

L2 ENGINEERS

17848 NE 198th Place
Woodinville, WA 98072



Structural Calculations

Hu Residence

2448 – 72nd Ave SE
Mercer Island, WA

Project # 22-052

June 15, 2022



06/23/2022

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Loads and Design Criteria



Roof Dead Load	Weight (psf)	
Composition Shingles & Felt Underlay	3.30	
5/8" Plywood	1.70	
Roof Rafters/Trusses	5.50	
Insulation	1.00	
R49 Batt Insulation - Assume 16"	0.62	
Miscellaneous	1.5	
	<hr/>	
	13.62	15 psf

Floor Assembly Weight	Weight (psf)	
Hardwood	4.00	
23/32" Plywood	2.40	
Floor Joists	5.50	
Insulation	1.00	
Miscellaneous	1.6	
	<hr/>	
	14.50	15 psf

Exterior Wall Assembly	Weight (psf)	
5/8" DensGlass	2.50	
15/32 Plywood	1.70	
2x6 Studs @ 16" OC	1.70	
Batt Insulation	0.25	
5/8" gypsum board	2.75	
	<hr/>	
	8.90	

Interior Wall Assembly	Weight (psf)	
5/8" Gypsum Wall Board	2.75	
2x4 Studs @ 16" OC	1.70	
5/8" Gypsum Wall Board	2.75	
	<hr/>	
	7.20	

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Gravity Analysis

HU ROOF

AG01
S101
S102
S103

4500

ROOF DECK
BELOW
LL=60PSF

RBI l=10'

RI l=14'

PRB2
D 1.152
Lr 1.18
S 1.6

RB2
l=8'

D 2.1
Lr 2.44
S 3.05
l=27.1'
14.6

D .96
Lr 1.1
S 1.41

D 1.14
Lr 1.34
S 1.64

ROOF DECK
LL=60PSF

GIRDER TRUSS

PRG1
D 2.1
Lr 2.44
S 3.05

GIRDER TRUSS

PRG1
D 2.1
Lr 2.44
S 3.05

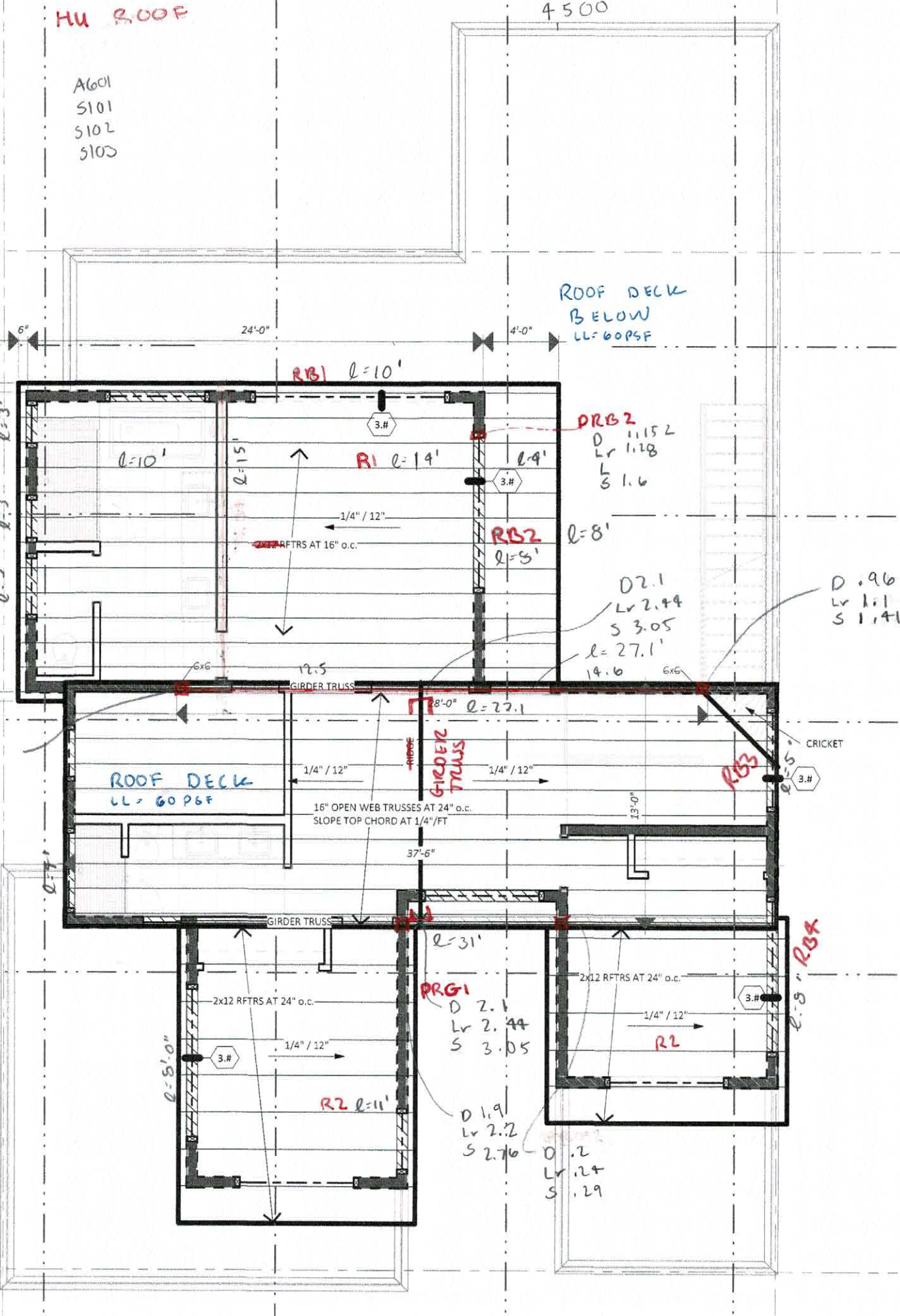
R2 l=11'

D 1.9
Lr 2.2
S 2.76

D .2
Lr .24
S .29

R3
l=5'

R4
l=5'



HU 2ND

P2B17
D .97
Lr 3.23
L 1.55

2.#

2B17 e=11.5'

2B17 e=19.2

18" OPEN WEB FLR TRUSSES AT 16" O.C.

1/4" / 12" (TOP CHORD)

P2B2.1
D 4.98
Lr 1.45
L 8.64
S 2.44

18" OPEN WEB FLR TRUSSES AT 16" O.C.

ROOF DECK
e=15.16'

18" OPEN WEB FLR TRUSSES AT 16" O.C.

1/4" / 12" (TOP CHORD)

D 4.55
Lr 3.05
L 5.35
S 3.81

D .538
Lr .209
L .942
S .259

P2B8.2

RE
D .96
Lr 1.1
S 1.41

2B5
D .402
L 1.382

2B8
D 1.177
Lr .89
L 2.59
S 1.11

2B15 e

2B16

ROOF DECK
1/4" / 12" (TOP CHORD)
e=21.2'

2B1

e=19.75'

P2B1.2
D 4.11
Lr 2.6
L 1.34
S 3.25

P2B2.2
D 2.26
Lr .91
L 4.38
S 1.01

D 1.43
Lr .04
L .15
S .05

P2B7.1
D 3.89
Lr 2.67
L 6.34
S 3.34

P2B7.2
D 1.14
Lr .34
L .04
S .11

P2B8.1
D 1.14
Lr .34
L .04
S .11

2B7

2B8

D 2.5
Lr 1.858
L 3.49
S 2.247

e=2.25'

D 1.17
L 2.57

P2B8.1

2B7
D 1.22
Lr .66
L 2.66
S .07

2B8
D 4.76
Lr 2.37
L 6.92
S 2.96

2B9

2B3

D 1.866
Lr .819
L 2.50
S 1.024

D .721
Lr .429
L .718
S .536

D .2
Lr .24
S .29

18" OPEN WEB FLR TRUSSES AT 16" O.C.

1/4" / 12" (TOP CHORD)

2B10 e=15.33

V=3.052
D .17
Lr .17
L .16
S .11

e=15.6'

2B13 e=9'

2B14

18" OPEN WEB FLR TRUSSES AT 16" O.C.

1/4" / 12" (TOP CHORD)

P2B12.1
D 3.33
Lr .52
L 7.59
S .65

ROOF DECK

2B12 e=20.25'

D 2.71
Lr .44
L 5.71
S .55

ROOF DECK

2B18

2B19

D 1.42
Lr .14
L .58



Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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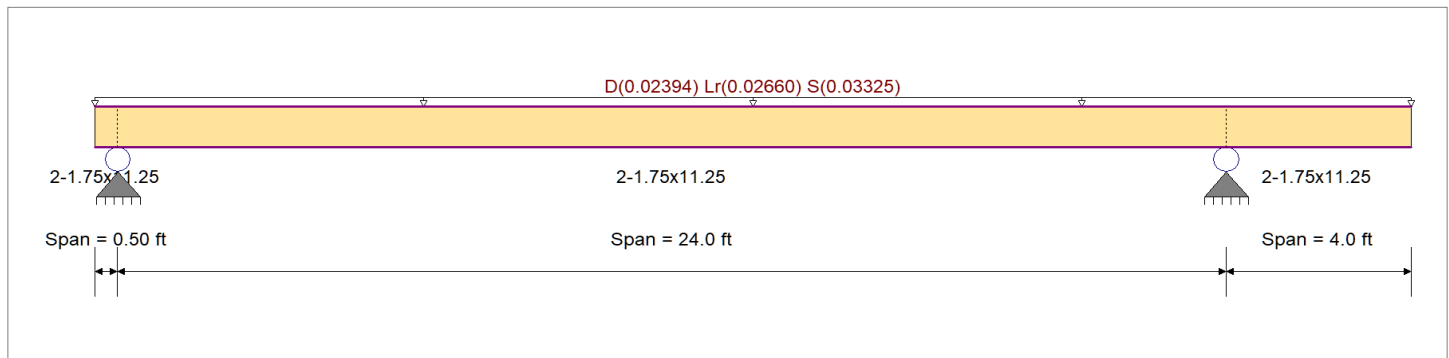
DESCRIPTION: R1

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2600 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	2600 psi	Ebend- xx	1900 ksi
	Fc - Prll	2510 psi	Eminbend - xx	965.71 ksi
Wood Species : iLevel Truss Joist	Fc - Perp	750 psi		
Wood Grade : MicroLam LVL 1.9 E	Fv	285 psi		
	Ft	1555 psi	Density	42.01 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added
Loads on all spans...

Uniform Load on ALL spans : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 1.330 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.211 : 1	Maximum Shear Stress Ratio	=	0.077 : 1
Section used for this span		2-1.75x11.25	Section used for this span		2-1.75x11.25
fb: Actual	=	632.02psi	fv: Actual	=	25.10 psi
Fb: Allowable	=	2,990.00psi	Fv: Allowable	=	327.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	11.697ft	Location of maximum on span	=	23.193ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 2
Maximum Deflection					
Max Downward Transient Deflection	0.297 in	Ratio = 968 >=360	Span: 2 : S Only		
Max Upward Transient Deflection	-0.020 in	Ratio = 606 >=360	Span: 3 : S Only		
Max Downward Total Deflection	0.511 in	Ratio = 563 >=240	Span: 2 : +D+S		
Max Upward Total Deflection	-0.034 in	Ratio = 352 >=240	Span: 3 : +D+S		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0000	0.000	+D+S	-0.0340	0.000
	2	0.5114	11.899		0.0000	0.000
	3	0.0000	11.899	+D+S	-0.2523	4.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum		0.696	0.934	
Overall MINimum		0.405	0.543	
D Only		0.291	0.391	
+D+Lr		0.615	0.825	
+D+S		0.696	0.934	
+D+0.750Lr		0.534	0.717	
+D+0.750S		0.595	0.798	



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Design & Planning
17848 NE 198th Place

Wood Beam

Project File: Hu Residence.ec6

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DESCRIPTION: R1

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
+0.60D		0.175	0.235	
Lr Only		0.324	0.434	
S Only		0.405	0.543	



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Wood Beam

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DESCRIPTION: R2

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0667	5.540		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.315	0.315
Overall MINimum	0.183	0.183
D Only	0.132	0.132
+D+Lr	0.279	0.279
+D+S	0.315	0.315
+D+0.750Lr	0.242	0.242
+D+0.750S	0.269	0.269
+0.60D	0.079	0.079
Lr Only	0.147	0.147
S Only	0.183	0.183

Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: RB1

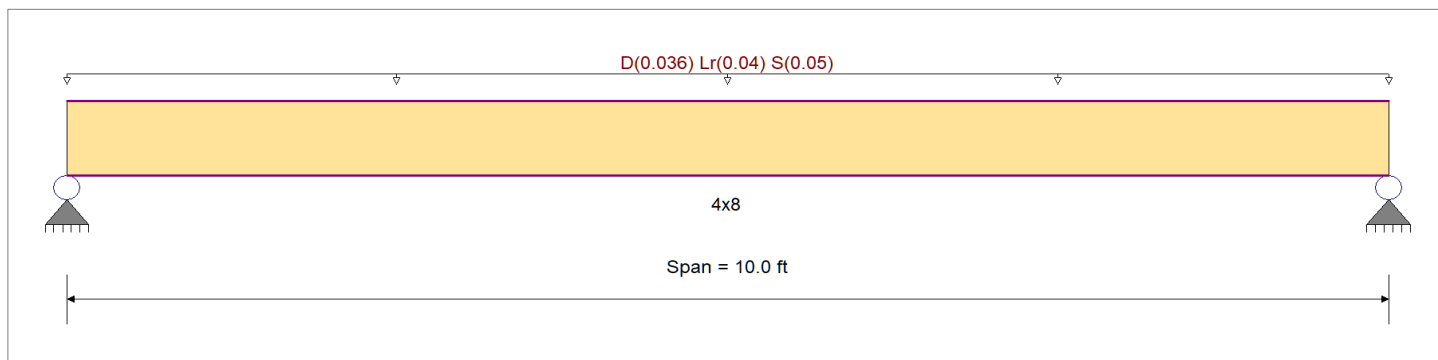
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 2.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.313 < 1	Maximum Shear Stress Ratio	=	0.108 < 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	420.72psi	fv: Actual	=	22.45 psi
Fb: Allowable	=	1,345.50psi	Fv: Allowable	=	207.00 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	5.000ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.064 in	Ratio = 1885 >=360	Span: 1 : S Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.109 in	Ratio = 1096 >=240	Span: 1 : +D+S		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.1094	5.036		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.430	0.430
Overall MINimum	0.250	0.250
D Only	0.180	0.180
+D+Lr	0.380	0.380
+D+S	0.430	0.430
+D+0.750Lr	0.330	0.330
+D+0.750S	0.368	0.368
+0.60D	0.108	0.108
Lr Only	0.200	0.200
S Only	0.250	0.250



Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: RB2

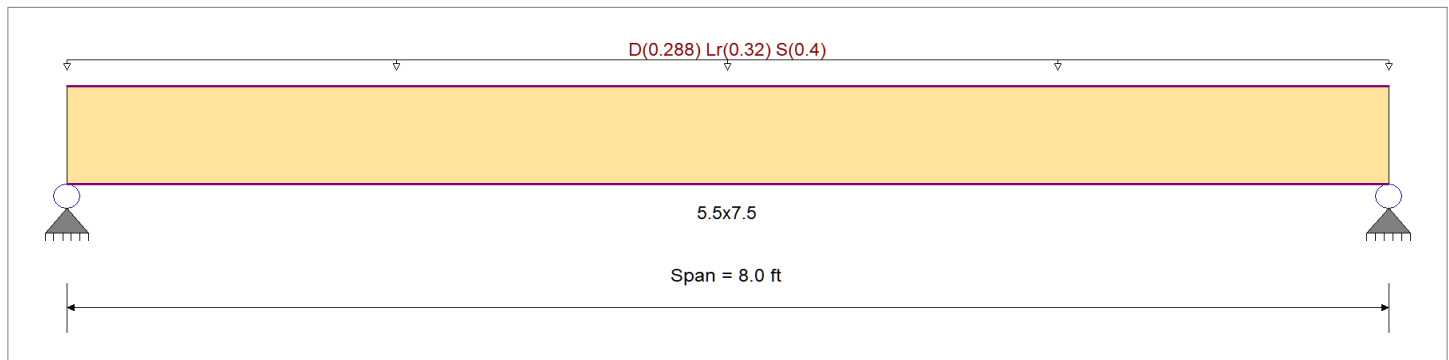
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2400 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1850 psi	Ebend- xx	1800ksi
	Fc - Prll	1650 psi	Eminbend - xx	950ksi
Wood Species : DF/DF	Fc - Perp	650 psi	Ebend- yy	1600ksi
Wood Grade : 24F-V4	Fv	265 psi	Eminbend - yy	850ksi
	Ft	1100 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 16.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.464 : 1	Maximum Shear Stress Ratio	=	0.278 : 1
Section used for this span		5.5x7.5	Section used for this span		5.5x7.5
fb: Actual	=	1,280.93psi	fv: Actual	=	84.73 psi
Fb: Allowable	=	2,760.00psi	Fv: Allowable	=	304.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	4.000ft	Location of maximum on span	=	7.387 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.107 in Ratio = 901 >=360	Span: 1 : S Only		
Max Upward Transient Deflection		0 in Ratio = 0 <360	n/a		
Max Downward Total Deflection		0.183 in Ratio = 523 >=240	Span: 1 : +D+S		
Max Upward Total Deflection		0 in Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.1832	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.752	2.752
Overall MINimum	1.600	1.600
D Only	1.152	1.152
+D+Lr	2.432	2.432
+D+S	2.752	2.752
+D+0.750Lr	2.112	2.112
+D+0.750S	2.352	2.352
+0.60D	0.691	0.691
Lr Only	1.280	1.280
S Only	1.600	1.600



Wood Column

DESCRIPTION: PRB2

Maximum Reactions

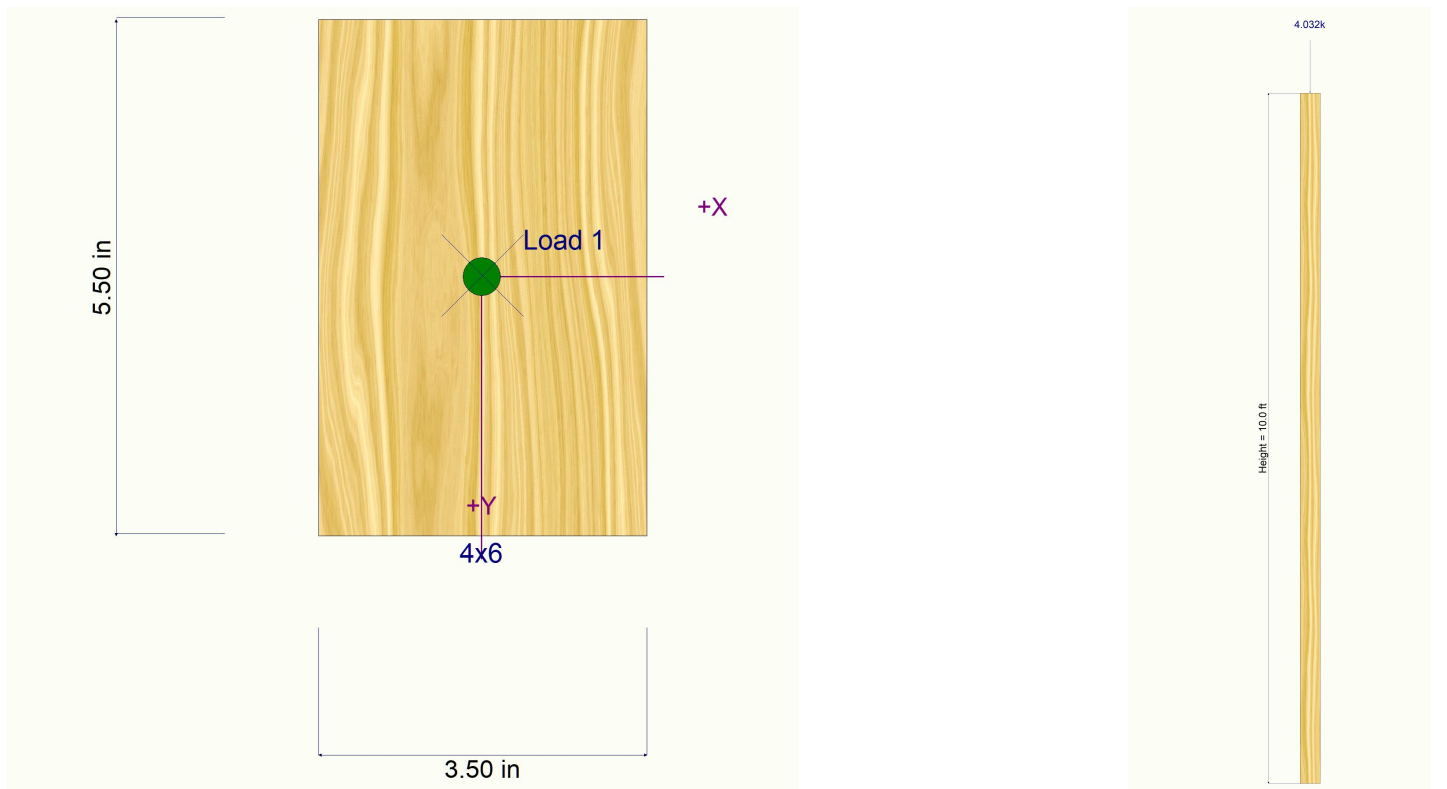
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+D+Lr						2.474				
+D+S						2.794				
+D+0.750Lr						2.154				
+D+0.750S						2.394				
+0.60D						0.716				
Lr Only						1.280				
S Only						1.600				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Max. Y-Y Deflection	
	Distance	Distance	Distance	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft

Sketches





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Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: RB3

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0325	2.518		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.021	1.021
Overall MINimum	0.594	0.594
D Only	0.428	0.428
+D+Lr	0.903	0.903
+D+S	1.021	1.021
+D+0.750Lr	0.784	0.784
+D+0.750S	0.873	0.873
+0.60D	0.257	0.257
Lr Only	0.475	0.475
S Only	0.594	0.594

Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: RB4

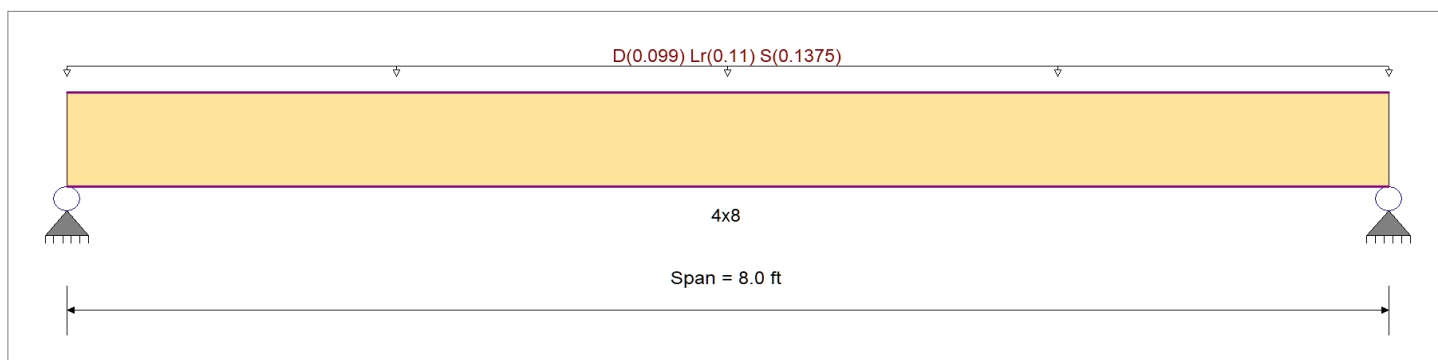
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	<i>E : Modulus of Elasticity</i>
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx 1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx 580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi	
Wood Grade : No.2	Fv	180.0 psi	
	Ft	575.0 psi	Density 31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 5.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.550 : 1	Maximum Shear Stress Ratio	=	0.231 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	740.47 psi	fv: Actual	=	47.76 psi
Fb: Allowable	=	1,345.50 psi	Fv: Allowable	=	207.00 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	4.000ft	Location of maximum on span	=	7.416 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.072 in	Ratio = 1339 >=360	Span: 1 : S Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.123 in	Ratio = 778 >=240	Span: 1 : +D+S		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.1233	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.946	0.946
Overall MINimum	0.550	0.550
D Only	0.396	0.396
+D+Lr	0.836	0.836
+D+S	0.946	0.946
+D+0.750Lr	0.726	0.726
+D+0.750S	0.809	0.809
+0.60D	0.238	0.238
Lr Only	0.440	0.440
S Only	0.550	0.550



Wood Column

DESCRIPTION: PRG1

Maximum Reactions

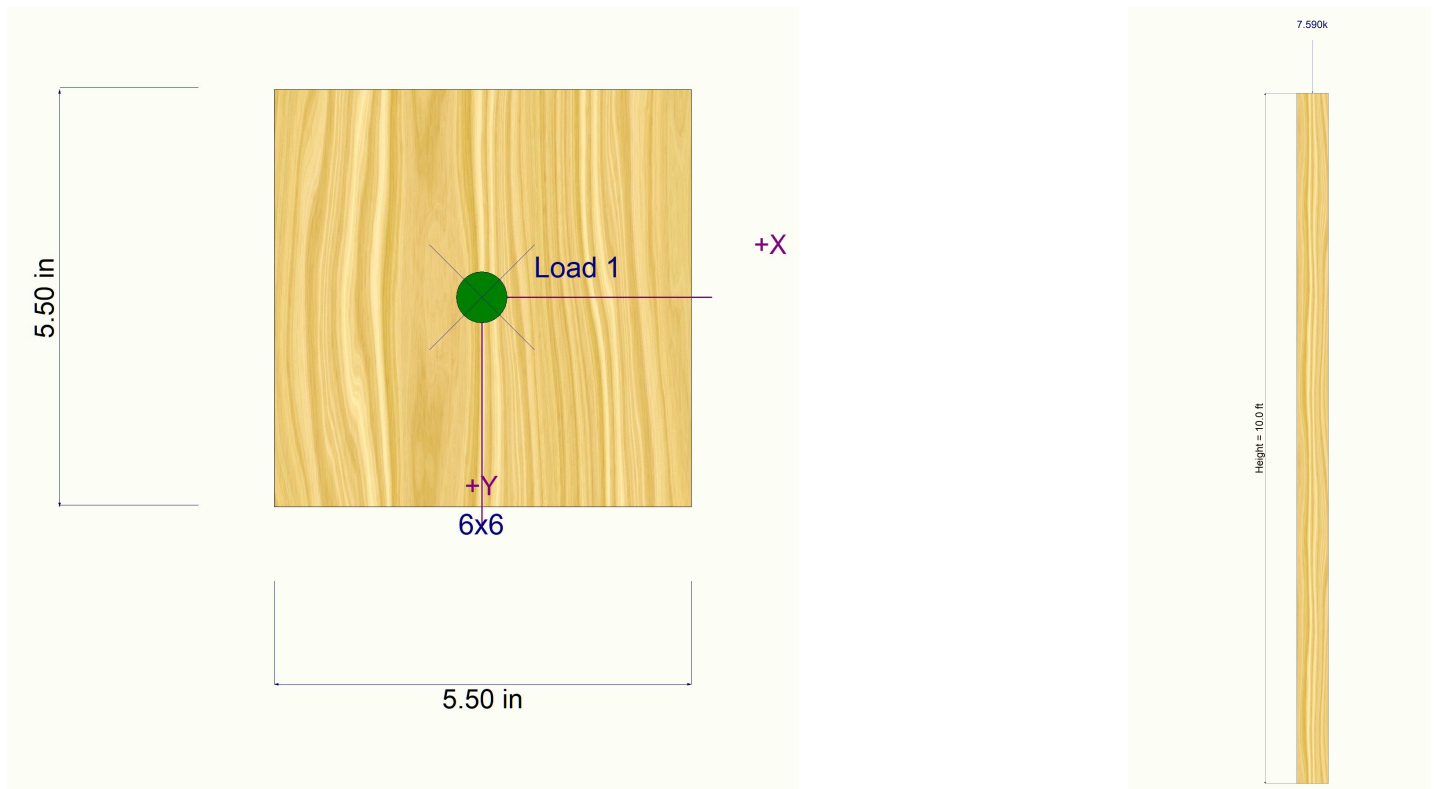
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+D+Lr						4.606				
+D+S						5.216				
+D+0.750Lr						3.996				
+D+0.750S						4.453				
+0.60D						1.299				
Lr Only						2.440				
S Only						3.050				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Max. Y-Y Deflection	Distance	
	Distance	Distance		Distance	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft	0.000 ft
+D+0.750Lr	0.000 in	0.000ft	0.000 in	0.000 ft	0.000 ft
+D+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft	0.000 ft

Sketches





Wood Beam

DESCRIPTION: 2B1

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

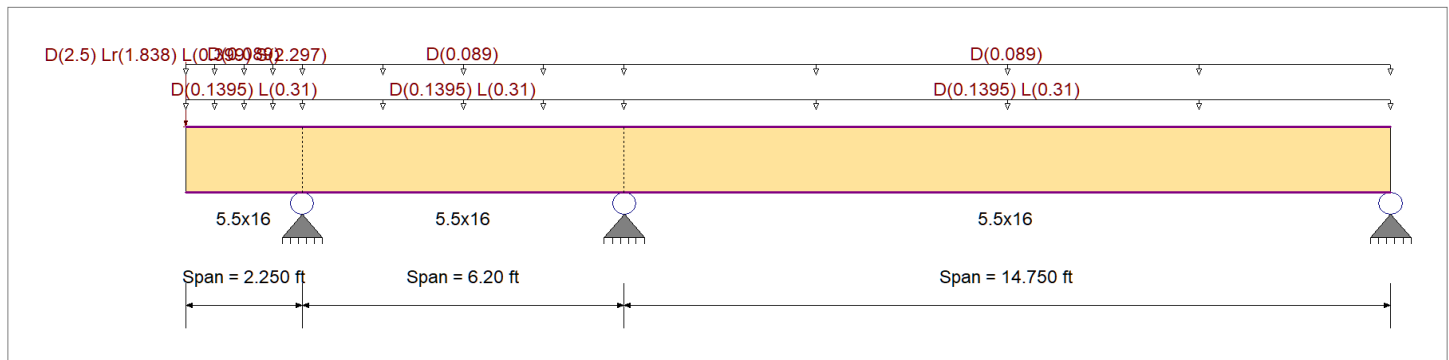
Material Properties

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

Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Fv	265.0 psi	Eminbend - yy	850.0ksi
Ft	1,100.0 psi	Density	31.210pcf



Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

- Point Load : D = 2.50, Lr = 1.838, L = 0.3990, S = 2.297 k @ 0.0 ft, (Roof)
- Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 7.750 ft, (Floor)
- Uniform Load : D = 0.0890, Tributary Width = 1.0 ft, (Wall)

Load for Span Number 2

- Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 7.750 ft, (Floor)
- Uniform Load : D = 0.0890, Tributary Width = 1.0 ft, (Wall)

Load for Span Number 3

- Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 7.750 ft, (Floor)
- Uniform Load : D = 0.0890, Tributary Width = 1.0 ft, (Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.274 : 1	Maximum Shear Stress Ratio	=	0.288 : 1
Section used for this span		5.5x16	Section used for this span		5.5x16
fb: Actual	=	506.74psi	fv: Actual	=	87.63 psi
Fb: Allowable	=	1,850.00psi	Fv: Allowable	=	304.75 psi
Load Combination		+D+L	Load Combination		+D+0.750L+0.750S
Location of maximum on span	=	6.200ft	Location of maximum on span	=	1.342 ft
Span # where maximum occurs	=	Span # 2	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.056 in Ratio = 3154 >=360	Span: 3 : L Only		
Max Upward Transient Deflection		-0.007 in Ratio = 10993 >=360	Span: 2 : L Only		
Max Downward Total Deflection		0.041 in Ratio = 1330 >=240	Span: 3 : +D+L		
Max Upward Total Deflection		-0.019 in Ratio = 3840 >=240	Span: 2 : +D+0.750L+0.750S		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.0406	0.000		0.0000	0.000
	2	0.0000	0.000	+D+0.750L+0.750S	-0.0194	3.022
+D+L	3	0.1025	8.057		0.0000	3.022



L2 Engineers LLC
Design & Planning
17848 NE 198th Place

Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B1

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum		7.559	6.639	3.300
Overall MINimum		3.254	-1.009	0.052
D Only		4.113	2.259	1.429
+D+L		5.454	6.639	3.300
+D+Lr		6.717	1.452	1.470
+D+S		7.367	1.251	1.481
+D+0.750Lr+0.750L		7.071	4.939	2.863
+D+0.750L+0.750S		7.559	4.788	2.871
+0.60D		2.468	1.356	0.857
Lr Only		2.604	-0.807	0.041
L Only		1.341	4.380	1.871
S Only		3.254	-1.009	0.052

Wood Column

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: P2B1.2

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Analysis Method	Allowable Stress Design			Wood Section Name	6x6
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber
Overall Column Height	10 ft			Wood Member Type	Sawn
<i>(Used for non-slender calculations)</i>					
Wood Species	Douglas Fir-Larch			Exact Width	5.50 in
Wood Grade	No.2			Exact Depth	5.50 in
Fb +	750.0 psi	Fv	170.0 psi	Area	30.250 in ²
Fb -	750.0 psi	Ft	475.0 psi	Ix	76.255 in ⁴
Fc - Prll	700.0 psi	Density	31.210 pcf	Iy	76.255 in ⁴
Fc - Perp	625.0 psi			Allow Stress Modification Factors	
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	Cf or Cv for Bending 1.0	
	Basic	1,300.0	1,300.0	1,300.0 ksi	Cf or Cv for Compression 1.0
	Minimum	470.0	470.0		Cf or Cv for Tension 1.0
					Cm : Wet Use Factor 1.0
					Ct : Temperature Fact 1.0
					Cfu : Flat Use Factor 1.0
					Kf : Built-up columns 1.0 <i>NDS 15.3.2</i>
					Use Cr : Repetitive ? No

Brace condition for deflection (buckling) along columns :
X-X (width) axis : Unbraced Length for buckling ABOUT Y-Y Axis = 10
Y-Y (depth) axis : Unbraced Length for buckling ABOUT X-X Axis = 10

Applied Loads

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

Column self weight included : 65.563 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 10.0 ft, D = 4.110, Lr = 2.60, L = 1.340, S = 3.250 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.4509 : 1**
Load Combination +D+0.750L+0.750S
Governing NDS Formula Comp Only, f_c/F_c'
Location of max.above base 0.0 ft
At maximum location values are .
Applied Axial 7.618 k
Applied Mx 0.0 k-ft
Applied My 0.0 k-ft
Fc : Allowable 558.50 psi

Maximum SERVICE Lateral Load Reactions . .
Top along Y-Y 0.0 k Bottom along Y-Y 0.0 k
Top along X-X 0.0 k Bottom along X-X 0.0 k

Maximum SERVICE Load Lateral Deflections . . .
Along Y-Y 0.0 in at 0.0 ft above base
for load combination : n/a
Along X-X 0.0 in at 0.0 ft above base
for load combination : n/a

PASS Maximum Shear Stress Ratio = **0.0 : 1**
Load Combination +0.60D
Location of max.above base 10.0 ft
Applied Design Shear 0.0 psi
Allowable Shear 272.0 psi

Other Factors used to calculate allowable stresses . . .
Bending Compression Tension

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
D Only	0.900	0.771	0.2843	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+L	1.000	0.740	0.3522	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+Lr	1.250	0.664	0.3853	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+S	1.150	0.694	0.4395	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750Lr+0.750L	1.250	0.664	0.4055	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L+0.750S	1.150	0.694	0.4509	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.60D	1.600	0.572	0.1293	PASS	0.0 ft	0.0	PASS	10.0 ft



Wood Column

DESCRIPTION: P2B1.2

Maximum Reactions

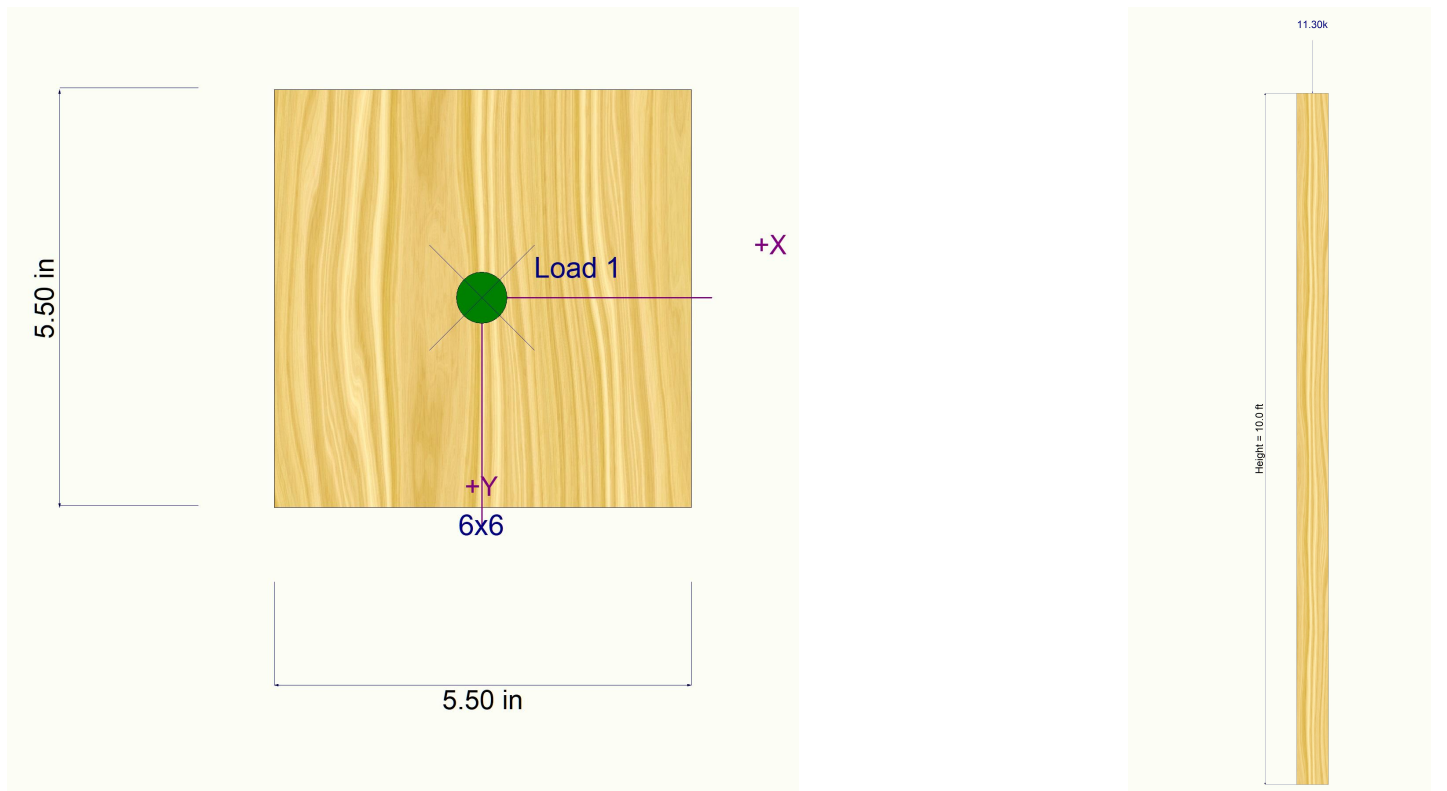
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						4.176				
+D+L						5.516				
+D+Lr						6.776				
+D+S						7.426				
+D+0.750Lr+0.750L						7.131				
+D+0.750L+0.750S						7.618				
+0.60D						2.505				
Lr Only						2.600				
L Only						1.340				
S Only						3.250				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft
L Only	0.000 in	0.000ft	0.000 in	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft

