From: Brian Gaudet <BGaudet@allpointstech.com>
Sent: Tuesday, November 17, 2020 9:45 AM
To: Robidoux, Evan <Evan.Robidoux@ct.gov>; CSC-DL Siting Council <Siting.Council@ct.gov>
Cc: Mike Libertine <mlibertine@allpointstech.com>; Lord, Andrew <andrew.lord@eversource.com>; Shanley, Kathleen M <kathleen.shanley@eversource.com>
Subject: RE: Notice of Exempt Modification - Eversource - 2 Center Hill Road, West Hartland, CT 06091 - Filing/Electronic Copy

Hi Evan,

Per my discussion with Ifeanyi on a previous site we would like to submit a supplemental Mount Analysis that was performed for this site. Please see the attached analysis for all three applicable Eversource mounts at this site.

Please let me know if you have any questions.

Best Regards,

Brian Gaudet
Project Manager

D: 860.581.4482
M: 860.798.6597
E: bgaudet@allpointstech.com

All-Points Technology Corporation, P.C.
567 Vauxhall Street Extension – Suite 311
Waterford, CT 06385

Please note our new corporate office address

From: Robidoux, Evan <Evan.Robidoux@ct.gov>
Sent: Wednesday, November 4, 2020 12:11 PM
To: Brian Gaudet <BGaudet@allpointstech.com>; CSC-DL Siting Council <Siting.Council@ct.gov>
Cc: Mike Libertine <mlibertine@allpointstech.com>; Lord, Andrew <andrew.lord@eversource.com>; Shanley, Kathleen M <kathleen.shanley@eversource.com>
Subject: Re: Notice of Exempt Modification - Eversource - 2 Center Hill Road, West Hartland, CT 06091 - Filing/Electronic Copy

Good afternoon,

Your electronic correspondence has been received by the CSC for 11/4/2020. Thank you.

Evan Robidoux
Clerk Typist
Connecticut Siting Council

10 Franklin Square
New Britain, CT 06051

From: Brian Gaudet <BGaudet@allpointstech.com>
Sent: Wednesday, November 4, 2020 12:09 PM
To: CSC-DL Siting Council <Siting.Council@ct.gov>
Cc: Mike Libertine <mlibertine@allpointstech.com>; Lord, Andrew <andrew.lord@eversource.com>; Shanley, Kathleen M <kathleen.shanley@eversource.com>
Subject: Notice of Exempt Modification - Eversource - 2 Center Hill Road, West Hartland, CT 06091 - Filing/Electronic Copy

Good Afternoon,

Please see attached the Notice of Exempt Modification for proposed modifications by Eversource on an existing self-support tower at 2 Center Hill Road in West Hartland. Feel free to reach out to me with any questions or if anything further is needed from our end.

Best Regards,

EVERSOURCE ENERGY

BLACK & VEATCH
Building a world of difference.
BLACK & VEATCH CORPORATION
6800 W 115TH ST, SUITE 2292, OVERLAND PARK, KS 66211
+1 913-458-2522 | RILEYJJ@BV.COM

November 13, 2020

MOUNT EVALUATION LETTER

Site Number: ES-033
Site Name: WHartland
Site Data: 2 Center Hill Rd.
West Hartland, CT 06091
Latitude: 41° 58’ 43.5”
Longitude: -72° 58’ 56”

Black & Veatch Corporation is pleased to submit this “Mount Evaluation Letter” to determine the structural integrity of antenna mounting system on the above-mentioned site. The purpose of this evaluation is to determine the capacity of the system in supporting the final loading in the attached “Loading Summary”.

Proposed Mounting System
SitePro 1 (USF-4U) 48” Ultimate Universal Stand-off Frame

Based on our evaluation we have determined the proposed antenna mounting system to be: **SUFFICIENT**

Structure Rating (max from all components) =	16.9%

The proposed mounting system will be capable of supporting the proposed equipment, under the assumptions described in Section 4 of the report and the following conditions:

- Contractor shall be responsible for the means and methods of construction.
- Contractor shall inspect the condition of all existing and proposed structural members, all relevant members and connections and report any deficiencies to the engineer prior to installation of any new antennas and other equipment.

The scope of this evaluation pertains only to the proposed antenna mounting system and does not include examination of the loads imparted by the antenna mounting system to the existing tower and its structural components. This document was prepared based on information provided to Black & Veatch. If existing conditions do not reflect those represented, this analysis is no longer valid.

Please contact Josh Riley in our Overland Park Office
at 913-458-2522 if you have any questions or comments.

Sincerely,
Black & Veatch Corporation

Prepared By: Joohwan Jung
Submitted By: Josh Riley, P.E.

