [*] _c)/2c =	0.781	
C _p =	0.235	
F' _c =	508.2 psi	
D+0.75(W)+0.7	5(L)+0.75(S)	

D+0.75(W)+0.75(L)+0.75(S)	D+W
f _c =	28.4	13.2 psi
Check =	oĸ	ok
Combined Stress:		
F _{cEx} =	539.5	539.5 psi
Interaction Formula =	0.62	0.80
Check =	ок	ок

None

None

Crosswise Reinforcement:

Post Calculations

	2"-4" Thick	5"x5"and Larger			
	Timber DF-L#2	Timber DF-L#2	Parallam	Glulam Comb #4	
Fa	1350	700	2500	2100	psi
Fbx	900	750	2400	1900	psi
Fby	900	750	2400	2200	psi
Ex	1600000	1300000	1800000	1900000	psi
E	1600000	1300000	1800000	1900000	psi

Example Calculations:

	lb	ft	ft	ft	in	in												
Post	Max P	1	le _x	ley	ex	e _y	Cd	(le/d) _x	(le/d) _y	Α	Sx	Sy	fc	F'c	F' _{bx}	F'by	Comb.	
(2) 2x4	3725	8	8	1	0.61	0.00	1.15	27.4	4.0	10.5	6	5	355	582	1551	1708	0.6	ок
(2) 2x6	8990	8	8	1	0.96	0.00	1.15	17.5	4.0	16.5	15	8	545	1013	1344	1547	0.7	ок
(3) 2x4	5805	8	8	1	0.61	0.00	1.15	27.4	2.7	15.75	9	12	369	582	1785	1964	0.6	OK
(3) 2x6	14295	8	8	1	0.96	0.00	1.15	17.5	2.7	24.75	23	19	578	1019	1547	1779	0.7	ок
(4) 2x4	7745	8	8	1	0.61	0.00	1.15	27.4	2.0	21	12	21	369	582	1785	1964	0.6	ОК
(4) 2x6	19080	8	8	1	0.96	0.00	1.15	17.5	2.0	33	30	33	578	1022	1547	1779	0.7	OK
(5) 2x4	9680	8	8	1	0.61	0.00	1.15	27.4	1.6	26.25	15	33	369	582	1785	1964	0.6	OK
(5) 2x6	23860	8	8	1	0.96	0.00	1.15	17.5	1.6	41.25	38	52	578	1023	1547	1779	0.7	OK
4x4	4340	8	8	1	0.61	0.00	1.15	27.4	3.4	12.25	7	7	354	571	1034	1035	0.7	OK
6x6	11200	8	8	1	0.96	0.00	1.15	17.5	2.2	30.25	28	28	370	663	862	863	8.0	OK
3 1/2" x 3 1/2" PLP	7440	8	1	8	0.00	0.61	1.15	3.4	27.4	12.25	7	7	607	953	3171	3174	1.0	ок
3 1/2" x 5 1/4" PLP	11035	8	1	8	0.00	0.61	1.15	2.3	27.4	18.375	16	11	601	953	3032	3036	1.0	OK
5 1/4" x 5 1/4" PLP	27915	8	1	8	0.00	0.92	1.15	2.3	18.3	27.563	24	24	1013	1889	3034	3036	1.0	OK
3 1/8" x 7 1/2" GLP	11495	8	1	8	0.00	0.55	1.15	1.6	30.7	23.438	29	12	490	802	2181	2935	0.9	ОК
3 1/8" x 9" GLP	13790	8	1	8	0.00	0.55	1.15	1.3	30.7	28.125	42	15	490	802	2180	2935	0.9	OK
5 1/8" x 6" GLP	26595	8	1	8	0.00	0.90	1.15	2.0	18.7	30.75	31	26	865	1773	2184	2783	8.0	OK
5 1/8" x 7 1/2" GLP	33240	8	1	8	0.00	0.90	1.15	1.6	18.7	38.438	48	33	865	1773	2184	2783	0.8	ок
5 1/8" x 9" GLP	39890	8	1	8	0.00	0.90	1.15	1.3	18.7	46.125	69	39	865	1773	2183	2783	8.0	OK
Additional Post Cal	culations	s:																
	0	8	8	8	0.61	0.61	1.15	27.4	27.4	12.25	7	7	0	571	1031	1035	0.0	OK
	0	8	8	8	0.61	0.61	1.15	27.4	27.4	12.25	7	7	0	571	1031	1035	0.0	OK
	0	8	8	8	0.61	0.61	1.15	27.4	27.4	12.25	7	7	0	571	1031	1035	0.0	ОК