Sketches



Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: 2B2

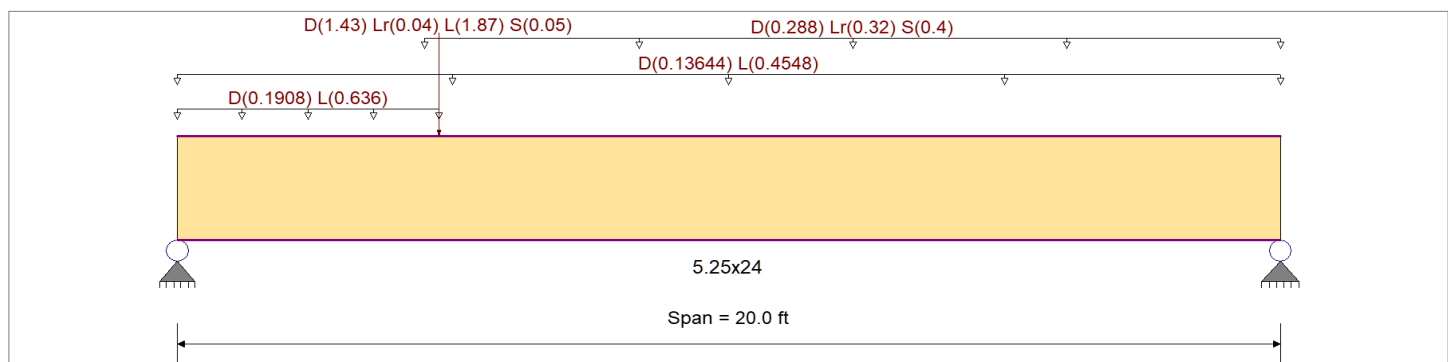
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,900.0 psi	E : Modulus of Elasticity
Load Combination : ASCE 7-16	Fb -	2,900.0 psi	Ebend- xx
	Fc - Prll	2,900.0 psi	Eminbend - xx
Wood Species : iLevel Truss Joist	Fc - Perp	750.0 psi	
Wood Grade : Parallam PSL 2.2E	Fv	290.0 psi	Density
	Ft	2,025.0 psi	45.070pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			



Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Uniform Load : D = 0.0180, L = 0.060 ksf, Extent = 0.0 --> 4.750 ft, Tributary Width = 10.60 ft, (Roof Deck)

Uniform Load : D = 0.0180, L = 0.060 ksf, Tributary Width = 7.580 ft, (Roof Deck)

Point Load : D = 1.430, Lr = 0.040, L = 1.870, S = 0.050 k @ 4.750 ft

Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Extent = 4.50 --> 20.0 ft, Tributary Width = 16.0 ft, (Roof)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.457 : 1	Maximum Shear Stress Ratio	=	0.444 : 1
Section used for this span		5.25x24	Section used for this span		5.25x24
fb: Actual	=	1,326.16psi	fv: Actual	=	128.87 psi
Fb: Allowable	=	2,900.00psi	Fv: Allowable	=	290.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	8.759ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1

Maximum Deflection

Max Downward Transient Deflection	0.173 in	Ratio =	1383 >=360	Span: 1 : L Only
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection	0.336 in	Ratio =	713 >=240	Span: 1 : +D+0.750L+0.750S
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.3362	9.854		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	13.619	11.416
Overall MINimum	2.441	3.809
D Only	4.983	4.546
+D+L	13.619	9.897
+D+Lr	6.936	7.593
+D+S	7.424	8.355



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Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: 2B2

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750Lr+0.750L	12.925	10.845
+D+0.750L+0.750S	13.291	11.416
+0.60D	2.990	2.728
Lr Only	1.953	3.048
L Only	8.636	5.351
S Only	2.441	3.809



Wood Column

DESCRIPTION: P2B2.1

Maximum Reactions

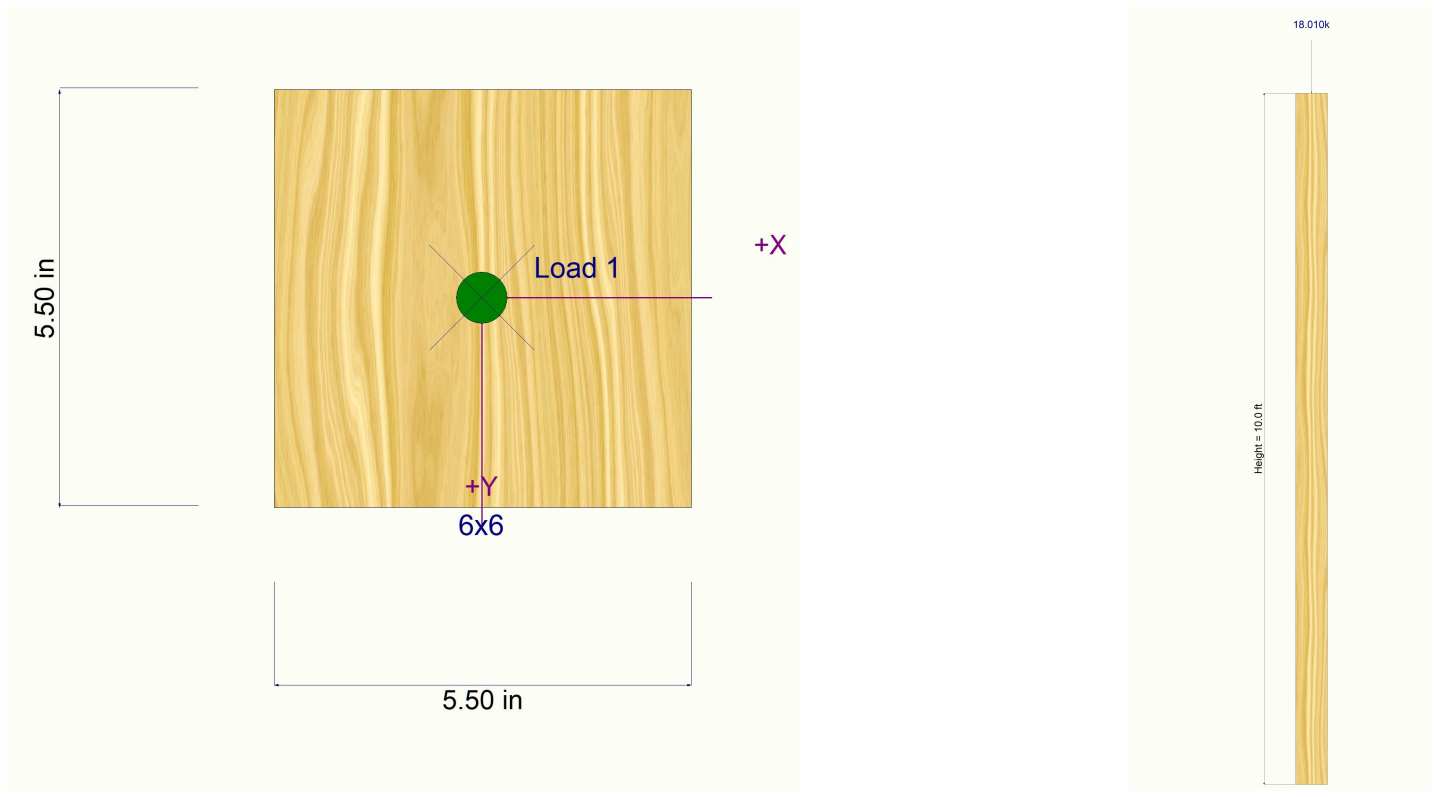
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						5.046				
+D+L						13.686				
+D+Lr						6.996				
+D+S						7.486				
+D+0.750Lr+0.750L						12.988				
+D+0.750L+0.750S						13.356				
+0.60D						3.027				
Lr Only						1.950				
L Only						8.640				
S Only						2.440				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft
L Only	0.000 in	0.000ft	0.000 in	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft

Sketches





Wood Beam

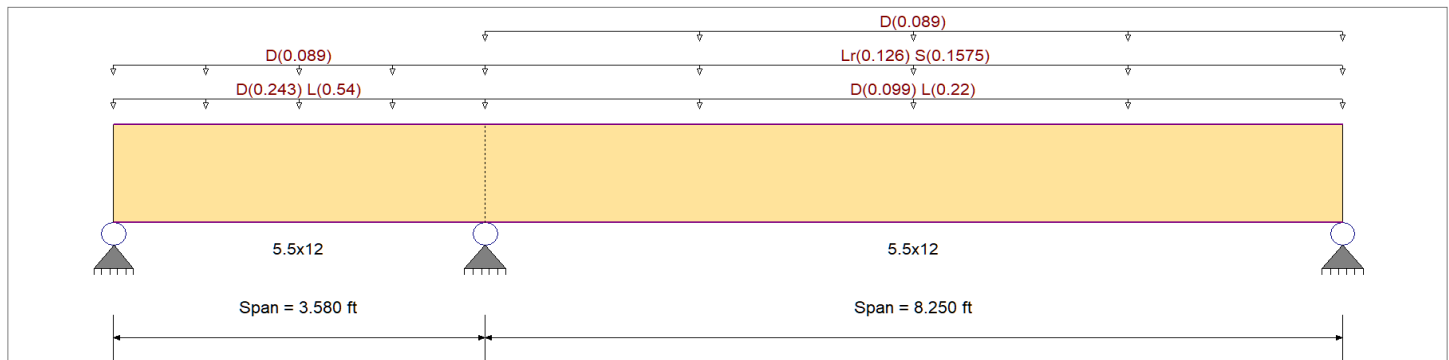
DESCRIPTION: 2B3

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
	Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 13.50 ft

Uniform Load : D = 0.0890, Tributary Width = 1.0 ft, (Wall)

Load for Span Number 2

Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 5.50 ft, (Floor)

Uniform Load : Lr = 0.020, S = 0.0250 ksf, Tributary Width = 6.30 ft, (Roof)

Uniform Load : D = 0.0890, Tributary Width = 1.0 ft, (Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.140 1	Maximum Shear Stress Ratio	=	0.140 : 1
Section used for this span		5.5x12	Section used for this span		5.5x12
fb: Actual	=	258.50psi	fv: Actual	=	37.11 psi
Fb: Allowable	=	1,850.00psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	3.580ft	Location of maximum on span	=	3.580 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.008 in Ratio = 12093 >=360	Span: 2 : L Only		
Max Upward Transient Deflection		0 in Ratio = 0 <360	n/a		
Max Downward Total Deflection		0.019 in Ratio = 5338 >=240	Span: 2 : +D+0.750L+0.750S		
Max Upward Total Deflection		-0.001 in Ratio = 30870 >=240	Span: 1 : +D+S		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
	1	0.0000	0.000	+D+S	-0.0014	2.260
+D+0.750L+0.750S	2	0.0185	4.563		0.0000	2.260

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	0.767	4.525	1.561
Overall MINimum	-0.261	1.024	0.536
D Only	0.238	1.881	0.621



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Wood Beam

Project File: Hu Residence.ec6

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DESCRIPTION: 2B3

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
+D+L	0.767	4.383	1.338
+D+Lr	0.029	2.700	1.050
+D+S	-0.023	2.905	1.157
+D+0.750Lr+0.750L	0.478	4.372	1.481
+D+0.750L+0.750S	0.439	4.525	1.561
+0.60D	0.143	1.129	0.372
Lr Only	-0.209	0.819	0.429
L Only	0.529	2.502	0.718
S Only	-0.261	1.024	0.536



Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: 2B4

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

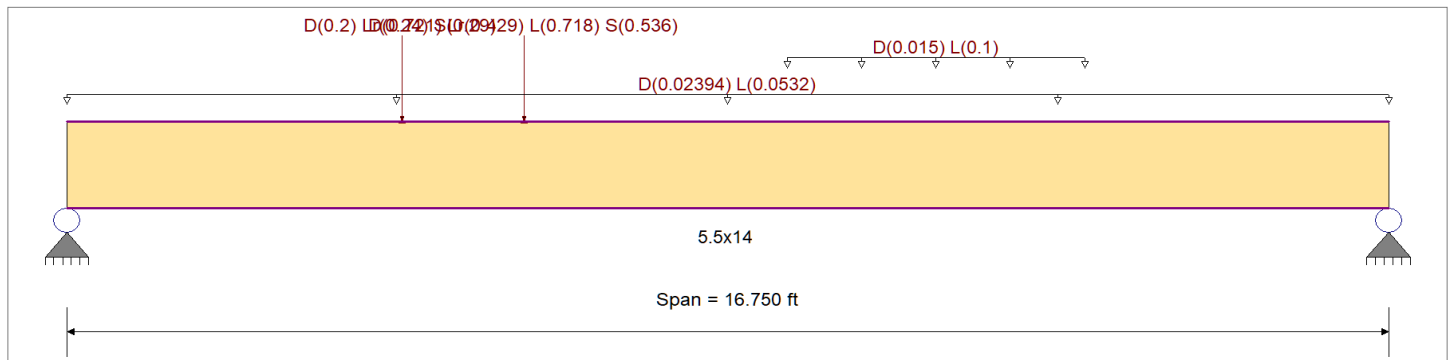
Material Properties

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

Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Fv	265.0 psi	Eminbend - yy	850.0ksi
Ft	1,100.0 psi	Density	31.210pcf



Applied Loads

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

Beam self weight NOT internally calculated and added

- Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 1.330 ft, (Floor)
- Point Load : D = 0.7210, Lr = 0.4290, L = 0.7180, S = 0.5360 k @ 5.80 ft, (2B3)
- Point Load : D = 0.20, Lr = 0.240, S = 0.290 k @ 4.250 ft, (Roof Girder Truss)
- Uniform Load : D = 0.0150, L = 0.10 k/ft, Extent = 9.130 --> 12.90 ft, Tributary Width = 1.0 ft, (Stairs)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.259 < 1	Maximum Shear Stress Ratio	=	0.132 < 1
Section used for this span		5.5x14	Section used for this span		5.5x14
fb: Actual	=	622.54psi	fv: Actual	=	34.96 psi
Fb: Allowable	=	2,400.00psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	5.807ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.113 in	Ratio = 1777	>=360	Span: 1 : L Only	
Max Upward Transient Deflection	0 in	Ratio = 0	<360	n/a	
Max Downward Total Deflection	0.203 in	Ratio = 988	>=240	Span: 1 : +D+0.750L+0.750S	
Max Upward Total Deflection	0 in	Ratio = 0	<240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.2034	8.008		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.049	1.480
Overall MINimum	0.567	0.259
D Only	0.840	0.538
+D+L	1.884	1.480
+D+Lr	1.300	0.748
+D+S	1.407	0.797
+D+0.750Lr+0.750L	1.968	1.402



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17848 NE 198th Place

Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: 2B4

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L+0.750S	2.049	1.439
+0.60D	0.504	0.323
Lr Only	0.460	0.209
L Only	1.044	0.942
S Only	0.567	0.259



Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: S1

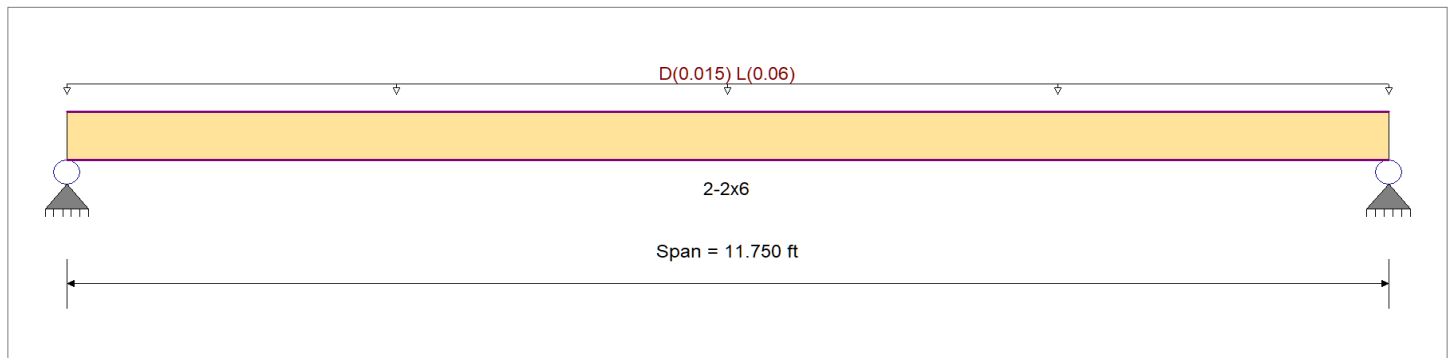
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900 psi	Ebend- xx	1600ksi
	Fc - Prll	1350 psi	Eminbend - xx	580ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625 psi		
Wood Grade : No.2	Fv	180 psi		
	Ft	575 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.0150, L = 0.060 , Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.920 : 1	Maximum Shear Stress Ratio	=	0.216 : 1
Section used for this span		2-2x6	Section used for this span		2-2x6
fb: Actual	=	1,075.88psi	fv: Actual	=	38.90 psi
Fb: Allowable	=	1,170.00psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	5.875ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.389 in	Ratio =	362 >=360	Span: 1 : L Only	
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a	
Max Downward Total Deflection	0.509 in	Ratio =	276 >=240	Span: 1 : +D+L	
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.5093	5.918		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.462	0.462
Overall MINimum	0.353	0.353
D Only	0.109	0.109
+D+L	0.462	0.462
+D+0.750L	0.374	0.374
+0.60D	0.065	0.065
L Only	0.353	0.353

Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B5

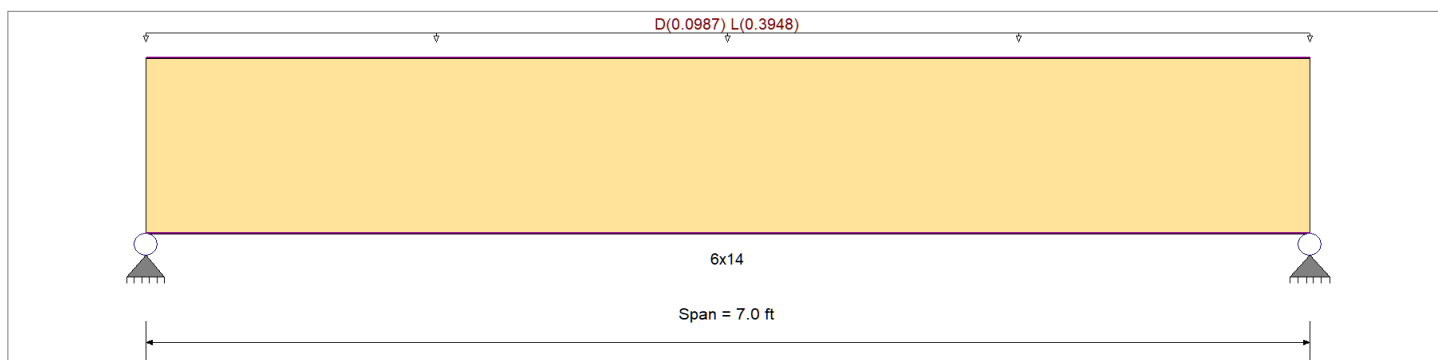
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.0150, L = 0.060 ksf, Tributary Width = 6.580 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.249 < 1	Maximum Shear Stress Ratio	=	0.136 < 1
Section used for this span		6x14	Section used for this span		6x14
fb: Actual	=	224.20psi	fv: Actual	=	24.46 psi
Fb: Allowable	=	900.00psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	3.500ft	Location of maximum on span	=	5.876 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.012 in	Ratio = 7064 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.015 in	Ratio = 5473 >=240	Span: 1 : +D+L		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0153	3.526		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.784	1.784
Overall MINimum	1.382	1.382
D Only	0.402	0.402
+D+L	1.784	1.784
+D+0.750L	1.438	1.438
+0.60D	0.241	0.241
L Only	1.382	1.382



Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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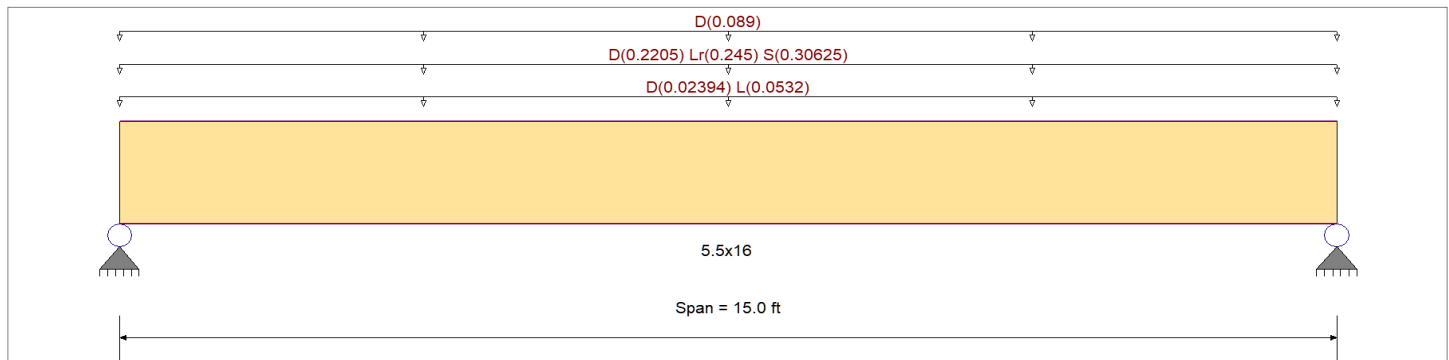
DESCRIPTION: 2B6

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
	Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

- Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 1.330 ft, (Floor)
- Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 12.250 ft, (Roof)
- Uniform Load : D = 0.0890, Tributary Width = 1.0 ft, (Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.334	1	Maximum Shear Stress Ratio	=	0.221	: 1
Section used for this span		5.5x16		Section used for this span		5.5x16	
fb: Actual	=	920.01 psi		fv: Actual	=	67.45 psi	
Fb: Allowable	=	2,753.98 psi		Fv: Allowable	=	304.75 psi	
Load Combination		+D+S		Load Combination		+D+S	
Location of maximum on span	=	7.500ft		Location of maximum on span	=	13.686 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.104 in	Ratio =	1733	>=360	Span: 1 : S Only	
Max Upward Transient Deflection		0 in	Ratio =	0	<360	n/a	
Max Downward Total Deflection		0.217 in	Ratio =	829	>=240	Span: 1 : +D+S	
Max Upward Total Deflection		0 in	Ratio =	0	<240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.2169	7.555		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.798	4.798
Overall MINimum	2.297	2.297
D Only	2.501	2.501
+D+L	2.900	2.900
+D+Lr	4.338	4.338
+D+S	4.798	4.798
+D+0.750Lr+0.750L	4.178	4.178
+D+0.750L+0.750S	4.523	4.523



L2 Engineers LLC
Design & Planning
17848 NE 198th Place

Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B6

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+0.60D	1.500	1.500
Lr Only	1.838	1.838
L Only	0.399	0.399
S Only	2.297	2.297



Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B7

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

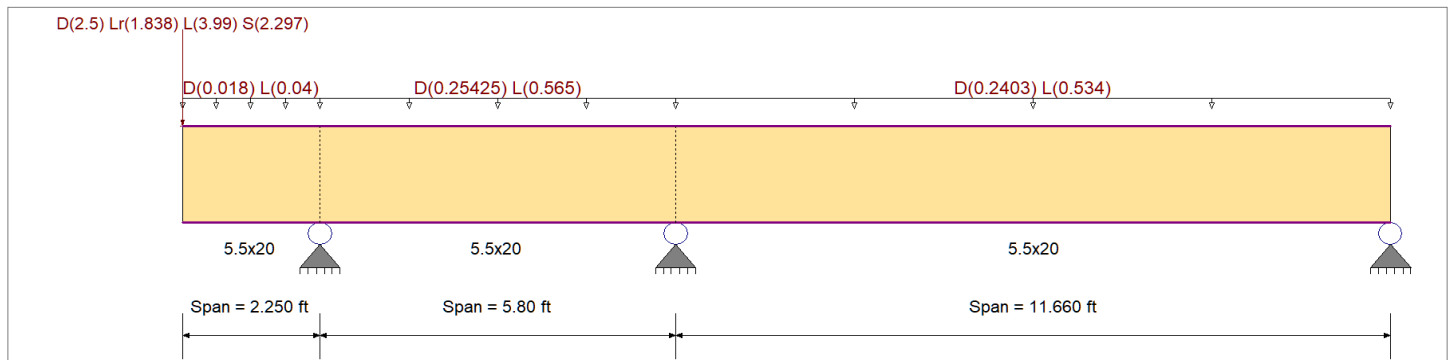
Material Properties

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

Wood Species : DF/DF
Wood Grade : 24F-V4

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

Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Fv	265.0 psi	Eminbend - yy	850.0ksi
Ft	1,100.0 psi	Density	31.210pcf



Applied Loads

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

Beam self weight NOT internally calculated and added

Load for Span Number 1

Uniform Load : D = 0.0180, L = 0.040, Tributary Width = 1.0 ft, (Floor)

Point Load : D = 2.50, Lr = 1.838, L = 3.990, S = 2.297 k @ 0.0 ft

Load for Span Number 2

Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 14.125 ft, (Floor)

Load for Span Number 3

Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 13.350 ft, (Floor)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.261 : 1	Maximum Shear Stress Ratio	=	0.339 : 1
Section used for this span		5.5x20	Section used for this span		5.5x20
fb: Actual	=	482.70psi	fv: Actual	=	89.83 psi
Fb: Allowable	=	1,850.00psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	2.250ft	Location of maximum on span	=	1.683 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.015 in Ratio = 3672 >=360	Span: 3 : L Only		
Max Upward Transient Deflection		-0.006 in Ratio = 11804 >=360	Span: 2 : L Only		
Max Downward Total Deflection		0.026 in Ratio = 2094 >=240	Span: 3 : +D+L		
Max Upward Total Deflection		-0.010 in Ratio = 7155 >=240	Span: 2 : +D+0.750L+0.750S		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.0258	0.000		0.0000	0.000
	2	0.0000	0.000	+D+0.750L+0.750S	-0.0097	2.632
+D+L	3	0.0326	6.271		0.0000	2.632

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
Overall MAXimum		11.161	6.279	3.872
Overall MINimum		3.336	-1.113	0.074



L2 Engineers LLC
Design & Planning
17848 NE 198th Place

Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: 2B7

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3	Support 4
D Only		3.886	1.713	1.217
+D+L		10.249	6.279	3.872
+D+Lr		6.556	0.823	1.276
+D+S		7.223	0.601	1.291
+D+0.750Lr+0.750L		10.661	4.470	3.253
+D+0.750L+0.750S		11.161	4.303	3.264
+0.60D		2.332	1.028	0.730
Lr Only		2.669	-0.890	0.059
L Only		6.363	4.566	2.655
S Only		3.336	-1.113	0.074



Wood Column

DESCRIPTION: P2B7.1

Maximum Reactions

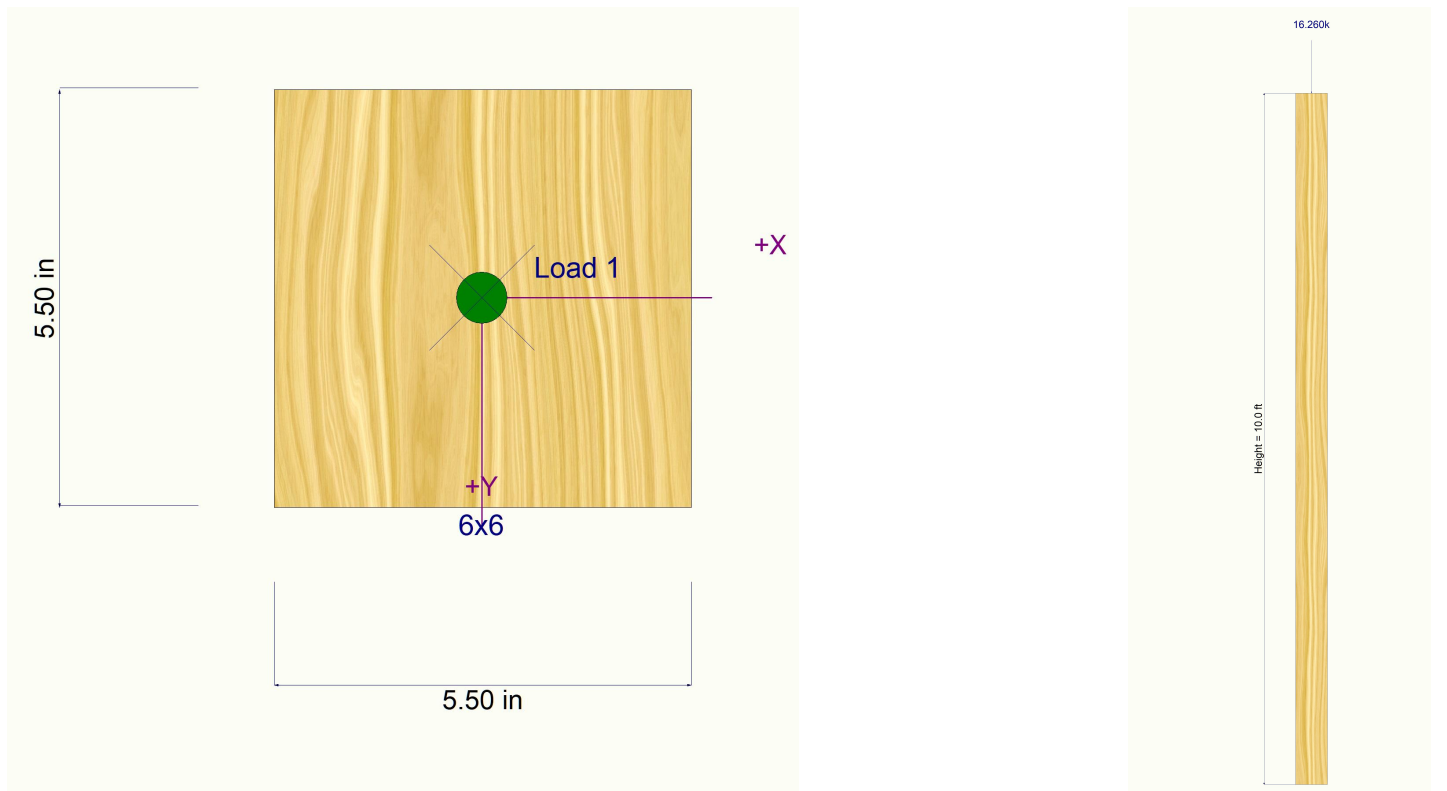
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k		Y-Y Axis Reaction		Axial Reaction @ Base	My - End Moments k-ft		Mx - End Moments	
	@ Base	@ Top	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only					3.956				
+D+L					10.316				
+D+Lr					6.626				
+D+S					7.296				
+D+0.750Lr+0.750L					10.728				
+D+0.750L+0.750S					11.231				
+0.60D					2.373				
Lr Only					2.670				
L Only					6.360				
S Only					3.340				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft
L Only	0.000 in	0.000ft	0.000 in	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft

Sketches





Wood Column

DESCRIPTION: P2B7.2

Maximum Reactions

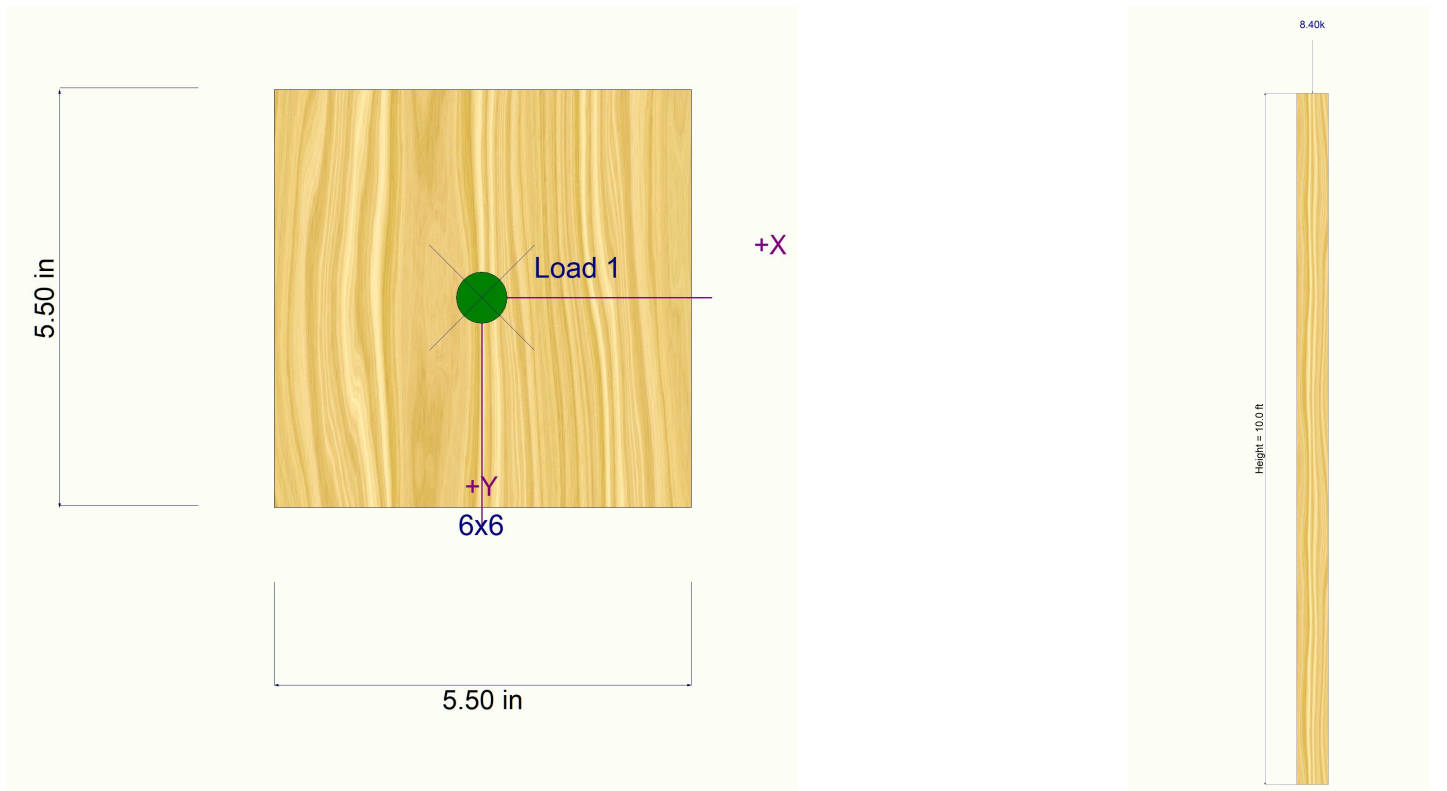
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						2.916				
+D+L						7.486				
+D+Lr						3.366				
+D+S						3.446				
+D+0.750Lr+0.750L						6.681				
+D+0.750L+0.750S						6.741				
+0.60D						1.749				
Lr Only						0.450				
L Only						4.570				
S Only						0.530				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft
L Only	0.000 in	0.000ft	0.000 in	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft

Sketches



Wood Column

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: P2B7.2 FDN

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Analysis Method	Allowable Stress Design			Wood Section Name	6x6
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber
Overall Column Height	5 ft			Wood Member Type	Sawn
<i>(Used for non-slender calculations)</i>					
Wood Species	Douglas Fir-Larch			Exact Width	5.50 in
Wood Grade	No.2			Exact Depth	5.50 in
Fb +	750.0 psi	Fv	170.0 psi	Area	30.250 in ²
Fb -	750.0 psi	Ft	475.0 psi	Ix	76.255 in ⁴
Fc - Prll	700.0 psi	Density	31.210 pcf	Iy	76.255 in ⁴
Fc - Perp	625.0 psi			Allow Stress Modification Factors	
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	Cf or Cv for Bending 1.0	
	Basic	1,300.0	1,300.0	1,300.0 ksi	Cf or Cv for Compression 1.0
	Minimum	470.0	470.0		Cf or Cv for Tension 1.0
					Cm : Wet Use Factor 1.0
					Ct : Temperature Fact 1.0
					Cfu : Flat Use Factor 1.0
					Kf : Built-up columns 1.0 <i>NDS 15.3.2</i>
					Use Cr : Repetitive ? No

Brace condition for deflection (buckling) along columns :

X-X (width) axis : Unbraced Length for buckling ABOUT Y-Y Axis = 5

Y-Y (depth) axis : Unbraced Length for buckling ABOUT X-X Axis = 5

Applied Loads

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

Column self weight included : 32.781 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 5.0 ft, D = 4.010, Lr = 0.450, L = 7.150, S = 0.530 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.5559 : 1**
 Load Combination +D+L
 Governing NDS Formula Comp Only, f_c/F_c'
 Location of max.above base 0.0 ft
 At maximum location values are .
 Applied Axial 11.193 k
 Applied Mx 0.0 k-ft
 Applied My 0.0 k-ft
 Fc : Allowable 665.66 psi

Maximum SERVICE Lateral Load Reactions . .
 Top along Y-Y 0.0 k Bottom along Y-Y 0.0 k
 Top along X-X 0.0 k Bottom along X-X 0.0 k

Maximum SERVICE Load Lateral Deflections . . .
 Along Y-Y 0.0 in at 0.0 ft above base
 for load combination : n/a
 Along X-X 0.0 in at 0.0 ft above base
 for load combination : n/a

PASS Maximum Shear Stress Ratio = **0.0 : 1**
 Load Combination +0.60D
 Location of max.above base 5.0 ft
 Applied Design Shear 0.0 psi
 Allowable Shear 272.0 psi

Other Factors used to calculate allowable stresses . . .
Bending Compression Tension

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
D Only	0.900	0.956	0.2218	PASS	0.0 ft	0.0	PASS	5.0 ft
+D+L	1.000	0.951	0.5559	PASS	0.0 ft	0.0	PASS	5.0 ft
+D+Lr	1.250	0.937	0.1812	PASS	0.0 ft	0.0	PASS	5.0 ft
+D+S	1.150	0.943	0.1992	PASS	0.0 ft	0.0	PASS	5.0 ft
+D+0.750Lr+0.750L	1.250	0.937	0.3930	PASS	0.0 ft	0.0	PASS	5.0 ft
+D+0.750L+0.750S	1.150	0.943	0.4271	PASS	0.0 ft	0.0	PASS	5.0 ft
+0.60D	1.600	0.915	0.07821	PASS	0.0 ft	0.0	PASS	5.0 ft



