RCRBD Record Set
10/27/2021

Date: **July 29, 2021**

Stephen Lester
Mountain Wireless Construction
927 Salida Way
Aurora, CO 80011
P: 303-589-8899

TeleMtn Engineering
104 N. Broadway, Suite 600
Denver, CO 80203
P: 303-596-6804

Subject:	**Mount Structural Analysis Report**	
Carrier Designation:	**AT&T**	
	Carrier Site Number:	**10148686**
	Carrier Site Name:	**Steamboat Ski Area Gondola Base**
Site Data:	**2305 Mount Werner Cir, Steamboat Springs, Routt County, CO, 80487**	
	Latitude: 40.457348° Longitude: -106.805584°	
Structure Information:	**Structure Height & Type:**	**60ft Building**
	Mount Elevation:	**60ft**
	Mount Type:	**Pipe Mount**

Dear Mr. Stephen Lester,

TeleMtn Engineering is pleased to submit this **"Mount Structural Analysis Report"** to determine the structural integrity of the AT&T antenna mounting system with the proposed appurtenance and equipment addition on the above-mentioned supporting building structure. Analysis of the existing supporting building structure is to be completed by others and therefore is not part of this analysis. Analysis of the antenna mounting system as a tie-off point for fall protection or rigging is not part of this document.

Based on this analysis, it has been determined that the structural capacity of the antenna mounting system that will support the existing and proposed loading to be:

Pipe Mount	**10.8% Sufficient Capacity**

This analysis has been performed in accordance with the 2018 IBC, and the Routt County Building Code Amendments. This analysis utilizes an ultimate 3-second gust wind speed of 107mph. Applicable standard references and design criteria are listed in Section 2) Analysis Criteria.

All new antennas and equipment shall be placed on the structure as shown in the drawings issued by this office.

We at TeleMtn Engineering appreciate the opportunity of providing our continuing professional services to you and AT&T. If you have any questions or need further assistance on this or any other projects, please give us a call.

Mount structural analysis report prepared by: Rick Emerson, EI
Respectfully Submitted by:

COLORADO LICENSED PROFESSIONAL ENGINEER
KHRISTOPHER JAMES SCOTT
34610
07/30/2021

Khristopher Scott, PE
Principal Engineer
303-596-6804
kscott@telemtn.com

TABLE OF CONTENTS

1) INTRODUCTION

At the request of AT&T, TeleMtn Engineering, LLC has analyzed the proposed structure including all proposed and existing loads as listed in section 2 of this report. This analysis has been completed in accordance with all applicable codes and standards as required by the local jurisdiction. If any of the provided information or assumptions incorrectly represents this mount TeleMtn Engineering must be notified immediately to evaluate the significance of the discrepancy.

The proposed mounts are pipe mount mounted to the supporting building structure at 60ft. The supporting structure is a 60ft building. This mount analysis has been completed based on the structural information shown in the documents listed in Table 2.

2) ANALYSIS CRITERIA

Building Code: 2018 IBC
TIA-222 Revision: TIA-222-H
Risk Category: II
Ultimate Wind Speed: 107mph V_{ult}
Exposure Category: C
Topographic Category & Crest Height: 1 with a crest height of 0ft
Site Ground Elevation: 6923 ft
Ice Thickness: 0.25in[1]
Wind Speed with Ice: 50mph
Seismic Ss: 0.596
Seismic S1: 0.103

Notes:
1) Per TIA-222-H-4 section 2.6.4, ice loads may be ignored since the design ice thickness is less than or equal to 0.5in.

Table 1 - Proposed Equipment Configuration

Mount Level (ft)	Appurtenance Level (ft)	Number	Manufacturer	Model	Mount Type
60	60	1	Galtronics	GP2712-06367	Pipe Mount

3) ANALYSIS PROCEDURE

Table 2 - Documents Provided

Document	Source	Reference	Date
Preliminary Construction Drawings	Mountain Wireless	GONDOLA RELO	06.09.2021

3.1) Analysis Method

RISA-3D (Version 17.0.4), a commercially available analysis software package, was used to create a three-dimensional model of the antenna mounting system and calculate member stresses for various load cases. Selected analysis output is included in Appendices of this report.

MathCAD (Version 3.1 Prime), a commercially available analysis software package, was used to assist in conservative calculations of the antenna mounting system and calculate member stresses and roof pressures. Selected analysis output is included in Appendices of this report.

3.2) Assumptions

1) The antenna mounting system was properly fabricated, installed, and maintained in good condition in accordance with its original design, manufacturer's specifications, and all applicable codes and standards.
2) The configuration of antennas, mounts, and other appurtenances, are as specified in Tables 1 and the referenced drawings.
3) All member connections are assumed to have been designed to meet or exceed the load carrying capacity of the connected member unless otherwise specified in this report.
4) Steel grades have been assumed as follows:

Channel, Solid Round, Angle, Plate	ASTM A36 (GR 36)
HSS (Rectangular)	ASTM 500 (GR B-46)
Pipe	ASTM A53 (GR 35)
Connection Bolts	ASTM A325
Threaded Rods	ASTM A36 (GR 36)

This analysis may be affected if any assumptions are not valid or have been made in error. TeleMtn Engineering should be notified to determine the effect on the structural integrity of the antenna mounting system.

4) ANALYSIS RESULTS

Table 3 - Mount Component Stresses vs. Capacity (Pipe Mount)

Notes	Component	Mount Level (ft)	Capacity (%)	Pass / Fail
1	Antenna Mount Pipe – 2in sch 40 Pipe	60	10.7	Pass
	Mounting Board – HSS2x2x4		3.8	Pass
	Connection Plate – 3/16in Bent Plate		10.8	Pass
	Connection Bolts – (4) 1/2in Thru Bolts		7.2	Pass

Structure Rating (max from all components) =	10.8%	Sufficient

Notes:
1) See additional documentation in "Appendix C - Analysis Output" for calculations supporting the percent capacity.

Table 4 - Mount Displacement and Deflection

Notes	Elevation (ft)	Appurtenance	Deflection			Displacement		
			X-Axis (in)	Y-Axis (in)	Z-Axis (in)	X-Axis (deg)	Y-Axis (deg)	Z-Axis (deg)
1	60	Pipe Mount	0.022	0	0.128	0.287	0	0.054

Notes:
1) The deflections listed are the envelope results using the design wind speed listed.

4.1) Recommendations

The proposed mounts are adequate to support the proposed loads in all sectors.

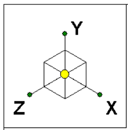
4.2) General Notes

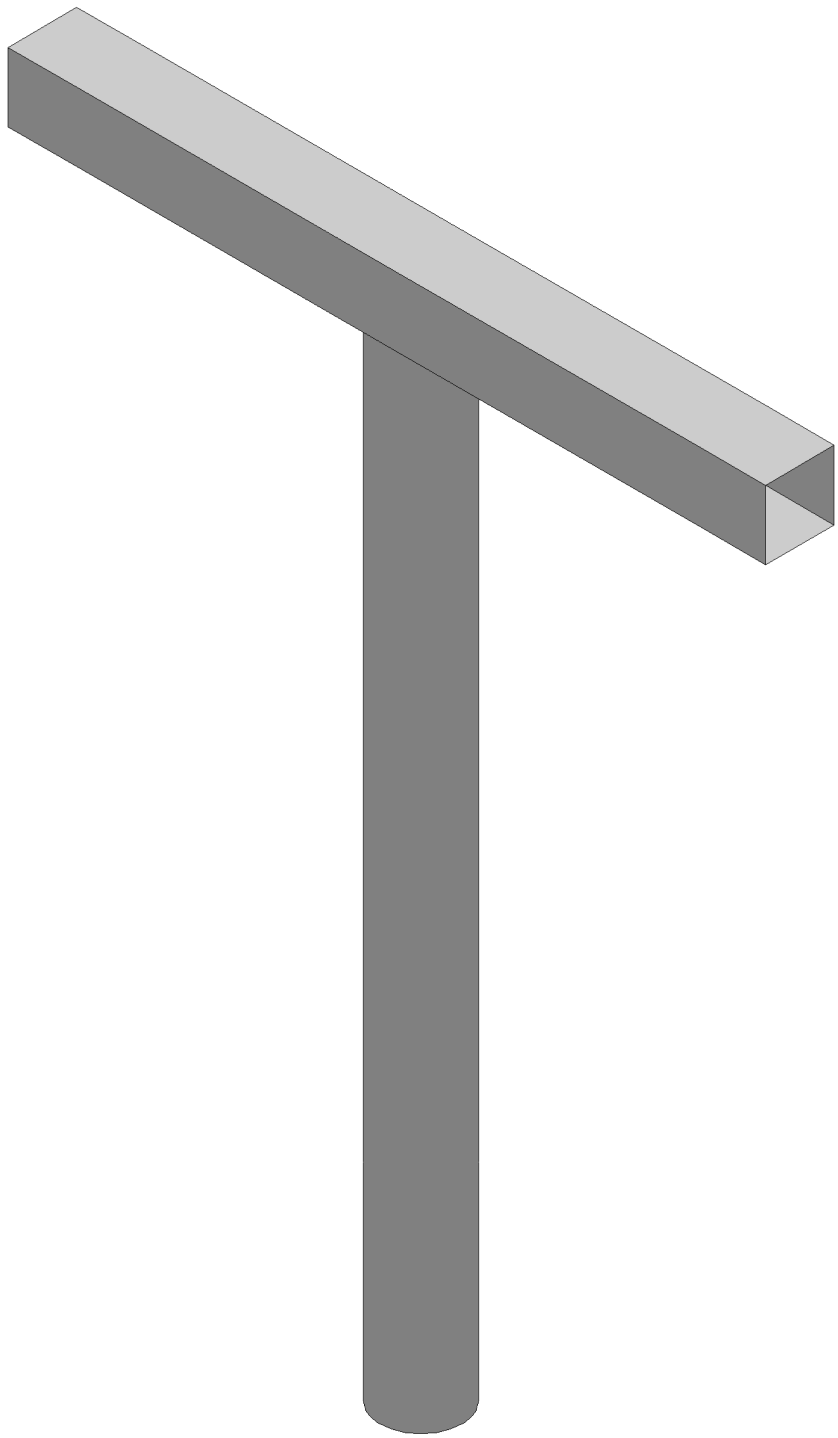
TeleMtn Engineering performed this structural analysis of the mounting frames at which the antennas and equipment attach. These structures are assumed to have been properly constructed and designed in accordance with all applicable codes and standards. For the purpose of this analysis it is assumed that the existing structure is properly maintained per the TIA standard and manufacturer specifications, and is in good condition free of any defects, deterioration, discrepancies, and/or damage. The scope of this analysis is limited to the carrying capacity of the structural members referenced within the calculations of this report.

