

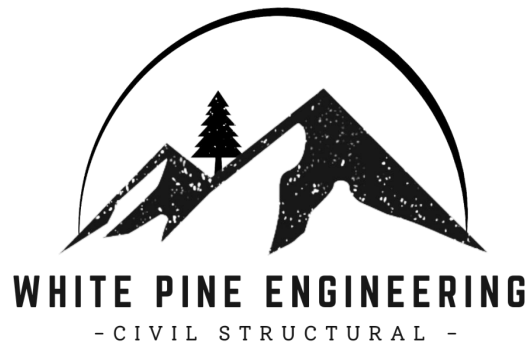
Residential Structural Engineering Calculations

Kessler Townhomes Magna
Residential Plan
Leah Court Subdivision Lots 1 & 2
2823 South 9150 West
Magna, Utah

Prepared for:

Mike Kessler
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Date: 6/21/2023



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Design Criteria

Codes

IBC 2018
 ASCE7-16

Risk Category **II** ASCE 7-16 Table 1.5-1

Is	1.0	ASCE 7-16 Table 1.5-2
Ie	1.0	ASCE 7-16 Table 1.5-2

Seismic Loads

S1	0.35	ASCE 7 Hazard Tool
SM1	0.83	ASCE 7 Hazard Tool
SMS	1.24	ASCE 7 Hazard Tool
TL	8	ASCE 7 Hazard Tool

Site Class	D	Assumed
SDC	D	ASCE 7 Hazard Tool

R	6.5	ASCE7-16 table 12.2-1
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Wind Loads

V	120	mph 3 Sec Gust
Category	C	
Elevation	4306	ft USU Snow Load Map

Snow Loads

Pg	43	psf USU Snow Load Map
Ws	0	psf

Ce	1.0	ASCE7-16 Table 7.3-1
Ct	1.0	ASCE7-16 Table 7.3-2
Cs	1.0	ASCE7-16 Figure 7.4-1

Pf	30	ASCE7-16 Eq 7.3-1
Ps	30	ASCE7-16 Eq 7.4-1

Dead Loads

Roof	15	psf
Floor	15	psf
Walls	10	psf
Decks	10	psf
Concrete	145	pcf

Live Loads

Roof	20	psf	ASCE7-16 Table 4.3-1
Floor	40	psf	ASCE7-16 Table 4.3-1
Bedroom	30	psf	ASCE7-16 Table 4.3-1
Deck	60	psf	ASCE7-16 Table 4.3-1
Garage	40	psf	ASCE7-16 Table 4.3-1

Project Kessler Townhomes Magna
Date 6/21/2023
Engineer J. Sagers



Soil Properties

Geotechnical Report by N/A
Report Number N/A
Date of Report N/A

If no report is listed above, the follow values are assumed
Unified Soil Classification Assumed to be GW, GP, SW, or SP IBC Table 1610.1

Bearing Pressure 1500 psf
Active Pressure 35 pcf
At Rest Presssure 60 pcf
Passive Pressure 250 pcf
Coefficient of Friction 0.3

**Engineer assumes stable soil conditions.
If there are any global stability concerns, a geotechnical report is required.

Deflection Criteria

Roof

Live Load L/240 Table 1604.3
Total Load L/180 Table 1604.3

Floor

Live Load L/360 Table 1604.3
Total Load L/240 Table 1604.3

Wall

Live Load L/360 Table 1604.3 W/ Stucco
Live Load L/240 Table 1604.3 W/ Other Brittle Finishes
Live Load L/120 Table 1604.3 W/ Flexible Finishes

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	Span/Height (ft)	Live Load (psf)	Dead Load (psf)	Total Load (plf)	LL Factor
Roof	0	30	15	0	1
Top Wall	8	0	10	80	N/A
Upper Floor	48	40	15	1320	1
Middle Wall	9	0	10	90	N/A
Main Floor	0	40	15	0	1
Bottom Wall	0	0	10	0	N/A
Deck 1	0	60	10	0	1
Deck 2	0	60	10	0	1
Suspended Slab	0	40	150	0	1
Foundation	3	0	150	450	N/A
				1940	

Allowable Soil Bearing Pressure 1500 psf
 Required Continuous Footing Width 15.5 Inches



