CIVIL/STRUCTURAL ENGINEERING DEPARTMENT

STRUCTURAL CALCULATIONS
STEIGERWALT RESIDENCE
ROOF IMPROVEMENTS AT PV PANELS

5424 Se 64th Ave
Portland, Oregon

January 9, 2024

DESIGN PARAMETERS:

2022 Oregon Structural Specialty Code

Supervising Engineer:	**Trevor Jones, PE**	**(208)-994-1680**
Structural Project Manager:	**Troy Custodio**	**(208)-994-1680**

ROOF DEAD LOAD…..... 7 psf
SOLAR DEAD LOAD…..... 2.53 psf
LIVE (SNOW) LOAD…..... 20 psf (non-reducible)

CONTENTS:

SOLGEN POWER
CIVIL/STRUCTURAL ENGINEERING DEPARTMENT

Subject: STEIGERWALT RESIDENCE ROOF 1
Engineer: TAJ Eng. Tech: Troy Custodio
Date: 12/28/2023

Project Notes

* Point load locations and tributary areas have been measured by hand from the plans. Although multiple loading conditions exist, the one that has been selected for analysis is believed to be the most conservative, based on engineering judgement, considering point load locations, quantity, and magnitudes, and location of intermediate supports (if any).

Distributed Loading

Existing Dead Load - Rafter/TC

Asphalt Shingles	3	psf
1/2" Plywood	1.5	psf
Framing	--	psf*
M,E, & Misc	0.5	psf
Total Existing Dead Load - TC*	5	psf

* - framing accounted for with member self-weight in RISA, not included in this calc.

Existing Dead Load - Joist/BC

1/2" Gypsum	1.5	psf
Blown-In Insulation	0.5	psf
Framing	--	psf*
Total Existing Dead Load - BC*	2	psf
Solar Panel Dead Load	2.53	psf

Snow Load

Sloped Roof Snow Load	20.0	psf

Note: Roof Live Load will not govern over snow loads, and is therefore not treated in this analysis. ($p_{snow} = p_{RLL}$, but $C_{d,snow} < C_{d,RLL}$. Also, RLL may be removed where panels are located per the IBC, while snow loads are non-reducible.)

Line and Point Loading

Line Loads

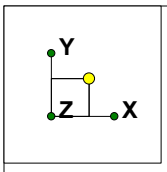
Tributary Width	2	ft
Dead Load - TC	**10**	**plf**
Dead Load - BC	**4**	**plf**
Snow Load	**40**	**plf**

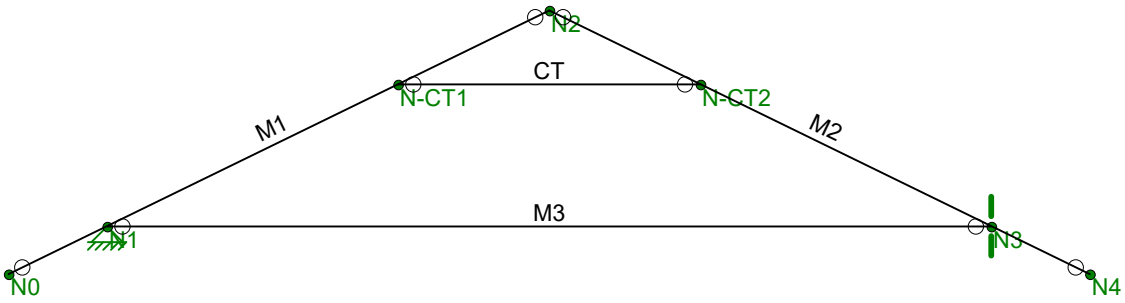
	Start Loc	End Loc	
Snow Shade Locations on Left Roof	**0.80**	**7.60**	**ft from rafter end**
Snow Shade Locations on Right Roof	**3.00**	**12.15**	**ft from ridge**

Point Loads

	Trib area (ft^2)	Location (ft)	Solar pt load	Snow pt load	
Right Roof Load #1	11.5	7.25	**29.095**	**230**	**lbs**
Right Roof Load #2	7	11.15	**17.71**	**140**	**lbs**

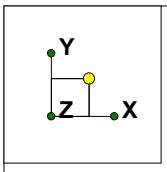
Right Roof Load #1	11.5	4.5	**29.095**	**230**	**lbs**
Right Roof Load #2	7	9.75	**17.71**	**140**	**lbs**

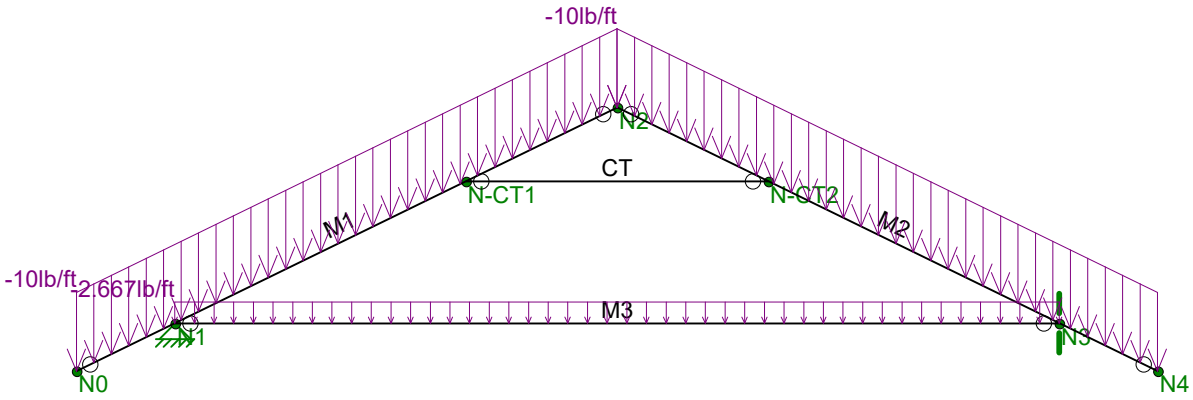




Envelope Only Solution

Solgen Power	Steigerwalt Roof 1	SK - 1
TAJ		Dec 28, 2023 at 2:33 AM
		Matthew Steigerwalt - RISA.r2d





Loads: BLC 1, DL
Envelope Only Solution

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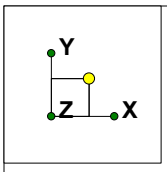
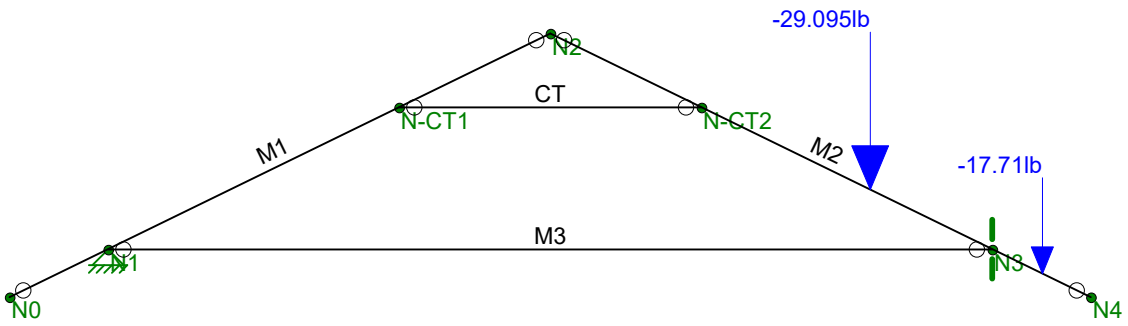
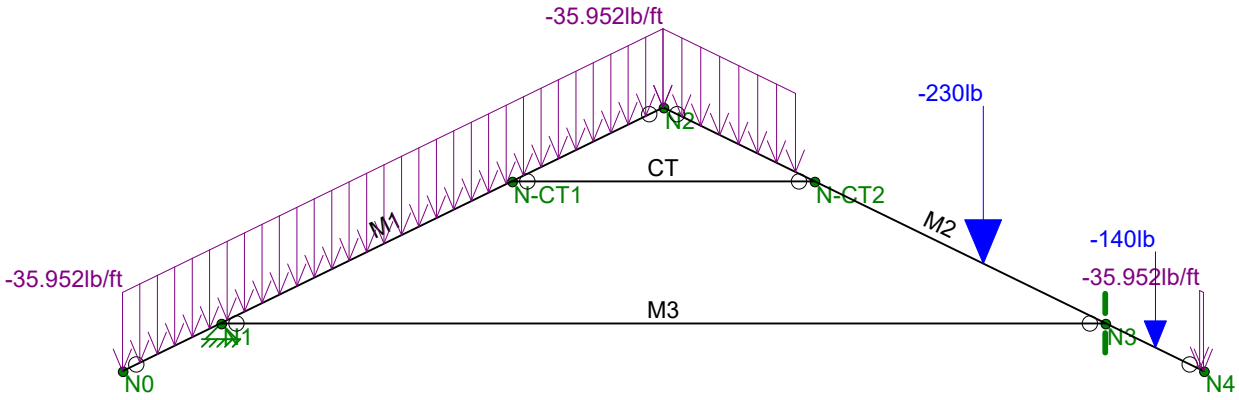
TAJ		Dec 28, 2023 at 2:34 AM
		Matthew Steigerwalt - RISA.r2d





