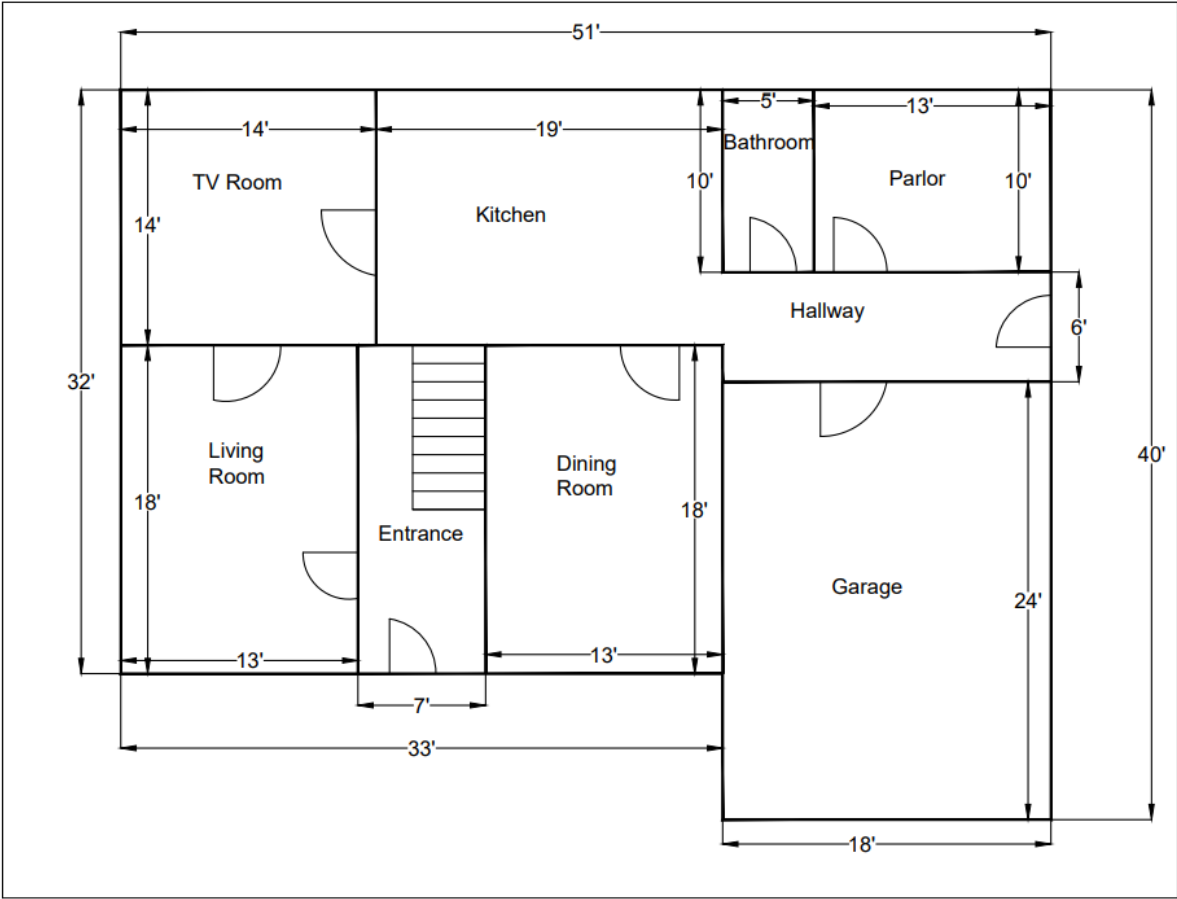


The Simpson's House

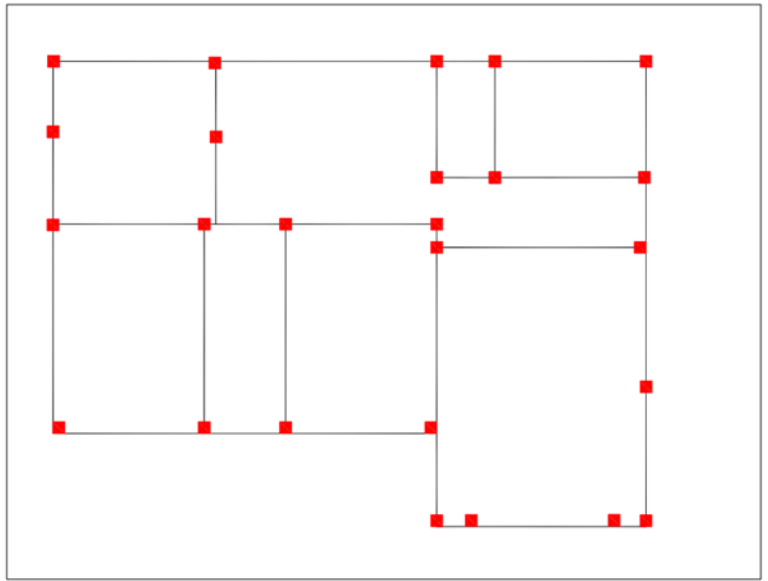
Structural Engineering Final Project

M.C

First Story Floor Plan

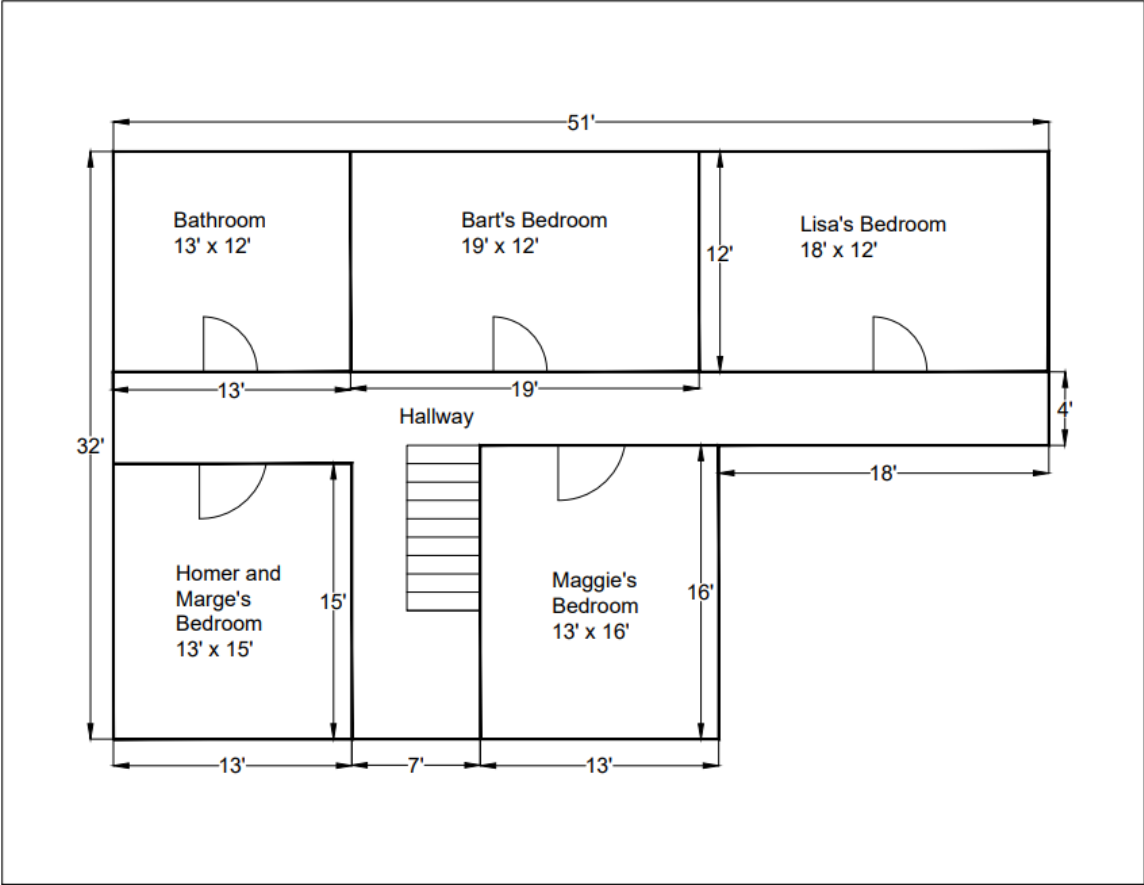


Simpson's House
Floor Plan: First Story
Structural Engineering Final Project

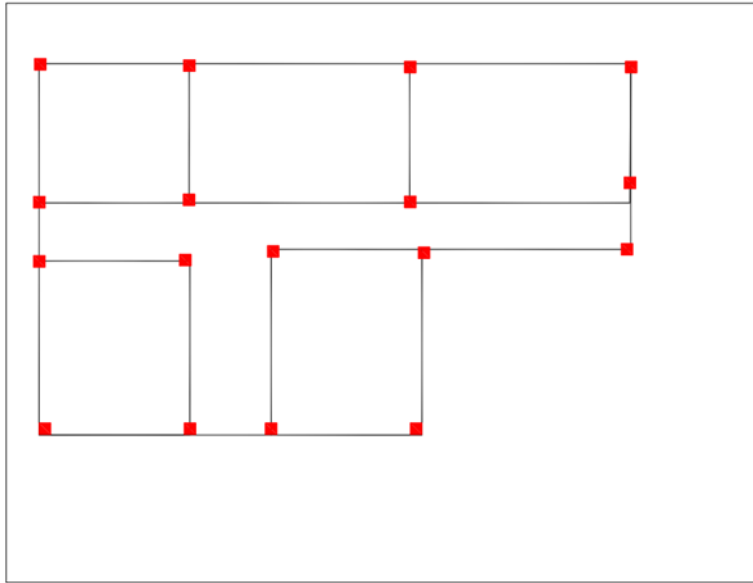


Simpson's House
Column Plan: First Story
Structural Engineering Final Project

Second Story Floor Plan

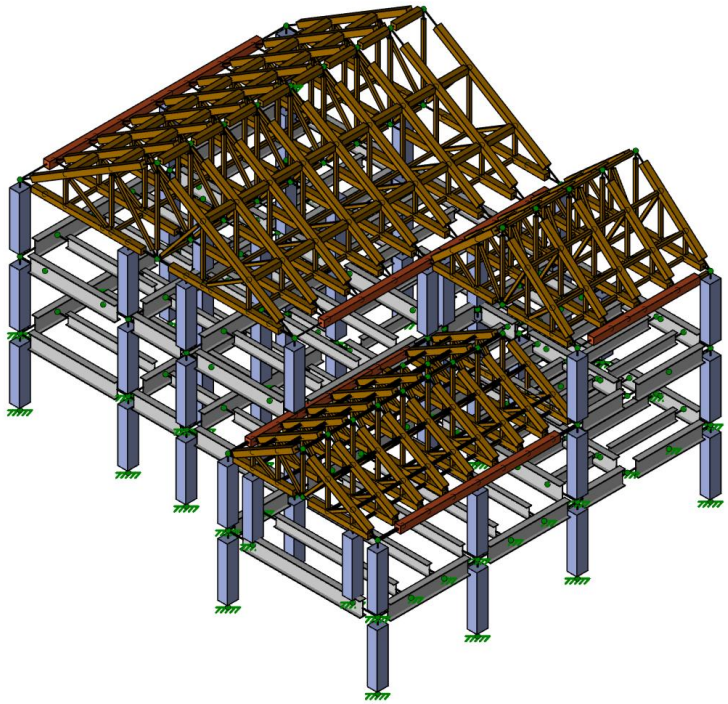


Simpson's House
Floor Plan: Second Story
Structural Engineering Final Project



Simpson's House
Column Plan: Second Story
Structural Engineering Final Project

Simpson's House on Risa Rendered View



Load Combinations

Gravity Wind Seismic

LC Region _____
LC Code _____

Seismic Load Options

None Reversible
 2D Only Include p
 X and Z Include Ev (vertical)
 X and Z w/Ecc Include Non Ortho (100%+30%)
 X and Z RSA

Add notional Loads to Seismic Load Combinations?

Overstrength LC Options

None Reversible
 2D Only Include Ev (vertical)
 X and Z Include Non Ortho (100%+30%)
 X and Z w/Ecc
 X and Z RSA

Capacity-Limited (CL) LC Options for Braced Frames

None Reversible
 2D Only Include Ev (vertical)
 X and Z Include Non Ortho (100%+30%)
 Include Non Ortho (100%+100%)

Gravity Wind Seismic

LC Region
LC Code

Wind Load Options

None Reversible
 2D Only
 X and Z
 X and Z w/Ecc
 X and Z w/Ecc, Quart

None
 Generate Roof Wind Loads?
 Generate Semi-Rigid Diaphragm Loads?
 Add Notional Loads to Wind Load Combinations?

