23 Mauchly, #110, Irvine, CA 92618

Antenna Mount Analysis

December 27, 2023

Site: BA00324A, "SF324 Meadow Park School"
Type: Building
Address: 5400 Nave Dr., Novato, CA 94949
County: Marin County
Lat/Long: 38° 3' 2.0" N, 122° 31' 49.7" W (38.050544, -122.530467)
P#/Eng: P-095412/AN

REGISTERED PROFESSIONAL ENGINEER
SEUNG KUN OH
C 84365
CIVIL
STATE OF CALIFORNIA

DATE: 12/27/2023
EXPIRES: 09/30/2025

J5 Infrastructure Partners (J5IP) is pleased to submit this antenna mount analysis report to T-Mobile. The purpose of this analysis is to evaluate existing antenna mounts. The project scope of work relevant to this report includes the following items:

- Remove (6) (E) Panel Antennas
- Remove (4) (E) RRU Units
- Remove (4) (E) TMAs
- Remove (2) (E) Diplexers
- Install (4) (P) Panel Antennas
- Install (4) (P) RRU Units

A site visit was performed by J5IP personnel on June 13, 2019. Existing elements relevant to the project scope of work were visually inspected and found to be in good condition.

This report was prepared in accordance with the 2022 CBC, ASCE 7-16, AISC 360-16, and the NDS-2018.

This analysis is based off third party data and assumes satisfactory workmanship of all previously-installed and proposed components. If existing conditions vary from what is shown in this report, or if assumptions made within this analysis are inaccurate, the Engineer of Record shall be notified immediately in writing.

It has been our pleasure to be of service to you in this matter. The results of our analysis are summarized in the table below. Please contact us should you have any specific questions, require further clarification, or if we can be of further service.

Sincerely,
J5 Infrastructure Partners, Inc.

Description of Element	Demand-Capacity Ratio	Result	Notes
(N) Antenna Pipe Mast (Pipe 2.5 STD)	9%	PASS	
(E) Antenna Mount Post (Pipe 2 STD)	75%	PASS	
(E) Component Anchorage (1/2" Lag Bolt w/ 3.5" Embed)	73%	PASS	

Due Diligence Review

This report is based on the information obtained in the documents listed below.

Documents Summary

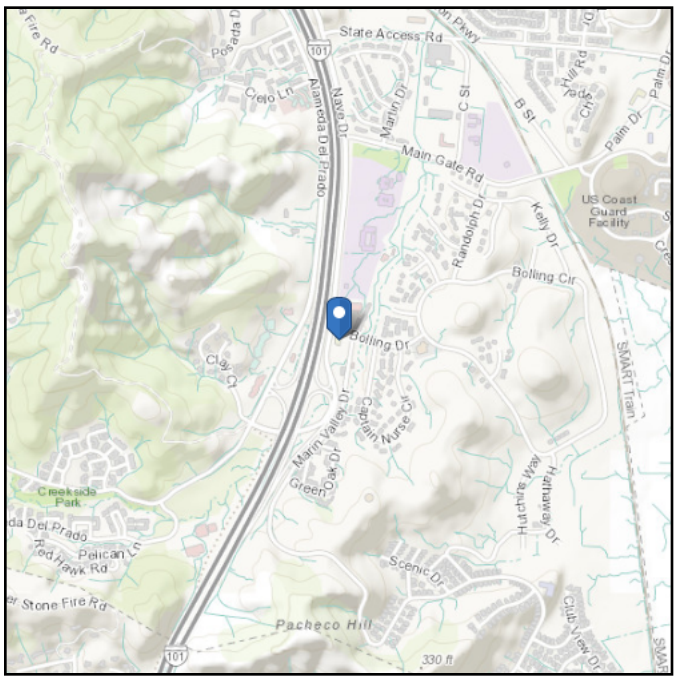
No.	Document Type	Firm	Date	Information Obtained
1	Site Visit Photos	Centerline	Jul 10, 2023	Site Photos
2	As-Built Drawings	ZON Architects	Dec 30, 2015	(E) Equipment Anchorage (Assume 6" Pad)
3	Structural Analysis	ZON Architects	Nov 5, 2015	(E) Antenna Mount Framing Analysis (E) Roof Framing Check

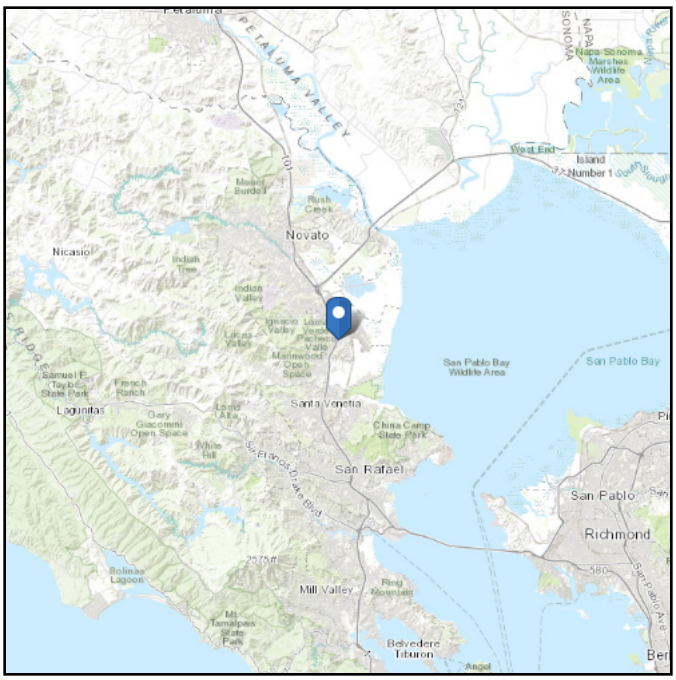
ASCE 7 Hazards Report

Address:
5400 Nave Dr
Novato, California
94949

Standard: ASCE/SEI 7-16
Risk Category: II
Soil Class: D - Default (see Section 11.4.3)

Latitude: 38.050669
Longitude: -122.530488
Elevation: 79.7455980899168 ft (NAVD 88)





Wind

Results:

Wind Speed	92 Vmph
10-year MRI	64 Vmph
25-year MRI	70 Vmph
50-year MRI	74 Vmph
100-year MRI	79 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: Fri Dec 15 2023

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.

Seismic

Site Soil Class: D - Default (see Section 11.4.3)

Results:

S_S :	1.5	S_{D1} :	N/A
S_1 :	0.6	T_L :	12
F_a :	1.2	PGA :	0.583
F_v :	N/A	PGA_M :	0.7
S_{MS} :	1.8	F_{PGA} :	1.2
S_{M1} :	N/A	I_e :	1
S_{DS} :	1.2	C_v :	1.4

Ground motion hazard analysis may be required. See ASCE/SEI 7-16 Section 11.4.8.

Data Accessed: Fri Dec 15 2023

Date Source: USGS Seismic Design Maps

The ASCE 7 Hazard Tool is provided for your convenience, for informational purposes only, and is provided “as is” and without warranties of any kind. The location data included herein has been obtained from information developed, produced, and maintained by third party providers; or has been extrapolated from maps incorporated in the ASCE 7 standard. While ASCE has made every effort to use data obtained from reliable sources or methodologies, ASCE does not make any representations or warranties as to the accuracy, completeness, reliability, currency, or quality of any data provided herein. Any third-party links provided by this Tool should not be construed as an endorsement, affiliation, relationship, or sponsorship of such third-party content by or from ASCE.

ASCE does not intend, nor should anyone interpret, the results provided by this Tool to replace the sound judgment of a competent professional, having knowledge and experience in the appropriate field(s) of practice, nor to substitute for the standard of care required of such professionals in interpreting and applying the contents of this Tool or the ASCE 7 standard.

In using this Tool, you expressly assume all risks associated with your use. Under no circumstances shall ASCE or its officers, directors, employees, members, affiliates, or agents be liable to you or any other person for any direct, indirect, special, incidental, or consequential damages arising from or related to your use of, or reliance on, the Tool or any information obtained therein. To the fullest extent permitted by law, you agree to release and hold harmless ASCE from any and all liability of any nature arising out of or resulting from any use of data provided by the ASCE 7 Hazard Tool.

