

CORRECTIONS

Mercer Residence

6950 SE Maker Street
Mercer Island, WA 98040

PROJECT NO.: 2207-19

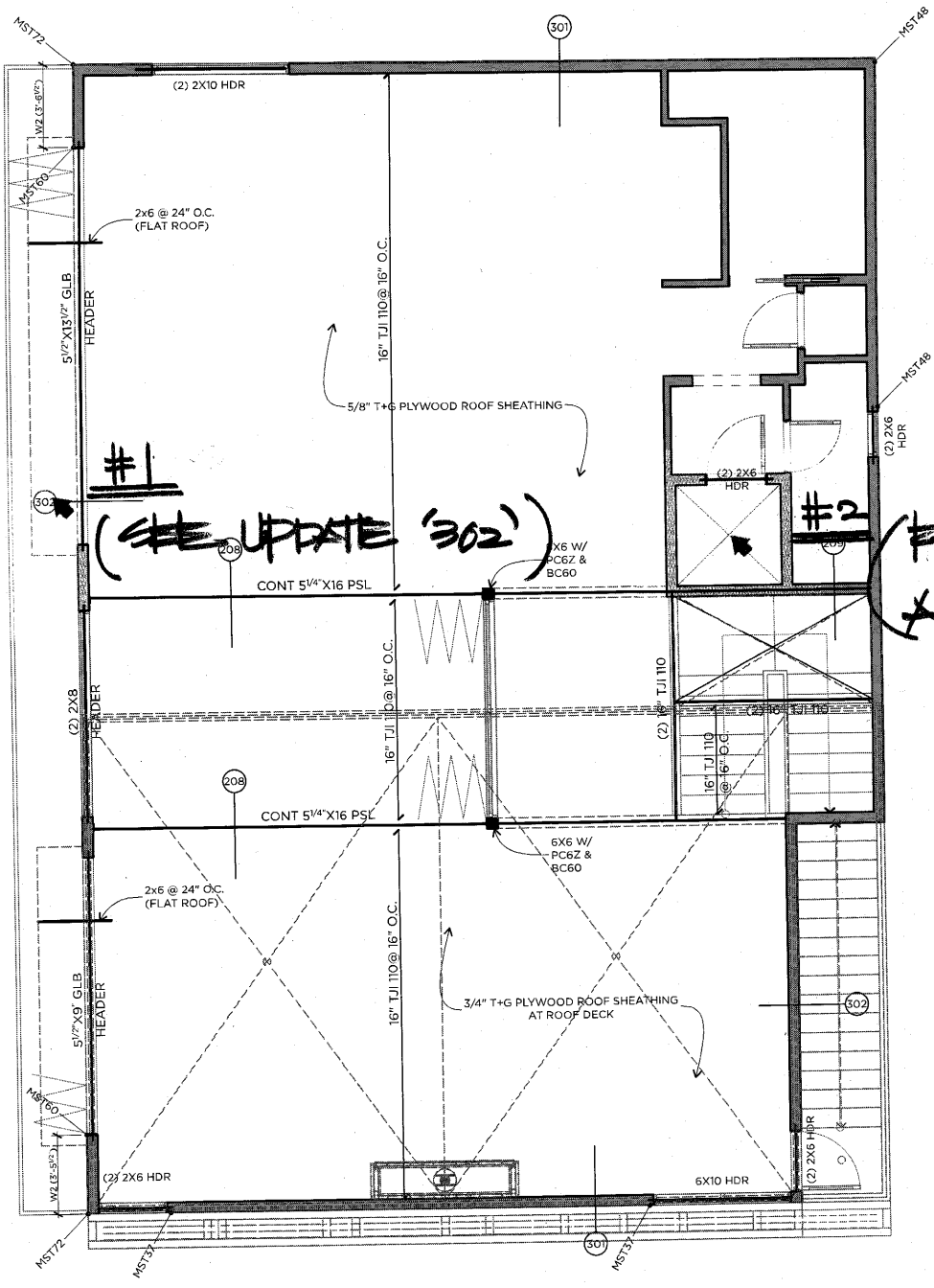
DATE: January 25, 2023

D. S. Engineering
Consulting Structural Engineers

3121 147th Place SE
Mill Creek, WA 98012
T: 425-338-4776

01/25/2023





#1

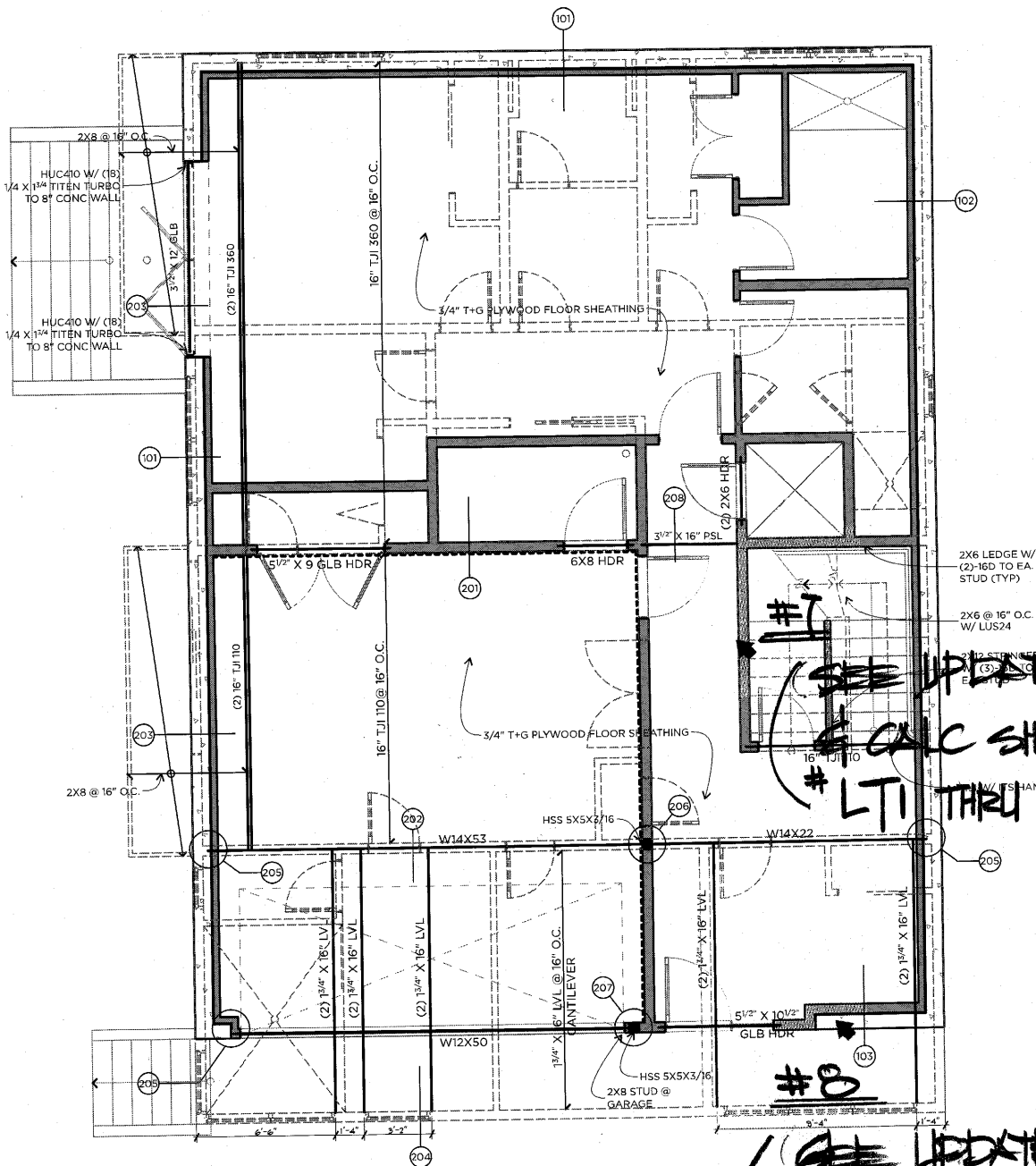
(~~SEE~~ UPDATE '302')

#2

(FLASH FRAMED)
ABOVE ELEVATOR

ROOF FRAMING

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

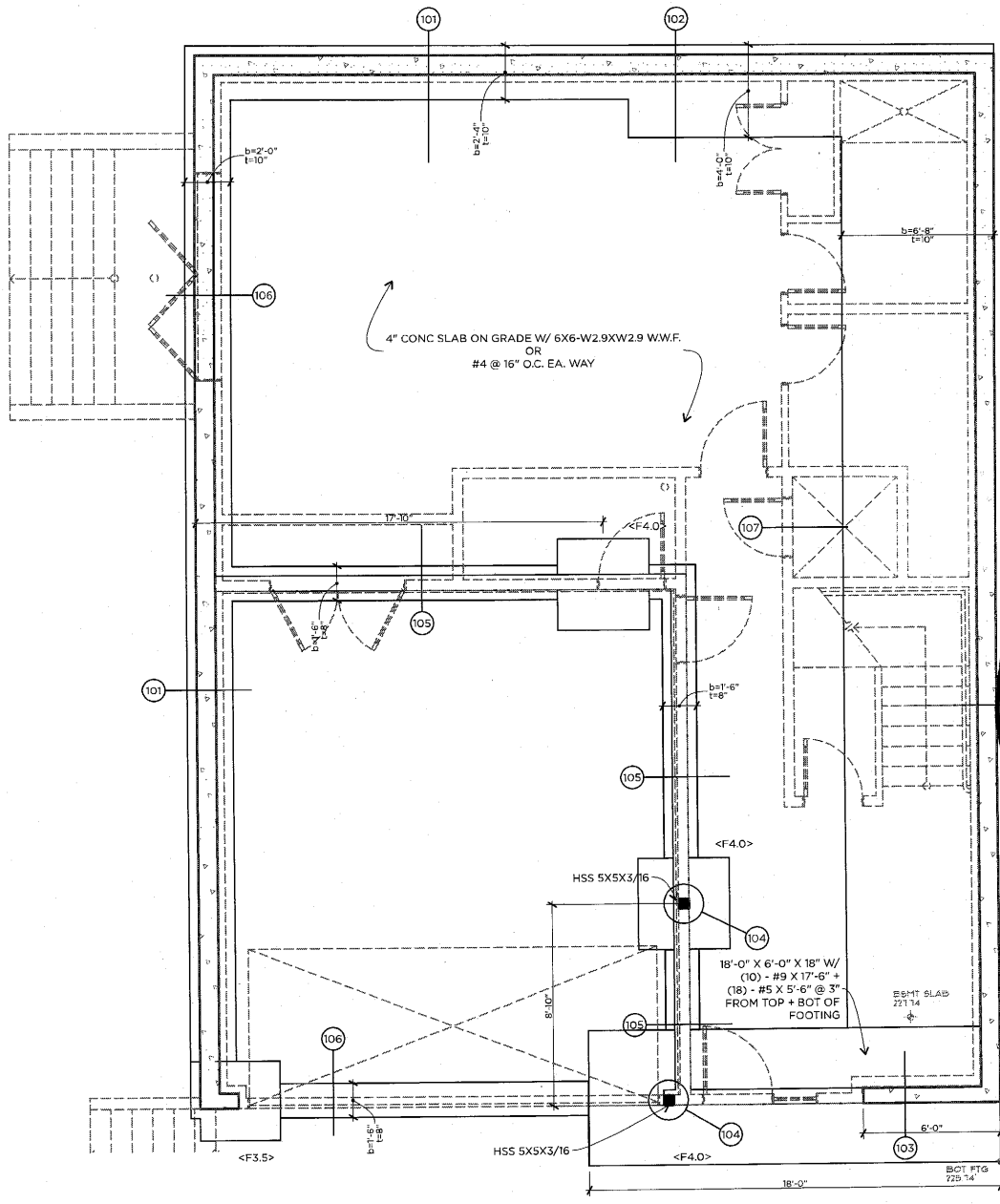


FIRST FLOOR FRAMING

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

#7
 SEE UPDATE PLAN
 & CALC SHEET
 #LT1 THRU #LT9

#8
 SEE UPDATE PLAN
 & DETAIL '20'
 & CALC SHEET
 #LT11 & #LT12

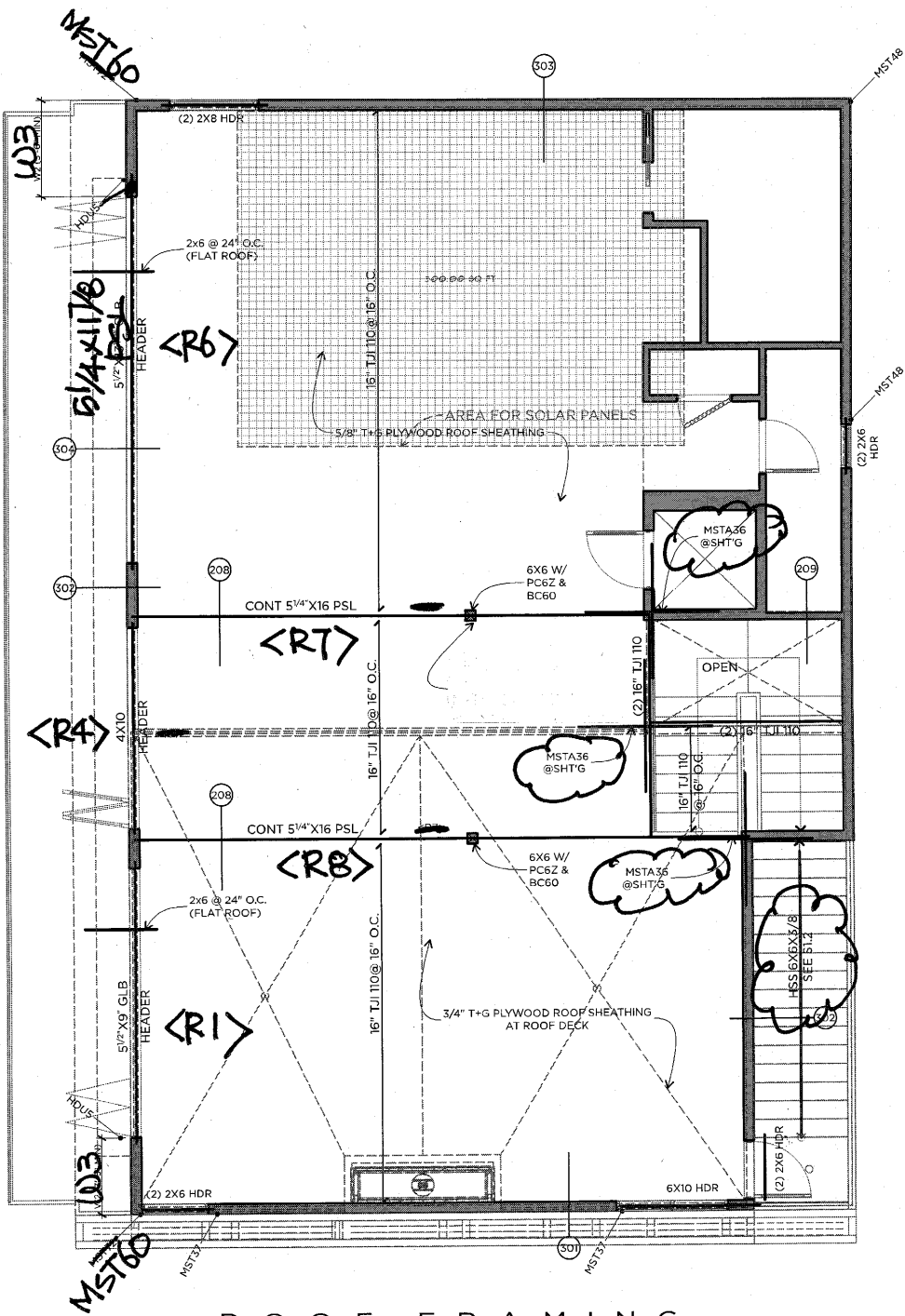


#9
 SEE UPDATE
 EAST WALL
 @ S.I. /

FOUNDATION PLAN

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

Design Analysis



ROOF FRAMING

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

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: header

CODE REFERENCES

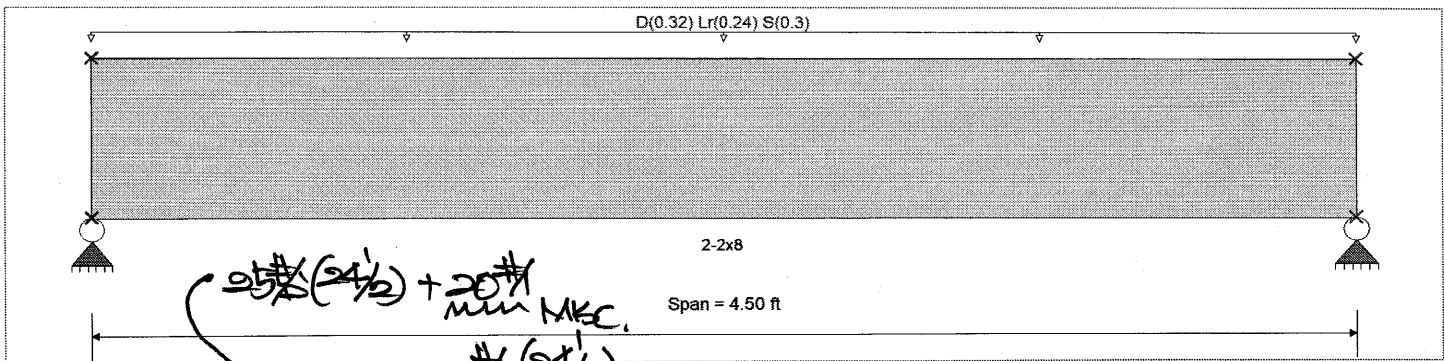
(@ NORTH OAH)

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

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design	Fb +	850 psi	<i>E : Modulus of Elasticity</i>	
Load Combination : IBC 2018	Fb -	850 psi	Ebend- xx	1300ksi
	Fc - Prll	1300 psi	Eminbend - xx	470ksi
Wood Species : Hem-Fir	Fc - Perp	405 psi		
Wood Grade : No.2	Fv	150 psi		
	Ft	525 psi	Density	26.84 pcf
Beam Bracing : Completely Unbraced				



Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.320, Lr = 0.240, S = 0.30, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.622	1	Maximum Shear Stress Ratio =	0.414	: 1
Section used for this span	2-2x8		Section used for this span	2-2x8	
fb: Actual =	721.26psi		fv: Actual =	71.39 psi	
F'b =	1,160.10psi		F'v =	172.50 psi	
Load Combination =	+D+S		Load Combination =	+D+S	
Location of maximum on span =	2.250ft		Location of maximum on span =	3.909 ft	
Span # where maximum occurs =	Span # 1		Span # where maximum occurs =	Span # 1	
Maximum Deflection					
Max Downward Transient Deflection	0.022 in	Ratio = 2402 >= 360	Span: 1 : S Only		
Max Upward Transient Deflection	0 in	Ratio = 0 < 360	n/a		
Max Downward Total Deflection	0.047 in	Ratio = 1154 >= 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	0.0468	2.266		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.404	1.404
Max Upward from Load Combinations	1.404	1.404
Max Upward from Load Cases	0.729	0.729
D Only	0.729	0.729
+D+Lr	1.269	1.269
+D+S	1.404	1.404
+D+0.750Lr	1.134	1.134
+D+0.750S	1.235	1.235
+0.60D	0.437	0.437
Lr Only	0.540	0.540

R 2

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

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DESCRIPTION: header

Vertical Reactions

(@ NORTH WALL)

Support notation : Far left is #1

Values in KIPS

Load Combination

Support 1 Support 2

S Only

0.675

0.675

R3

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: header <R1>

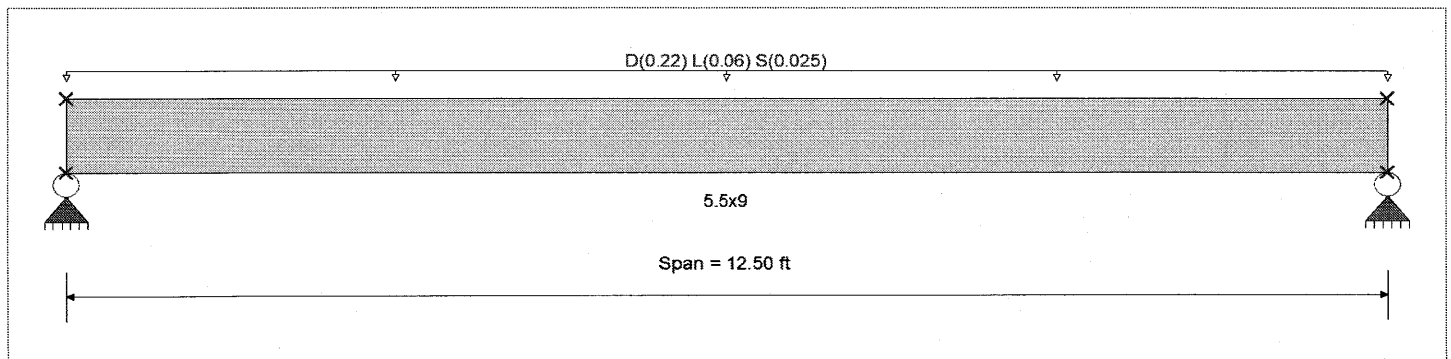
CODE REFERENCES

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

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2400 psi	E : Modulus of Elasticity	
Load Combination : IBC 2018	Fb -	1850 psi	Ebend- xx	1800 ksi
	Fc - Prll	1650 psi	Eminbend - xx	950 ksi
Wood Species : DF/DF	Fc - Perp	650 psi	Ebend- yy	1600 ksi
Wood Grade : 24F-V4	Fv	265 psi	Eminbend - yy	850 ksi
	Ft	1100 psi	Density	31.21 pcf
Beam Bracing : Completely Unbraced				



Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.220, L = 0.060, S = 0.0250, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.386	1	Maximum Shear Stress Ratio	=	0.184	: 1
Section used for this span		5.5x9		Section used for this span		5.5x9	
fb: Actual	=	917.70psi		fv: Actual	=	48.63 psi	
F'b	=	2,375.48psi		F'v	=	265.00 psi	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	6.250ft		Location of maximum on span	=	11.770 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.055 in	Ratio = 2721	>=360	Span: 1 : L Only		
Max Upward Transient Deflection		0 in	Ratio = 0	<360	n/a		
Max Downward Total Deflection		0.271 in	Ratio = 554	>=180	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection		0 in	Ratio = 0	<180	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	0.2705	6.296		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.840	1.840
Max Upward from Load Combinations	1.840	1.840
Max Upward from Load Cases	1.442	1.442
D Only	1.442	1.442
+D+L	1.817	1.817
+D+Lr	1.442	1.442
+D+S	1.598	1.598
+D+0.750Lr+0.750L	1.723	1.723
+D+0.750L+0.750S	1.840	1.840
+0.60D	0.865	0.865

R4

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: header <R>**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
L Only	0.375	0.375
S Only	0.156	0.156

Wood Beam

Lic. #: KW-06010224

File: examples.ec6
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D.S. ENGINEERING PC

DESCRIPTION: header <R4>

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : IBC 2018

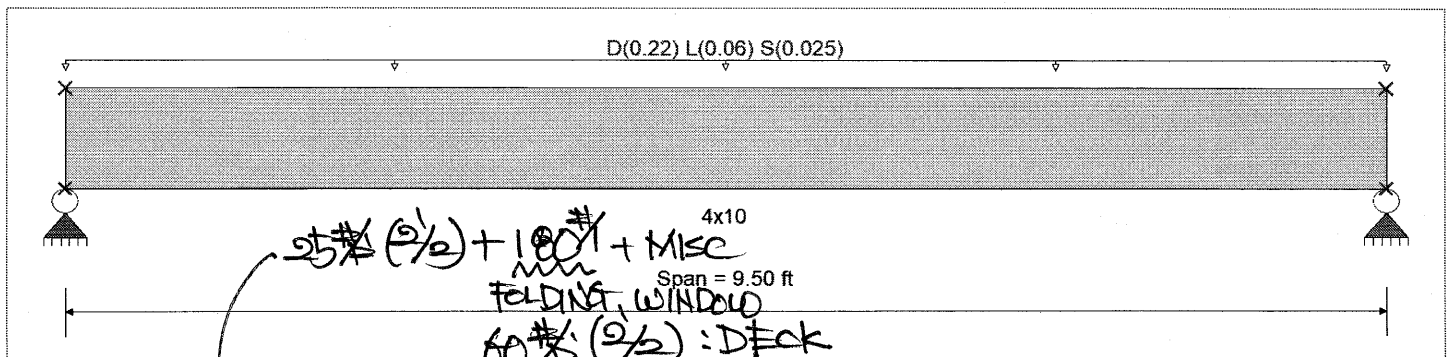
Material Properties

Analysis Method : Allowable Stress Design
Load Combination IBC 2018

Fb +	850 psi	E : Modulus of Elasticity	
Fb -	850 psi	Ebend- xx	1300 ksi
Fc - Prll	1300 psi	Eminbend - xx	470 ksi
Fc - Perp	405 psi		
Fv	150 psi		
Ft	525 psi	Density	26.84 pcf

Wood Species : Hem-Fir
Wood Grade : No.2

Beam Bracing : Completely Unbraced



Applied Loads

Beam self weight calculated and added to loads

Uniform Load : D = 0.220, L = 0.060, S = 0.0250, Tributary Width = 1.0 ft

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

DESIGN SUMMARY

				Design OK			
Maximum Bending Stress Ratio	=	0.776	1	Maximum Shear Stress Ratio	=	0.352	1
Section used for this span		4x10		Section used for this span		4x10	
fb: Actual	=	775.81 psi		fv: Actual	=	52.84 psi	
Fb: Allowable	=	999.98 psi		Fv: Allowable	=	150.00 psi	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	4.750 ft		Location of maximum on span	=	8.737 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.037 in	Ratio =	3093	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.178 in	Ratio =	640	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.1780	4.785		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	1.503	1.503
Overall MINimum	0.119	0.119
+1.40D	1.503	1.503
+D+L	1.359	1.359
+D+Lr	1.074	1.074
+D+S	1.192	1.192
+D+0.750Lr+0.750L	1.287	1.287
+D+0.750L+0.750S	1.376	1.376
D Only	1.074	1.074
+0.60D	0.644	0.644

R6

Wood Beam

File: examples.ec6

Lic. #: KW-06010224

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D.S. ENGINEERING PC

DESCRIPTION: header <R4>

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
L Only	0.285	0.285
S Only	0.119	0.119

R7

Wood Beam

Project File: ENERCALC_20

LIC#: KVV-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: header <R6>

CODE REFERENCES

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

Load Combination Set : IBC 2018

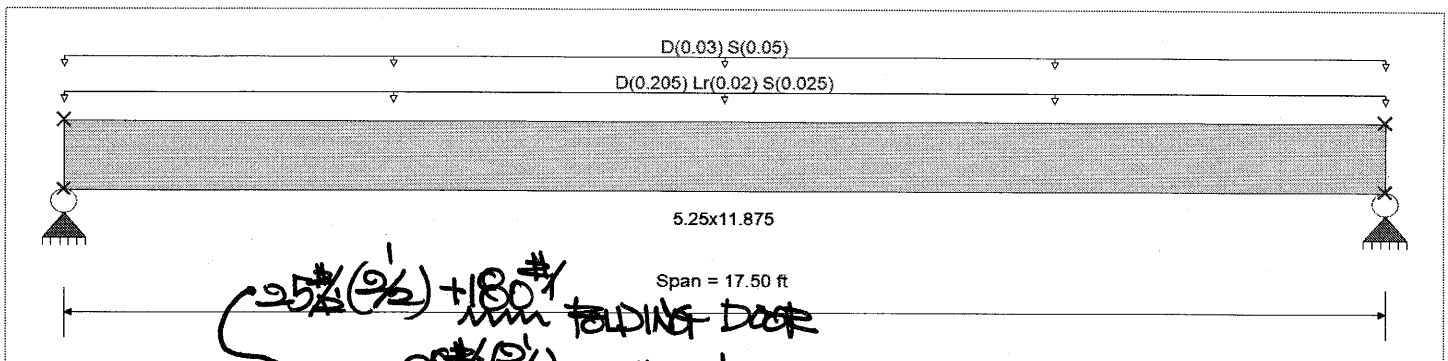
Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2018

Fb +	2900 psi	E : Modulus of Elasticity	
Fb -	2900 psi	Ebend- xx	2200ksi
Fc - Prll	2900 psi	Eminbend - xx	1118.19ksi
Fc - Perp	750 psi		
Fv	290 psi		
Ft	2025 psi	Density	45.07pcf

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

Beam Bracing : Completely Unbraced



Applied Loads

Beam self weight calculated and added to loading

Uniform Load : D = 0.2050, Lr = 0.020, S = 0.0250, Tributary Width = 1.0 ft

Uniform Load : D = 0.030, S = 0.050, Tributary Width = 1.0 ft, (from flat roof)

DESIGN SUMMARY

Maximum Bending Stress Ratio	=	0.380	1	Maximum Shear Stress Ratio	=	0.185	1
Section used for this span	=	5.25x11.875		Section used for this span	=	5.25x11.875	
fb: Actual	=	1,226.77	psi	fv: Actual	=	61.78	psi
F'b	=	3,230.81	psi	F'v	=	333.50	psi
Load Combination	=	+D+S		Load Combination	=	+D+S	
Location of maximum on span	=	8.750	ft	Location of maximum on span	=	0.000	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection	0.099	in	Ratio =	2126	>=	360	Span: 1 : S Only
Max Upward Transient Deflection	0	in	Ratio =	0	<	360	n/a
Max Downward Total Deflection	0.434	in	Ratio =	483	>=	180	Span: 1 : +D+S
Max Upward Total Deflection	0	in	Ratio =	0	<	180	n/a

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.4339	8.814		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	2.883	2.883
Max Upward from Load Combinations	2.883	2.883
Max Upward from Load Cases	2.227	2.227
D Only	2.227	2.227
+D+Lr	2.402	2.402
+D+S	2.883	2.883
+D+0.750Lr	2.358	2.358
+D+0.750S	2.719	2.719
+0.60D	1.336	1.336

R8

Wood Beam

Project File: ENERCALC_20

LIC# : KW-06015335, Build:20.22.12.28

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DESCRIPTION: header <R6>**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Lr Only	0.175	0.175
S Only	0.656	0.656

R9

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

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DESCRIPTION: <R7>

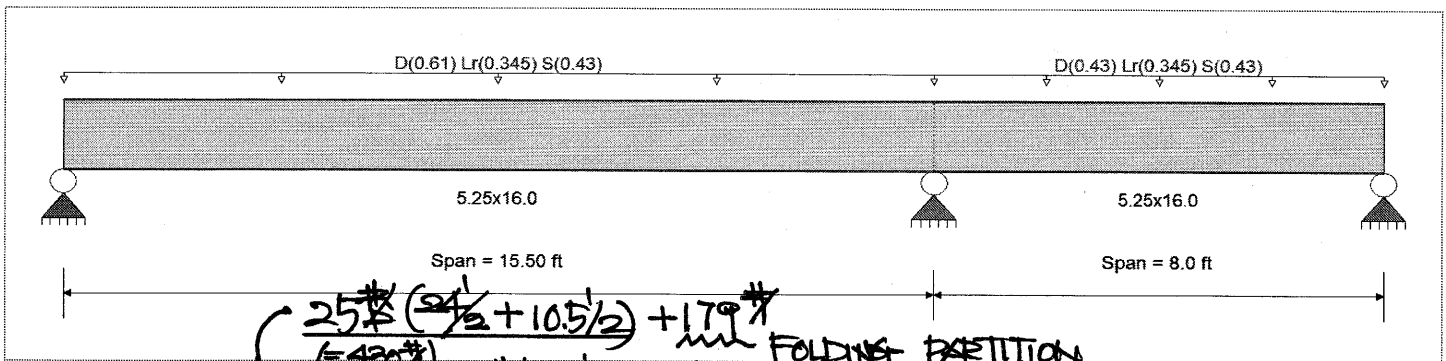
CODE REFERENCES

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

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2900 psi	E : Modulus of Elasticity
Load Combination : IBC 2018	Fb -	2900 psi	Ebend- xx 2200ksi
	Fc - Prll	2900 psi	Eminbend - xx 1118.19ksi
Wood Species : iLevel Truss Joist	Fc - Perp	750 psi	
Wood Grade : Parallam PSL 2.2E	Fv	290 psi	
	Ft	2025 psi	Density 45.07pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			



Applied Loads

Beam self weight calculated and added to loading
 Load for Span Number 1
 Uniform Load : D = 0.610, Lr = 0.3450, S = 0.430, Tributary Width = 1.0 ft
 Load for Span Number 2
 Uniform Load : D = 0.430, Lr = 0.3450, S = 0.430, Tributary Width = 1.0 ft

DESIGN SUMMARY

				Design OK			
Maximum Bending Stress Ratio	=	0.390	1	Maximum Shear Stress Ratio	=	0.450	: 1
Section used for this span	=	5.25x16.0		Section used for this span	=	5.25x16.0	
fb: Actual	=	1,260.78psi		fv: Actual	=	149.95 psi	
F'b	=	3,230.19psi		F'v	=	333.50 psi	
Load Combination	=	+D+S		Load Combination	=	+D+S	
Location of maximum on span	=	15.500ft		Location of maximum on span	=	14.201 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.080 in	Ratio = 2333	>=360		Span: 1 : S Only	
Max Upward Transient Deflection		-0.008 in	Ratio = 11701	>=360		Span: 2 : S Only	
Max Downward Total Deflection		0.201 in	Ratio = 926	>=180		Span: 1 : +D+S	
Max Upward Total Deflection		-0.023 in	Ratio = 4134	>=180		Span: 2 : +D+S	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+S	1	0.2008	7.101	+D+S	0.0000	0.000
	2	0.0000	7.101		-0.0232	2.860

Vertical Reactions

Load Combination	Support notation : Far left is #1			Values in KIPS
	Support 1	Support 2	Support 3	
Max Upward from all Load Conditions	6.745	16.269	0.603	
Max Upward from Load Combinations	6.745	16.269	0.603	
Max Upward from Load Cases	4.038	9.380	0.509	
D Only	4.038	9.380	0.094	
+D+Lr	6.210	14.907	0.503	
+D+S	6.745	16.269	0.603	

R10

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: <R7>**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
+D+0.750Lr	5.667	13.526	0.401
+D+0.750S	6.069	14.547	0.476
+0.60D	2.423	5.628	0.057
Lr Only	2.172	5.527	0.408
S Only	2.707	6.889	0.509

R11

Wood Beam

Lic. #: KW-06010224

File: examples.ec6
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D.S. ENGINEERING PC

DESCRIPTION: beam <R8>

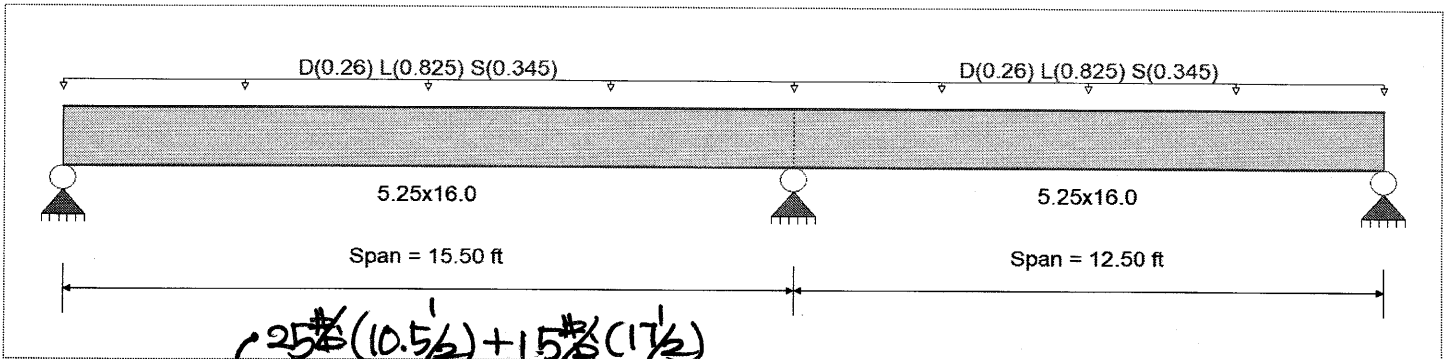
CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2900 psi	E : Modulus of Elasticity	
Load Combination IBC 2018	Fb -	2900 psi	Ebend-xx	2200 ksi
	Fc - Prll	2900 psi	Eminbend-xx	1118.19 ksi
Wood Species : iLevel Truss Joist	Fc - Perp	750 psi		
Wood Grade : Parallam PSL 2.2E	Fv	290 psi		
	Ft	2025 psi	Density	45.07 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 loads.

Load for Span Number 1

Uniform Load : D = 0.260, L = 0.8250, S = 0.3450, Tributary Width = 1.0 ft

Load for Span Number 2

Uniform Load : D = 0.260, L = 0.8250, S = 0.3450, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.537 : 1	Maximum Shear Stress Ratio	=	0.553 : 1
Section used for this span		5.25x16.0	Section used for this span		5.25x16.0
fb: Actual	=	1,508.80 psi	fv: Actual	=	160.47 psi
Fb: Allowable	=	2,808.86 psi	Fv: Allowable	=	290.00 psi
Load Combination		+D+L	Load Combination		+D+L
Location of maximum on span	=	15.500ft	Location of maximum on span	=	14.201 ft
Span # where maximum occurs	=	Span # 1	Span # where maximum occurs	=	Span # 1
Maximum Deflection					
Max Downward Transient Deflection		0.138 in Ratio = 1345 >=360			
Max Upward Transient Deflection		-0.005 in Ratio = 29676 >=360			
Max Downward Total Deflection		0.195 in Ratio = 953 >=240			
Max Upward Total Deflection		-0.007 in Ratio = 21037 >=240			

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.1951	6.841		0.0000	0.000
+D+0.750L+0.750S	2	0.0412	7.891	+D+0.750L+0.750S	-0.0071	1.187

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
Overall MAXimum	7.116	20.556	4.914
Overall MINimum	2.110	6.094	1.457
+1.40D	2.451	7.079	1.692
+D+L	6.795	19.628	4.692
+D+Lr	1.751	5.057	1.209
+D+S	3.860	11.150	2.666

R12

Wood Beam

File: examples.ec6

Lic. #: KW-06010224

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D.S. ENGINEERING PC

DESCRIPTION: beam <R8>

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	Support 3
+D+0.750Lr+0.750L	5.534	15.985	3.822
+D+0.750L+0.750S	7.116	20.556	4.914
D Only	1.751	5.057	1.209
+0.60D	1.050	3.034	0.725
L Only	5.045	14.572	3.484
S Only	2.110	6.094	1.457

R13

Wood Column

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: under <R8>

Code References

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

Load Combinations Used : IBC 2018

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 Allow Stress Modification Factors
Wood Grade	No.2			Exact Depth	5.50 in Cf or Cv for Bending 1.0
Fb +	750 psi	Fv	170 psi	Area	30.250 in ² Cf or Cv for Compression 1.0
Fb -	750 psi	Ft	475 psi	Ix	76.255 in ⁴ Cf or Cv for Tension 1.0
Fc - Prll	700 psi	Density	31.21 pcf	Iy	76.255 in ⁴ Cm : Wet Use Factor 1.0
Fc - Perp	625 psi				Ct : Temperature Fact 1.0
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial		Cfu : Flat Use Factor 1.0
	Basic	1300	1300	1300 ksi	Kf : Built-up columns 1.0 <i>NDS 15.3.2</i>
	Minimum	470	470		Use Cr : Repetitive ? No

Brace condition for deflection (buckling) along columns :
 X-X (width) axis : Fully braced against buckling ABOUT Y-Y Axis
 Y-Y (depth) axis : Fully braced against buckling ABOUT X-X Axis

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 = 5.057, L = 14.572, S = 6.094 k

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio =	0.9301 : 1	Maximum SERVICE Lateral Load Reactions . .
Load Combination	+D+L	Top along Y-Y 0.0 k Bottom along Y-Y 0.0 k
Governing NDS Formula	Comp Only, fc/Fc'	Top along X-X 0.0 k Bottom along X-X 0.0 k
Location of max.above base	0.0 ft	Maximum SERVICE Load Lateral Deflections . . .
At maximum location values are .		Along Y-Y 0.0 in at 0.0 ft above base
Applied Axial	19.695 k	for load combination : n/a
Applied Mx	0.0 k-ft	Along X-X 0.0 in at 0.0 ft above base
Applied My	0.0 k-ft	for load combination : n/a
Fc : Allowable	700.0 psi	Other Factors used to calculate allowable stresses . . .
PASS Maximum Shear Stress Ratio =	0.0 : 1	<u>Bending</u> <u>Compression</u> <u>Tension</u>
Load Combination	+0.60D	
Location of max.above base	10.0 ft	
Applied Design Shear	0.0 psi	
Allowable Shear	272.0 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	1.000	0.2688	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+L	1.000	1.000	0.9301	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+S	1.150	1.000	0.4606	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L	1.250	1.000	0.6064	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L+0.750S	1.150	1.000	0.8469	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.60D	1.600	1.000	0.09072	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 @ Base	My - End Moments k-ft		Mx - End Moments k-ft	
	@ Base	@ Top	@ Base	@ Top		@ Base	@ Top	@ Base	@ Top
D Only					5.123				