Gravity Wind Seismic

LC Region
LC Code

Beam Deflection Options

Generate Deflection LC's

Roof Live Load Options

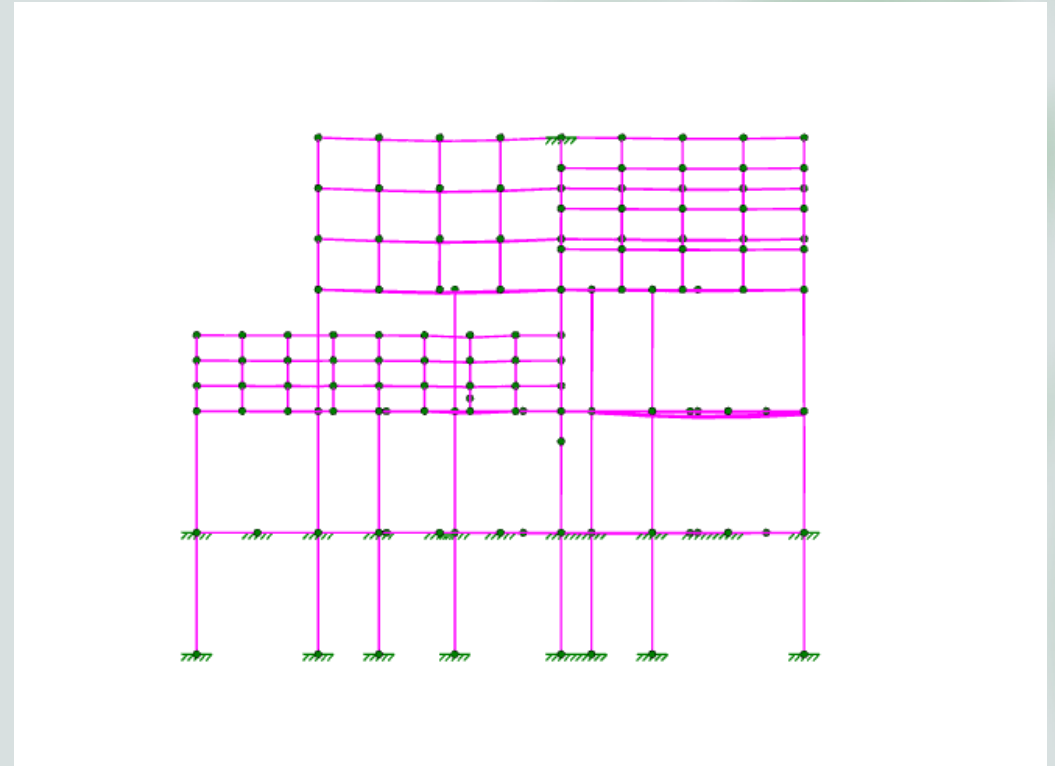
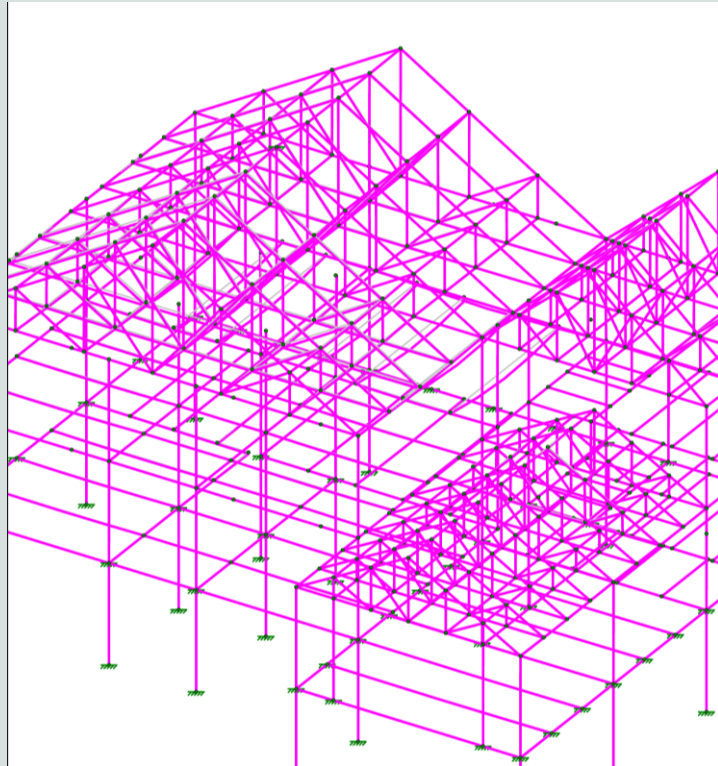
Include :

RLL (Roof Live Load)
 SL (Snow Load)
 RL (Rain Load)

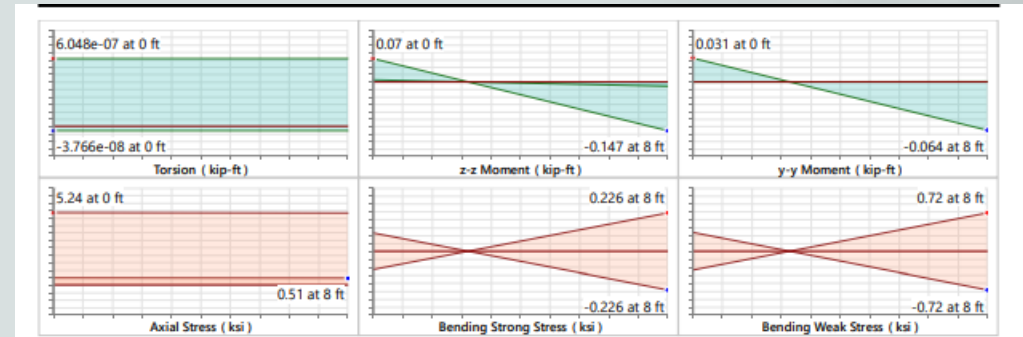
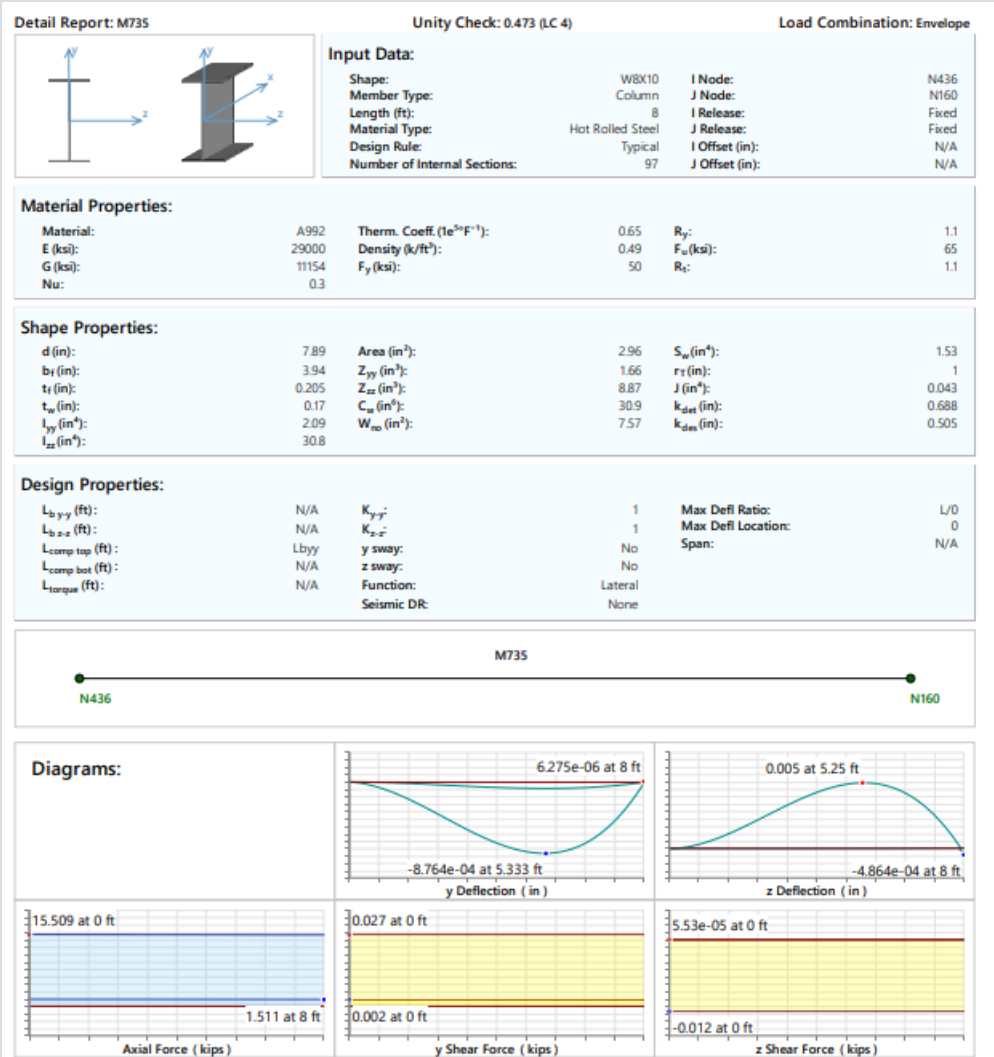
Notional Load Options