Wood Column

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: P2B7.2 FDN

Maximum Reactions

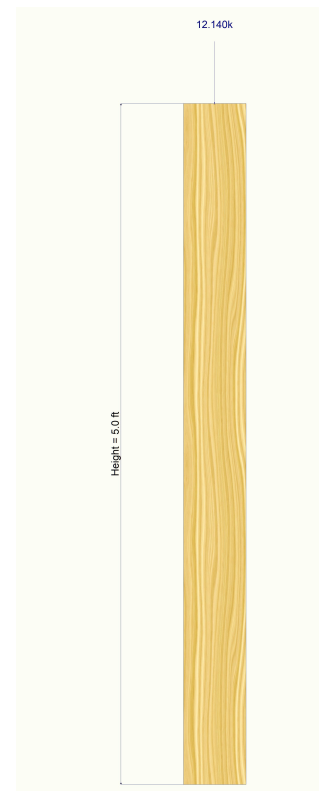
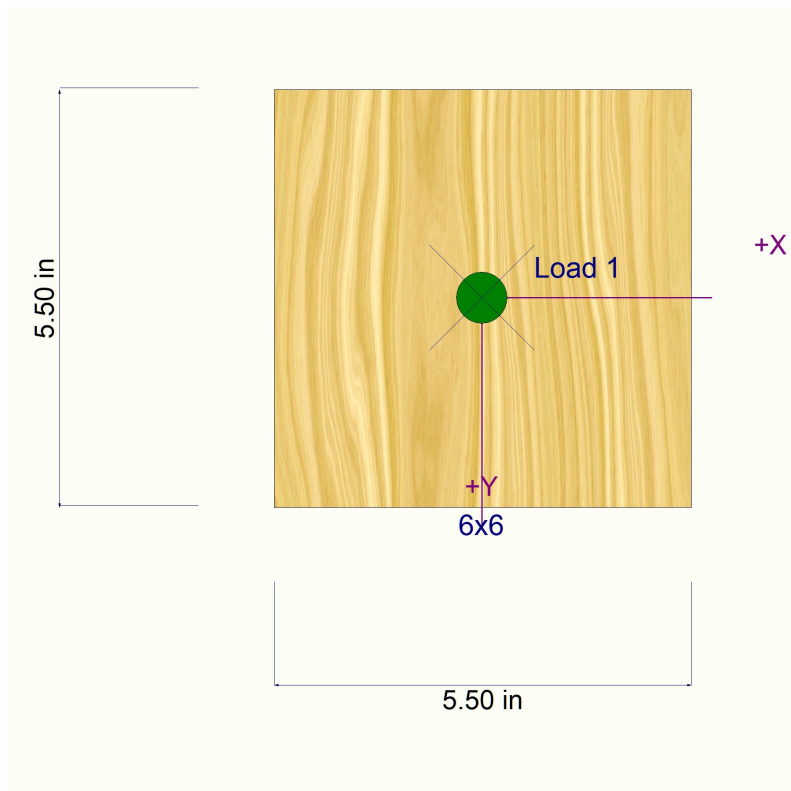
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						4.043				
+D+L						11.193				
+D+Lr						4.493				
+D+S						4.573				
+D+0.750Lr+0.750L						9.743				
+D+0.750L+0.750S						9.803				
+0.60D						2.426				
Lr Only						0.450				
L Only						7.150				
S Only						0.530				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft
L Only	0.000 in	0.000ft	0.000 in	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft

Sketches





Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B8

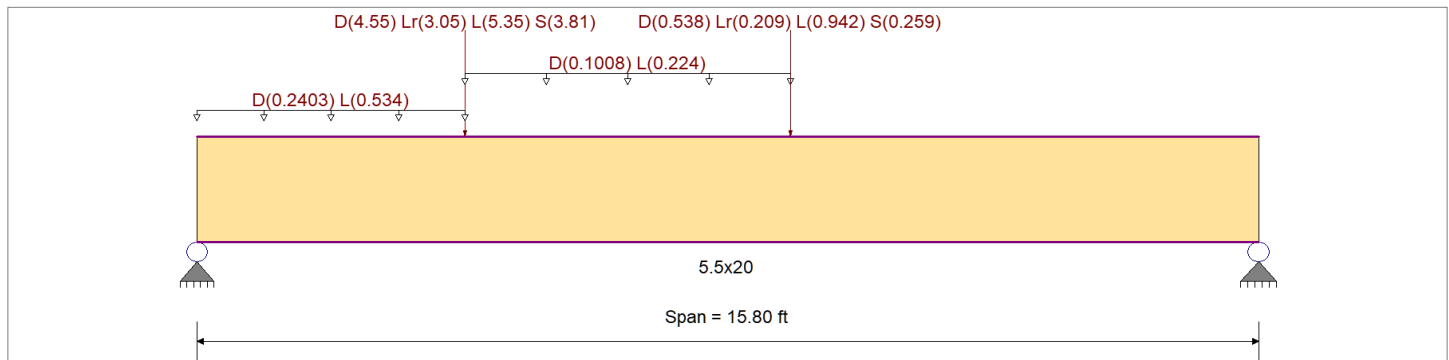
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Ebend- xx
	Fc - Prll	1,650.0 psi	Eminbend - xx
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy
	Ft	1,100.0 psi	Density
			31.210pcf

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



Applied Loads

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

Beam self weight NOT internally calculated and added

- Point Load : D = 4.550, Lr = 3.050, L = 5.350, S = 3.810 k @ 4.0 ft, (2B2)
- Uniform Load : D = 0.0180, L = 0.040 ksf, Extent = 0.0 --> 4.0 ft, Tributary Width = 13.350 ft, (Floor)
- Uniform Load : D = 0.0180, L = 0.040 ksf, Extent = 4.0 --> 8.830 ft, Tributary Width = 5.60 ft, (Floor)
- Point Load : D = 0.5380, Lr = 0.2090, L = 0.9420, S = 0.2590 k @ 8.830 ft, (2B4)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.569 1	Maximum Shear Stress Ratio	=	0.537 : 1
Section used for this span		5.5x20	Section used for this span		5.5x20
fb: Actual	=	1,325.18psi	fv: Actual	=	142.27 psi
Fb: Allowable	=	2,329.78psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	4.036ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.140 in	Ratio =	1356 >=360	Span: 1 : L Only	
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a	
Max Downward Total Deflection	0.251 in	Ratio =	756 >=240	Span: 1 : +D+0.750L+0.750S	
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.2506	7.208		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	12.173	4.547
Overall MINimum	2.960	1.109
D Only	4.764	1.772
+D+L	11.684	4.362
+D+Lr	7.134	2.661
+D+S	7.724	2.881
+D+0.750Lr+0.750L	11.731	4.382



L2 Engineers LLC
Design & Planning
17848 NE 198th Place

Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B8

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L+0.750S	12.173	4.547
+0.60D	2.858	1.063
Lr Only	2.370	0.889
L Only	6.919	2.591
S Only	2.960	1.109

Wood Column

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: P2B8.1

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Analysis Method	Allowable Stress Design	Wood Section Name	5.25x5.25
End Fixities	Top & Bottom Pinned	Wood Grading/Manuf.	Trus Joist
Overall Column Height	10 ft	Wood Member Type	Parallam PSL
<i>(Used for non-slender calculations)</i>			
Wood Species	iLevel Truss Joist	Exact Width	5.250 in Allow Stress Modification Factors
Wood Grade	Parallam PSL 2.2E	Exact Depth	5.250 in Cf or Cv for Bending 1.0
Fb +	2,900.0 psi	Area	27.563 in ² Cf or Cv for Compression 1.0
Fb -	2,900.0 psi	Ix	63.308 in ⁴ Cf or Cv for Tension 1.0
Fc - Prll	2,900.0 psi	Iy	63.308 in ⁴ Cm : Wet Use Factor 1.0
Fc - Perp	750.0 psi		Ct : Temperature Fact 1.0
E : Modulus of Elasticity . . .	x-x Bending y-y Bending Axial		Cfu : Flat Use Factor 1.0
	Basic 2,200.0 2,200.0 2,200.0 ksi		Kf : Built-up columns 1.0 <i>NDS 15.3.2</i>
	Minimum 1,118.19 1,118.19		Use Cr : Repetitive ? No
Brace condition for deflection (buckling) along columns :			
X-X (width) axis : Unbraced Length for buckling ABOUT Y-Y Axis = 10			
Y-Y (depth) axis : Unbraced Length for buckling ABOUT X-X Axis = 10			

Applied Loads

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

Column self weight included : 86.268 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 10.0 ft, D = 5.980, Lr = 2.430, L = 9.580, S = 3.030 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.3609 : 1**
 Load Combination +D+L
 Governing NDS Formula Comp Only, f_c/F_c'
 Location of max.above base 0.0 ft
 At maximum location values are .
 Applied Axial 15.646 k
 Applied Mx 0.0 k-ft
 Applied My 0.0 k-ft
 Fc : Allowable 1,572.89 psi

Maximum SERVICE Lateral Load Reactions . .
 Top along Y-Y 0.0 k Bottom along Y-Y 0.0 k
 Top along X-X 0.0 k Bottom along X-X 0.0 k

Maximum SERVICE Load Lateral Deflections . . .
 Along Y-Y 0.0 in at 0.0 ft above base
 for load combination : n/a
 Along X-X 0.0 in at 0.0 ft above base
 for load combination : n/a

PASS Maximum Shear Stress Ratio = **0.0 : 1**
 Load Combination +0.60D
 Location of max.above base 10.0 ft
 Applied Design Shear 0.0 psi
 Allowable Shear 464.0 psi

Other Factors used to calculate allowable stresses . . .
Bending Compression Tension

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
D Only	0.900	0.589	0.1431	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+L	1.000	0.542	0.3609	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+Lr	1.250	0.449	0.1895	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+S	1.150	0.483	0.2051	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750Lr+0.750L	1.250	0.449	0.3362	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L+0.750S	1.150	0.483	0.350	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.60D	1.600	0.359	0.07927	PASS	0.0 ft	0.0	PASS	10.0 ft



Wood Column

DESCRIPTION: P2B8.1

Maximum Reactions

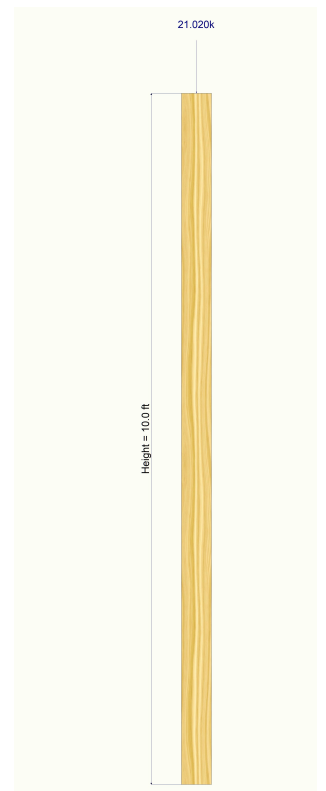
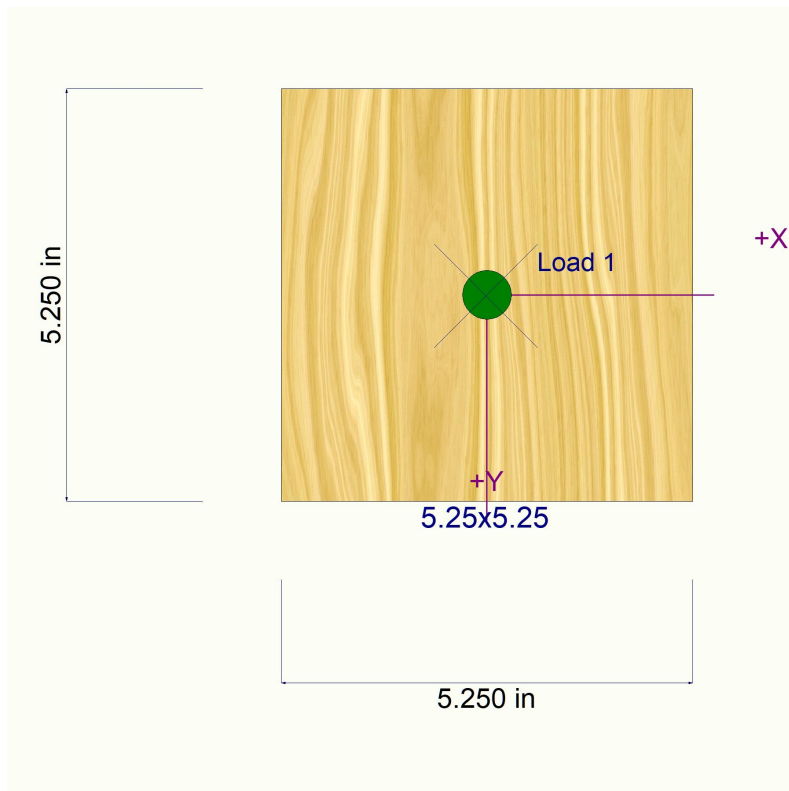
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						6.066				
+D+L						15.646				
+D+Lr						8.496				
+D+S						9.096				
+D+0.750Lr+0.750L						15.074				
+D+0.750L+0.750S						15.524				
+0.60D						3.640				
Lr Only						2.430				
L Only						9.580				
S Only						3.030				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Distance	Max. Y-Y Deflection		Distance
	in	ft		in	ft	
D Only	0.000	0.000	0.000ft	0.000	0.000	0.000ft
+D+L	0.000	0.000	0.000ft	0.000	0.000	0.000ft
+D+Lr	0.000	0.000	0.000ft	0.000	0.000	0.000ft
+D+S	0.000	0.000	0.000ft	0.000	0.000	0.000ft
+D+0.750Lr+0.750L	0.000	0.000	0.000ft	0.000	0.000	0.000ft
+D+0.750L+0.750S	0.000	0.000	0.000ft	0.000	0.000	0.000ft
+0.60D	0.000	0.000	0.000ft	0.000	0.000	0.000ft
Lr Only	0.000	0.000	0.000ft	0.000	0.000	0.000ft
L Only	0.000	0.000	0.000ft	0.000	0.000	0.000ft
S Only	0.000	0.000	0.000ft	0.000	0.000	0.000ft

Sketches





Wood Column

DESCRIPTION: P2B8.2

Maximum Reactions

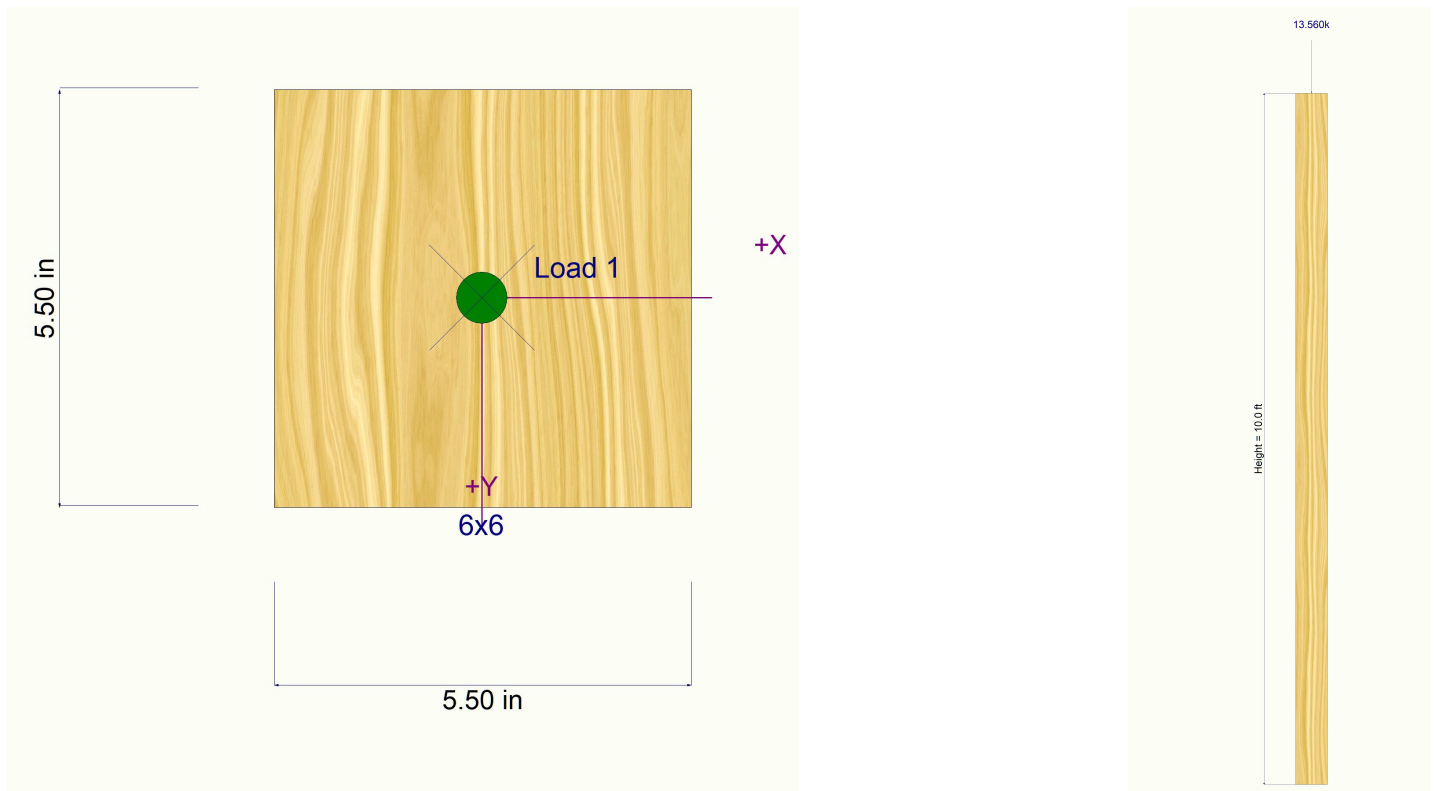
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						4.206				
+D+L						9.106				
+D+Lr						6.206				
+D+S						6.726				
+D+0.750Lr+0.750L						9.381				
+D+0.750L+0.750S						9.771				
+0.60D						2.523				
Lr Only						2.000				
L Only						4.900				
S Only						2.520				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft
L Only	0.000 in	0.000ft	0.000 in	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft

Sketches





Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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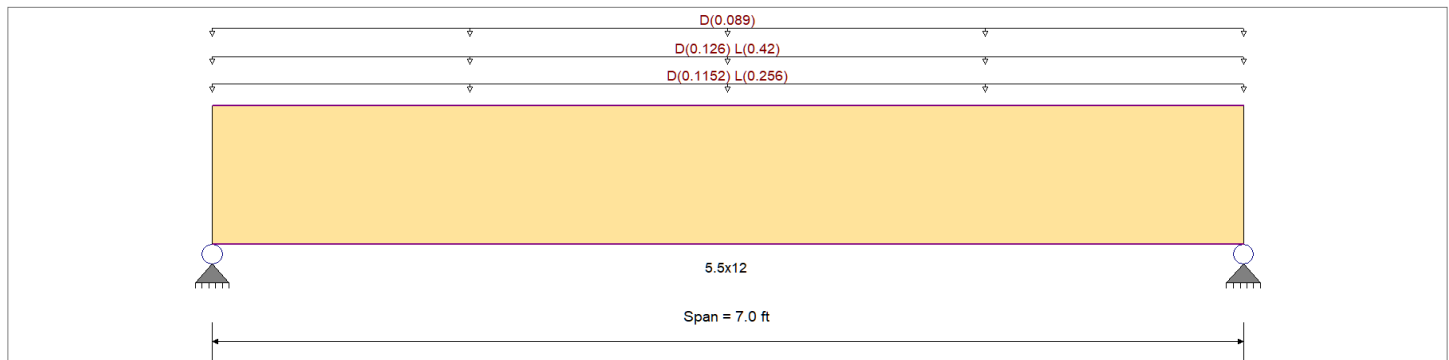
DESCRIPTION: 2B9

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2400 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1850 psi	Ebend- xx	1800ksi
	Fc - Prll	1650 psi	Eminbend - xx	950ksi
Wood Species : DF/DF	Fc - Perp	650 psi	Ebend- yy	1600ksi
Wood Grade : 24F-V4	Fv	265 psi	Eminbend - yy	850ksi
	Ft	1100 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added
 Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 6.40 ft, (Floor)
 Uniform Load : D = 0.0180, L = 0.060 ksf, Tributary Width = 7.0 ft, (Deck)
 Uniform Load : D = 0.0890, Tributary Width = 1.0 ft, (Wall)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.233	1	Maximum Shear Stress Ratio	=	0.216	: 1
Section used for this span		5.5x12		Section used for this span		5.5x12	
fb: Actual	=	560.27psi		fv: Actual	=	57.25 psi	
Fb: Allowable	=	2,400.00psi		Fv: Allowable	=	265.00 psi	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	3.500ft		Location of maximum on span	=	6.004 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.026 in	Ratio =	3260	>=	360	Span: 1 : L Only
Max Upward Transient Deflection		0 in	Ratio =	0	<	360	n/a
Max Downward Total Deflection		0.038 in	Ratio =	2190	>=	240	Span: 1 : +D+L
Max Upward Total Deflection		0 in	Ratio =	0	<	240	n/a

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0384	3.526		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	3.522	3.522
Overall MINimum	2.366	2.366
D Only	1.156	1.156
+D+L	3.522	3.522
+D+0.750L	2.930	2.930
+0.60D	0.693	0.693
L Only	2.366	2.366



Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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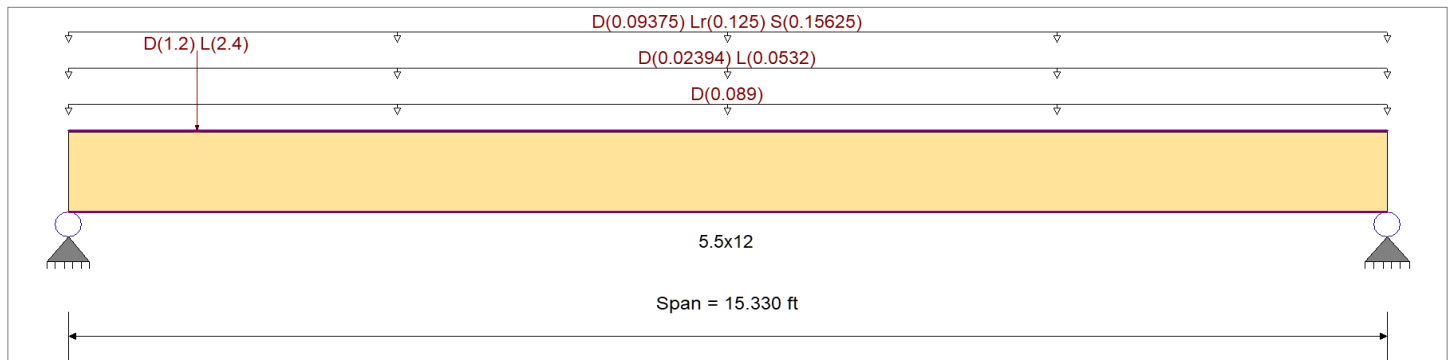
DESCRIPTION: 2B10

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Eband- xx	1,800.0ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Eband- yy	1,600.0ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
	Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added
 Point Load : D = 1.20, L = 2.40 k @ 1.50 ft, (2b9)
 Uniform Load : D = 0.0890, Tributary Width = 1.0 ft, (Wall)
 Uniform Load : D = 0.0180, L = 0.040 ksf, Tributary Width = 1.330 ft, (fLOOR)
 Uniform Load : D = 0.0150, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 6.250 ft, (rOOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.430 < 1	Maximum Shear Stress Ratio	=	0.428 < 1
Section used for this span	=	5.5x12	Section used for this span	=	5.5x12
fb: Actual	=	1,186.79psi	fv: Actual	=	113.47 psi
Fb: Allowable	=	2,760.00psi	Fv: Allowable	=	265.00 psi
Load Combination	=	+D+0.750L+0.750S	Load Combination	=	+D+L
Location of maximum on span	=	6.882ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.137 in	Ratio = 1342	>=360	Span: 1 : S Only	
Max Upward Transient Deflection	0 in	Ratio = 0	<360	n/a	
Max Downward Total Deflection	0.399 in	Ratio = 460	>=240	Span: 1 : +D+0.750L+0.750S	
Max Upward Total Deflection	0 in	Ratio = 0	<240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.3991	7.497		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	5.495	3.082
Overall MINimum	1.198	1.198
D Only	2.667	1.702
+D+L	5.240	2.344
+D+Lr	3.625	2.660
+D+S	3.865	2.899
+D+0.750Lr+0.750L	5.315	2.902



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Wood Beam

Project File: Hu Residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: 2B10

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750L+0.750S	5.495	3.082
+0.60D	1.600	1.021
Lr Only	0.958	0.958
L Only	2.573	0.643
S Only	1.198	1.198



Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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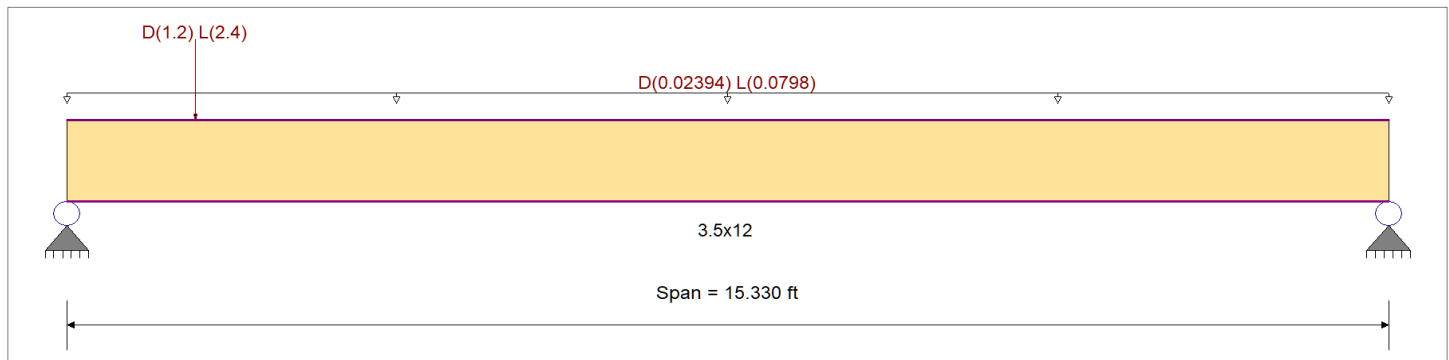
DESCRIPTION: 2B11

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
	Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Point Load : D = 1.20, L = 2.40 k @ 1.50 ft, (2b9)

Uniform Load : D = 0.0180, L = 0.060 ksf, Tributary Width = 1.330 ft, (fLOOR)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.378 < 1	Maximum Shear Stress Ratio	=	0.532 < 1
Section used for this span		3.5x12	Section used for this span		3.5x12
fb: Actual	=	906.50psi	fv: Actual	=	140.87 psi
Fb: Allowable	=	2,400.00psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	4.252ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.211 in	Ratio =	870 >=360	Span: 1 : L Only	
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a	
Max Downward Total Deflection	0.295 in	Ratio =	623 >=240	Span: 1 : +D+L	
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.2952	7.106		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.043	1.147
Overall MINimum	2.777	0.847
D Only	1.266	0.301
+D+L	4.043	1.147
+D+0.750L	3.349	0.936
+0.60D	0.760	0.181
L Only	2.777	0.847



Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: 2B12

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

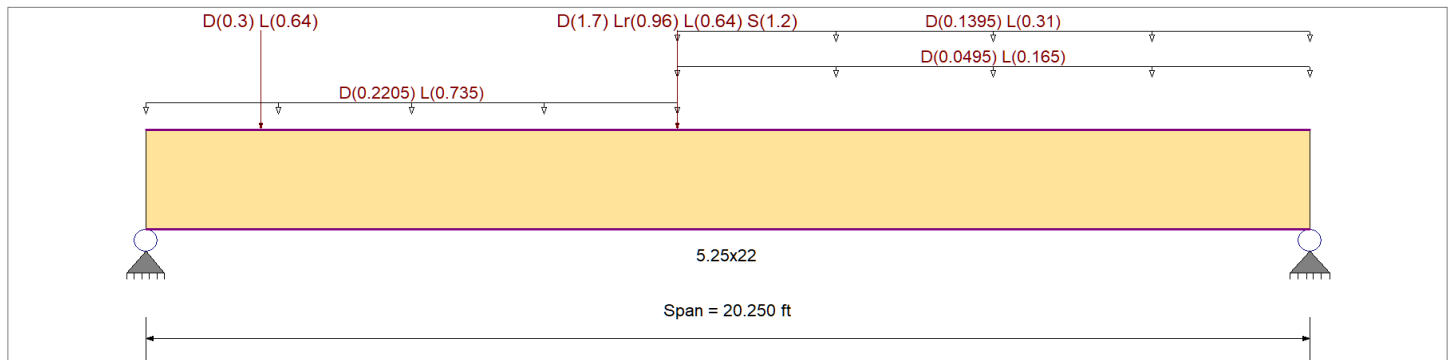
Material Properties

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

Wood Species : iLevel Truss Joist
Wood Grade : Parallam PSL 2.2E

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

Fb +	2,900.0 psi	E : Modulus of Elasticity	
Fb -	2,900.0 psi	Ebend- xx	2,200.0ksi
Fc - Prll	2,900.0 psi	Eminbend - xx	1,118.19ksi
Fc - Perp	750.0 psi		
Fv	290.0 psi		
Ft	2,025.0 psi	Density	45.070pcf



Applied Loads

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

Beam self weight NOT internally calculated and added

Point Load : D = 0.30, L = 0.640 k @ 2.0 ft, (2b11)

Uniform Load : D = 0.0180, L = 0.060 ksf, Extent = 0.0 --> 9.250 ft, Tributary Width = 12.250 ft, (rOOF dECK)

Uniform Load : D = 0.0180, L = 0.060 ksf, Extent = 9.250 --> 20.250 ft, Tributary Width = 2.750 ft, (rOOF dECK)

Uniform Load : D = 0.0180, L = 0.040 ksf, Extent = 9.250 --> 20.250 ft, Tributary Width = 7.750 ft, (fLOOR)

Point Load : D = 1.70, Lr = 0.960, L = 0.640, S = 1.20 k @ 9.250 ft, (2b10)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.521 : 1	Maximum Shear Stress Ratio	=	0.413 : 1
Section used for this span		5.25x22	Section used for this span		5.25x22
fb: Actual	=	1,510.86psi	fv: Actual	=	119.83 psi
Fb: Allowable	=	2,900.00psi	Fv: Allowable	=	290.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	9.238ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.242 in	Ratio = 1003 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.369 in	Ratio = 657 >=240	Span: 1 : +D+L		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.3694	9.977		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	10.922	8.501
Overall MINimum	0.652	0.548
D Only	3.332	2.786
+D+L	10.922	8.501
+D+Lr	3.854	3.225
+D+S	3.984	3.334



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Design & Planning
17848 NE 198th Place

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: 2B12

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750Lr+0.750L	9.416	7.401
+D+0.750L+0.750S	9.513	7.483
+0.60D	1.999	1.672
Lr Only	0.521	0.439
L Only	7.590	5.714
S Only	0.652	0.548



Wood Column

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: P2B12.1

Maximum Reactions

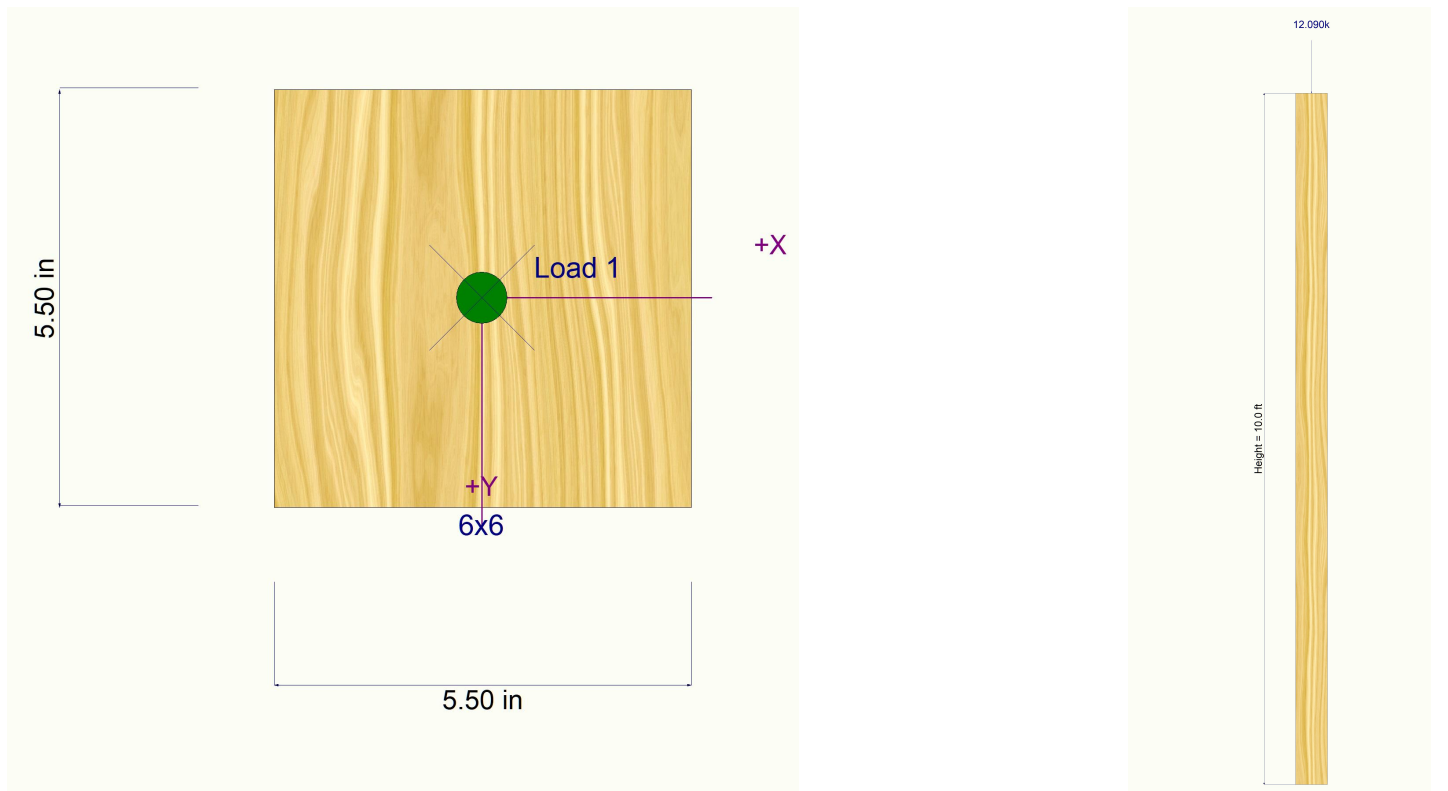
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only						3.396				
+D+L						10.986				
+D+Lr						3.916				
+D+S						4.046				
+D+0.750Lr+0.750L						9.478				
+D+0.750L+0.750S						9.576				
+0.60D						2.037				
Lr Only						0.520				
L Only						7.590				
S Only						0.650				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+Lr	0.000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750Lr+0.750L	0.000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.000 in	0.000ft	0.000 in	0.000 ft
Lr Only	0.000 in	0.000ft	0.000 in	0.000 ft
L Only	0.000 in	0.000ft	0.000 in	0.000 ft
S Only	0.000 in	0.000ft	0.000 in	0.000 ft

Sketches



Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B13

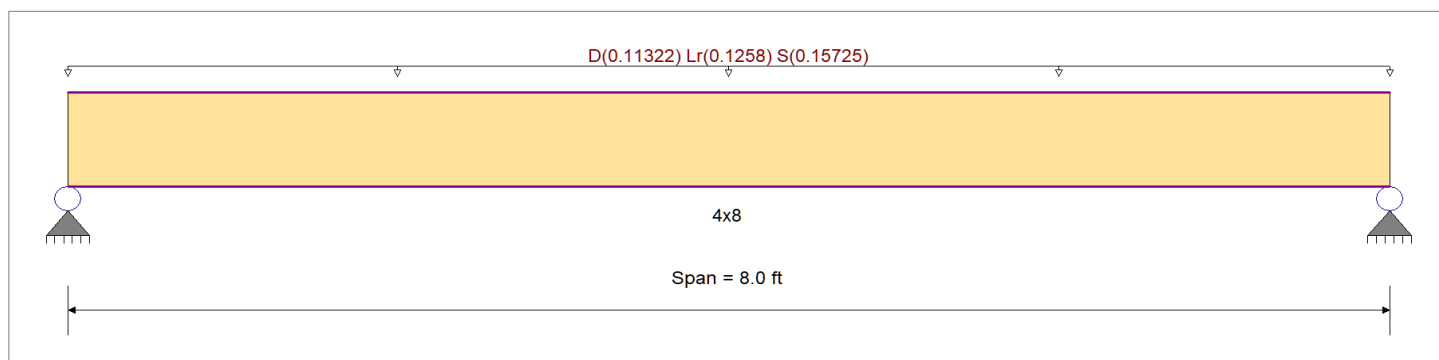
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	875 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	875 psi	Ebend- xx	1300ksi
	Fc - Prll	600 psi	Eminbend - xx	470ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625 psi		
Wood Grade : No.2	Fv	170 psi		
	Ft	425 psi	Density	31.21pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 6.290 ft, (rOOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.647 : 1	Maximum Shear Stress Ratio	=	0.279 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	846.83psi	fv: Actual	=	54.62 psi
Fb: Allowable	=	1,308.13psi	Fv: Allowable	=	195.50 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	4.000ft	Location of maximum on span	=	7.416 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.101 in	Ratio = 951 >=360	Span: 1 : S Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.174 in	Ratio = 553 >=240	Span: 1 : +D+S		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.1735	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.082	1.082
Overall MINimum	0.629	0.629
D Only	0.453	0.453
+D+L	0.453	0.453
+D+Lr	0.956	0.956
+D+S	1.082	1.082
+D+0.750Lr+0.750L	0.830	0.830
+D+0.750L+0.750S	0.925	0.925
+0.60D	0.272	0.272
Lr Only	0.503	0.503