R14

Wood Column

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

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DESCRIPTION: under <R8>

Maximum Reactions

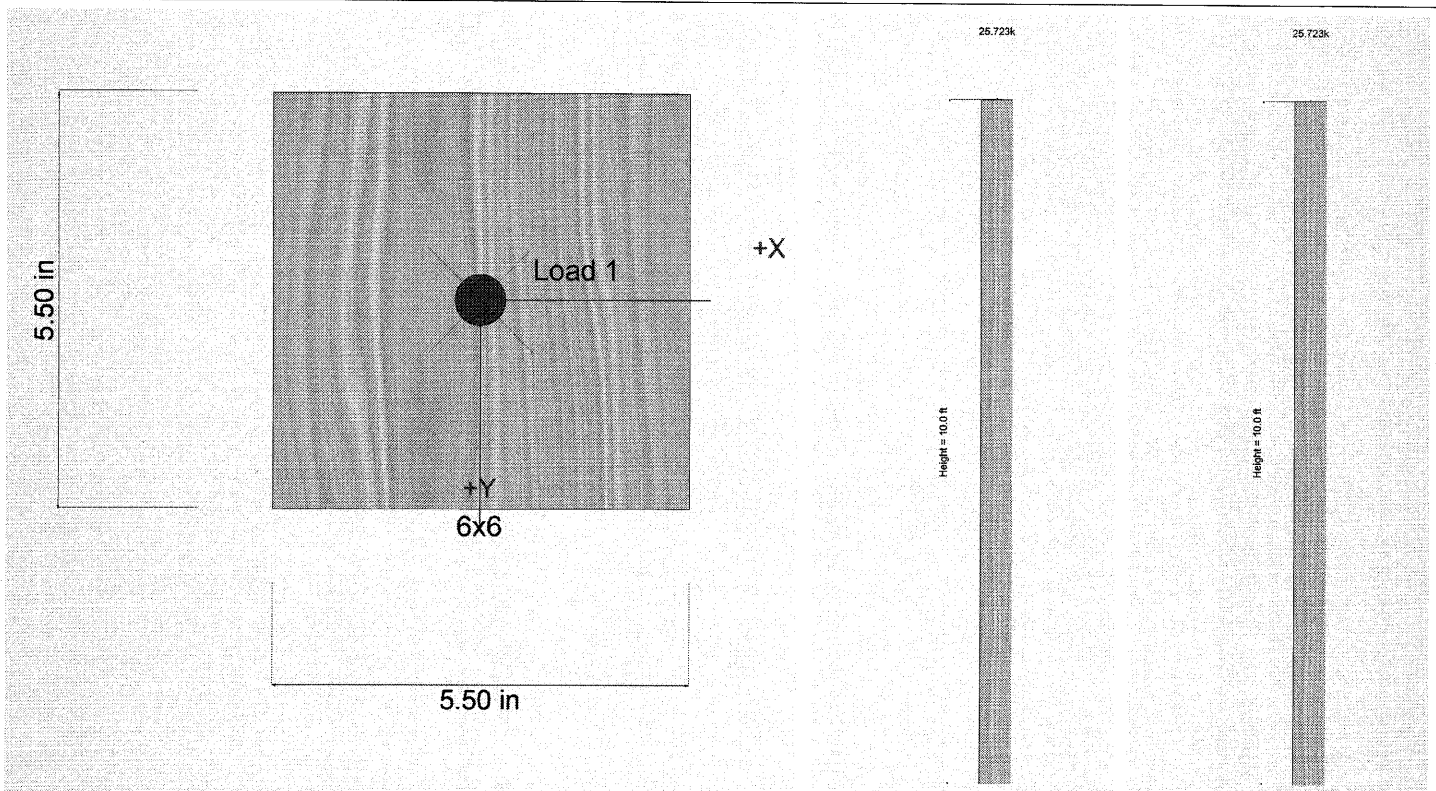
Note: Only non-zero reactions are listed.

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						19.695				
+D+S						11.217				
+D+0.750L						16.052				
+D+0.750L+0.750S						20.622				
+0.60D						3.074				
L Only						14.572				
S Only						6.094				

Maximum Deflections for Load Combinations

Load Combination	Max. X-X Deflection	Distance	Max. Y-Y Deflection	Distance
D Only	0.0000 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	0.000 ft
+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



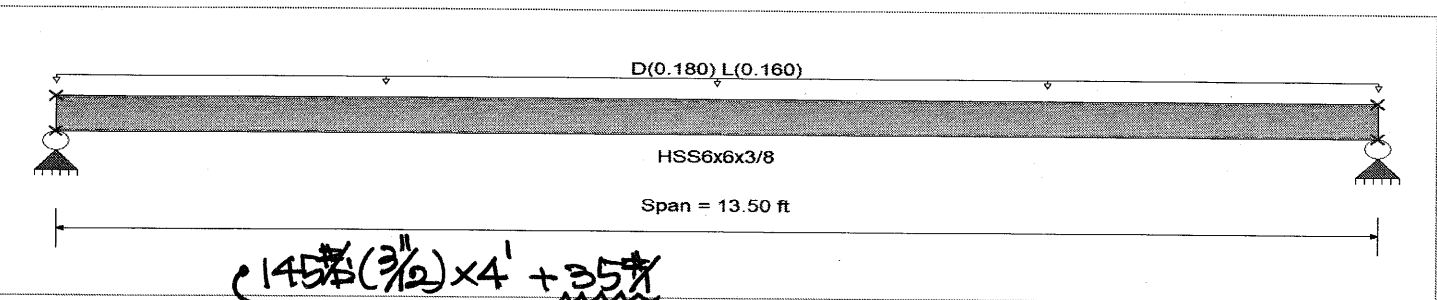
R 15

CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Strength Design Fy : Steel Yield : 46.0 ksi
 Beam Bracing : Completely Unbraced E: Modulus : 29,000.0 ksi
 Bending Axis : Major Axis Bending



Applied Loads

Beam self weight calculated and added to loading Some loads entered. Load Factors will be applied for calculations.
 Uniform Load : D = 0.180, L = 0.160 k/ft, Tributary Width = 1.0 ft, (3" max. concrete tread)

DESIGN SUMMARY

		Design OK	
Maximum Bending Stress Ratio =	0.231 : 1	Maximum Shear Stress Ratio =	0.043 : 1
Section used for this span	HSS6x6x3/8	Section used for this span	HSS6x6x3/8
Ma : Applied	8.372 k-ft	Va : Applied	2.480 k
Mn / Omega : Allowable	36.267 k-ft	Vn/Omega : Allowable	57.137 k
Load Combination	+D+L	Load Combination	+D+L
Span # where maximum occurs	Span # 1	Location of maximum on span	0.000 ft
		Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.105 in Ratio = 1,544	>=360	
Max Upward Transient Deflection	0.000 in Ratio = 0	<360	Span: 1 : L Only
Max Downward Total Deflection	0.241 in Ratio = 673	>=180	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in Ratio = 0	<180	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.2408	6.789		0.0000	0.000

Vertical Reactions

Load Combination	Support notation : Far left is #		Values in KIPS
	Support 1	Support 2	
Max Upward from all Load Conditions	2.480	2.480	
Max Upward from Load Combinations	2.480	2.480	
Max Upward from Load Cases	1.400	1.400	
D Only	1.400	1.400	
+D+L	2.480	2.480	
+D+0.750L	2.210	2.210	
+0.60D	0.840	0.840	
L Only	1.080	1.080	

Steel Beam

Project File: ENERCALC_20

LIC# : KW-06015335, Build:20.22.12.28

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DESCRIPTION: stair (outside)**Steel Section Properties : HSS6x6x3/8**

Depth	=	6.000 in	I xx	=	39.50 in ⁴	J	=	64.600 in ⁴
			S xx	=	13.20 in ³			
Width	=	6.000 in	R xx	=	2.280 in			
Wall Thick	=	0.349 in	Zx	=	15.800 in ³			
Area	=	7.580 in ²	I yy	=	39.500 in ⁴	C	=	0.000 in ³
Weight	=	27.480 plf	S yy	=	13.200 in ³			
			R yy	=	2.280 in			
Ycg	=	3.000 in						

R17

Wood Beam

Project File: ENERCALC_20

LIC#: KVV-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: 2nd floor <B1>

CODE REFERENCES

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

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design

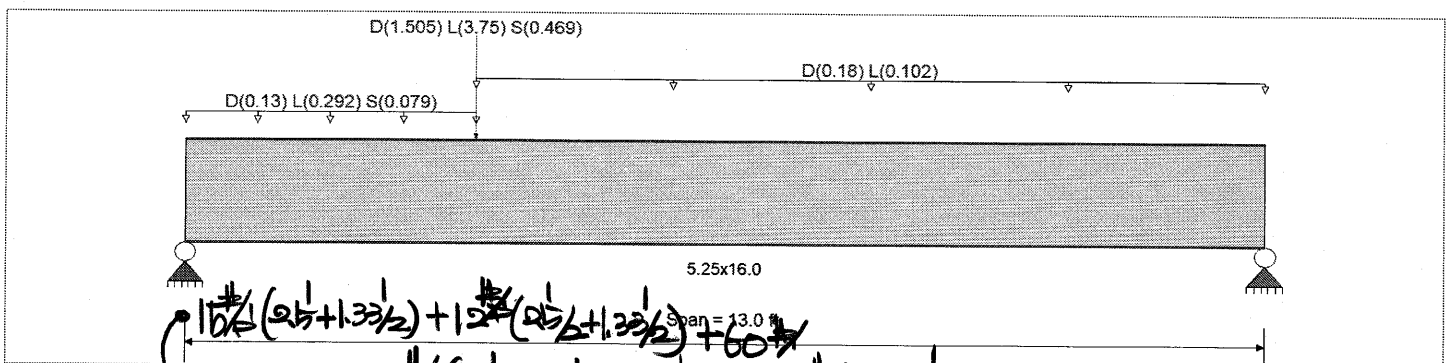
Load Combination : IBC 2018

Wood Species : iLevel Truss Joist

Wood Grade : Parallam PSL 2.0E

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

Fb +	2900 psi	E : Modulus of Elasticity	
Fb -	2900 psi	Ebend- xx	2000ksi
Fc - Prll	2900 psi	Eminbend - xx	1016.535ksi
Fc - Perp	750 psi		
Fv	290 psi		
Ft	2025 psi	Density	45.07 pcf



Applied Loads

Beam self weight NOT internally calculated and added

Load for Span Number 1

Uniform Load : D = 0.130, L = 0.2920, S = 0.0790 k/ft, Extent = 0.0 -->> 3.50 ft, Tributary Width = 1.0 ft

Point Load : D = 1.505, L = 3.750, S = 0.4690 k @ 3.50 ft, (from <R5>)

Uniform Load : D = 0.180, L = 0.1020 k/ft, Extent = 3.50 -->> 13.0 ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Maximum Bending Stress Ratio	=	0.358	1	Maximum Shear Stress Ratio	=	0.341	: 1
Section used for this span		5.25x16.0		Section used for this span		5.25x16.0	
fb: Actual	=	1,004.39	psi	fv: Actual	=	98.87	psi
F'b	=	2,808.86	psi	F'v	=	290.00	psi
Load Combination	=	+D+L		Load Combination	=	+D+L	
Location of maximum on span	=	3.511	ft	Location of maximum on span	=	0.000	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.086	in	Ratio =	1821	>=360	Span: 1 : L Only
Max Upward Transient Deflection		0	in	Ratio =	0	<360	n/a
Max Downward Total Deflection		0.141	in	Ratio =	1105	>=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	0.1411	6.073		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	6.097	3.314
Max Upward from Load Combinations	6.097	3.314
Max Upward from Load Cases	3.979	1.762
D Only	2.118	1.552
+D+L	6.097	3.314
+D+Lr	2.118	1.552
+D+S	2.700	1.715

FL 2

Wood Beam

Project File: ENERCALC_20

LIC# : KW-06015335, Build:20.22.12.28

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DESCRIPTION: 2nd floor <B1>**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+0.750Lr+0.750L	5.103	2.873
+D+0.750L+0.750S	5.539	2.996
+0.60D	1.271	0.931
L Only	3.979	1.762
S Only	0.582	0.163

FL3

Wood Beam

Project File: ENERCALC_20

LIC#: KVV-06015335, Build:20.22.12.28

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DESCRIPTION: 2nd floor <B2>

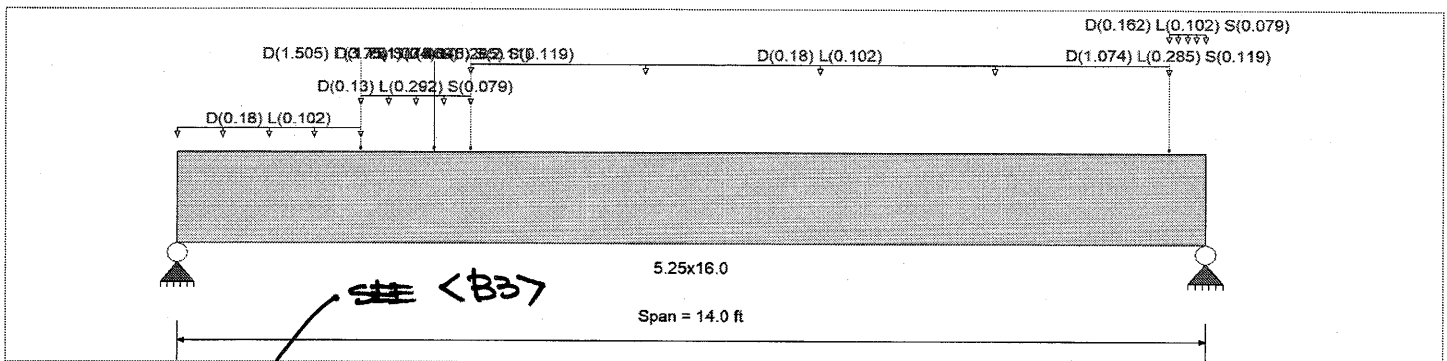
CODE REFERENCES

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

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2900 psi	E : Modulus of Elasticity	
Load Combination : IBC 2018	Fb -	2900 psi	Ebend- xx	2000 ksi
	Fc - Prll	2900 psi	Eminbend - xx	1016.535 ksi
Wood Species : iLevel Truss Joist	Fc - Perp	750 psi		
Wood Grade : Parallam PSL 2.0E	Fv	290 psi		
	Ft	2025 psi	Density	45.07 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

Load for Span Number 1

- Uniform Load : D = 0.180, L = 0.1020 k/ft, Extent = 0.0 --> 2.50 ft, Tributary Width = 1.0 ft, (folding window)
- Uniform Load : D = 0.130, L = 0.2920, S = 0.0790 k/ft, Extent = 2.50 --> 4.0 ft, Tributary Width = 1.0 ft
- Uniform Load : D = 0.180, L = 0.1020 k/ft, Extent = 4.0 --> 13.50 ft, Tributary Width = 1.0 ft, (folding window)
- Uniform Load : D = 0.1620, L = 0.1020, S = 0.0790 k/ft, Extent = 13.50 --> 14.0 ft, Tributary Width = 1.0 ft
- Point Load : D = 1.505, L = 3.750, S = 0.4690 k @ 2.50 ft, (from <R5>)
- Point Load : D = 1.751, L = 5.045, S = 2.110 k @ 3.50 ft, (from <R8>)
- Point Load : D = 1.074, L = 0.2850, S = 0.1190 k @ 4.0 ft, (from <R4>)
- Point Load : D = 1.074, L = 0.2850, S = 0.1190 k @ 13.50 ft, (from <R4>)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.713	1	Maximum Shear Stress Ratio	=	0.760	: 1
Section used for this span		5.25x16.0		Section used for this span		5.25x16.0	
fb: Actual	=	2,003.85	psi	fv: Actual	=	220.40	psi
F'b	=	2,808.86	psi	F'v	=	290.00	psi
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	3.526	ft	Location of maximum on span	=	0.000	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.189	in	Ratio =	889	>=360	Span: 1 : L Only
Max Upward Transient Deflection		0	in	Ratio =	0	<360	n/a
Max Downward Total Deflection		0.319	in	Ratio =	526	>=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	0.3188	6.387		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	12.752	6.534
Max Upward from Load Combinations	12.752	6.534

FL4

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

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DESCRIPTION: 2nd floor <B2>**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from Load Cases	8.011	3.467
D Only	4.741	3.467
+D+L	12.752	6.534
+D+Lr	4.741	3.467
+D+S	6.890	4.293
+D+0.750Lr+0.750L	10.749	5.767
+D+0.750L+0.750S	12.361	6.387
+0.60D	2.845	2.080
L Only	8.011	3.067
S Only	2.149	0.826

FL5

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build: 20.22.12.28

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DESCRIPTION: 2nd floor <B3>

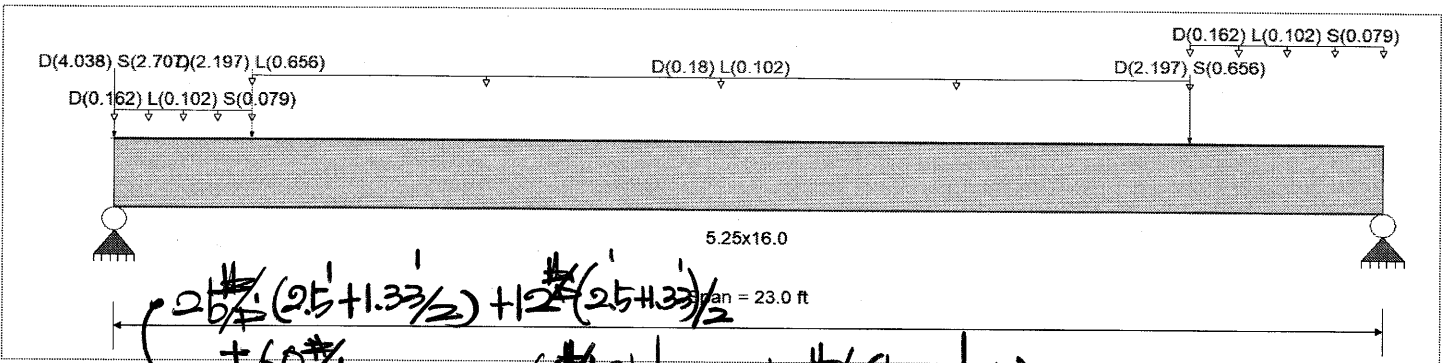
CODE REFERENCES

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

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design	Fb +	2900 psi	E : Modulus of Elasticity
Load Combination : IBC 2018	Fb -	2900 psi	Ebend- xx
	Fc - Prll	2900 psi	2000ksi
	Fc - Perp	750 psi	Eminbend - xx
Wood Species : iLevel Truss Joist	Fv	290 psi	1016.535ksi
Wood Grade : Parallam PSL 2.0E	Ft	2025 psi	
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling	Density		45.07 pcf



Applied Loads

Beam self weight NOT internally calculated and added

- Point Load : D = 4.038, S = 2.707 k @ 0.0 ft, (from <B7>)
- Uniform Load : D = 0.1620, L = 0.1020, S = 0.0790 k/ft, Extent = 0.0 --> 2.50 ft, Tributary Width = 1.0 ft
- Point Load : D = 2.197, L = 0.6560 k @ 2.50 ft, (from <R6>)
- Uniform Load : D = 0.180, L = 0.1020 k/ft, Extent = 2.50 --> 19.50 ft, Tributary Width = 1.0 ft, (folding window)
- Point Load : D = 2.197, S = 0.6560 k @ 19.50 ft, (from <R6>)
- Uniform Load : D = 0.1620, L = 0.1020, S = 0.0790 k/ft, Extent = 19.50 --> 23.0 ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

				Design OK			
Maximum Bending Stress Ratio	=	0.495	1	Maximum Shear Stress Ratio	=	0.353	1
Section used for this span	=	5.25x16.0		Section used for this span	=	5.25x16.0	
fb: Actual	=	1,391.56psi		fv: Actual	=	102.51 psi	
F'b	=	2,808.86psi		F'v	=	290.00 psi	
Load Combination	=	+D+L		Load Combination	=	+D+L	
Location of maximum on span	=	11.584ft		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		0.206 in	Ratio = 1338	>=360	Span: 1 : L Only		
Max Upward Transient Deflection		0 in	Ratio = 0	<360	n/a		
Max Downward Total Deflection		0.728 in	Ratio = 379	>=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	0.7279	11.584		0.0000	0.000

Vertical Reactions

Load Combination	Support notation : Far left is #1		Values in KIPS	
	Support 1	Support 2		
Max Upward from all Load Conditions	11.932	5.661		
Max Upward from Load Combinations	11.932	5.661		
Max Upward from Load Cases	8.353	4.111		
D Only	8.353	4.111		
+D+L	10.111	5.355		

FL6

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

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DESCRIPTION: 2nd floor <B3>**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+D+Lr	8.353	4.111
+D+S	11.368	4.933
+D+0.750Lr+0.750L	9.671	5.044
+D+0.750Lr+0.750S	11.932	5.661
+0.60D	5.012	2.466
L Only	1.758	1.244
S Only	3.015	0.822

FL7

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

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DESCRIPTION: header (south wall @ 2nd floor)