Description Main

ELF		
SD1	0.55	Eq 11.4-4
SDB	0.83	Eq 11.4-3
Cs	0.13	Eq 12.8-2
Ta	0.21	Eq 12.8-7
Ct	0.02	table 12.8-2
x	0.75	table 12.8-2
hn	22.5	
Cs Max	0.41	Eq 12.8-3
Cs Max	N/A	Eq 12.8-4
Cs Min	0.04	Eq 12.8-5
Cs Min	0.01	Eq 12.8-5
Cs Min	N/A	Eq 12.8-6
Cs Max	0.41	
Cs Min	0.04	
Cs	0.13	
V (lbs)	6835	Eq 12.8-1

Building Info		k=1 for T<=5						
Z (ft)	Area (ft^2)	Weight (psf)	Weight (lbs)	Wx (lbs)	Cvx	Fx (lbs)	Shear (lbs)	
Roof	26	1032	15	15480				
Top Wall	19	1072	10	10720	20840	0.596	4072	
Upper Floor	10	1032	15	15480				
Middle Wall	10	1206	10	12060	26870	0.404	2763	
Main Floor	0	1032	0	0				
Bottom Wall	0	0	0	0	6030	0.000	0	
				53740			6835	

Width	43
Length	24
Roof Pitch F-B	4 :12 Pitch
Roof Pitch L-R	9999999 :12 Pitch

Simplified Seismic	
V	7518.0882 Eq 12.14-12
F	1.1
	1 1 story
	1.1 2 story
	1.2 3 story

Wx (lbs)	Fx (lbs)	Shear (lbs)
20840	2915	2915
26870	3759	6675
6030	844	7518

Directional

hn	22.5	V	120 mph 3 Sec Gust
G	0.85 (26.11.4,26.11.2)	Category	C
ke	0.8556643		
kzt	1		
kd	0.85		
kh	0.92		

Surface	Cp	L/B or h/L	z or h	kz or kh	Theta	q (psf)	p (psf)	Area (ft^2)	Force (lbs)
Top Front Wall	0.8	1.79166667	19	0.89	0.00	23.86	16.23	216	3505
Middle Front Wall	0.8	1.79166667	10	0.85	0.00	22.79	15.50	240	3719
Bottom Front Wall	0.8	1.79166667	0	0.85	0.00	22.79	15.50	0	0
Front Roof Plane	-0.06	0.52325581	22.5	0.92	18.43	24.67	-1.30	167.9999412	-219
Top Rear Wall	-0.341667	1.79166667	22.5	0.92	0.00	24.67	-7.16	216	-1547
Middle Rear Wall	-0.341667	1.79166667	22.5	0.92	0.00	24.67	-7.16	240	-1719
Bottom Rear Wall	-0.341667	1.79166667	22.5	0.92	0.00	24.67	-7.16	0	0
Rear Roof Plane	-0.570155	0.52325581	22.5	0.92	18.43	24.67	-11.95	167.9999412	-2008
Top Left Wall	0.8	0.55813953	19	0.89	0.00	23.86	16.23	387	6280
Middle Left Wall	0.8	0.55813953	10	0.85	0.00	22.79	15.50	430	6664
Bottom Left Wall	0.8	0.55813953	0	0.85	0.00	22.79	15.50	0	0
Left Roof Plane	0.80	0.9375	22.5	0.92	90.00	24.67	16.77	154	2583
Top Right Wall	-0.5	0.55813953	22.5	0.92	0.00	24.67	-10.48	387	-4057
Middle Right Wall	-0.5	0.55813953	22.5	0.92	0.00	24.67	-10.48	430	-4508
Bottom Right Wall	-0.5	0.55813953	22.5	0.92	0.00	24.67	-10.48	0	0
Right Roof Plane	-0.6	0.9375	22.5	0.92	90.00	24.67	-12.58	154	-1937