Project: **BA00324A**
Engineer: **AN**
Date: **December 27, 2023**

Load Combinations for Building Appurtenances

Codes & Standards

- 2021 IBC
- ASCE 7-16

Project Criteria

S_{DS}:	**1.123**	
Ω_o:	**2.0**	*(ASCE Table 13.6-1)*
f_1:	**0.5**	*(IBC 1605.2)*
f_2:	**0.2**	*(IBC 1605.2)*

Load Combinations - LRFD

- The following load combinations are applied in our analysis model.
- Lateral loads are considered in 2 orthogonal directions.
- For load definitions see IBC 1605.2 and ASCE 12.4

LC1:	1.4(D + F)	*(IBC Eq 16-1)*
LC2:	1.2(D + F) + 1.6(L + H) + 0.5(L_r or S or R)	*(IBC Eq 16-2)*
LC3:	1.2(D + F) + 1.6(L_r or S or R) + 1.6H + (f_1L or 0.5W)	*(IBC Eq 16-3)*
LC4:	1.2(D + F) + W + f_1L + 1.6H + 0.5(L_r or S or R)	*(IBC Eq 16-4)*
LC5:	(1.2 + 0.2S_{DS})(D + F) + E + f_1L + 1.6H + f_2S	*(IBC Eq 16-5, ASCE 12.4.2.3)*
LC6:	0.9D + W + 1.6H	*(IBC Eq 16-6)*
LC7:	(0.9 - 0.2SDS)(D + F) + E + 1.6H	*(IBC Eq 16-7, ASCE 12.4.2.3)*

Load Combinations - ASD

- The following load combinations are applied in our analysis model.
- Lateral loads are considered in 2 orthogonal directions.
- For load definitions see IBC 1605.2 and ASCE 12.4

LC11:	D + F	*(IBC Eq 16-8)*
LC12:	D + H + F + L	*(IBC Eq 16-9)*
LC13:	D + H + F + (L_r or S or R)	*(IBC Eq 16-10)*
LC14:	D + H + F + 0.75L + 0.75(L_r or S or R)	*(IBC Eq 16-11)*
LC15a:	D + H + F + 0.6W	*(IBC Eq 16-12)*
LC15b:	(1.0 + 0.14S_{DS})(D + F) + H + 0.7E	*(IBC Eq 16-12)*
LC16:	D + H + F + 0.45W + 0.75L + 0.75(L_r or S or R)	*(IBC Eq 16-13)*
LC17:	(1.0 + 0.10S_{DS})(D + F) + H + 0.525E + 0.75L + 0.75S	*(IBC Eq 16-14)*
LC18:	0.6D + 0.6W + H	*(IBC Eq 16-15)*
LC19:	(0.6 - 0.14S_{DS})(D + F) + 0.7E + H	*(IBC Eq 16-16)*

Load Combinations for Anchorage to Concrete - LRFD

- The following load combinations are used to determine anchorage forces for concrete anchorage.

LC21:	1.2(D + F) + W + f_1L + 1.6H + 0.5(L_r or S or R)	*(IBC Eq 16-4)*
LC22:	(1.2 + 0.2S_{DS})(D + F) + Ω_oE + f_1L + 1.6H + f_2S	*(IBC Eq 16-5, ASCE 12.4.3.1)*
LC23:	0.9D + W + 1.6H	*(IBC Eq 16-6)*
LC24:	(0.9 - 0.2S_{DS})(D + F) + Ω_oE + 1.6H	*(IBC Eq 16-7, ASCE 12.4.3.1)*

Project: **BA00324A**
Engineer: **AN**
Date: **December 27, 2023**

Seismic Design Criteria where ASCE 7-16 CH 11.4.8 Applies

The web-based tools used to determine seismic design criteria do not produce values for F_a and F_v where ASCE 7-16 CH 11.4.8 is applicable. This tool produces the missing values and determines if a site-specific ground motion study per ASCE 7-16 CH 21.1 is required.

Site Information

Risk Category:	**II**
Site Class:	**D** *(Default)*
S_S:	**1.500**
S_1:	**0.600**
F_a:	1.200
F_v:	1.700
S_{MS}:	1.800
S_{M1}:	1.020
S_{DS}:	**1.200**
S_{D1}:	**0.680**
T_L:	**12**
T_S:	0.567
T_0:	0.113

For Site Class D, Only

Is Site Class assumed? **Yes**

Seismic Design Category

Seismic Design Category: **D**

Notes regarding ASCE 7-16 CH 11.4.8

A site-specific analysis is not required for structures on Site Class D sites where $S_1 \geq 0.2$, provided the seismic response coefficient, C_s, is modified per ASCE CH 11.4.8 Exception 2. There are no additional requirements for non-structural components designed per ASCE CH 13.

Loads on Building Appurtenances (page 1 of 2)

- Design is in accordance with the 2021 IBC.
- Wind loading procedure is per ASCE 7-16 CH 29.4
- Seismic loads are 1.0E
- Wind loads are 1.0W

Site Criteria - Wind (ASCE CH 26.10.2)

Exposure:	C		*(ASCE CH 26.7)*
K_{zt}:	1.00		*(ASCE CH 26.8.2)*
K_e:	1.00		*(ASCE CH 26.9)*
V:	92	mph	*(ASCE CH 26.5.1)*

Site Criteria - Seismic (ASCE CH 13.3)

S_{DS}:	1.200	g	
I_p:	1.0		*(ASCE CH 13.1.3)*
a_p:	1.0		*(ASCE Table 13.6-1)*
R_p:	2.5		*(ASCE Table 13.6-1)*

Building Info

h:	21	ft	*(Mean roof height)*
z_g:	80	ft	*(Ground elevation)*

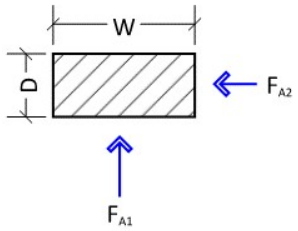


Figure 1
Flat Appurtenance
Plan View

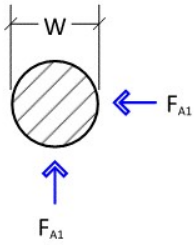


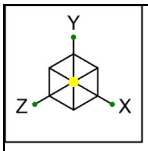
Figure 2
Round Appurtenance
Plan View

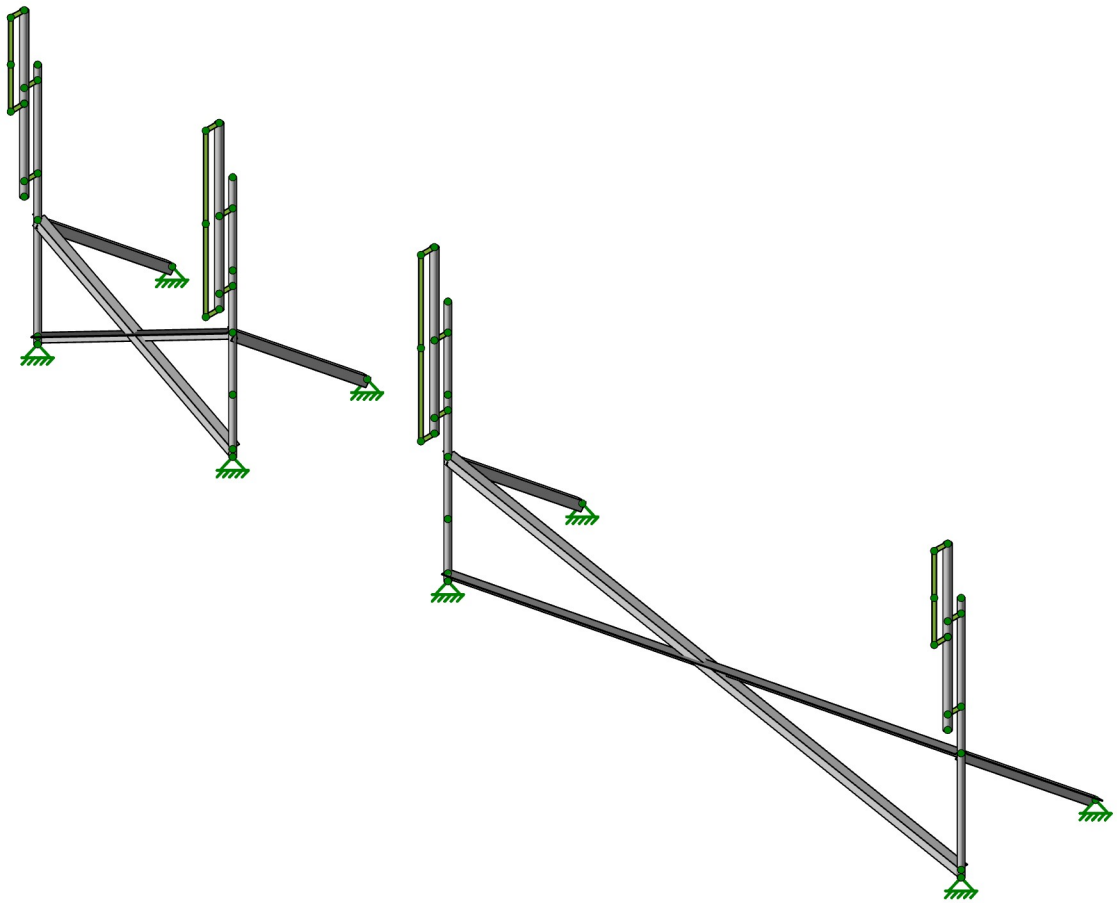
See next page for individual appurtenance loads.