L2 Engineers LLC
Design & Planning
17848 NE 198th Place

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B13

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
S Only	0.629	0.629

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B14

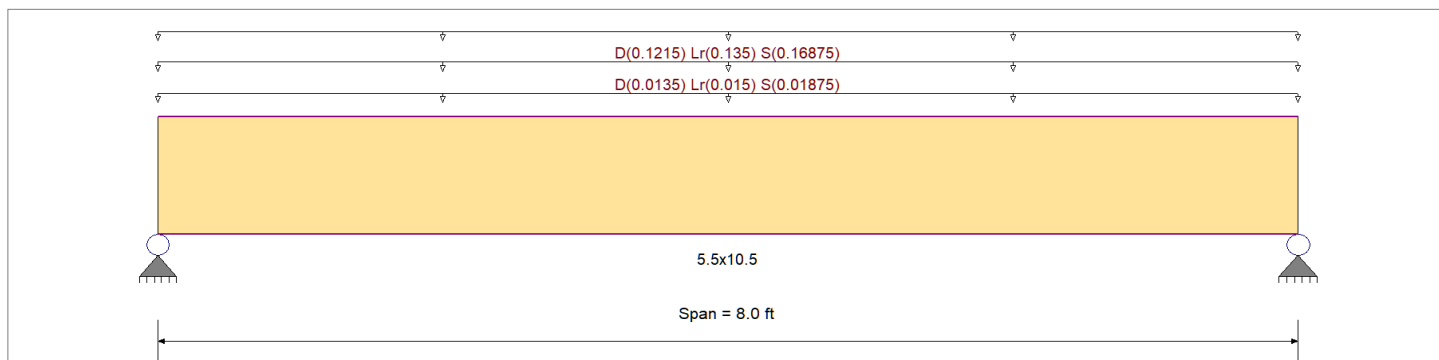
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2400 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1850 psi	Ebend- xx	1800ksi
	Fc - Prll	1650 psi	Eminbend - xx	950ksi
Wood Species : DF/DF	Fc - Perp	650 psi	Ebend- yy	1600ksi
Wood Grade : 24F-V4	Fv	265 psi	Eminbend - yy	850ksi
	Ft	1100 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 0.750 ft, (rOOF DECK)

Uniform Load : D = 0.0180, Lr = 0.020, S = 0.0250 ksf, Tributary Width = 6.750 ft, (FLOOR)

Uniform Load : D = 0.0890 ksf, Tributary Width = 0.0 ft, (WALL)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.111 : 1	Maximum Shear Stress Ratio	=	0.087 : 1
Section used for this span		5.5x10.5	Section used for this span		5.5x10.5
fb: Actual	=	306.35psi	fv: Actual	=	26.41 psi
Fb: Allowable	=	2,760.00psi	Fv: Allowable	=	304.75 psi
Load Combination		+D+S	Load Combination		+D+S
Location of maximum on span	=	4.000ft	Location of maximum on span	=	7.153 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.018 in	Ratio =	5274 >=360	Span: 1 : S Only
Max Upward Transient Deflection		0 in	Ratio =	0 <360	n/a
Max Downward Total Deflection		0.031 in	Ratio =	3066 >=240	Span: 1 : +D+S
Max Upward Total Deflection		0 in	Ratio =	0 <240	n/a

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.0313	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.290	1.290
Overall MINimum	0.750	0.750
D Only	0.540	0.540
+D+L	0.540	0.540
+D+Lr	1.140	1.140
+D+S	1.290	1.290
+D+0.750Lr+0.750L	0.990	0.990
+D+0.750L+0.750S	1.103	1.103



L2 Engineers LLC
Design & Planning
17848 NE 198th Place

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B14

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+0.60D	0.324	0.324
Lr Only	0.600	0.600
S Only	0.750	0.750



Wood Beam

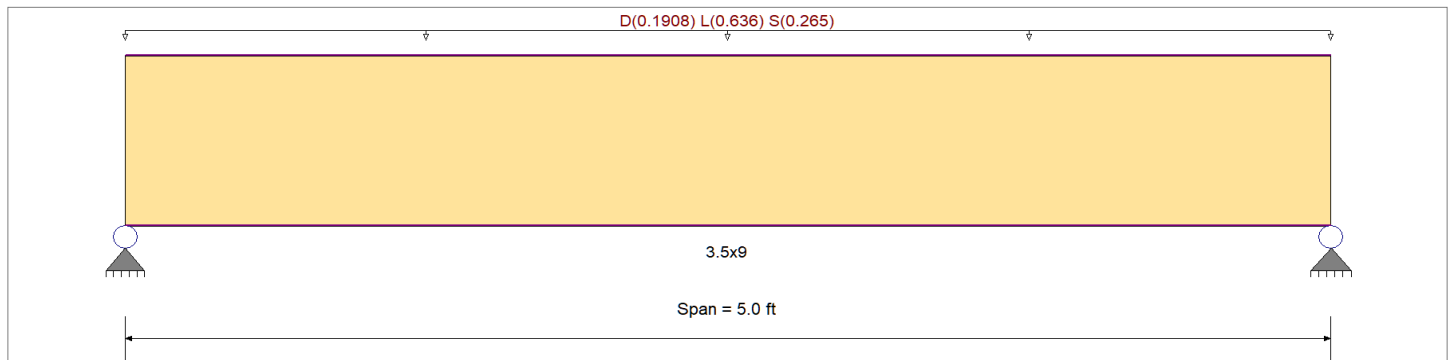
DESCRIPTION: 2B15

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
	Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, L = 0.060, S = 0.0250 ksf, Tributary Width = 10.60 ft, (ROOF DECK)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.273 : 1	Maximum Shear Stress Ratio	=	0.260 : 1
Section used for this span		3.5x9	Section used for this span		3.5x9
fb: Actual	=	656.19psi	fv: Actual	=	68.97 psi
Fb: Allowable	=	2,400.00psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	2.500ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.024 in	Ratio = 2552 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.032 in	Ratio = 1873 >=240	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.0320	2.518		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.166	2.166
Overall MINimum	0.663	0.663
D Only	0.477	0.477
+D+L	2.067	2.067
+D+S	1.140	1.140
+D+0.750L	1.670	1.670
+D+0.750L+0.750S	2.166	2.166
+0.60D	0.286	0.286
L Only	1.590	1.590
S Only	0.663	0.663

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B16

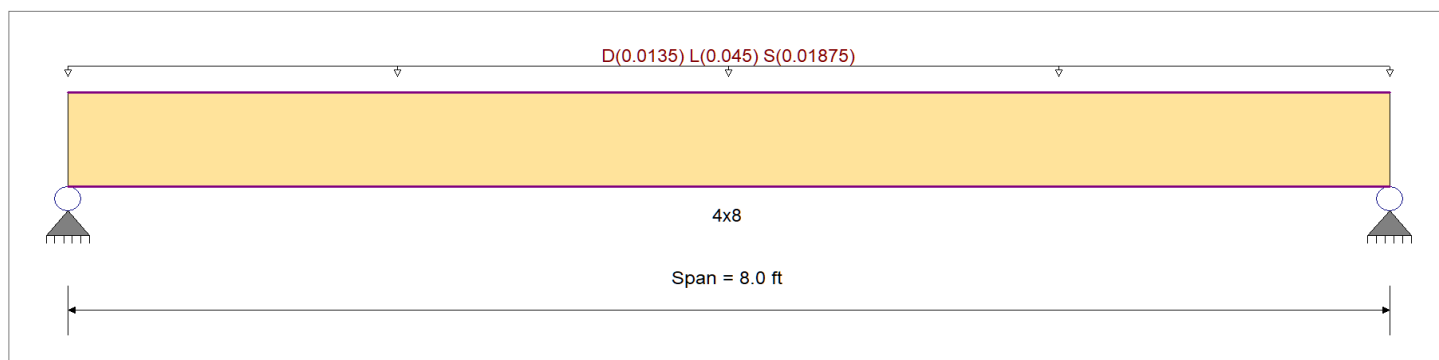
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900 psi	Ebend- xx	1600ksi
	Fc - Prll	1350 psi	Eminbend - xx	580ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625 psi		
Wood Grade : No.2	Fv	180 psi		
	Ft	575 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, L = 0.060, S = 0.0250 ksf, Tributary Width = 0.750 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.157 : 1	Maximum Shear Stress Ratio	=	0.066 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	183.16psi	fv: Actual	=	11.81 psi
Fb: Allowable	=	1,170.00psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	4.000ft	Location of maximum on span	=	7.416 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.023 in	Ratio = 4092 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.032 in	Ratio = 3003 >=240	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.0320	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.245	0.245
Overall MINimum	0.075	0.075
D Only	0.054	0.054
+D+L	0.234	0.234
+D+S	0.129	0.129
+D+0.750L	0.189	0.189
+D+0.750L+0.750S	0.245	0.245
+0.60D	0.032	0.032
L Only	0.180	0.180
S Only	0.075	0.075



Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B17

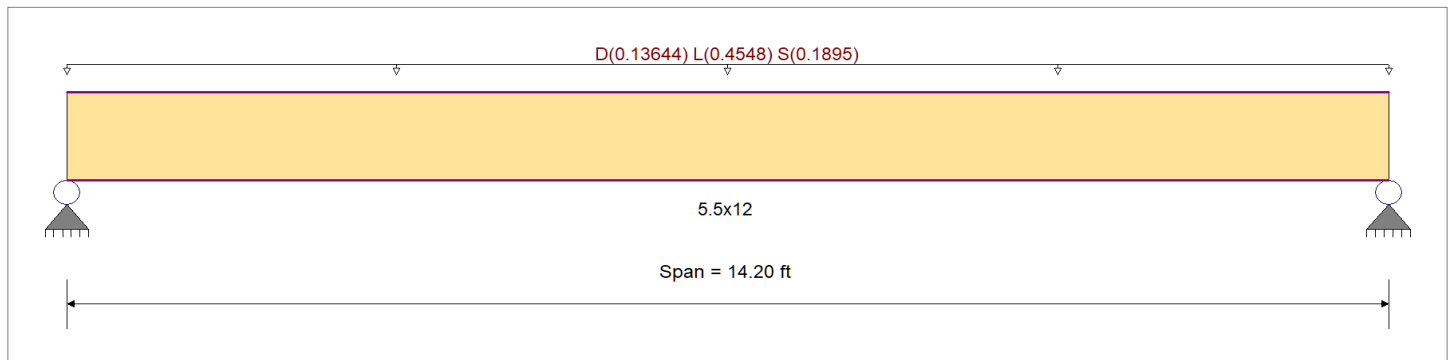
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2400 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1850 psi	Ebend- xx	1800ksi
	Fc - Prll	1650 psi	Eminbend - xx	950ksi
Wood Species : DF/DF	Fc - Perp	650 psi	Ebend- yy	1600ksi
Wood Grade : 24F-V4	Fv	265 psi	Eminbend - yy	850ksi
	Ft	1100 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, L = 0.060, S = 0.0250 ksf, Tributary Width = 7.580 ft, (ROOF)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.564 : 1	Maximum Shear Stress Ratio	=	0.310 : 1
Section used for this span		5.5x12	Section used for this span		5.5x12
fb: Actual	=	1,354.75psi	fv: Actual	=	82.17 psi
Fb: Allowable	=	2,400.00psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	7.100ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.294 in Ratio =	580 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in Ratio =	0 <360	n/a		
Max Downward Total Deflection	0.400 in Ratio =	426 >=240	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection	0 in Ratio =	0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.4000	7.152		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	4.400	4.400
Overall MINimum	1.345	1.345
D Only	0.969	0.969
+D+L	4.198	4.198
+D+S	2.314	2.314
+D+0.750L	3.391	3.391
+D+0.750L+0.750S	4.400	4.400
+0.60D	0.581	0.581
L Only	3.229	3.229
S Only	1.345	1.345

Wood Column

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: P2B17

Code References

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Analysis Method	Allowable Stress Design			Wood Section Name	6x6
End Fixities	Top & Bottom Pinned			Wood Grading/Manuf.	Graded Lumber
Overall Column Height	10 ft			Wood Member Type	Sawn
<i>(Used for non-slender calculations)</i>					
Wood Species	Hem-Fir			Exact Width	5.50 in
Wood Grade	No.2			Exact Depth	5.50 in
Fb +	575 psi	Fv	140 psi	Area	30.250 in ²
Fb -	575 psi	Ft	375 psi	Ix	76.255 in ⁴
Fc - Prll	575 psi	Density	26.84 pcf	Iy	76.255 in ⁴
Fc - Perp	405 psi			Incising Factors :	
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial	for Bending	0.80
	Basic	1100	1100	for Elastic Modulus	0.95
	Minimum	400	400		
				Allow Stress Modification Factors	
				Cf or Cv for Bending	1.0
				Cf or Cv for Compression	1.0
				Cf or Cv for Tension	1.0
				Cm : Wet Use Factor	.85
				Ct : Temperature Fact	1.0
				Cfu : Flat Use Factor	1.0
				Kf : Built-up columns	1.0 <i>NDS 15.3.2</i>
				Use Cr : Repetitive ?	No
Brace condition for deflection (buckling) along columns :					
X-X (width) axis : Unbraced Length for buckling ABOUT Y-Y Axis = 10					
Y-Y (depth) axis : Unbraced Length for buckling ABOUT X-X Axis = 10					

Applied Loads

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

Column self weight included : 56.383 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 10.0 ft, D = 0.970, L = 3.230, S = 1.350 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.4573 : 1**
 Load Combination +D+L
 Governing NDS Formula Comp Only, f_c/F_c'
 Location of max.above base 0.0 ft
 At maximum location values are .
 Applied Axial 4.256 k
 Applied Mx 0.0 k-ft
 Applied My 0.0 k-ft
 Fc : Allowable 307.689 psi

Maximum SERVICE Lateral Load Reactions . .
 Top along Y-Y 0.0 k Bottom along Y-Y 0.0 k
 Top along X-X 0.0 k Bottom along X-X 0.0 k

Maximum SERVICE Load Lateral Deflections . . .
 Along Y-Y 0.0 in at 0.0 ft above base
 for load combination : n/a
 Along X-X 0.0 in at 0.0 ft above base
 for load combination : n/a

Other Factors used to calculate allowable stresses . . .
 Bending Compression Tension

PASS Maximum Shear Stress Ratio = **0.0 : 1**
 Load Combination +0.60D
 Location of max.above base 10.0 ft
 Applied Design Shear 0.0 psi
 Allowable Shear 173.824 psi

Load Combination Results

Load Combination	C _D	C _P	Maximum Axial + Bending Stress Ratios			Maximum Shear Ratios		
			Stress Ratio	Status	Location	Stress Ratio	Status	Location
D Only	0.900	0.856	0.1196	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+L	1.000	0.836	0.4573	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+S	1.150	0.805	0.2306	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L	1.250	0.784	0.3163	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L+0.750S	1.150	0.805	0.4330	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.60D	1.600	0.709	0.04874	PASS	0.0 ft	0.0	PASS	10.0 ft

Maximum Reactions

Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction k		Y-Y Axis Reaction k		Axial Reaction k	My - End Moments k-ft		Mx - End Moments k-ft	
	@ Base	@ Top	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only					1.026				



Wood Column

DESCRIPTION: P2B17

Maximum Reactions

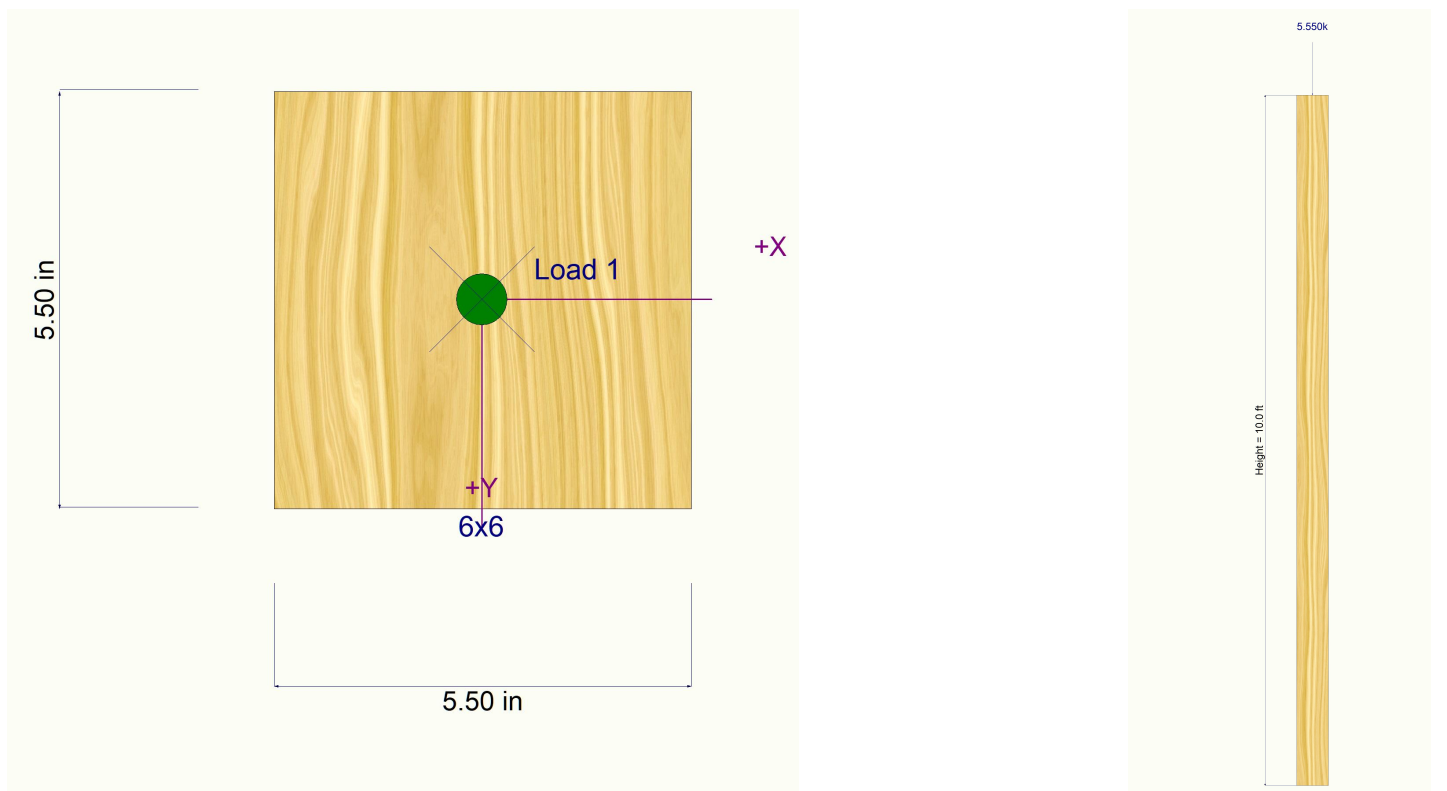
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+D+L						4.256				
+D+S						2.376				
+D+0.750L						3.449				
+D+0.750L+0.750S						4.461				
+0.60D						0.616				
L Only						3.230				
S Only						1.350				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Max. Y-Y Deflection	
	Distance	Distance	Distance	Distance
D Only	0.000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+S	0.0000 in	0.000ft	0.000 in	0.000ft
+D+0.750L	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+0.750L+0.750S	0.0000 in	0.000ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000 ft
L Only	0.0000 in	0.000ft	0.000 in	0.000 ft
S Only	0.0000 in	0.000ft	0.000 in	0.000 ft

Sketches





Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 2B18

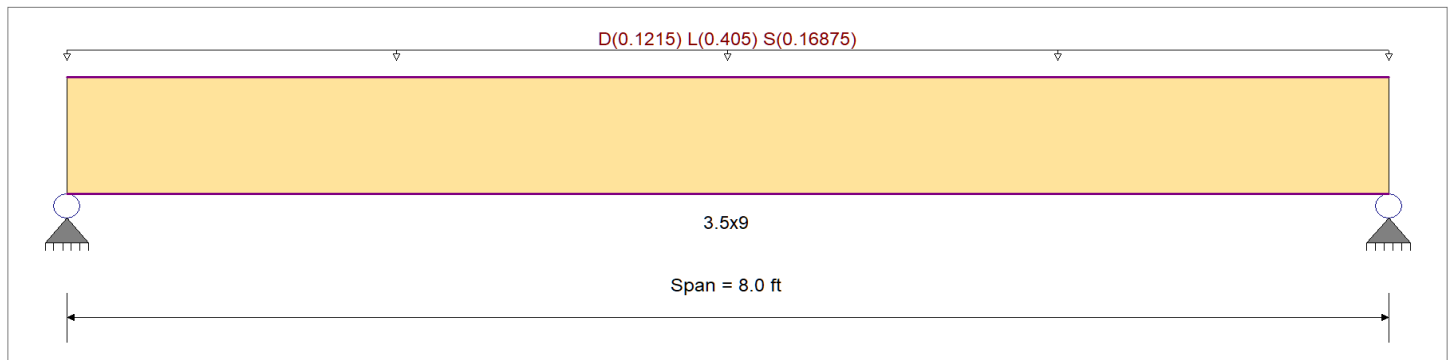
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Ebend- xx	1,800.0ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Ebend- yy	1,600.0ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
	Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, L = 0.060, S = 0.0250 ksf, Tributary Width = 6.750 ft, (ROOF DECK)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.446 1	Maximum Shear Stress Ratio	=	0.309 : 1
Section used for this span		3.5x9	Section used for this span		3.5x9
fb: Actual	=	1,069.71 psi	fv: Actual	=	81.99 psi
Fb: Allowable	=	2,400.00 psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	4.000ft	Location of maximum on span	=	7.270 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.098 in Ratio =	978 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in Ratio =	0 <360	n/a		
Max Downward Total Deflection	0.134 in Ratio =	718 >=240	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection	0 in Ratio =	0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.1337	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	2.207	2.207
Overall MINimum	0.675	0.675
D Only	0.486	0.486
+D+L	2.106	2.106
+D+S	1.161	1.161
+D+0.750L	1.701	1.701
+D+0.750L+0.750S	2.207	2.207
+0.60D	0.292	0.292
L Only	1.620	1.620
S Only	0.675	0.675



Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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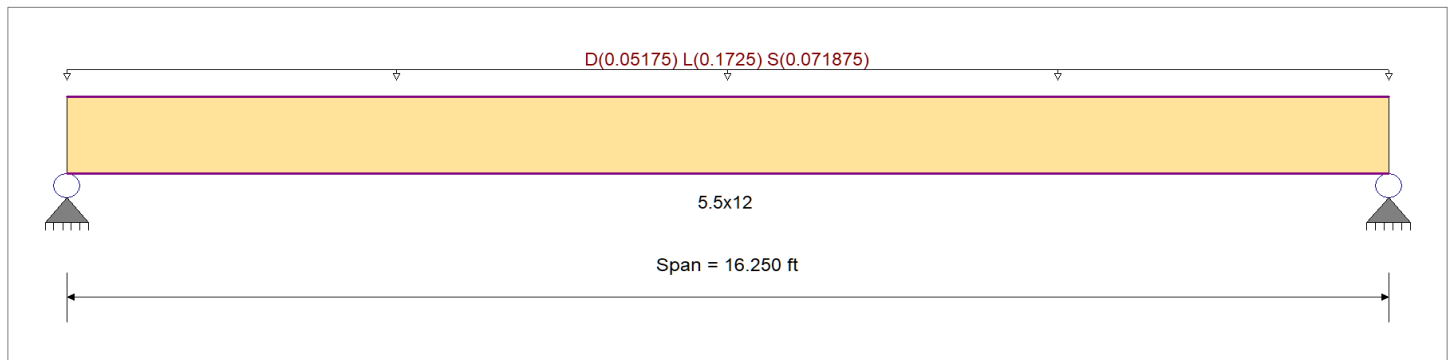
DESCRIPTION: 2B19

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2,400.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	1,850.0 psi	Eband- xx	1,800.0ksi
	Fc - Prll	1,650.0 psi	Eminbend - xx	950.0ksi
Wood Species : DF/DF	Fc - Perp	650.0 psi	Eband- yy	1,600.0ksi
Wood Grade : 24F-V4	Fv	265.0 psi	Eminbend - yy	850.0ksi
	Ft	1,100.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0180, L = 0.060, S = 0.0250 ksf, Tributary Width = 2.875 ft, (ROOF DECK)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.280 < 1	Maximum Shear Stress Ratio	=	0.138 < 1
Section used for this span		5.5x12	Section used for this span		5.5x12
fb: Actual	=	672.91psi	fv: Actual	=	36.57 psi
Fb: Allowable	=	2,400.00psi	Fv: Allowable	=	265.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	8.125ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.191 in	Ratio = 1021 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.260 in	Ratio = 749 >=240	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.2602	8.184		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.910	1.910
Overall MINimum	0.584	0.584
D Only	0.420	0.420
+D+L	1.822	1.822
+D+S	1.004	1.004
+D+0.750L	1.472	1.472
+D+0.750L+0.750S	1.910	1.910
+0.60D	0.252	0.252
L Only	1.402	1.402
S Only	0.584	0.584



Wood Beam

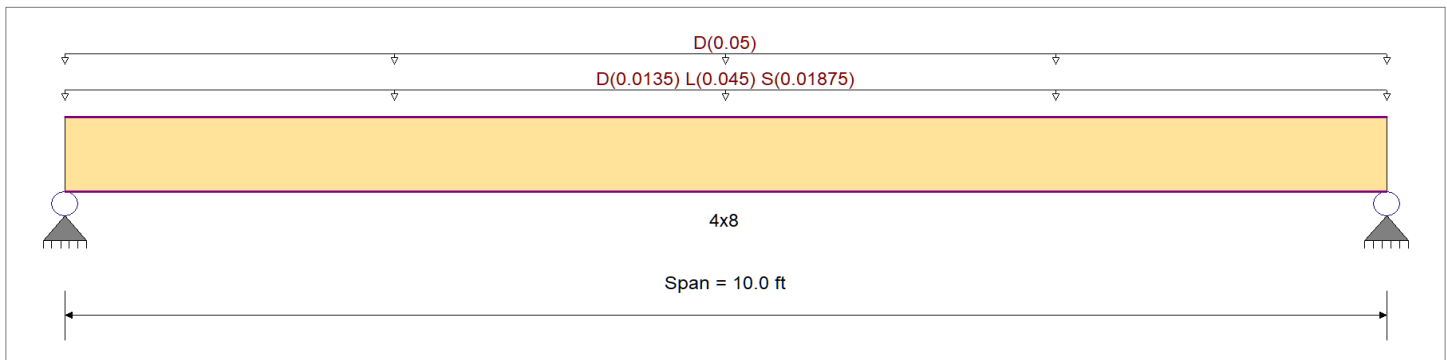
DESCRIPTION: 2B20

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.0180, L = 0.060, S = 0.0250 ksf, Tributary Width = 0.750 ft, (rOOF)
Uniform Load : D = 0.050, Tributary Width = 1.0 ft, (Sliding Door)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.454 1	Maximum Shear Stress Ratio	=	0.157 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	530.80psi	fv: Actual	=	28.32 psi
Fb: Allowable	=	1,170.00psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	5.000ft	Location of maximum on span	=	0.000 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.057 in	Ratio = 2095 >=720	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <720	n/a		
Max Downward Total Deflection	0.142 in	Ratio = 847 >=720	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection	0 in	Ratio = 0 <720	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.1417	5.036		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.557	0.557
Overall MINimum	0.094	0.094
D Only	0.318	0.318
+D+L	0.543	0.543
+D+S	0.411	0.411
+D+0.750L	0.486	0.486
+D+0.750L+0.750S	0.557	0.557
+0.60D	0.191	0.191
L Only	0.225	0.225



L2 Engineers LLC
Design & Planning
17848 NE 198th Place

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.5.16

L2 Engineers

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DESCRIPTION: 2B20

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
S Only	0.094	0.094



Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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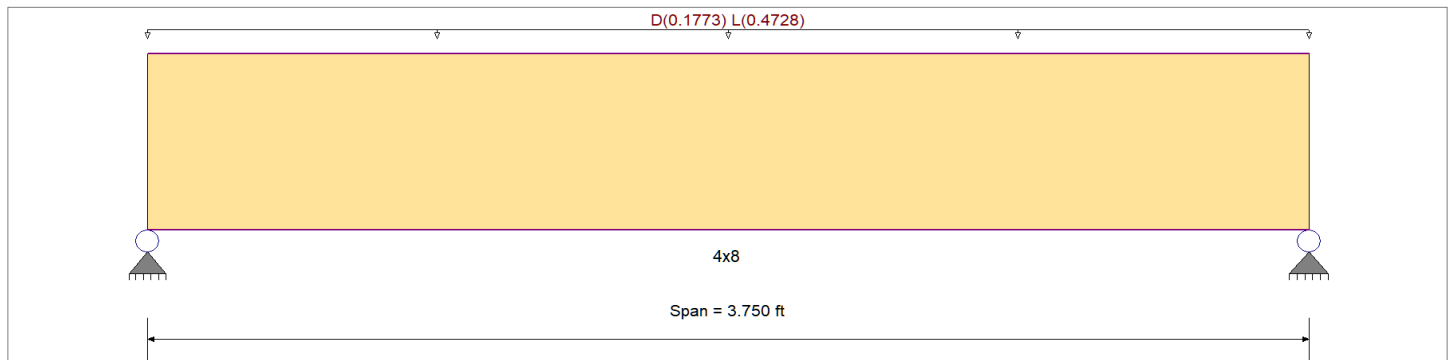
DESCRIPTION: 1B1

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900 psi	Ebend- xx	1600ksi
	Fc - Prll	1350 psi	Eminbend - xx	580ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625 psi		
Wood Grade : No.2	Fv	180 psi		
	Ft	575 psi	Density	31.21 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added
Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 11.820 ft, (Floor)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.382	1	Maximum Shear Stress Ratio	=	0.272	: 1
Section used for this span		4x8		Section used for this span		4x8	
fb: Actual	=	447.24psi		fv: Actual	=	48.91 psi	
Fb: Allowable	=	1,170.00psi		Fv: Allowable	=	180.00 psi	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	1.875ft		Location of maximum on span	=	3.148ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.012 in	Ratio =	3781	>=360	Span: 1 : L Only	
Max Upward Transient Deflection		0 in	Ratio =	0	<360	n/a	
Max Downward Total Deflection		0.016 in	Ratio =	2750	>=240	Span: 1 : +D+L	
Max Upward Total Deflection		0 in	Ratio =	0	<240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0164	1.889		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.219	1.219
Overall MINimum	0.887	0.887
D Only	0.332	0.332
+D+L	1.219	1.219
+D+0.750L	0.997	0.997
+0.60D	0.199	0.199
L Only	0.887	0.887

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 1B2

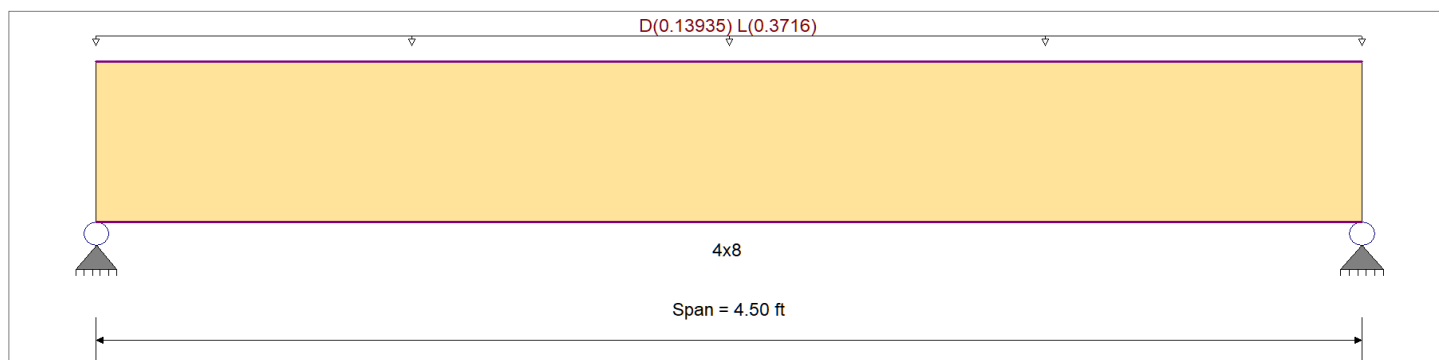
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 9.290 ft, (Floor)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.433 : 1	Maximum Shear Stress Ratio	=	0.278 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	506.18psi	fv: Actual	=	50.10 psi
Fb: Allowable	=	1,170.00psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	2.250ft	Location of maximum on span	=	3.909ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.019 in	Ratio = 2784 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.027 in	Ratio = 2025 >=240	Span: 1 : +D+L		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0267	2.266		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.150	1.150
Overall MINimum	0.836	0.836
D Only	0.314	0.314
+D+L	1.150	1.150
+D+0.750L	0.941	0.941
+0.60D	0.188	0.188
L Only	0.836	0.836



Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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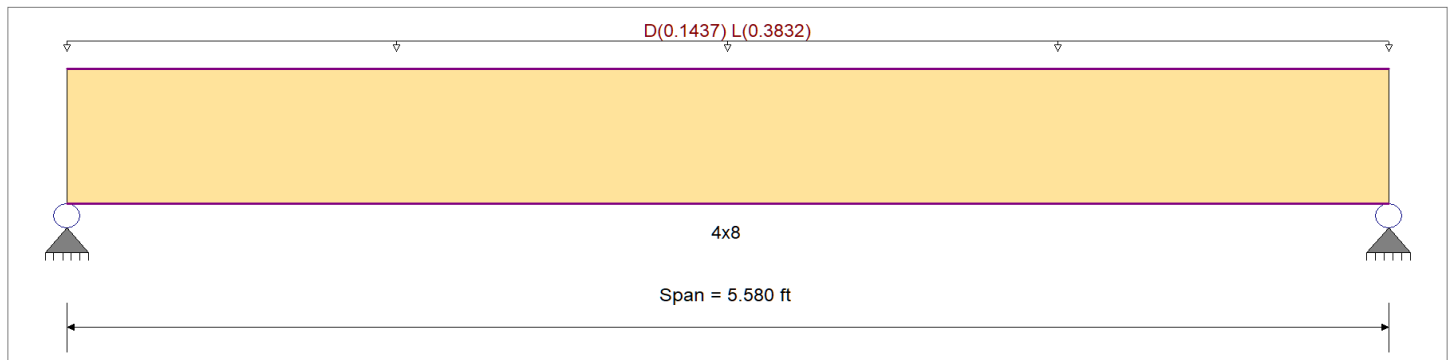
DESCRIPTION: 1B3

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 9.580 ft, (Floor)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.686 : 1	Maximum Shear Stress Ratio	=	0.381 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	802.59psi	fv: Actual	=	68.50 psi
Fb: Allowable	=	1,170.00psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	2.790ft	Location of maximum on span	=	4.989 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.047 in	Ratio =	1416 >=360	Span: 1 : L Only	
Max Upward Transient Deflection	0 in	Ratio =	0 <360	n/a	
Max Downward Total Deflection	0.065 in	Ratio =	1030 >=240	Span: 1 : +D+L	
Max Upward Total Deflection	0 in	Ratio =	0 <240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0650	2.810		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.470	1.470
Overall MINimum	1.069	1.069
D Only	0.401	0.401
+D+L	1.470	1.470
+D+0.750L	1.203	1.203
+0.60D	0.241	0.241
L Only	1.069	1.069



Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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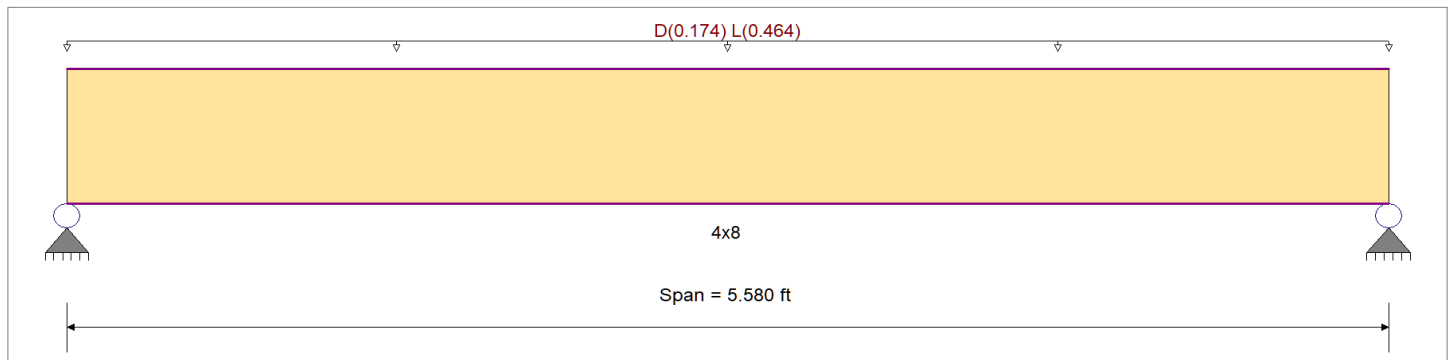
DESCRIPTION: 1B4

CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0150, L = 0.040 ksf, Tributary Width = 11.60 ft, (Floor)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.831 : 1	Maximum Shear Stress Ratio	=	0.461 : 1
Section used for this span		4x8	Section used for this span		4x8
fb: Actual	=	971.82psi	fv: Actual	=	82.95 psi
Fb: Allowable	=	1,170.00psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	2.790ft	Location of maximum on span	=	4.989 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.057 in	Ratio = 1169	>=360	Span: 1 : L Only	
Max Upward Transient Deflection	0 in	Ratio = 0	<360	n/a	
Max Downward Total Deflection	0.079 in	Ratio = 850	>=240	Span: 1 : +D+L	
Max Upward Total Deflection	0 in	Ratio = 0	<240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0787	2.810		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.780	1.780
Overall MINimum	1.295	1.295
D Only	0.485	0.485
+D+L	1.780	1.780
+D+0.750L	1.456	1.456
+0.60D	0.291	0.291
L Only	1.295	1.295

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 1B5

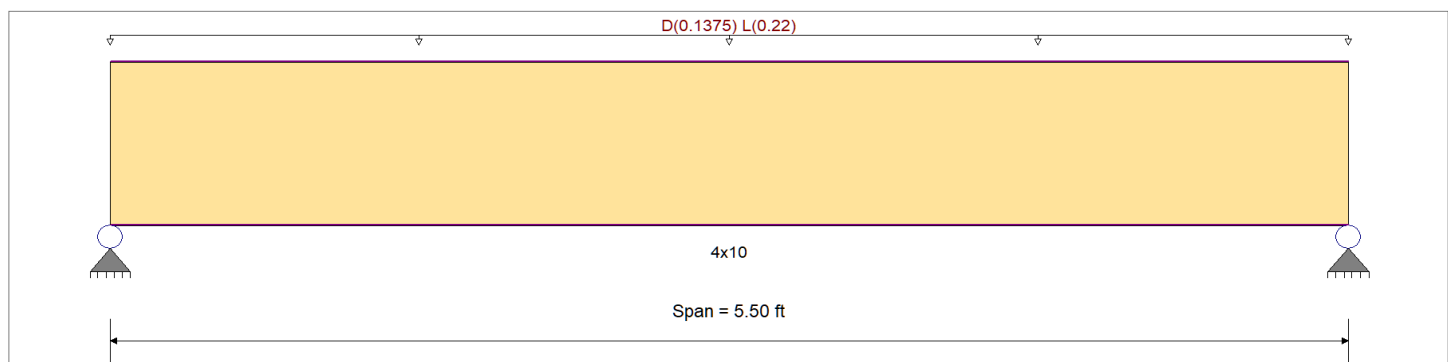
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 5.50 ft, (Floor)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.301 : 1	Maximum Shear Stress Ratio	=	0.183 : 1
Section used for this span		4x10	Section used for this span		4x10
fb: Actual	=	325.01 psi	fv: Actual	=	32.92 psi
Fb: Allowable	=	1,080.00 psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	2.750ft	Location of maximum on span	=	4.737 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection	0.012 in	Ratio = 5350 >=360	Span: 1 : L Only		
Max Upward Transient Deflection	0 in	Ratio = 0 <360	n/a		
Max Downward Total Deflection	0.020 in	Ratio = 3292 >=240	Span: 1 : +D+L		
Max Upward Total Deflection	0 in	Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0200	2.770		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.983	0.983
Overall MINimum	0.605	0.605
D Only	0.378	0.378
+D+L	0.983	0.983
+D+0.750L	0.832	0.832
+0.60D	0.227	0.227
L Only	0.605	0.605