L/R Walls	Shear (lbs)
Top	4316
Middle	9561
Bottom	12280

F/B Walls	Shear (lbs)
Top	9689
Middle	20443
Bottom	26029

Simplified Wind

Case A	A	B	C	D
Ps30	30.69	0.00	20.47	0.00
Ps	40.51	0.00	27.03	0.00

Case B	A	C
Ps30	22.80	15.10
Ps	30.10	19.93

a 3 Lambda 1.32

	C&D (lbs)	C&D/2 (lbs)	A&B (lbs)	L/R Shear (lbs)		C&D (lbs)	C&D/2 (lbs)	AA&BA (lbs)	AB (lbs)	A&B (lbs)	F/B Shear (lbs)
Top	2919	1459	364	1824		6926	3463	364	137	137	3600
Middle	9081	4540	1133	5673		15069	7534	1133	427	427	7961
Bottom	12324	6162	1538	7699		19354	9677	1538	579	579	10256

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Shear Table

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
ELF	2036	2036	3417	3417	3417	3417
Simplified S	1458	1458	3337	3337	3759	3759
Directional	4844	2158	10221	4781	13014	6140
Simplified W	3600	1824	7961	5673	10256	7699

Factored Shear Table (0.6W 0.7E)

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
ELF	1425	1425	2392	2392	2392	2392
Simplified S	1020	1020	2336	2336	2631	2631
Directional	2907	1295	6133	2868	7809	3684
Simplified W	2160	1094	4777	3404	6154	4620

Factored Shear Table w/ Wind Converted to Seismic Equivalent Loading (W/1.4)

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
ELF	1425	1425	2392	2392	2392	2392
Simplified S	1020	1020	2336	2336	2631	2631
Directional	1038	925	2190	2049	2789	2632
Simplified W	772	782	1706	2431	2198	3300

Factored Shear Table w/ Wind Converted to Seismic Equivalent Loading (W/1.4)

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
ELF	1425	1425	2392	2392	2392	2392
Simplified W	771.51407	781.527919	1705.968	2431.420193	2197.7859	3299.78455

Factored Shear Table w/ Wind Converted to Seismic Equivalent Loading (W/1.4)

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
Max Load	1425	1425	2392	2431	2392	3300



Beam Calc #1

Span (ft)	4
Plys	2
Ref. #	4

	Live Loads	Dead Loads	Units	Location	
Distributed	630	315	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.1
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	2 X 10 DF-L#2	OK

Fb	900.00 psi	Max Moment	1,890 ft lbs	Flexure Check	Ratio
Fb'	990.00 psi	Location	2.00 ft From Left	OK	0.535
Sx	42.78 In ³	Req Sx	22.91 In ³		
Fv	180.00 psi	L Reaction	1,890 lbs	Shear Check	Ratio
Fv'	180.00 psi	R Reaction	1,890 lbs	OK	0.568
Area	27.75 In ²	Max Shear	1,890 lbs		
		Req Area	15.75 In ²	Adj Shear Check	Ratio
		Req Max Shear	1,172 lbs	OK	0.352
		Req Area	9.77 In ²		
		(Non Hangered Loads)			
E	1,600,000 psi	Max LL Defl.	0.011 In	LL Deflection Check	Actual L/
E'	1,600,000 psi	Location	2.00 ft From Left	OK	4188
Ix	197.86 In ⁴				
Deflection Limits		Max TL Defl.	0.017 In	TL Deflection Check	Actual L/
LL	0.133 In	Location	2.00 ft From Left	OK	2792
TL	0.200 In				



Beam Calc #2

Span (ft)	16
Plys	2
Ref. #	103

	Live Loads	Dead Loads	Units	Location	
Distributed	120	60	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.0
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	1-3/4" X 11-7/8" LVL	OK

Fb	2600.00 psi	Max Moment	5,760 ft lbs	Flexure Check	Ratio
Fb'	2600.00 psi	Location	8.00 ft From Left	OK	0.323
Sx	82.26 In ³	Req Sx	26.58 In ³		
Fv	285.00 psi	L Reaction	1,440 lbs	Shear Check	Ratio
Fv'	285.00 psi	R Reaction	1,440 lbs	OK	0.182
Area	41.56 In ²	Max Shear	1,440 lbs		
		Req Area	7.58 In ²	Adj Shear Check	Ratio
	3.4.3.1	Adj Max Shear	1,267 lbs	OK	0.160
	(Non Hangered Loads)	Req Area	6.67 In ²		
E	1,900,000 psi	Max LL Defl.	0.191 In	LL Deflection Check	Actual L/
E'	1,900,000 psi	Location	8.00 ft From Left	OK	1007
Ix	488.41 In ⁴				
Deflection Limits		Max TL Defl.	0.286 In	TL Deflection Check	Actual L/
LL	0.533 In	Location	8.00 ft From Left	OK	671
TL	0.800 In				