Load Charts:

Load Citatis.										
		Roof I	<u>_oads</u>				Floor_	<u>_oads</u>		
	7 ft	8 ft	9 ft	10 ft	_	7 ft	8 ft	9 ft	10 ft	
(1) 2 x 4	2215	1855	1570	1340		2100	1775	1505	1290	
(1) 2 x 6	5150	4630	4140	3695		4695	4270	3855	3470	<u>.</u> 5
(2) 2 x 4	4450	3725	3150	2690		4215	3560	3025	2595	
(2) 2 x 6	9535	8990	8325	7430		8500	8080	7615	6970	ᄒ
(3) 2 x 4	6960	5805	4890	4160		6620	5560	4710	4025	Braced in One Direction
(3) 2 x 6	15165	14295	13180	11720		13510	12845	12105	11020	일
(4) 2 x 4	9290	7745	6520	5550		8830	7415	6280	5365	ᇢ
(4) 2 x 6	20245	19080	17580	15630		18035	17145	16155	14700	%
(5) 2 x 4	11615	9680	8150	6935		11035	9265	7850	6710	<u> </u>
(5) 2 x 6	25320	23860	21980	19535	10	22555	21440	20200	18375	
(2) 2 x 4	2905	2350	1930	1605		2800	2285	1885	1575	
(2) 2 x 6	4670	3775	3095	2570		4500	3670	3025	2525	
(3) 2 x 4	6605	5590	4750	4065		6205	5310	4550	3915	
(3) 2 x 6	11575	9985	8575	7380		10745	9405	8170	7090	
(4) 2 x 4	9290	7745	6520	5550		8830	7415	6280	5365	မူ
(4) 2 x 6	18155	16500	14830	13245		16425	15120	13760	12425	Unbraced in Both Directions
(5) 2 x 4	11615	9680	8150	6935		11035	9265	7850	6710	<u> </u>
(5) 2 x 6	23935	22215	20425	18635		21465	20125	18695	17235	ا ق ا
4 x 4	5185	4340	3670	3135		4915	4145	3525	3025	ᄫ
6 x 6	12040	11200	10330	9460		10790	10130	9430	8720	n E
3 1/2" x 3 1/2" PLP	9000	7440	6225	5270		8595	7155	6015	5115	
3 1/2" x 5 1/4" PLP	13330	11035	9245	7840		12720	10600	8930	7600	ä
5 1/4" x 5 1/4" PLP	31850	27915	24355	21295		29340	26080	23000	20250	훁
3 1/8" x 7 1/2"	13795	11495	9680	8245	1 1	13115	11005	9320	7970	>
3 1/8" x 9"	16555	13790	11620	9895		15735	13205	11185	9565	
5 1/8" x 6"	29565	26595	23720	21095		26900	24510	22110	19840	
5 1/8" x 7 1/2"	36955	33240	29650	26370		33625	30640	27640	24805	
5 1/8" x 9"	44350	39890	35580	31645	1 1	40350	36765	33170	29765	

Notes: 1. Example calculations show posts braced in one direction.

 Loads have been adjusted to accommodate for the worst case of the following eccentric conditions: .175 of column thickness or .175 of column width.

Location: P8

Multi-Loaded Multi-Span Beam

HSS 5-1/2 x 5-1/2 x 3/8 x 14.0 FT (12 + 2) / ASTM A500-GR.B-46

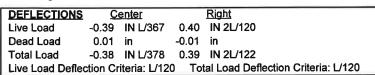
Section Adequate By: 0.8% Controlling Factor: Deflection



page of

StruCalc Version 10.0.1.6

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REACTIONS	Α		В		
Live Load	-1767	lb	12367	' lb	
Dead Load	147	lb	206	i lb	
Total Load	-1620	lb	12573	i lb	
Uplift (1.5 F.S)	-1669	lb	0) lb	
Bearing Length	0.70	Ĭn	1.19	in	

BEAM DATA	Ce	nter	R	ight
Span Length	12	ft	2	ft
Unbraced Length-Top	0	ft	0	ft
Unbraced Length-Bottom	12	ft	2	ft



HSS 5-1/2 x 5-1/2 x 3/8 - A500-GR.B-46

Properties:

Steel Yield Strength:	Fy =	46	ksi
Modulus of Elasticity:	E =	29000	ksi
Tube Steel Section (X Axis):	dx =	5.5	in
Tube Steel Section (Y Axis):	dy =	5.5	in
Tube Steel Wall Thickness:	t =	0.349	in
Area:	A =	6.88	in2
Moment of Inertia (X Axis):	lx =	29.7	in4
Section Modulus (X Axis):	Sx =	10.8	in3
Plastic Section Modulus (X Axis):	Zx =	13.1	in3
Plastic Section Modulus (Y Axis):	Zy =	13.1	in3
Design Properties per AISC 14th Edition Ste	el Manual:		

Design Properties per AISC 14th Edition Stee	el Manual:		
Flange Buckling Ratio:	FBR =	12.76	
Allowable Flange Buckling Ratio:	AFBR =	28.12	
Allowable Flange Buckling Ratio non-compact:	AFBR_NC =	35.15	
Web Buckling Ratio:	WBR =	12.76	
Allowable Web Buckling Ratio for Eqn. F7-5:	AWBR =	60.76	
Nominal Flexural Strength w/ Safety Factor:	Mn =	30070 ft-lb	
Controlling Equation:	F7-1		

Controlling Moment: -21250 ft-lb

Over right support of span 2 (Center Span)

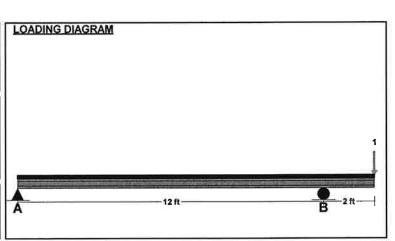
Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear: 10650 lb

At left support of span 3 (Right Span)

Created by combining all dead loads and live loads on span(s

<u>Req'd</u>	<u>Provided</u>
29.47 in4	29.7 in4
-21250 ft-lb	30070 ft-lb
10650 lb	57191 lb
	29.47 in4 -21250 ft-lb



UNIFORM LOADS	<u>C</u>	enter		Right	
Uniform Live Load	0	plf	0	plf	
Uniform Dead Load	0	plf	0	plf	
Beam Self Weight	25	plf	25	plf	
Total Uniform Load	25	plf	25	plf	

POINT LOA	DS - RIGHT S	SPAN		
Load Numb	er <u>One</u>			
Live Load	10600 lb			
Dead Load	0 lb			
Location	2 ft			

Location: P9 Column

HSS 4 x 4 x 1/4 x 12.0 FT /ASTM A500-GR.B-46

Section Adequate By: 50.9%



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StruCalc Version 10.0.1.6

2/24/2020 4:27:47 PM



COLUMN DATA

Total Column Length: 12 ft
Unbraced Length (X-Axis) Lx: 12 ft
Unbraced Length (Y-Axis) Ly: 12 ft
Column End Condition-K (e): 1

COLUMN PROPERTIES HSS 4 x 4 x 1/4 - Square

Steel Yield Strength:	Fy=	46 ksi		
Modulus of Elasticity:	E =	29000 ksi		
Column Section:	dx =	4 in	dy =	4 in
Column Wall Thickness:	t =	0.233 in		
Area:	A =	3.37 in		
Moment of Inertia (deflection):	lx =	7.8 in4	ly =	7.8 in4
Section Modulus:	Sx =	3.9 in3	Sy=	3.9 in3
Plastic Section Modulus:	Zx =	4.69 in3	Zy =	4.69 in3
Rad. of Gyration:	rx =	1.52 in	ry =	1.52 in

KLy/ry = 94.74

51 kip

KL/r Ratio: KLx/rx = 94.74

Controlling Direction for Compr. Calcs: (Y-Y Axis)
Flexural Buckling Stress: Fcr = 25.15 ksi

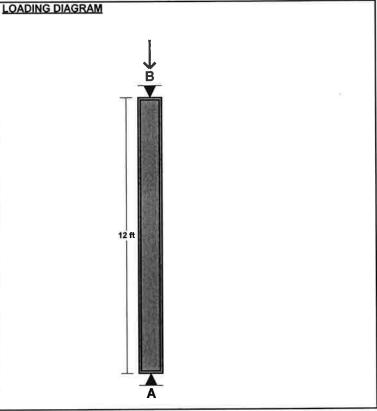
Controlling Equation F7-1
Nominal Compressive Strength: Pc =

Combined Stress Calculations:

Column Compression Calculations:

H1-1a Controls: 0.49

Controlling Combined Stress Factor: 0.49



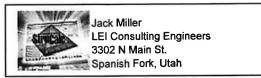
AXIAL LOADING
Live Load: PL = 15299 lb
Dead Load: PD = 9485 lb
Column Self Weight: CSW = 148 lb
Total Axial Load: PT = 24932 lb