11/17/2020

TABLE OF CONTENTS

1. LOADING SUMMARY

2. ANALYSIS CRITERIA SUMMARY

3. REFERENCES

4. ASSUMPTIONS

5. RESULTS SUMMARY

APPENDICES

APPENDIX 1: MOUNT ANALYSIS REPORT

APPENDIX 2: RISA PRINTOUTS

APPENDIX 3: ATTACHMENTS

1. LOADING SUMMARY

Appurtenance								
Carrier	Position	Sector	Antenna RAD Center (ft)	Mount Centerline (ft)	Qty	Type	Manufacturer	Model
Eversource	1	-	110	107.25	1	Dipole	Comprod	871F-70-2

2. ANALYSIS CRITERIA SUMMARY

ANALYSIS CRITERIA	
STANDARD	TIA-222-H
WIND SPEED	Ultimate of 125 mph
WIND SPEED WITH ICE	50 mph with 1.5" radial ice thickness
EXPOSURE CATEGORY	B
RISK CATEGORY	III
TOPO CATEGORY	Flat
CREST HEIGHT	N/A
SPECTRAL RESPONSE FACTORS, Ss & S1	0.175 g & 0.065 g

3. REFERENCES

- American Institute of Steel Construction, AISC 15th Edition
- Telecommunications Industry Association Standard, TIA-222-H & 2018 Connecticut State Building Code
- Antenna Mount Assembly Drawing (Model: USF-4U) by SitePro 1, dated 02/16/2011

4. ASSUMPTIONS

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

- The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
- The configuration of antennas, mounts, and other appurtenances are as specified in the Loading Summary and the referenced drawings.
- 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.
- Sector frame center line: located equidistant between top & bottom boom; Platform center line: located at the base perimeter of platform, unless otherwise specified.
- Steel grades have been assumed as follows, unless noted otherwise:

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

5. RESULTS SUMMARY

Name	Bending Stress Ratio		Shear Stress Ratio	
Arm: HSS3X3X3/16	12.1%	Pass	2.6%	Pass
Bracing: Pipe 2.0 Std	16.9%	Pass	2.2%	Pass
Mount Pipe: Pipe 3.0 Std	9.6%	Pass	2.5%	Pass

*Von Mises SR = (Max Von Mises Value From RISA-3D)/(0.9*Fy)

**Capacity rating per TIA-222-H Section 15.5.

APPENDIX 1:
MOUNT ANALYSIS REPORT

Dead and Live Loads

Maintenance Live Load: L_V = 250 lb
Installation Live Load: L_M = 0 lb

Appurtenance Dead Loads	
Name	Weight (lb)
871F-70-2	12.5

Client:	Eversource	Computed By:	Joohwan Jung
Site Name:	WHartland (ES-033)	Date:	11/13/2020
		Verified By:	JW
Title:	MOUNT ANALYSIS REPORT	Date:	11/16/2020

BLACK & VEATCH

Appurtenance Wind Loading

			TIA-222-H
Exposure Category =	B		
Risk Category =	III		
Topographic Category =	1		
Basic Wind Speed, V =	125	mph	
Height Above Ground, z =	110	ft	
Crest Height, H =	N/A	ft	
Velocity Pressure Coefficient, K_z =	1.02		
Topographic Factor, K_{zt} =	1.00		
Wind Directionality Factor, K_d =	0.95		
Shielding Factor, K_a =	0.90		
Ground Elevation Factor, K_e =	0.957		
Wind Velocity Pressure, q_z =	36.91	psf	
Gust Effect Factor, G_h =	1.00		

Equations

$K_z = 2.01\ (z / z_g)^{2/\alpha}$ — 2.6.5.2

$K_h = e^{(f \cdot z / H)}$ — 2.6.6.2.1

$K_{zt} = [1 + K_c K_t / K_h]^2$ — 2.6.6.2.1

$K_e = e^{-0.000032 z^{2.5}}$ — 2.6.8

$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$ — 2.6.11.6

$F_A = q_z G_h (EPA)$ — 2.6.11.2

$F_M = q_z G_h C_f D_p$ — 2.6.11.2

Appurtenance Wind Loads

Name	Height (ft)	Width (ft)	Depth (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
871F-70-2	5.50	2.58	0.16	1.66	3.07	113.43	1.66	3.07	113.43

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	WHartland (ES-033)	Date: 11/13/2020
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 11/16/2020

Member Wind Loading

Exposure Category =	B		
Risk Category =	III		
Topographic Category =	1		
Basic Wind Speed, V =	125	mph	
Height Above Ground, z =	110	ft	
Crest Height, H =	N/A	ft	
Velocity Pressure Coefficient, K_z =	1.02		
Topographic Factor, K_{zt} =	1.00		
Wind Directionality Factor, K_d =	0.95		
Shielding Factor, K_a =	0.90		
Ground Elevation Factor, K_e =	0.957		
Wind Velocity Pressure, q_z =	36.91	psf	
Gust Effect Factor, G_h =	1.00		