Beam Calc #3

Span (ft)	18.7
Plys	2
Ref. #	103

	Live Loads	Dead Loads	Units	Location	
Distributed	120	140	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.0
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	1-3/4" X 11-7/8" LVL	OK

Fb	2600.00 psi	Max Moment	11,365 ft lbs	Flexure Check	Ratio
Fb'	2600.00 psi	Location	9.35 ft From Left	OK	0.638
Sx	82.26 In ³	Req Sx	52.45 In ³		
Fv	285.00 psi	L Reaction	2,431 lbs	Shear Check	Ratio
Fv'	285.00 psi	R Reaction	2,431 lbs	OK	0.308
Area	41.56 In ²	Max Shear	2,431 lbs		
		Req Area	12.79 In ²	Adj Shear Check	Ratio
	3.4.3.1	Adj Max Shear	2,188 lbs	OK	0.277
	(Non Hangered Loads)	Req Area	11.52 In ²		
E	1,900,000 psi	Max LL Defl.	0.356 In	LL Deflection Check	Actual L/
E'	1,900,000 psi	Location	9.35 ft From Left	OK	631
Ix	488.41 In ⁴				
Deflection Limits		Max TL Defl.	0.771 In	TL Deflection Check	Actual L/
LL	0.623 In	Location	9.35 ft From Left	OK	291
TL	0.935 In				

Project Kessler Townhomes Magna
 Date 6/21/2023
 Engineer J. Sagers



Beam Calc #4

Span (ft)	4
Plys	2
Ref. #	4

	Live Loads	Dead Loads	Units	Location	
Distributed	400	230	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.1
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	2 X 10 DF-L#2	OK

Fb	900.00 psi	Max Moment	1,260 ft lbs	Flexure Check	Ratio
Fb'	990.00 psi	Location	2.00 ft From Left	OK	0.357
Sx	42.78 In ³	Req Sx	15.27 In ³		
Fv	180.00 psi	L Reaction	1,260 lbs	Shear Check	Ratio
Fv'	180.00 psi	R Reaction	1,260 lbs	OK	0.378
Area	27.75 In ²	Max Shear	1,260 lbs		
		Req Area	10.50 In ²	Adj Shear Check	Ratio
	3.4.3.1	Adj Max Shear	781 lbs	OK	0.235
	(Non Hangered Loads)	Req Area	6.51 In ²		
E	1,600,000 psi	Max LL Defl.	0.007 In	LL Deflection Check	Actual L/
E'	1,600,000 psi	Location	2.00 ft From Left	OK	6595
Ix	197.86 In ⁴				
Deflection Limits		Max TL Defl.	0.011 In	TL Deflection Check	Actual L/
LL	0.133 In	Location	2.00 ft From Left	OK	4188
TL	0.200 In				



Beam Calc #5

Span (ft)	3
Plys	2
Ref. #	3

	Live Loads	Dead Loads	Units	Location	
Distributed	400	150	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.2
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	2 X 8 DF-L#2	OK

Fb	900.00 psi	Max Moment	619 ft lbs	Flexure Check	Ratio
Fb'	1080.00 psi	Location	1.50 ft From Left	OK	0.262
Sx	26.28 In ³	Req Sx	6.88 In ³		
Fv	180.00 psi	L Reaction	825 lbs	Shear Check	Ratio
Fv'	180.00 psi	R Reaction	825 lbs	OK	0.316
Area	21.75 In ²	Max Shear	825 lbs		
		Req Area	6.88 In ²	Adj Shear Check	Ratio
		Req Max Shear	495 lbs	OK	0.190
		Req Area	4.13 In ²		
		(Non Hangered Loads)			
E	1,600,000 psi	Max LL Defl.	0.005 In	LL Deflection Check	Actual L/
E'	1,600,000 psi	Location	1.50 ft From Left	OK	7527
Ix	95.27 In ⁴				
Deflection Limits		Max TL Defl.	0.007 In	TL Deflection Check	Actual L/
LL	0.100 In	Location	1.50 ft From Left	OK	5475
TL	0.150 In				