Location: P10

Multi-Loaded Multi-Span Beam



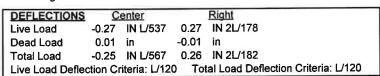
Section Adequate By: 47.5% Controlling Factor: Deflection



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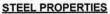
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REACTIONS	Α		В	
Live Load	-650	lb	4550	lb
Dead Load	92	lb	128	lb
Total Load	-558	lb	4678	lb
Uplift (1.5 F.S)	-589	lb	0	lb
Bearing Length	0.47	in	0.66	in

BEAM DATA	Ce	enter	R	ight
Span Length	12	ft	2	ft
Unbraced Length-Top	0	ft	0	ft
Unbraced Length-Bottom	12	ft	2	ft



HSS 5 x 5 x 1/4 - A500-GR.B-46

Properties:

Steel Yield Strength:	Fy =	46 ksi
Modulus of Elasticity:	E≂	29000 ksi
Tube Steel Section (X Axis):	dx =	5 in
Tube Steel Section (Y Axis):	dy =	5 in
Tube Steel Wall Thickness:	t =	0.233 in
Area:	A =	4.3 in2
Moment of Inertia (X Axis):	lx =	16 in4
Section Modulus (X Axis):	Sx =	6.41 in3
Plastic Section Modulus (X Axis):	Zx =	7.61 in3
Plastic Section Modulus (Y Axis):	Zy =	7.61 in3

Design Properties per AISC 14th Edition Steel Manual:

Flange Buckling Ratio:	FBR =	18.46	
Allowable Flange Buckling Ratio:	AFBR =	28.12	
Allowable Flange Buckling Ratio non-compact:	AFBR_NC =	35.15	
Web Buckling Ratio:	WBR =	18.46	
Allowable Web Buckling Ratio for Eqn. F7-5:	AWBR =	60.76	
Nominal Flexural Strength w/ Safety Factor:	Mn =	17468	ft-lb
Controlling Equation:	F7-1		

Controlling Moment: -7831 ft-lb

Over right support of span 2 (Center Span)

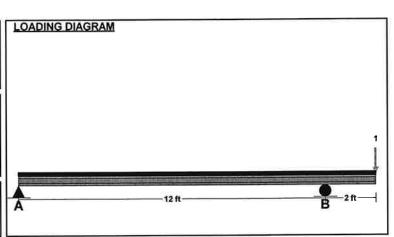
Created by combining all dead loads and live loads on span(s) 2, 3

Controlling Shear: 3931 lb

At left support of span 3 (Right Span)

Created by combining all dead loads and live loads on span(s

Comparisons with required sections:	Reg'd	Provided
Moment of Inertia (deflection):	10.84 in4	16 in4
Moment:	-7831 ft-lb	17468 ft-lb
Shear:	3931 lb	36878 lb



UNIFORM LOADS	<u>C</u>	enter	§ 1	Right
Uniform Live Load	0	plf	0	plf
Uniform Dead Load	0	plf	0	plf
Beam Self Weight	16	plf	16	plf
Total Uniform Load	16	plf	16	plf

POINT LOAD	DS - RIGHT	SPAN		
Load Numbe	r <u>One</u>			
Live Load	3900 lb			
Dead Load	0 lb			
Location	2 ft			

POST / SHEAR WALL / FOOTING / FOUNDATION WALL SCHEDULE

(not all are necessarily used)

Post Schedule								
Designation	Post Size							
P1	(1) 2x							
P2	(2) 2x							
P3	(3) 2x							
P4	(4) 2x							
P5	(5) 2x							
P6	4x4							
P7	6x6							
P8	HSS 5 1/2x5 1/2x3/8 A500 Gr. B-46							
P9	HSS 4x4x1/4 A500 Gr. B-46							
P10	HSS 5x5x1/4 A500 Gr. B-46							

- Posts indicate number of trimmer studs when specified a headers. All other post designations refer to full height king studs U.N.O.
- 2. Install (1) trimmer stud and (1) king stud each side of
- each opening U.N.O.

 3. Install (2) trimmer studs each side of openings greater than 6'-0" U.N.O.
- 4. Install (2) king stude each side of openings greater than 8
- 0" U.N.O. 5. 2x built-up posts shall be the same width of the wall in
- which they are framed U.N,O.

 6. Nail each ply of 2x built-up posts w/ 16d nails @ 6" o.c. staggered U.N.O.
- 7. Posts that are not framed within a stud wall shall be braced with BC or AC post cap and PB or ABA post base U.N.O.