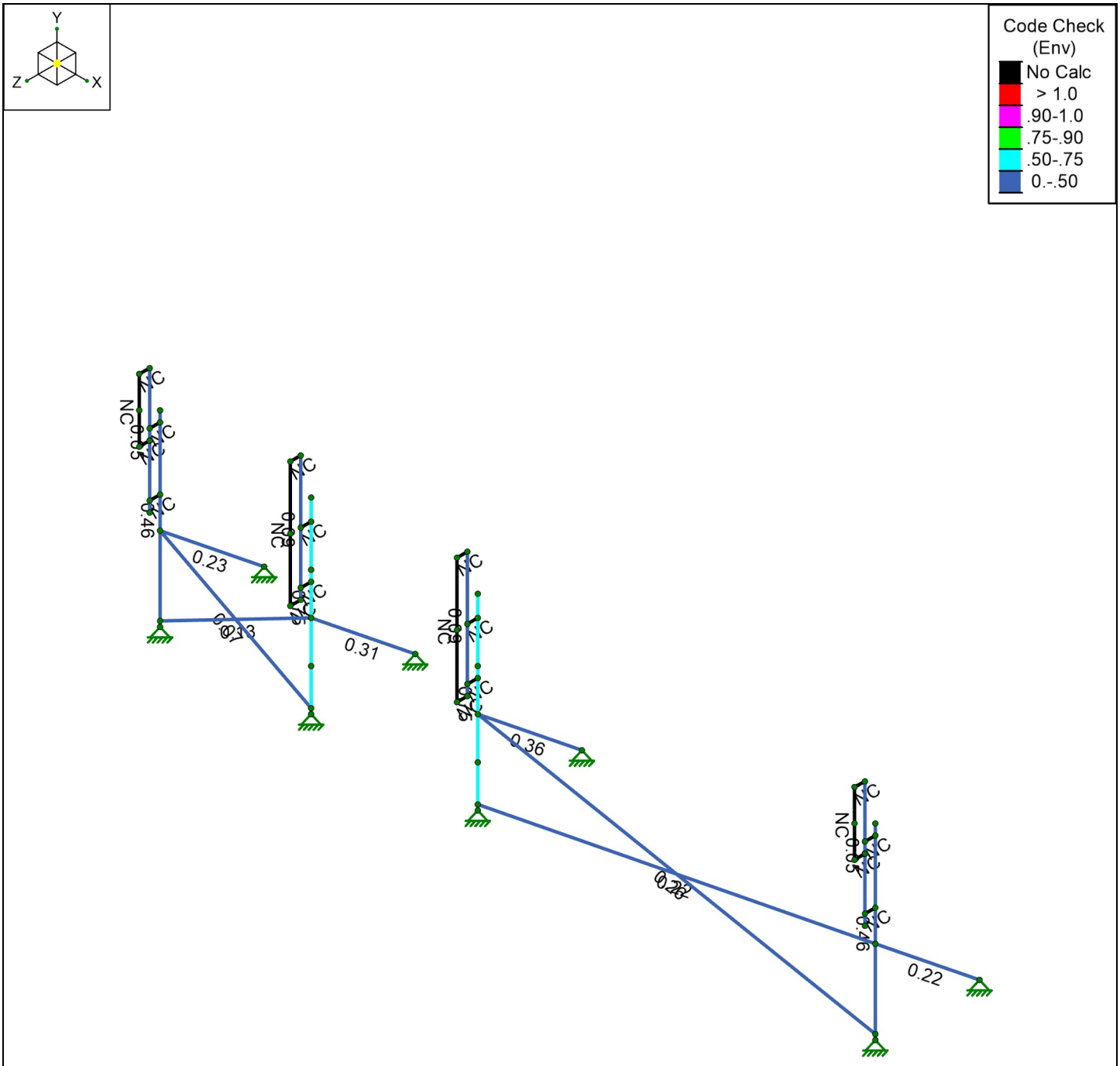
Loads on Building Appurtenances (page 2 of 2)

Building Appurtenances

Description	Type	Dimensions & Weight					Wind			Seismic		
		z	H	W	D	W_p	F_{A1}	F_{A2}	q_z	F_p		z/h
		ft	*in*	*in*	*in*	*lb*	*lb*	*lb*	*psf*	*lb*	W_p	
ERICSSON AIR 6419 B41_TMO	FLAT	**30.5**	36.3	20.9	9.0	96.5	**132**	**59**	19.2	**56**	0.58	1.00
RFS/CELWAVE APXVAALL18_43-U-NA20_TMO	FLAT	**29**	72.0	24.0	8.5	111.7	**303**	**117**	19.0	**64**	0.58	1.00
ERICSSON RADIO 4480 B71 B85A	29	**83**	21.8	15.7	7.5	93.1	**46**	**23**	23.7	**54**	0.58	1.00
ERICSSON RADIO 4460 B25/B66	29	**83**	19.6	15.7	12.1	118.1	**41**	**32**	23.7	**68**	0.58	1.00