Residential Structural Engineering Calculations

Kessler Townhomes Magna
Residential Plan
Leah Court Subdivision Lots 3 & 4
2823 South 9150 West
Magna, Utah

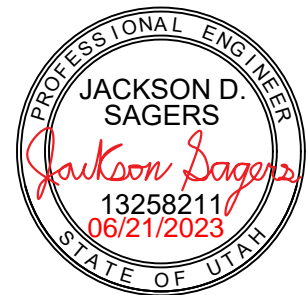
Prepared for:

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Date: 6/21/2023



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Design Criteria

Codes

IBC 2018
 ASCE7-16

Risk Category **II** ASCE 7-16 Table 1.5-1

Is	1.0	ASCE 7-16 Table 1.5-2
Ie	1.0	ASCE 7-16 Table 1.5-2

Seismic Loads

S1	0.35	ASCE 7 Hazard Tool
SM1	0.83	ASCE 7 Hazard Tool
SMS	1.24	ASCE 7 Hazard Tool
TL	8	ASCE 7 Hazard Tool

Site Class	D	Assumed
SDC	D	ASCE 7 Hazard Tool

R	6.5	ASCE7-16 table 12.2-1
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Wind Loads

V	120	mph 3 Sec Gust
Category	C	
Elevation	4306	ft USU Snow Load Map

Snow Loads

Pg	43	psf USU Snow Load Map
Ws	0	psf

Ce	1.0	ASCE7-16 Table 7.3-1
Ct	1.0	ASCE7-16 Table 7.3-2
Cs	1.0	ASCE7-16 Figure 7.4-1

Pf	30	ASCE7-16 Eq 7.3-1
Ps	30	ASCE7-16 Eq 7.4-1

Dead Loads

Roof	15	psf
Floor	15	psf
Walls	10	psf
Decks	10	psf
Concrete	145	pcf

Live Loads

Roof	20	psf	ASCE7-16 Table 4.3-1
Floor	40	psf	ASCE7-16 Table 4.3-1
Bedroom	30	psf	ASCE7-16 Table 4.3-1
Deck	60	psf	ASCE7-16 Table 4.3-1
Garage	40	psf	ASCE7-16 Table 4.3-1

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Soil Properties

Geotechnical Report by N/A
Report Number N/A
Date of Report N/A

If no report is listed above, the follow values are assumed
Unified Soil Classification Assumed to be GW, GP, SW, or SP IBC Table 1610.1

Bearing Pressure 1500 psf
Active Pressure 35 pcf
At Rest Presssure 60 pcf
Passive Pressure 250 pcf
Coefficient of Friction 0.3

**Engineer assumes stable soil conditions.
If there are any global stability concerns, a geotechnical report is required.

Deflection Criteria

Roof

Live Load L/240 Table 1604.3
Total Load L/180 Table 1604.3

Floor

Live Load L/360 Table 1604.3
Total Load L/240 Table 1604.3

Wall

Live Load L/360 Table 1604.3 W/ Stucco
Live Load L/240 Table 1604.3 W/ Other Brittle Finishes
Live Load L/120 Table 1604.3 W/ Flexible Finishes

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	Span/Height (ft)	Live Load (psf)	Dead Load (psf)	Total Load (plf)	LL Factor
Roof	0	30	15	0	1
Top Wall	8	0	10	80	N/A
Upper Floor	48	40	15	1320	1
Middle Wall	9	0	10	90	N/A
Main Floor	0	40	15	0	1
Bottom Wall	0	0	10	0	N/A
Deck 1	0	60	10	0	1
Deck 2	0	60	10	0	1
Suspended Slab	0	40	150	0	1
Foundation	3	0	150	450	N/A
				1940	

Allowable Soil Bearing Pressure 1500 psf
 Required Continuous Footing Width 15.5 Inches



Description Main

ELF		
SD1	0.55	Eq 11.4-4
SDB	0.83	Eq 11.4-3
Cs	0.13	Eq 12.8-2
Ta	0.21	Eq 12.8-7
Ct	0.02	table 12.8-2
x	0.75	table 12.8-2
hn	22.5	
Cs Max	0.41	Eq 12.8-3
Cs Max	N/A	Eq 12.8-4
Cs Min	0.04	Eq 12.8-5
Cs Min	0.01	Eq 12.8-5
Cs Min	N/A	Eq 12.8-6
Cs Max	0.41	
Cs Min	0.04	
Cs	0.13	
V (lbs)	6835	Eq 12.8-1