None Reversible
 2D Only
 X and Z

Deflection



Hot Rolled Steel Beam W8x10



AISC 15th (360-16): ASD Code Check

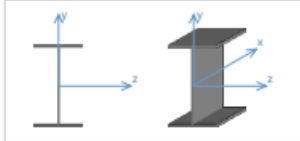
Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	4	-	-	-	-
Applied Loading - Shear + Torsion	4	-	-	-	-
Axial Tension Analysis	4	0.000 k	88.623 k	-	-
Axial Compression Analysis	4	15.429 k	34.087 k	-	-
Flexural Analysis (Strong Axis)	4	0.147 k-ft	21.87 k-ft	-	-
Flexural Analysis (Weak Axis)	4	0.064 k-ft	4.071 k-ft	-	-
Shear Analysis (Major Axis y)	4	0.027 k	26.826 k	0.001	Pass
Shear Analysis (Minor Axis z)	4	0.012 k	29.019 k	0.000	Pass
Bending & Axial Interaction Check (UC Bending Max)	4	-	-	0.473	Pass

Hot Rolled Steel Beam W14x43

Detail Report: M249

Unity Check: 0.936 (LC 4)

Load Combination: Envelope



Input Data:

Shape:	W14X43	I Node:	N146
Member Type:	Beam	J Node:	N147
Length (ft):	19	I Release:	Fixed
Material Type:	Hot Rolled Steel	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

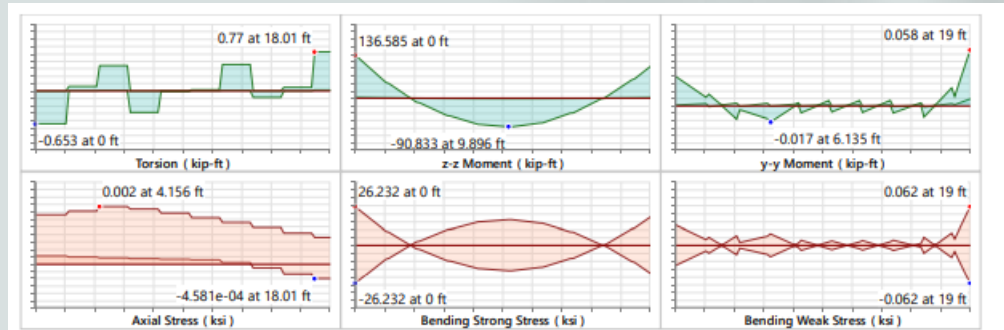
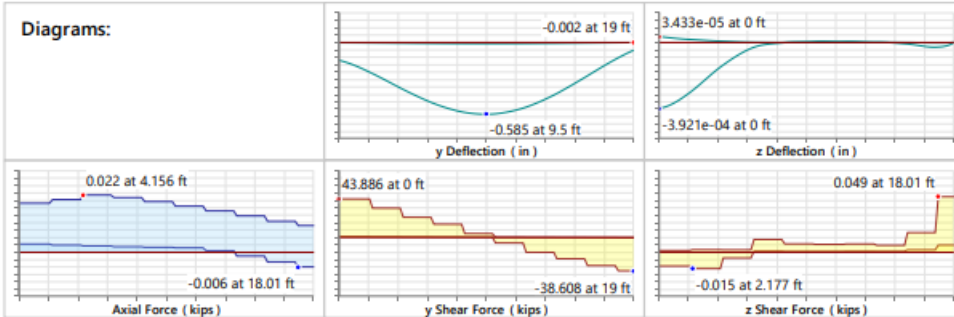
Material:	A992	Therm. Coeff. (1e-6/F-1):	0.65	R _y :	1.1
E (ksi):	29000	Density (k/ft ³):	0.49	F _u (ksi):	65
G (ksi):	11154	F _y (ksi):	50	R _c :	1.1
Nu:	0.3				

Shape Properties:

d (in):	13.7	Area (in ²):	12.6	S _w (in ⁴):	27.9
b _f (in):	8	Z _{yy} (in ³):	17.3	r ₁ (in):	2.14
t _f (in):	0.53	Z _{zz} (in ³):	69.6	J (in ⁴):	1.05
t _w (in):	0.305	C _w (in ⁶):	1950	k _{det} (in):	1.375
I _{yy} (in ⁴):	45.2	W _{pl} (in ³):	26.3	k _{des} (in):	1.12
I _{zz} (in ⁴):	428				

Design Properties:

L _{b y-y} (ft):	N/A	K _{y-y} :	1	Max Defl Ratio:	L/475
L _{b z-z} (ft):	N/A	K _{z-z} :	1	Max Defl Location:	9.698
L _{comp top} (ft):	L _{by}	y sway:	No	Span:	1
L _{comp bot} (ft):	N/A	z sway:	No		
L _{torsion} (ft):	N/A	Function:	Lateral		
		Seismic DR:	None		

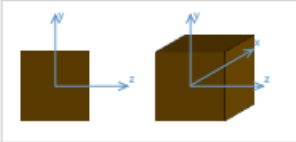


AISC 15th (360-16): ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	4	-	-	-	-
Applied Loading - Shear + Torsion	4	-	-	-	-
Axial Tension Analysis	4	0.000 k	377.246 k	-	-
Axial Compression Analysis	4	0.006 k	130.692 k	-	-
Flexural Analysis (Strong Axis)	4	136.585 k-ft	173.653 k-ft	-	-
Flexural Analysis (Weak Axis)	4	6.45 k-ft	43.164 k-ft	-	-
Shear Analysis (Major Axis y)	4	48.172 k	83.57 k	0.576	Pass
Shear Analysis (Minor Axis z)	4	10.202 k	152.335 k	0.067	Pass
Bending & Axial Interaction Check (UC Bending Max)	4	-	-	0.936	Pass