CODE REFERENCES

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

Load Combination Set : IBC 2018

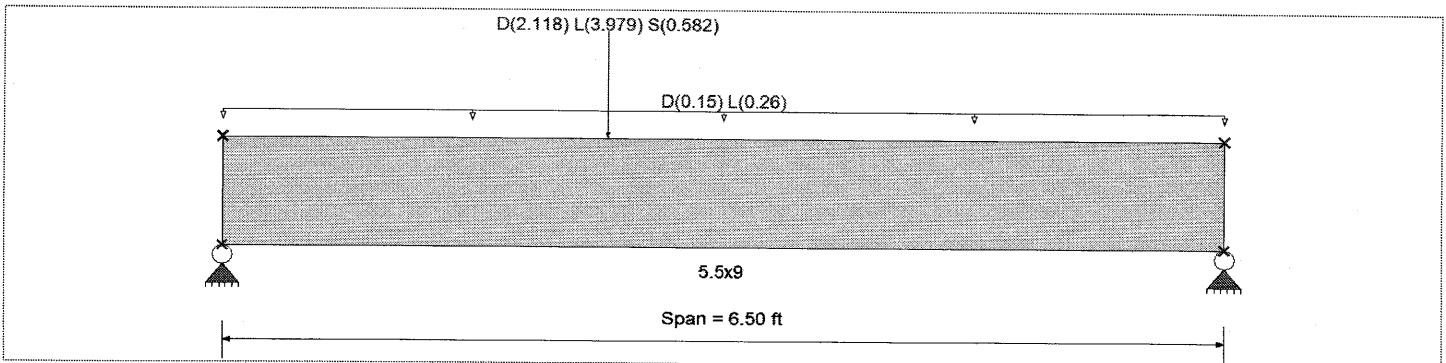
Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2018

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

Beam Bracing : Completely Unbraced

Fb +	2400 psi	E : Modulus of Elasticity	
Fb -	1850 psi	Ebend- xx	1800 ksi
Fc - Prll	1650 psi	Eminbend - xx	950 ksi
Fc - Perp	650 psi	Ebend- yy	1600 ksi
Fv	265 psi	Eminbend - yy	850 ksi
Ft	1100 psi	Density	31.21 pcf



Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.150, L = 0.260, Tributary Width = 1.0 ft

Point Load : D = 2.118, L = 3.979, S = 0.5820 k @ 2.50 ft, (from <B1>)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.775	1	Maximum Shear Stress Ratio	=	0.550	: 1
Section used for this span		5.5x9		Section used for this span		5.5x9	
fb: Actual	=	1,851.15	psi	fv: Actual	=	145.76	psi
F'b	=	2,387.32	psi	F'v	=	265.00	psi
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	2.515	ft	Location of maximum on span	=	0.000	ft
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.079	in	Ratio =	991	>=360	Span: 1 : L Only
Max Upward Transient Deflection		0	in	Ratio =	0	<360	n/a
Max Downward Total Deflection		0.122	in	Ratio =	639	>=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	0.1221	3.084		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	5.119	3.712
Max Upward from Load Combinations	5.119	3.712
Max Upward from Load Cases	3.294	2.375
D Only	1.826	1.337
+D+L	5.119	3.712
+D+Lr	1.826	1.337
+D+S	2.184	1.561
+D+0.750Lr+0.750L	4.296	3.119
+D+0.750L+0.750S	4.565	3.286

FL8

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

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DESCRIPTION: header (south wall @ 2nd floor)



Support notation : Far left is #1

Values in KIPS

Vertical Reactions

Load Combination	Support 1	Support 2
+0.60D	1.095	0.802
L Only	3.294	2.375
S Only	0.358	0.224

FL9

Wood Column

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: under <R7>, <B2>, <B3>

Code References

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

Load Combinations Used : IBC 2018

General Information

Analysis Method	Allowable Stress Design	Wood Section Name	4-2x6
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>		Exact Width	6.0 in
Wood Species	Douglas Fir-Larch	Exact Depth	5.50 in
Wood Grade	No.2	Area	33.0 in ²
Fb +	750 psi	Fv	170 psi
Fb -	750 psi	Ft	475 psi
Fc - Prll	700 psi	Density	31.21 pcf
Fc - Perp	625 psi	lx	83.188 in ⁴
E : Modulus of Elasticity . . .	x-x Bending	y-y Bending	Axial
	Basic	1300	1300
	Minimum	470	470
			1300 ksi
			Brace condition for deflection (buckling) along columns :
			X-X (width) axis : Fully braced against buckling ABOUT Y-Y Axis
			Y-Y (depth) axis : Fully braced against buckling ABOUT X-X Axis

(ALT. 6x8)

Applied Loads

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

Column self weight included : 71.523 lbs * Dead Load Factor

AXIAL LOADS . . .

Axial Load at 10.0 ft, D = 15.858, L = 4.825, S = 6.548 k

<B2>	3467	3067	826
<B3>	8353	1758	3015
<R7>	4038	Ø	2707
	15858	4825	6548

DESIGN SUMMARY

Bending & Shear Check Results

PASS Max. Axial+Bending Stress Ratio = **0.8370 : 1**
 Load Combination +D+0.750L+0.750S
 Governing NDS Formula Comp Only, fc/Fc'
 Location of max.above base 0.0 ft
 At maximum location values are .
 Applied Axial 24.459 k
 Applied Mx 0.0 k-ft
 Applied My 0.0 k-ft
 Fc : Allowable 885.50 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

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 272.0 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	1.000	0.6966	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+L	1.000	1.000	0.8168	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+S	1.150	1.000	0.7692	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L	1.250	1.000	0.6155	PASS	0.0 ft	0.0	PASS	10.0 ft
+D+0.750L+0.750S	1.150	1.000	0.8370	PASS	0.0 ft	0.0	PASS	10.0 ft
+0.60D	1.600	1.000	0.2351	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		Axial Reaction	My - End Moments		k-ft		Mx - End Moments	
	@ Base	@ Top		@ Base	@ Top		@ Base	@ Top	@ Base	@ Top		
D Only												

15.930

FL10

Wood Column

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: under <R7>, <B2>, <B3>

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						20.755				
+D+S						22.478				
+D+0.750L						19.548				
+D+0.750L+0.750S						24.459				
+0.60D						9.558				
L Only						4.825				
S Only						6.548				

$$A_{req} = (24.459k + 6.031k) / 3$$

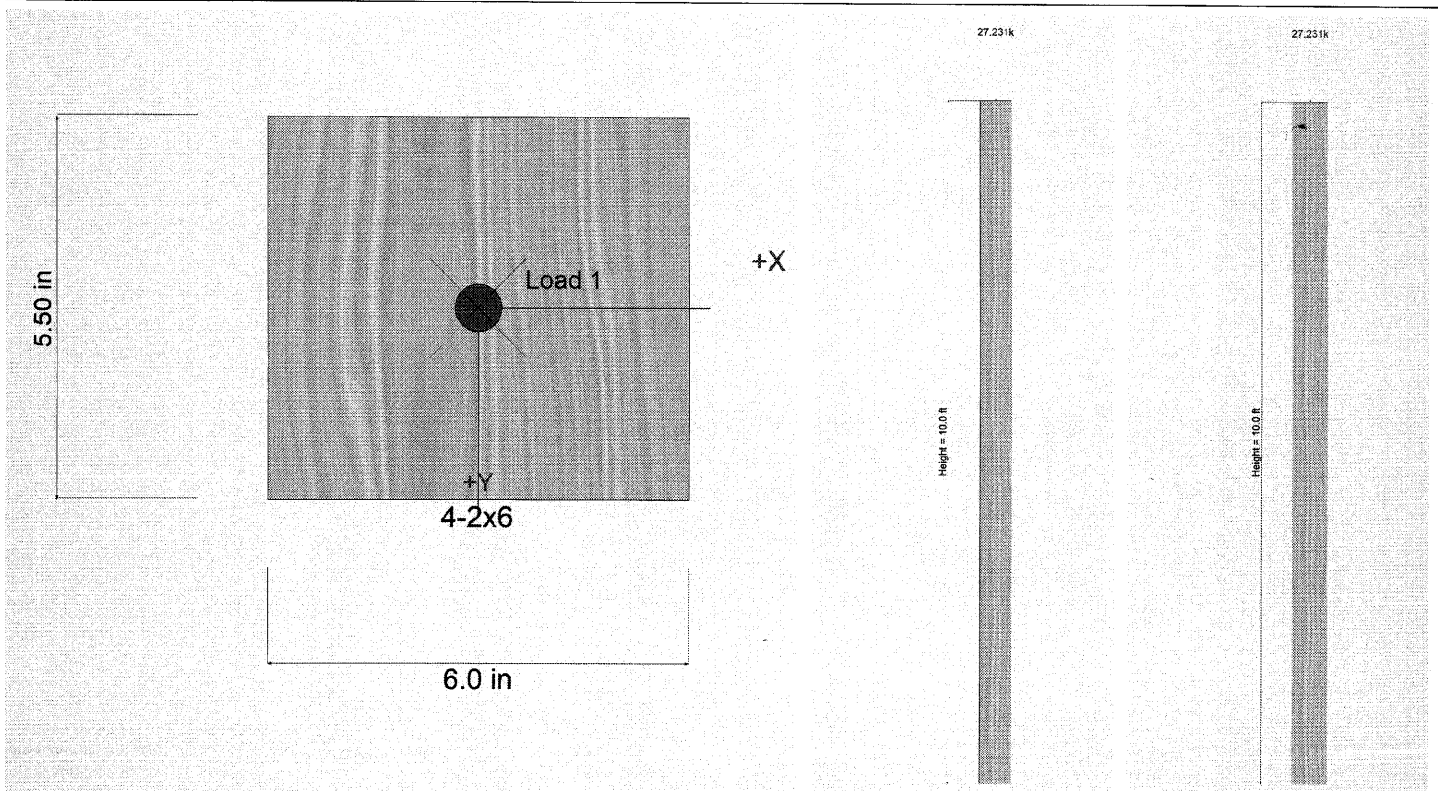
$$= 10.2 D'$$

<F3.5>

Maximum Deflections for Load Combinations

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

Sketches



FL11

Wood Beam

Lic. # : KW-06010224

File: examples.ec6
 Software copyright ENERCALC, INC. 1983-2020, Build: 12.20.8.24
 D.S. ENGINEERING PC

DESCRIPTION: beam <F3> update

CODE REFERENCES

Calculations per NDS 2015, IBC 2015, CBC 2016, ASCE 7-10

Load Combination Set : IBC 2018

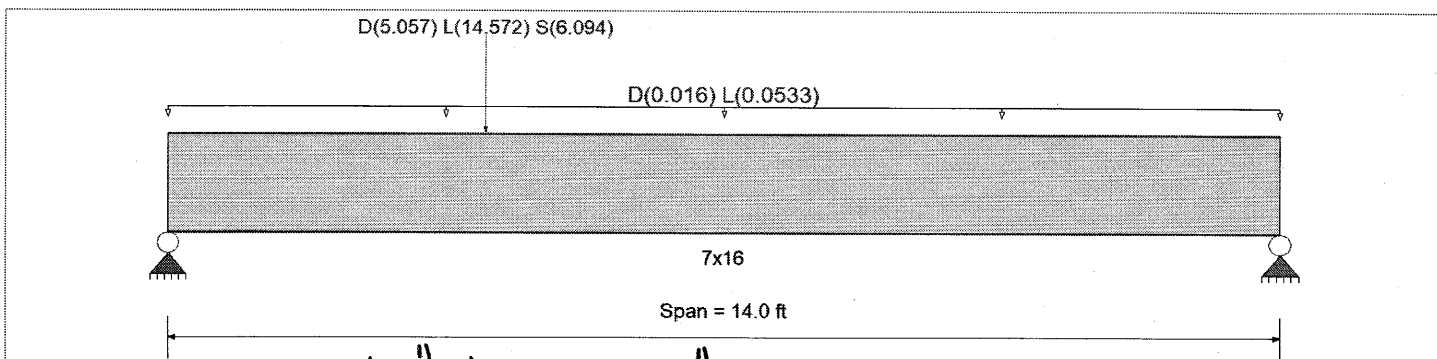
Material Properties

Analysis Method : Allowable Stress Design
 Load Combination IBC 2018

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

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

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



Applied Loads

Beam self weight calculated and added to loads

Uniform Load : D = 0.0160, L = 0.05330, Tributary Width = 1.0 ft
 Point Load : D = 5.057, L = 14.572, S = 6.094 k @ 4.0 ft, (from <R8>)

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

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio	=	0.829	1	Maximum Shear Stress Ratio	=	0.675	1
Section used for this span		7x16		Section used for this span		7x16	
fb: Actual	=	2,329.42 psi		fv: Actual	=	195.70 psi	
Fb: Allowable	=	2,808.86 psi		Fv: Allowable	=	290.00 psi	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	4.036 ft		Location of maximum on span	=	0.000 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.222 in	Ratio =	756	>=	360	
Max Upward Transient Deflection		0.000 in	Ratio =	0	<	360	
Max Downward Total Deflection		0.316 in	Ratio =	531	>=	240	
Max Upward Total Deflection		0.000 in	Ratio =	0	<	240	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+0.750L+0.750S	1	0.3159	6.336		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
Overall MAXimum	15.320	6.510
Overall MINimum	4.353	1.741
+1.40D	5.557	2.523
+D+L	14.751	6.339
+D+Lr	3.970	1.802
+D+S	8.322	3.543
+D+0.750Lr+0.750L	12.056	5.205
+D+0.750L+0.750S	15.320	6.510
D Only	3.970	1.802

FL12

Wood Beam

File: examples.ec6

Software copyright ENERCALC, INC. 1983-2020, Build:12.20.8.24

Lic. # : KW-06010224

D.S. ENGINEERING PC

DESCRIPTION: beam <F3> update

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+0.60D	2.382	1.081
L Only	10.782	4.537
S Only	4.353	1.741

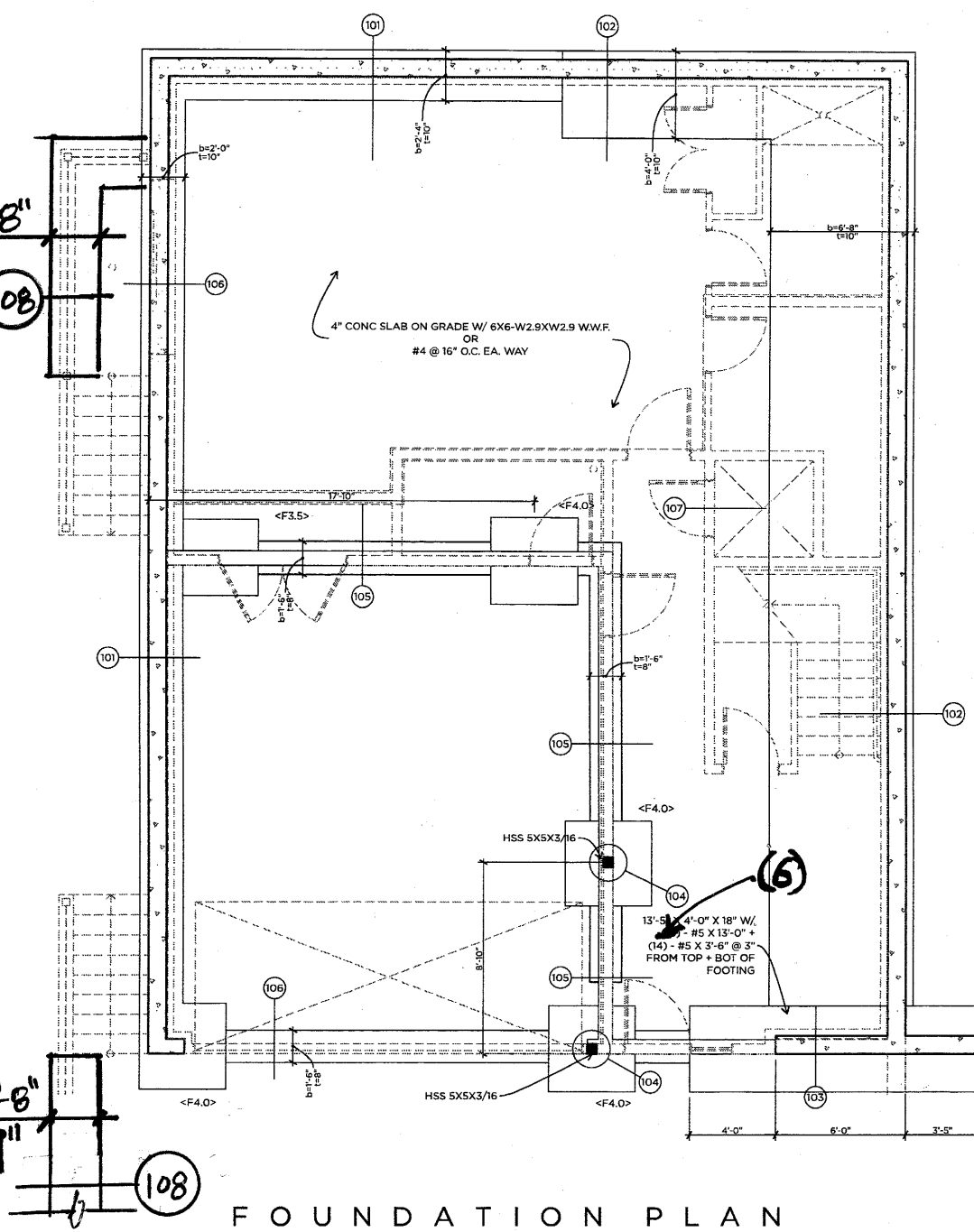
FL13

b=2'-8"
t=9"

108

b=2'-8"
t=9"

108



FOUNDATION PLAN

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

FL15

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: header <F17> update

CODE REFERENCES

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

Load Combination Set : IBC 2018

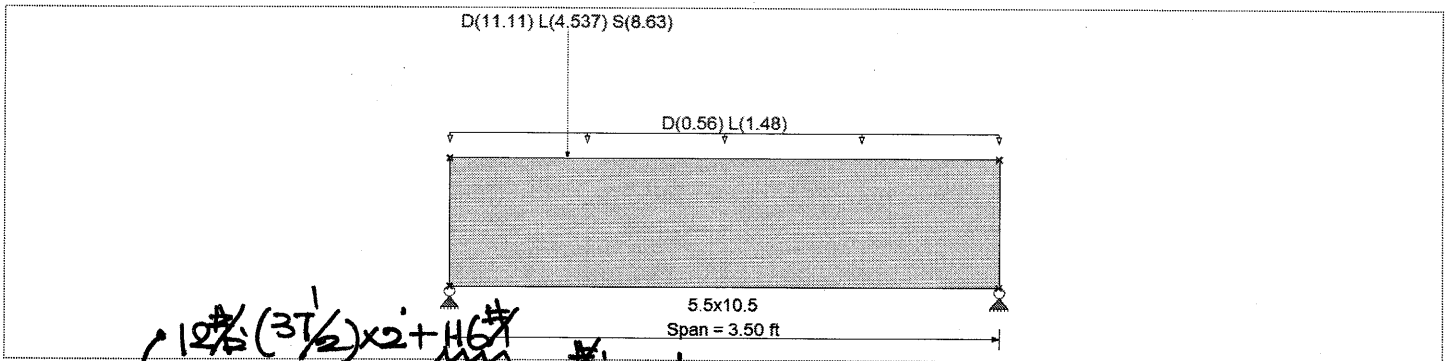
Material Properties

Analysis Method : Allowable Stress Design
Load Combination : IBC 2018

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

Beam Bracing : Completely Unbraced

Fb +	2400 psi	E : Modulus of Elasticity	
Fb -	1850 psi	Ebend- xx	1800ksi
Fc - Prll	1650 psi	Eminbend - xx	950ksi
Fc - Perp	650 psi	Ebend- yy	1600ksi
Fv	265 psi	Eminbend - yy	850ksi
Ft	1100 psi	Density	31.21 pcf



Applied Loads

Beam self weight calculated and added to loading

Uniform Load : D = 0.560, L = 1.480, Tributary Width = 1.0 ft

Point Load : D = 11.110, L = 4.537, S = 8.630 k @ 0.750 ft, (from <F3> & <R7>)

DESIGN SUMMARY

				Design OK			
Maximum Bending Stress Ratio	=	0.609	1	Maximum Shear Stress Ratio	=	0.510	1
Section used for this span		5.5x10.5		Section used for this span		5.5x10.5	
fb: Actual	=	1,673.16 psi		fv: Actual	=	155.32 psi	
F'b	=	2,749.27 psi		Fv	=	304.75 psi	
Load Combination		+D+0.750L+0.750S		Load Combination		+D+0.750L+0.750S	
Location of maximum on span	=	0.754 ft		Location of maximum on span	=	2.631 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.010 in	Ratio = 4304	>=360	Span: 1 : L Only		
Max Upward Transient Deflection		0 in	Ratio = 0	<360	n/a		
Max Downward Total Deflection		0.027 in	Ratio = 1561	>=180	Span: 1 : +D+0.750L+0.750S		
Max Upward Total Deflection		0 in	Ratio = 0	<180	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	0.0269	1.584		0.0000	0.000