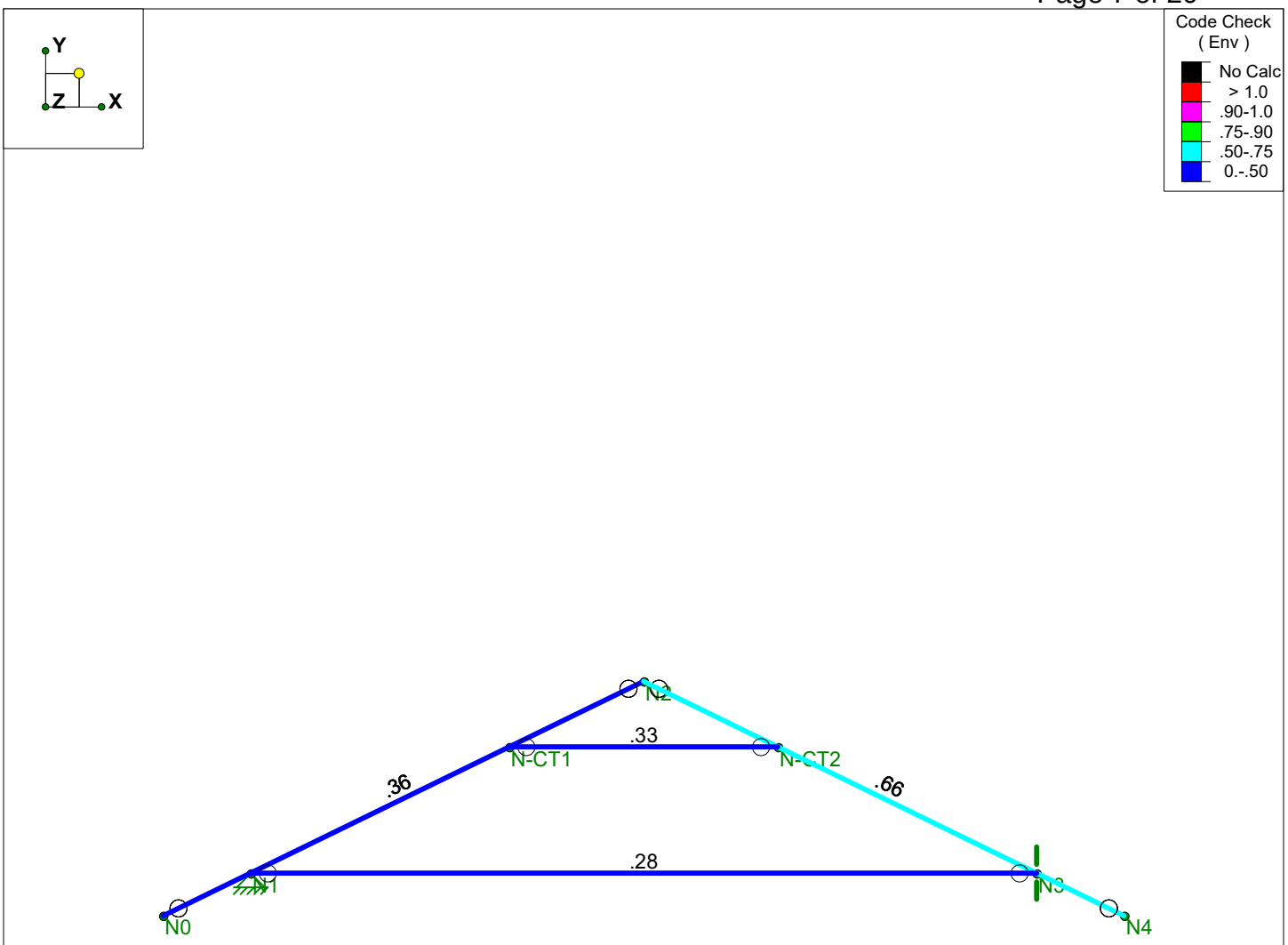
Loads: BLC 2, DL - Solar
Envelope Only Solution

Solgen Power	Steigerwalt Roof 1	SK - 3
TAJ		Dec 28, 2023 at 2:34 AM
		Matthew Steigerwalt - RISA.r2d



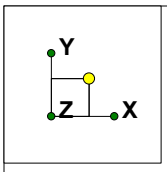
Loads: BLC 3, SL
Envelope Only Solution

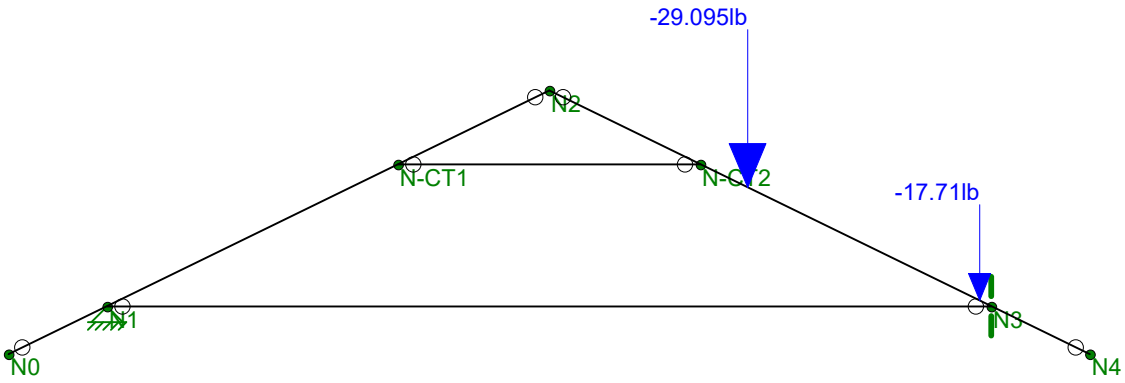
Solgen Power	Steigerwalt Roof 1	SK - 4
TAJ		Dec 28, 2023 at 2:34 AM
		Matthew Steigerwalt - RISA.r2d



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

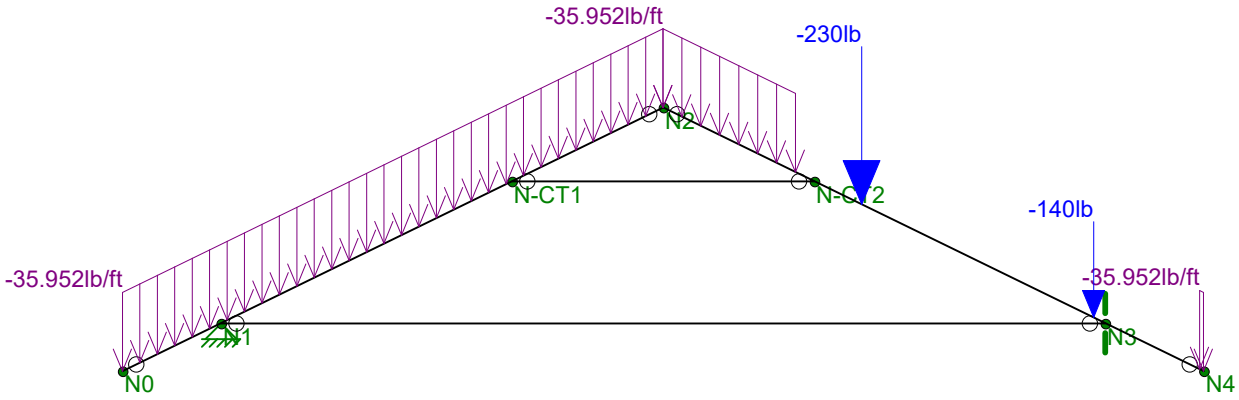
Solgen Power	Steigerwalt Roof 1	SK - 5
TAJ		Dec 28, 2023 at 2:34 AM
		Matthew Steigerwalt - RISA.r2d