Douglas Fir 4x4

Detail Report: M724 Unity Check: 0.031 (LC 6) Load Combination: Envelope



Input Data:

Shape:	4X4 (nominal)	I Node:	N426
Member Type:	Column	J Node:	N428
Length (ft):	8.643	I Release:	BenPIN
Material Type:	Wood	J Release:	BenPIN
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

Material:	DF	Grade:	No.1	Nu:	0.3
Type:	Solid Sawn	Cm:	No	Therm. Coeff. (1e-5/F-1):	0.3
Database:	Visually Graded	Emod:	1	Density (k/ft³):	0.035
Species:	Douglas Fir-Larch				

Shape Properties:

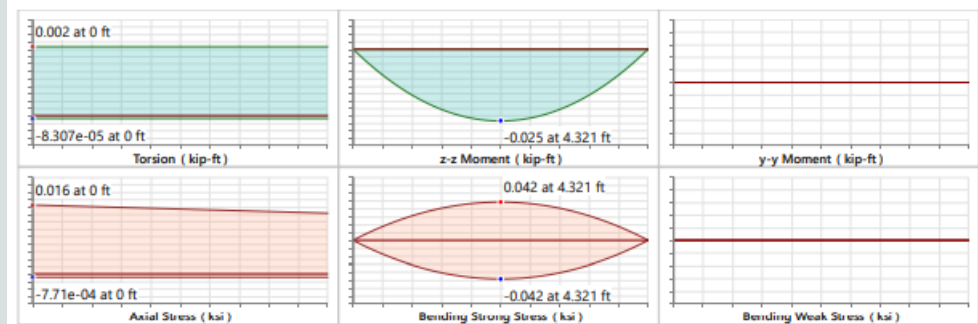
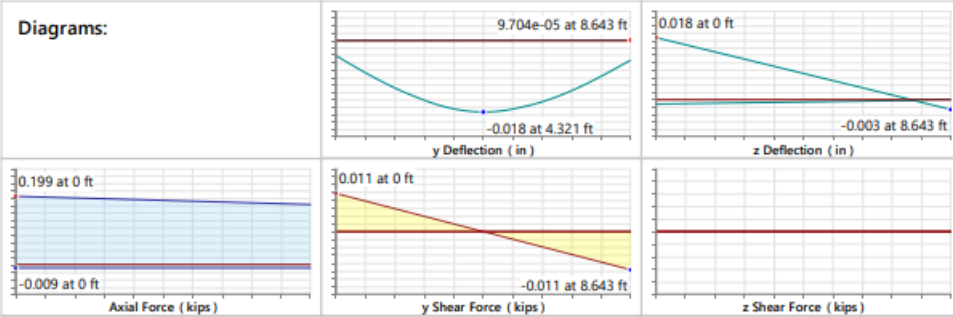
F _b (ksi):	1	E (ksi):	1700	E _{min} (ksi):	621.025
F _t (ksi):	0.675	E mod:	1	b (actual) (in):	3.5
F _v (ksi):	0.18	COV _E (Table F1):	0.25	d (actual) (in):	3.5
F _c (ksi):	1.5				

Design Properties:

le2 (ft):	N/A	C _D :	1	Max Defl Ratio:	L/6620
le1 (ft):	N/A	R _B :	5.444	Max Defl Location:	0
le-bend top (ft):	Lbyy	C _L :	1	Span:	N/A
le-bend bot (ft):	N/A	C _T :	1		
K _{y-y} :	1	C _M :	1		
K _{z-z} :	1	C _P :	0.309		
y sway:	No				
z sway:	No				



Diagrams:



AWC NDS-18: ASD Code Check

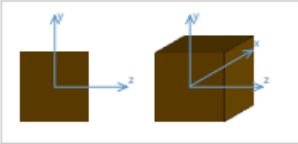
Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	6	-	-	-	-
Applied Loading - Shear + Torsion	20	-	-	-	-
Axial Compression Analysis		0.016 ksi	0.534 ksi	-	-
Axial Tension Analysis		0.000 ksi	1.013 ksi	-	-
Flexural Analysis, Fb1'		0.000 ksi	1.5 ksi	-	-
Flexural Analysis, Fb2'		0.000 ksi	1.5 ksi	-	-
Bending & Axial Compression Analysis		-	-	0.031	Pass
Bending & Axial Tension Analysis		-	-	0.000	Pass
Shear Analysis		0.004 ksi	0.18 ksi	0.022	Pass

Douglas fir 8x8

Detail Report: M723

Unity Check: 0.12 (LC 21)

Load Combination: Envelope



Input Data:

Shape:	8x8 (nominal)	I Node:	N213
Member Type:	Column	J Node:	N425
Length (ft):	19.294	I Release:	Fixed
Material Type:	Wood	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:

Material:	DF	Grade:	No.1	Nu:	0.3
Type:	Solid Sawn	Cm:	No	Therm. Coeff. (1e ⁻³ /°F):	0.3
Database:	Visually Graded	Emod:	1	Density (k/ft ³):	0.035
Species:	Douglas Fir-Larch				

Shape Properties:

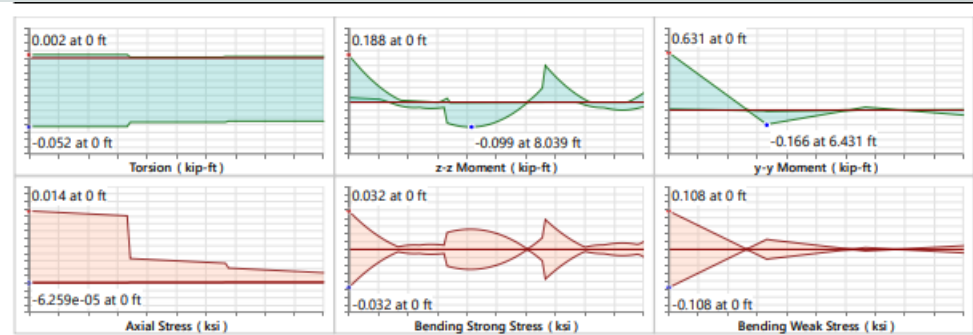
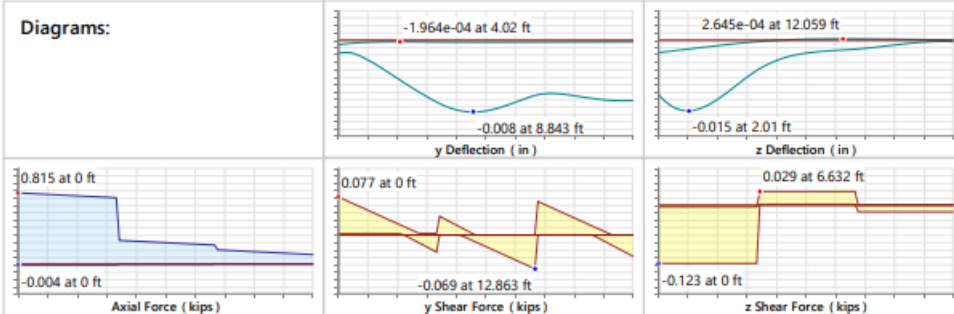
F ₁ (ksi):	1.2	E (ksi):	1600	E _{min} (ksi):	584.494
F ₂ (ksi):	0.825	E mod:	1	b (actual) (in):	7.5
F _v (ksi):	0.17	COV _E (Table F1):	0.25	d (actual) (in):	7.5
F _c (ksi):	1				