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2	DL	LL	SL
Max Upward from all Load Conditions	19.433	7.441			
Max Upward from Load Combinations	19.433	7.441			
Max Upward from Load Cases	9.731	3.562			
D Only	9.731	3.383			
+D+L	15.886	6.945	<F3>	1802#	4537#
+D+Lr	9.731	3.383	<R7>	9308#	0
+D+S	16.512	5.232			1741#
+D+0.750Lr+0.750L	14.347	6.054			6889#
+D+0.750L+0.750S	19.433	7.441			

FL 16

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: header <F17> update**Vertical Reactions**

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
+0.60D	5.839	2.030
L Only	6.155	3.562
S Only	6.781	1.849

FL17

Steel Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build: 20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: update beam (F18)

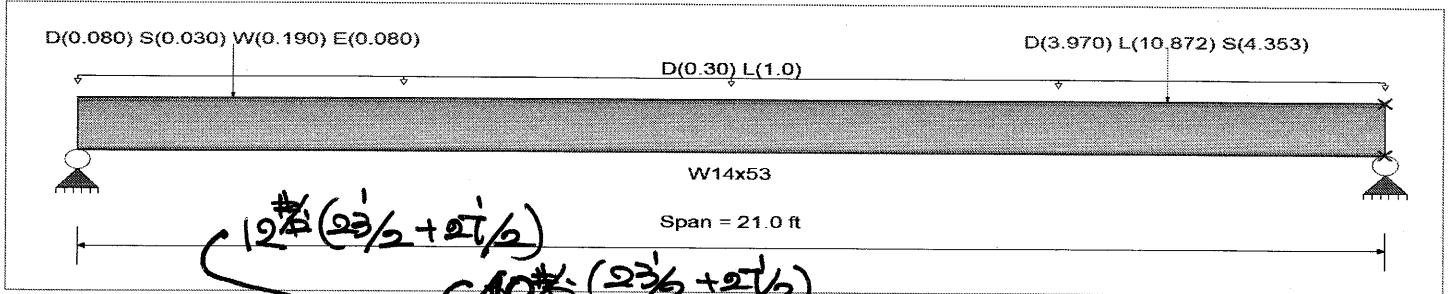
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loading
Uniform Load : D = 0.30, L = 1.0 k/ft, Tributary Width = 1.0 ft

Point Load : D = 0.080, S = 0.030, W = 0.190, E = 0.080 k @ 2.50 ft, (from <B1> & <B2>)

Point Load : D = 3.970, L = 10.872, S = 4.353 k @ 17.50 ft, (from <F3>)

DESIGN SUMMARY

Design OK

Maximum Bending Stress Ratio =	0.474 : 1	Maximum Shear Stress Ratio =	0.258 : 1
Section used for this span	W14x53	Section used for this span	W14x53
Ma : Applied	102.901 k-ft	Va : Applied	26.584 k
Mn / Omega : Allowable	217.315 k-ft	Vn/Omega : Allowable	102.860 k
Load Combination	+D+L	Load Combination	+D+L
Span # where maximum occurs	Span # 1	Location of maximum on span	21.000 ft
Span # where maximum occurs	Span # 1	Span # where maximum occurs	Span # 1
Maximum Deflection			
Max Downward Transient Deflection	0.392 in Ratio = 642	>=360	
Max Upward Transient Deflection	0.000 in Ratio = 0	<360	Span: 1 : L Only
Max Downward Total Deflection	0.533 in Ratio = 473	>=180	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in Ratio = 0	<180	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.5330	10.920		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	16.751	26.584
Max Upward from Load Combinations	16.751	26.584
Max Upward from Load Cases	12.312	19.560
D Only	4.439	7.024
+D+L	16.751	26.584
+D+S	5.191	10.655
+D+0.750L	13.673	21.694
+D+0.750L+0.750S	14.237	24.418
+D+0.60W	4.539	7.038
+D+0.70E	4.488	7.031
+D+0.750L+0.450W	13.748	21.705
+D+0.750L+0.750S+0.450W	14.312	24.428
+D+0.750L+0.750S+0.5250E	14.274	24.423
+0.60D+0.60W	2.764	4.228

Handwritten calculations:
 $P = 26.584^k + 9.254^k$
 $= 35.84^k$
 $35.84^k / 3 = 11.95^k < F4.0$
W14x22
F18

Steel Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: update beam (F18)**Vertical Reactions**

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
+0.60D+0.70E	2.713	4.221
L Only	12.312	19.560
S Only	0.752	3.631
W Only	0.167	0.023
E Only	0.070	0.010

Steel Section Properties : W14x53

Depth	=	13.900 in	I xx	=	541.00 in ⁴	J	=	1.940 in ⁴
Web Thick	=	0.370 in	S xx	=	77.80 in ³	Cw	=	2,540.00 in ⁶
Flange Width	=	8.060 in	R xx	=	5.890 in			
Flange Thick	=	0.660 in	Zx	=	87.100 in ³			
Area	=	15.600 in ²	I yy	=	57.700 in ⁴			
Weight	=	53.000 plf	S yy	=	14.300 in ³	Wno	=	26.700 in ²
Kdesign	=	1.250 in	R yy	=	1.920 in	Sw	=	35.500 in ⁴
K1	=	1.000 in	Zy	=	22.000 in ³	Qf	=	16.800 in ³
rts	=	2.220 in				Qw	=	42.500 in ³
Ycg	=	6.950 in						

FL19

Steel Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: beam

<F21>

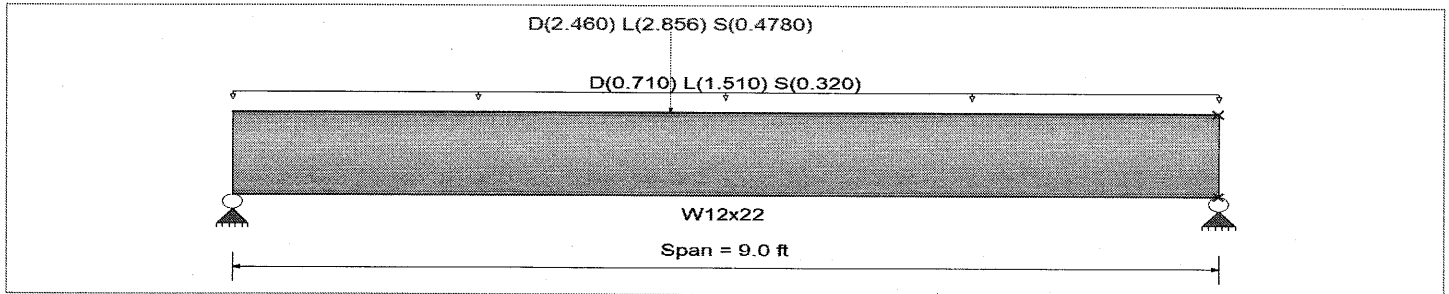
CODE REFERENCES

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
Load Combination Set : IBC 2018

Material Properties

Analysis Method Allowable Strength Design
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling
Bending Axis : Major Axis Bending

Fy : Steel Yield : 50.0 ksi
E : Modulus : 29,000.0 ksi



Applied Loads

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

Beam self weight calculated and added to loading

Uniform Load : D = 0.710, L = 1.510, S = 0.320 k/ft, Tributary Width = 1.0 ft, (from 1.75x16 LVL joist (see <F20>))

Point Load : D = 2.460, L = 2.856, S = 0.4780 k @ 4.0 ft, (from <F11>)

DESIGN SUMMARY

(SEE ORIGINAL CALC ENT # 1-16)

Design OK

Maximum Bending Stress Ratio =	0.468 : 1	Maximum Shear Stress Ratio =	0.204 : 1
Section used for this span	W12x22	Section used for this span	W12x22
Ma : Applied	34.219 k-ft	Va : Applied	13.042 k
Mn / Omega : Allowable	73.104 k-ft	Vn/Omega : Allowable	63.960 k
Load Combination	+D+L	Load Combination	+D+L
Span # where maximum occurs	Span # 1	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	0.066 in Ratio = 1,640	>=360	
Max Upward Transient Deflection	0.000 in Ratio = 0	<360	Span: 1 : L Only
Max Downward Total Deflection	0.104 in Ratio = 1039	>=180	Span: 1 : +D+L
Max Upward Total Deflection	0.000 in Ratio = 0	<180	

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.1039	4.474		0.0000	0.000

Vertical Reactions

Support notation : Far left is #

Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	13.042	12.452
Max Upward from Load Combinations	13.042	12.452
Max Upward from Load Cases	8.382	8.064
D Only	4.661	4.387
+D+L	13.042	12.452
+D+S	6.366	6.040
+D+0.750L	10.947	10.436
+D+0.750L+0.750S	12.226	11.675
+0.60D	2.796	2.632
L Only	8.382	8.064
S Only	1.706	1.652

TO CONC WALL

<F4.0>

$P = 13.042^k + 20.998^k = 34.04^k$
<F20>

FL20

Steel Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: beam

Steel Section Properties : W12x22

Depth	=	12.300 in	I xx	=	156.00 in ⁴	J	=	0.293 in ⁴
Web Thick	=	0.260 in	S xx	=	25.40 in ³	Cw	=	164.00 in ⁶
Flange Width	=	4.030 in	R xx	=	4.910 in			
Flange Thick	=	0.425 in	Zx	=	29.300 in ³			
Area	=	6.480 in ²	I yy	=	4.660 in ⁴	Wno	=	12.000 in ²
Weight	=	22.000 plf	S yy	=	2.310 in ³	Sw	=	5.120 in ⁴
Kdesign	=	0.725 in	R yy	=	0.848 in	Qf	=	4.760 in ³
K1	=	0.625 in	Zy	=	3.660 in ³	Qw	=	14.400 in ³
rts	=	1.040 in						
Ycg	=	6.150 in						

6.92k (DEAD) ~~11.5~~ ~~11.5~~ 'L10'

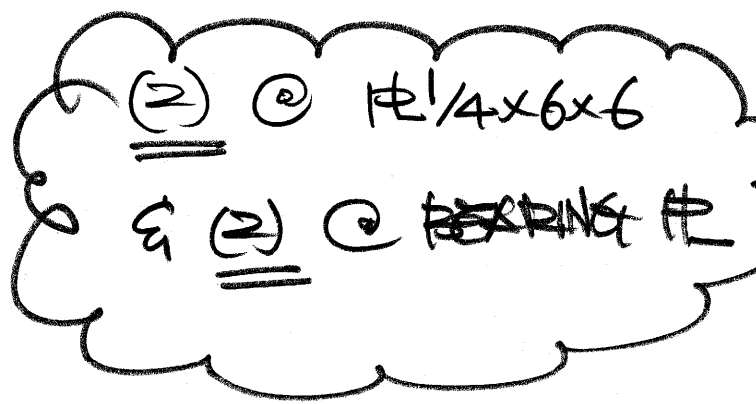
OR

10.76k (WIND)

$$\# \text{ of } 3/4" \text{ Bolt } = \frac{10.76k}{7.51k}$$

$$= 1.43 < 4 \text{ PROVIDED}$$

(206/51.1)



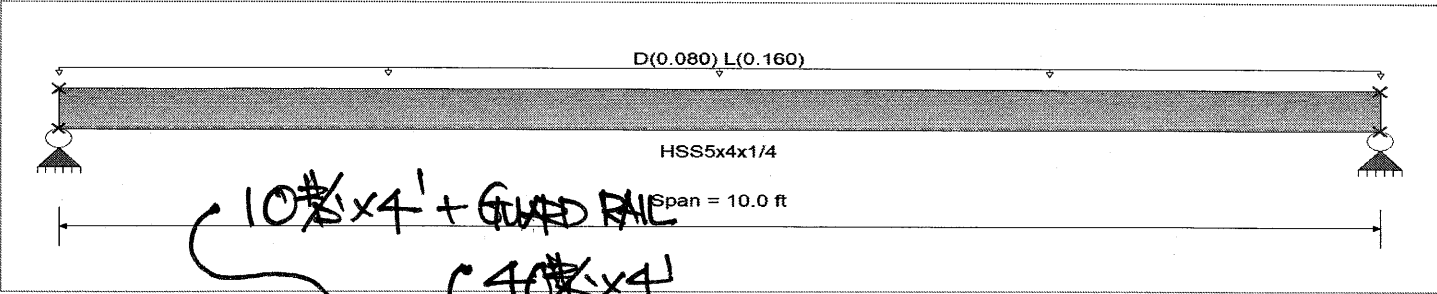
DESCRIPTION: beam (stair)

CODE REFERENCES ← F22 →

Calculations per AISC 360-16, IBC 2018, CBC 2019, ASCE 7-16
 Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Strength Design Fy : Steel Yield : 46.0 ksi
 Beam Bracing : Completely Unbraced E : Modulus : 29,000.0 ksi
 Bending Axis : Major Axis Bending



Applied Loads

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

Beam self weight calculated and added to loading
 Uniform Load : D = 0.080, L = 0.160 k/ft, Tributary Width = 1.0 ft

DESIGN SUMMARY

Design OK

<p>Maximum Bending Stress Ratio = 0.213 : 1</p> <p>Section used for this span HSS5x4x1/4</p> <p>Ma : Applied 3.174 k-ft</p> <p>Mn / Omega : Allowable 14.897 k-ft</p> <p>Load Combination +D+L</p> <p>Span # where maximum occurs Span # 1</p> <p>Maximum Deflection</p> <p>Max Downward Transient Deflection 0.093 in Ratio = 1,289 >=360</p> <p>Max Upward Transient Deflection 0.000 in Ratio = 0 <360</p> <p>Max Downward Total Deflection 0.148 in Ratio = 813 >=180</p> <p>Max Upward Total Deflection 0.000 in Ratio = 0 <180</p>	<p>Maximum Shear Stress Ratio = 0.038 : 1</p> <p>Section used for this span HSS5x4x1/4</p> <p>Va : Applied 1.270 k</p> <p>Vn/Omega : Allowable 33.124 k</p> <p>Load Combination +D+L</p> <p>Location of maximum on span 0.000 ft</p> <p>Span # where maximum occurs Span # 1</p>
--	---

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.1477	5.029		0.0000	0.000

Vertical Reactions

Support notation : Far left is # Values in KIPS

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	1.270	1.270
Max Upward from Load Combinations	1.270	1.270
Max Upward from Load Cases	0.800	0.800
D Only	0.470	0.470
+D+L	1.270	1.270
+D+0.750L	1.070	1.070
+0.60D	0.282	0.282
L Only	0.800	0.800

(2) - 2x6 & (2) - 4x6



$$P_{allow} = (10'' + 4'' \times 2)(5.5'' + 4'' \times 2) / 144 \times 3000 \text{ PSF} = 5060^{\#} \gg 1270^{\#}$$

4" CONE SLAB ON GRADE
 UNDER (2) - 2x6 & (2) - 4x6
 O.K. FOR P = 1240[#]

FL22

Steel Beam

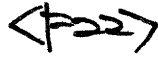
Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: beam (stair)

**Steel Section Properties : HSS5x4x1/4**

Depth	=	5.000 in	I xx	=	13.40 in ⁴	J	=	18.000 in ⁴
			S xx	=	5.35 in ³	Cw	=	8.32 in ⁶
Width	=	4.000 in	R xx	=	1.870 in			
Wall Thick	=	0.233 in	Zx	=	6.490 in ³			
Area	=	3.840 in ²	I yy	=	9.460 in ⁴	C	=	0.000 in ³
Weight	=	13.910 plf	S yy	=	4.730 in ³			
			R yy	=	1.570 in			
			Zy	=	5.570 in ³			
Ycg	=	2.500 in						

FL23

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: deck

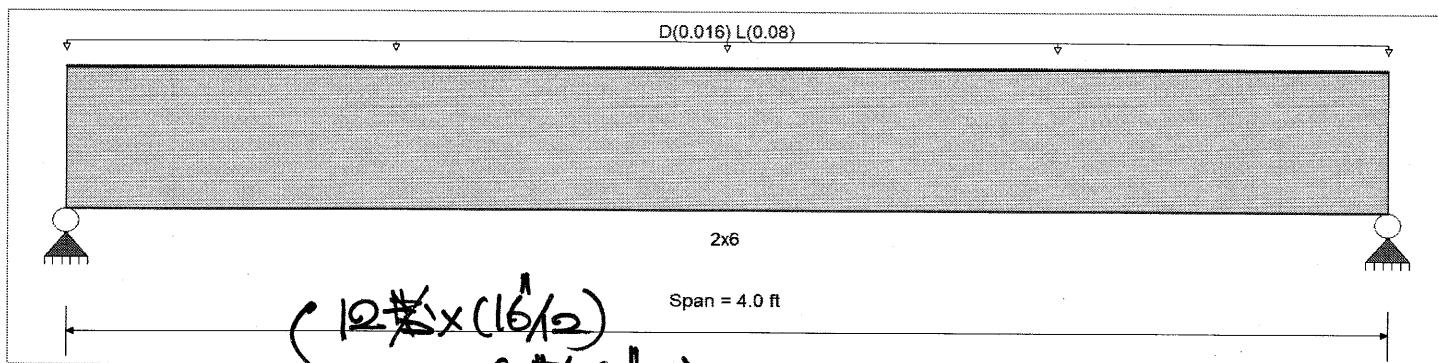
CODE REFERENCES

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

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design	Fb +	850 psi	E : Modulus of Elasticity	
Load Combination : IBC 2018	Fb -	850 psi	Ebend- xx	1300ksi
	Fc - Prll	1300 psi	Eminbend - xx	470ksi
Wood Species : Hem-Fir	Fc - Perp	405 psi		
Wood Grade : No.2	Fv	150 psi		
	Ft	525 psi	Density	26.84pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling			Repetitive Member Stress Increase	



Applied Loads

Beam self weight NOT internally calculated and added

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

Uniform Load : D = 0.0160, L = 0.080, Tributary Width = 1.0 ft

DESIGN SUMMARY

				Design OK			
Maximum Bending Stress Ratio	=	0.240	1	Maximum Shear Stress Ratio	=	0.180	1
Section used for this span		2x6		Section used for this span		2x6	
fb: Actual	=	304.66psi		fv: Actual	=	27.01 psi	
F'b	=	1,270.75psi		F'v	=	150.00 psi	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	2.000ft		Location of maximum on span	=	3.547 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.017 in	Ratio = 2799 >= 360	Span: 1 : L Only			
Max Upward Transient Deflection		0 in	Ratio = 0 < 360	n/a			
Max Downward Total Deflection		0.021 in	Ratio = 2333 >= 180	Span: 1 : +D+L			
Max Upward Total Deflection		0 in	Ratio = 0 < 180	n/a			

Overall Maximum Deflections

Load Combination	Span	Max. "-" Defl	Location in Span	Load Combination	Max. "+" Defl	Location in Span
+D+L	1	0.0206	2.015		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.192	0.192
Max Upward from Load Combinations	0.192	0.192
Max Upward from Load Cases	0.160	0.160
D Only	0.032	0.032
+D+L	0.192	0.192
+D+Lr	0.032	0.032
+D+S	0.032	0.032
+D+0.750Lr+0.750L	0.152	0.152
+D+0.750L+0.750S	0.152	0.152
+0.60D	0.019	0.019

FL24

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: deck

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
L Only	0.160	0.160
S Only		

FL25

Wood Beam

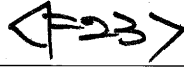
Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

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DESCRIPTION: deck



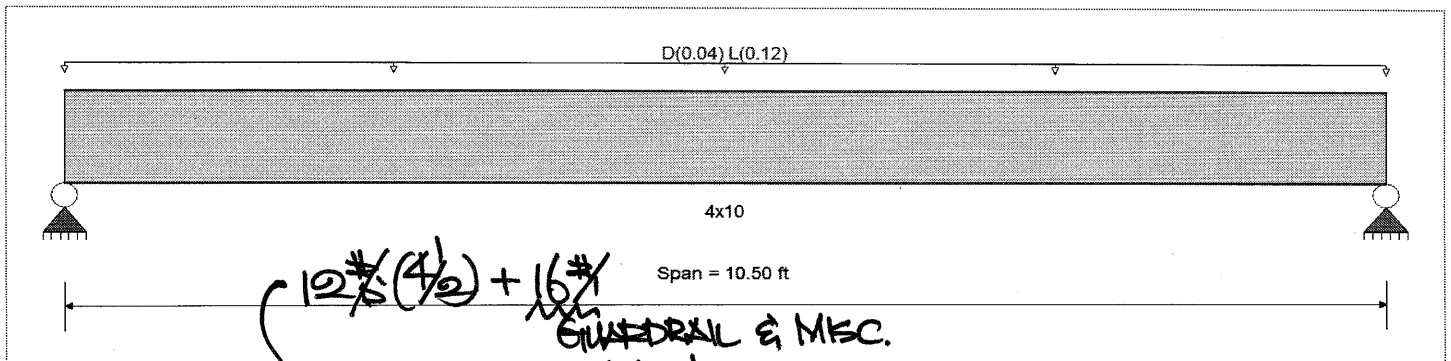
CODE REFERENCES

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

Load Combination Set : IBC 2018

Material Properties

Analysis Method : Allowable Stress Design	Fb +	850 psi	E : Modulus of Elasticity	
Load Combination : IBC 2018	Fb -	850 psi	Ebend- xx	1300 ksi
	Fc - Prll	1300 psi	Eminbend - xx	470 ksi
Wood Species : Hem-Fir	Fc - Perp	405 psi		
Wood Grade : No.2	Fv	150 psi		
	Ft	525 psi	Density	26.84 pcf
Beam Bracing : Beam is Fully Braced against lateral-torsional buckling				



Applied Loads

Beam self weight calculated and added to loading
 Uniform Load : D = 0.040, L = 0.120, Tributary Width = 1.0 ft
 Service loads entered. Load Factors will be applied for calculations.