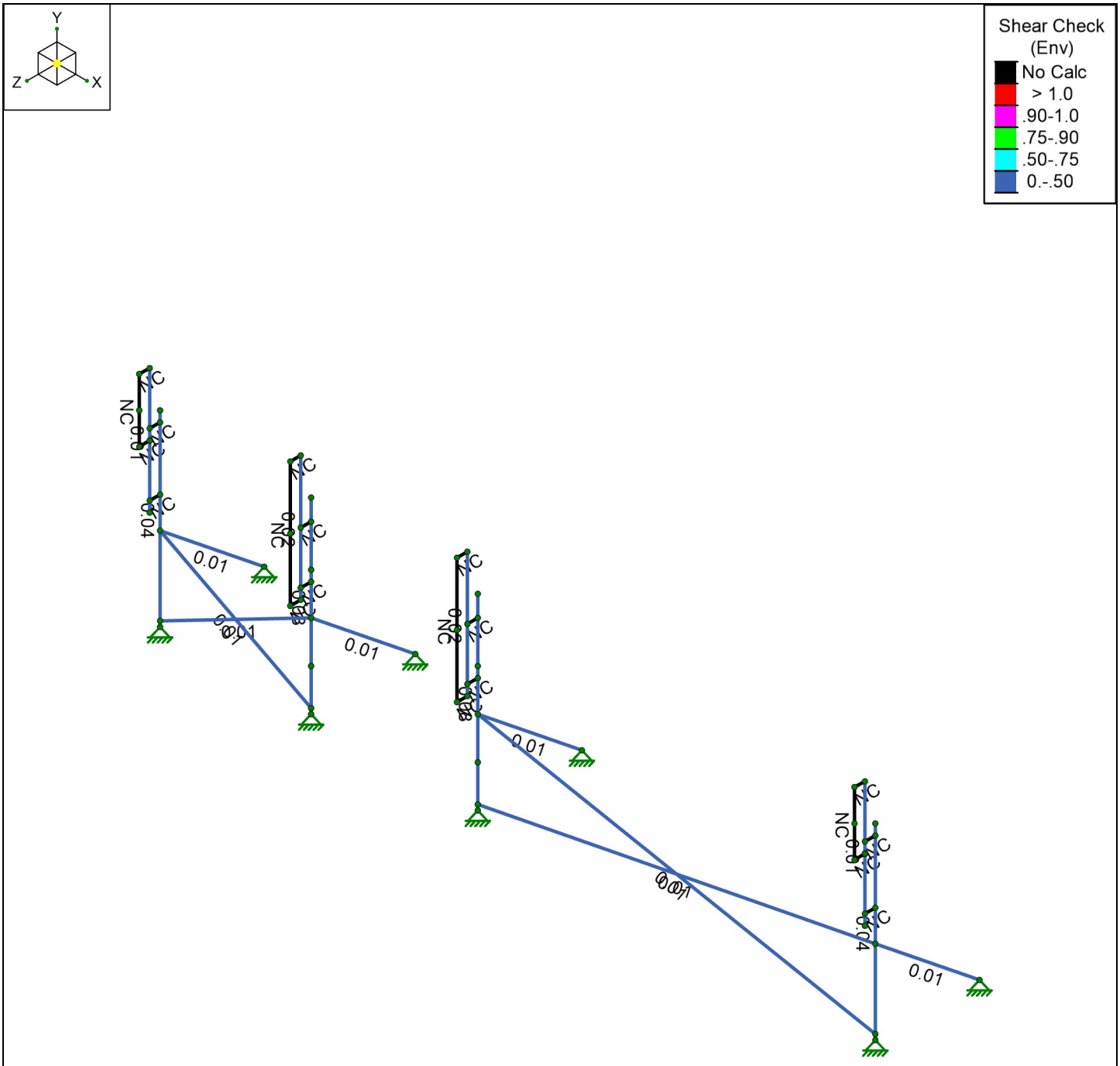

Y
Z
X





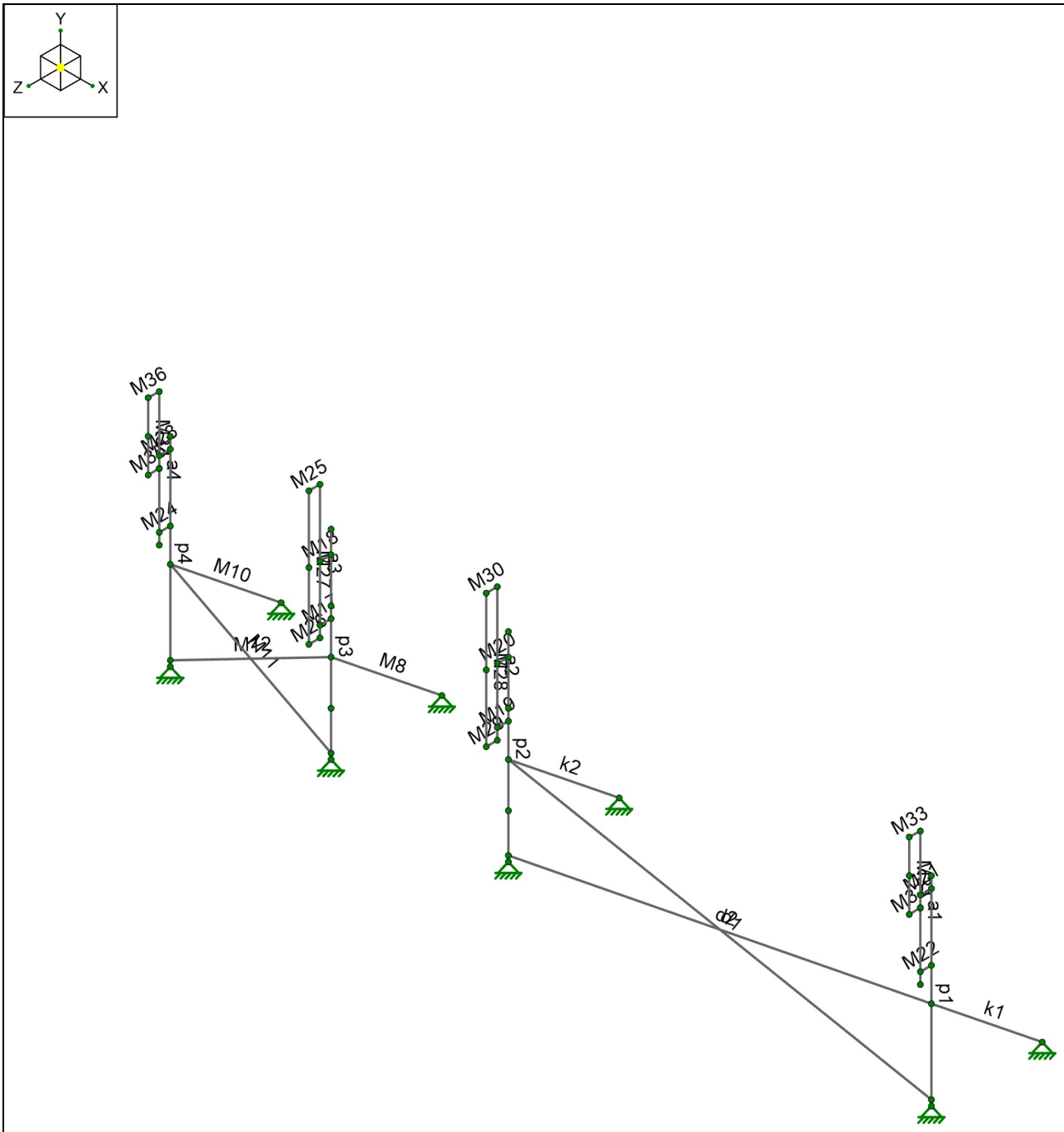
Member Code Checks Displayed (Enveloped)

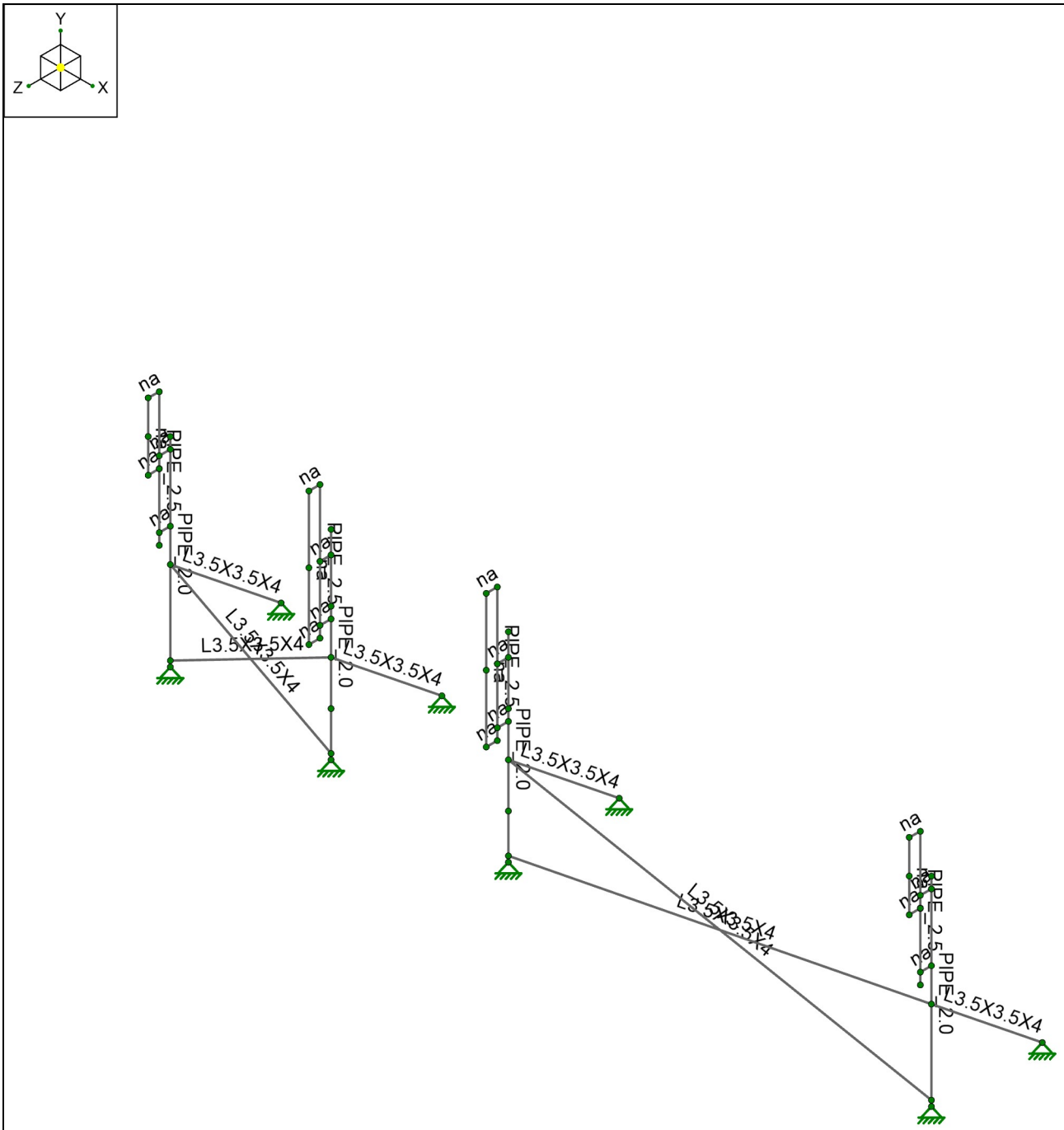
RISA A NEMETSCHEK COMPANY	Centerline	BA00324A	SK-2
	AN		Dec 27, 2023 at 11:42 AM
	BA00324A		BA00324A.r3d