The General Contractor shall verify the existing dimensions, member sizes, connections, and conditions prior to commencing any work. Any discrepancies or defects shall be called to the attention of TeleMtn Engineering and shall be resolved before proceeding with the work. A contractor experienced in installation procedures and loading should provide temporary bracing, if necessary, for the structure and structural components until all final connections have been completed in accordance with the plans.

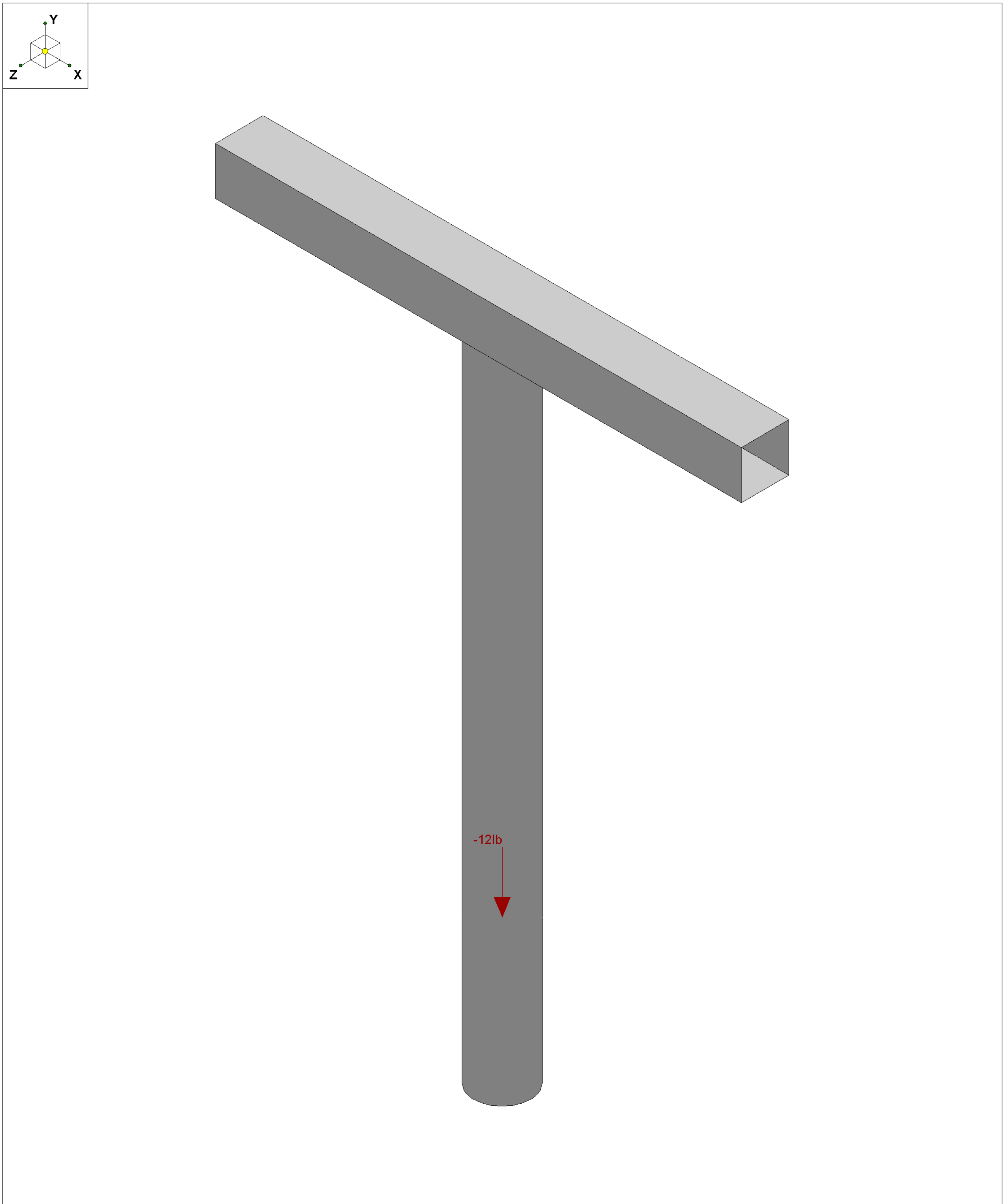
APPENDIX A

WIRE FRAME AND RENDERED MODELS



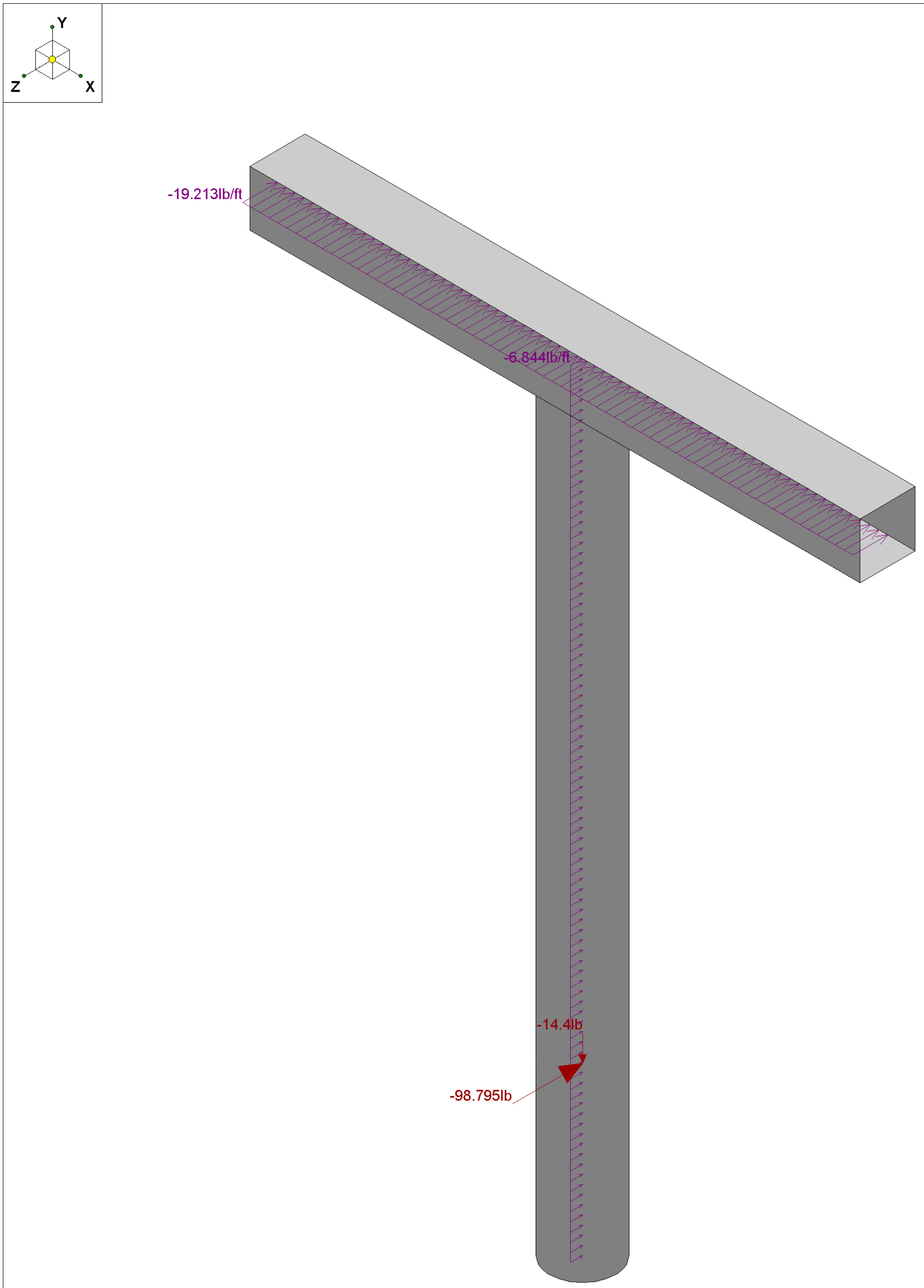


TeleMtn Engineering	Steamboat Ski	SK - 1
Rick Emerson, EI		July 29, 2021 at 12:46 PM
		Steamboat Ski.r3d