DESIGN SUMMARY

				Design OK			
Maximum Bending Stress Ratio	=	0.539	1	Maximum Shear Stress Ratio	=	0.230	1
Section used for this span		4x10		Section used for this span		4x10	
fb: Actual	=	550.13 psi		fv: Actual	=	34.49 psi	
F'b	=	1,020.00 psi		F'v	=	150.00 psi	
Load Combination		+D+L		Load Combination		+D+L	
Location of maximum on span	=	5.250 ft		Location of maximum on span	=	0.000 ft	
Span # where maximum occurs	=	Span # 1		Span # where maximum occurs	=	Span # 1	
Maximum Deflection							
Max Downward Transient Deflection		0.110 in	Ratio = 1145 >= 360	Span: 1 : L Only			
Max Upward Transient Deflection		0 in	Ratio = 0 < 360	n/a			
Max Downward Total Deflection		0.152 in	Ratio = 827 >= 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	0.1522	5.288		0.0000	0.000

Vertical Reactions

Load Combination	Support 1	Support 2
Max Upward from all Load Conditions	0.872	0.872
Max Upward from Load Combinations	0.872	0.872
Max Upward from Load Cases	0.630	0.630
D Only	0.242	0.242
+D+L	0.872	0.872
+D+Lr	0.242	0.242
+D+S	0.242	0.242
+D+0.750Lr+0.750L	0.714	0.714
+D+0.750L+0.750S	0.714	0.714
+0.60D	0.145	0.145

Handwritten notes: 4x4 POST W/ EPICAZ & EPB 44 PHDG W/ 1/2" SET-3G EPOXY " 3/8" x 12/5" (UPU#T) " FL26

Wood Beam

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: deck

<F23>

Vertical Reactions

Support notation : Far left is #1

Values in KIPS

Load Combination	Support 1	Support 2
L Only	0.630	0.630
S Only		

FL27

RetainPro (c) 1987-2019, Build 11.20.03.31
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 License To : D.S. Engineering

Cantilevered Retaining Wall

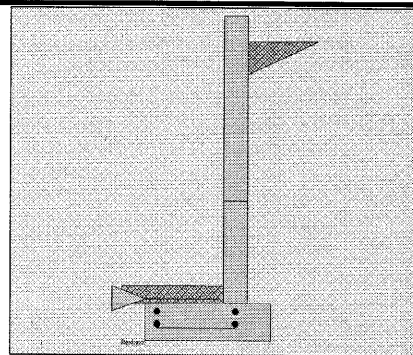
Code: IBC 2018,ACI 318-14,TMS 402-16

Criteria

Retained Height = 5.17 ft
 Wall height above soil = 0.50 ft
 Slope Behind Wall = 0.00
 Height of Soil over Toe = 4.00 in
 Water height over heel = 0.0 ft

Soil Data

Allow Soil Bearing = 3,000.0 psf
 Equivalent Fluid Pressure Method
 Active Heel Pressure = 35.0 psf/ft
 =
 Passive Pressure = 300.0 psf/ft
 Soil Density, Heel = 110.00 pcf
 Soil Density, Toe = 110.00 pcf
 Footing||Soil Friction = 0.250
 Soil height to ignore for passive pressure = 12.00 in



Surcharge Loads

Surcharge Over Heel = 0.0 psf
 Used To Resist Sliding & Overturning
 Surcharge Over Toe = 0.0 psf
 NOT Used for Sliding & Overturning

Lateral Load Applied to Stem

Lateral Load = 0.0 #/ft
 ...Height to Top = 0.00 ft
 ...Height to Bottom = 0.00 ft
 Load Type = Wind (W)
 (Service Level)
 Wind on Exposed Stem = 15.0 psf
 (Service Level)
 Wind acts left-to-right toward retention side.

Adjacent Footing Load

Adjacent Footing Load = 0.0 lbs
 Footing Width = 0.00 ft
 Eccentricity = 0.00 in
 Wall to Ftg CL Dist = 0.00 ft
 Footing Type = Square Footing
 Base Above/Below Soil at Back of Wall = 0.0 ft
 Poisson's Ratio = 0.300

Axial Load Applied to Stem

Axial Dead Load = 0.0 lbs
 Axial Live Load = 0.0 lbs
 Axial Load Eccentricity = 0.0 in

Earth Pressure Seismic Load

Method : Uniform
 Multiplier Used = 1.750
 (Multiplier used on soil density)

Uniform Seismic Force = 10.360
 Total Seismic Force = 61.331

Design Summary

Wall Stability Ratios
 Overturning = 1.52 OK
 Slab Resists All Sliding !

Total Bearing Load = 1,071 lbs
 ...resultant ecc. = 8.56 in

Soil Pressure @ Toe = 1,149 psf OK
 Soil Pressure @ Heel = 0 psf OK
 Allowable = 3,000 psf
 Soil Pressure Less Than Allowable
 ACI Factored @ Toe = 1,609 psf
 ACI Factored @ Heel = 0 psf
 Footing Shear @ Toe = 15.9 psi OK
 Footing Shear @ Heel = 5.7 psi OK
 Allowable = 75.0 psi

Sliding Calcs
 Lateral Sliding Force = 648.7 lbs

Stem Construction

	2nd	Bottom
Design Height Above Ftg	ft = Stem OK 2.00	Stem OK 0.00
Wall Material Above "Ht"	= Concrete	Concrete
Design Method	= LRFD	LRFD
Thickness	= 6.00	6.00
Rebar Size	= # 4	# 4
Rebar Spacing	= 18.00	12.00
Rebar Placed at	= Center	Center

Design Data
 fb/FB + fa/Fa = 0.196 0.585

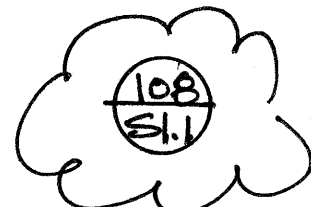
Total Force @ Section
 Service Level lbs =
 Strength Level lbs = 322.0 839.0

Moment....Actual
 Service Level ft-# =
 Strength Level ft-# = 334.6 1,456.0
 Moment.....Allowable ft-# = 1,705.6 2,487.6

Shear.....Actual
 Service Level psi =
 Strength Level psi = 8.9 23.3
 Shear.....Allowable psi = 75.0 75.0
 Anet (Masonry) in2 =
 Rebar Depth 'd' in = 3.00 3.00

Masonry Data
 fm psi =
 Fs psi =
 Solid Grouting =
 Modular Ratio 'n' =
 Wall Weight psf = 75.0 75.0
 Short Term Factor =
 Equiv. Solid Thick. =
 Masonry Block Type = Medium Weight
 Masonry Design Method = ASD

Concrete Data
 fc psi = 2,500.0 2,500.0
 Fy psi = 60,000.0 60,000.0



Vertical component of active lateral soil pressure IS NOT considered in the calculation of soil bearing

Load Factors
 Building Code IBC 2018,ACI
 Dead Load 1.400
 Live Load 1.700
 Earth, H 1.700
 Wind, W 1.300
 Seismic, E 1.000

FL28

Concrete Stem Rebar Area Details

2nd Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.0277 in2/ft		
(4/3) * As :	0.037 in2/ft	Min Stem T&S Reinf Area 0.528 in2	
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.144 in2/ft	
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.1296 in2/ft	#4@ 16.67 in	#4@ 33.33 in
Provided Area :	0.1333 in2/ft	#5@ 25.83 in	#5@ 51.67 in
Maximum Area :	0.4064 in2/ft	#6@ 36.67 in	#6@ 73.33 in

Bottom Stem	Vertical Reinforcing	Horizontal Reinforcing	
As (based on applied moment) :	0.1207 in2/ft		
(4/3) * As :	0.1609 in2/ft	Min Stem T&S Reinf Area 0.288 in2	
200bd/fy : 200(12)(3)/60000 :	0.12 in2/ft	Min Stem T&S Reinf Area per ft of stem Height : 0.144 in2/ft	
0.0018bh : 0.0018(12)(6) :	0.1296 in2/ft	Horizontal Reinforcing Options :	
	=====	One layer of :	Two layers of :
Required Area :	0.1207 in2/ft	#4@ 16.67 in	#4@ 33.33 in
Provided Area :	0.2 in2/ft	#5@ 25.83 in	#5@ 51.67 in
Maximum Area :	0.4064 in2/ft	#6@ 36.67 in	#6@ 73.33 in

Footing Data

Toe Width	=	1.67 ft
Heel Width	=	1.00
Total Footing Width	=	2.67
Footing Thickness	=	9.00 in
Key Width	=	0.00 in
Key Depth	=	0.00 in
Key Distance from Toe	=	0.00 ft
f _c =	2,500 psi	F _y = 60,000 psi
Footing Concrete Density	=	150.00 pcf
Min. As %	=	0.0018
Cover @ Top	2.00	@ Btm = 3.00 in

Footing Design Results

		<u>Toe</u>	<u>Heel</u>
Factored Pressure	=	1,609	0 psf
Mu' : Upward	=	18,883	0 ft-#
Mu' : Downward	=	3,494	119 ft-#
Mu : Design	=	1,282	119 ft-#
Actual 1-Way Shear	=	15.90	5.68 psi
Allow 1-Way Shear	=	75.00	40.00 psi
Toe Reinforcing	=	# 4 @ 12.00 in	
Heel Reinforcing	=	None Spec'd	
Key Reinforcing	=	# 4 @ 18.00 in	
Footing Torsion, Tu	=		0.00 ft-lbs
Footing Allow. Torsion, phi Tu	=		0.00 ft-lbs

If torsion exceeds allowable, provide supplemental design for footing torsion.

Other Acceptable Sizes & Spacings

Toe: #4@ 12.34 in, #5@ 19.13 in, #6@ 27.16 in, #7@ 37.03 in, #8@ 48.76 in, #9@ 6
 Heel: phiMn = phi'5'lambda'sqrt(fc)'Sm
 Key: No key defined

Min footing T&S reinf Area	0.52 in2
Min footing T&S reinf Area per foot	0.19 in2 /ft
If one layer of horizontal bars:	If two layers of horizontal bars:
#4@ 12.35 in	#4@ 24.69 in
#5@ 19.14 in	#5@ 38.27 in
#6@ 27.16 in	#6@ 54.32 in

Cantilevered Retaining Wall

Summary of Overturning & Resisting Forces & Moments

ItemOVERTURNING.....		RESISTING.....			
	Force lbs	Distance ft	Moment ft-#	Force lbs	Distance ft	Moment ft-#	
HL Act Pres (ab water tbl)	613.3	1.97	1,210.3	Soil Over HL (ab. water tbl)	284.4	2.42	688.1
HL Act Pres (be water tbl)				Soil Over HL (bel. water tbl)		2.42	688.1
Hydrostatic Force				Watre Table			
Buoyant Force =				Sloped Soil Over Heel =			
Surcharge over Heel =				Surcharge Over Heel =			
Surcharge Over Toe =				Adjacent Footing Load =			
Adjacent Footing Load =				Axial Dead Load on Stem =			
Added Lateral Load =				* Axial Live Load on Stem =			
Load @ Stem Above Soil =	-7.5	6.17	-46.3	Soil Over Toe =	61.2	0.84	51.1
Seismic Earth Load =	42.9	2.96	127.1	Surcharge Over Toe =			
				Stem Weight(s) =	425.3	1.92	816.5
				Earth @ Stem Transitions =			
Total	= 648.7	O.T.M. =	1,291.1	Footing Weight =	300.4	1.34	401.0
				Key Weight =			
				Vert. Component =			
Resisting/Overturning Ratio		= 1.52		Total =	1,071.2 lbs	R.M. =	1,956.7
Vertical Loads used for Soil Pressure =		1,071.2 lbs					

* Axial live load NOT included in total displayed, or used for overturning resistance, but is included for soil pressure calculation.

If seismic is included, the OTM and sliding ratios may be 1.1 per section 1807.2.3 of IBC.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Sliding Resistance.

Vertical component of active lateral soil pressure IS NOT considered in the calculation of Overturning Resistance.

Tilt

Horizontal Deflection at Top of Wall due to settlement of soil

(Deflection due to wall bending not considered)

Soil Spring Reaction Modulus 250.0 pci

Horizontal Defl @ Top of Wall (approximate only) 0.068 in

The above calculation is not valid if the heel soil bearing pressure exceeds that of the toe, because the wall would then tend to rotate into the retained soil.

Design Lateral Seismic Load per "IBC 2018' & 'ASCE/SEI 7-16":

The total design lateral seismic force is determined from:

$V = C_s \times W = 0.1015 \times W = 8670 \text{ lb.} \quad : \text{ ASD}$

- From:
- $S_s = 1.414 \text{ g}$ (=0.2 sec response) Seismic Design Category : **D**
 - $S_1 = 0.492 \text{ g}$ (=1.0 sec response) Occupancy Category : **II**
 - $F_a = 1.000$ (=site Coefficients: site classification 'D') Seismic Use Group : **I**
 - $F_v = 1.808$ (=site Coefficients: site classification 'D')
 - $S_{MS} = 1.414$ (= $F_a \times S_s$)
 - $S_{M1} = 0.890$ (= $F_v \times S_1$)
 - $S_{DS} = 0.943$ [= $S_{MS} \times (2/3)$]
 - $S_{D1} = 0.593$ [= $S_{M1} \times (2/3)$]
 - $C_t = 0.020$ $T_L = 6.00 \text{ sec.}$
 - $h_n = 21.00 \text{ ft.}$ (=Mean Height of Roof) $T = 0.20 \text{ sec.}$
 - $I_e = 1.00$
 - $R = 6.50$
 - $C_s = 0.1015$ (= $S_{DS} / (R / I_e) \times 0.7$) : **ASD**
 - $W = 85400 \text{ lb.}$ (=Included Exterior & Interior Partition Wall)

ASCE/SEI 7-16' Section 12.8.1 has a requirement that V be not less than 0.01 W
BUT not more than $\{(S_{D1} \times I) / (R \times T)\} \times W$

Check: $(0.01) \times W < V < \{(S_{D1} \times I) / (R \times T)\} \times W$
 $598 \text{ lb.} < V < 27798 \text{ lb.} \quad : \quad \text{O. K.}$

Distribution of Base Shear (ASD):

Level	W_i (lb)	h_i (ft)	$(W_i)(h_i)$	$(W_i h_i) / \text{Sum}(W_i h_i)$	F_x	Sum (F_x)
Roof	46900	21.00	984900	0.709	6147	6147 lb.
2nd Floor	38500	10.50	404250	0.291	2523	8670 lb.
	85400		1389150	1.000		

From Roof : $(25+4) \text{ ft} \times 35 \text{ ft} \times 28 \text{ ft} + (20+4) \text{ ft} \times 35 \text{ ft} \times 22 \text{ ft} = 46900 \text{ lb.}$

2nd Floor : $(12+10) \text{ ft} \times 35 \text{ ft} \times 60 \text{ ft} = 38500 \text{ lb.}$

Diaphragm Load (ASD):

Level	F_i (lb)	sum: F_i	W_i	sum: F_i / sum: W_i	Adjust	F_{ox}
Roof	6147	6147	46900	0.131	0.132	6191 lb.
2nd Floor	2523	8670	38500	0.102	0.132	5082 lb.
			85400			

$F_x(\text{max}) = 0.4 S_{DS} I_e W_{px} (0.7) = 0.264$
 $F_x(\text{min}) = 0.2 S_{DS} I_e W_{px} (0.7) = 0.132$

1st Floor : $(12+10) \text{ ft} \times 35 \text{ ft} \times 60 \text{ ft} \times 0.1015 = 3020 \text{ lb.}$
 (SUPPORT BY CONC. WALL)

LTI
12

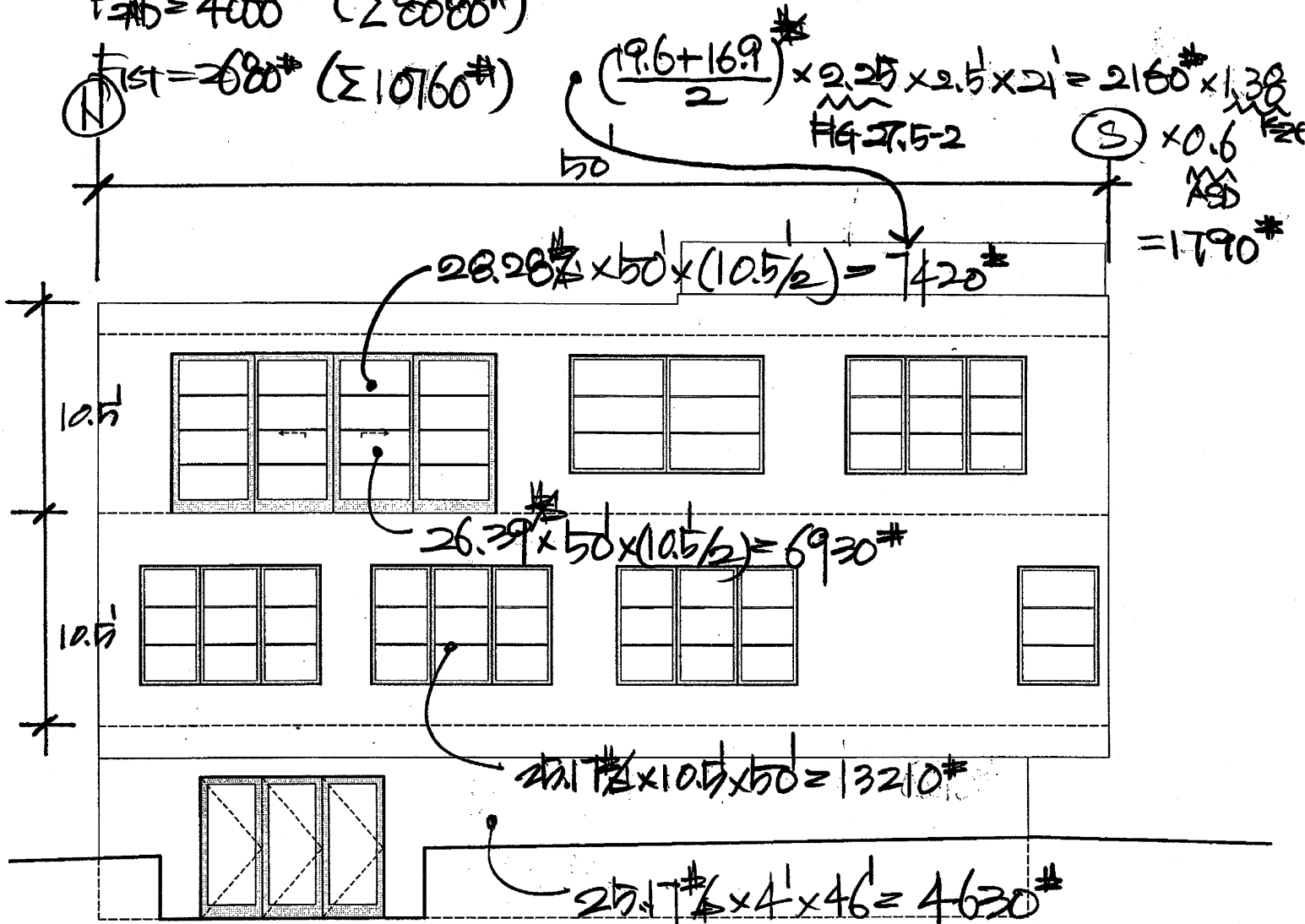
GRIDS

$F_{\text{roof}} = 2230\# + 1790\# = 4020\#$

Table 27.5-1: 30'

$F_{\text{2ND}} = 4060\# (\Sigma 8080\#)$

$F_{\text{1ST}} = 2680\# (\Sigma 10760\#)$



WEST ELEVATION

0 4

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

GRID (N):