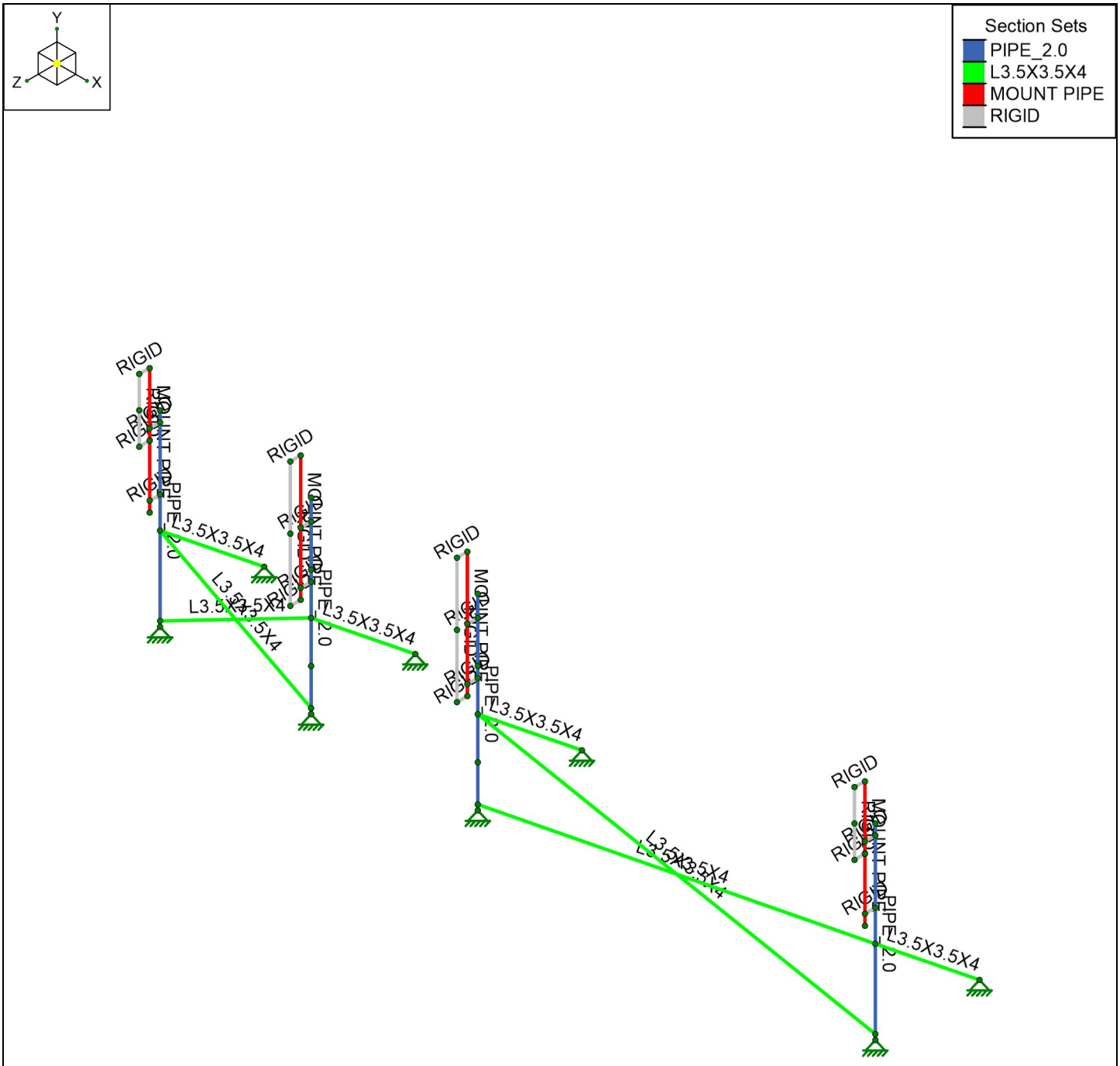


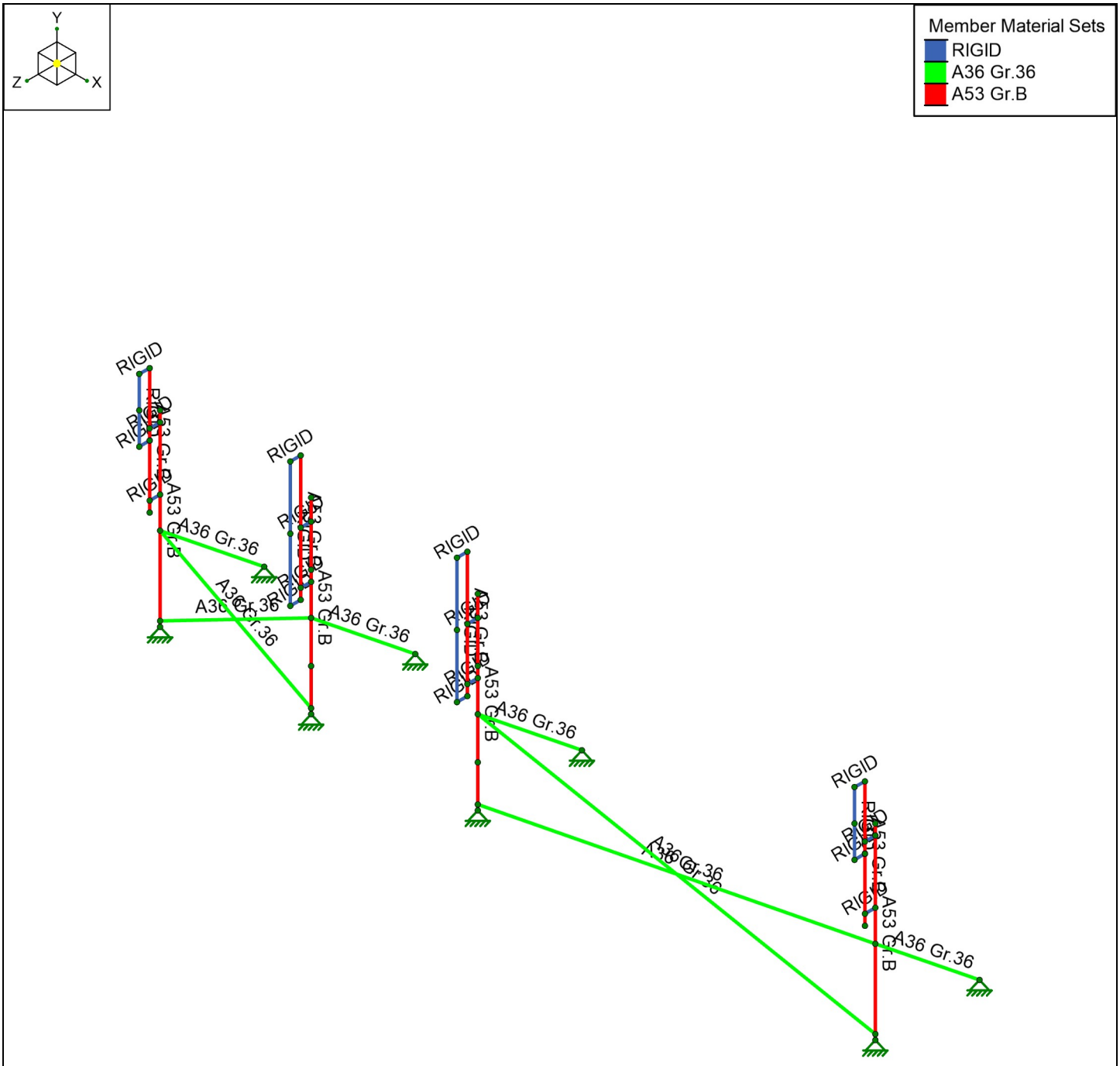
Member Shear Checks Displayed (Enveloped)

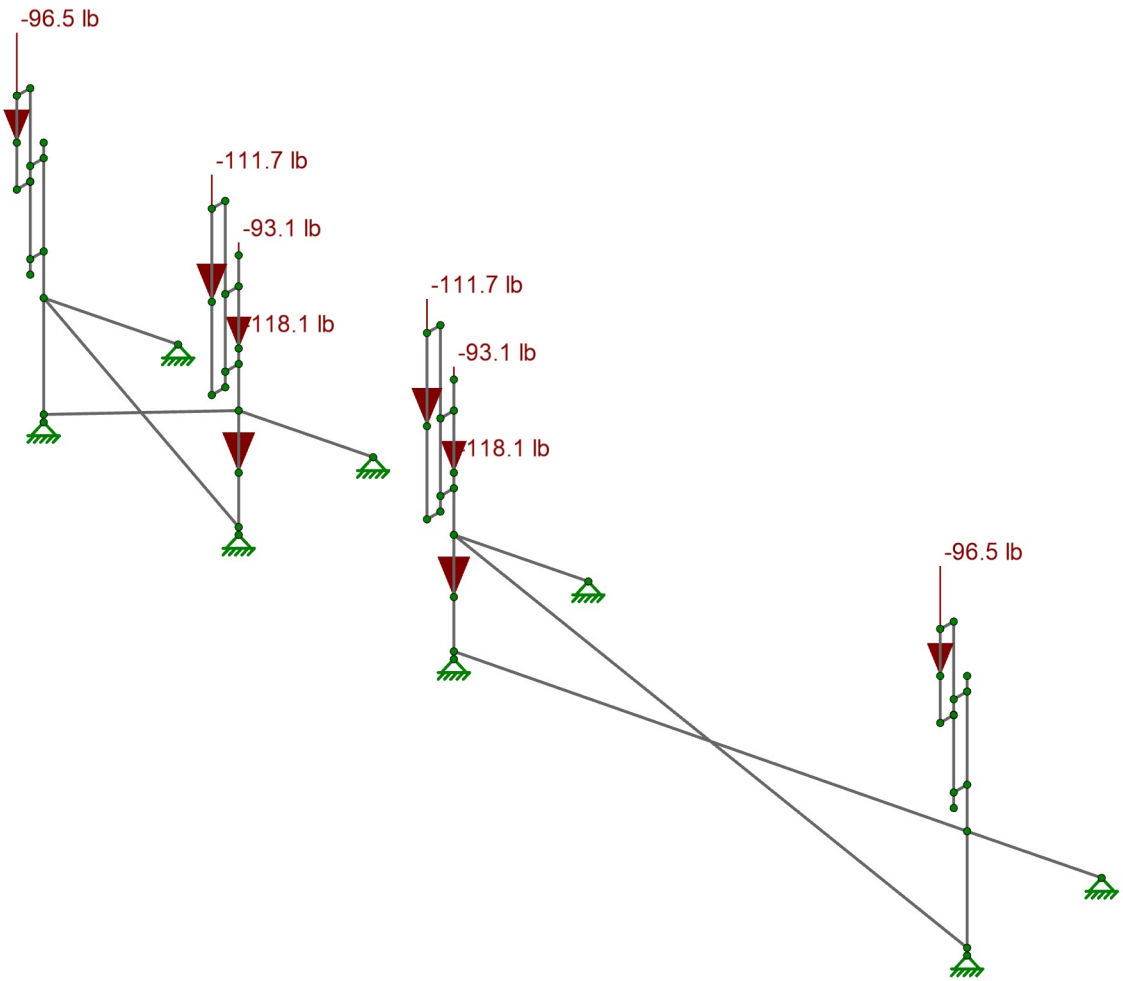
RISA A NEMETSCHEK COMPANY	Centerline	BA00324A	SK-3
	AN		Dec 27, 2023 at 11:42 AM
	BA00324A		BA00324A.r3d