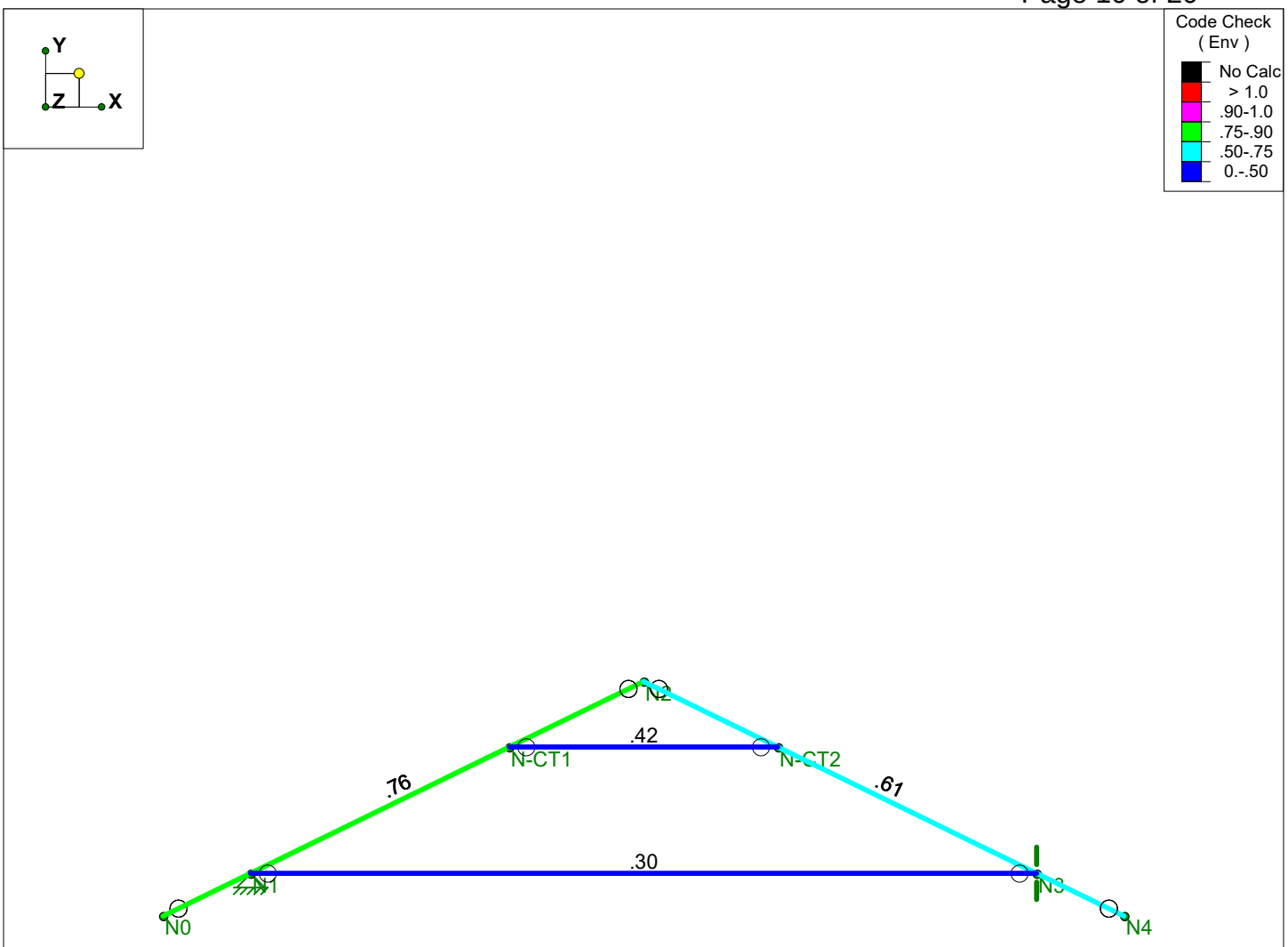
Loads: BLC 2, DL - Solar
Envelope Only Solution

Solgen Power	Steigerwalt Roof 1	SK - 6
TAJ		Jan 10, 2024 at 3:38 AM
		Matthew Steigerwalt - RISA.r2d



Loads: BLC 3, SL
Envelope Only Solution

Solgen Power	Steigerwalt Roof 1	SK - 7
TAJ		Jan 10, 2024 at 3:38 AM
		Matthew Steigerwalt - RISA.r2d



Member Code Checks Displayed (Enveloped)
Loads: BLC 4,
Envelope Only Solution

Solgen Power	Steigerwalt Roof 1	SK - 8
TAJ		Jan 10, 2024 at 3:38 AM
		Matthew Steigerwalt - RISA.r2d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	0.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th (360-16): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-16: ASD
Wood Code	AWC NDS-18: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-19
Masonry Code	TMS 402-16: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Wood Material Properties

	Label	Type	Database	Species	Grade	Cm	Ci	Emod	Nu	Therm (/...	Dens[k/ft...
1	DF	Solid Sa...	Visually ...	Douglas F...	No.2			1	0.3	0.3	0.035
2	SP	Solid Sa...	Visually ...	Southern ...	No.1			1	0.3	0.3	0.035
3	HF	Solid Sa...	Visually ...	Hem-Fir	No.1			1	0.3	0.3	0.035
4	SPF	Solid Sa...	Visually ...	Spruce-Pi...	No.1			1	0.3	0.3	0.035
5	24F-1.8E DF Bala...	Glulam	NDS Ta...	24F-1.8E...	na			1	0.3	0.3	0.035
6	24F-1.8E DF Unba...	Glulam	NDS Ta...	24F-1.8E...	na			1	0.3	0.3	0.035
7	24F-1.8E SP Bala...	Glulam	NDS Ta...	24F-1.8E...	na			1	0.3	0.3	0.035
8	24F-1.8E SP Unba...	Glulam	NDS Ta...	24F-1.8E...	na			1	0.3	0.3	0.035
9	1.3E-1600F_VERS...	SCL	Boise Ca...	1.3E-160...	na			1	0.3	0.3	0.035
10	1.35E LSL_SolidSt...	SCL	Louisian...	1.35E LS...	na			1	0.3	0.3	0.035
11	1.3E_RIGIDLAM L...	SCL	SCL	1.3E_RIG...	na			1	0.3	0.3	0.035
12	2.0E_DF Parallam ...	SCL	TrusJoist	2.0E_DF ...	na			1	0.3	0.3	0.035
13	LVL_PRL_1.5E_2...	Custom	N/A	LVL_PRL...	na			1	0.3	0.3	0.035
14	LVL_Microlam_1.9...	Custom	N/A	LVL_Micr...	na			1	0.3	0.3	0.035
15	PSL_Parallam_2.0...	Custom	N/A	PSL_Para...	na			1	0.3	0.3	0.035
16	LSL_TimberStrand...	Custom	N/A	LSL_Timb...	na			1	0.3	0.3	0.035

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N0	-2	-0.975465	0
2	N1	0	0	0
3	N2	9	4.389593	0
4	N3	18	0	0
5	N4	20	-0.975465	0
6	N-CT1	5.924544	2.889593	0
7	N-CT2	12.075456	2.889593	0

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	DL	DL		-1			3
2	DL - Solar	DL				2	
3	SL	SL				2	3

Load Combinations

	Description	Solve	PDelta	S...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...
1	DL	Yes	Y		DL	1																		
2	DL + SL	Yes	Y		DL	1	SL	1																

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N0	N2		Rafter / TC	None	None	DF	Typical
2	M2	N2	N4		Rafter / TC	None	None	DF	Typical
3	M3	N1	N3		Joist / BC	None	None	DF	Typical
4	CT	N-CT1	N-CT2		Collar Tie	None	None	DF	Typical

Wood Design Parameters

	Label	Shape	Length[ft]	Le-out[ft]	Le-in[ft]	le-bend to...	le-bend bo...	K-out	K-in	CV	Cr	Out sway	In sway
1	M1	Rafter / TC	12.239	1	Segment	Lb out	Segment						
2	M2	Rafter / TC	12.239	1	Segment	Lb out	Segment						
3	M3	Joist / BC	18	1		Lb out							
4	CT	Collar Tie	6.151			Lb out							

Wood Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [i...	I (0,180) [in4]
1	Rafter / TC	2x4	None	None	DF	Typical	5.25	0.984	5.359
2	Joist / BC	2x6	None	None	DF	Typical	8.25	1.547	20.797
3	Sister	2x4	None	None	DF	Typical	5.25	0.984	5.359
4	Brace/post/k...	2x4	None	None	DF	Typical	5.25	0.984	5.359
5	Collar Tie	2x6	None	None	DF	Typical	8.25	1.547	20.797
6	Webbing	2x4	None	None	DF	Typical	5.25	0.984	5.359