Building Info		k=1 for T<=5						
Z (ft)	Area (ft^2)	Weight (psf)	Weight (lbs)	Wx (lbs)	Cvx	Fx (lbs)	Shear (lbs)	
Roof	26	1032	15	15480				
Top Wall	19	1072	10	10720	20840	0.596	4072	
Upper Floor	10	1032	15	15480				
Middle Wall	10	1206	10	12060	26870	0.404	2763	
Main Floor	0	1032	0	0				
Bottom Wall	0	0	0	0	6030	0.000	0	
				53740			6835	

Width	43
Length	24
Roof Pitch F-B	4 :12 Pitch
Roof Pitch L-R	9999999 :12 Pitch

Simplified Seismic	
V	7518.0882 Eq 12.14-12
F	1.1
	1 1 story
	1.1 2 story
	1.2 3 story

Wx (lbs)	Fx (lbs)	Shear (lbs)
20840	2915	2915
26870	3759	6675
6030	844	7518

Directional

hn	22.5	V	120 mph 3 Sec Gust
G	0.85	Category	C
ke	0.8556643		
kzt	1		
kd	0.85		
kh	0.92		

Surface	Cp	L/B or h/L	z or h	kz or kh	Theta	q (psf)	p (psf)	Area (ft^2)	Force (lbs)
Top Front Wall	0.8	1.79166667	19	0.89	0.00	23.86	16.23	216	3505
Middle Front Wall	0.8	1.79166667	10	0.85	0.00	22.79	15.50	240	3719
Bottom Front Wall	0.8	1.79166667	0	0.85	0.00	22.79	15.50	0	0
Front Roof Plane	-0.06	0.52325581	22.5	0.92	18.43	24.67	-1.30	167.9999412	-219
Top Rear Wall	-0.341667	1.79166667	22.5	0.92	0.00	24.67	-7.16	216	-1547
Middle Rear Wall	-0.341667	1.79166667	22.5	0.92	0.00	24.67	-7.16	240	-1719
Bottom Rear Wall	-0.341667	1.79166667	22.5	0.92	0.00	24.67	-7.16	0	0
Rear Roof Plane	-0.570155	0.52325581	22.5	0.92	18.43	24.67	-11.95	167.9999412	-2008
Top Left Wall	0.8	0.55813953	19	0.89	0.00	23.86	16.23	387	6280
Middle Left Wall	0.8	0.55813953	10	0.85	0.00	22.79	15.50	430	6664
Bottom Left Wall	0.8	0.55813953	0	0.85	0.00	22.79	15.50	0	0
Left Roof Plane	0.80	0.9375	22.5	0.92	90.00	24.67	16.77	154	2583
Top Right Wall	-0.5	0.55813953	22.5	0.92	0.00	24.67	-10.48	387	-4057
Middle Right Wall	-0.5	0.55813953	22.5	0.92	0.00	24.67	-10.48	430	-4508
Bottom Right Wall	-0.5	0.55813953	22.5	0.92	0.00	24.67	-10.48	0	0
Right Roof Plane	-0.6	0.9375	22.5	0.92	90.00	24.67	-12.58	154	-1937

L/R Walls	Shear (lbs)
Top	4316
Middle	9561
Bottom	12280

F/B Walls	Shear (lbs)
Top	9689
Middle	20443
Bottom	26029

Simplified Wind

Case A	A	B	C	D
Ps30	30.69	0.00	20.47	0.00
Ps	40.51	0.00	27.03	0.00

Case B	A	C
Ps30	22.80	15.10
Ps	30.10	19.93

a 3 Lambda 1.32

	C&D (lbs)	C&D/2 (lbs)	A&B (lbs)	L/R Shear (lbs)		C&D (lbs)	C&D/2 (lbs)	AA&BA (lbs)	AB (lbs)	A&B (lbs)	F/B Shear (lbs)
Top	2919	1459	364	1824		6926	3463	364	137	137	3600
Middle	9081	4540	1133	5673		15069	7534	1133	427	427	7961
Bottom	12324	6162	1538	7699		19354	9677	1538	579	579	10256