Y
Z
X
M36
M25
M30
M33
M24
M22
M10
M8
p4
p3
p2
p1
k2
k1
e1


Y
Z
X
na
PIPE 2.5
L3.5X3.5X4
L2.0

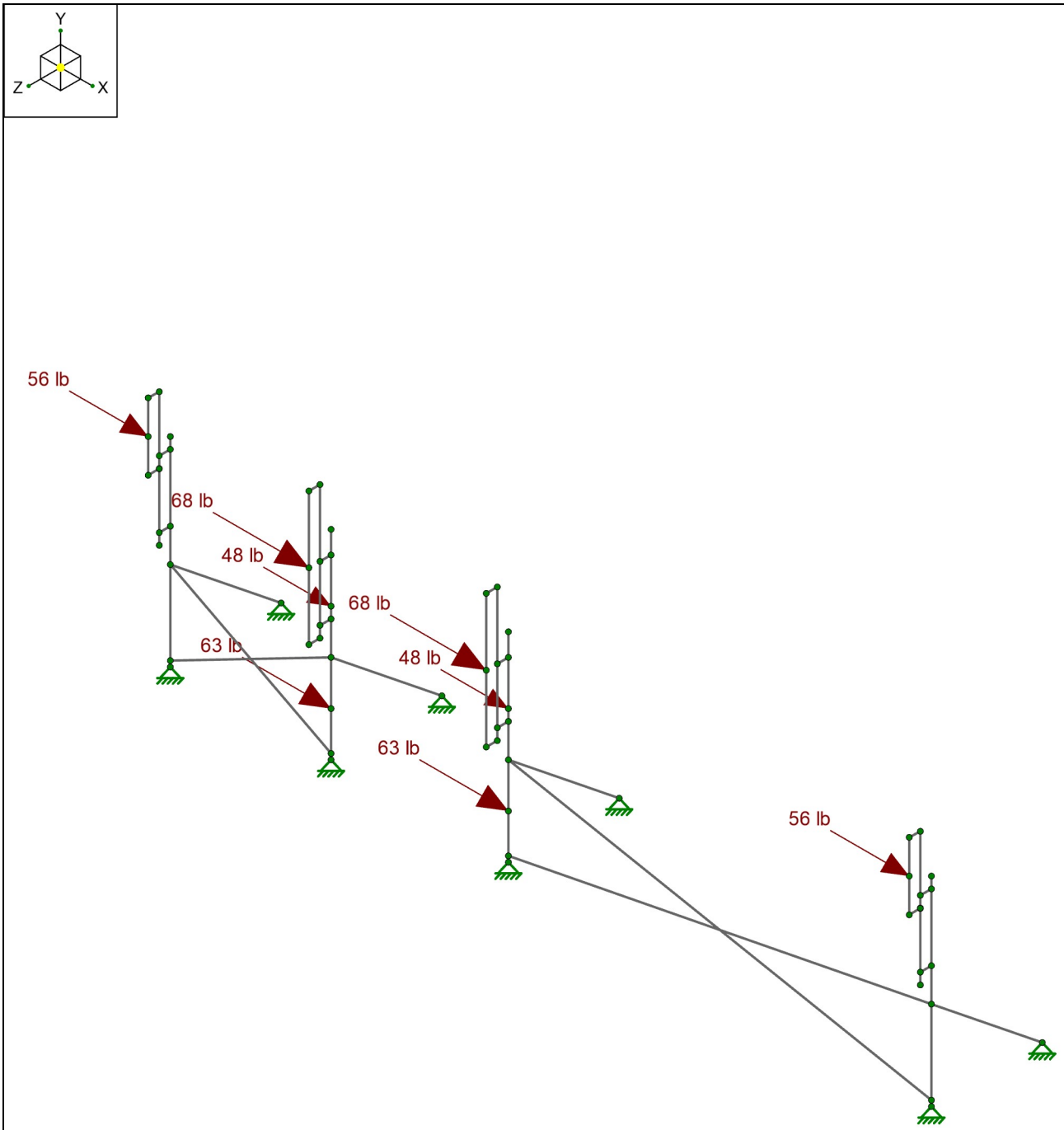

Y
Z
X
Section Sets
PIPE_2.0
L3.5X3.5X4
MOUNT PIPE
RIGID
RIGID
MOUNT PIPE
PIPE 2.0
L3.5X3.5X4


Y
Z
X
Member Material Sets
RIGID
A36 Gr.36
A53 Gr.B
RIGID
A53 Gr.B
A36 Gr.36
A36 Gr.36
A36 Gr.36
A36 Gr.36
A36 Gr.36
A36 Gr.36



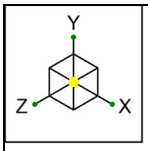
Loads: BLC 1, D

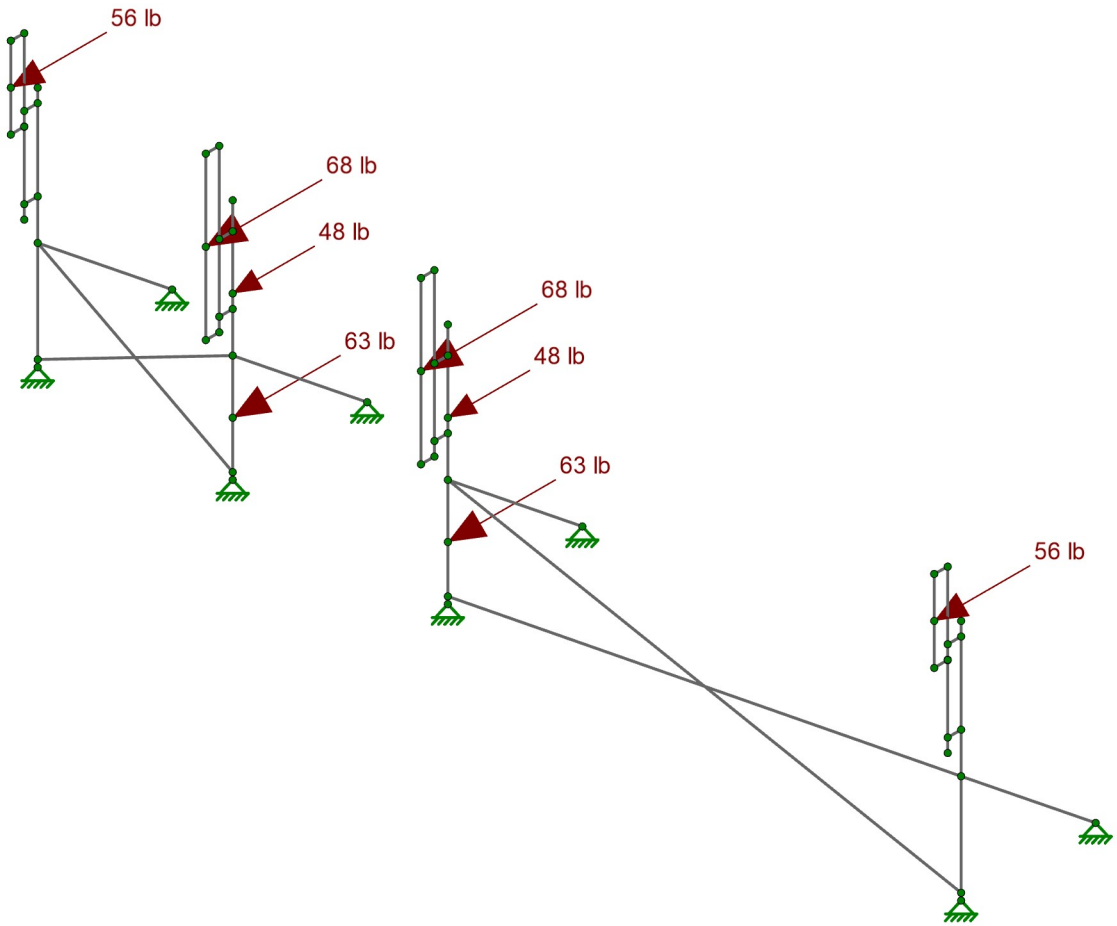
RISA A NEMETSCHEK COMPANY	Centerline	BA00324A	SK-8
	AN		Dec 27, 2023 at 11:43 AM
	BA00324A		BA00324A.r3d



Loads: BLC 2, Ex

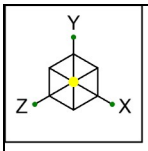
RISA A NEMETSCHEK COMPANY	Centerline	BA00324A	SK-9
	AN		Dec 27, 2023 at 11:43 AM
	BA00324A		BA00324A.r3d