Envelope Member End Reactions

	Member	Membe...		Axial[lb]	LC	Shear[lb]	LC	Moment[lb-ft]	LC
1	M1	I	max	0	2	0.001	1	0	1
2			min	0	1	-0.056	2	0	1
3		J	max	54.998	2	-3.554	1	0	1

Envelope Member End Reactions (Continued)

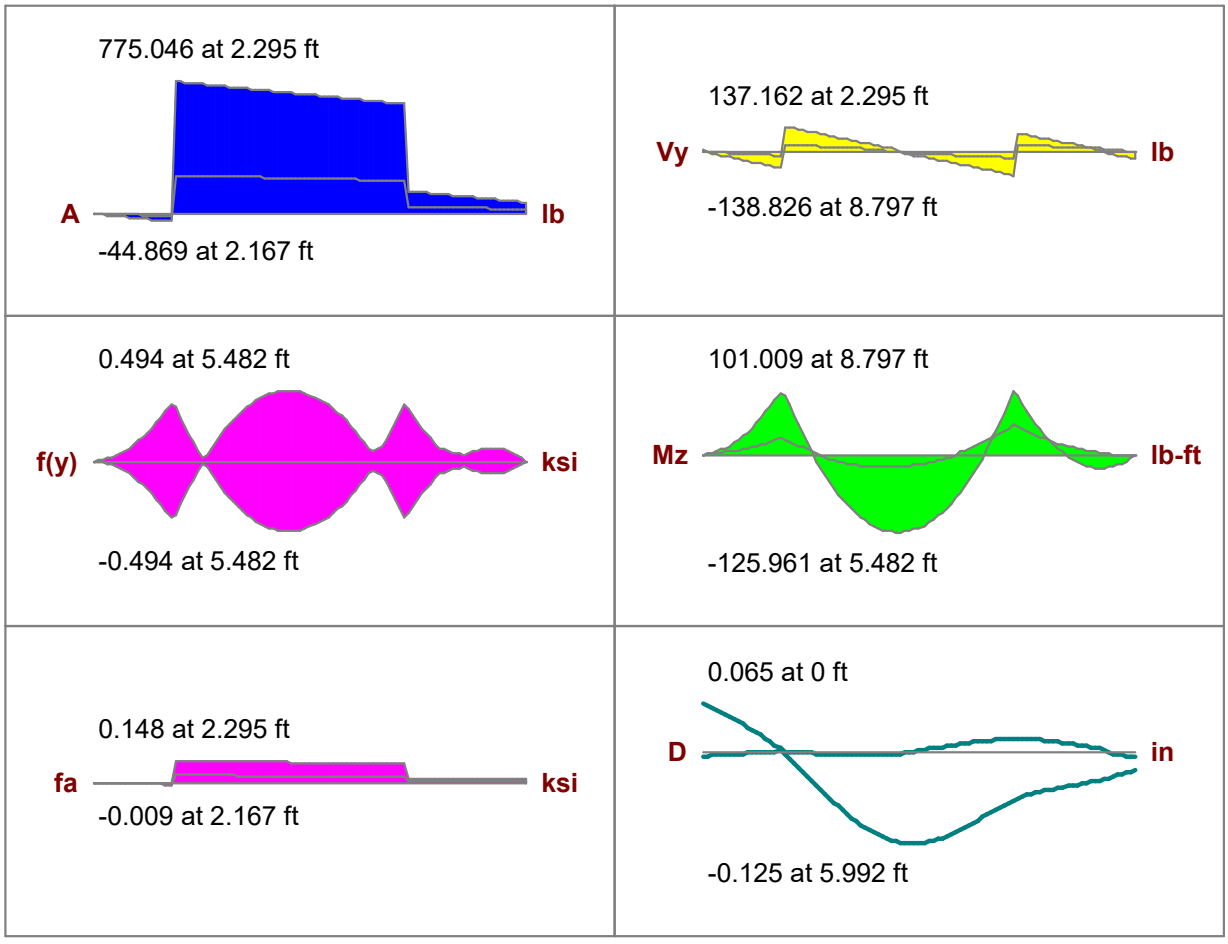
	Member	Membe...		Axial[lb]	LC	Shear[lb]	LC	Moment[lb-ft]	LC
4			min	14.408	1	-42.282	2	0	1
5	M2	I	max	67.108	2	17.277	2	0	1
6			min	11.681	1	9.17	1	0	1
7		J	max	0	2	0.025	2	0	1
8			min	0	1	0.01	1	0	1
9	M3	I	max	-181.684	1	42.047	1	0	1
10			min	-636.736	2	42.047	1	0	1
11		J	max	-181.684	1	-42.047	1	0	1
12			min	-636.736	2	-42.047	1	0	1
13	CT	I	max	568.809	2	6.167	1	0	1
14			min	167.171	1	6.167	1	0	1
15		J	max	568.809	2	-6.167	1	0	1
16			min	167.171	1	-6.167	1	0	1

Envelope Wood Code Checks

	Member	Shape	Code Check	Loc[ft]	LC	Shear ...	Loc[ft]	LC	Fc' [k..	Ft' [ksi]	Fb' [k..	Fv' [k...	RB	CL	CP	Eqn
1	M1	2x4	0.356	5.482	2	0.192	8.797	2	0.865	1.164	1.721	0.207	4.32	0.998	0.436	3.9-3
2	M2	2x4	0.657	7.267	2	0.233	9.944	2	0.865	1.164	1.721	0.207	4.32	0.998	0.436	3.9-3
3	M3	2x6	0.277	9	2	0.042	18	1	0.318	1.009	1.49	0.18	5.416	0.997	0.168	3.9-1
4	CT	2x6	0.335	6.151	2	0.006	6.151	1	0.206	1.009	1.455	0.18	13.432	0.974	0.108	3.6.3

Member: ***M1***

Shape: **2x4**
Material: **DF**
Length: **12.239 ft**
I Joint: **N0**
J Joint: **N2**
Envelope
Code Check: **0.356 (LC 2)**
Report Based On 97 Sections



AWC NDS-18: ASD Code Check

Max Bending Check	**0.356 (LC 2)**	Max Shear Check	**0.192 (LC 2)**
Location	**5.482 ft**	Location	**8.797 ft**
Equation	**3.9-3**	Max Defl Ratio	**L/994**