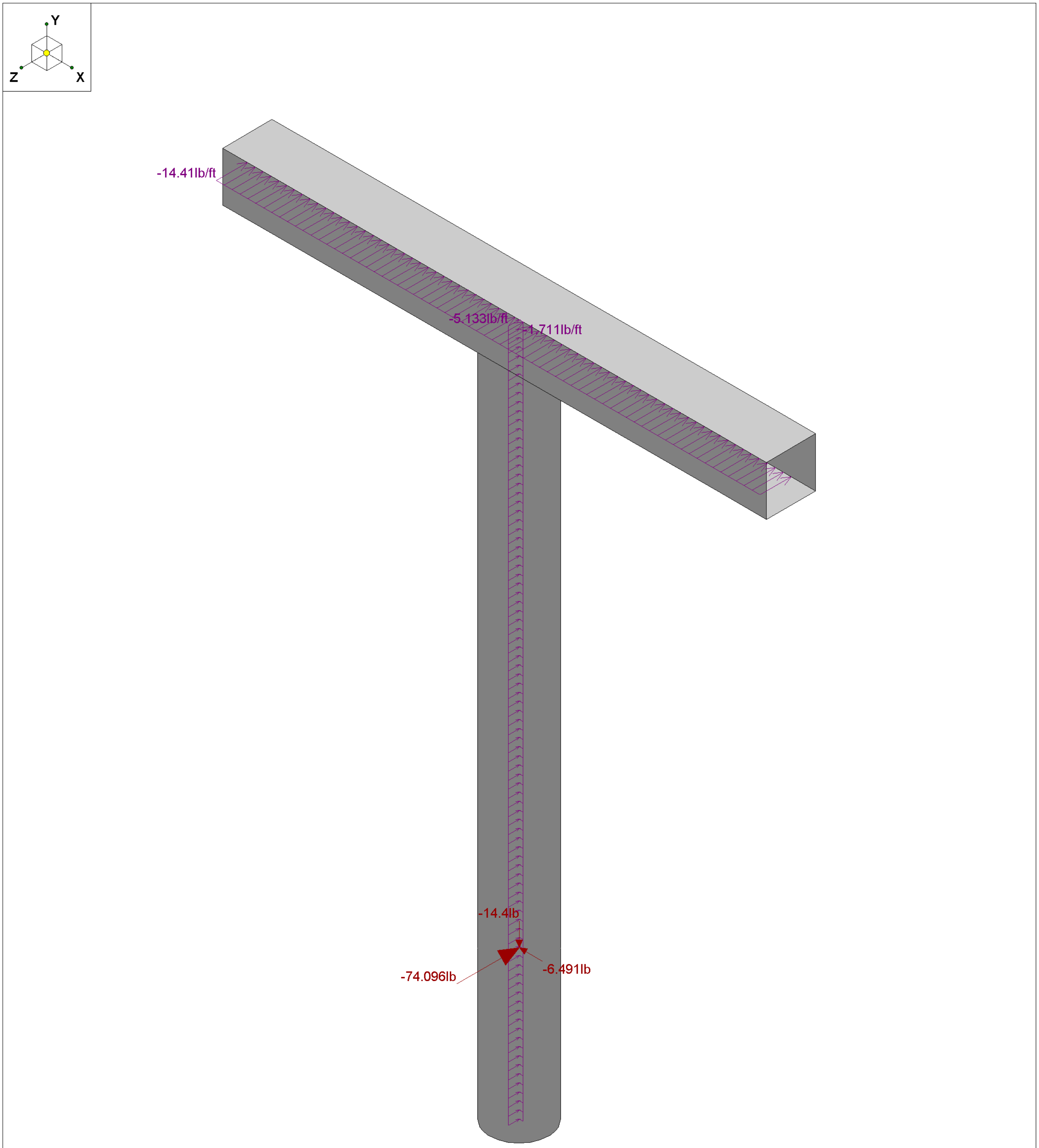
Loads: LC 1, Deflection 1

TeleMtn Engineering	Steamboat Ski	SK - 2
Rick Emerson, EI		July 29, 2021 at 12:47 PM
		Steamboat Ski.r3d



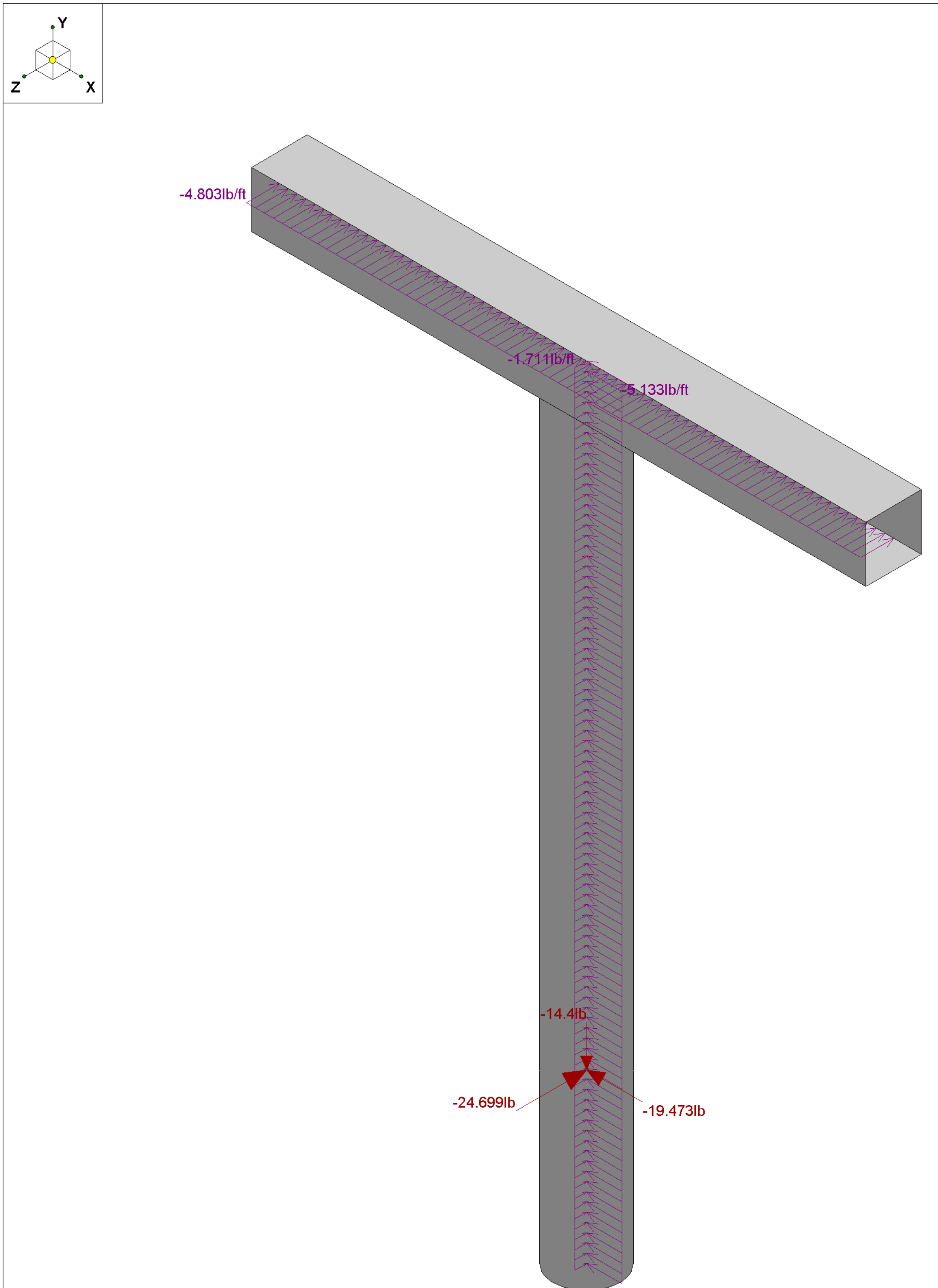
Loads: LC 4, TIA-222-H 2.3.2.1 (0)

TeleMtn Engineering	Steamboat Ski	SK - 3
Rick Emerson, EI		July 29, 2021 at 12:47 PM
		Steamboat Ski.r3d