Design Properties:

le2 (ft):	N/A	C _D :	1	Max Defl Ratio:	L/10000
le1 (ft):	N/A	R _D :	5.556	Max Defl Location:	0
le-bend top (ft):	Lbyy	C _L :	1	Span:	N/A
le-bend bot (ft):	N/A	C _F :	1		
K _{y-y} :	1	C _B :	1		
K _{z-z} :	1	C _P :	0.437		
y sway:	No				
z sway:	No				



Diagrams:



AWC NDS-18: ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	21	-	-	-	-
Applied Loading - Shear + Torsion	6	-	-	-	-
Axial Compression Analysis		0.014 ksi	0.437 ksi	-	-
Axial Tension Analysis		0.000 ksi	0.825 ksi	-	-
Flexural Analysis, Fb1'		0.032 ksi	1.2 ksi	-	-
Flexural Analysis, Fb2'		0.107 ksi	1.2 ksi	-	-
Bending & Axial Compression Analysis		-	-	0.12	Pass
Bending & Axial Tension Analysis		-	-	0.116	Pass
Shear Analysis		0.01 ksi	0.17 ksi	0.062	Pass

Douglas Fir 2x3

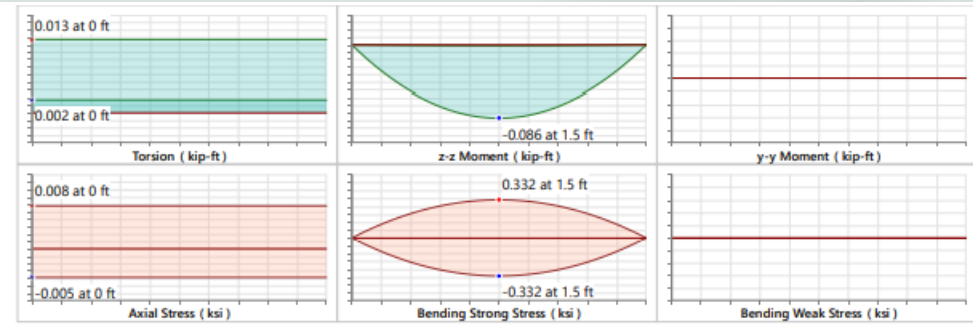
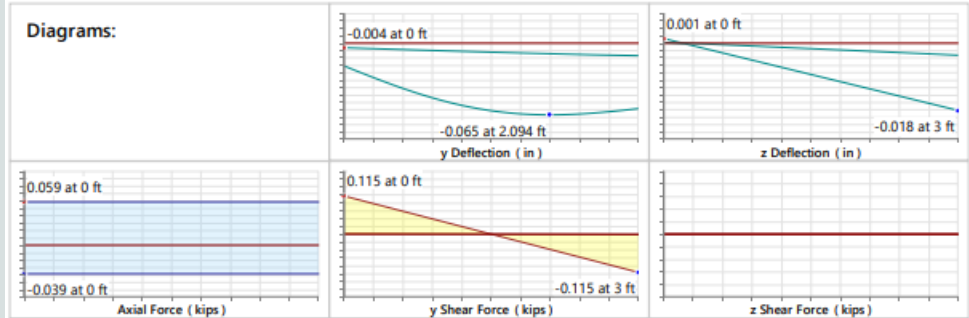
Detail Report: M78 Unity Check: 0.21 (LC 4) Load Combination: Envelope

Input Data:			
Shape:	2-2X3 (nominal)	I Node:	N69
Member Type:	Beam	J Node:	N81
Length (ft):	3	I Release:	BenPIN
Material Type:	Wood	J Release:	BenPIN
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A

Material Properties:			
Material:	DF	Grade:	No.1
Type:	Solid Sawn	Emod:	1
Database:	Visually Graded	Therm. Coeff. (1e-5/F°):	0.3
Species:	Douglas Fir-Larch	Density (k/ft³):	0.035

Shape Properties:			
F _b (ksi):	1	E (ksi):	1700
F _t (ksi):	0.675	E mod:	1
F _v (ksi):	0.18	COV _E (Table F1):	0.25
F _c (ksi):	1.5	E _{min} (ksi):	621.025
		b (actual) (in):	3
		d (actual) (in):	2.5
		# of Plies:	2
		K _c :	0.6