CD **1.15** RB **4.32** CL **0.998**
Cr **1** Cfu **1** CP **0.436**

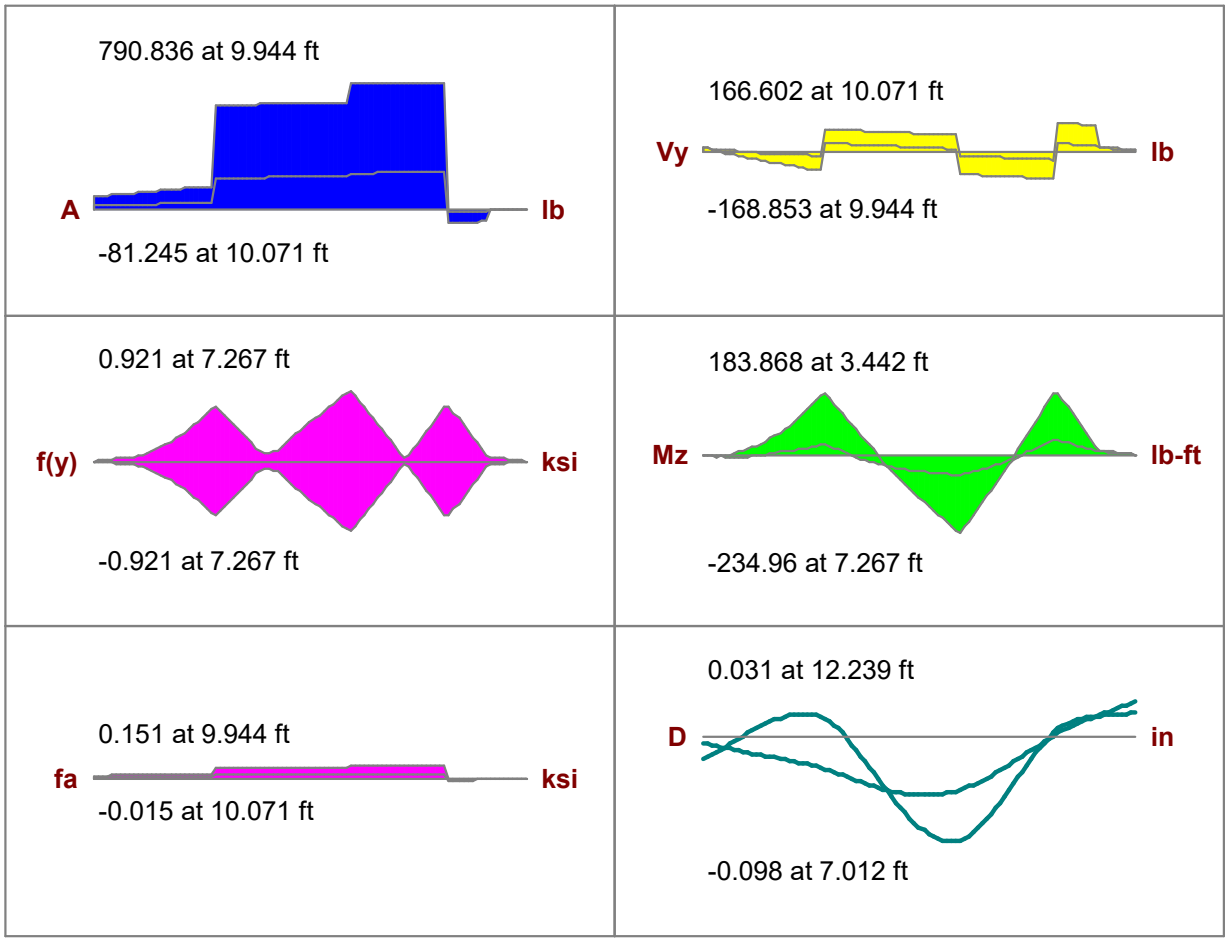
	(ksi)	Cm	Ct	CF	Ci
Fc'	**0.865**	**1**	**1**	**1.15**	**1**
Ft'	**1.164**	**1**	**1**	**1.5**	**1**
Fb'	**1.721**	**1**	**1**	**1.5**	**1**
Fv'	**0.207**	**1**	**1**		**1**
E'	**1700**	**1**	**1**		**1**

	Out	In
Lb	**1 ft**	**6.592 ft**
le/d	**8**	**22.6**
Sway	**No**	**No**

Le-Bending Top **1 ft**
Le-Bending Bot **6.592 ft**

Member: ***M2***

Shape: **2x4**
Material: **DF**
Length: **12.239 ft**
I Joint: **N2**
J Joint: **N4**
Envelope
Code Check: **0.657 (LC 2)**
Report Based On 97 Sections



AWC NDS-18: ASD Code Check

Max Bending Check	**0.657 (LC 2)**	Max Shear Check	**0.233 (LC 2)**
Location	**7.267 ft**	Location	**9.944 ft**
Equation	**3.9-3**	Max Defl Ratio	**L/1456**

CD **1.15** RB **4.32** CL **0.998**
Cr **1** Cfu **1** CP **0.436**

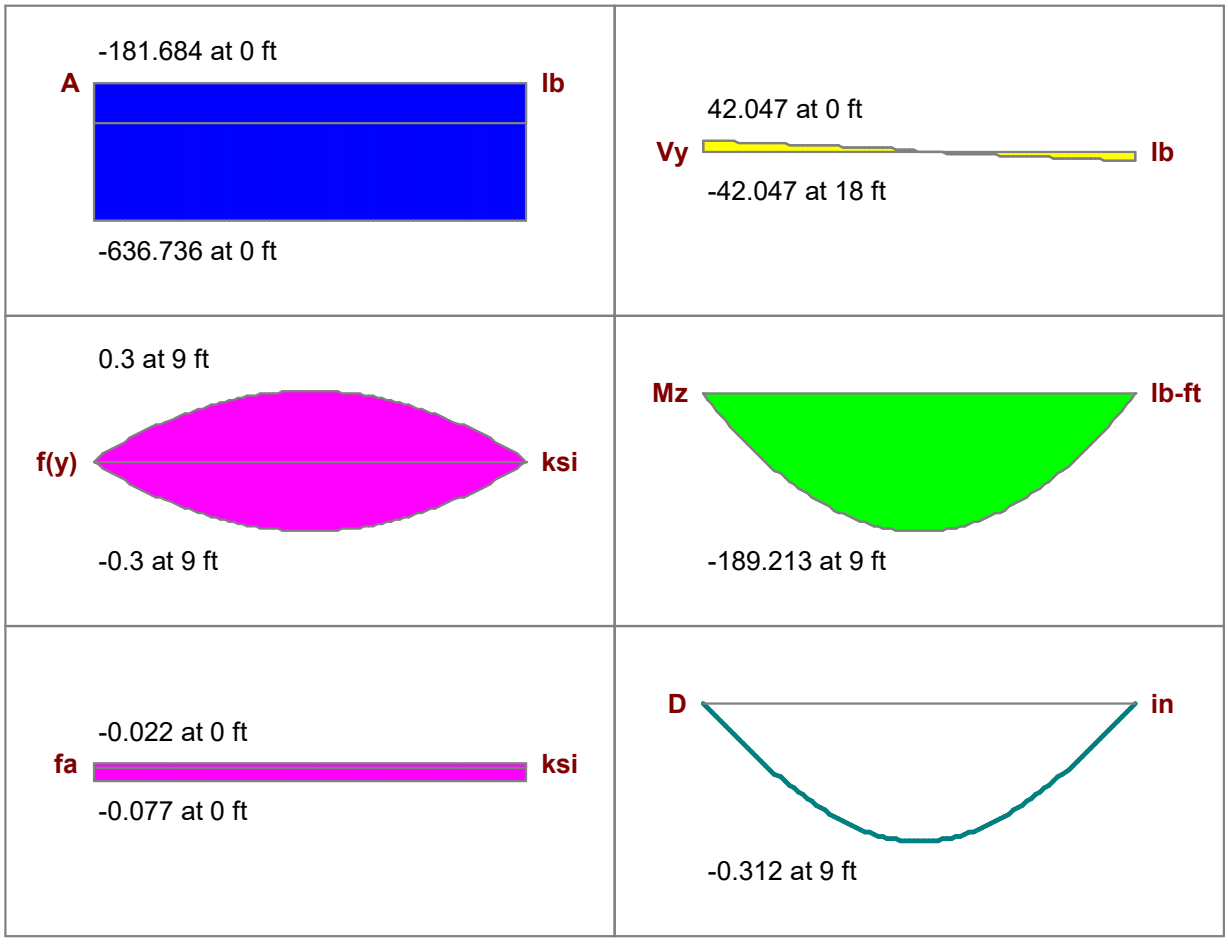
	(ksi)	Cm	Ct	CF	Ci
Fc'	**0.865**	**1**	**1**	**1.15**	**1**
Ft'	**1.164**	**1**	**1**	**1.5**	**1**
Fb'	**1.721**	**1**	**1**	**1.5**	**1**
Fv'	**0.207**	**1**	**1**		**1**
E'	**1700**	**1**	**1**		**1**

	Out	In
Lb	**1 ft**	**6.592 ft**
le/d	**8**	**22.6**
Sway	**No**	**No**

Le-Bending Top **1 ft**
Le-Bending Bot **6.592 ft**

Member: ***M3***

Shape: **2x6**
Material: **DF**
Length: **18 ft**
I Joint: **N1**
J Joint: **N3**
Envelope
Code Check: **0.277 (LC 2)**
Report Based On 97 Sections



AWC NDS-18: ASD Code Check

Max Bending Check	**0.277 (LC 2)**	Max Shear Check	**0.042 (LC 1)**
Location	**9 ft**	Location	**18 ft**
Equation	**3.9-1**	Max Defl Ratio	**L/692**