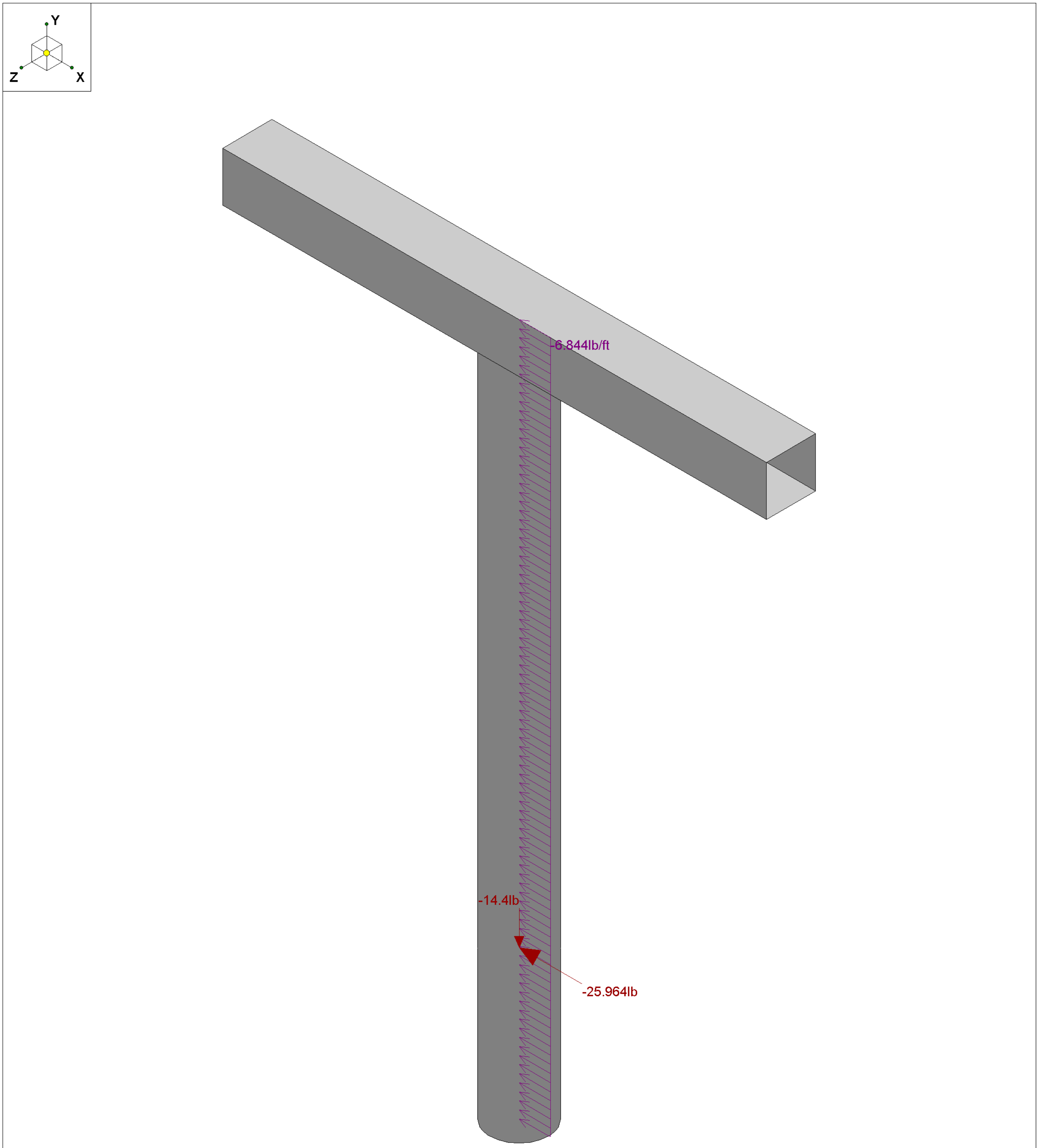
Loads: LC 5, TIA-222-H 2.3.2.1 (30)

TeleMtn Engineering	Steamboat Ski	SK - 4
Rick Emerson, EI		July 29, 2021 at 12:47 PM
		Steamboat Ski.r3d



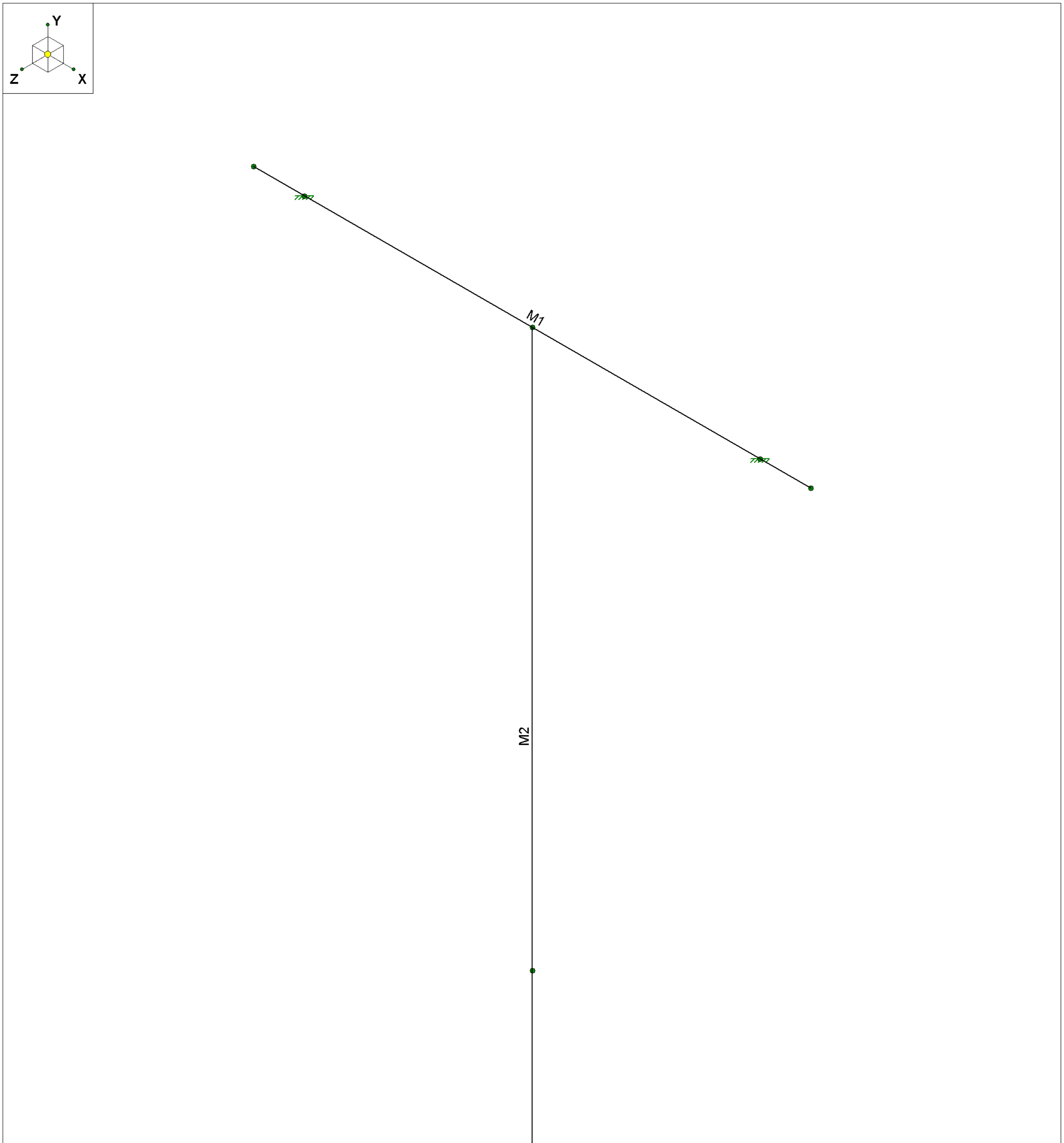
Loads: LC 6, TIA-222-H 2.3.2.1 (60)

TeleMtn Engineering	Steamboat Ski	SK - 5
Rick Emerson, EI		July 29, 2021 at 12:47 PM
		Steamboat Ski.r3d