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: 1B6

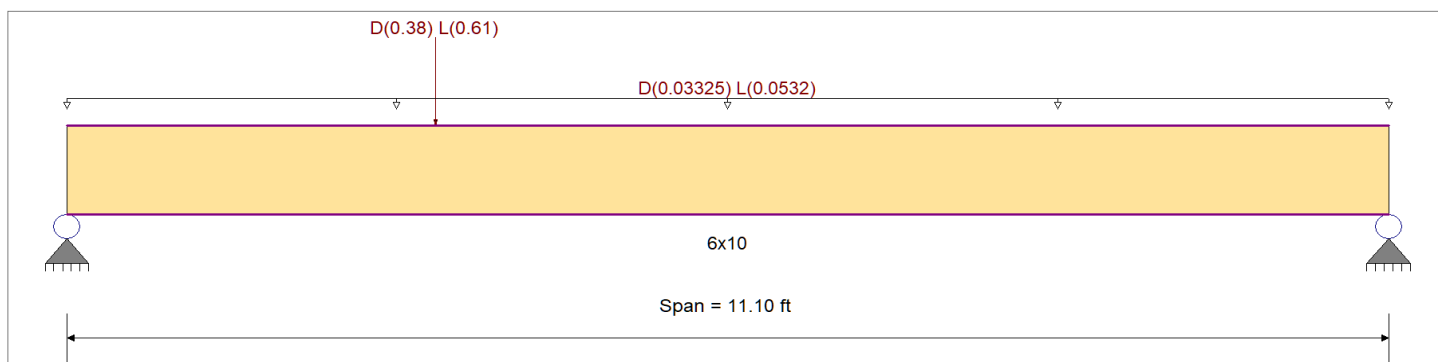
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	E : Modulus of Elasticity	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

Uniform Load : D = 0.0250, L = 0.040 ksf, Tributary Width = 1.330 ft, (Floor)

Point Load : D = 0.380, L = 0.610 k @ 3.10 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.529 : 1	Maximum Shear Stress Ratio	=	0.180 : 1
Section used for this span		6x10	Section used for this span		6x10
fb: Actual	=	476.15psi	fv: Actual	=	32.35 psi
Fb: Allowable	=	900.00psi	Fv: Allowable	=	180.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	3.119ft	Location of maximum on span	=	0.000ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.065 in Ratio = 2035 >=360	Span: 1 : L Only		
Max Upward Transient Deflection		0 in Ratio = 0 <360	n/a		
Max Downward Total Deflection		0.106 in Ratio = 1253 >=240	Span: 1 : +D+L		
Max Upward Total Deflection		0 in Ratio = 0 <240	n/a		

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.1063	5.226		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.193	0.756
Overall MINimum	0.735	0.466
D Only	0.458	0.291
+D+L	1.193	0.756
+D+0.750L	1.010	0.640
+0.60D	0.275	0.174
L Only	0.735	0.466

Wood Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.5.16

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: Parapet Gutter Beam

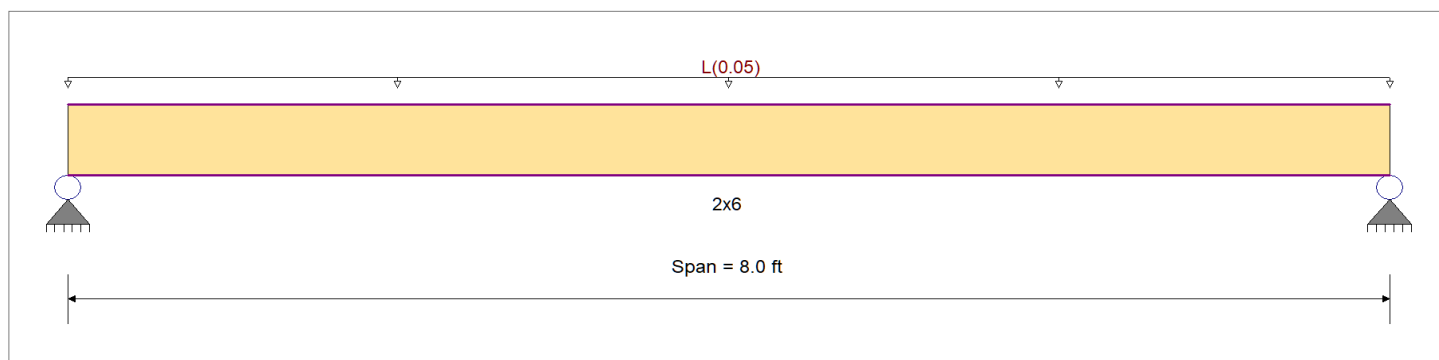
CODE REFERENCES

Calculations per NDS 2018, IBC 2018, CBC 2019, ASCE 7-16

Load Combination Set : ASCE 7-16

Material Properties

Analysis Method : Allowable Stress Design	Fb +	900.0 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : ASCE 7-16	Fb -	900.0 psi	Ebend- xx	1,600.0ksi
	Fc - Prll	1,350.0 psi	Eminbend - xx	580.0ksi
Wood Species : Douglas Fir-Larch	Fc - Perp	625.0 psi		
Wood Grade : No.2	Fv	180.0 psi		
	Ft	575.0 psi	Density	31.210pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

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

Beam self weight NOT internally calculated and added

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

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.542	1	Maximum Shear Stress Ratio	=	0.180	: 1
Section used for this span		2x6		Section used for this span		2x6	
fb: Actual	=	634.71 psi		fv: Actual	=	32.38 psi	
Fb: Allowable	=	1,170.00 psi		Fv: Allowable	=	180.00 psi	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	4.000ft		Location of maximum on span	=	7.562 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.139 in	Ratio =	689	>=360	Span: 1 : L Only	
Max Upward Transient Deflection		0 in	Ratio =	0	<360	n/a	
Max Downward Total Deflection		0.139 in	Ratio =	689	>=240	Span: 1 : +D+L	
Max Upward Total Deflection		0 in	Ratio =	0	<240	n/a	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
L Only	1	0.1393	4.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	0.200	0.200
Overall MINimum	0.200	0.200
+D+L	0.200	0.200
+D+0.750L	0.150	0.150
L Only	0.200	0.200



Wood Column

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.5.16

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: Parapet Post

Maximum Reactions

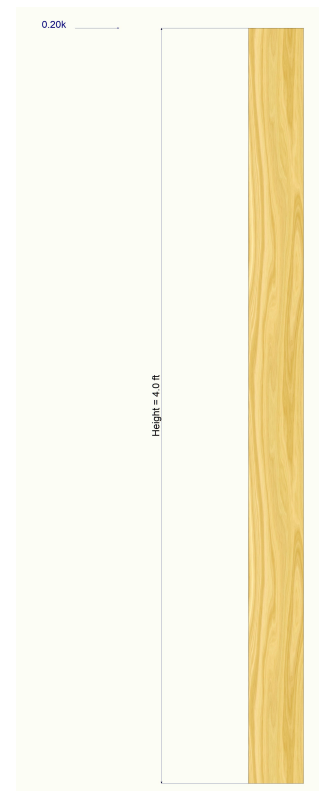
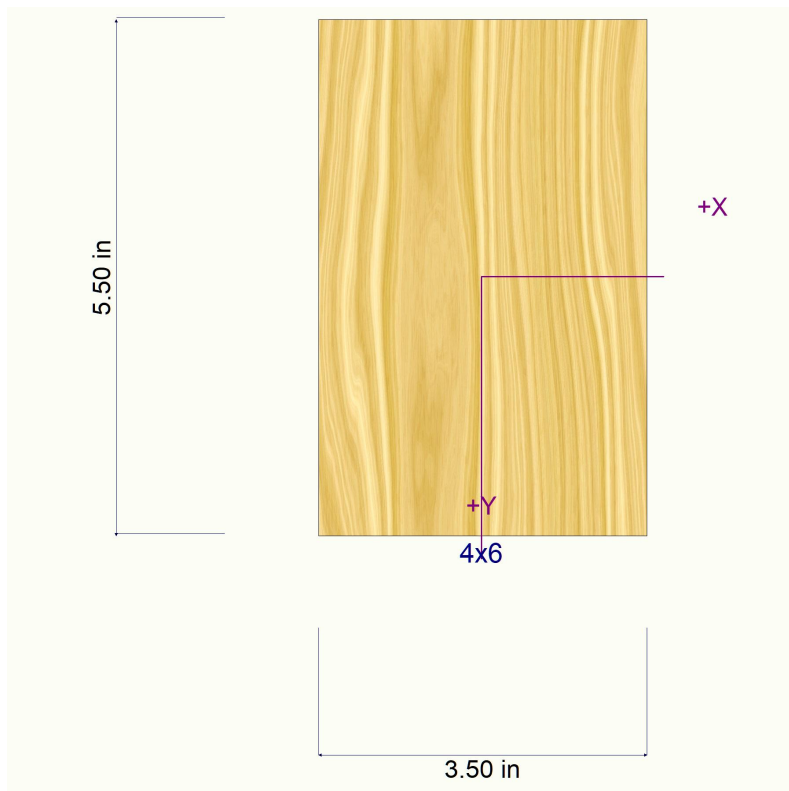
Note: Only non-zero reactions are listed.

Load Combination	X-X Axis Reaction		k	Y-Y Axis Reaction		Axial Reaction	My - End Moments		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
+0.60D						0.010				
L Only	0.200						0.800			

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection		Max. Y-Y Deflection	
	Distance		Distance	
D Only	0.0000 in	0.000ft	0.000 in	0.000 ft
+D+L	0.2456 in	4.000ft	0.000 in	0.000 ft
+D+0.750L	0.1842 in	4.000ft	0.000 in	0.000 ft
+0.60D	0.0000 in	0.000ft	0.000 in	0.000 ft
L Only	0.2431 in	3.973ft	0.000 in	0.000 ft

Sketches





General Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: F1

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing Depth

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

Increases based on footing plan dimension

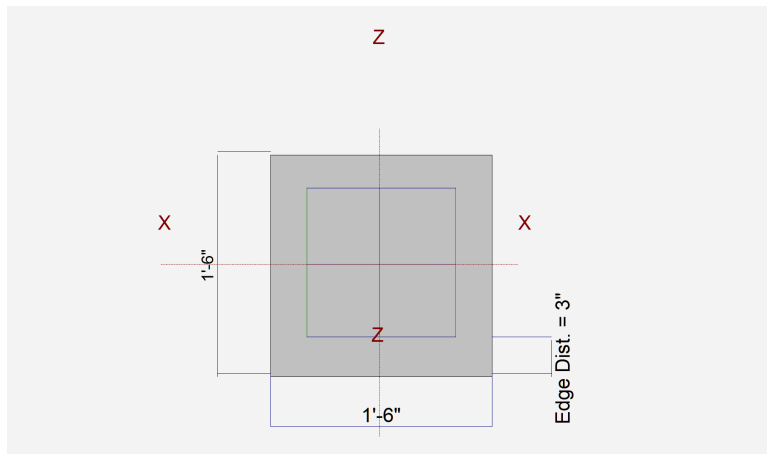
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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Dimensions

Width parallel to X-X Axis	=	1.50 ft
Length parallel to Z-Z Axis	=	1.50 ft
Footing Thickness	=	10.0 in

Pedestal dimensions...

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



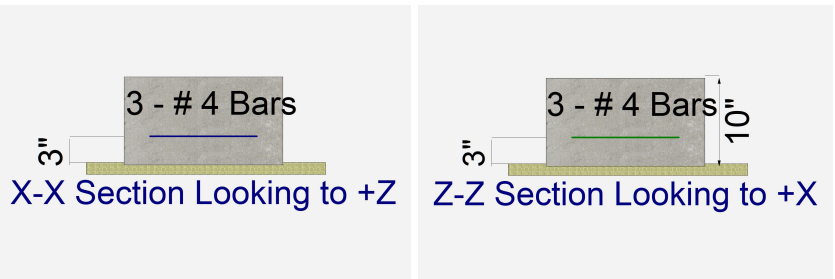
Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	3.0
Reinforcing Bar Size	=	# 4

Bars parallel to Z-Z Axis	=	
Number of Bars	=	3.0
Reinforcing Bar Size	=	# 4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	=	n/a
# Bars required within zone	=	n/a
# Bars required on each side of zone	=	n/a



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	1.160		2.580			k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



General Footing

DESCRIPTION: F1

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7132	Soil Bearing	1.783 ksf	2.50 ksf	+D+L about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.05801	Z Flexure (+X)	0.690 k-ft/ft	11.894 k-ft/ft	+1.20D+1.60L
PASS	0.05801	Z Flexure (-X)	0.690 k-ft/ft	11.894 k-ft/ft	+1.20D+1.60L
PASS	0.05801	X Flexure (+Z)	0.690 k-ft/ft	11.894 k-ft/ft	+1.20D+1.60L
PASS	0.05801	X Flexure (-Z)	0.690 k-ft/ft	11.894 k-ft/ft	+1.20D+1.60L
PASS	0.05866	1-way Shear (+X)	4.819 psi	82.158 psi	+1.20D+1.60L
PASS	0.05866	1-way Shear (-X)	4.819 psi	82.158 psi	+1.20D+1.60L
PASS	0.05866	1-way Shear (+Z)	4.819 psi	82.158 psi	+1.20D+1.60L
PASS	0.05866	1-way Shear (-Z)	4.819 psi	82.158 psi	+1.20D+1.60L
PASS	0.1466	2-way Punching	24.096 psi	164.317 psi	+1.20D+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xeccc	Zeccc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.50	n/a	0.0	0.6364	0.6364	n/a	n/a	0.255
X-X, +D+L	2.50	n/a	0.0	1.783	1.783	n/a	n/a	0.713
X-X, +D+0.750L	2.50	n/a	0.0	1.496	1.496	n/a	n/a	0.598
X-X, +0.60D	2.50	n/a	0.0	0.3818	0.3818	n/a	n/a	0.153
Z-Z, D Only	2.50	0.0	n/a	n/a	n/a	0.6364	0.6364	0.255
Z-Z, +D+L	2.50	0.0	n/a	n/a	n/a	1.783	1.783	0.713
Z-Z, +D+0.750L	2.50	0.0	n/a	n/a	n/a	1.496	1.496	0.598
Z-Z, +0.60D	2.50	0.0	n/a	n/a	n/a	0.3818	0.3818	0.153

Overturing Stability

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

All units k

Sliding Stability

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

General Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.4.26

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: P2B8.1 FDN

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing Depth

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

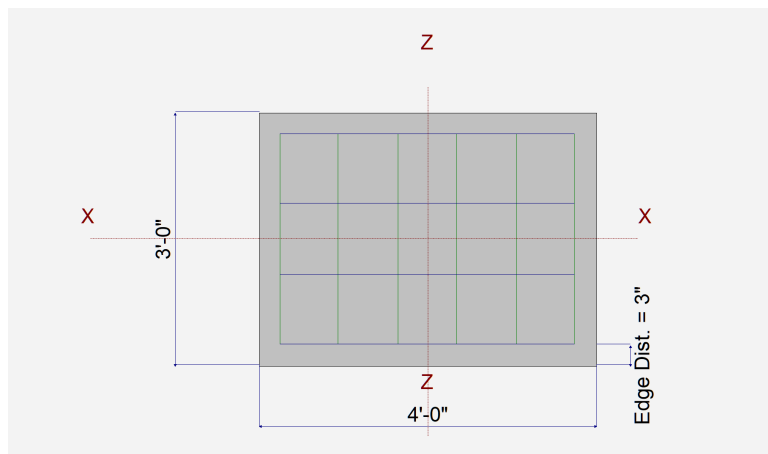
Increases based on footing plan dimension

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

Width parallel to X-X Axis	=	4.0 ft
Length parallel to Z-Z Axis	=	3.0 ft
Footing Thickness	=	12.0 in

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

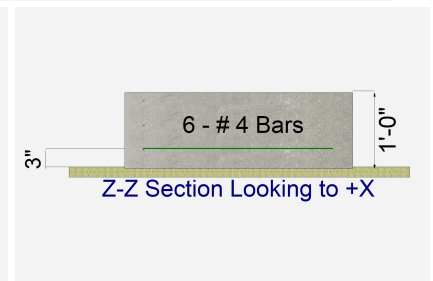
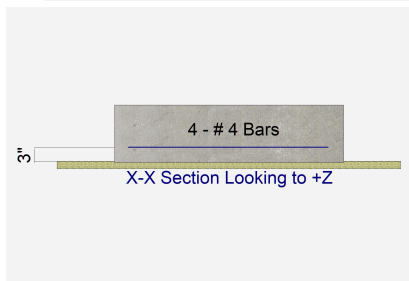


Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	4
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis	=	
Number of Bars	=	6
Reinforcing Bar Size	=	# 4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation		Bars along Z-Z Axis
# Bars required within zone	85.7 %	
# Bars required on each side of zone	14.3 %	



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	7.140	2.430	12.160	3.030		k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



General Footing

DESCRIPTION: P2B8.1 FDN

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.7012	Soil Bearing	1.753 ksf	2.50 ksf	+D+L about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.4695	Z Flexure (+X)	4.923 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.4695	Z Flexure (-X)	4.923 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.2356	X Flexure (+Z)	2.769 k-ft/ft	11.753 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.2356	X Flexure (-Z)	2.769 k-ft/ft	11.753 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.3440	1-way Shear (+X)	28.263 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.3440	1-way Shear (-X)	28.263 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.2081	1-way Shear (+Z)	17.094 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.2081	1-way Shear (-Z)	17.094 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.5299	2-way Punching	87.067 psi	164.317 psi	+1.20D+1.60L+0.50S

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xeccc	Zeccc (in)	Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
				Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.50	n/a	0.0	0.740	0.740	n/a	n/a	0.296
X-X, +D+L	2.50	n/a	0.0	1.753	1.753	n/a	n/a	0.701
X-X, +D+Lr	2.50	n/a	0.0	0.9425	0.9425	n/a	n/a	0.377
X-X, +D+S	2.50	n/a	0.0	0.9925	0.9925	n/a	n/a	0.397
X-X, +D+0.750Lr+0.750L	2.50	n/a	0.0	1.652	1.652	n/a	n/a	0.661
X-X, +D+0.750L+0.750S	2.50	n/a	0.0	1.689	1.689	n/a	n/a	0.676
X-X, +0.60D	2.50	n/a	0.0	0.4440	0.4440	n/a	n/a	0.178
Z-Z, D Only	2.50	0.0	n/a	n/a	n/a	0.740	0.740	0.296
Z-Z, +D+L	2.50	0.0	n/a	n/a	n/a	1.753	1.753	0.701
Z-Z, +D+Lr	2.50	0.0	n/a	n/a	n/a	0.9425	0.9425	0.377
Z-Z, +D+S	2.50	0.0	n/a	n/a	n/a	0.9925	0.9925	0.397
Z-Z, +D+0.750Lr+0.750L	2.50	0.0	n/a	n/a	n/a	1.652	1.652	0.661
Z-Z, +D+0.750L+0.750S	2.50	0.0	n/a	n/a	n/a	1.689	1.689	0.676
Z-Z, +0.60D	2.50	0.0	n/a	n/a	n/a	0.4440	0.4440	0.178

Overturing Stability

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

Sliding Stability

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

All units k



General Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: P2B8.2 FDN

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing Depth

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

Increases based on footing plan dimension

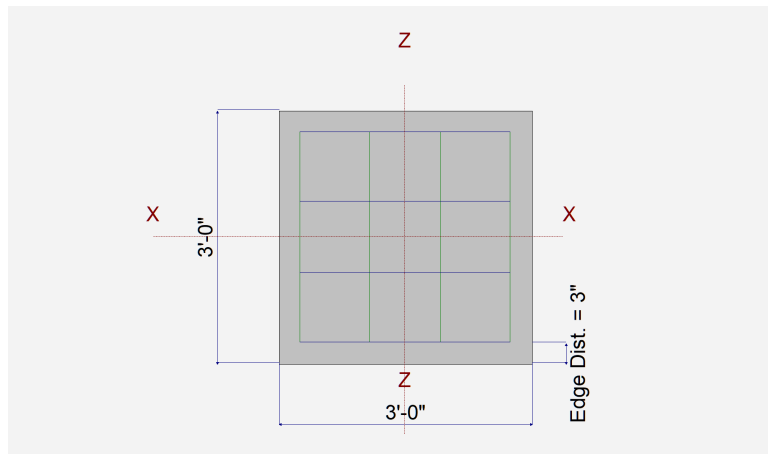
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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Dimensions

Width parallel to X-X Axis	=	3.0 ft
Length parallel to Z-Z Axis	=	3.0 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

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



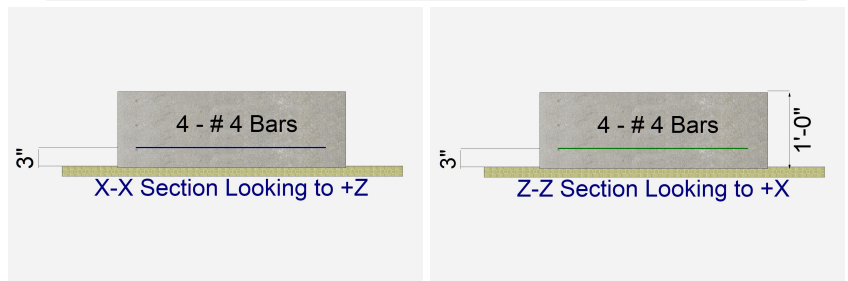
Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 4

Bars parallel to Z-Z Axis	=	
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	=	n/a
# Bars required within zone	=	n/a
# Bars required on each side of zone	=	n/a



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	5.30	2.0	7.480	2.520		k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



General Footing

DESCRIPTION: P2B8.2 FDN

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.6268	Soil Bearing	1.567 ksf	2.50 ksf	+D+0.750L+0.750S about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.2335	Z Flexure (+X)	2.449 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.2335	Z Flexure (-X)	2.449 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.2335	X Flexure (+Z)	2.449 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.2335	X Flexure (-Z)	2.449 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.1840	1-way Shear (+X)	15.114 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.1840	1-way Shear (-X)	15.114 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.1840	1-way Shear (+Z)	15.114 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.1840	1-way Shear (-Z)	15.114 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.3449	2-way Punching	56.678 psi	164.317 psi	+1.20D+1.60L+0.50S

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc		Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
		Zecc (in)	(in)	Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.50	n/a	0.0	0.7339	0.7339	n/a	n/a	0.294
X-X, +D+L	2.50	n/a	0.0	1.565	1.565	n/a	n/a	0.626
X-X, +D+Lr	2.50	n/a	0.0	0.9561	0.9561	n/a	n/a	0.382
X-X, +D+S	2.50	n/a	0.0	1.014	1.014	n/a	n/a	0.406
X-X, +D+0.750Lr+0.750L	2.50	n/a	0.0	1.524	1.524	n/a	n/a	0.610
X-X, +D+0.750L+0.750S	2.50	n/a	0.0	1.567	1.567	n/a	n/a	0.627
X-X, +0.60D	2.50	n/a	0.0	0.4403	0.4403	n/a	n/a	0.176
Z-Z, D Only	2.50	0.0	n/a	n/a	n/a	0.7339	0.7339	0.294
Z-Z, +D+L	2.50	0.0	n/a	n/a	n/a	1.565	1.565	0.626
Z-Z, +D+Lr	2.50	0.0	n/a	n/a	n/a	0.9561	0.9561	0.382
Z-Z, +D+S	2.50	0.0	n/a	n/a	n/a	1.014	1.014	0.406
Z-Z, +D+0.750Lr+0.750L	2.50	0.0	n/a	n/a	n/a	1.524	1.524	0.610
Z-Z, +D+0.750L+0.750S	2.50	0.0	n/a	n/a	n/a	1.567	1.567	0.627
Z-Z, +0.60D	2.50	0.0	n/a	n/a	n/a	0.4403	0.4403	0.176

Overturing Stability

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

Sliding Stability

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

All units k



General Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: P2B2.1 FDN

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing depth

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

Increases based on footing plan dimension

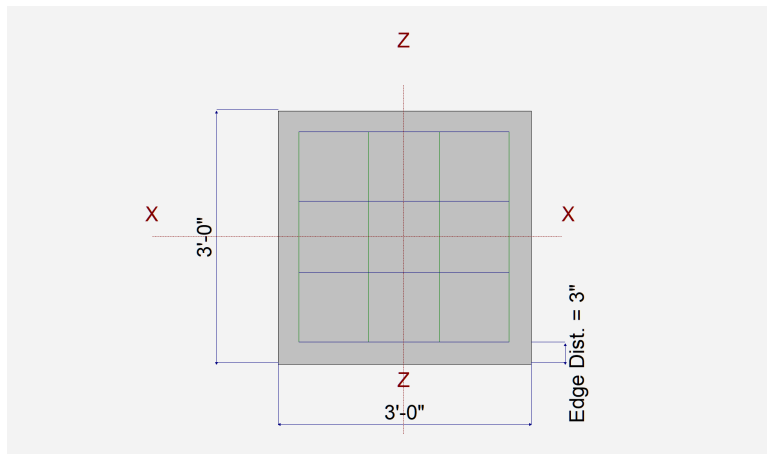
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf
	=	ft

Dimensions

Width parallel to X-X Axis	=	3.0 ft
Length parallel to Z-Z Axis	=	3.0 ft
Footing Thickness	=	12.0 in

Pedestal dimensions...

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



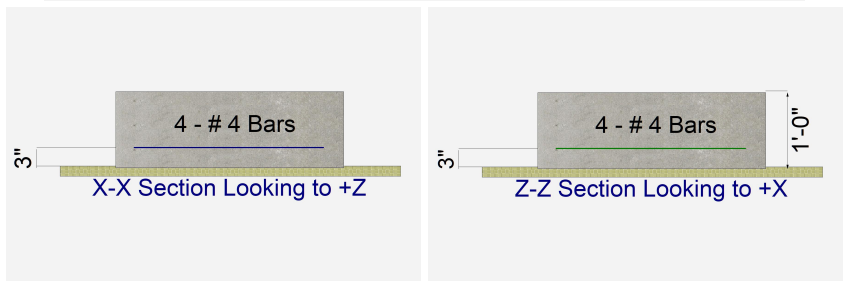
Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 4

Bars parallel to Z-Z Axis	=	
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 4

Bandwidth Distribution Check (ACI 15.4.4.2)

Direction Requiring Closer Separation	=	n/a
# Bars required within zone	=	n/a
# Bars required on each side of zone	=	n/a



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	6.140	1.950	11.220	2.440		k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



General Footing

DESCRIPTION: P2B2.1 FDN

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.8296	Soil Bearing	2.074 ksf	2.50 ksf	+D+L about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.3164	Z Flexure (+X)	3.318 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.3164	Z Flexure (-X)	3.318 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.3164	X Flexure (+Z)	3.318 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.3164	X Flexure (-Z)	3.318 k-ft/ft	10.486 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.2493	1-way Shear (+X)	20.478 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.2493	1-way Shear (-X)	20.478 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.2493	1-way Shear (+Z)	20.478 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.2493	1-way Shear (-Z)	20.478 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.4674	2-way Punching	76.794 psi	164.317 psi	+1.20D+1.60L+0.50S

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc		Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
		Zecc (in)	(in)	Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.50	n/a	0.0	0.8272	0.8272	n/a	n/a	0.331
X-X, +D+L	2.50	n/a	0.0	2.074	2.074	n/a	n/a	0.830
X-X, +D+Lr	2.50	n/a	0.0	1.044	1.044	n/a	n/a	0.418
X-X, +D+S	2.50	n/a	0.0	1.098	1.098	n/a	n/a	0.439
X-X, +D+0.750Lr+0.750L	2.50	n/a	0.0	1.925	1.925	n/a	n/a	0.770
X-X, +D+0.750L+0.750S	2.50	n/a	0.0	1.966	1.966	n/a	n/a	0.786
X-X, +0.60D	2.50	n/a	0.0	0.4963	0.4963	n/a	n/a	0.199
Z-Z, D Only	2.50	0.0	n/a	n/a	n/a	0.8272	0.8272	0.331
Z-Z, +D+L	2.50	0.0	n/a	n/a	n/a	2.074	2.074	0.830
Z-Z, +D+Lr	2.50	0.0	n/a	n/a	n/a	1.044	1.044	0.418
Z-Z, +D+S	2.50	0.0	n/a	n/a	n/a	1.098	1.098	0.439
Z-Z, +D+0.750Lr+0.750L	2.50	0.0	n/a	n/a	n/a	1.925	1.925	0.770
Z-Z, +D+0.750L+0.750S	2.50	0.0	n/a	n/a	n/a	1.966	1.966	0.786
Z-Z, +0.60D	2.50	0.0	n/a	n/a	n/a	0.4963	0.4963	0.199

Overturing Stability

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

Sliding Stability

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

All units k



General Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: P2B1.2 FDN

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing depth

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

Increases based on footing plan dimension

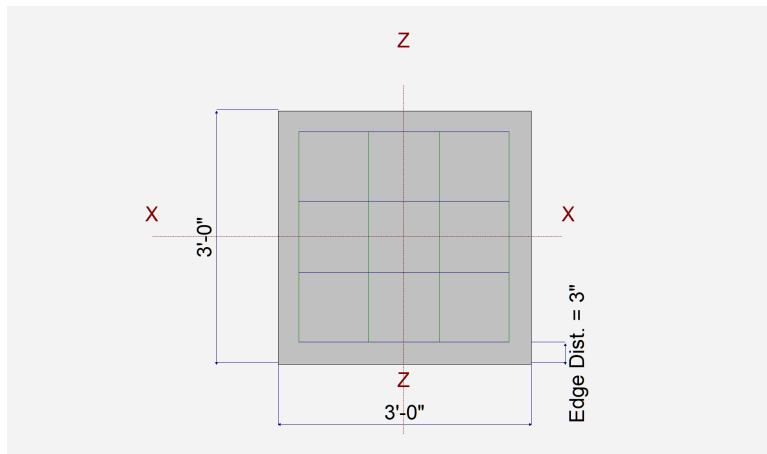
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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Dimensions

Width parallel to X-X Axis	=	3.0 ft
Length parallel to Z-Z Axis	=	3.0 ft
Footing Thickness	=	12.0 in

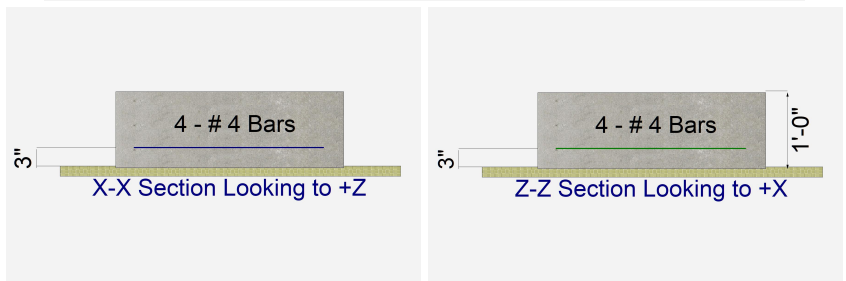
Pedestal dimensions...

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



Reinforcing

Bars parallel to X-X Axis	=	
Number of Bars	=	4
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis	=	
Number of Bars	=	4.0
Reinforcing Bar Size	=	# 4
Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		n/a
# Bars required within zone		n/a
# Bars required on each side of zone		n/a



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	4.0	1.0	7.0	1.0		k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



General Footing

DESCRIPTION: P2B1.2 FDN

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.5468	Soil Bearing	1.367 ksf	2.50 ksf	+D+L about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.1967	Z Flexure (+X)	2.063 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.1967	Z Flexure (-X)	2.063 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.1967	X Flexure (+Z)	2.063 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.1967	X Flexure (-Z)	2.063 k-ft/ft	10.486 k-ft/ft	+1.20D+0.50Lr+1.60L
PASS	0.1550	1-way Shear (+X)	12.731 psi	82.158 psi	+1.20D+0.50Lr+1.60L
PASS	0.1550	1-way Shear (-X)	12.731 psi	82.158 psi	+1.20D+0.50Lr+1.60L
PASS	0.1550	1-way Shear (+Z)	12.731 psi	82.158 psi	+1.20D+0.50Lr+1.60L
PASS	0.1550	1-way Shear (-Z)	12.731 psi	82.158 psi	+1.20D+0.50Lr+1.60L
PASS	0.2906	2-way Punching	47.743 psi	164.317 psi	+1.20D+0.50Lr+1.60L

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc		Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
		Zecc (in)		Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.50	n/a	0.0	0.5894	0.5894	n/a	n/a	0.236
X-X, +D+L	2.50	n/a	0.0	1.367	1.367	n/a	n/a	0.547
X-X, +D+Lr	2.50	n/a	0.0	0.7006	0.7006	n/a	n/a	0.280
X-X, +D+S	2.50	n/a	0.0	0.7006	0.7006	n/a	n/a	0.280
X-X, +D+0.750Lr+0.750L	2.50	n/a	0.0	1.256	1.256	n/a	n/a	0.502
X-X, +D+0.750L+0.750S	2.50	n/a	0.0	1.256	1.256	n/a	n/a	0.502
X-X, +0.60D	2.50	n/a	0.0	0.3537	0.3537	n/a	n/a	0.142
Z-Z, D Only	2.50	0.0	n/a	n/a	n/a	0.5894	0.5894	0.236
Z-Z, +D+L	2.50	0.0	n/a	n/a	n/a	1.367	1.367	0.547
Z-Z, +D+Lr	2.50	0.0	n/a	n/a	n/a	0.7006	0.7006	0.280
Z-Z, +D+S	2.50	0.0	n/a	n/a	n/a	0.7006	0.7006	0.280
Z-Z, +D+0.750Lr+0.750L	2.50	0.0	n/a	n/a	n/a	1.256	1.256	0.502
Z-Z, +D+0.750L+0.750S	2.50	0.0	n/a	n/a	n/a	1.256	1.256	0.502
Z-Z, +0.60D	2.50	0.0	n/a	n/a	n/a	0.3537	0.3537	0.142

Overturing Stability

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

Sliding Stability

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

All units k



General Footing

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: P2B17 FDN

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Soil Density	=	110.0 pcf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Analysis Settings

Min Steel % Bending Reinf.	=	
Min Allow % Temp Reinf.	=	0.00180
Min. Overturning Safety Factor	=	1.0 : 1
Min. Sliding Safety Factor	=	1.0 : 1
Add Ftg Wt for Soil Pressure	:	Yes
Use ftg wt for stability, moments & shears	:	Yes
Add Pedestal Wt for Soil Pressure	:	No
Use Pedestal wt for stability, mom & shear	:	No

Increases based on footing Depth

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

Increases based on footing plan dimension

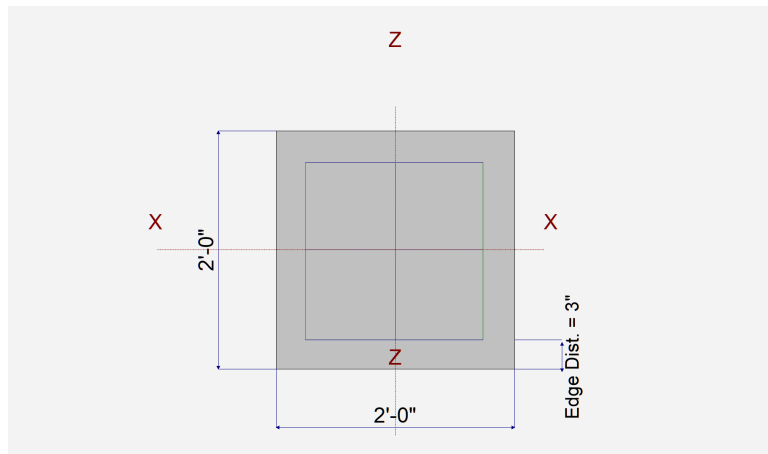
Allowable pressure increase per foot of depth when max. length or width is greater than	=	ksf ft
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Dimensions

Width parallel to X-X Axis	=	2.0 ft
Length parallel to Z-Z Axis	=	2.0 ft
Footing Thickness	=	10.0 in

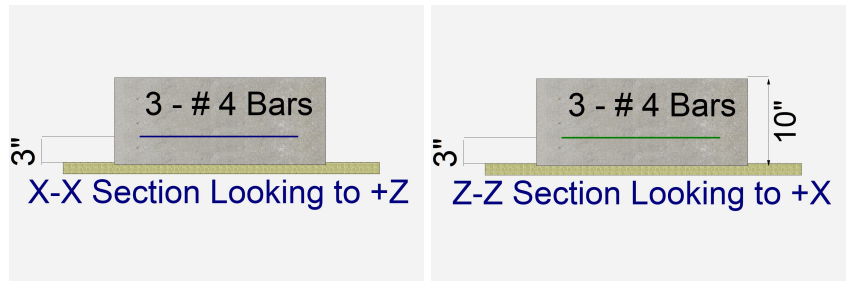
Pedestal dimensions...