CD **1.15** RB **5.416** CL **0.997**
Cr **1** Cfu **1** CP **0.168**

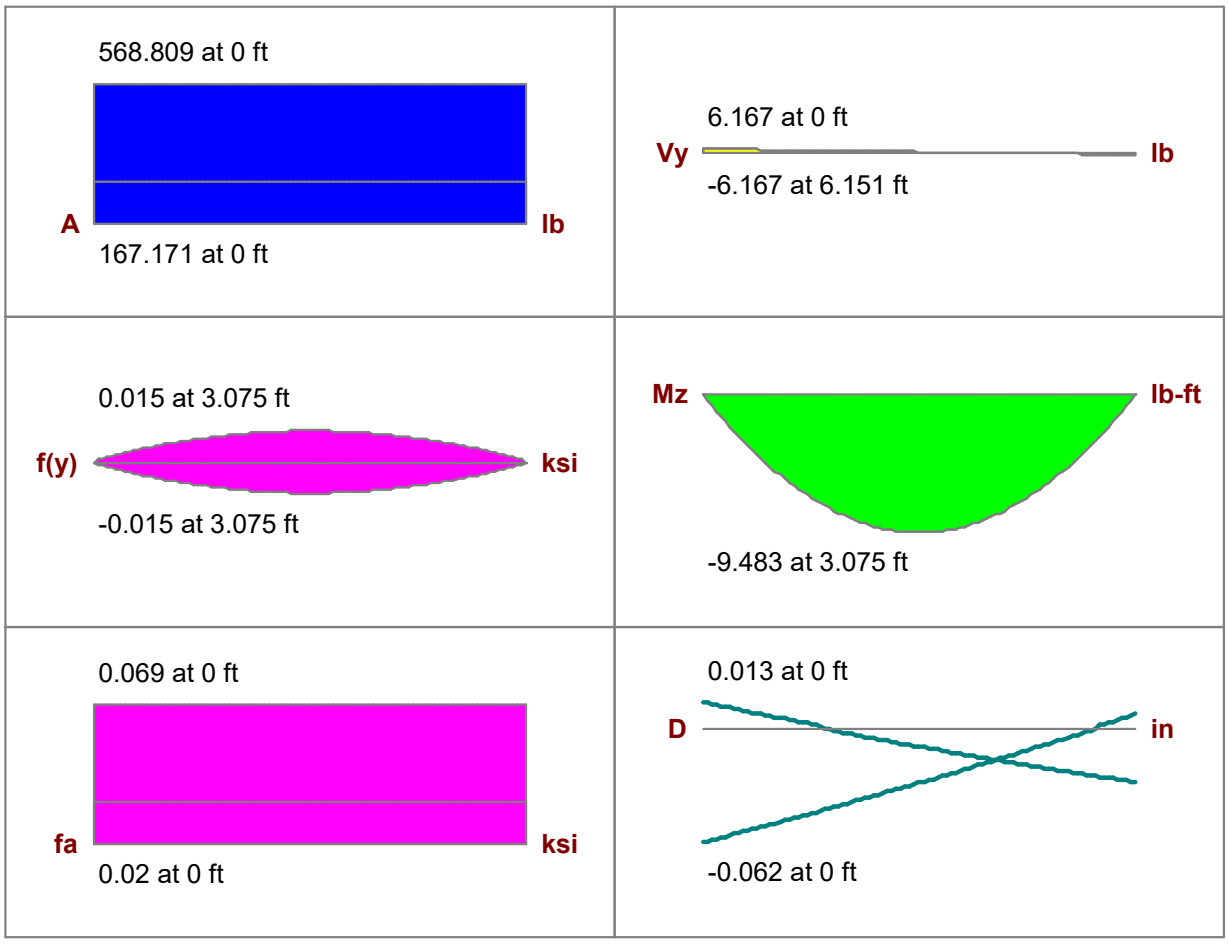
	(ksi)	Cm	Ct	CF	Ci
Fc'	**0.318**	**1**	**1**	**1.1**	**1**
Ft'	**1.009**	**1**	**1**	**1.3**	**1**
Fb'	**1.49**	**1**	**1**	**1.3**	**1**
Fv'	**0.18**	**1**	**1**		**1**
E'	**1700**	**1**	**1**		**1**

	Out	In
Lb	**1 ft**	**18 ft**
le/d	**8**	**39.273**
Sway	**No**	**No**

Le-Bending Top **1 ft**
Le-Bending Bot **18 ft**

Member: ***CT***

Shape: **2x6**
Material: **DF**
Length: **6.151 ft**
I Joint: **N-CT1**
J Joint: **N-CT2**
Envelope
Code Check: **0.335 (LC 2)**
Report Based On 97 Sections



AWC NDS-18: ASD Code Check

Max Bending Check	**0.335 (LC 2)**	Max Shear Check	**0.006 (LC 1)**
Location	**6.151 ft**	Location	**6.151 ft**
Equation	**3.6.3**	Max Defl Ratio	**L/10000**

CD **1.15** RB **13.432** CL **0.974**
Cr **1** Cfu **1** CP **0.108**

	(ksi)	Cm	Ct	CF	Ci
Fc'	**0.206**	**1**	**1**	**1.1**	**1**
Ft'	**1.009**	**1**	**1**	**1.3**	**1**
Fb'	**1.455**	**1**	**1**	**1.3**	**1**
Fv'	**0.18**	**1**	**1**		**1**
E'	**1700**	**1**	**1**		**1**

	Out	In
Lb	**6.151 ft**	**6.151 ft**
le/d	**49.207**	**13.42**
Sway	**No**	**No**

Le-Bending Top **6.151 ft**
Le-Bending Bot **6.151 ft**

SOLGEN POWER

Subject: STEIGERWALT RESIDENCE ROOF 1
Date: 01/10/2024
Engineer: TAJ Eng. Tech: Troy Custodio

CIVIL/STRUCTURAL ENGINEERING DEPARTMENT

Connection Analysis

The purpose of this calculation is to verify the connections - either existing or as retrofit - are adequate for the required design loads.

NEW COLLAR TIE CONNECTION

Connection Demand**	779	lbs

** - from RISA analysis. Tension in joist/bottom chord at member ends.

Proposed Nail Connection

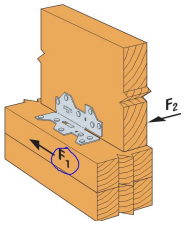
# of connectors	3	(assumed)
Connector Size & Type	16d Common Wire Nail	(assumed)
Proposed Nail Connection Capacity	486	lbs (Note: nail capacity = 162 lbs)

Proposed A34 Connection

# of connectors	1	(top and bottom)
Connector Size & Type	A34, w/ #9 x 1 1/2" SDS Screws	
Base Capacity (F1, Cd = 1.15*)	640	lbs
Cr, repetitive member factor	1.15	
Proposed A34 Connection Capacity	736	lbs
Total Connection Capacity	**1222**	lbs
	OK	

* - linear interpolation between 1.00 and 1.25 values, below:

Model No.	Type of Connection	Fasteners (in.)	Direction of Load	DF/SP Allowable Loads Floor (100)	Roof (125)	(160)
A34	1	(8) 0.131 x 1½	F_1	395	480	545
			F_2[6]	395	430	430
	1	(8) #9 x 1½ SD	F_1	640	640	640
			F_2	495	495	495
			Uplift	240	240	240



SOLGEN POWER

Subject: STEIGERWALT RESIDENCE ROOF 1
Date: 12/28/2023
Engineer: TAJ Eng. Tech: Troy Custodio

CIVIL/STRUCTURAL ENGINEERING DEPARTMENT

Connection Analysis

The purpose of this calculation is to verify the connections - either existing or as retrofit - are adequate for the required design loads.

HEEL CONNECTION

Connection Demand**	637	lbs	** - from RISA analysis. Tension in joist/bottom chord at member ends.

Existing Connection

# of connectors	4	(assumed)
Connector Size & Type	16d Common Wire Nail	(assumed)
Existing Connection Capacity	648	lbs (Note: nail capacity = 162 lbs per next page)

OK

Design Method	Allowable Stress Design (ASD)
Connection Type	Lateral loading
Fastener Type	Nail
Loading Scenario	Single Shear

Main Member Type	Douglas Fir-Larch
Main Member Thickness	1.5 in.
Side Member Type	Douglas Fir-Larch
Side Member Thickness	1.5 in.
Nail Type	Common Wire
Nail Size	16d (D = 0.162 in.; L = 3.5 in.)
Load Duration Factor	C_D = 1.15
Wet Service Factor	C_M = 1.0
End Grain Factor	C_eg = 1.0
Temperature Factor	C_t = 1.0
Diaphragm Factor	C_di = 1.0

Connection Yield Modes

Im	591 lbs.
Is	591 lbs.
II	245 lbs.
IIIm	219 lbs.
IIIs	219 lbs.
IV	162 lbs.

Adjusted ASD Capacity	**162 lbs.**
Fastener length exceeds total connection thickness	

- Nail bending yield strength of 90000 psi is assumed.
- The Adjusted ASD Capacity does not apply for toe-nails installed in wood members.
- Length of tapered tip is assumed to be two times the nail diameter for calculating dowel bearing length in the main member.
- The Adjusted ASD Capacity only applies for nails that have been driven flush with the side member surface. It does not apply for nails that have been overdriven into the side member.