$F_{\text{roof}} = 7420\# / 2 = 3710\# \times 0.6 = 2230\#$

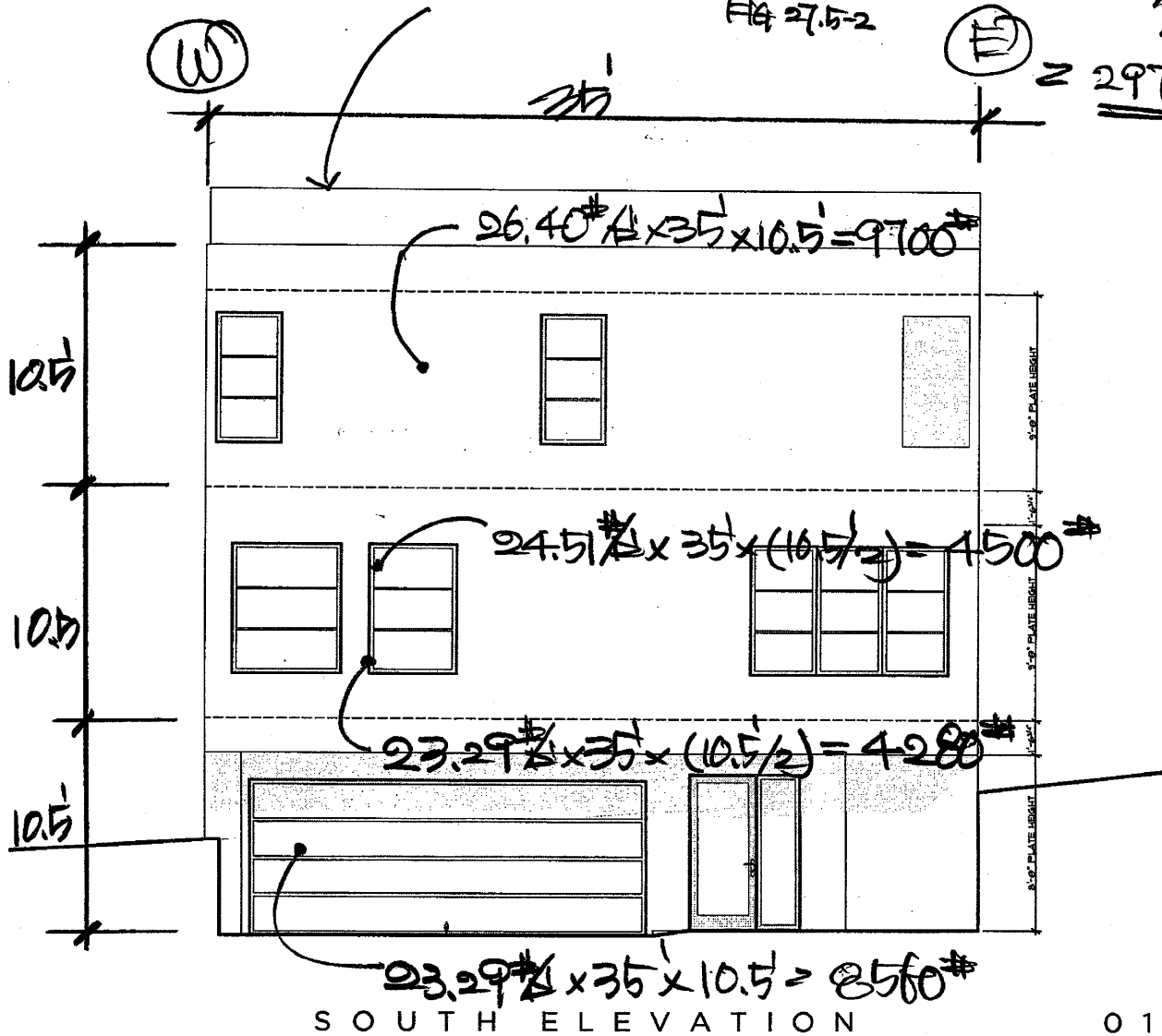
$F_{\text{2ND}} = 6930\# / 2 + 13210\# / 4 = 6710\# \times 0.6 = 4060\#$

$F_{\text{1ST}} = 13210\# / 4 + 4630\# / 4 = 4460\# \times 0.6 = 2680\#$
 $(\Sigma 6290\#)$
 $(\Sigma 8970\#)$
 LT 2
 1-6

Table 27.5-1

$$\left(\frac{19.6 + 16.9}{2}\right) \times 2.25 \times 2.5 \times 35 = 359 \times 1.38 \times 0.6$$

Eq 27.5-2



01

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

FRID (E) & (W):

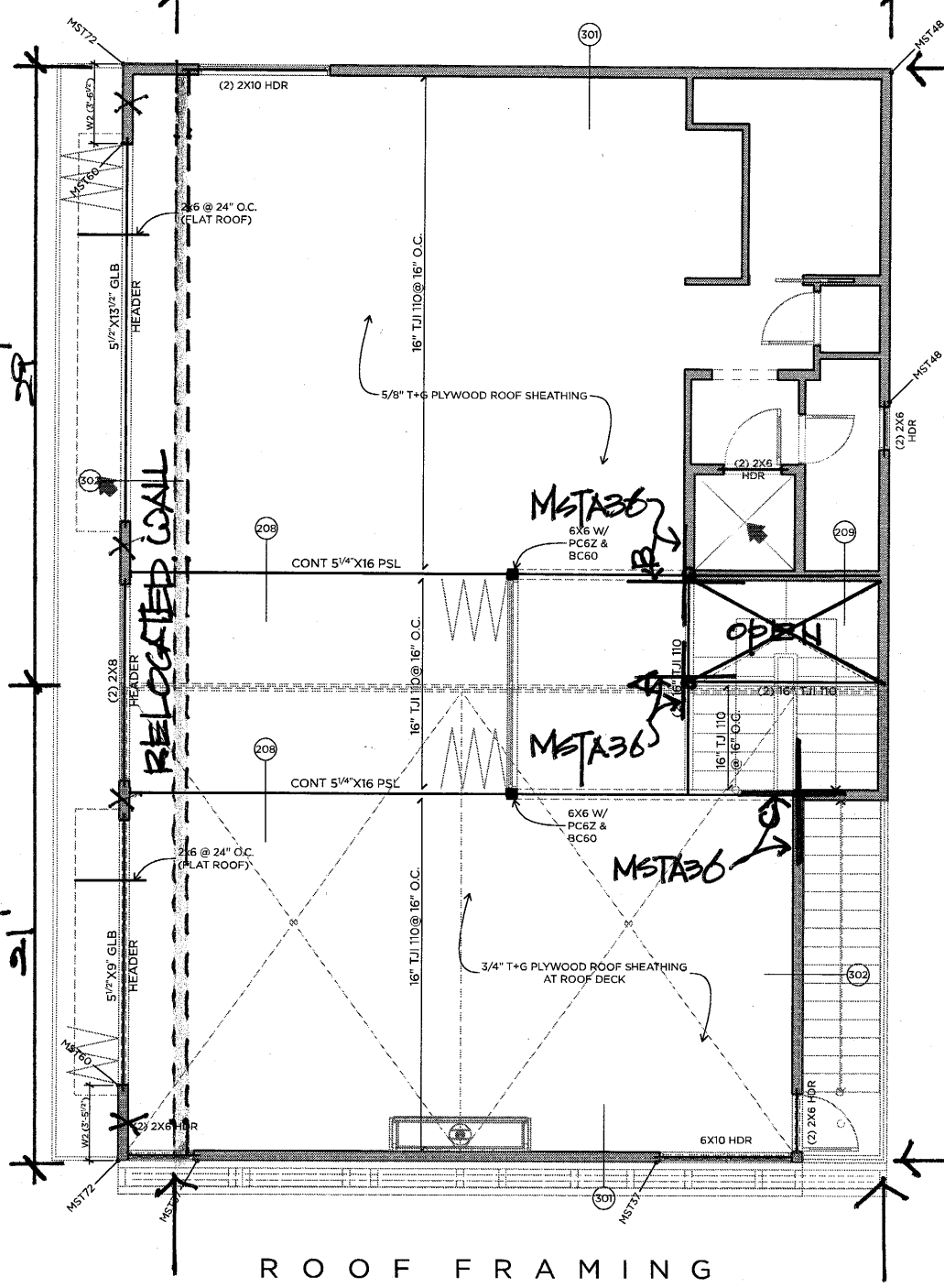
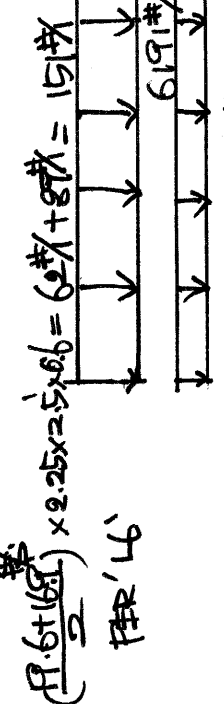
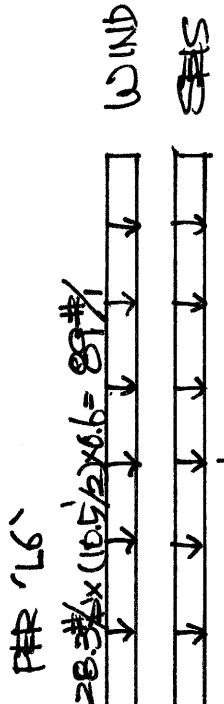
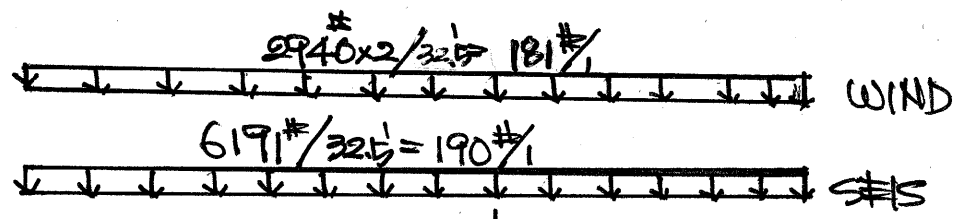
$$F_{FRID} = 9700/4 = 2425 \times 0.6 = 1455 + 2970/2 = 2940$$

$$F_{SAT} = 9700/4 + 4500/2 = 4675 \times 0.6 = 2805 \quad (\Sigma 5745)$$

$$F_{SUN} = 4280/4 + 8560/4 = 3210 \times 0.6 = 1926 \quad (\Sigma 7670)$$

LT3-L7

DIXIE EXEM:



$F = 2500$
 $V = 3100$

$F = 3250$
 $V = 3100$

ROOF FRAMING

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

$F = 2940$
 $V = 3090$

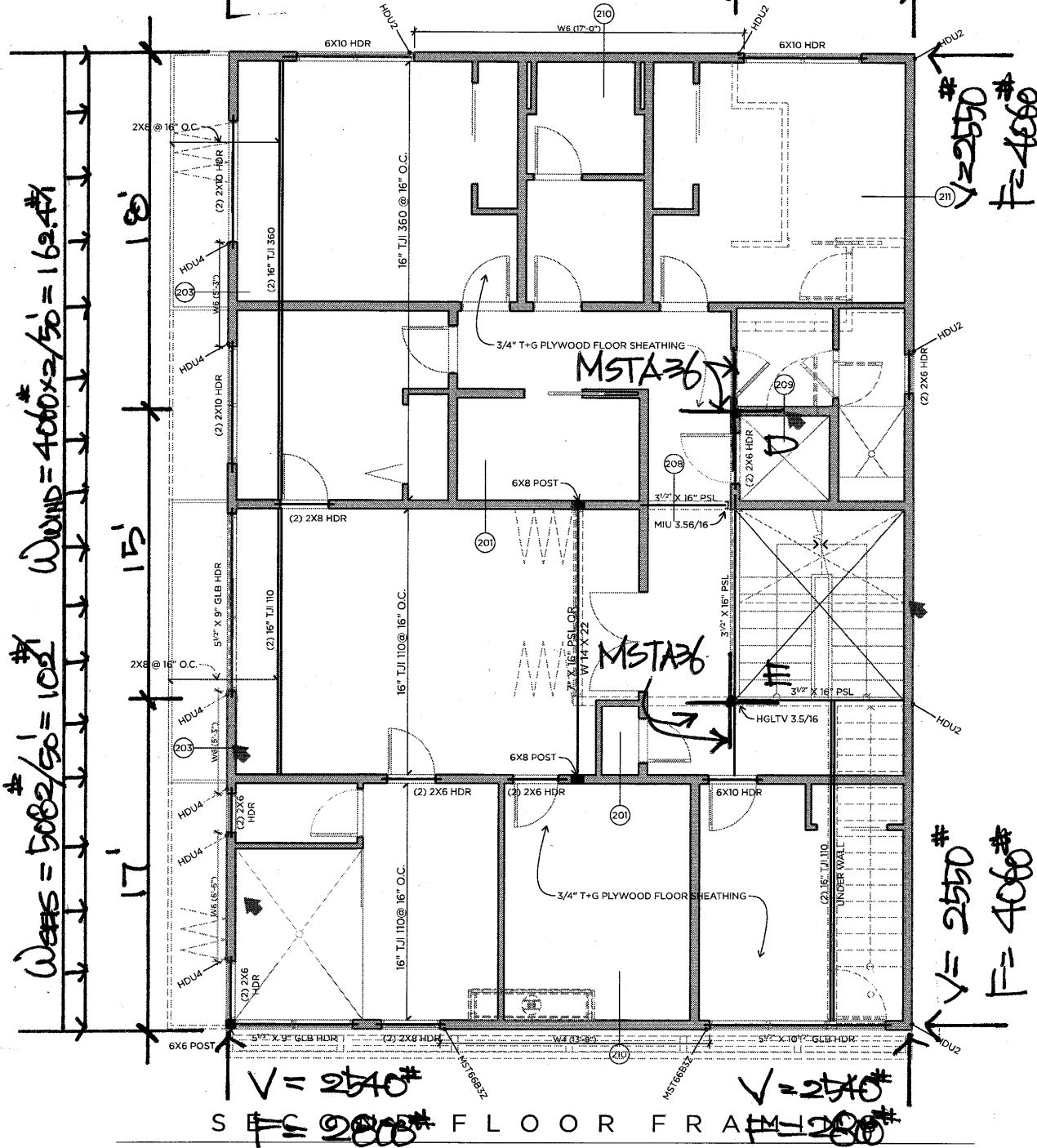
$F = 2940$
 $V = 3090$

LT4

DIAPHRAGM:

- V: ~~SEK~~
- F: WIND

$W_{SEK} = 5082 / 35 = 145 \#$
 $W_{WIND} = 2805 \times 2 / 35 = 160.3 \#$



$W_{SEK} = 5082 / 50 = 102 \#$
 $W_{WIND} = 4060 \times 2 / 50 = 162.4 \#$

$V = 2550 \#$
 $F = 4060 \#$

$V = 2550 \#$
 $F = 4060 \#$

$V = 2540 \#$
 $F = 2800 \#$ SECTION FLOOR FRAME $V = 2540 \#$
 $F = 2800 \#$

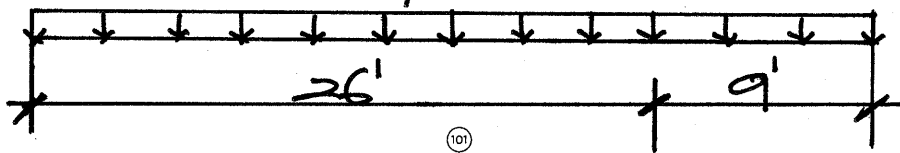
SCALE: 1/4" = 1'-0"

LF

DIAPHRAGM

$$W_{WIND} = 3020 \# / 35' = 86.3 \# / 1 \text{ (6.5/5)} = 112 \# / 1$$

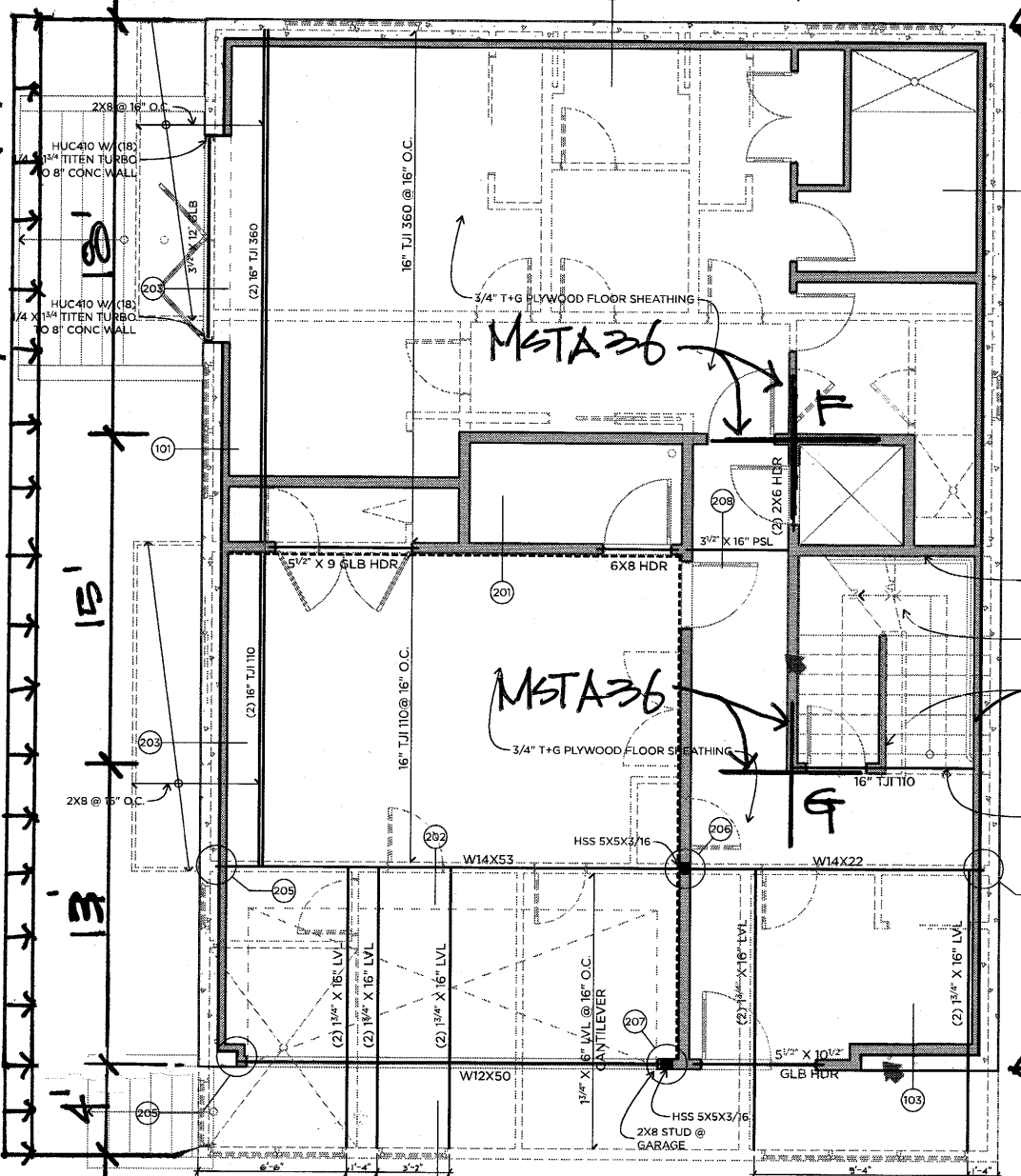
$$W_{WIND} = 1925 \# / 35' = 55 \# / 1 \times 2 = 110 \# / 1$$



$$W_{WIND} = 3020 \# / 50' \text{ (6.5/5)}$$

$$= 78.4 \# / 1$$

$$W_{WIND} = 2680 \# / 50' \times 2 = 107.2 \# / 1$$



$$V = 1805 \#$$

$$F = 2470 \#$$

$$V = 2120 \#$$

$$F = 2895 \#$$

$$V = 1960 \#$$

$$F = 1925 \#$$

$$V = 1960 \#$$

$$F = 1925 \#$$

FIRST FLOOR FRAMING

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

LT6

E-W DIRECTION:

- @ A: $F = (3250 \times 22' - 151 \times \frac{22^2}{2}) / 235' = 1490 \#$
 $V = (3100 \times 22' - 124 \times \frac{22^2}{2}) / 235' = 1630 \#$
- @ B: $F = (2500 \times 23' - 89 \times \frac{23^2}{2}) / 226' = 1450 \#$
 $V = (3100 \times 23' - 124 \times \frac{23^2}{2}) / 225' = 1640 \#$
- @ C: $F = (2250 \times 17' - 151 \times \frac{17^2}{2}) / 28.5' = 1170 \#$
 $V = (3100 \times 17' - 124 \times \frac{17^2}{2}) / 28.5' = 1220 \#$

N-S DIRECTION:

- @ A: $F = (2940 \times 9' - 181 \times \frac{9^2}{2}) / 22' = 870 \#$
 $V = (3090 \times 9' - 190 \times \frac{9^2}{2}) / 22' = 910 \#$
- @ B: $F = \quad (1) / 23' = 830 \#$
 $V = \quad (1) / 23' = 880 \#$
- @ C: $F = (2940 \times 4' - 181 \times \frac{4^2}{2}) / 17' = 610 \#$
 $V = (3090 \times 4' - 190 \times \frac{4^2}{2}) / 17' = 640 \#$