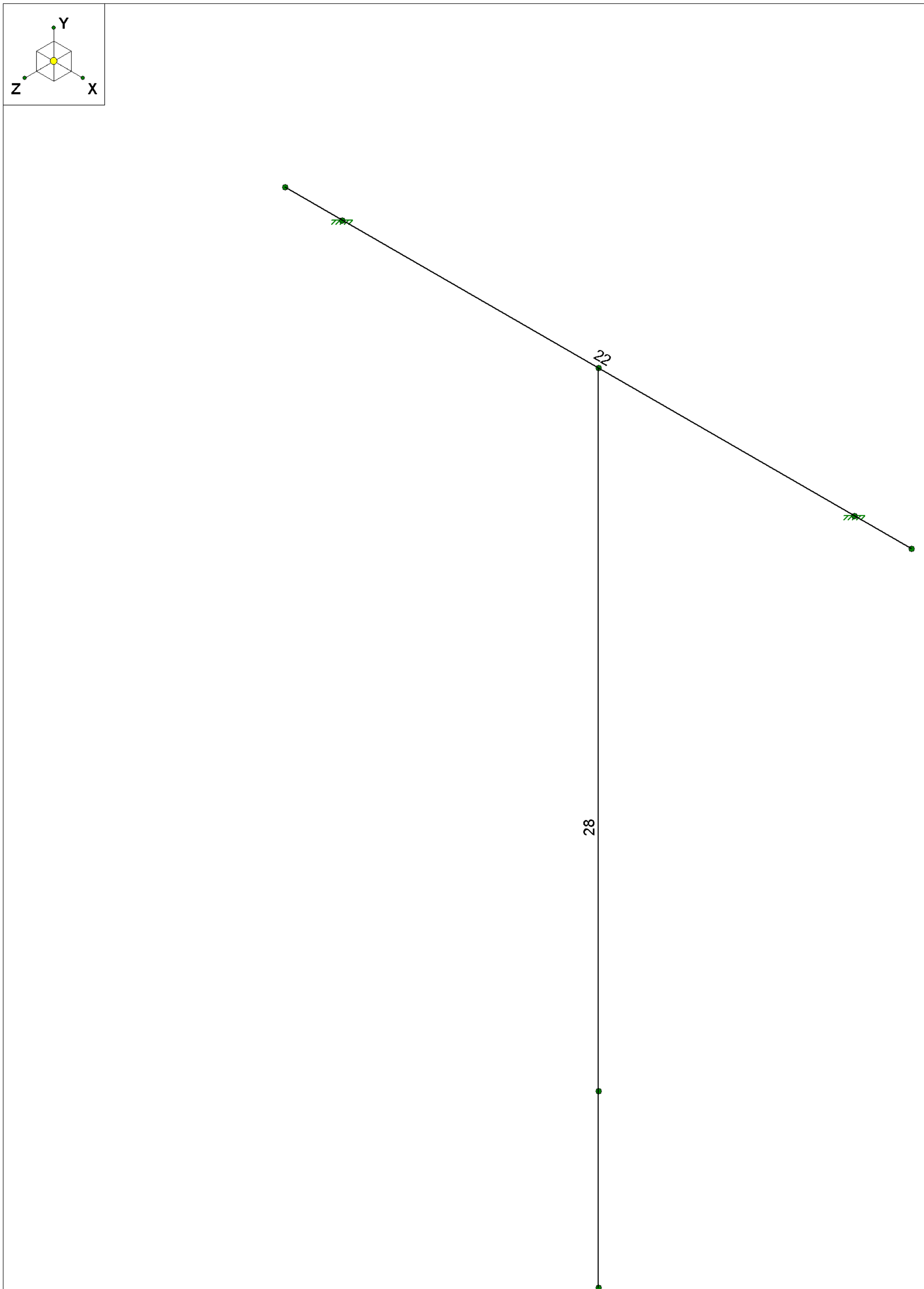


Loads: LC 7, TIA-222-H 2.3.2.1 (90)

TeleMtn Engineering	Steamboat Ski	SK - 6
Rick Emerson, EI		July 29, 2021 at 12:47 PM
		Steamboat Ski.r3d

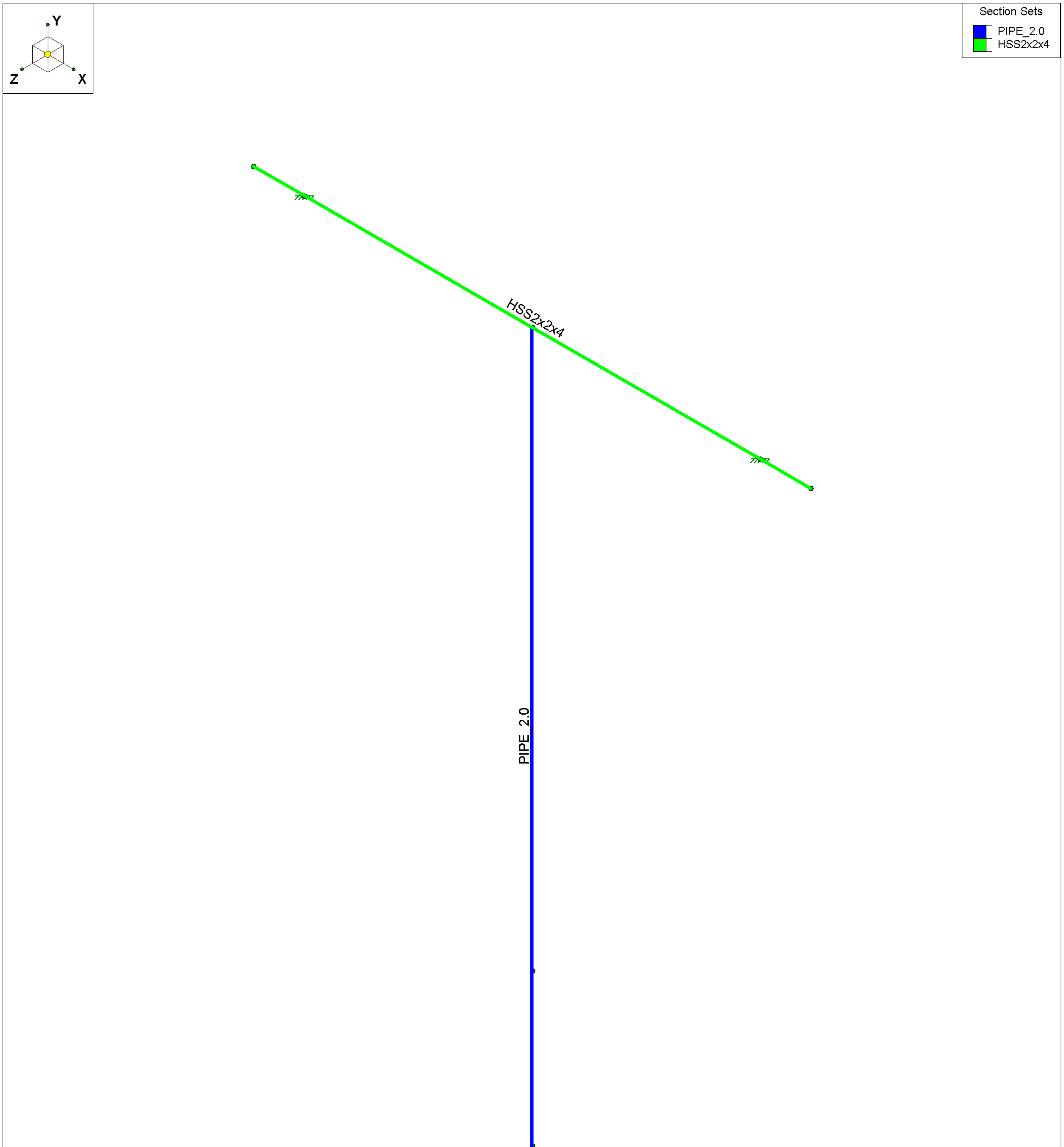


TeleMtn Engineering		SK - 7
Rick Emerson, EI	Steamboat Ski	July 29, 2021 at 12:47 PM
		Steamboat Ski.r3d



Member Length (in) Displayed

TeleMtn Engineering	Steamboat Ski	SK - 8
Rick Emerson, EI		July 29, 2021 at 12:49 PM
		Steamboat Ski.r3d



TeleMtn Engineering	Steamboat Ski	SK - 9
Rick Emerson, EI		July 29, 2021 at 12:49 PM
		Steamboat Ski.r3d

APPENDIX B

SOFTWARE INPUT CALCULATIONS

104 Broadway, Suite 600
Denver, CO 80203
P: 303-596-6804

Mount Analysis: Software Input Calculations

Design Conditions:

Rooftop Analysis/Design (Y/N):	$Roof = \text{"Y"}$	
Wind Load Factor, Design Wind:	$W = 1$	TIA 2.3.2
Wind Load Factor, Iced Conditions:	$W_i = 1$	TIA 2.3.2
Wind Load Factor, Live Loads:	$W_l = 1$	
Wind 3-Sec Gust, Design Speed:	$V = 107$ mph	Per ASCE 7-16
Wind 3-Sec Gust, Iced Speed:	$V_i = 50$ mph	Per ASCE 7-16
Wind 3-Sec Gust, Live Loads:	$V_l = 30$ mph	
Elevation (Antenna Centerline, AGL):	$z = 60\ ft$	
Elevation of Structure (AMSL):	$z_s = 6923\ ft$	TIA 2.6.8
Structure Class:	$Class = \text{"II"}$	TIA Table 2-1
Exposure:	$Exp = \text{"C"}$	TIA 2.6.5.1.2
Topographic Category:	$Topo = \text{"1"}$	TIA 2.6.6.2.1
Crest Height:	$H = 0$ ft	
Design Ice Thickness:	$t_i = 0.021\ ft$	Per ASCE 7-16

*Per TIA 2.6.4, ice loads may be ignored if design ice thickness is less than or equal to 0.5in.