NAIL CAPACITY CALCULATION,
PER AWC'S ONLINE CALCULATOR

22-191583-REV-01-RS

SOLGEN POWER

CIVIL/STRUCTURAL ENGINEERING DEPARTMENT

STRUCTURAL CALCULATIONS
STEIGERWALT RESIDENCE
ROOF IMPROVEMENTS AT PV PANELS
5424 Se 64th Ave
Portland, Oregon

October 24, 2023

DESIGN PARAMETERS:

2022 Oregon Structural Specialty Code

Supervising Engineer:	**Trevor Jones, PE**	**(208)-994-1680**
Structural Project Manager:	**Troy Custodio**	**(208)-994-1680**

ROOF DEAD LOAD…..... 9 psf
SOLAR DEAD LOAD…..... 2.53 psf
LIVE (SNOW) LOAD…..... 20 psf (non-reducible)

CONTENTS:

SOLGEN POWER

CIVIL/STRUCTURAL ENGINEERING DEPARTMENT

Subject: STEIGERWALT RESIDENCE ROOF 1
Engineer: TAJ Eng. Tech: Troy Custodio
Date: 10/25/2023

Project Notes

* Point load locations and tributary areas have been measured by hand from the plans. Although multiple loading conditions exist, the one that has been selected for analysis is believed to be the most conservative, based on engineering judgement, considering point load locations, quantity, and magnitudes, and location of intermediate supports (if any).

Distributed Loading

Existing Dead Load - Rafter/TC

Asphalt Shingles	3	psf
1/2" Plywood	1.5	psf
Framing	--	psf*
M,E, & Misc	0.5	psf
Total Existing Dead Load - TC*	5	psf

* - framing accounted for with member self-weight in RISA, not included in this calc.

Existing Dead Load - Joist/BC

1/2" Gypsum	1.5	psf
Blown-In Insulation	0.5	psf
Framing	--	psf*
Total Existing Dead Load - BC*	2	psf
Solar Panel Dead Load	2.53	psf

Snow Load

Sloped Roof Snow Load	20.0	psf

Note: Roof Live Load will not govern over snow loads, and is therefore not treated in this analysis. ($p_{snow} = p_{RLL}$, but $C_{d,snow} < C_{d,RLL}$. Also, RLL may be removed where panels are located per the IBC, while snow loads are non-reducible.)

Line and Point Loading

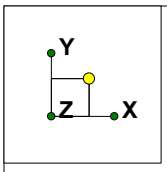
Line Loads

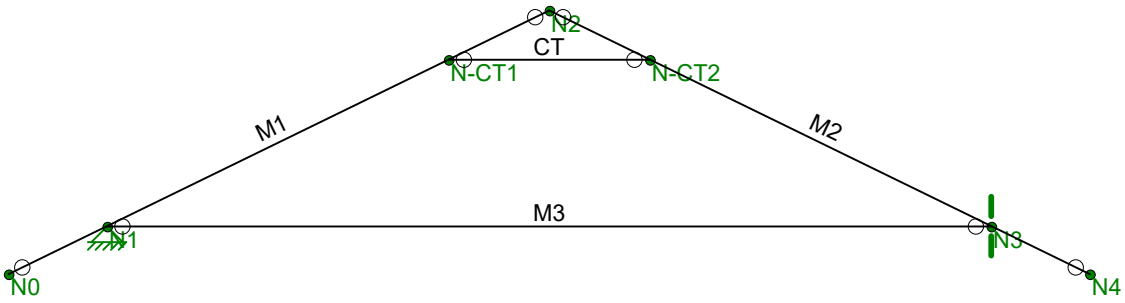
Tributary Width	2	ft
Dead Load - TC	**10**	**plf**
Dead Load - BC	**4**	**plf**
Snow Load	**40**	**plf**

	Start Loc	End Loc	
Snow Shade Locations on Left Roof	**0.80**	**7.60**	**ft from rafter end**
Snow Shade Locations on Right Roof	**2.50**	**11.65**	**ft from ridge**

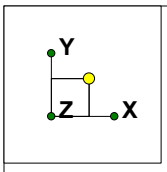
Point Loads

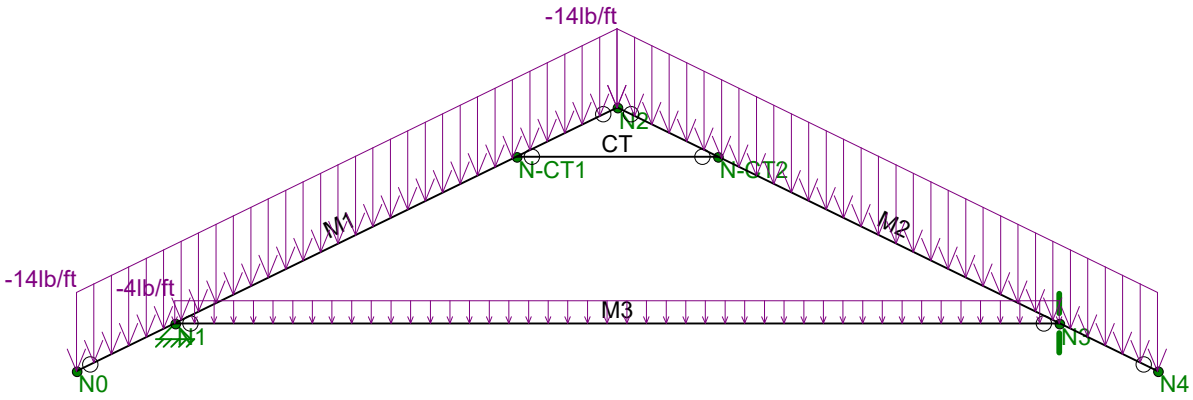
	Trib area (ft^2)	Location (ft)	Solar pt load	Snow pt load	
Right Roof Load #1	11.5	6.75	**29.095**	**230**	**lbs**
Right Roof Load #2	7	10.65	**17.71**	**140**	**lbs**





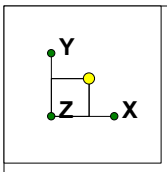
Solgen Power	Steigerwalt Roof 1	SK - 1
TAJ		Oct 25, 2023 at 5:51 AM
		Matthew Steigerwalt - RISA.r2d

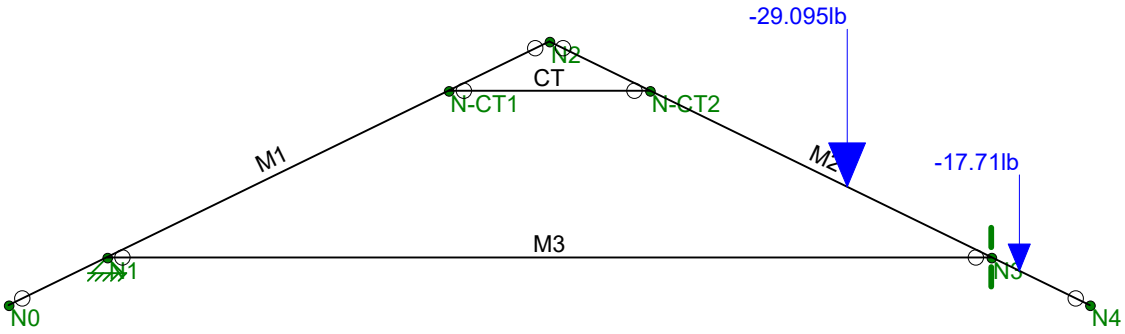




Loads: BLC 1, DL

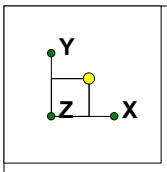
Solgen Power	Steigerwalt Roof 1	SK - 2
TAJ		Oct 25, 2023 at 5:51 AM
		Matthew Steigerwalt - RISA.r2d