Shear Wall Schedule ^{1,3,4}								
Designation		1 ¹ / ₂ " 16 Ge	ga Staples	8d Nails		Cap	Note	
	Material	Edge	Field	Edge	Field	Wind	Seismic	More
1	7/16" OSB or CDX plywood	31/2	12"	6"	12"	360	260	2,5
2	7/16" OSB or CDX plywood	2" 6	12"	4"	12"	530	350	2,5
3	7/16" OSB or CDX plywood			3"	12"	685	490	2,5,6
4	7/16" OSB or CDX plywood			2"	12"	895	640	2,5,6
S1	WSW12x12 Simpson Wood Strong							
S2	WSW18x12 Simpson Wood Strong	Wall See Deta	ails13/S4.0	, 15/84	.0, 30	'S4.1, 12	2/S1.1, and	13/\$1.1

- Wall studs are to be spaced at 18" o.c. U.N.O.
- Well studs are to be spaced at 10° o.c. U.N.O.
 Sheath above and below openings in perforated shear walls as per the adjacent shear wall designation on each side of the opening.
 Use (2) king studs at each end of shear panels (Shear Wall Chords) U.N.O.
 All panel edges shall be blocked with 2x or wider framing with edge neiling at all supports and panel edges U.N.O.

- 5. Where panels are applied on both faces of a wall and nail spacing is less than 6" o.c. on either side, panel joints shall be offset to fall on different framing members.
- on omerent transing members.

 6. Framing at adjoining panel edges and sill plates shall be 3x or wider for edge nailing 3* o.e. or less, Nails at adjoining panel edges and into sill plates shall be staggered. (Double 2x framing stitch-nailed with staggered 16d nails with spacing equal to the shear wall edgen lilling is an adequate substitute for 3x framing.)

 7. Fasteners for sheet rock shear walls shall be No. 6 Type S or W drywall screws 1-1/4* long in lieu of 8d nails.

	Footing Schedule												
		T	Lengthwise Reinforcement				Crosswise Reinforcement				Capacity	Note	
Designation	Length	Width	Depth	Qty.	Size	Length	Spacing	Qty.	Size	Length	Spacing	Сарасну	Note
FT1	Cont.	20"	10"	2	#4	Cont	EQ.		(a)	1/2	(A)	4167 PLF	
FT2	Cont.	18"	10"	2	#4	Cont.	EQ.					3750 PLF	See detail 10/S1.1
FT3	24"	24"	10"	3	#4	18"	EQ.	3	#4	18"	EQ.	10000 LBS	
FT4	30"	30"	10"	3	#4	24 ^H	EQ.	3	#4	24"	EQ.	15625 LBS	
FT5	36"	36"	10"	4	#4	30"	EQ.	4	#4	30"	EQ.	22500 LB\$	
FT6	42"	42"	10"	4	#4	36"	EQ.	4	#4	36"	EQ.	30625 LBS	
FI7	48"	48"	10*	5	#4	42"	EQ.	5	#4	42"	EQ.	40000 LBS	

. Fc= 2.500 psi, fy= 50,000 psi, No special inspection required.

- 2. Footings shall bear on undisturbed native solls or structural compacted fill (95% compaction), specified and tested by a registered geotechnical engine
- 2. Tourings stress deal or understands have an additional compension in the configuration of the configuration of the locality, (30" U.N.O.) Provide 12" (dameter sono-tube at exterior spot footings per detail 20/SD.1.4. Provide J-bars to match vertical foundation wall reinforcement with 24" minimum lap spilce into foundation wall.
- Center footing under foundation wall U.N.O.

Foundation Wall Schedule				
Maximum Height	Reinforcement			
3' Foundation Wall	#4 bars @ 24" o.c. vertical, (3) #4 bars horizontal			

- 1. Use 5/6" diameter x 14" long (7" embedment) anchor bolts @ 24" o.c. w/ 3"x3"x1/4" (0.229") plate we walls U.N.O. (Edge of plate washer to be located within 1/2" of sheathed edge of slil plate.)
 - 2. fc= 3,000 psi, fy= 60,000 psi. No special inspection required.
 - 3. Place (1) #4 bar below and on each side of each opening and (2) #4 bars above each opening. Bars shall be placed within 2" of the openings and extend 24" beyond the edge of the opening; vertical bars may terminate 3" from the top of the concrete. Opening
 - reinforcement is in addition to standard well reinforcement.

 4. Top and bottom bars shall be within 4" of the top and bottom of the wall.

 5. Place reinforcement in center of wall U.N.O.