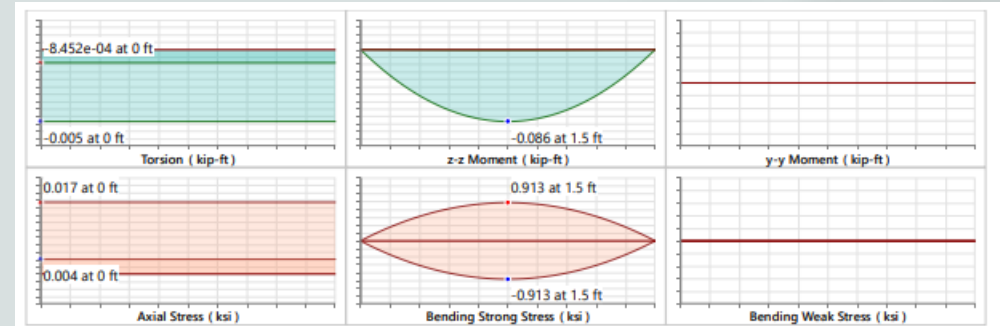
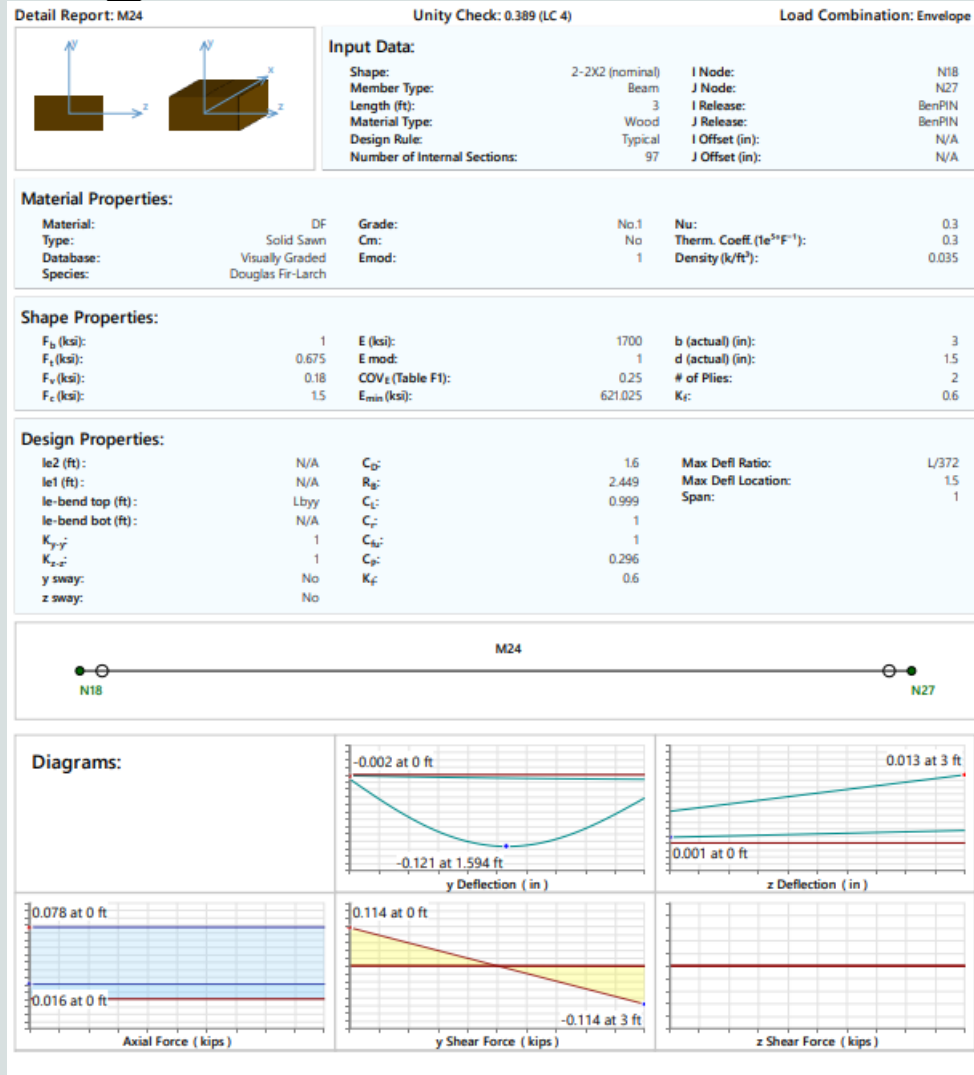
Design Properties:			
le2 (ft):	N/A	C _p :	1.6
le1 (ft):	N/A	R _g :	3.162
le-bend top (ft):	L _{byy}	C _L :	0.998
le-bend bot (ft):	N/A	C _T :	1
K _{y-y} :	1	C _M :	1
K _{z-z} :	1	C _P :	0.462
y sway:	No	K _F :	0.6
z sway:	No		
		Max Defl Ratio:	L/1707
		Max Defl Location:	1.5
		Span:	1



AWC NDS-18: ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	4	-	-	-	-
Applied Loading - Shear + Torsion	4	-	-	-	-
Axial Compression Analysis		0.008 ksi	1.275 ksi	-	-
Axial Tension Analysis		0.000 ksi	1.62 ksi	-	-
Flexural Analysis, Fb1'		0.332 ksi	2.396 ksi	-	-
Flexural Analysis, Fb2'		0.000 ksi	2.4 ksi	-	-
Bending & Axial Compression Analysis		-	-	0.139	Pass
Bending & Axial Tension Analysis		-	-	0.139	Pass
Shear Analysis		0.06 ksi	0.288 ksi	0.21	Pass

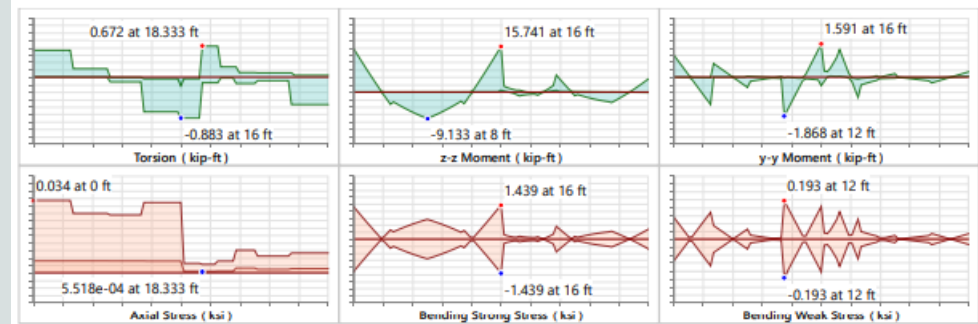
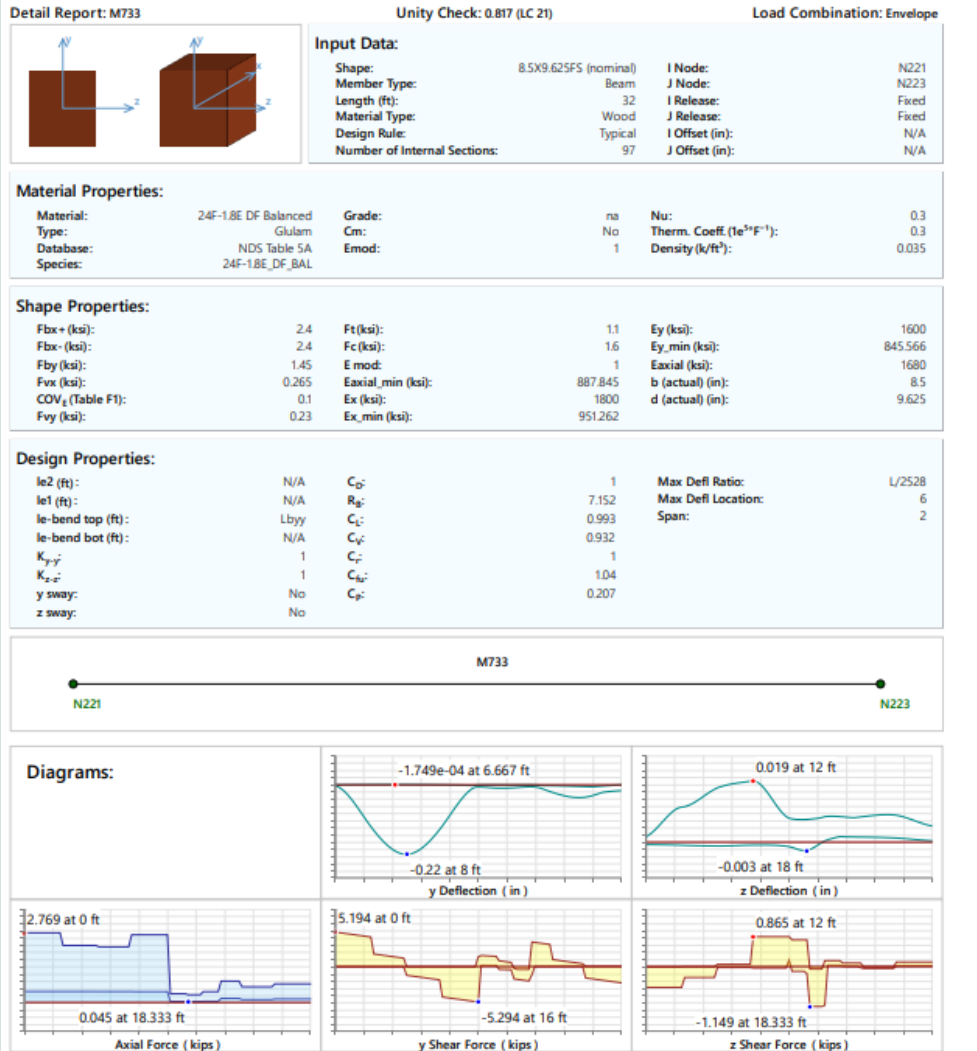
Douglas Fir 2x2