TIA Factors and Coefficients:

Mount/Appurtenance Shielding:	$K_a := 0.9$	TIA 16.6.1.1/16.6.1.2
Gust Effect Factor:	$G := 1.0$	TIA 2.6.9/16.6
Wind Direction Factor, Kd:	$k_d := 0.95$	TIA 16.6
Ice Importance Factor, I:	$I_i = 1$	TIA Table 2-3
Escalated Ice Thickness:	$t_{iz} = 0.265\ in$	TIA 2.6.10
Velocity Pressure Coefficient, Kz:	$k_z = 1.137$	TIA 2.6.5.2
TIA Topographic Method:	$TopoM = \text{"1"}$	TIA 2.6.6.2
Topographic Factor, Kzt:	$K_{zt} = 1$	TIA 2.6.6.2
Rooftop Wind Speed-Up Factor, Ks:	$K_s = 1.3$	TIA 2.6.7
Ground Elevation Factor, Ke:	$K_e = 0.778$	TIA 2.6.8

Seismic Properties:

Seismic Load Factor:	$E \equiv 1.0$	
Total Height of Structure:	$h_{structure} = 60\ ft$	
Component Importance Factor:	$I_p = 1$	TIA Table 2-3
Site Soils Classification:	$SC \equiv \text{"D"}$	TIA Table 2-10
Response Modification Coefficient:	$R \equiv 2.5$	ASCE 7-16 Table 13.6.1
Amplification Factor:	$a \equiv 1.0$	ASCE 7-16 Table 13.6.1

Seismic Spectral Responses	$S_S = 0.596$	$S_{MS} = 0.788$	$S_{DS} = 0.526$
From ASCE Hazard 7 Tool:	$S_1 = 0.103$	$S_{M1} = 0.247$	$S_{D1} = 0.165$

Seismic Design Category:	$SDC = \text{"D"}$	Per ASCE 7-16

TeleMtn ENGINEERING

104 Broadway, Suite 600
Denver, CO 80203
P: 303-596-6804

Velocity Pressure, qz:

Velocity Pressure, Design Speed: $q_z := 0.00256 \cdot k_z \cdot K_{zt} \cdot K_s \cdot K_e \cdot k_d \cdot V^2 \cdot \boldsymbol{psf} = 32.021\ \boldsymbol{psf}$

Seismic Unit Design Force, fs:

Calculated Unit Seismic Design Force: $f_{s\_calc} := \frac{0.4\ a \cdot S_{DS} \cdot I_p}{R} \cdot \left(1 + 2\left(\frac{z}{h_{structure}}\right)\right) = 0.252$

ASCE 7-16 Eqs. 13.3-1 to 13.3-3

Minimum Unit Seismic Design Force: $f_{s\_min} := 0.3\ S_{DS} \cdot I_p = 0.158$

Maximum Unit Seismic Design Force: $f_{s\_max} := 1.6 \cdot S_{DS} \cdot I_p = 0.842$

Unit Seismic Design Force: $f_s := min\left(f_{s\_max}, \max\left(f_{s\_calc}, f_{s\_min}\right)\right) = 0.252$

Member Properties:

Pipe Size: 2in Std. Pipe (Only the largest pipe is shown for clarity. All members have been considered.)

Total Length: $l_{pipe} = 28\ \boldsymbol{in}$

Diameter: $OD_{pipe} = 2.375\ \boldsymbol{in}$

Unit Weight: $wt_{pipe} = 3.66\ \boldsymbol{plf}$

EPA: $EPA_{pipe} = 0.499\ \boldsymbol{ft}^2$

Design Wind Force: $F_{pipe} := q_z \cdot G \cdot EPA_{pipe} = 15.97\ \boldsymbol{lbf}$

Rectangle Size: HSS4x4x1/4 (Only the largest rectangle is shown for clarity. All members have been considered.)

Total Length: $l_{rect} = 22\ \boldsymbol{in}$

Width: $W_{rect} = 2\ \boldsymbol{in}$

Height $H_{rect} = 2\ \boldsymbol{in}$

Unit Weight: $wt_{rect} = 5.41\ \boldsymbol{plf}$

EPA: $EPA_{rect} = 0.55\ \boldsymbol{ft}^2$

Design Wind Force: $F_{rect} := q_z \cdot G \cdot EPA_{rect} = 17.611\ \boldsymbol{lbf}$

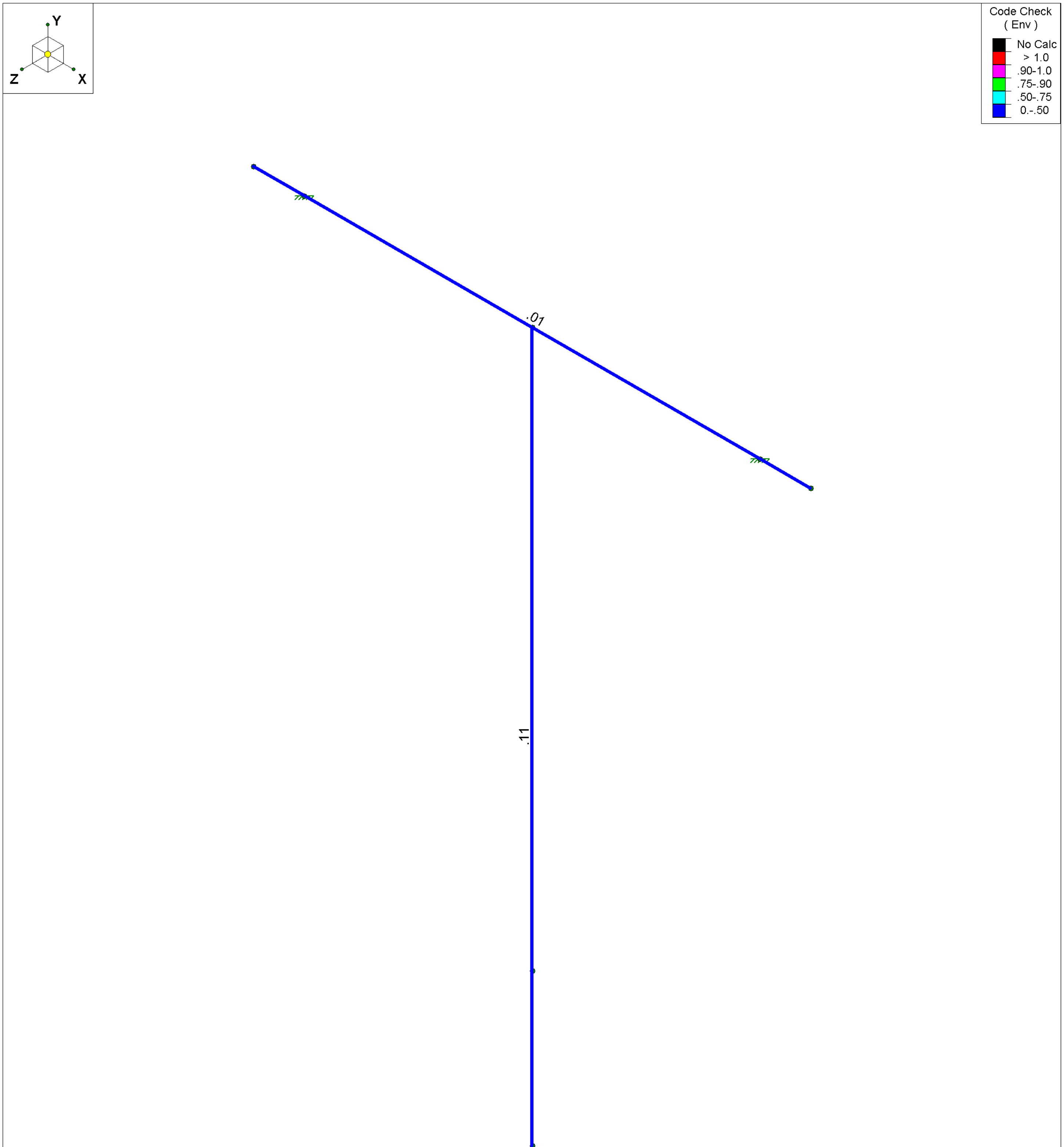
104 Broadway, Suite 600
Denver, CO 80203
P: 303-596-6804

Appurtenance Details:

Appurt 1:	Antenna: GP2712-06367
Height:	$h_1 = 13.9\ \boldsymbol{in}$
Width:	$w_1 = 27\ \boldsymbol{in}$
Depth:	$d_1 = 7\ \boldsymbol{in}$
Weight:	$wt_1 = 12\ \boldsymbol{lbf}$
Profile Round or Flat (r/f)	$Pr_1 =$ "f"
Qty. Per Sector:	$n_1 = 1$
EPA Normal:	$EPAN_1 = 3.085\ \boldsymbol{ft}^2$
EPA Tangential:	$EPAT_1 = 0.811\ \boldsymbol{ft}^2$
Design Wind Force (Normal):	$FN_1 := q_z \cdot G \cdot EPAN_1 = 98.795\ \boldsymbol{ft} \cdot \boldsymbol{plf}$
Design Wind Force (Tangential):	$FT_1 := q_z \cdot G \cdot EPAT_1 = 25.964\ \boldsymbol{ft} \cdot \boldsymbol{plf}$
Seismic Force:	$Fs_1 := E \cdot f_s \cdot wt_1 = 3.03\ \boldsymbol{lbf}$