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Shear Table

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
ELF	2036	2036	3417		3417	3417
Simplified S	1458	1458	3337		3759	3759
Directional	4844	2158	10221		4781	13014
Simplified W	3600	1824	7961		5673	10256

Factored Shear Table (0.6W 0.7E)

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
ELF	1425	1425	2392		2392	2392
Simplified S	1020	1020	2336		2336	2631
Directional	2907	1295	6133		2868	7809
Simplified W	2160	1094	4777		3404	6154

Factored Shear Table w/ Wind Converted to Seismic Equivalent Loading (W/1.4)

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
ELF	1425	1425	2392		2392	2392
Simplified S	1020	1020	2336		2336	2631
Directional	1038	925	2190		2049	2789
Simplified W	772	782	1706		2431	2198

Factored Shear Table w/ Wind Converted to Seismic Equivalent Loading (W/1.4)

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
ELF	1425	1425	2392		2392	2392
Simplified W	771.51407	781.527919	1705.968		2431.420193	2197.7859

Factored Shear Table w/ Wind Converted to Seismic Equivalent Loading (W/1.4)

	Top		Middle		Bottom	
	F/B	L/R	F/B	L/R	F/B	L/R
Max Load	1425	1425	2392		2431	3300



Beam Calc #1

Span (ft)	4
Plys	2
Ref. #	4

	Live Loads	Dead Loads	Units	Location	
Distributed	630	315	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.1
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	2 X 10 DF-L#2	OK

Fb	900.00 psi	Max Moment	1,890 ft lbs	Flexure Check	Ratio
Fb'	990.00 psi	Location	2.00 ft From Left	OK	0.535
Sx	42.78 In ³	Req Sx	22.91 In ³		
Fv	180.00 psi	L Reaction	1,890 lbs	Shear Check	Ratio
Fv'	180.00 psi	R Reaction	1,890 lbs	OK	0.568
Area	27.75 In ²	Max Shear	1,890 lbs		
		Req Area	15.75 In ²	Adj Shear Check	Ratio
	3.4.3.1	Adj Max Shear	1,172 lbs	OK	0.352
	(Non Hangered Loads)	Req Area	9.77 In ²		
E	1,600,000 psi	Max LL Defl.	0.011 In	LL Deflection Check	Actual L/
E'	1,600,000 psi	Location	2.00 ft From Left	OK	4188
Ix	197.86 In ⁴				
Deflection Limits		Max TL Defl.	0.017 In	TL Deflection Check	Actual L/
LL	0.133 In	Location	2.00 ft From Left	OK	2792
TL	0.200 In				



Beam Calc #2

Span (ft)	16
Plys	2
Ref. #	103

	Live Loads	Dead Loads	Units	Location	
Distributed	120	60	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.0
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	1-3/4" X 11-7/8" LVL	OK

Fb	2600.00 psi	Max Moment	5,760 ft lbs	Flexure Check	Ratio
Fb'	2600.00 psi	Location	8.00 ft From Left	OK	0.323
Sx	82.26 In ³	Req Sx	26.58 In ³		
Fv	285.00 psi	L Reaction	1,440 lbs	Shear Check	Ratio
Fv'	285.00 psi	R Reaction	1,440 lbs	OK	0.182
Area	41.56 In ²	Max Shear	1,440 lbs		
		Req Area	7.58 In ²	Adj Shear Check	Ratio
	3.4.3.1	Adj Max Shear	1,267 lbs	OK	0.160
	(Non Hangered Loads)	Req Area	6.67 In ²		
E	1,900,000 psi	Max LL Defl.	0.191 In	LL Deflection Check	Actual L/
E'	1,900,000 psi	Location	8.00 ft From Left	OK	1007
Ix	488.41 In ⁴				
Deflection Limits		Max TL Defl.	0.286 In	TL Deflection Check	Actual L/
LL	0.533 In	Location	8.00 ft From Left	OK	671
TL	0.800 In				

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Beam Calc #3

Span (ft)	18.7
Plys	2
Ref. #	103

	Live Loads	Dead Loads	Units	Location	
Distributed	120	140	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.0
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	1-3/4" X 11-7/8" LVL	OK