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



Reinforcing

Bars parallel to X-X Axis		
Number of Bars	=	3
Reinforcing Bar Size	=	# 4
Bars parallel to Z-Z Axis		
Number of Bars	=	3
Reinforcing Bar Size	=	# 4
Bandwidth Distribution Check (ACI 15.4.4.2)		
Direction Requiring Closer Separation		n/a
# Bars required within zone		n/a
# Bars required on each side of zone		n/a



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	0.970	1.080	3.230	1.350		k
OB : Overburden	=						ksf
M-xx	=						k-ft
M-zz	=						k-ft
V-x	=						k
V-z	=						k



General Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: P2B17 FDN

DESIGN SUMMARY

Design OK

	Min. Ratio	Item	Applied	Capacity	Governing Load Combination
PASS	0.4888	Soil Bearing	1.222 ksf	2.50 ksf	+D+0.750L+0.750S about Z-Z axis
PASS	n/a	Overturing - X-X	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Sliding - Z-Z	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift
PASS	0.09675	Z Flexure (+X)	0.8759 k-ft/ft	9.053 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.09675	Z Flexure (-X)	0.8759 k-ft/ft	9.053 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.09675	X Flexure (+Z)	0.8759 k-ft/ft	9.053 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.09675	X Flexure (-Z)	0.8759 k-ft/ft	9.053 k-ft/ft	+1.20D+1.60L+0.50S
PASS	0.1066	1-way Shear (+X)	8.759 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.1066	1-way Shear (-X)	8.759 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.1066	1-way Shear (+Z)	8.759 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.1066	1-way Shear (-Z)	8.759 psi	82.158 psi	+1.20D+1.60L+0.50S
PASS	0.1980	2-way Punching	32.533 psi	164.317 psi	+1.20D+1.60L+0.50S

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc		Actual Soil Bearing Stress @ Location				Actual / Allow Ratio
		Zecc (in)	(in)	Bottom, -Z	Top, +Z	Left, -X	Right, +X	
X-X, D Only	2.50	n/a	0.0	0.3633	0.3633	n/a	n/a	0.145
X-X, +D+L	2.50	n/a	0.0	1.171	1.171	n/a	n/a	0.468
X-X, +D+Lr	2.50	n/a	0.0	0.6333	0.6333	n/a	n/a	0.253
X-X, +D+S	2.50	n/a	0.0	0.7008	0.7008	n/a	n/a	0.280
X-X, +D+0.750Lr+0.750L	2.50	n/a	0.0	1.171	1.171	n/a	n/a	0.468
X-X, +D+0.750L+0.750S	2.50	n/a	0.0	1.222	1.222	n/a	n/a	0.489
X-X, +0.60D	2.50	n/a	0.0	0.2180	0.2180	n/a	n/a	0.087
Z-Z, D Only	2.50	0.0	n/a	n/a	n/a	0.3633	0.3633	0.145
Z-Z, +D+L	2.50	0.0	n/a	n/a	n/a	1.171	1.171	0.468
Z-Z, +D+Lr	2.50	0.0	n/a	n/a	n/a	0.6333	0.6333	0.253
Z-Z, +D+S	2.50	0.0	n/a	n/a	n/a	0.7008	0.7008	0.280
Z-Z, +D+0.750Lr+0.750L	2.50	0.0	n/a	n/a	n/a	1.171	1.171	0.468
Z-Z, +D+0.750L+0.750S	2.50	0.0	n/a	n/a	n/a	1.222	1.222	0.489
Z-Z, +0.60D	2.50	0.0	n/a	n/a	n/a	0.2180	0.2180	0.087

Overturing Stability

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

Sliding Stability

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

All units k



Wall Footing

DESCRIPTION: F2

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
 Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'c : Concrete 28 day strength	=	3.0 ksi
fy : Rebar Yield	=	60.0 ksi
Ec : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
φ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

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

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

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

Increases based on footing Width

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

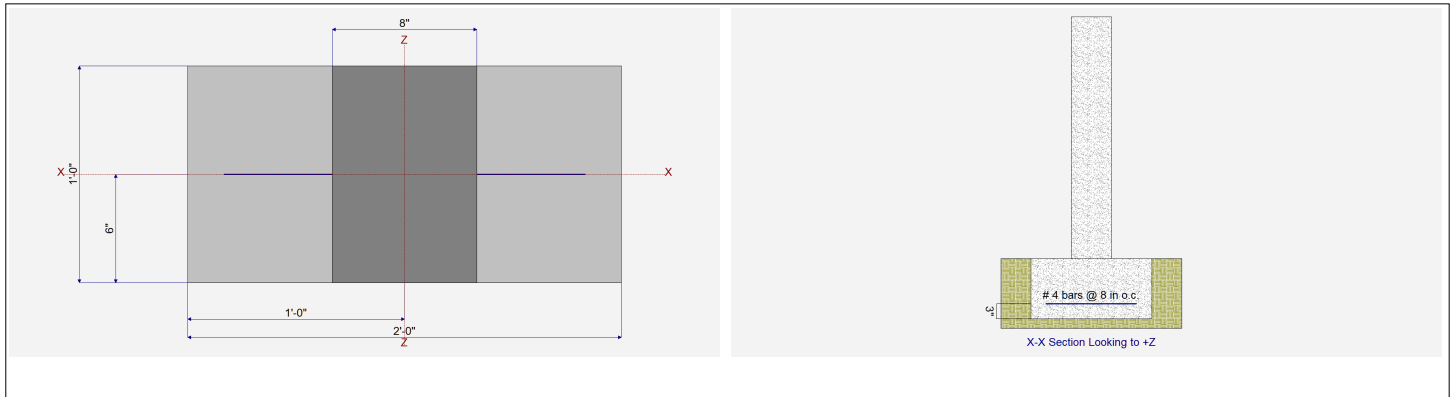
Adjusted Allowable Bearing Pressure

=	2.50 ksf
---	----------

Dimensions

Reinforcing

Footing Width	=	2.0 ft	Footing Thickness	=	12.0 in	Bars along X-X Axis		
Wall Thickness	=	8.0 in	Rebar Centerline to Edge of Concrete...			Bar spacing	=	8.00
Wall center offset from center of footing	=	0 in	at Bottom of footing =	3.0 in		Reinforcing Bar Size	=	# 4



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	0.8070	0.240	0.780	0.30		k
OB : Overburden	=						ksf
V-x	=						k
M-zz	=						k-ft
Vx applied	=						in above top of footing

Wall Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: F2

DESIGN SUMMARY

Design OK

Factor of Safety	Item	Applied	Capacity	Governing Load Combination	
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift

Utilization Ratio	Item	Applied	Capacity	Governing Load Combination	
PASS	0.3814	Soil Bearing	0.9535 ksf	2.50 ksf	+D+0.750L+0.750S
PASS	0.02566	Z Flexure (+X)	0.3016 k-ft	11.753 k-ft	+1.20D+1.60L+0.50S
PASS	0.02039	Z Flexure (-X)	0.2396 k-ft	11.753 k-ft	+1.20D+L+0.20S
PASS	n/a	1-way Shear (+X)	0.0 psi	82.158 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress -X	Actual Soil Bearing Stress +X	Actual / Allowable Ratio
, D Only	2.50 ksf	0.0 in	0.5485 ksf	0.5485 ksf	0.219
, +D+L	2.50 ksf	0.0 in	0.9385 ksf	0.9385 ksf	0.375
, +D+Lr	2.50 ksf	0.0 in	0.6685 ksf	0.6685 ksf	0.267
, +D+S	2.50 ksf	0.0 in	0.6985 ksf	0.6985 ksf	0.279
, +D+0.750Lr+0.750L	2.50 ksf	0.0 in	0.9310 ksf	0.9310 ksf	0.372
, +D+0.750L+0.750S	2.50 ksf	0.0 in	0.9535 ksf	0.9535 ksf	0.381
, +0.60D	2.50 ksf	0.0 in	0.3291 ksf	0.3291 ksf	0.132

Units : k-ft

Overturing Stability

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

Sliding Stability

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

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.40D	0.1706	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.40D	0.1706	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+0.50Lr+1.60L	0.2983	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+0.50Lr+1.60L	0.2983	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60L+0.50S	0.3016	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60L+0.50S	0.3016	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60Lr+L	0.2756	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60Lr+L	0.2756	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60Lr	0.1889	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60Lr	0.1889	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+1.60S	0.2863	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+1.60S	0.2863	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60S	0.1996	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60S	0.1996	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+0.50Lr+L	0.2463	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+0.50Lr+L	0.2463	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+0.50S	0.2496	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+0.50S	0.2496	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +0.90D	0.1097	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +0.90D	0.1097	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+0.20S	0.2396	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+0.20S	0.2396	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK



L2 Engineers LLC
 Design & Planning
 17848 NE 198th Place

Wall Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

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DESCRIPTION: F2

One Way Shear

Units : k

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+0.50Lr+1.60L	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+1.60L+0.50S	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+1.60Lr+L	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+1.60Lr	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+L+1.60S	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+1.60S	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+0.50Lr+L	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+L+0.50S	0 psi	0 psi	0 psi	82.158 psi	0	OK
+0.90D	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+L+0.20S	0 psi	0 psi	0 psi	82.158 psi	0	OK

Wall Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: F2 @ POST

Code References

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

Load Combinations Used : ASCE 7-16

General Information

Material Properties

f'_c : Concrete 28 day strength	=	3.0 ksi
f_y : Rebar Yield	=	60.0 ksi
E_c : Concrete Elastic Modulus	=	3,122.0 ksi
Concrete Density	=	145.0 pcf
ϕ Values Flexure	=	0.90
Shear	=	0.750

Analysis Settings

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

Soil Design Values

Allowable Soil Bearing	=	2.50 ksf
Increase Bearing By Footing Weight	=	No
Soil Passive Resistance (for Sliding)	=	250.0 pcf
Soil/Concrete Friction Coeff.	=	0.30

Increases based on footing Depth

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

Increases based on footing Width

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

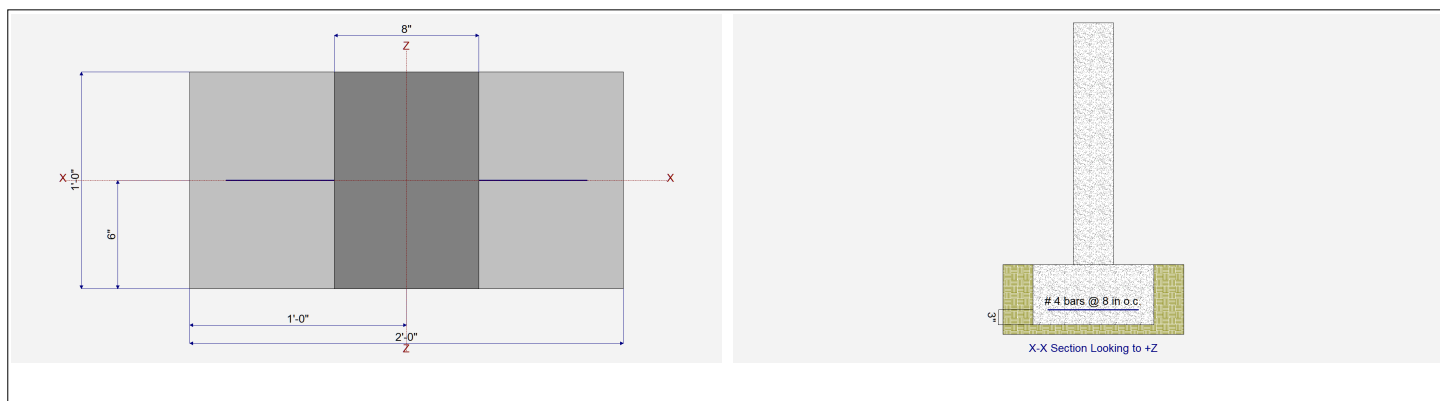
Adjusted Allowable Bearing Pressure

= 2.50 ksf

Dimensions

Reinforcing

Footing Width	=	2.0 ft	Footing Thickness	=	12.0 in	Bars along X-X Axis		
Wall Thickness	=	8.0 in	Rebar Centerline to Edge of Concrete...			Bar spacing	=	8.00
Wall center offset from center of footing	=	0 in	at Bottom of footing =	=	3.0 in	Reinforcing Bar Size	=	# 4



Applied Loads

	D	Lr	L	S	W	E	H
P : Column Load	=	2.0	0.460	2.0	0.5670		k
OB : Overburden	=						ksf
V-x	=						k
M-zz	=						k-ft
Vx applied	=						in above top of footing



Wall Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: F2 @ POST

DESIGN SUMMARY

Design OK

Factor of Safety	Item	Applied	Capacity	Governing Load Combination	
PASS	n/a	Overturing - Z-Z	0.0 k-ft	0.0 k-ft	No Overturing
PASS	n/a	Sliding - X-X	0.0 k	0.0 k	No Sliding
PASS	n/a	Uplift	0.0 k	0.0 k	No Uplift

Utilization Ratio	Item	Applied	Capacity	Governing Load Combination	
PASS	0.8580	Soil Bearing	2.145 ksf	2.50 ksf	+D+L
PASS	0.05891	Z Flexure (+X)	0.6924 k-ft	11.753 k-ft	+1.20D+1.60L+0.50S
PASS	0.04596	Z Flexure (-X)	0.5402 k-ft	11.753 k-ft	+1.20D+L+0.20S
PASS	n/a	1-way Shear (+X)	0.0 psi	82.158 psi	n/a
PASS	0.0	1-way Shear (-X)	0.0 psi	0.0 psi	n/a

Detailed Results

Soil Bearing

Rotation Axis & Load Combination...	Gross Allowable	Xecc	Actual Soil Bearing Stress -X	Actual Soil Bearing Stress +X	Actual / Allowable Ratio
, D Only	2.50 ksf	0.0 in	1.145 ksf	1.145 ksf	0.458
, +D+L	2.50 ksf	0.0 in	2.145 ksf	2.145 ksf	0.858
, +D+Lr	2.50 ksf	0.0 in	1.375 ksf	1.375 ksf	0.550
, +D+S	2.50 ksf	0.0 in	1.429 ksf	1.429 ksf	0.571
, +D+0.750Lr+0.750L	2.50 ksf	0.0 in	2.068 ksf	2.068 ksf	0.827
, +D+0.750L+0.750S	2.50 ksf	0.0 in	2.108 ksf	2.108 ksf	0.843
, +0.60D	2.50 ksf	0.0 in	0.6870 ksf	0.6870 ksf	0.275

Units : k-ft

Overturing Stability

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

Sliding Stability

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

Footing Flexure

Flexure Axis & Load Combination	Mu k-ft	Which Side ?	Tension @ Bot. or Top ?	As Req'd in^2	Gvrn. As in^2	Actual As in^2	Phi*Mn k-ft	Status
, +1.40D	0.3562	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.40D	0.3562	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+0.50Lr+1.60L	0.6864	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+0.50Lr+1.60L	0.6864	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60L+0.50S	0.6924	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60L+0.50S	0.6924	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60Lr+L	0.6093	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60Lr+L	0.6093	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60Lr	0.3871	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60Lr	0.3871	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+1.60S	0.6284	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+1.60S	0.6284	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60S	0.4061	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+1.60S	0.4061	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+0.50Lr+L	0.5531	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+0.50Lr+L	0.5531	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+0.50S	0.5591	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+0.50S	0.5591	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +0.90D	0.229	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +0.90D	0.229	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+0.20S	0.5402	-X	Bottom	0.2592	Min Temp %	0.3	11.753	OK
, +1.20D+L+0.20S	0.5402	+X	Bottom	0.2592	Min Temp %	0.3	11.753	OK



L2 Engineers LLC
 Design & Planning
 17848 NE 198th Place

Wall Footing

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.3.31

L2 Engineers

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DESCRIPTION: F2 @ POST

One Way Shear

Units : k

Load Combination...	Vu @ -X	Vu @ +X	Vu:Max	Phi Vn	Vu / Phi*Vn	Status
+1.40D	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+0.50Lr+1.60L	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+1.60L+0.50S	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+1.60Lr+L	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+1.60Lr	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+L+1.60S	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+1.60S	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+0.50Lr+L	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+L+0.50S	0 psi	0 psi	0 psi	82.158 psi	0	OK
+0.90D	0 psi	0 psi	0 psi	82.158 psi	0	OK
+1.20D+L+0.20S	0 psi	0 psi	0 psi	82.158 psi	0	OK

Beam on Elastic Foundation

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.5.16

L2 Engineers

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DESCRIPTION: GRADE BEAM

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16

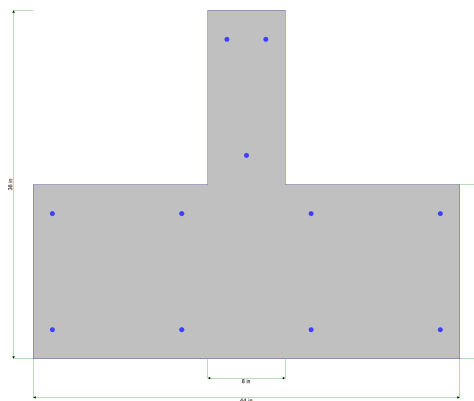
Load Combinations Used : ASCE 7-16

Material Properties

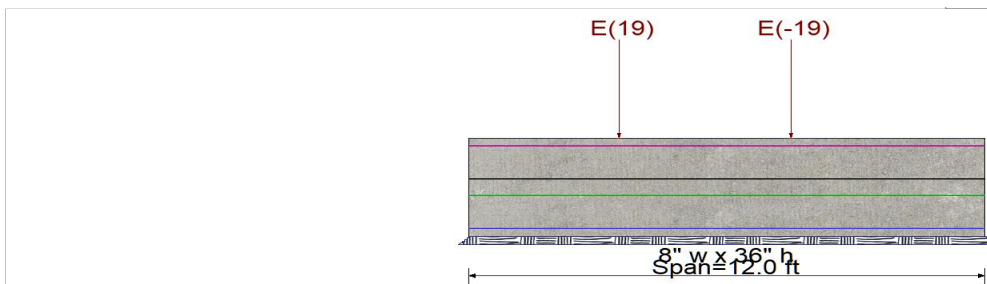
f'_c = 4.50 ksi ϕ Phi Values Flexure : 0.90
 $f_r = f'_c \cdot 1.25$ = 503.12 psi Shear : 0.750
 ψ Density = 145.0 pcf β_1 = 0.8250
 λ Lt Wt Factor = 1.0
 Elastic Modulus = 3,122.0 ksi
 Soil Subgrade Modulus = 250.0 psi / (inch deflection)

Load Combination: ASCE 7-16

f_y - Main Rebar = 60.0 ksi F_y - Stirrups = 40.0 ksi
 E - Main Rebar = 29,000.0 ksi E - Stirrups = 29,000.0 ksi
 Stirrup Bar Size # = # 3
 Number of Resisting Legs Per Stirrup = 2



Beam is supported on an elastic foundation.



Cross Section & Reinforcing Details

Inverted Tee Section, Stem Width = 8.0 in, Total Height = 36.0 in, Top Flange Width = 44.0 in, Flange Thickness = 18.0 in
 Span #1 Reinforcing....

4-#4 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span 4-#4 at 15.0 in from Bottom, from 0.0 to 12.0 ft in this span
 2-#4 at 3.0 in from Top, from 0.0 to 12.0 ft in this span 1-#4 at 15.0 in from Top, from 0.0 to 12.0 ft in this span

Applied Loads

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

Beam self weight calculated and added to loads

Point Load : E = 19.0 k @ 3.50 ft
 Point Load : E = -19.0 k @ 7.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio = 0.169 : 1 Section used for this span μ_u : Applied -23.514 k-ft $\mu_n \cdot \phi$: Allowable 139.218 k-ft Load Combination +1.20D+E Location of maximum on span 7.482 ft Span # where maximum occurs Span # 1	Typical Section Maximum Deflection Max Downward L+Lr+S Deflection 0.000 in Max Upward L+Lr+S Deflection 0.000 in Max Downward Total Deflection 0.031 in Max Upward Total Deflection -0.016 in
Maximum Soil Pressure = 1.124 ksf at 0.00 ft Allowable Soil Pressure = 3,333.0 ksf OK	LdComb: E Only

Shear Stirrup Requirements

Entire Beam Span Length : $V_u < \phi V_c/2$, Req'd V_s = Not Req'd, use stirrups spaced at 0.000 in

Maximum Forces & Stresses for Load Combination

Load Combination	Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft)		
				μ_u : Max	$\phi_i \cdot \mu_{nx}$	Stress Ratio
Maximum Bending Envelope						
+1.40D						
Span # 1	1	1	11.859	-0.03	139.22	0.00
Span # 1	1	1	11.859	-0.00	193.84	0.00

Beam on Elastic Foundation

Project File: hu residence.ec6

LIC#: KW-06016908, Build:20.22.5.16

L2 Engineers

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DESCRIPTION: GRADE BEAM

Load Combination	Segment Length	Span #	Location (ft) in Span	Bending Stress Results (k-ft)		
				Mu : Max	Phi*Mnx	Stress Ratio
+1.20D						
Span # 1	1	11.859		-0.00	193.84	0.00
+0.90D						
Span # 1	1	11.859		-0.00	193.84	0.00
+1.20D+E						
Span # 1	1	11.859		-0.03	139.22	0.00
+0.90D+E						
Span # 1	1	11.859		-0.03	139.22	0.00

Overall Maximum Deflections - Unfactored Lo

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
Span 1	1	0.0312	0.000	Span 1	-0.0160	12.000

Detailed Shear Information

Load Combination	Span Number	Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Spacing (in)	
		(ft)	(in)	Actual	Design						Req'd	Suggest
+0.90D+E	1	0.00	33.00	0.29	0.29	0.00	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	0.14	33.00	0.73	0.73	0.03	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	0.28	33.00	1.16	1.16	0.13	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	0.42	33.00	1.58	1.58	0.28	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	0.56	33.00	1.98	1.98	0.49	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	0.71	33.00	2.38	2.38	0.76	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	0.85	33.00	2.77	2.77	1.09	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	0.99	33.00	3.14	3.14	1.47	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	1.13	33.00	3.51	3.51	1.91	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	1.27	33.00	3.86	3.86	2.39	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	1.41	33.00	4.21	4.21	2.93	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	1.55	33.00	4.54	4.54	3.51	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	1.69	33.00	4.87	4.87	4.14	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	1.84	33.00	5.18	5.18	4.82	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	1.98	33.00	5.49	5.49	5.55	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	2.12	33.00	5.78	5.78	6.31	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	2.26	33.00	6.06	6.06	7.12	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	2.40	33.00	6.33	6.33	7.96	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	2.54	33.00	6.60	6.60	8.85	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	2.68	33.00	6.85	6.85	9.77	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	2.82	33.00	7.09	7.09	10.73	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	2.96	33.00	7.32	7.32	11.72	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	3.11	33.00	7.53	7.53	12.74	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	3.25	33.00	7.74	7.74	13.80	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	3.39	33.00	7.94	7.94	14.88	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	3.53	33.00	-10.87	10.87	15.43	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	3.67	33.00	-10.70	10.70	13.89	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	3.81	33.00	-10.53	10.53	12.37	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	3.95	33.00	-10.38	10.38	10.87	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	4.09	33.00	-10.23	10.23	9.40	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	4.24	33.00	-10.10	10.10	7.94	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	4.38	33.00	-9.98	9.98	6.51	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	4.52	33.00	-9.87	9.87	5.09	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	4.66	33.00	-9.77	9.77	3.69	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	4.80	33.00	-9.68	9.68	2.30	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	4.94	33.00	-9.61	9.61	0.92	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	5.08	33.00	-9.54	9.54	0.45	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	5.22	33.00	-9.49	9.49	1.80	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	5.36	33.00	-9.44	9.44	3.15	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	5.51	33.00	-9.41	9.41	4.49	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	5.65	33.00	-9.39	9.39	5.83	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	5.79	33.00	-9.38	9.38	7.17	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	5.93	33.00	-9.38	9.38	8.50	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	6.07	33.00	-9.39	9.39	9.83	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	6.21	33.00	-9.41	9.41	11.17	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	6.35	33.00	-9.45	9.45	12.51	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	6.49	33.00	-9.49	9.49	13.85	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	6.64	33.00	-9.55	9.55	15.20	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	6.78	33.00	-9.61	9.61	16.56	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	6.92	33.00	-9.69	9.69	17.92	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	7.06	33.00	-9.78	9.78	19.30	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	7.20	33.00	-9.88	9.88	20.69	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	7.34	33.00	-9.98	9.98	22.09	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00



L2 Engineers LLC
 Design & Planning
 17848 NE 198th Place

Beam on Elastic Foundation

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.5.16

L2 Engineers

(c) ENERCALC INC 1983-2022

DESCRIPTION: GRADE BEAM

Detailed Shear Information

Load Combination	Span Number	Distance 'd'		Vu (k)		Mu (k-ft)	d*Vu/Mu	Phi*Vc (k)	Comment	Phi*Vs (k)	Spacing (in)	
		(ft)	(in)	Actual	Design						Req'd	Suggest
+0.90D+E	1	7.48	33.00	-10.10	10.10	23.51	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	7.62	33.00	8.77	8.77	22.60	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	7.76	33.00	8.63	8.63	21.37	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	7.91	33.00	8.48	8.48	20.16	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	8.05	33.00	8.32	8.32	18.98	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	8.19	33.00	8.15	8.15	17.81	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	8.33	33.00	7.97	7.97	16.67	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	8.47	33.00	7.78	7.78	15.56	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	8.61	33.00	7.58	7.58	14.47	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	8.75	33.00	7.37	7.37	13.41	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	8.89	33.00	7.15	7.15	12.38	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	9.04	33.00	6.92	6.92	11.38	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	9.18	33.00	6.68	6.68	10.41	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	9.32	33.00	6.43	6.43	9.48	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	9.46	33.00	6.17	6.17	8.58	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	9.60	33.00	5.90	5.90	7.72	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	9.74	33.00	5.62	5.62	6.89	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	9.88	33.00	5.33	5.33	6.11	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	10.02	33.00	5.03	5.03	5.37	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	10.16	33.00	4.72	4.72	4.67	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	10.31	33.00	4.41	4.41	4.01	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	10.45	33.00	4.08	4.08	3.40	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	10.59	33.00	3.74	3.74	2.83	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	10.73	33.00	3.40	3.40	2.31	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	10.87	33.00	3.04	3.04	1.84	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	11.01	33.00	2.68	2.68	1.42	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	11.15	33.00	2.30	2.30	1.05	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	11.29	33.00	1.92	1.92	0.74	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	11.44	33.00	1.52	1.52	0.47	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	11.58	33.00	1.12	1.12	0.27	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	11.72	33.00	0.71	0.71	0.12	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00
+0.90D+E	1	11.86	33.00	0.28	0.28	0.03	1.00	29.36	Vu < PhiVc/2	Not Reqd	0.00	0.00

Concrete Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.5.16

L2 Engineers

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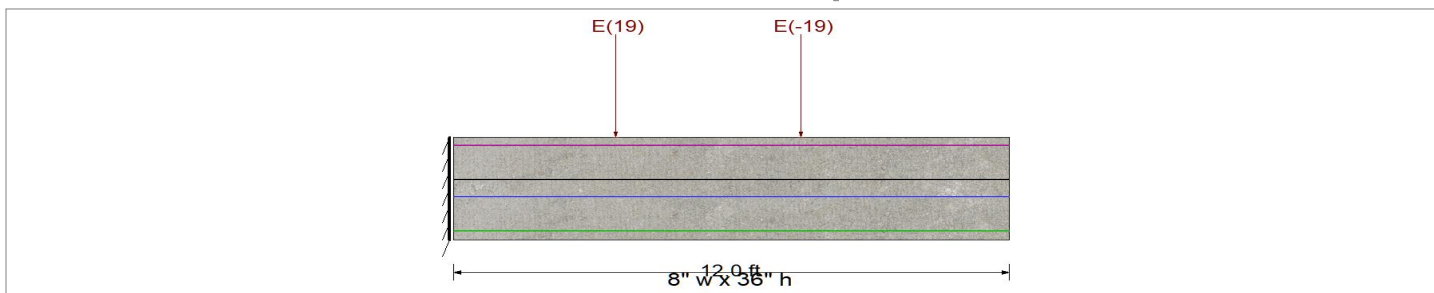
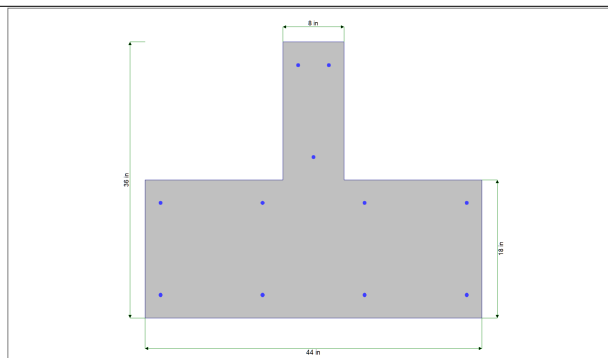
DESCRIPTION: Grade Beam Deflection

CODE REFERENCES

Calculations per ACI 318-14, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : ASCE 7-16

Material Properties

f'_c	=	3.0 ksi	ϕ Phi Values	Flexure :	0.90
$f_r = f'_c^{1/2} \cdot 7.50$	=	410.792 psi		Shear :	0.750
ψ Density	=	145.0 pcf	β_1	=	0.850
λ LtWt Factor	=	1.0	F_y - Stirrups	=	40.0 ksi
Elastic Modulus	=	3,122.0 ksi	E - Stirrups	=	29,000.0 ksi
f_y - Main Rebar	=	60.0 ksi	Stirrup Bar Size #	=	3
E - Main Rebar	=	29,000.0 ksi	Number of Resisting Legs Per Stirrup	=	2



Cross Section & Reinforcing Details

Inverted Tee Section, Stem Width = 8.0 in, Total Height = 36.0 in, Top Flange Width = 44.0 in, Flange Thickness = 18.0 in
 Span #1 Reinforcing....

- 4-#4 at 15.0 in from Bottom, from 0.0 to 12.0 ft in this span
- 2-#4 at 3.0 in from Top, from 0.0 to 12.0 ft in this span
- 4-#4 at 3.0 in from Bottom, from 0.0 to 12.0 ft in this span
- 1-#4 at 15.0 in from Top, from 0.0 to 12.0 ft in this span

Point Load : E = 19.0 k @ 3.50 ft
 Point Load : E = -19.0 k @ 7.50 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.403	: 1
Section used for this span		Typical Section	
Mu : Applied		76.0	k-ft
Mn * Phi : Allowable		188.595	k-ft
Location of maximum on span		3.497	ft
Span # where maximum occurs		Span # 1	

Maximum Deflection

Max Downward Transient Deflection	0.000 in	Ratio =	0	<360.0	Overall MAXimum Envelope
Max Upward Transient Deflection	-0.033 in	Ratio =	8828	>=360.0	
Max Downward Total Deflection	0.000 in	Ratio =	0	<180.0	
Max Upward Total Deflection	-0.033 in	Ratio =	8828	>=180.0	Span: 1 : E Only

Vertical Reactions

Support notation : Far left is #1

Load Combination	Support 1	Support 2
Overall MAXimum	0.000	
Overall MINimum	0.000	
E Only * 0.70	0.000	
E Only * 0.5250	0.000	
E Only	0.000	



L2 Engineers LLC
Design & Planning
17848 NE 198th Place

Concrete Beam

Project File: hu residence.ec6

LIC# : KW-06016908, Build:20.22.5.16

L2 Engineers

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DESCRIPTION: Grade Beam Deflection

Overall Maximum Deflections

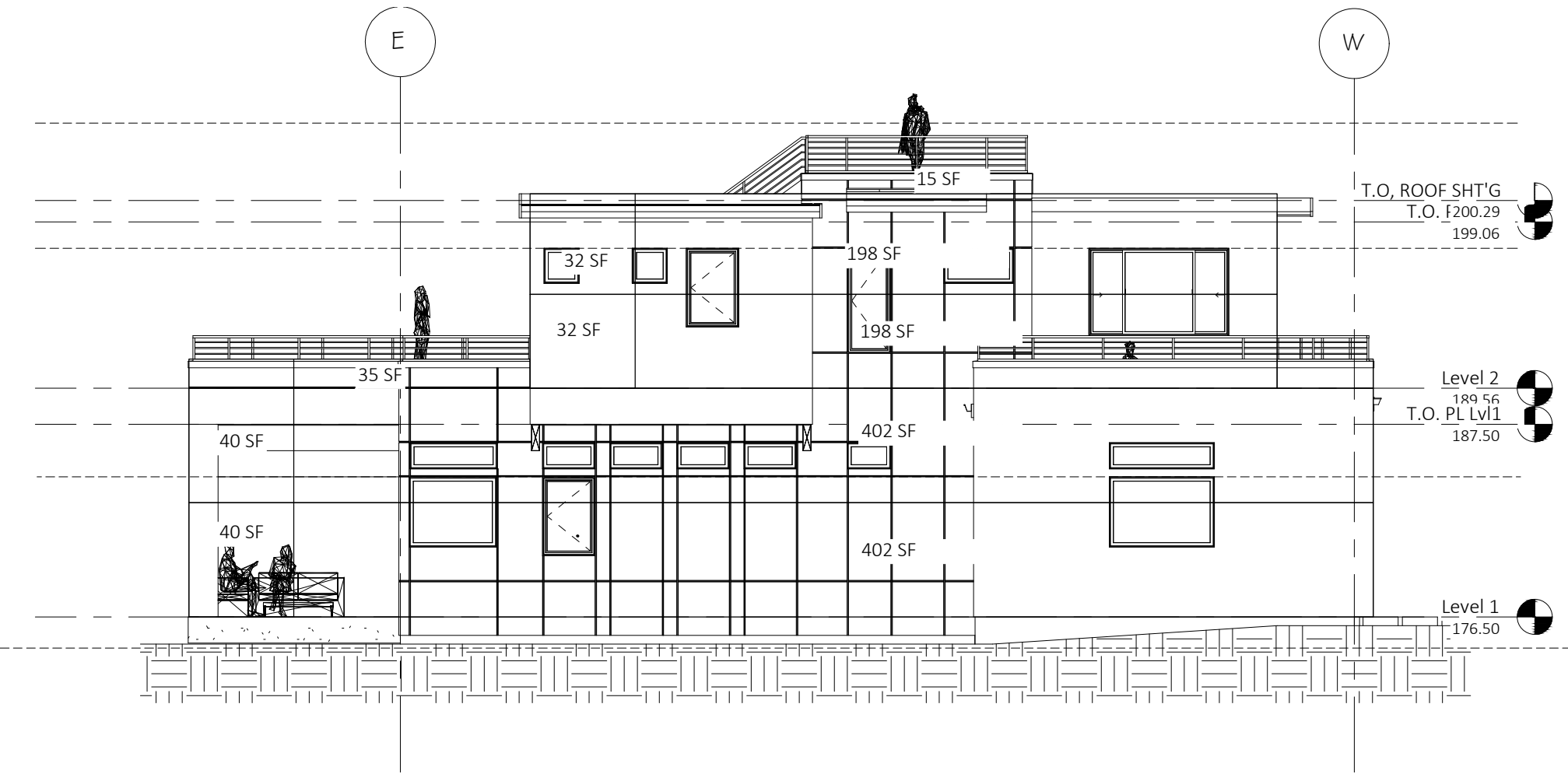
Load Combination	Span	Max. "-" Defl (in)	Location in Span (ft)	Load Combination	Max. "+" Defl (in)	Location in Span (ft)
E Only	1	0.0000	0.000	E Only	-0.0326	12.000

L2 ENGINEERS

17848 NE 198th Place
Woodinville, WA 98072



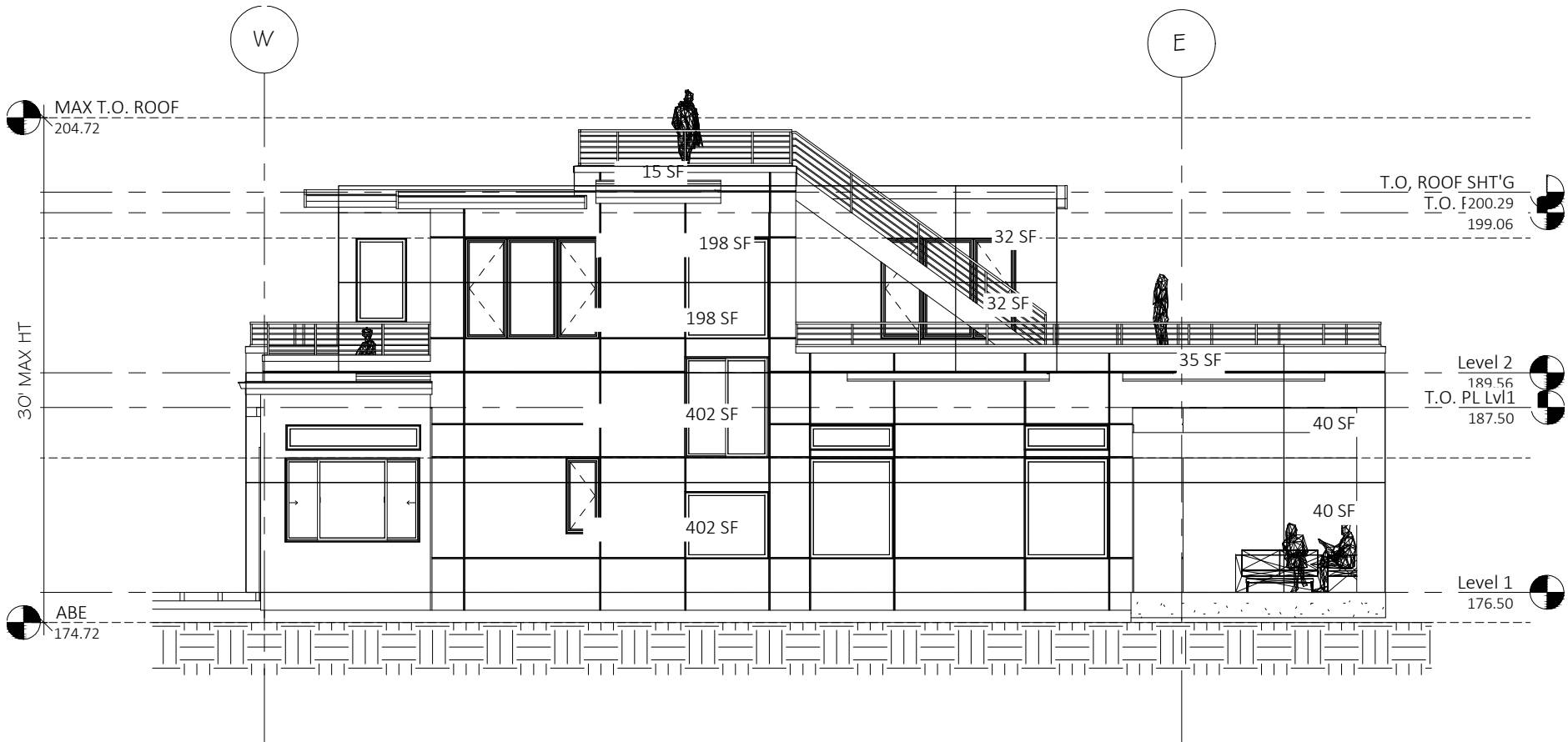
Lateral Analysis



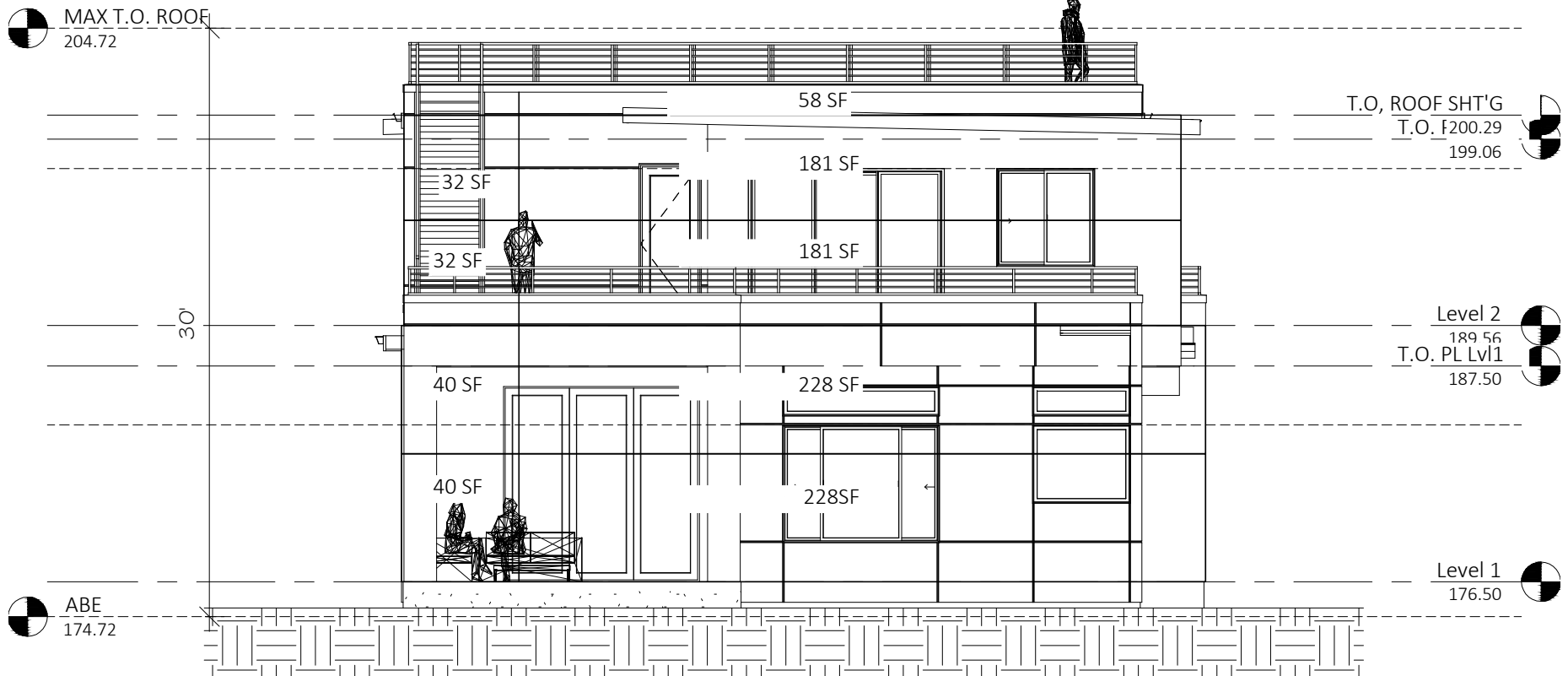
3

NORTH ELEVATION

SCALE: 1/8" = 1'-0"