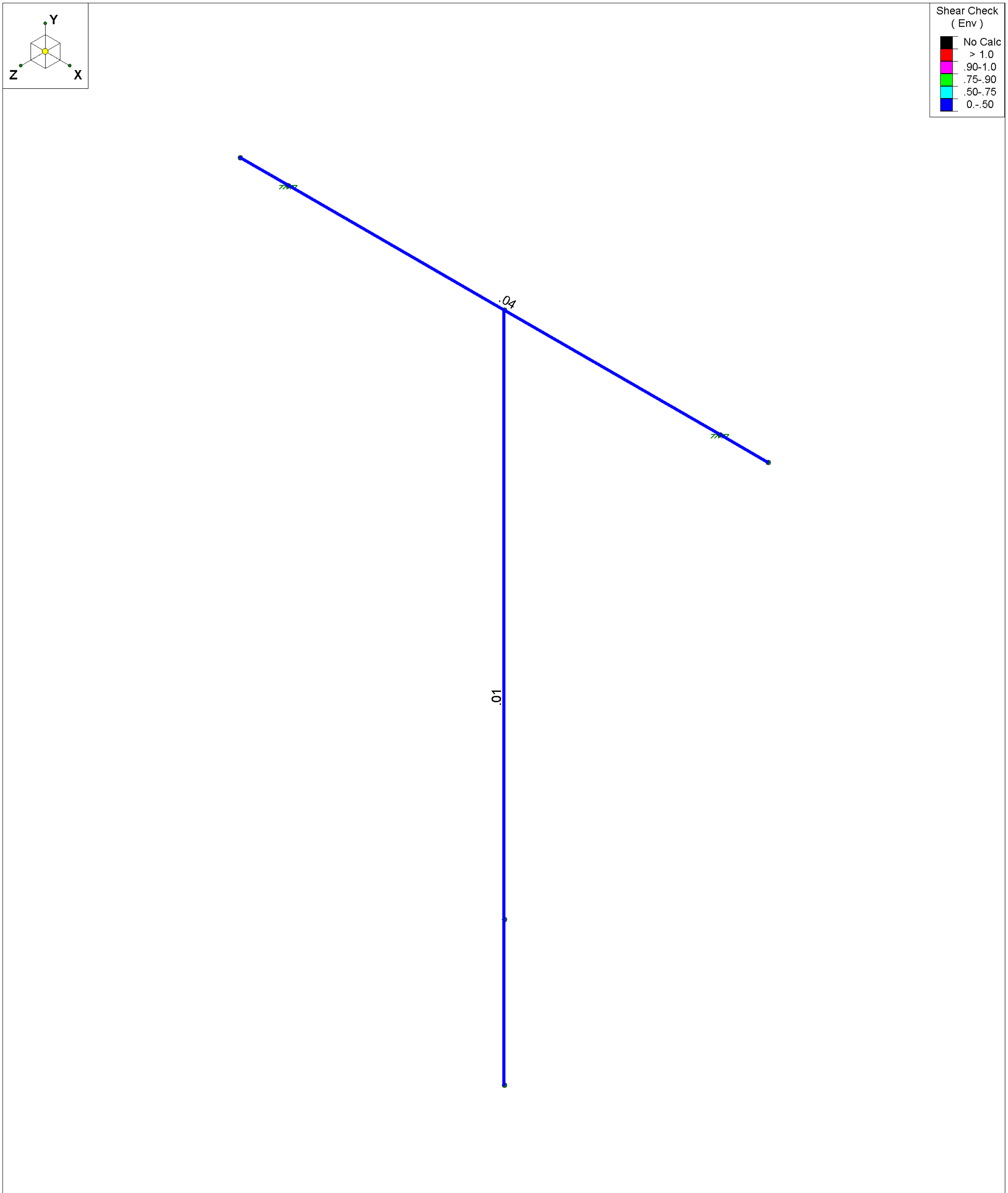
APPENDIX C

SOFTWARE ANALYSIS OUTPUT



Member Code Checks Displayed (Enveloped)
Results for LC 1, Deflection 1

TeleMtn Engineering	Steamboat Ski	SK - 10
Rick Emerson, EI		July 29, 2021 at 12:49 PM
		Steamboat Ski.r3d



Member Shear Checks Displayed (Enveloped)
Results for LC 1, Deflection 1

TeleMtn Engineering	Steamboat Ski	SK - 11
Rick Emerson, EI		July 29, 2021 at 12:49 PM
		Steamboat Ski.r3d

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E...	Density[k/ft...	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2
7	A1085	29000	11154	.3	.65	.49	50	1.25	65	1.15
8	A913 Gr.65	29000	11154	.3	.65	.49	65	1.1	80	1.1

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rules	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	PIPE_2.0	PIPE_2.0	None	None	A53 Gr.B	Typical	1.02	.627	.627	1.25
2	HSS2x2x4	HSS2X2X4	None	None	A500 Gr.B R...	Typical	1.51	.747	.747	1.31

Hot Rolled Steel Design Parameters

	Label	Shape	Length[in]	Lbyy[in]	Lbzz[in]	Lcomp top[in]	Lcomp bot[in]	L-torqu...	Kyy	Kzz	Cb	Function
1	M1	HSS2x2x4	22									Lateral
2	M2	PIPE_2.0	28									Lateral

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N1	max	20.967	19	79.778	13	74.994	16	.1	22	.025	22	.019	13
2		min	-20.967	13	-48.041	19	-74.994	10	-.1	16	-.025	4	-.009	19
3	N2	max	20.967	19	79.778	7	74.994	16	.1	22	.025	16	.009	25
4		min	-20.967	13	-48.041	25	-74.994	10	-.1	16	-.025	10	-.019	7
5	Totals:	max	41.933	19	42.322	64	149.988	16						
6		min	-41.933	13	0	2	-149.988	10						

Envelope AISC 15th(360-16): LRFD Steel Code Checks

	Member	Shape	Code Check	Loc[i...	LC	Shear ...	Loc[i...	Dir	LC	phi*Pnc...	phi*Pnt ...	phi*Mn ...	phi*Mn ...	Cb	Eqn
1	M1	HSS2X2X4	.012	11	7	.038	2.063	y	22	58532.2...	62514	3.326	3.326	1	H1-1b
2	M2	PIPE_2.0	.107	0	10	.012	0		22	30099.6...	32130	1.872	1.872	1	H1-1b

APPENDIX D

ADDITIONAL CALCULATIONS

104 Broadway, Suite 600
Denver, CO 80203
P: 303-596-6804

Mount Analysis: Additional Calculations

Risa Output:

Max X Reaction (shear):	$R_x \equiv 0.02\ kip$
Max Y Reaction (shear):	$R_y \equiv 0.075\ kip$
Max Z Reaction (tensile):	$R_z \equiv 0.08\ kip$
Max Moment X:	$M_x \equiv 0.1\ kip \cdot ft$
Max Moment Y:	$M_y \equiv 0.025\ kip \cdot ft$
Max Moment Z:	$M_z \equiv 0.02\ kip \cdot ft$

Bolt Properties:

Bolt Diameter:	$Dia_{bolt} \equiv 0.375\ in$
Bolt Grade:	$Grade_{bolt} \equiv$ "A307"
Bolt Area:	$A_{bolt} = 0.11\ in^2$
Number Bolts:	$N_{bolt} \equiv 4$
Vertical Bolt Spacing (c/c):	$d_{bolt\_y} \equiv 3\ in$
Horizontal Bolt Spacing (c/c):	$d_{bolt\_x} \equiv 3\ in$
Bolt Group Area Moment of Inertia (X-axis):	$I_{x.bolt} := N_{bolt} \cdot \left(\left(I_{0.bolt} \right) + \left(A_{bolt} \cdot \left(0.5 \cdot d_{bolt\_y} \right)^2 \right) \right) = 0.998\ in^4$
Bolt Group Area Moment of Inertia (Y-axis):	$I_{y.bolt} := N_{bolt} \cdot \left(\left(I_{0.bolt} \right) + \left(A_{bolt} \cdot \left(0.5 \cdot d_{bolt\_x} \right)^2 \right) \right) = 0.998\ in^4$
Bolt Group Polar Moment of Inertia:	$J_{bg} := I_{x.bolt} + I_{y.bolt} = 1.996\ in^4$

Plate Properties:

Plate Width:	$w_{plate} \equiv 4.0\ in$	
Plate Height:	$h_{plate} \equiv 10\ in$	
Plate Thickness:	$t_{plate} \equiv 0.5\ in$	
Bend Line Distance:	$d_{bend} \equiv 2.0\ in$	(dist. from bolt to bend line)
Edge Distance:	$d_{edge} \equiv 0.5\ in$	(dist. from bolt to edge of plate)
Plastic Section Modulus:	$z_{plate} = 0.25\ in^3$	(Assumes bend line length is full width of plate)
Steel Yield Strength:	$f_{y.plate} \equiv 36\ ksi$	

104 Broadway, Suite 600
Denver, CO 80203
P: 303-596-6804

Bolts Check:

Bolt Shear Load: AISC 14th Ed., Equ. 7-8a

$$Sload_{bolt} := \sqrt{\left(\frac{R_x}{N_{bolt}} + \frac{M_z \cdot 0.5 \cdot d_{bolt\_y} \cdot A_{bolt}}{J_{bg}}\right)^2 + \left(\frac{R_y}{N_{bolt}} + \frac{M_z \cdot 0.5 \cdot d_{bolt\_x} \cdot A_{bolt}}{J_{bg}}\right)^2} = 0.046\ \boldsymbol{kip}$$

Bolt Tensile Load: ASCE/SEI 48-11, Equ. A-VI-3

$$Tload_{bolt\_max1} := \left(\frac{R_z}{N_{bolt}} + \left|\frac{M_x \cdot 0.5 \cdot d_{bolt\_y} \cdot A_{bolt}}{I_{x.bolt}} + \frac{M_y \cdot 0.5 \cdot d_{bolt\_x} \cdot A_{bolt}}{I_{y.bolt}}\right|\right) = 0.269\ \boldsymbol{kip}$$

$$Tload_{bolt\_max2} := \left(\frac{R_z}{N_{bolt}} + \left|\frac{M_x \cdot 0.5 \cdot d_{bolt\_y} \cdot A_{bolt}}{I_{x.bolt}} - \frac{M_y \cdot 0.5 \cdot d_{bolt\_x} \cdot A_{bolt}}{I_{y.bolt}}\right|\right) = 0.169\ \boldsymbol{kip}$$

Conservative check for 1/2" Thru bolts, allowable load per AISC 14th Edition.