AWC NDS-18: ASD Code Check

Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	4	-	-	-	-
Applied Loading - Shear + Torsion	4	-	-	-	-
Axial Compression Analysis		0.017 ksi	0.817 ksi	-	-
Axial Tension Analysis		0.000 ksi	1.62 ksi	-	-
Flexural Analysis, Fb1'		0.913 ksi	2.398 ksi	-	-
Flexural Analysis, Fb2'		0.000 ksi	2.4 ksi	-	-
Bending & Axial Compression Analysis		-	-	0.389	Pass
Bending & Axial Tension Analysis		-	-	0.381	Pass
Shear Analysis		0.071 ksi	0.288 ksi	0.248	Pass

Glulam Beam



AWC NDS-18: ASD Code Check

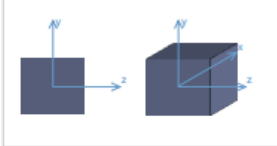
Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial	21	-	-	-	-
Applied Loading - Shear + Torsion	21	-	-	-	-
Axial Compression Analysis		0.033 ksi	0.332 ksi	-	-
Axial Tension Analysis		0.000 ksi	1.1 ksi	-	-
Flexural Analysis, Fb1'		1.439 ksi	2.236 ksi	-	-
Flexural Analysis, Fb2'		0.159 ksi	1.508 ksi	-	-
Bending & Axial Compression Analysis		-	-	0.817	Pass
Bending & Axial Tension Analysis		-	-	0.749	Pass
Shear Analysis		0.157 ksi	0.265 ksi	0.591	Pass

Concrete Column

Detail Report: M313

Unity Check: 0.087 (shear)

Load Combination: Envelope



Input Data:

Shape:	CRECT14X16	I Node:	N134
Member Type:	Column	J Node:	N221
Length (ft):	8	I Release:	Fixed
Material Type:	Concrete	J Release:	Fixed
Design Rule:	Typical	I Offset (in):	N/A
Number of Internal Sections:	97	J Offset (in):	N/A
Design Code:	ACI 318-19		

Material Properties:

Material:	Conc3000NW	Therm. Coeff. (1e ⁻⁶ /F ¹):	0.6	Lambda:	1
E (ksi):	3156	Density (k/ft ³):	0.145	Flex Steel (ksi):	60
G (ksi):	1372	Fc (ksi):	3	Shear Steel (ksi):	60
Nu:	0.15				

Shape Properties:

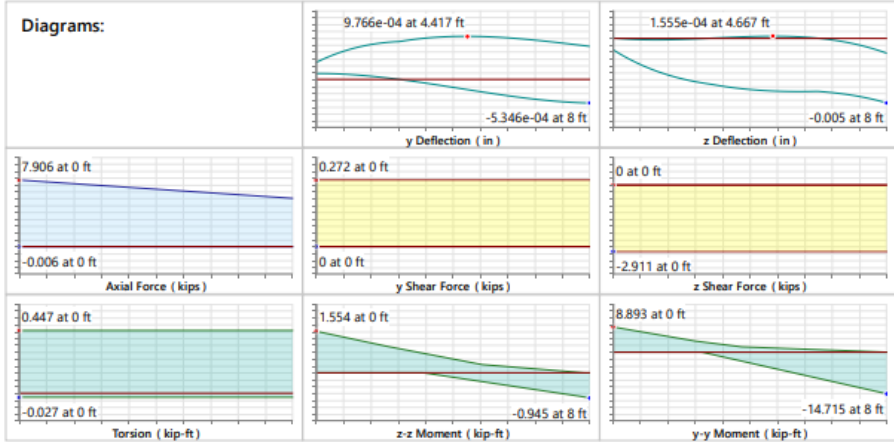
D (in):	14	W (in):	16
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Design Properties:

C _{m-y-y} :	N/A	Concrete Stress Block:	Rectangular	Flex Rebar Set:	ASTM A615
C _{m-z-z} :	N/A	Cracked Sections Used:	Yes	Shear Rebar Set:	ASTM A615
K _{y-y} :	1	Cracked "I" Factor:	0.7	Top Cover (in):	1.5
K _{z-z} :	1	Effective "I" (in ⁴):	2561.067	Bottom Cover (in):	1.5
y sway:	No	Effective "I" (Service) (in ⁴):	3662.325	Side Cover (in):	1.5
z sway:	No			Legs/Stirrup:	2



Diagrams:



Limit State	Gov. LC	Required	Available	Unity Check	Result
Applied Loading - Bending/Axial					
Flexural Reinforcement	6	2.24 in ²	2.405 in ²	-	Pass
Axial Capacity	6	0.000 k	461.099 k	0.045	Pass
Bending Unity Check	6	-	-	0.076	Pass
Y Shear Design Strength	19	0.272 k	30.398 k	0.009	Pass
Z Shear Design Strength	21	2.911 k	33.339 k	0.087	Pass
Threshold Torsion		0.128 k-ft	2.907 k-ft	1	Pass
Span Information					
Rebar Detailing					

Materials Used

Material	Size	Pieces	Length (ft)	Weight (K)	Price Per Piece	Total Price
Hot Rolled Steel						
A992	W8x10	39	312	9.385	98.19	3829.41
A992	W14x43	56	649	19.544	649.5	36372
Total		95	961	28.929		40201.41
Wood						
24F-1.8E DF Balanced Glulam	8.5x9.625FS	6	144	2.864	100.71	604.26
DF	10x12	125	1402	87.238	24.95	3118.75
DF	2-2x2	88	264	0.289	5.58	491.04
DF	2-2x3	8	24	0.044	3.15	25.2
DF	4x4	290	1372.2	4.086	9.98	2894.2
DF	8x8	131	1351.7	18.481	14.65	1919.15
Total		648	4557.9	113.001		9052.6
Concrete			Volume (yds^3)			
Conc3000NW	CRECT12x14	17	5.9	23.007	117	195.56
		17	5.9	23.007	117	195.56
Total Material Cost						49449.57