4
SOUTH ELEVATION
 SCALE: 1/8" = 1'-0"



2 EAST ELEVATION
 SCALE: 1/8" = 1'-0"

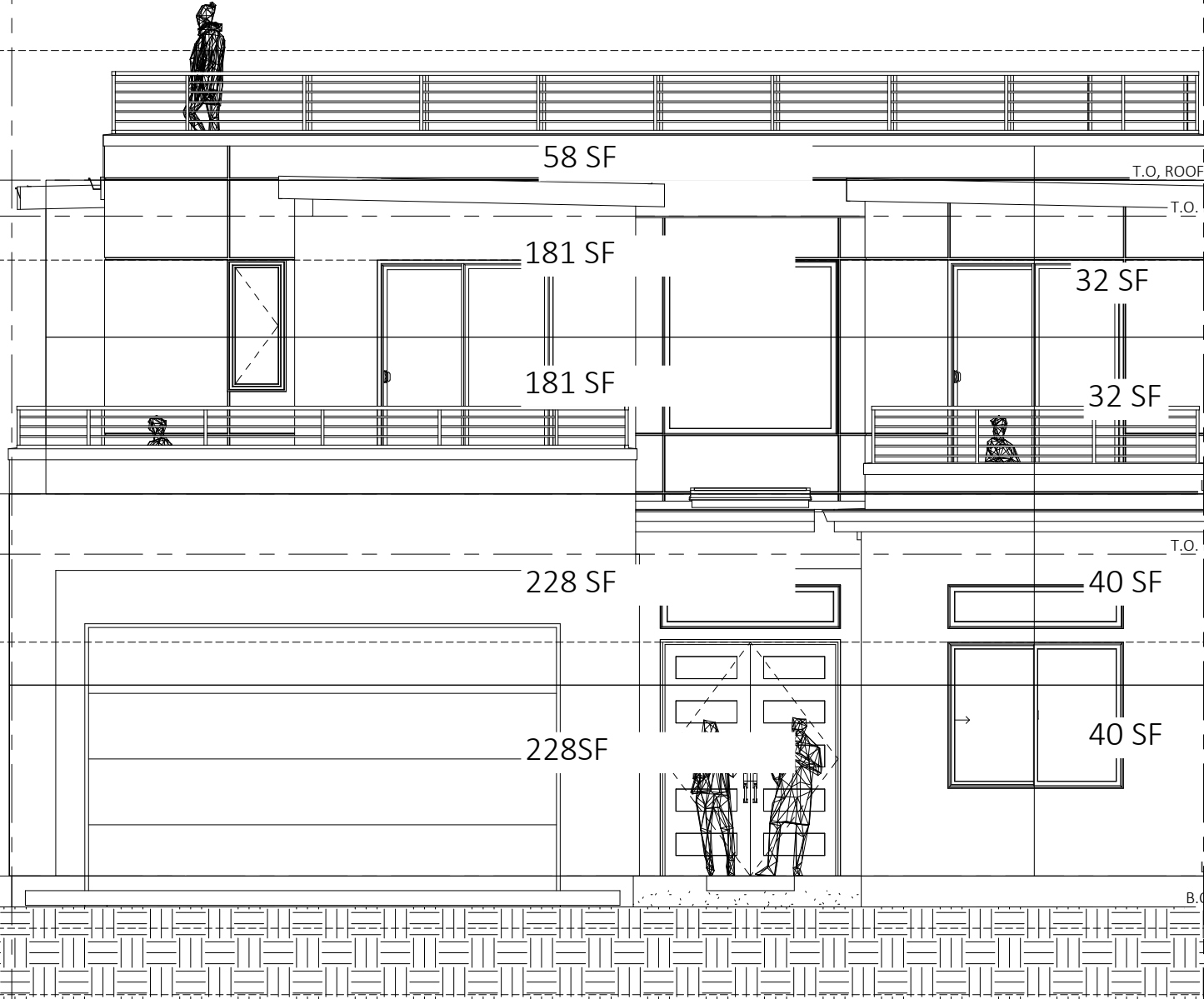
N

S

MAX T.O. ROOF
204.72

30'

ABE
174.72



T.O. ROOF SHT'G
200.29
T.O. PL Lvl2
199.06

Level 2
189.56

T.O. PL Lvl1
187.50

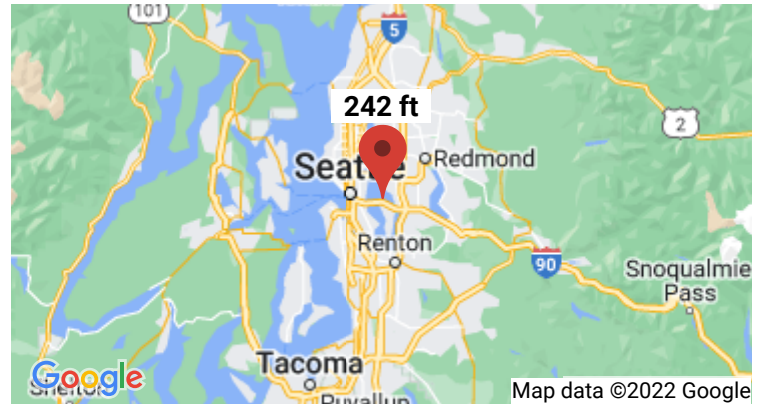
Level 1
176.50
B.O. JSTS
175.45

1 WEST ELEVATION

SCALE: 1/4" = 1'-0"

Search Information

Address: 2448 72nd Ave SE, Mercer Island, WA 98040, USA
Coordinates: 47.587646, -122.2428136
Elevation: 242 ft
Timestamp: 2022-05-10T04:42:56.445Z
Hazard Type: Wind



ASCE 7-16

MRI 10-Year 67 mph
 MRI 25-Year 73 mph
 MRI 50-Year 78 mph
 MRI 100-Year 83 mph
 Risk Category I 92 mph
 Risk Category II 97 mph
 Risk Category III 104 mph
 Risk Category IV 108 mph

ASCE 7-10

MRI 10-Year 72 mph
 MRI 25-Year 79 mph
 MRI 50-Year 85 mph
 MRI 100-Year 91 mph
 Risk Category I 100 mph
 Risk Category II 110 mph
 Risk Category III-IV 115 mph

ASCE 7-05

ASCE 7-05 Wind Speed 85 mph

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

Disclaimer

Hazard loads are interpolated from data provided in ASCE 7 and rounded up to the nearest whole integer. Per ASCE 7, islands and coastal areas outside the last contour should use the last wind speed contour of the coastal area – in some cases, this website will extrapolate past the last wind speed contour and therefore, provide a wind speed that is slightly higher. NOTE: For queries near wind-borne debris region boundaries, the resulting determination is sensitive to rounding which may affect whether or not it is considered to be within a wind-borne debris region.

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

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Project: 22-052 Hu Residence

Exposure:	B
Risk Cat:	II
z:	30 ft
Kz:	0.7
Kzt:	1.6
Kd:	0.85
Ke:	0.99
v:	97
End Zone:	6
Roof Angle:	0

(Table 26.10-1)

(Table 26.6-1)

(Table 26.9-1)

$$qz = .00256 * kz * kzt * kd * Ke * v^2$$

(26.10-1)

$$qz = 22.70 \text{ psf}$$

Table 26.9-1 Ground Elevation Factor, K_e

Ground Elevation above Sea Level		Ground Elevation Factor K_e
ft	m	
<0	<0	See note 2
0	0	1.00
1,000	305	0.96
2,000	610	0.93
3,000	914	0.90
4,000	1,219	0.86
5,000	1,524	0.83
6,000	1,829	0.80
>6,000	>1,829	See note 2

Notes

- The conservative approximation $K_e = 1.00$ is permitted in all cases.
- The factor K_e shall be determined from the above table using interpolation or from the following formula:
 $K_e = e^{-0.000362z_g}$ (z_g = ground elevation above sea level in ft).
 $K_e = e^{-0.000119z_g}$ (z_g = ground elevation above sea level in m).
 K_e is permitted to be taken as 1.00 in all cases.

Table 26.6-1 Wind Directionality Factor, K_d

Structure Type	Directionality Factor K_d
Buildings	
Main Wind Force Resisting System	0.85
Components and Cladding	0.85

Table 26.10-1 Velocity Pressure Exposure Coefficients, K_h and K_z

Height above Ground Level, z	Exposure			
		B	C	D
ft	m			
0-15	0-4.6	0.57 (0.70) ^α	0.85	1.03
20	6.1	0.62 (0.70) ^α	0.90	1.08
25	7.6	0.66 (0.70) ^α	0.94	1.12
30	9.1	0.70	0.98	1.16

^αUse 0.70 in Chapter 28, Exposure B, when $z < 30$ ft (9.1 m).

Notes

- The velocity pressure exposure coefficient K_z may be determined from the following formula:
 For $15 \text{ ft (4.6 m)} \leq z \leq z_g$ $K_z = 2.01(z/z_g)^{2/\alpha}$
 For $z < 15 \text{ ft (4.6 m)}$ $K_z = 2.01(15/z_g)^{2/\alpha}$
- α and z_g are tabulated in Table 26.11-1.
- Linear interpolation for intermediate values of height z is acceptable.
- Exposure categories are defined in Section 26.7.

Roof Angle	Building Surface							
	1	2	3	4	1E	2E	3E	4E
0-5	0.4	-0.69	-0.37	-0.29	0.61	-1.07	-0.53	-0.43
20	0.53	-0.69	-0.48	-0.43	0.8	-1.07	-0.69	-0.64
30-45	0.56	0.21	-0.43	-0.37	0.69	0.27	-0.53	-0.48
90	0.56	0.56	-0.37	-0.37	0.69	0.69	-0.48	-0.48

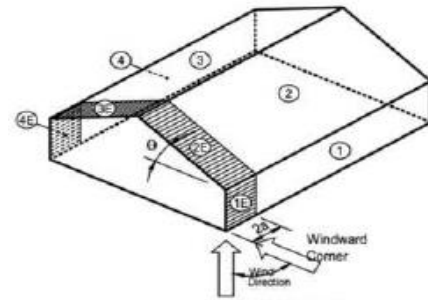
0	0.40	-0.69	-0.37	-0.29	0.61	-1.07	-0.53	-0.43
---	------	-------	-------	-------	------	-------	-------	-------



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N/S DIRECTION

REGION	Gcpf	A(sf)	PRESSURE (psf)	SUM
1	0.40	15	136.21	136.21
	0.40	198	1797.96	1797.96
	0.40	198	1797.96	1797.96
	0.40	35	317.82	317.82
	0.40	402	3650.41	3650.41
	0.40	402	3650.41	3650.41
4	-0.29	15	-98.75	98.75
	-0.29	198	-1303.52	1303.52
	-0.29	198	-1303.52	1303.52
	-0.29	35	-230.42	230.42
	-0.29	402	-2646.55	2646.55
	-0.29	402	-2646.55	2646.55
1E	0.61	32	443.13	443.13
	0.61	32	443.13	443.13
	0.61	40	553.92	553.92
	0.61	40	553.92	553.92
4E	-0.43	32	-312.37	312.37
	-0.43	32	-312.37	312.37
	-0.43	40	-390.47	390.47
	-0.43	40	-390.47	390.47
				22979.87
		.6W=		13787.92



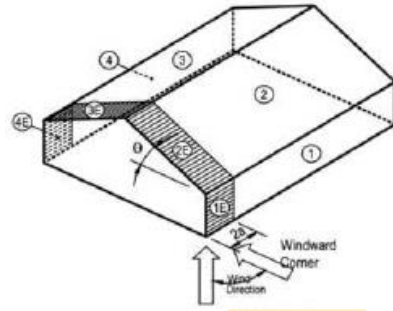
Roof	4091.96
Level 2	11646.58
Fdn	7241.34



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E/W DIRECTION

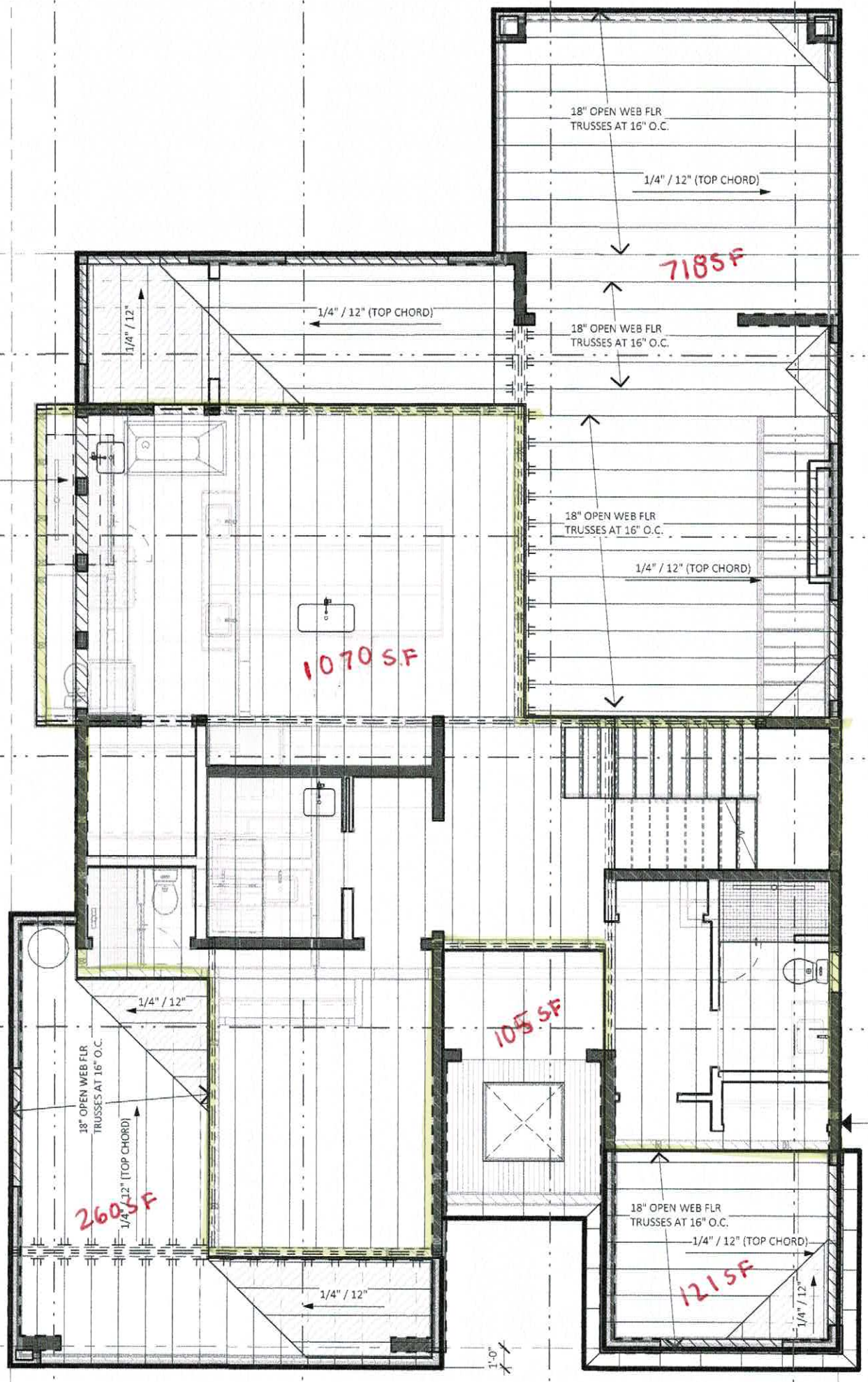
REGION	Gcpf	A(sf)	PRESSURE (psf)	SUM
1	0.40	58	526.68	526.68
	0.40	181	1643.59	1643.59
	0.40	181	1643.59	1643.59
	0.40	228	2070.38	2070.38
	0.40	228	2070.38	2070.38
4	-0.29	58	-381.84	381.84
	-0.29	181	-1191.60	1191.60
	-0.29	181	-1191.60	1191.60
	-0.29	228	-1501.03	1501.03
	-0.29	228	-1501.03	1501.03
1E	0.61	32	443.13	443.13
	0.61	32	443.13	443.13
	0.61	40	553.92	553.92
	0.61	40	553.92	553.92
4E	-0.43	32	-312.37	312.37
	-0.43	32	-312.37	312.37
	-0.43	40	-390.47	390.47
	-0.43	40	-390.47	390.47
				17121.51
.6W=				10272.91



Roof	4499.22
Level 2	8106.50
Fdn	4515.79

2.#

" FOR



Search Information

Address: 2448 72nd Ave SE, Mercer Island, WA 98040, USA

Coordinates: 47.587646, -122.2428136

Elevation: 242 ft

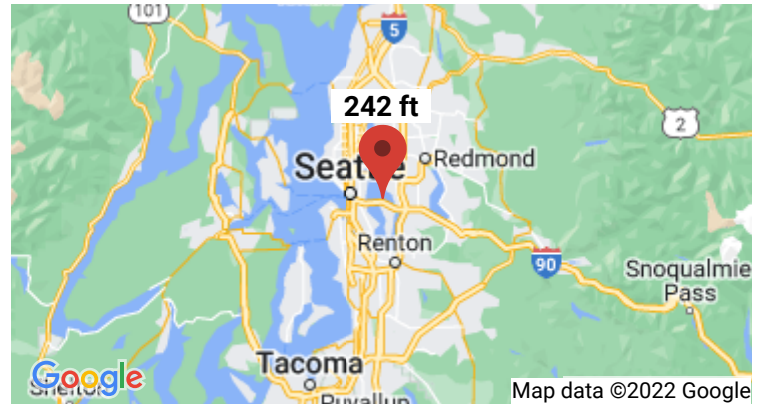
Timestamp: 2022-05-10T04:45:41.688Z

Hazard Type: Seismic

Reference Document: ASCE7-16

Risk Category: II

Site Class: D-default



Basic Parameters

Name	Value	Description
S_S	1.395	MCE_R ground motion (period=0.2s)
S_1	0.486	MCE_R ground motion (period=1.0s)
S_{MS}	1.674	Site-modified spectral acceleration value
S_{M1}	* null	Site-modified spectral acceleration value
S_{DS}	1.116	Numeric seismic design value at 0.2s SA
S_{D1}	* null	Numeric seismic design value at 1.0s SA

* See Section 11.4.8

▼Additional Information

Name	Value	Description
SDC	* null	Seismic design category
F_a	1.2	Site amplification factor at 0.2s
F_v	* null	Site amplification factor at 1.0s
CR_S	0.902	Coefficient of risk (0.2s)
CR_1	0.896	Coefficient of risk (1.0s)
PGA	0.597	MCE_G peak ground acceleration
F_{PGA}	1.2	Site amplification factor at PGA
PGA_M	0.716	Site modified peak ground acceleration

T _L	6	Long-period transition period (s)
SsRT	1.395	Probabilistic risk-targeted ground motion (0.2s)
SsUH	1.546	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
SsD	3.197	Factored deterministic acceleration value (0.2s)
S1RT	0.486	Probabilistic risk-targeted ground motion (1.0s)
S1UH	0.542	Factored uniform-hazard spectral acceleration (2% probability of exceedance in 50 years)
S1D	1.307	Factored deterministic acceleration value (1.0s)
PGAd	1.105	Factored deterministic acceleration value (PGA)

* See Section 11.4.8

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

Disclaimer

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

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 Woodinville, WA 98072

SEISMIC MASS, W

Item	Floor Area (SF) or Wall Length (LF)	Area Weight (psf) Wall Weight (plf)	Item Wt (lbs)
Roof 1	496	15	7,440
Exterior Walls	101	98	9,898
Interior Walls	31	72	2,232
Roof 2	478	15	7,170
Exterior Walls	56	98	5,488
Interior Walls	56	72	4,032
Roof 3	198	15	2,970
Exterior Walls	40	98	3,920
Interior Walls	12	72	864
Roof 4	132	15	1,980
Exterior Walls	29	98	2,842
Interior Walls	0	72	0
Level 2	2,275	15	34,125
Exterior Walls	231	97.9	22,615
Interior Walls	231	72	16,632
			122,208

SEISMIC BASE SHEAR

Risk Cat: II
 SDs: 1.116
 S1: 0.486
 Fv: 1.814
 SD1: 0.588
 R: 6.5
 ρ: 1.3
 Ie: 1
 ct: 0.02 (Table 12.8-2)
 x: 0.75 (Table 12.8-2)
 TL: 6 (Fig 22-14)
 hn: 30 ft

note: structural base elevation varies. Conservative value used.

$$T_a = ct \cdot h_n^{\rho} \quad (12.8.2.1)$$

$$= 0.26$$

$$k = 1.0$$

For $T \leq T_L$:

$$C_s \text{ max} = S_d1 / (T \cdot R / I_e)$$

$$= 0.35$$

$$C_s = SD_s / (R / I_e)$$

$$= 0.172$$



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$$C_{smin} = .044 * S D_s * I_e$$
$$= 0.049$$

$$V = C_s * W \quad (12.8-1)$$

	Weight, W	h	$Wxhx^k$	C_{vx}	$F_x = C_{vx} * V$	$F_x * \rho$	$F_x * \rho^{.7}$
Roof	34,198	23.75	812,203	0.48	8,409	10,931	7,652
Lvl 2	68,386	13	889,024	0.52	9,204	11,965	8,376
Sum	102,584		1,701,226				

$$V = C_s * W \quad (12.8-1)$$
$$= 17,613$$

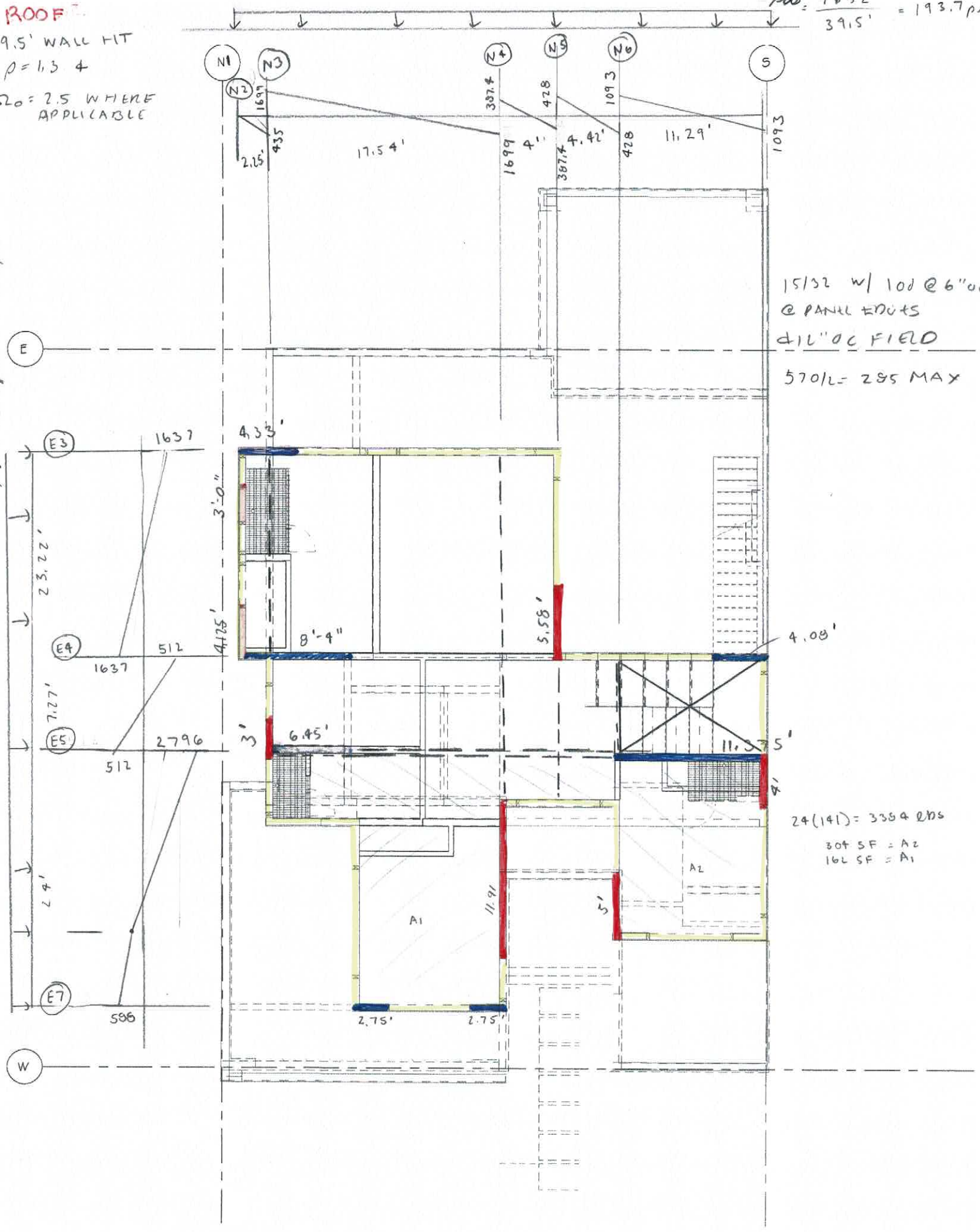
ROOF

9.5' WALL HIT
 $\rho = 1.34$

$\Omega_0 = 2.5$ WHERE APPLICABLE

$PW = \frac{7652}{39.5} = 193.7$

$PW = 7652 / 59.5 = 128.7$



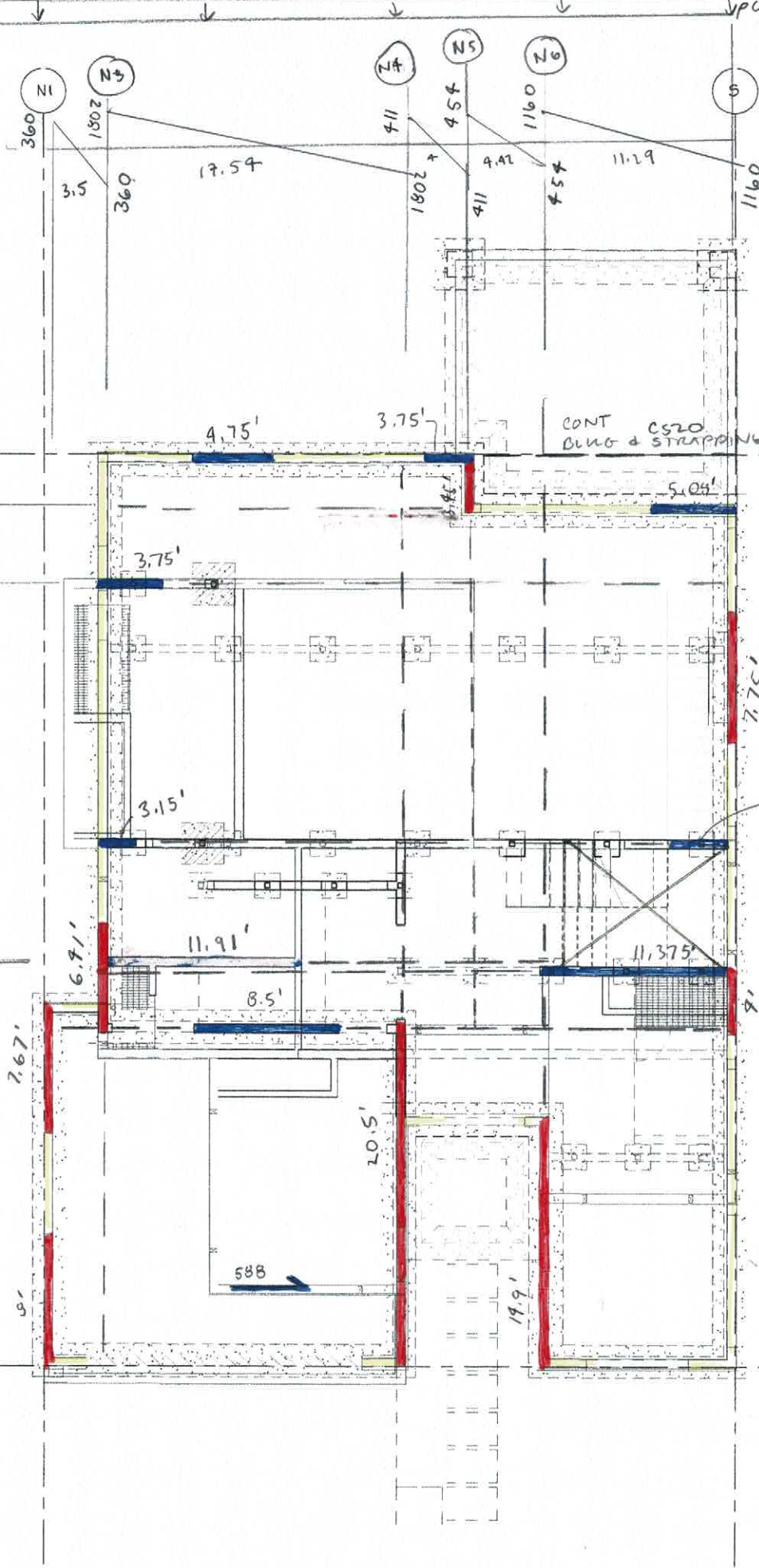
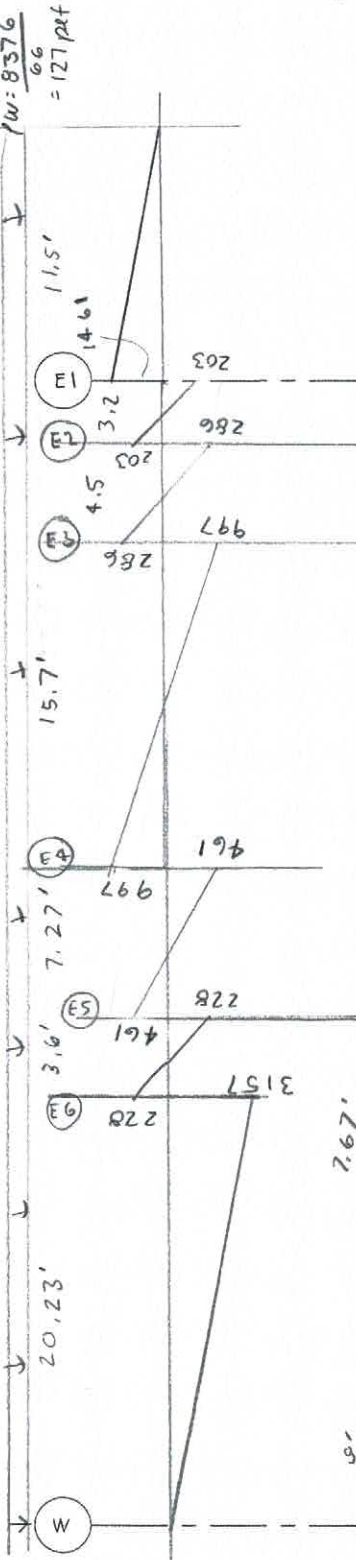
15/32 w/ 10d @ 6" oc
 @ PANEL EDGES
 4 1/2" OC FIELD
 570/L = 285 MAX

$24(141) = 3384$ lbs
 304 SF = A2
 162 SF = A1

UPPER
11' WALL HT

$\rho = 1.3$ &
 $\Omega_0 = 7.5$ WHERE
APPLICABLE

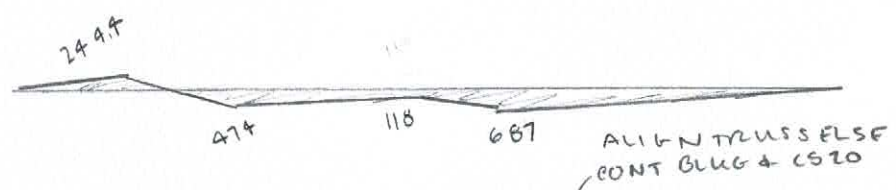
$W_{pw} = \frac{8376}{40.75} = 205.5$



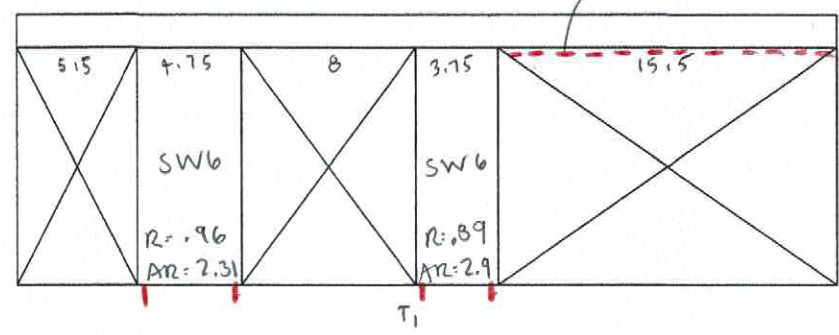
23/32" w/ 10d
@ 6" OC PANEL
EDGES & 12" OC
FIELD
570 lb = 255 psf
MAX

588

$v = 44.45 \text{ pcf}$
 $v_R = 195.76$
 $v_D = 151.31$

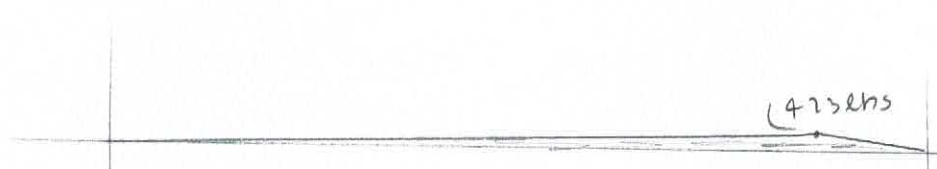


$.7PE = 1664$



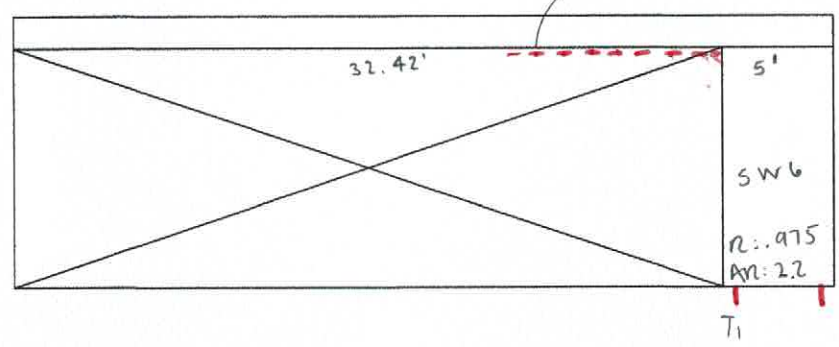
$\frac{1664}{4.75(.96) + 3.75(.89)}$
 $= 210 \text{ pcf}$

$T_1 = \frac{[195.76(3.75)(11) - .6(8.9)(3.75)(3.75/2)(11)] / 3.5}{E1} = 2200 \text{ lbs ST HD 14}$