$Bolt_{shear} = 2.237\ \boldsymbol{kip}$ > $Sload_{bolt} = 0.05\ \boldsymbol{kip}$

$Bolt_{tension} = 3.728\ \boldsymbol{kip}$ > $Tload_{bolt\_max1} = 0.27\ \boldsymbol{kip}$

$$Check_{bolt} := \text{if}\left(\left(\frac{Sload_{bolt}}{Bolt_{shear}}\right)^2 + \left(\frac{Tload_{bolt\_max1}}{Bolt_{tension}}\right)^2 \le 1.0, \text{“OK”}, \text{“NG”}\right) = \text{“OK”}$$

$$Capacity_{bolt} := \max\left(\left(\frac{Sload_{bolt}}{Bolt_{shear}}\right)^2 + \left(\frac{Tload_{bolt\_max1}}{Bolt_{tension}}\right)^2, \left(\frac{Sload_{bolt}}{Bolt_{shear}}\right), \left(\frac{Tload_{bolt\_max1}}{Bolt_{tension}}\right)\right) = 7.22\%$$

Plate Stress Check:

Resistance Factor: $\phi := .9$

Bending Moment: $M_{bend} := \left(Tload_{bolt\_max1} + Tload_{bolt\_max2}\right) \cdot d_{bend} = 0.073\ \boldsymbol{kip \cdot ft}$

Bending Stress: $\sigma_u := \frac{M_{bend}}{z_{plate}} = 3.508\ \boldsymbol{ksi}$ ASCE/SEI 48-11

Allowable Stress: $\sigma_n := \phi \cdot f_{y.plate} = 32.4\ \boldsymbol{ksi}$

Plate Stress Check: $Check_{plate} := \text{if}\left(\frac{\sigma_u}{\sigma_n} \le 1.0, \text{“OK”}, \text{“NG”}\right) = \text{“OK”}$

Plate Stress Capacity: $Capacity_{plate} := \frac{\sigma_u}{\sigma_n} = 10.83\%$

Minimum Plate Thickness: ASCE/SEI 48-11, Equ. A-VI-2

$$t_{plate\_min} := \sqrt{\left(\frac{4}{\phi \cdot w_{plate} \cdot f_{y.plate}}\right)\left(\left(Tload_{bolt\_max1} + Tload_{bolt\_max2}\right) \cdot d_{bend}\right)} = 0.165\ \boldsymbol{in}$$

Plate Thickness Check: $Check_{platethick} := \text{if}\left(\frac{t_{plate}}{t_{plate\_min}} \ge 1.0, \text{“OK”}, \text{“NG”}\right) = \text{“OK”}$

APPENDIX E

SITE SUPPORTING DOCUMENTATION

ASCE 7 Hazards Report

Address:
2305 Mount Werner Cir
Steamboat Springs, Colorado
80487

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Stiff Soil

Elevation: 6923.39 ft (NAVD 88)
Latitude: 40.457348
Longitude: -106.805584

Wind

Results:

Wind Speed:	106 Vmph
10-year MRI	76 Vmph
25-year MRI	83 Vmph
50-year MRI	88 Vmph
100-year MRI	92 Vmph

Data Source:	ASCE/SEI 7-16, Fig. 26.5-1B and Figs. CC.2-1–CC.2-4, and Section 26.5.2
Date Accessed:	Wed Jul 28 2021

Value provided is 3-second gust wind speeds at 33 ft above ground for Exposure C Category, based on linear interpolation between contours. Wind speeds are interpolated in accordance with the 7-16 Standard. Wind speeds correspond to approximately a 7% probability of exceedance in 50 years (annual exceedance probability = 0.00143, MRI = 700 years).

Site is not in a hurricane-prone region as defined in ASCE/SEI 7-16 Section 26.2.

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

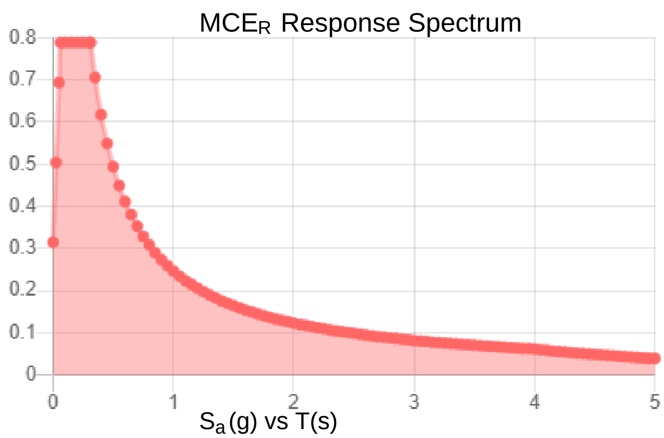
Seismic

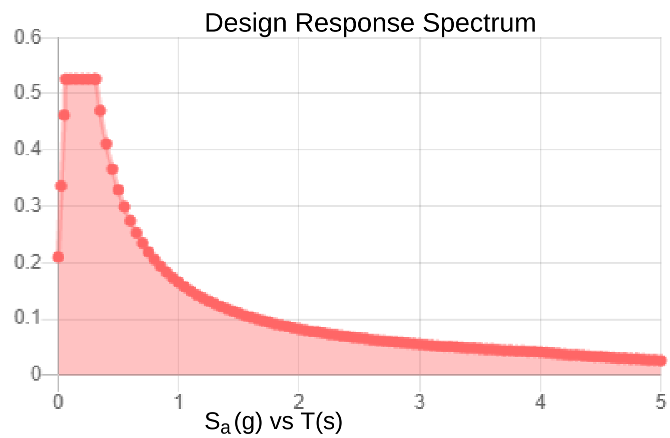
Site Soil Class: D - Stiff Soil

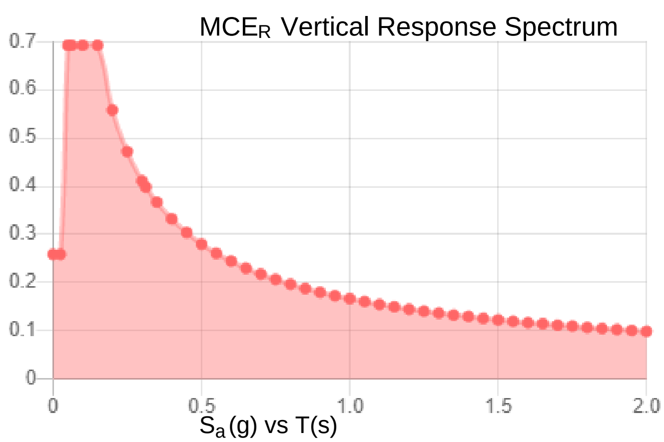
Results:

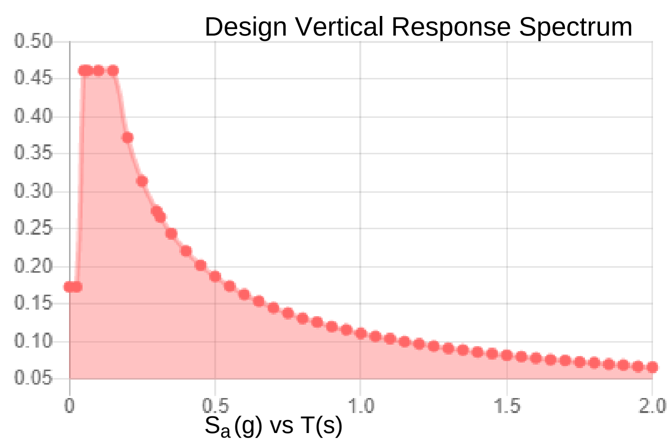
S_S :	0.596	S_{D1} :	0.165
S_1 :	0.103	T_L :	4
F_a :	1.323	PGA :	0.418
F_v :	2.394	PGA_M :	0.494
S_{MS} :	0.788	F_{PGA} :	1.182
S_{M1} :	0.247	I_e :	1
S_{DS} :	0.526	C_v :	1.097

Seismic Design Category D









Data Accessed: Wed Jul 28 2021

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-16 and ASCE/SEI 7-16 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-16 Ch. 21 are available from USGS.

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

Ice

Results:

Ice Thickness:	0.25 in.
Concurrent Temperature:	5 F
Gust Speed:	50 mph
Data Source:	Standard ASCE/SEI 7-16, Figs. 10-2 through 10-8
Date Accessed:	Wed Jul 28 2021

Ice thicknesses on structures in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.

In the mountain west, ice thicknesses may exceed the mapped values in the foothills and passes. However, at elevations above 5,000 ft, freezing rain is unlikely.

Values provided are equivalent radial ice thicknesses due to freezing rain with concurrent 3-second gust speeds, for a 500-year mean recurrence interval, and temperatures concurrent with ice thicknesses due to freezing rain. Thicknesses for ice accretions caused by other sources shall be obtained from local meteorological studies. Ice thicknesses in exposed locations at elevations higher than the surrounding terrain and in valleys and gorges may exceed the mapped values.