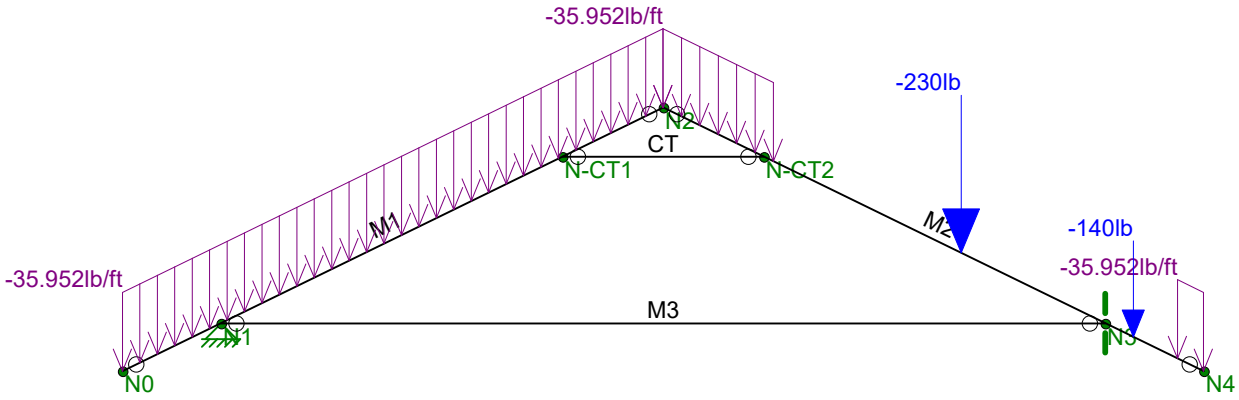




Loads: BLC 2, DL - Solar

Solgen Power	Steigerwalt Roof 1	SK - 3
TAJ		Oct 25, 2023 at 5:51 AM
		Matthew Steigerwalt - RISA.r2d





Loads: BLC 3, SL

Solgen Power	Steigerwalt Roof 1	SK - 4
TAJ		Oct 25, 2023 at 5:51 AM
		Matthew Steigerwalt - RISA.r2d

Member Code Checks Displayed (Enveloped)
Loads: BLC 4,
Envelope Only Solution

Solgen Power	Steigerwalt Roof 1	SK - 5
TAJ		Oct 25, 2023 at 5:52 AM
		Matthew Steigerwalt - RISA.r2d

(Global) Model Settings

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Increase Nailing Capacity for Wind?	Yes
Merge Tolerance (in)	0.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automatically Iterate Stiffness for Walls?	Yes
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th (360-16): ASD
Adjust Stiffness?	Yes(Iterative)
Cold Formed Steel Code	AISI S100-16: ASD
Wood Code	AWC NDS-18: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-19
Masonry Code	TMS 402-16: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Number of Shear Regions	4
Region Spacing Increment (in)	4
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

Wood Material Properties

	Label	Type	Database	Species	Grade	Cm	Ci	Emod	Nu	Therm (/1..	Dens[k/ft...
1	DF	Solid Sawn	Visually ...	Douglas Fir-Larch	No.2			1	0.3	0.3	0.035
2	SP	Solid Sawn	Visually ...	Southern Pine	No.1			1	0.3	0.3	0.035
3	HF	Solid Sawn	Visually ...	Hem-Fir	No.1			1	0.3	0.3	0.035
4	SPF	Solid Sawn	Visually ...	Spruce-Pine-fir	No.1			1	0.3	0.3	0.035
5	24F-1.8E DF...	Glulam	NDS Tabl...	24F-1.8E_DF_BAL	na			1	0.3	0.3	0.035
6	24F-1.8E DF...	Glulam	NDS Tabl...	24F-1.8E_DF_UNBAL	na			1	0.3	0.3	0.035
7	24F-1.8E SP...	Glulam	NDS Tabl...	24F-1.8E_SP_BAL	na			1	0.3	0.3	0.035
8	24F-1.8E SP...	Glulam	NDS Tabl...	24F-1.8E_SP_UNBAL	na			1	0.3	0.3	0.035
9	1.3E-1600F_...	SCL	Boise Ca...	1.3E-1600F_VERSAL...	na			1	0.3	0.3	0.035
10	1.35E LSL_S...	SCL	Louisiana...	1.35E LSL_SolidStart	na			1	0.3	0.3	0.035
11	1.3E_RIGIDL...	SCL	Roseburg...	1.3E_RIGIDLAM LVL	na			1	0.3	0.3	0.035
12	2.0E_DF Par...	SCL	TrusJoist	2.0E_DF Parallam PSL	na			1	0.3	0.3	0.035
13	LVL_PRL_1....	Custom	N/A	LVL_PRL_1.5E_2250F	na			1	0.3	0.3	0.035
14	LVL_Microla...	Custom	N/A	LVL_Microllam_1.9E...	na			1	0.3	0.3	0.035
15	PSL_Paralla...	Custom	N/A	PSL_Parallam_2.0E_...	na			1	0.3	0.3	0.035
16	LSL_Timber...	Custom	N/A	LSL_TimberStrand_1...	na			1	0.3	0.3	0.035

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Temp [F]
1	N0	-2	-0.975465	0
2	N1	0	0	0
3	N2	9	4.389593	0
4	N3	18	0	0
5	N4	20	-0.975465	0
6	N-CT1	6.949696	3.389593	0
7	N-CT2	11.050304	3.389593	0

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Joint	Point	Distributed
1	DL	DL		-1			3
2	DL - Solar	DL				2	
3	SL	SL				2	3

Load Combinations

	Description	So...	PDelta	S...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...	BLC	Fac...
1	DL	Yes	Y		DL	1																		
2	DL + SL	Yes	Y		DL	1	SL	1																

Member Primary Data

	Label	I Joint	J Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N0	N2		Rafter / TC	None	None	DF	Typical
2	M2	N2	N4		Rafter / TC	None	None	DF	Typical
3	M3	N1	N3		Joist / BC	None	None	DF	Typical
4	CT	N-CT1	N-CT2		Collar Tie	None	None	DF	Typical

Wood Design Parameters

	Label	Shape	Length[ft]	Le-out[ft]	Le-in[ft]	le-bend to...	le-bend bo...	K-out	K-in	CV	Cr	Out sway	In sway
1	M1	Rafter / TC	12.239	1	Segment	Lb out	Segment						
2	M2	Rafter / TC	12.239	1	Segment	Lb out	Segment						
3	M3	Joist / BC	18	1		Lb out							
4	CT	Collar Tie	4.101			Lb out							

Wood Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	I (90,270) [i...	I (0,180) [in4]
1	Rafter / TC	2x4	None	None	DF	Typical	5.25	0.984	5.359
2	Joist / BC	2x6	None	None	DF	Typical	8.25	1.547	20.797
3	Sister	2x4	None	None	DF	Typical	5.25	0.984	5.359
4	Brace/post/kn...	2x4	None	None	DF	Typical	5.25	0.984	5.359
5	Collar Tie	2x6	None	None	DF	Typical	8.25	1.547	20.797
6	Webbing	2x4	None	None	DF	Typical	5.25	0.984	5.359

Envelope Member End Reactions

	Member	Membe...		Axial[lb]	LC	Shear[lb]	LC	Moment[lb-ft]	LC
1	M1	I	max	0	2	-0.005	1	0	1
2			min	0	1	-0.109	2	0	1
3		J	max	-34.733	1	41.532	2	0	1

Envelope Member End Reactions (Continued)

	Member	Membe...		Axial[lb]	LC	Shear[lb]	LC	Moment[lb-ft]	LC
4			min	-110.71	2	21.821	1	0	1
5	M2	I	max	-38.596	1	-13.95	1	0	1
6			min	-100.866	2	-61.683	2	0	1
7		J	max	0	2	0.26	2	0	1
8			min	0	1	0.029	1	0	1
9	M3	I	max	-224.66	1	54.047	1	0	1
10			min	-661.601	2	54.047	1	0	1
11		J	max	-224.66	1	-54.047	1	0	1
12			min	-661.601	2	-54.047	1	0	1
13	CT	I	max	779.301	2	4.111	1	0	1
14			min	265.454	1	4.111	2	0	1
15		J	max	779.301	2	-4.111	1	0	1
16			min	265.454	1	-4.111	2	0	1

Envelope Wood Code Checks

	Member	Shape	Code ...	Loc[ft]	LC	Shear ...	Loc[ft]	LC	Fc' [ksi]	Ft' [ksi]	Fb' [ksi]	Fv' [ksi]	RB	CL	CP	Eqn
1	M1	2x4	0.628	9.944	2	0.263	9.944	2	0.66	1.164	1.684	0.207	12.014	0.976	0.333	3.9-3
2	M2	2x4	0.987	6.757	2	0.263	10.071	2	0.66	1.164	1.721	0.207	4.32	0.998	0.333	3.9-3
3	M3	2x6	0.338	9	2	0.055	18	1	0.318	1.009	1.49	0.18	5.416	0.997	0.168	3.9-1
4	CT	2x6	0.211	4.101	2	0.004	4.101	1	0.447	1.009	1.472	0.18	10.967	0.985	0.235	3.6.3