'MSTAB 36' (2050#) STRAP:

(~~BETWEEN~~ ~~FOR~~ STRUCTURAL MEMBERS)
OF 1 1/2" RIM BOARD

E-W DIRECTION:

$$\textcircled{a} \text{ D: } F = (4060 \times 18' - 162.4 \times \frac{18^2}{2}) / 26' = 1800 \#$$

$$V = (2550 \times 18' - 102 \times \frac{18^2}{2}) / 26' = 1130 \#$$

$$\textcircled{a} \text{ E: } F = (4060 \times 17' - 162.4 \times \frac{17^2}{2}) / 26' = 1750 \#$$

$$V = (2550 \times 17' - 102 \times \frac{17^2}{2}) / 26' = 1100 \#$$

$$T = C_{\text{CRITICAL}} = 162.4 \times 50' / (8 \times 26) = 1952 \#$$

$$\textcircled{a} - 2 \times 6 : 625 \times 1.5 \times 5.5 \times 2 \times \frac{1.6}{100} = 16500 \# \text{ O.K.}$$

N-S DIRECTION:

$$\textcircled{a} \text{ D: } F = (2800 \times 9' - 160.3 \times \frac{9^2}{2}) / 18' = 1040 \#$$

$$V = (2540 \times 9' - 145 \times \frac{9^2}{2}) / 18' = 940 \#$$

$$\textcircled{a} \text{ E: } F = (2800 \times 9' - 160.3 \times \frac{9^2}{2}) / 17' = 1100 \#$$

$$V = (2540 \times 9' - 145 \times \frac{9^2}{2}) / 17' = 1000 \#$$

'MST X 36' (2060#) STAIR:

(BETWEEN 2ND FLOOR STRUCTURAL MEMBERS & 1 1/2" RIM BOARD)

LTB

E-W DIRECTION:

$$\textcircled{C} F : F = (2470^{\#} \times 18' - 107.2^{\#} \times \frac{18^2}{2}) / 26' = 1040^{\#}$$
$$V = (1805^{\#} \times 18' - 78.5^{\#} \times \frac{18^2}{2}) / 26' = 760^{\#}$$

$$\textcircled{C} G : F = (2470^{\#} \times 33' - 107.2^{\#} \times \frac{33^2}{2}) / 26' = 890^{\#}$$
$$V = (1805^{\#} \times 33' - 78.5^{\#} \times \frac{33^2}{2}) / 26' = 650^{\#}$$

$$\cdot FC = 107.2^{\#} \times 50' / (8' \times 26') = 1290^{\#}$$

CRITICAL

$$\textcircled{2} \rightarrow \times 6 : 625 \times 1.5'' \times 5.5'' \times 2 \times 1.6 = 16500^{\#}$$

N-S DIRECTION:

$$\textcircled{C} F : F = (1925^{\#} \times 9' - 110^{\#} \times \frac{9^2}{2}) / 18' = 720^{\#}$$
$$V = (1960^{\#} \times 9' - 112^{\#} \times \frac{9^2}{2}) / 18' = 730^{\#}$$

$$\textcircled{C} G : F = (1925^{\#} \times 9' - 110^{\#} \times \frac{9^2}{2}) / 17' = 760^{\#}$$
$$V = (1960^{\#} \times 9' - 112^{\#} \times \frac{9^2}{2}) / 17' = 770^{\#}$$

'MSTA 36' (2050[#]) STRAP:

(~~BETWEEN~~ 1ST FLOOR STRUCTURAL MEMBERS & 1/2" RIM BOARD)

Reliability/Redundancy Factor: SEISMIC

Use R.F. = 1.00 $S_{DS} = 0.943$

$0.6D + 0.6W$ (Eq. 16-15)
 $0.6D + 0.7E$ (Eq. 16-16) & $E = Q_E - 0.2 S_{DS} D$
 $\rightarrow 0.47 D + 0.7 Q_E$

SEISMIC:

@ Grid 'N': Roof : V = 3070 #

$L = 26.5'$
 $V_{wall} = 3070$ lb.
 $V_{wall}' = 3070$ lb ($V_{wall} \times R.F.$)
 $L = 26.50$ ft.
 $H = 10.50$ ft.
 $V_{shear} = 116$ plf < TYP
 $T=C = 1240$ lb.

$RFS: [25\#(23\frac{1}{2}) + 60\#] (26\frac{1}{2}) = 4600 \times 0.47 = 2162\# > 1240\#$
 $\times 0.60 = 2760\# > 910\#$

NO UPLIFT

SEISMIC:

@ Grid 'N': 2nd Fir : V = 4330 #

$L = 17'$
 $V_{wall} = 4330$ lb.
 $V_{wall}' = 4330$ lb ($V_{wall} \times R.F.$)
 $L = 17.00$ ft.
 $H = 10.50$ ft.
 $V_{shear} = 255$ plf
 $T=C = 2755$ lb.

WIND:

@ Grid 'N': Roof : F = 2230 #

$L = 26.5'$
 $F_{wall} = 2230$ lb.
 $L = 26.50$ ft.
 $H = 10.50$ ft.
 $V_{shear} = 84$ plf < TYP
 $T=C = 901$ lb.

WIND:

@ Grid 'N': 2nd Fir : F = 6290 #

$L = 17'$
 $F_{wall} = 6290$ lb.
 $L = 17.00$ ft.
 $H = 10.50$ ft.
 $V_{shear} = 370$ plf
 $T=C = 4003$ lb.

SEISMIC:

@ Grid 'N': 1st Fir : V = 5840 #

$L = 35'$ (8" Concrete Shearwall)

WIND:

@ Grid 'N': 1st Fir : F = 8970 #

$L = 35'$ (8" Concrete Shearwall)

JAN 6, 2023

SEISMIC:

@ Grid 'S': Roof: V = 3070 #
L = 18'

V_{wall} = 3070 lb.
V_{wall}' = 3070 lb (V_{wall} x R.F.)

L = 18.00 ft.
H = 10.50 ft.

V_{shear} = 171 plf < TYP
T=C= 1842 lb.

RES: $[207 \times (1/2) + 60 \times 1] (1/2) = 1960 \times 0.47 = 930 \#$
 $\times 0.60 = 1180$
T_{NET} = 912 #
T_{NET} = 1224 #

'MST37'
(1720 #)

JAN 25, 2023

WIND:

@ Grid 'S': Roof: F = 4020 #
L = 18'

F_{wall} = 4020 lb.
L = 18.00 ft.

H = 10.50 ft.
V_{shear} = 223 plf < TYP

T=C= 2412 lb.

SEISMIC:

@ Grid 'S': 2nd Fir: V = 4330 #
L = 13.75'

V_{wall} = 4330 lb.
V_{wall}' = 4330 lb (V_{wall} x R.F.)

L = 13.75 ft.
H = 10.50 ft.

V_{shear} = 315 plf
T=C= 3431 lb.

WIND:

@ Grid 'S': 2nd Fir: F = 8080 #
L = 13.75'

F_{wall} = 8080 lb.
L = 13.75 ft.

H = 10.50 ft.
V_{shear} = 588 plf

T=C= 6403 lb.

JAN 25, 2023

SEISMIC:

@ Grid 'S': 1st Fir: V = 6920 #
L = 6' (8" Concrete Shearwall)

MIN. CHANGE TO * 10(60#/25) = 207 #/ 9'-5"

9'-5"

MIN. CHANGE TO 9'-5"

$930 \times 1.6 / 307 \times 1 = 4.84 \times 0.0(\text{MAX}) > 1.33$
TABLE 12E CP
16" O.C.

Concrete Shear Wall

Project File: ENERCALC_20

LIC# : KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: Concrete Shear Wall (South)

Code References

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

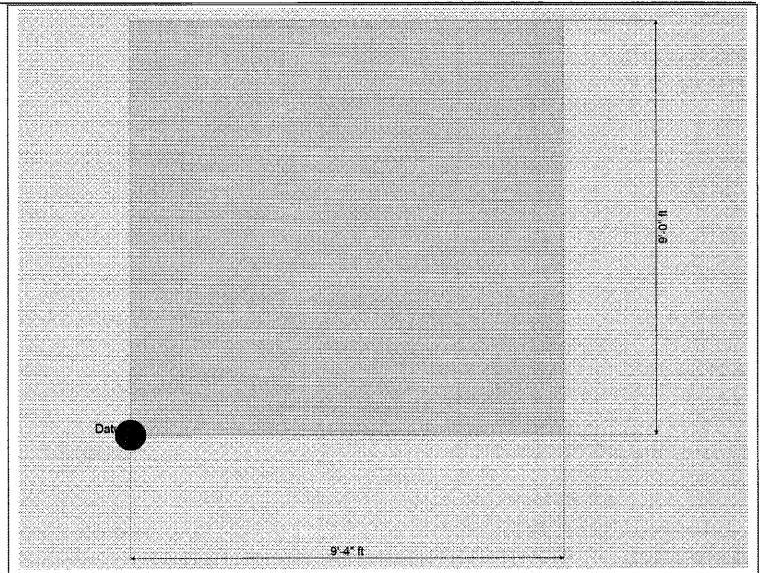
Load Combinations Used : IBC 2018

General Information

Wall Material CONCRETE		Material Properties			
Sds	0.9430	fc	3.0 ksi	Ec	3,120.0 ksi
		fy	60.0 ksi	Ev	1,248.0 ksi
		Density	150.0 pcf	Phi - Shear	0.650

Wall Data

	Bottom
Analysis Height	0.00 ft
Wall Offset (datum)	ft
Wall Length	9.333 ft
Wall Thickness	8.0 in
Structural Depth	8.833 ft



Applied Concentrated Vertical Loads

Load Location (ft)		Load Magnitude (kips)				
X Location	Y Location	Dead Load	Roof Live Load	Live Load	Snow Load	Earth Load
0.0	9.0	4.387	0.0	8.064	1.652	0.0

Applied Distributed Vertical Loads

Load Location (ft)			Load Magnitude (kips)				
Start Location	End Location	Height of Application	Dead Load	Roof Live Load	Live Load	Snow Load	Earth Load
0.0	6.0	9.0	0.710	0.0	1.510	0.320	0.0

Applied Concentrated Lateral Loads

Load "Y" Location (ft)	Load Magnitude (kips)					
	Dead Load	Roof Live Load	Floor Live Load	Wind Load	Seismic Load	Earth Load
9.0	0.0	0.0	0.0	10.760	9.0	0.0

LT13

Concrete Shear Wall

Project File: ENERCALC_20

LIC#: KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: Concrete Shear Wall (South)

DESIGN SUMMARY

Bottom Level

Vu : Story Shear 10.760 +1.20D+0.50L+
 Mu : Story Moment 122.906 +1.20D+1.60L+
 Nu : Axial 49.640 +1.20D+1.60L+
 Uplift @ Left End 5.667 +0.90D+W
 Uplift @ Right End 5.667 +0.90D+W

Phi * 10 * sqrt(fc)*h*d301.893 k
 Phi * Vc 60.379 k
 Phi * Vs Req'd 0.0 k
 Horizontal As Req'd 0.1920 in^2
 Vertical As Req'd 0.240 in^2
 Bending As Req'd 1.526 in^2

Force Summary

Load Combination Wall Level	Values for Wall section			Resultant Ecc (ft)	Overturning Ratio	Uplift (k)	
	Vu (k)	Mu (k)	Pu (k)			Left	Right
+1.40D							
Wall Level : 1		38.600	23.865	1.617			
+1.20D+1.60L							
Wall Level : 1		117.452	47.854	2.454			
+1.20D+1.60L+0.50S							
Wall Level : 1		122.906	49.640	2.476			
+1.20D+0.50L							
Wall Level : 1		59.450	29.018	2.049			
+1.20D+0.50W							
Wall Level : 1	5.380	15.335	20.456	0.750	2.655		
+1.20D+0.50L+1.60S							
Wall Level : 1		76.904	34.733	2.214			
+1.20D+1.60S+0.50W							
Wall Level : 1	5.380	2.119	26.171	0.081	3.566		
+1.20D+0.50L+W							
Wall Level : 1	10.760	37.390	29.018	1.289	2.012	2.364	2.364
+1.20D+0.50L+0.50S+W							
Wall Level : 1	10.760	31.936	30.804	1.037	2.155	2.038	2.038
+1.20D+0.50L+0.70S+E							
Wall Level : 1	9.000	13.914	31.518	0.441	2.644	0.114	0.114
+0.90D+W							
Wall Level : 1	10.760	72.026	15.342	4.695	0.996	5.667	5.667
+0.90D+E							
Wall Level : 1	9.000	56.186	15.342	3.662	1.190	3.874	3.874

LT14

Concrete Shear Wall

Project File: ENERCALC_20

LIC# : KW-06015335, Build:20.22.12.28

D.S. ENGINEERING PC

(c) ENERCALC INC 1983-2022

DESCRIPTION: Concrete Shear Wall (South)

Footing Information

Footing Dimensions

Dist. Left	4.0 ft	fc	3.0 ksi	Rebar Cover	3.0 in
Wall Length	9.333 ft	Fy	60.0 ksi	Footing Thickness	18.0 in
Dist. Right	0.0 ft			Width	4.0 ft
Total Ftg Length	13.333 ft				

Max Factored Soil Pressures

@ Left Side of Footing	1,514.16 psf
.... governing load comb	+1.20D+1.60L+0.50S
@ Right Side of Footing	2,385.84 psf
.... governing load comb	+0.90D+W

Max UNfactored Soil Pressures

@ Left Side of Footing	1,007.84 psf
.... governing load comb	D+L
@ Right Side of Footing	1,253.03 psf
.... governing load comb	D+0.750L+0.750S+0.450W

Footing One-Way Shear Check...

vu @ Left End of Footing	26.674 psi
vu @ Right End of Footing	0.0 psi
vn * phi : Allowable	93.113 psi

Overturning Stability...

	@ Left End of Ftg	@ Right End of Ftg
Overturning Moment	66.528 k-ft	66.528 k-ft
Resisting Moment	163.774 k-ft	135.788 k-ft
Stability Ratio	2.462 : 1	2.041 : 1
.... governing load comb	+0.60D+0.70E	+0.60D+0.70E

Footing Bending Design...

	@ Left End	@ Right End
Mu	47.519 k-ft	0.0 k-ft
Ru	58.666 psi	0.0 psi
As % Req'd	0.00180 in^2	0.00180 in^2
As Req'd in Footing Width	1.555 in^2	1.555 in^2

$$1.555 / 0.31 = 5$$

M
#5
BAR

LT15

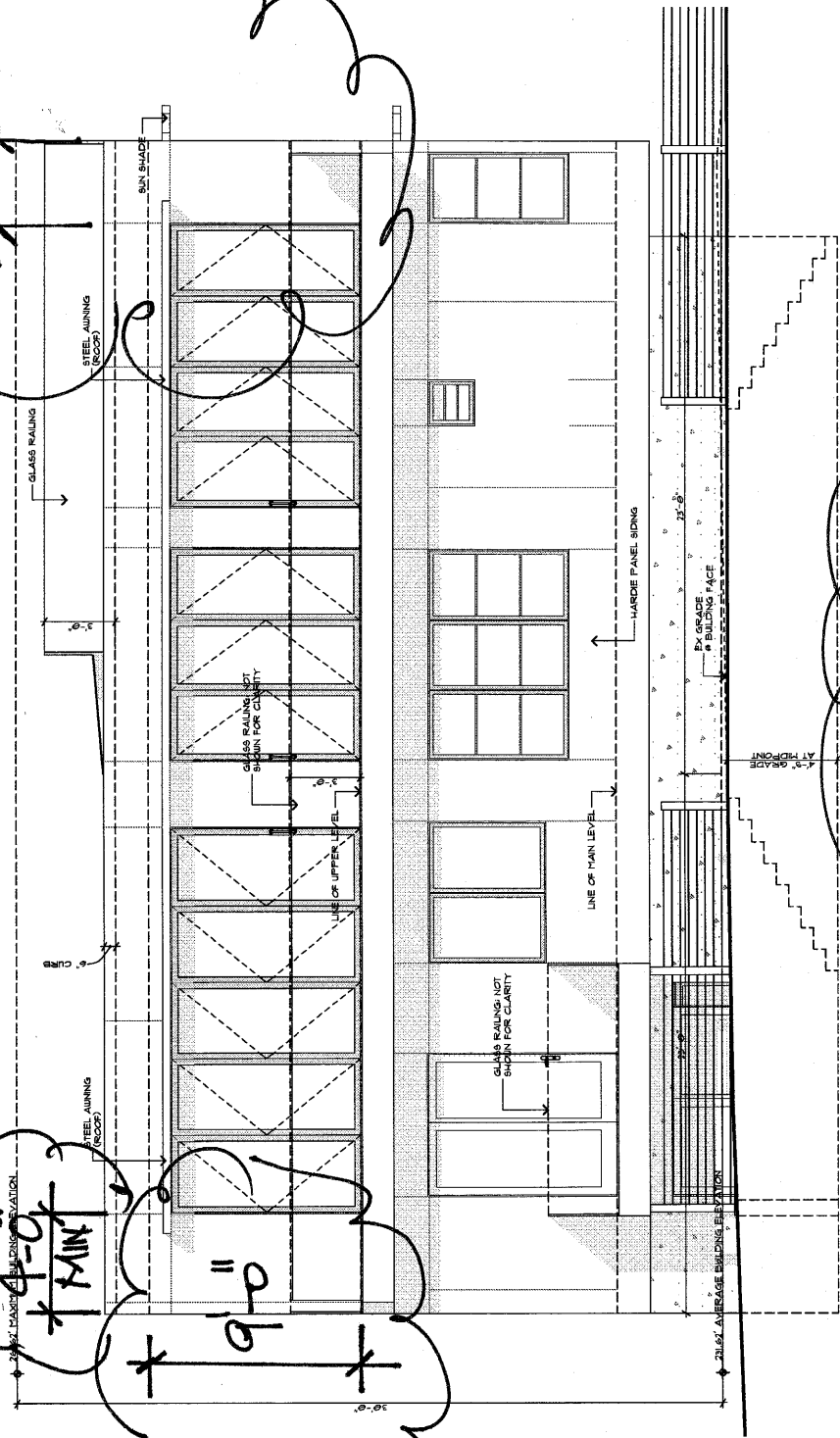
1'-6" MIN

4'-0" MIN

9'-0"

WEST ELEV.

FEB 6, 2023



FEB-6, 2023

SEISMIC:

@ Grid 'W': Roof: V = 3070 #
L = 3.5' + 4'

V_{wall} = 1433 lb.

V_{wall}' = 1433 lb (V_{wall} x R.F.)

L = 3.50 ft.

H = 9.00 ft.

V_{shear} = 409 plf < W3

T=C= 4299 lb.

WIND:

@ Grid 'W': Roof: F = 2940 #
L = 3.5' + 4'

F_{wall} = 1372 lb.

L = 3.50 ft.

H = 9.00 ft.

V_{shear} = 392 plf < W3

T=C= 4116 lb.

'MST 60' (5240)
OR 'HDU5' (5645)

V_{wall} = 1637 lb.

V_{wall}' = 1637 lb (V_{wall} x

L = 4.00 ft.

H = 9.00 ft.

V_{shear} = 409 plf < W3

T=C= 4209 lb.

F_{wall} = 1568 lb.

L = 4.00 ft.

H = 9.00 ft.

V_{shear} = 392 plf < W3

T=C= 4032 lb.

W3: 600 x 2 x 3.5' / 9' = 467 # > 409 # O.K.

SEISMIC:

@ Grid 'W': 2nd Flr: V = 4330 #
L = 5.25' + 5.25' + 6.5'

V_{wall} = 1337 lb.

V_{wall}' = 1337 lb (V_{wall} x R.F.)

L = 5.25 ft.

H = 10.50 ft.

V_{shear} = 255 plf

T=C= 2955 lb.

V_{wall} = 1656 lb.

V_{wall}' = 1656 lb (V_{wall} x R.F.)

L = 6.50 ft.

H = 10.50 ft.

V_{shear} = 255 plf

T=C= 2898 lb.

WIND:

@ Grid 'W': 2nd Flr: F = 5745 #
L = 5.25' + 5.25' + 6.5'

F_{wall} = 1774 lb.

L = 5.25 ft.

H = 10.50 ft.

V_{shear} = 338 plf

T=C= 3921 lb.

F_{wall} = 2197 lb.

L = 6.50 ft.

H = 10.50 ft.

V_{shear} = 338 plf

T=C= 3845 lb.

4299# - 0.47 x 1442# = 3621#

PER

CALC SHEET #R4

678#

SEISMIC:

@ Grid 'W': 1st Flr: V = 5840 #
L = 32' (8" Concrete Shearwall)

WIND:

@ Grid 'W': 1st Flr: F = 7670 #
L = 32' (8" Concrete Shearwall)

5/8" x 12" LAG SCREW

447# x 5.59" x 1.6 = 3998#
TABLE M
TABLE CP

L2

07/51.0 O.K.