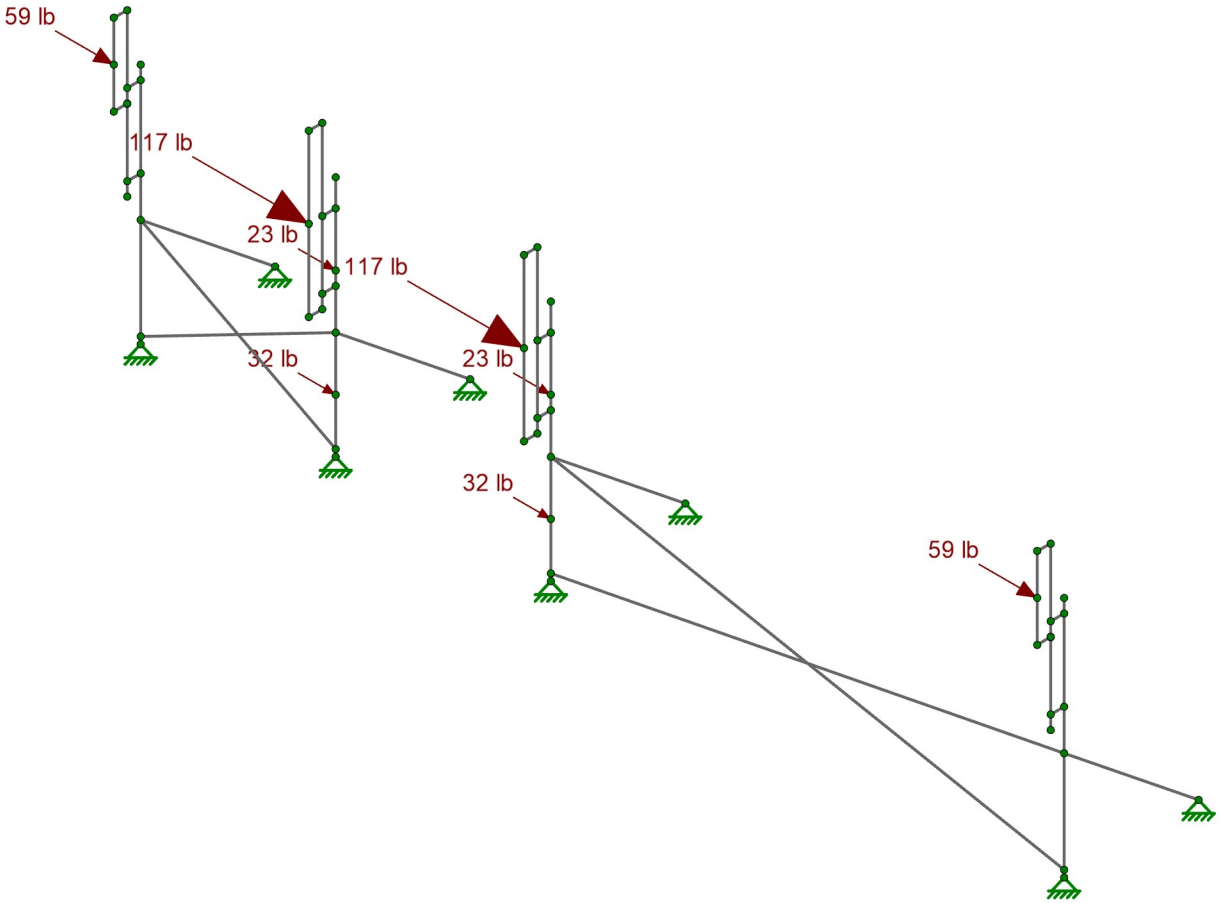




Loads: BLC 3, Ez

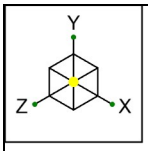
IRISA A NEMETSCHEK COMPANY	Centerline	BA00324A	SK-10
	AN		Dec 27, 2023 at 11:43 AM
	BA00324A		BA00324A.r3d

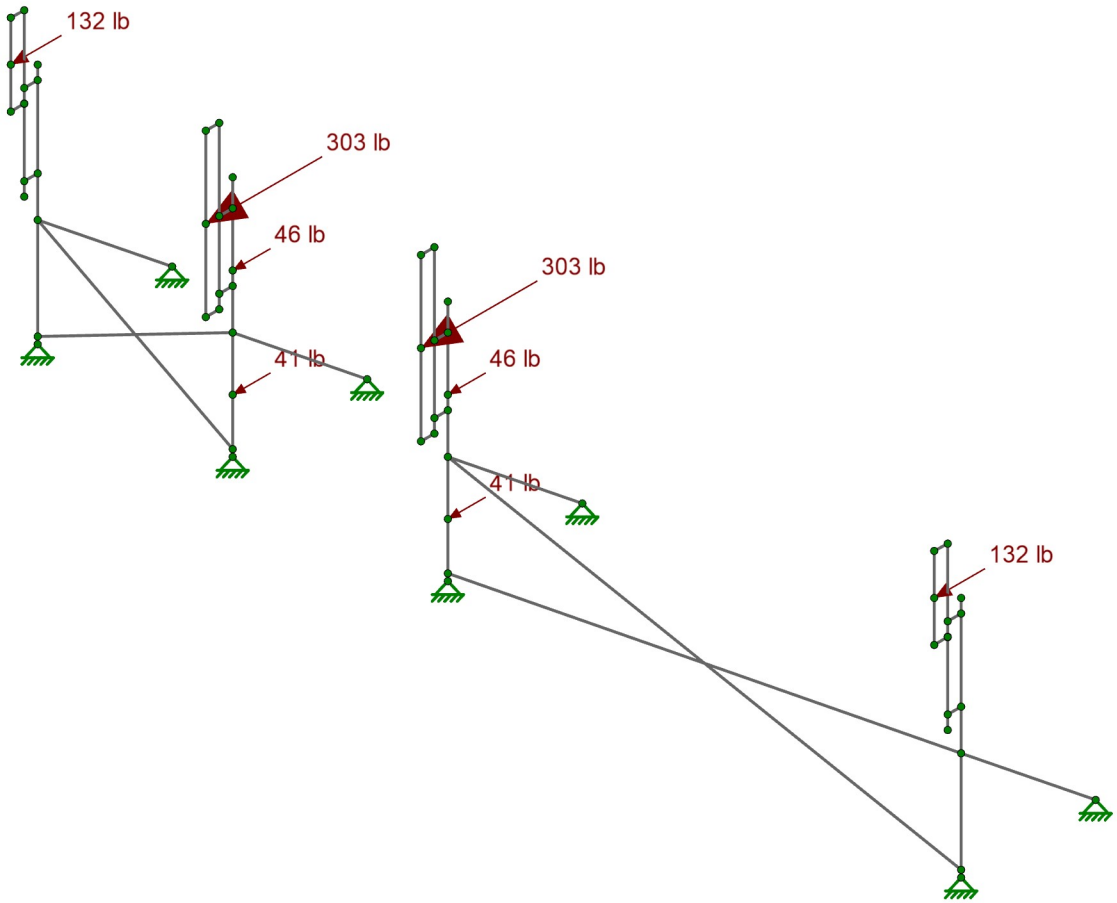




Loads: BLC 10, Wx

IRISA A NEMETSCHEK COMPANY	Centerline	BA00324A	SK-11
	AN		Dec 27, 2023 at 11:44 AM
	BA00324A		BA00324A.r3d





Loads: BLC 11, Wz

RISA A NEMETSCHEK COMPANY	Centerline	BA00324A	SK-12
	AN		Dec 27, 2023 at 11:44 AM
	BA00324A		BA00324A.r3d

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm. Coeff. [1e⁵°F⁻¹]	Density [k/ft³]	Yield [ksi]	Ry	Fu [ksi]	Rt
1	A992	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	0.3	0.65	0.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	0.3	0.65	0.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	0.3	0.65	0.527	42	1.4	58	1.3
5	A500 Gr.B RECT	29000	11154	0.3	0.65	0.527	46	1.4	58	1.3
6	A500 Gr.C RND	29000	11154	0.3	0.65	0.527	46	1.4	62	1.3
7	A500 Gr.C RECT	29000	11154	0.3	0.65	0.527	50	1.4	62	1.3
8	A53 Gr.B	29000	11154	0.3	0.65	0.49	35	1.6	60	1.2
9	A1085	29000	11154	0.3	0.65	0.49	50	1.4	65	1.3
10	A913 Gr.65	29000	11154	0.3	0.65	0.49	65	1.1	80	1.1

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Rule	Area [in²]	Iyy [in⁴]	Izz [in⁴]	J [in⁴]
1	PIPE_2.0	PIPE_2.0	Column	Pipe	A53 Gr.B	Typical	1.02	0.627	0.627	1.25
2	L3.5X3.5X4	L3.5X3.5X4	Beam	Single Angle	A36 Gr.36	Typical	1.7	2	2	0.039
3	PIPE_2.5	PIPE_2.5	Beam	Pipe	A53 Gr.B	Typical	1.61	1.45	1.45	2.89
4	MOUNT PIPE	PIPE_2.5	Column	Pipe	A53 Gr.B	Typical	1.61	1.45	1.45	2.89