$v = 13.06 \text{ pcf}$
 $v_R = 97.8 \text{ pcf}$
 $v_D = 84.74$

$.7PE = 489$

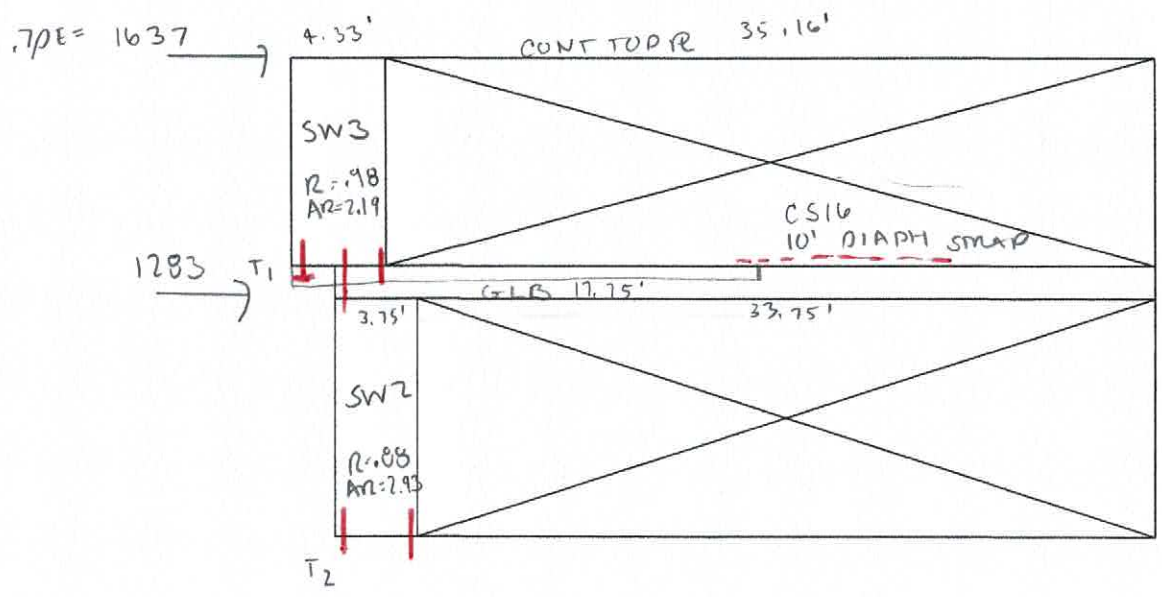


E2

$T_1 = 489(11) / 4.5 = 1195 \text{ ST HD 14}$



$$v = 34.21$$

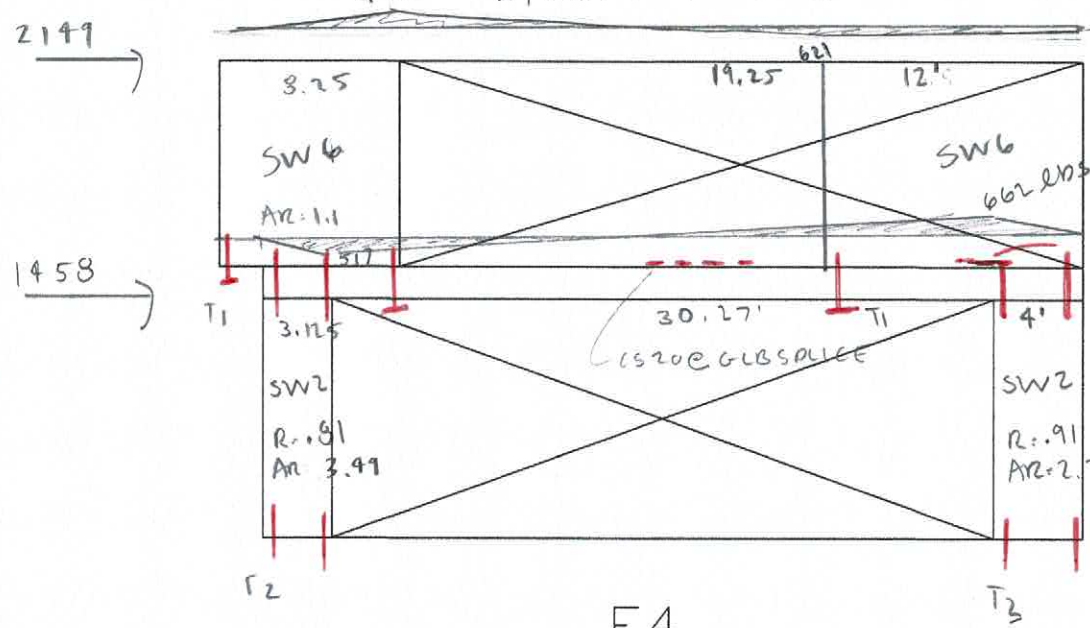


$$\frac{1637}{4.33(.98)} = 386 \text{ perf}$$

$$\frac{1637 + 1283}{3.75(.88)} = 575 \text{ perf}$$

$T_1 = 1637(9.5) / 3.83 = 4060 \text{ lbs}$ E3 → MSTC66B3 / CMST16
 $w/\Omega_0 = 7808 \text{ lbs}$ FOR BEAM / COL CHECK

$T_2 = [1637(22) + 1283(11)] / 3.25 = 15473 \text{ lbs}$ HD 19
 $w/\Omega_0 = 29,639 \text{ lbs}$ FOR ANCHOR / POST



$$v = 59.4$$

$$v = 106$$

$$V_0 = 51.59$$

$$\frac{2149 + 1458}{.81(3.125) + .91(4)} = 584 \text{ perf}$$

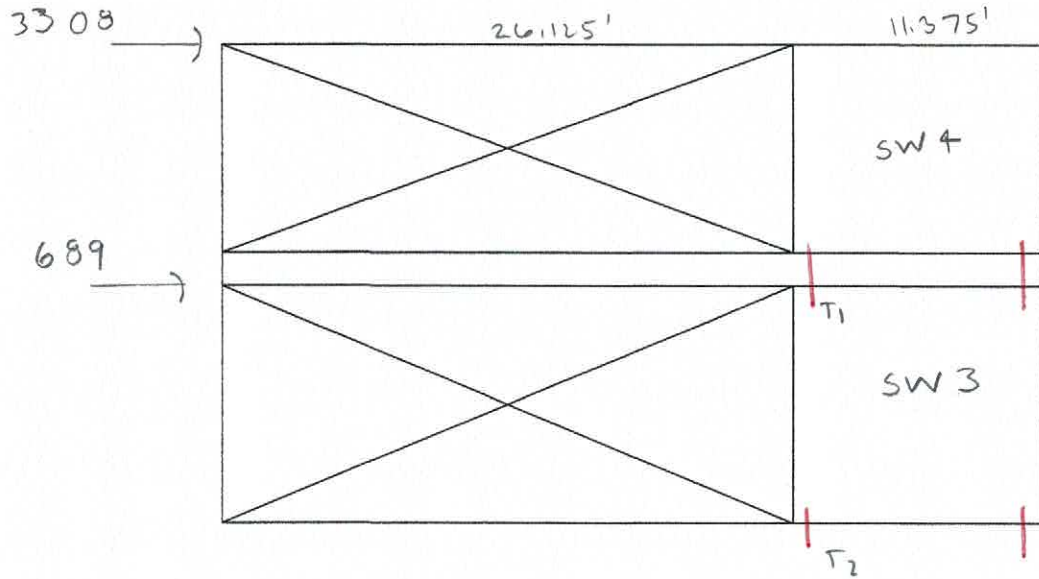
$$v = 38.98$$

$$V_R = 204.63$$

$$V_D = 165.65$$

$T_1 = 875(9.5) / 7.75 = 1072 \text{ lbs}$ MSTC48B3 / CS16
 $w/\Omega_0 = 2062 \text{ lbs}$ FOR BM / COL CHECK

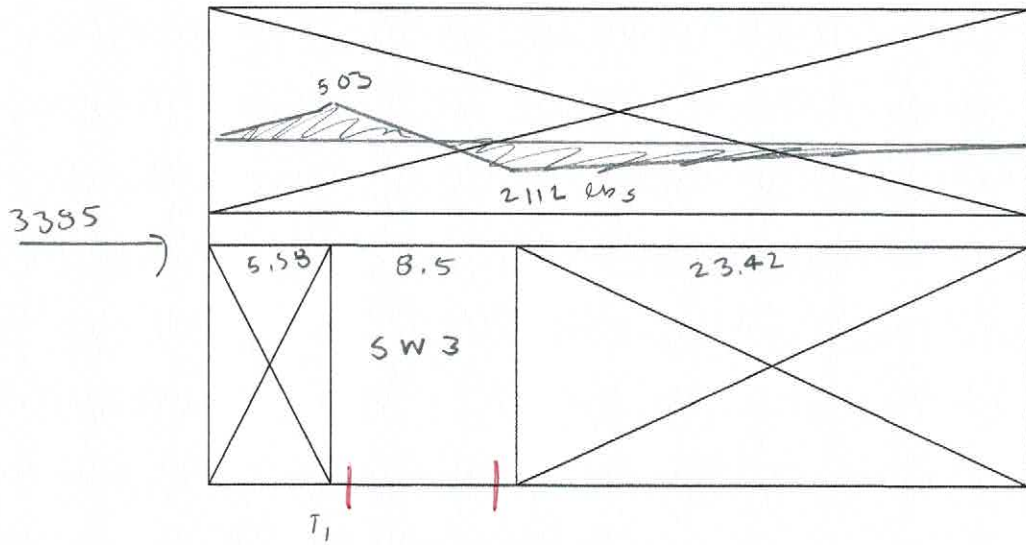
$T_2 = [875(22) + 204.6(3.125)(11)] / 3.125 = 8,410.6$ ∴ HD11
 $w/\Omega_0 = 16,174 \text{ lbs}$ FOR ANCHOR / POST



E5

$$T_1 = [3308(9.5) - 11.375(.6)(7.2)(9.5)(11.375/2)] / 10.875 = 2645 \text{ lbs} \quad \text{CMS 16}$$

$$T_2 = [3308(22) + 689(11) - .6(11.375)(7.2)(11)(11.375/2)] / 10.875 = 7106 \text{ lbs} \quad \text{HD 11}$$



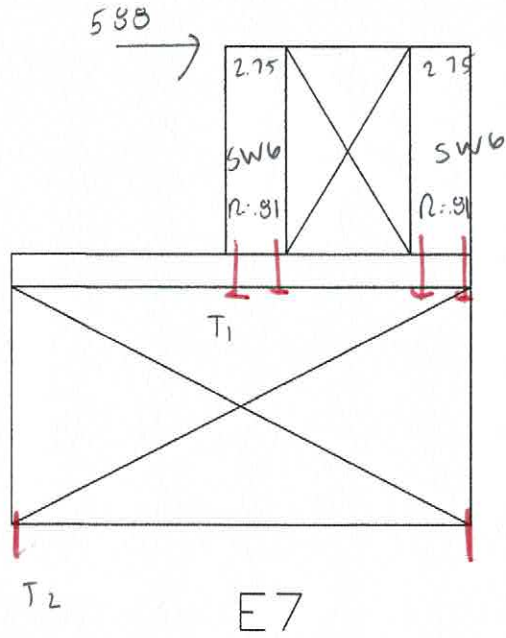
$$V = 40.26$$

$$V_0 = 307.79$$

$$V_f = 390 \text{ ref}$$

E6

$$T_1 = 3385(11) / 8 = 4659 \text{ lbs} \quad \therefore \text{HD 8}$$



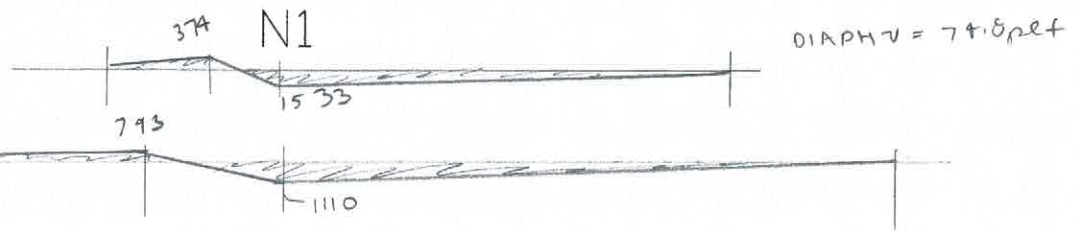
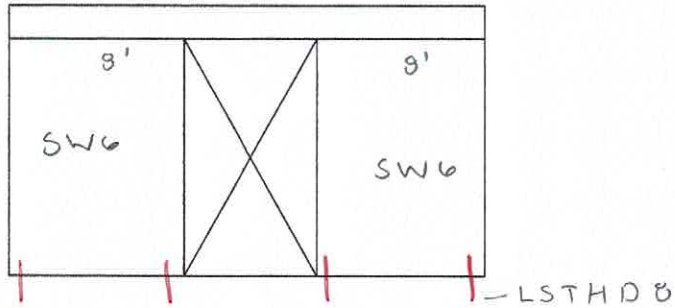
$$T_1 = 588 / 2 (9.5) / 2.25 = 1241 \text{ lbs} \quad \text{MSTC48BS}$$

$$w/\Omega_0 = 2387 \text{ lbs} \quad \text{FOR BM}$$

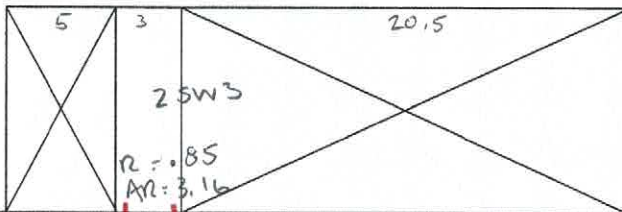
$$T_2 = 588 (22) / 21 = 616 \text{ lbs} \quad \text{LST408}$$

$$w/\Omega_0 = 1184 \text{ lbs} \quad \text{FOR POST}$$

$.7PF = 360 \rightarrow$

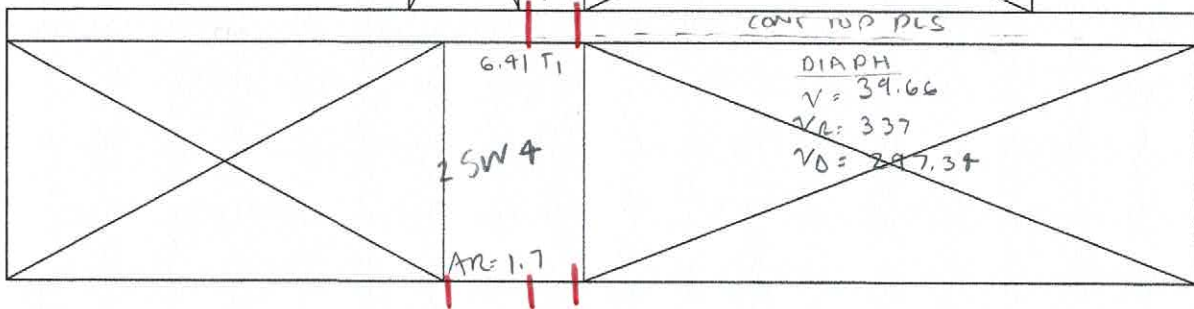


$.7PF = 2134 \rightarrow$



$v = 74.8 \text{ pef}$
 $v_r = \frac{2134}{.85(3)} = 836.8 \text{ pef}$

$2162 \rightarrow$



DIAPH
 $v = 39.66$
 $v_r = 337$
 $v_D = 297.34$

$v_r = 670 \text{ pef}$

N3

$T_1 = 2134(9.5) / 2.5 = 8109 \text{ lbs} \therefore \text{HOU 11}$

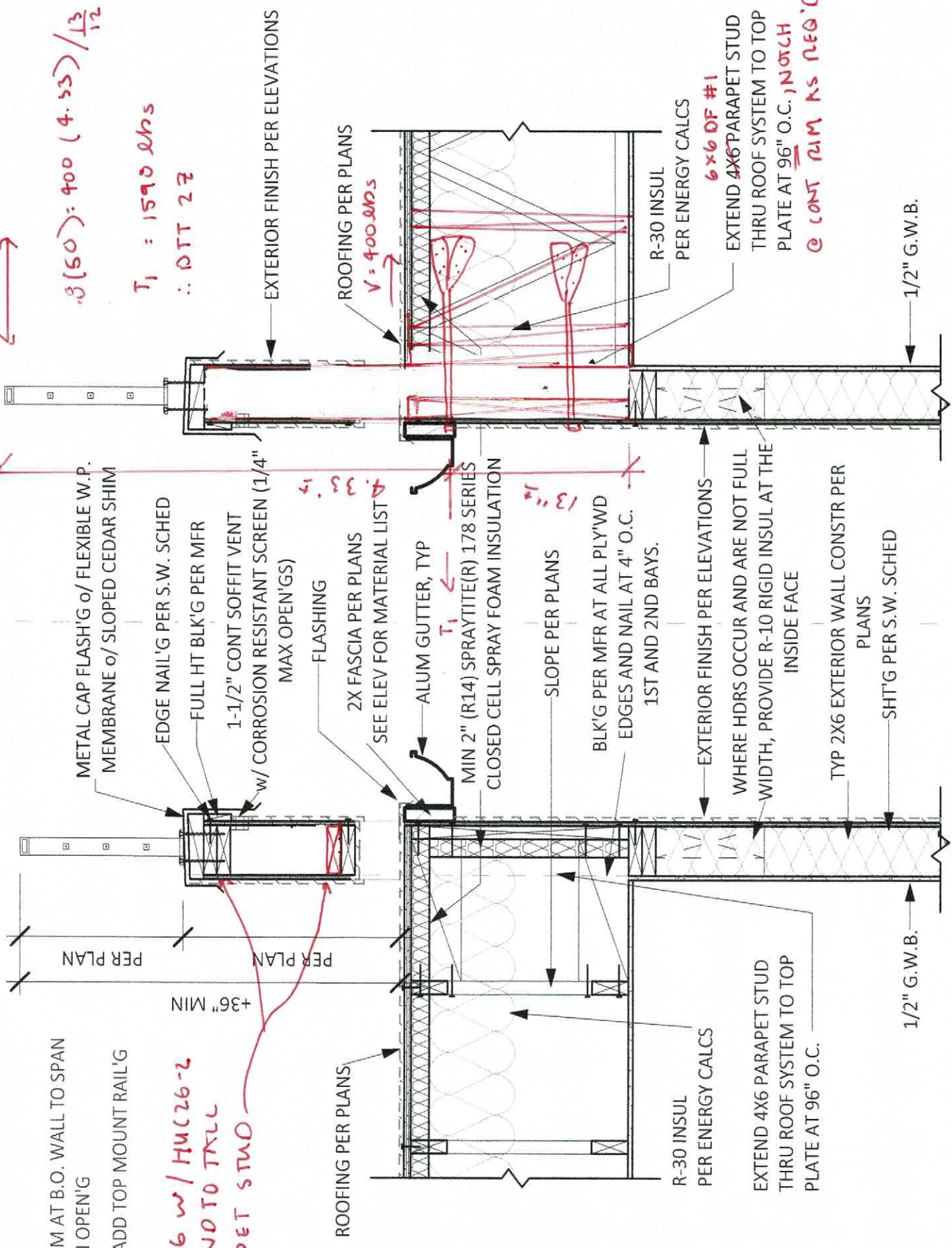
$T_2 = [2134(22) + 2162(11)] / 5.9 = 11,988 \text{ lbs} \therefore \text{HOU 14}$

CONDITION & GUTTER

NEED BEAM AT B.O. WALL TO SPAN
96" DRAIN OPEN'G
NEED TO ADD TOP MOUNT RAIL'G

(2) 2x6 w/ HUC26-2
EA END TO FULL
PARAPET STUD

3(50) = 400 (4.55) / 13/12
T₁ = 1590 lbs
∴ DTT 27



NEED SECURING/NAIL'G NOTES FOR PARAPET STUDS

6x6 DF #1
EXTEND 4x6 PARAPET STUD
THRU ROOF SYSTEM TO TOP
PLATE AT 96" O.C. NOTCH
@ CONT RUM AS REQ'D.

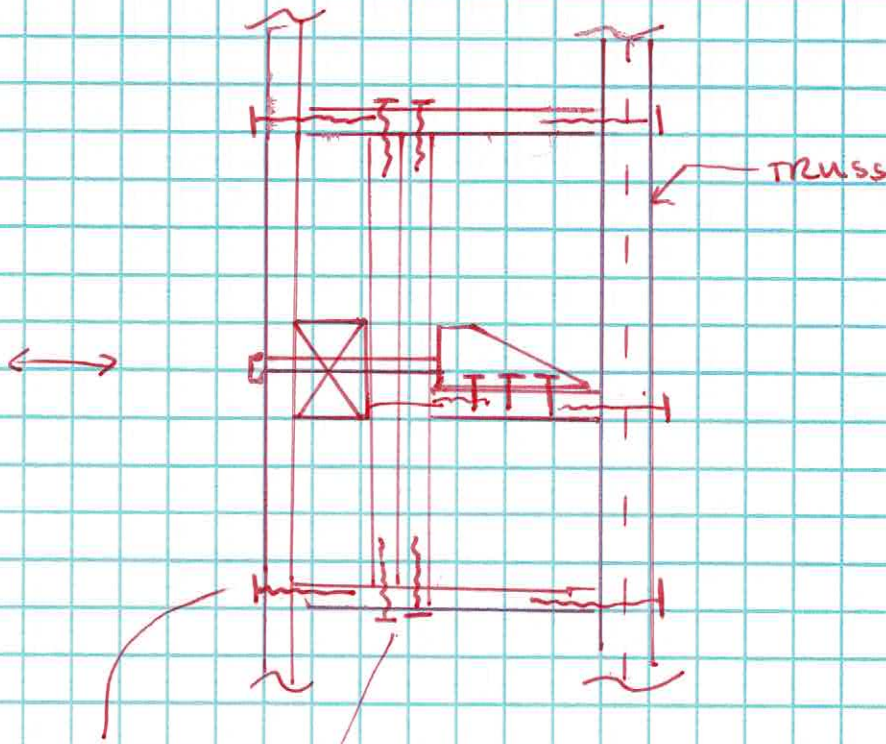
PARAMET POST @ 96" OC.

SIMPSON SDS SCREWS

$V_{ALLOW} = 250 \text{ lbs}$

WITHDRAWAL = 172 lbs

WITHDRAWAL @ END GRAIN = $172(.75) = 129 \text{ lbs}$



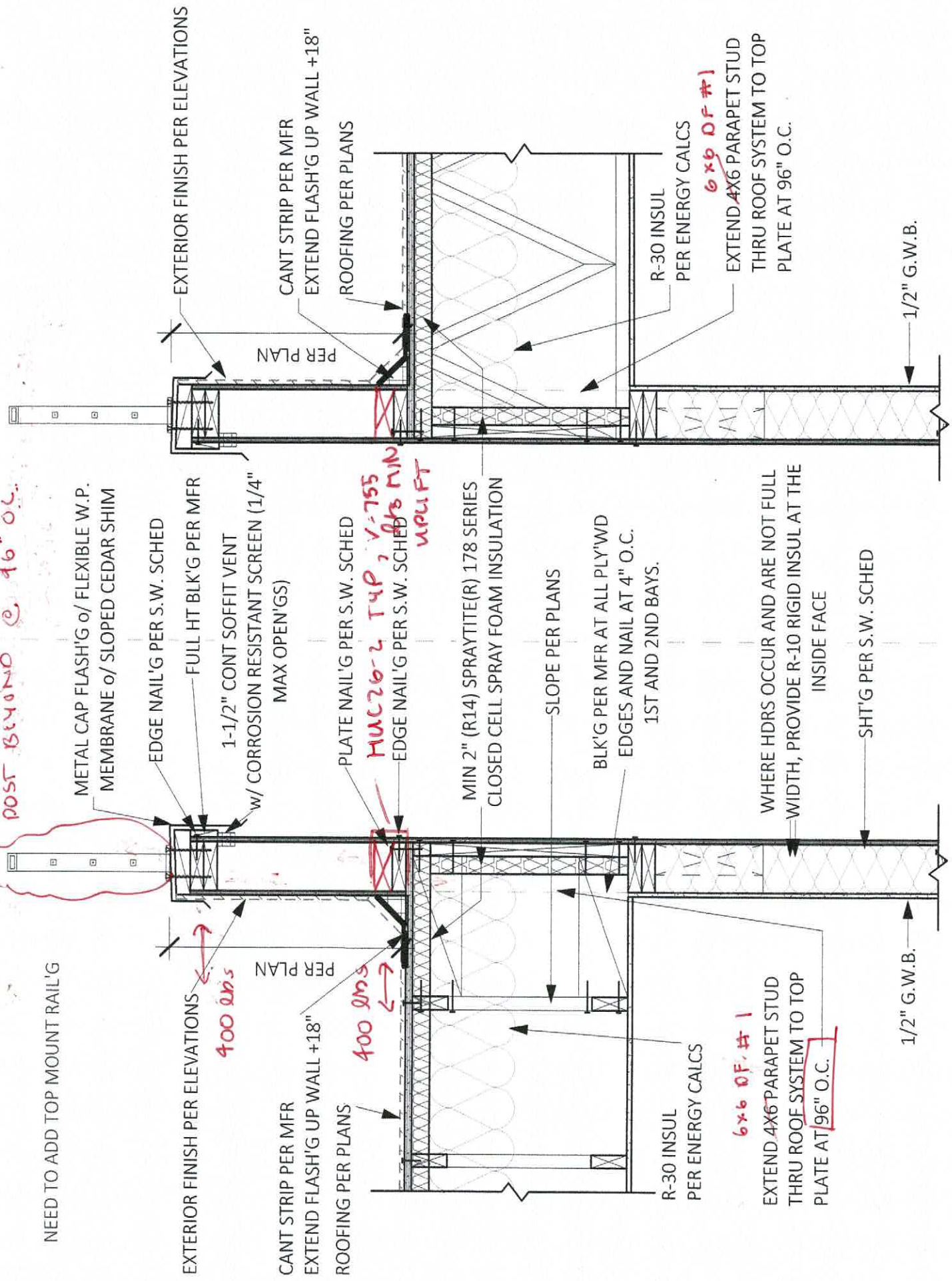
(4) SDS 228000B
 $V_{ALLOW} = 250 \text{ lbs}$
WITHDRAWAL = 172 lbs
 $172(.75) = 129 \text{ lbs}$
leg

SIMPSON SDS 2250
 $V_{ALLOW} = 250 \text{ lbs (8)} = 2000 \text{ lbs EA END}$

$129(4)(2) = 1032 \text{ lbs}$
+ DT 27 AB :: OKAY

POST BEYOND @ 16" O.C.

NEED TO ADD TOP MOUNT RAIL'G



EXTERIOR FINISH PER ELEVATIONS

CANT STRIP PER MFR

EXTEND FLASH'G UP WALL +18"

ROOFING PER PLANS

R-30 INSUL PER ENERGY CALCS

EXTEND 4X6 PARAPET STUD THRU ROOF SYSTEM TO TOP PLATE AT 96" O.C.

1/2" G.W.B.

METAL CAP FLASH'G o/ FLEXIBLE W.P. MEMBRANE o/ SLOPED CEDAR SHIM

EDGE NAIL'G PER S.W. SCHED

FULL HT BLK'G PER MFR

1-1/2" CONT SOFFIT VENT

w/ CORROSION RESISTANT SCREEN (1/4" MAX OPEN'GS)

PLATE NAIL'G PER S.W. SCHED

HMC26-2 TYP, V-755
EDGE NAIL'G PER S.W. SCHED
MIN 1/4" UP LIFT

MIN 2" (R14) SPRAYTITE(R) 178 SERIES CLOSED CELL SPRAY FOAM INSULATION

SLOPE PER PLANS

BLK'G PER MFR AT ALL PLY'WD EDGES AND NAIL AT 4" O.C. 1ST AND 2ND BAYS.

WHERE HDRS OCCUR AND ARE NOT FULL WIDTH, PROVIDE R-10 RIGID INSUL AT THE INSIDE FACE

SHT'G PER S.W. SCHED

1/2" G.W.B.

EXTERIOR FINISH PER ELEVATIONS

400 lbs

CANT STRIP PER MFR

EXTEND FLASH'G UP WALL +18"

ROOFING PER PLANS

400 lbs

R-30 INSUL PER ENERGY CALCS

6x6 OF #1
EXTEND 4X6 PARAPET STUD THRU ROOF SYSTEM TO TOP PLATE AT 96" O.C.

NEED SECURING/NAIL'G NOTES FOR PARAPET STUDS

Column: **M1**

Shape: **Stanchion Vert**

Material: **6063-T6**

Length: **3.167 ft**

I Joint: **N1**

J Joint: **N2**

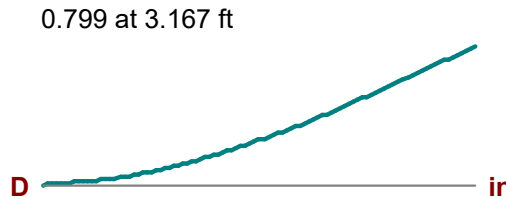
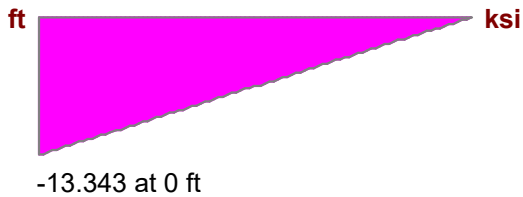
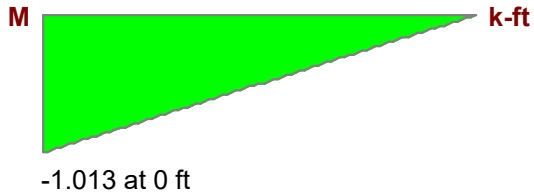
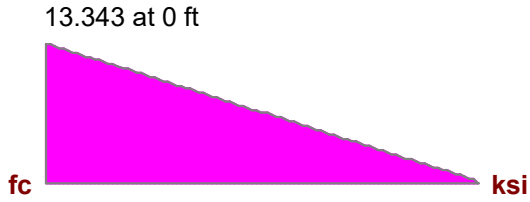
LC 1: **Point Load**

Code Check: **0.881 (bending)**

Report Based On 97 Sections

A ————— k

fa ————— ksi



AA ADM1-15: ASD - Building Code Check

Max Bending Check **0.881**
Location **0 ft**
Equation **H.1-1**

Max Shear Check **0.056**
Location **3.167 ft**
Max Defl Ratio **L/47**

	Slender. Limit λ_1	λ_2	Slender. Ratio λ	Gov Eqn	Lb KL/r	Out Plane 3.167 ft 52.66	In Plane 3.167 ft 52.66
Pnt/om 26.515 k				D.2-1			
Pnc/om 19.413 k		78.4	52.7	E.2-1		3.167 ft	3.167 ft
Mn/om 1.151 k-ft				B.5.5.2		3.167 ft	
Vn/om 5.682 k	38.7	75.7	6	G.1-1		1	1.667

Beam: **M1**

Shape: **Top Rail**

Material: **6063-T6**

Length: **4 ft**

I Joint: **N1**

J Joint: **N2**

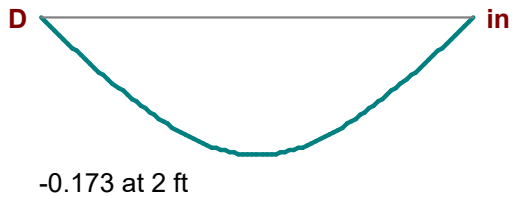
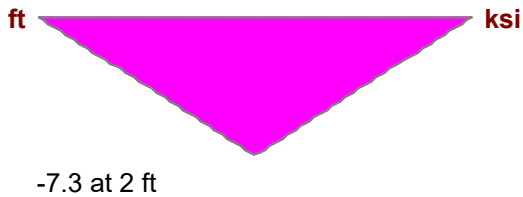
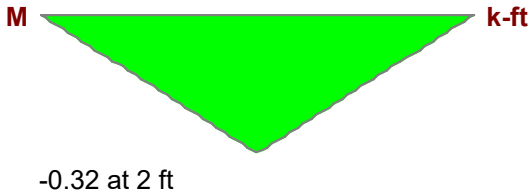
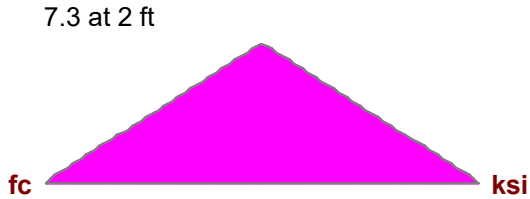
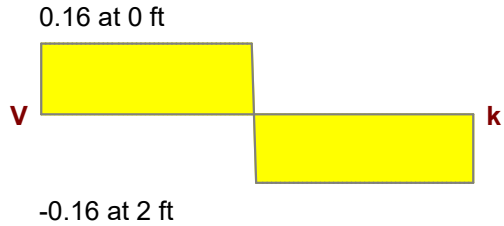
LC 1: Point Load

Code Check: **0.482 (bending)**

Report Based On 97 Sections

A ————— k

fa ————— ksi



AA ADM1-15: ASD - Building Code Check

Max Bending Check **0.482**
 Location **2 ft**
 Equation **H.1-1**

Max Shear Check **0.028**
 Location **4 ft**

Max Defl Ratio **L/276**
 Location **2 ft**
 Span **1**

	Slender. Limit λ_1	Slender. Ratio λ_2	Slender. Ratio λ	Gov Eqn
Pnt/om 18.939 k				D.2-1
Pnc/om 3.366 k		78.4	138.1	E.2-1
Mn/om 0.664 k-ft				B.5.4.2
Vn/om 5.682 k	38.7	75.7	6	G.1-1

	Out Plane	In Plane
Lb	4 ft	4 ft
KL/r	138.085	73.992
L Comp Top	4 ft	
L Comp Bot	4 ft	
Torque Length	4 ft	
Tau_b	1	
Cb	1.316	

Beam: **M1**

Shape: **7/8" Baluster**

Material: **6061-T6**

Length: **3.91 ft**

I Joint: **N1**

J Joint: **N2**

LC 1: Point Load

Code Check: **0.301 (bending)**

Report Based On 97 Sections

A ————— k

fa ————— ksi

0.039 at 0 ft

V ————— k

-0.041 at 2.036 ft

8.382 at 1.996 ft

fc ————— ksi

M ————— k-ft

-0.078 at 1.996 ft

ft ————— ksi

-8.382 at 1.996 ft

D ————— in

-0.436 at 1.955 ft

AA ADM1-15: ASD - Building Code Check

Max Bending Check **0.301**
 Location **1.996 ft**
 Equation **H.1-1**

Max Shear Check **0.004**
 Location **3.91 ft**

Max Defl Ratio **L/107**
 Location **1.955 ft**
 Span **1**

	Slender. Limit λ_1	Slender. Ratio λ_2	Slender. Ratio λ	Gov Eqn
Pnt/om 14.92 k				D.2-3
Pnc/om 1.139 k		65.7	185.8	E.2-1
Mn/om 0.259 k-ft				F.4
Vn/om 9.423 k	35.3	63.2	1	G.2-1

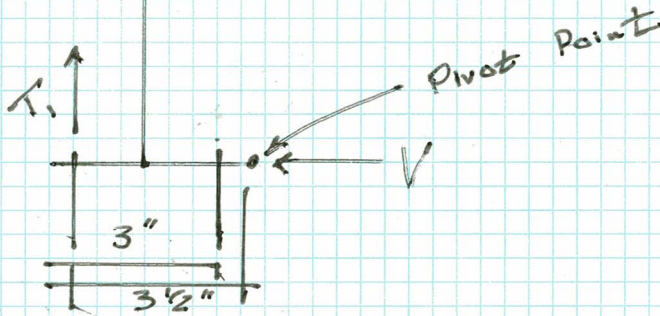
Lb KL/r	Out Plane	In Plane
	3.91 ft	3.91 ft
	185.755	185.755
L Comp Top	3.91 ft	
L Comp Bot	3.91 ft	
Torque Length	3.91 ft	
Tau_b	1	
Cb	1.326	

Rail Fasteners

• Demand

200 lb →

- 36" Max Stairs
- 18" Max Roof Deck



$V = 50 \text{ lb / screw}$
Stair Railing

$$T_1 = 200(36) / 3.5 / 2 = 1029 \text{ lb}$$

Roof Railing

$$T_1 = 200(18) / 3.5 / 2 = 514 \text{ lb}$$

• Capacity

} Demand

TABLE 2—REFERENCE WITHDRAWAL DESIGN VALUES (W)^{1,2,3}
[Reference withdrawal design values (W) are in pounds per inch of thread penetration into side grain of main member]

FASTENER	THREAD LENGTH, L^4 (inches)	W (lb./in.) FOR SPECIFIC GRAVITIES OF:					
		0.57	0.55	0.5	0.46	0.43	0.42
OlyLog/ TimberLOK	1.25 or 2.0	270	260	220	200	180	170
HeadLOK	2.0	290	270	230	200	180	170
LedgerLOK/ LedgerLOK Flat Head/ LogHog	2.0 or 3.0	330	310	270	240	220	210
TrussLOK	1 1/2	—	—	180	—	—	—
TrussLOK-Z	1 1/4	290	270	220	180	160	150
ThruLOK ⁽⁵⁾	NA ⁽⁶⁾	1140 ⁽⁶⁾	1060 ⁽⁶⁾	900 ⁽⁶⁾	780 ⁽⁶⁾	700 ⁽⁶⁾	680 ⁽⁶⁾

For SI: 1 inch = 25.4 mm, 1 lb/fin = 175 N/m.

Capacity Next Page →

Capacity Calc'D

• Stair Railing

Use HeadLok "F2.9HL" ←

TABLE 1B—FASTENER SPECIFICATIONS: HEADLOK FASTENERS

HEADLOK® FASTENER DESIGNATION	HEAD MARKING	OVERALL LENGTH ¹ (inches)	LENGTH OF THREAD ² (inches)	UNTHREADED SHANK DIAMETER (inch)	MINOR THREAD (ROOT) DIAMETER (inch)	BENDING YIELD ³ (F _{yb} , psi)	ALLOWABLE FASTENER STRENGTH	
							Tensile (lbf)	Shear ⁴ (lbf)
HLGM278	F2.9HL	2 ⁷ / ₈	2	0.191	0.172	187,300	1,215	965
HLGM412	F4.5HL	4 ¹ / ₂	2					
HLGM6	F6.0HL	6	2					
HLGM8	F8.0HL	8	2					
HLGM10	F10HL	10	2					

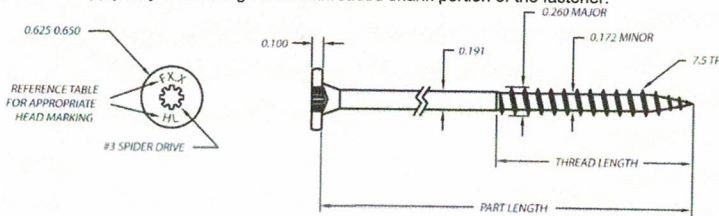
For SI: 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 psi = 6.895 kPa.

¹For purposes of measuring overall fastener length, fasteners must be measured from the underside of head to the tip, as shown in the figure below.

²Length of thread includes tip. See detailed figure below.

³Bending yield strength determined per methods specified in ASTM F1575 and based on the minor thread diameter.

⁴Allowable shear strength values apply only to shearing in the unthreaded shank portion of the fastener.



$$\text{Capacity} = 1.6 (2) (230) = 736 \text{ lb} > 543 \text{ lb} \therefore \text{OK}$$

• Deck Railing

Use Ledger Lok "LLF 3.5" ←

TABLE 1C—FASTENER SPECIFICATIONS: LEDGERLOK FASTENERS

LEDGERLOK® FASTENER DESIGNATION	HEAD STYLE	HEAD MARKING	OVERALL LENGTH ¹ (inches)	LENGTH OF THREAD ² (inches)	UNTHREADED SHANK DIAMETER (inch)	MINOR THREAD (ROOT) DIAMETER (inch)	BENDING YIELD ³ (F _{yb} , psi)	ALLOWABLE FASTENER STRENGTH	
								Tensile (lbf)	Shear ⁴ (lbf)
LL358	Hex Washer	F3.6	3 ⁵ / ₈	2	0.228	0.202	200,700	1,833	1,235
LL005		F5.0	5	3					
LLF358	Flat	LLF3.6	3 ⁵ / ₈	2					
LLF005		LLF5.0	5	3					

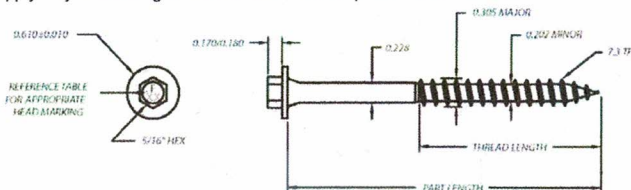
For SI: 1 inch = 25.4 mm, 1 lbf = 4.4 N, 1 psi = 6.895 kPa.

¹For purposes of measuring overall fastener length, fasteners must be measured from the underside of head to the tip, as shown in the figures below.

²Length of thread includes tip. See detailed figure below.

³Bending yield strength determined per methods specified in ASTM F1575 and based on the minor thread diameter.

⁴Allowable shear strength values apply only to shearing in the unthreaded shank portion of the fastener.



Hex Washer Head LedgerLok Fastener

$$\text{Capacity} = 1.6 (3) (270) = 1296 \text{ lb} > 1085 \text{ lb} \therefore \text{OK}$$