Fb	2600.00 psi	Max Moment	11,365 ft lbs	Flexure Check	Ratio
Fb'	2600.00 psi	Location	9.35 ft From Left	OK	0.638
Sx	82.26 In ³	Req Sx	52.45 In ³		
Fv	285.00 psi	L Reaction	2,431 lbs	Shear Check	Ratio
Fv'	285.00 psi	R Reaction	2,431 lbs	OK	0.308
Area	41.56 In ²	Max Shear	2,431 lbs		
		Req Area	12.79 In ²	Adj Shear Check	Ratio
	3.4.3.1	Adj Max Shear	2,188 lbs	OK	0.277
	(Non Hangered Loads)	Req Area	11.52 In ²		
E	1,900,000 psi	Max LL Defl.	0.356 In	LL Deflection Check	Actual L/
E'	1,900,000 psi	Location	9.35 ft From Left	OK	631
Ix	488.41 In ⁴				
Deflection Limits		Max TL Defl.	0.771 In	TL Deflection Check	Actual L/
LL	0.623 In	Location	9.35 ft From Left	OK	291
TL	0.935 In				

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Beam Calc #4

Span (ft)	4
Plys	2
Ref. #	4

	Live Loads	Dead Loads	Units	Location	
Distributed	400	230	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.1
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	2 X 10 DF-L#2	OK

Fb	900.00 psi	Max Moment	1,260 ft lbs	Flexure Check	Ratio
Fb'	990.00 psi	Location	2.00 ft From Left	OK	0.357
Sx	42.78 In ³	Req Sx	15.27 In ³		
Fv	180.00 psi	L Reaction	1,260 lbs	Shear Check	Ratio
Fv'	180.00 psi	R Reaction	1,260 lbs	OK	0.378
Area	27.75 In ²	Max Shear	1,260 lbs		
		Req Area	10.50 In ²	Adj Shear Check	Ratio
	3.4.3.1	Adj Max Shear	781 lbs	OK	0.235
	(Non Hangered Loads)	Req Area	6.51 In ²		
E	1,600,000 psi	Max LL Defl.	0.007 In	LL Deflection Check	Actual L/
E'	1,600,000 psi	Location	2.00 ft From Left	OK	6595
Ix	197.86 In ⁴				
Deflection Limits		Max TL Defl.	0.011 In	TL Deflection Check	Actual L/
LL	0.133 In	Location	2.00 ft From Left	OK	4188
TL	0.200 In				



Beam Calc #5

Span (ft)	3
Plys	2
Ref. #	3

	Live Loads	Dead Loads	Units	Location	
Distributed	400	150	plf		
Triangular	0	0	Max plf	Max @ Right	
Triangular	0	0	Max plf	Centered	
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left
Point Load	0	0	lbs	0	ft From Left

Deflection Limits

Live load	L/	360
Total Load	L/	240

Factors	
CD	1.0
CM	1.0
Ct	1.0
CL	1.0
CF	1.2
Cfu	1.0
Ci	1.0
Cr	1.0
CV	1.0
Cc	1.0
CI	1.0
CVR	1.0

Type	#	Size	Design
	2	2 X 8 DF-L#2	OK

Fb	900.00 psi	Max Moment	619 ft lbs	Flexure Check	Ratio
Fb'	1080.00 psi	Location	1.50 ft From Left	OK	0.262
Sx	26.28 In ³	Req Sx	6.88 In ³		
Fv	180.00 psi	L Reaction	825 lbs	Shear Check	Ratio
Fv'	180.00 psi	R Reaction	825 lbs	OK	0.316
Area	21.75 In ²	Max Shear	825 lbs		
		Req Area	6.88 In ²	Adj Shear Check	Ratio
		Req Max Shear	495 lbs	OK	0.190
		Req Area	4.13 In ²		
		(Non Hangered Loads)			
E	1,600,000 psi	Max LL Defl.	0.005 In	LL Deflection Check	Actual L/
E'	1,600,000 psi	Location	1.50 ft From Left	OK	7527
Ix	95.27 In ⁴				
Deflection Limits		Max TL Defl.	0.007 In	TL Deflection Check	Actual L/
LL	0.100 In	Location	1.50 ft From Left	OK	5475
TL	0.150 In				