Hot Rolled Steel Design Parameters

	Label	Shape	Length [in]	Lcomp top [in]	Channel Conn.	a [in]	Function
1	p2	PIPE_2.0	108	Lbyy	N/A	N/A	Lateral
2	p1	PIPE_2.0	108	Lbyy	N/A	N/A	Lateral
3	k2	L3.5X3.5X4	76.837	Lbyy	N/A	N/A	Lateral
4	k1	L3.5X3.5X4	76.837	Lbyy	N/A	N/A	Lateral
5	d1	L3.5X3.5X4	233.38	Lbyy	N/A	N/A	Lateral
6	d2	L3.5X3.5X4	233.38	Lbyy	N/A	N/A	Lateral
7	p3	PIPE_2.0	108	Lbyy	N/A	N/A	Lateral
8	M8	L3.5X3.5X4	76.837	Lbyy	N/A	N/A	Lateral
9	p4	PIPE_2.0	108	Lbyy	N/A	N/A	Lateral
10	M10	L3.5X3.5X4	76.837	Lbyy	N/A	N/A	Lateral
11	M11	L3.5X3.5X4	97.949	Lbyy	N/A	N/A	Lateral
12	M12	L3.5X3.5X4	97.949	Lbyy	N/A	N/A	Lateral
13	a4	MOUNT PIPE	72	Lbyy	N/A	N/A	Lateral
14	a3	MOUNT PIPE	72	Lbyy	N/A	N/A	Lateral
15	a2	MOUNT PIPE	72	Lbyy	N/A	N/A	Lateral
16	a1	MOUNT PIPE	72	Lbyy	N/A	N/A	Lateral

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Nodal
1	D	DL		-1		8
2	Ex	ELX	-0.58			8
3	Ez	ELZ			-0.58	8
4	F	FL				
5	H	HL				
6	L	LL				
7	Lr	RLL				
8	R	RL				
9	S	SL				
10	Wx	WLX				8
11	Wz	WLZ				8

Load Combination Design

	Description	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
1	**LC11 (IBC Eq 16-8)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2	LC11		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
3			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4	**LC12 (IBC Eq 16-9)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
5	LC12		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
6			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
7	**LC13 (IBC Eq 16-10)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8	LC13a (Lr)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9	LC13b (S)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10	LC13c (R)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
12	**LC14 (IBC Eq 16-11)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
13	LC14a (Lr)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
14	LC14b (S)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
15	LC14c (R)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
16			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
17	**LC15 (IBC Eq 16-12)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
18	LC15aa (Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
19	LC15aa (-Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
20	LC15ab (Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
21	LC15ab (-Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
22	LC15ba (Ex)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
23	LC15ba (-Ex)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
24	LC15bb (Ez)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
25	LC15bb (-Ez)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
26			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
27	**LC16 (IBC Eq 16-13)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
28	LC16aa (Lr + Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
29	LC16aa (Lr - Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
30	LC16ab (Lr + Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
31	LC16ab (Lr - Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
32	LC16ba (S + Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
33	LC16ba (S - Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
34	LC16bb (S + Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
35	LC16bb (S - Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
36	LC16ca (R + Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
37	LC16ca (R - Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
38	LC16cb (R + Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
39	LC16cb (R - Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
40			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
41	**LC17 (IBC Eq 16-14)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
42	LC17a (Ex)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
43	LC17a (-Ex)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
44	LC17b (Ez)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
45	LC17b (-Ez)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
46			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
47	**LC18 (IBC Eq 16-15)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
48	LC18aa (Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
49	LC18aa (-Wx)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
50	LC18ab (Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
51	LC18ab (-Wz)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
52			Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
53	**LC19 (IBC Eq 16-16)**		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
54	LC19a (Ex)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
55	LC19a (-Ex)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Load Combination Design (Continued)

	Description	Service	Hot Rolled	Cold Formed	Wood	Concrete	Masonry	Aluminum	Stainless	Connection
56	LC19b (Ez)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
57	LC19b (-Ez)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Envelope AISC 15TH (360-16): ASD Member Steel Code Checks

	Member	Shape	Code Check	Loc[in]	LC	Shear Check	Loc[in]	Dir	LC	Pnc/om [lb]	Pnt/om [lb]	Mnyy/om [lb-ft]	Mnzz/om [lb-ft]	Cb	Eqn
0	p2	PIPE_2.0	0.752	59.625	20	0.077	59.625		18	8079.805	21377.246	1245.259	1245.259	1	H1-1b
1	p3	PIPE_2.0	0.751	59.625	20	0.077	59.625		19	8079.805	21377.246	1245.259	1245.259	1	H1-1b
2	p4	PIPE_2.0	0.455	59.625	20	0.038	59.625		18	8079.805	21377.246	1245.259	1245.259	1	H1-1b
3	p1	PIPE_2.0	0.455	59.625	20	0.041	108		18	8079.805	21377.246	1245.259	1245.259	1	H1-1b
4	k2	L3.5X3.5X4	0.363	0	20	0.009	0	y	20	19004.803	36646.707	1607.158	3097.453	1.5	H2-1
5	M8	L3.5X3.5X4	0.309	0	20	0.009	0	y	20	19004.803	36646.707	1607.158	3097.453	1.5	H2-1
6	d1	L3.5X3.5X4	0.255	233.38	18	0.01	233.38	y	20	2220.655	36646.707	1607.158	1861.456	1.247	H2-1
7	M10	L3.5X3.5X4	0.226	0	20	0.006	0	y	20	19004.803	36646.707	1607.158	3097.453	1.5	H2-1
8	k1	L3.5X3.5X4	0.223	0	20	0.006	0	z	20	19004.803	36646.707	1607.158	3097.453	1.5	H2-1
9	d2	L3.5X3.5X4	0.223	233.38	25	0.009	0	y	20	2220.655	36646.707	1607.158	2090.464	1.5	H2-1
10	M12	L3.5X3.5X4	0.13	0	20	0.012	97.949	y	20	12606.861	36646.707	1607.158	2922.501	1.5	H2-1
11	a2	PIPE_2.5	0.088	72	20	0.021	72		18	25132.281	33742.515	2392.715	2392.715	1	H1-1b
12	a3	PIPE_2.5	0.088	72	20	0.021	72		19	25132.281	33742.515	2392.715	2392.715	1	H1-1b
13	M11	L3.5X3.5X4	0.066	0	19	0.011	0	y	20	12606.861	36646.707	1607.158	2922.501	1.5	H2-1
14	a4	PIPE_2.5	0.054	66	20	0.011	36		22	25132.281	33742.515	2392.715	2392.715	1	H1-1b
15	a1	PIPE_2.5	0.054	66	20	0.011	36		23	25132.281	33742.515	2392.715	2392.715	1	H1-1b

Envelope Node Reactions

	Node Label		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
0	N9	max	190.005	19	880.257	20	79.878	20	0	57	0	57	0	57
1		min	37.691	48	-9.236	51	-65.749	51	0	2	0	2	0	2
2	N15	max	23.942	49	821.331	20	58.25	20	0	57	0	57	0	57
3		min	-60.189	18	-54.656	51	-46.92	51	0	2	0	2	0	2
4	N10	max	34.506	49	466.507	20	50.12	20	0	57	0	57	0	57
5		min	-264.76	18	36.153	51	-39.642	51	0	2	0	2	0	2
6	N20	max	139.107	19	394.569	20	80.163	20	0	57	0	57	0	57
7		min	-114.032	48	3.523	51	-59.976	51	0	2	0	2	0	2
8	N12	max	43.537	20	337.449	51	309.074	51	0	57	0	57	0	57
9		min	-35.535	51	-350.147	20	-328.329	20	0	2	0	2	0	2
10	N2	max	28.941	18	361.154	51	299.216	51	0	57	0	57	0	57
11		min	-18.58	49	-343.661	20	-312.739	20	0	2	0	2	0	2
12	N5	max	14.31	57	149.954	51	119.442	51	0	57	0	57	0	57
13		min	-22.061	24	-156.404	20	-130.554	20	0	2	0	2	0	2
14	N17	max	20.543	22	143.363	51	111.046	51	0	57	0	57	0	57
15		min	-16.886	55	-149.622	20	-123.32	20	0	2	0	2	0	2
16	Totals:	max	277.199	19	1812.889	25	626.491	51						
17		min	-277.198	48	687.646	56	-626.532	20						

MAX. GOVERNING LOADS

(E) Connection : (2) 1/2" dia. X 3-1/2" embed. lag bolts

*per Structural Analysis by ZON Architects, dated November 5, 2014

Input Loads:

T_a: **350** lbs *(ASD tension)*

V_a: **328** lbs *(ASD shear)*

Lag Screw Check:

D=	0.5	in			lag screw diameter
p=	3	in			lag screw penetration
α=	46.9	degrees			angle of resultant
C_D=	1.6				NDS 2018 Table 2.3.2- Frequently Used Load Duration Factors
G=	0.5	(Douglas Fir-Larch)			NDS 2018 Table 12.3.3A - Assigned Specific Gravities
W=	378	lbs/in			NDS 2018 Table 12.2A - Lag Screw Reference Withdrawal Value
Z=	(510 lbs x p)/(8D)=		383	lbs	NDS 2018 Table 12.2B - Bolts: Reference Lateral Design Values
W'=	CD x (W x p)=		1814	lbs	
Z'=	CD x Z=		613	lbs	
Z (capacity)=	653				NDS 2018 Eq. 12.4-1
Z (demand)=	480	lbs			

D/C= Z (demand) / Z (capacity) = 0.73 < 1.00 **OK**