Equations

	TIA-222-H
$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
$K_e = e^{-0.000032 z^{2.5}}$	2.6.8
$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
$F_A = q_z G_h (EPA)$	2.6.11.2
$F_M = q_z G_h C_f D_p$	2.6.11.2

Member Wind Loads

Name	Depth (ft)	Width (ft)	C_f	D_p (ft)	F_M (lb)
Arm: HSS3X3X3/16	0.25	0.25	2	0.25	18.46
Bracing: Pipe 2.0 Std	0.20		1.2	0.20	8.77
Mount Pipe: Pipe 3.0 Std	0.29		1.2	0.29	12.92

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Appurtenance Ice Dead Loading

			Equations	TIA-222-H
Exposure Category =	B			
Risk Category =	III		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Topographic Category =	1			
Height Above Ground, z =	110	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Design Ice Thickness, T_i =	1.50	in	$K_{iz} = (z/33)^{0.10}$	2.6.10
Importance Factor, I =	1.15			
Topographic Factor, K_{zt} =	1.00		$T_{iz} = T_i I K_{iz}(K_{zt})^{0.35}$	2.6.10
Height Escalation Factor, K_{iz} =	1.13			
Factored Ice Thickness, T_{iz} =	1.95	in	$DL_{ice}=[(H_{ice}*D_{ice}*W_{ice}) - (H*W*D)]*56pcf$	
Grating Ice Dead Load, D_{Gice} =	9.08	psf		

Appurtenance Ice Dead Loads

Name	Height w/ ice (ft)	Width w/ice (ft)	Depth w/ ice (ft)	V_{ice} (ft^3)	DL_{ice} (lb)
871F-70-2	5.82	2.91	0.48	2.07	116.18

BLACK & VEATCH

Client:	Eversource	Computed By:	Joohwan Jung
Site Name:	WHartland (ES-033)	Date:	11/13/2020
		Verified By:	JW
Title:	MOUNT ANALYSIS REPORT	Date:	11/16/2020

Member Ice Dead Loading

Exposure Category =	B		
Risk Category =	III		
Topographic Category =	1		
Height Above Ground, z =	110	ft	
Crest Height, H =	N/A	ft	
Design Ice Thickness, T_i =	1.50	in	
Importance Factor, I =	1.15		
Topographic Factor, K_{zt} =	1.00		
Height Escalation Factor, K_{iz} =	1.13		
Factored Ice Thickness, T_{iz} =	1.95	in	
Grating Ice Dead Load, D_{Gice} =	9.08	psf	

Equations

	TIA-222-H
$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
$K_{iz} = (z/33)^{0.10}$	2.6.10
$T_{iz} = T_i I K_{iz} (K_{zt})^{0.35}$	2.6.10
Aiz = pi*Tiz*(Dc+Tiz)	2.6.10
DL_{ice}=Aiz*56pcf	

Member Ice Dead Loads

Name	Depth w/ ice (ft)	Width w/ ice (ft)	Dc (ft)	Aiz (ft^2)	DL_{ice} (lb/ft)
Arm: HSS3X3X3/16	0.57	0.57	0.35	0.26	14.71
Bracing: Pipe 2.0 Std	0.52		0.20	0.18	10.27
Mount Pipe: Pipe 3.0 Std	0.62		0.29	0.23	12.95

BLACK & VEATCH

Client: Eversource | Computed By: Joohwan Jung
Site Name: WHartland (ES-033) | Date: 11/13/2020
Verified By: JW
Title: MOUNT ANALYSIS REPORT | Date: 11/16/2020

Appurtenance Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	B		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	110	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.02	psf	$K_e = e^{-0.000032 \cdot zs}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	0.957		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	5.906			
Factored Ice Thickness, T_{iz} =	1.95	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Appurtenance Ice Wind Loads

Name	Height w/ Ice (ft)	Width w/ Ice (ft)	Depth w/ Ice (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
871F-70-2	5.82	2.91	0.48	-	4.18	24.70	-	4.18	24.70

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Member Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	B		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	110	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.02	psf	$K_e = e^{-0.000032 z_s}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	0.957		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	5.906			
Factored Ice Thickness, T_{iz} =	1.95	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Member Ice Wind Loads

Name	Depth w/ Ice (ft)	Width w/ Ice (ft)	C_f	$D_{p(ice)}$ (ft)	$F_{M(ice)}$ (lb/ft)
Arm: HSS3X3X3/16	0.57	0.57	2	0.57	6.78
Bracing: Pipe 2.0 Std	0.52		1.2	0.52	3.70
Mount Pipe: Pipe 3.0 Std	0.62		1.2	0.62	4.37

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	WHartland (ES-033)	Date: 11/13/2020
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 11/16/2020

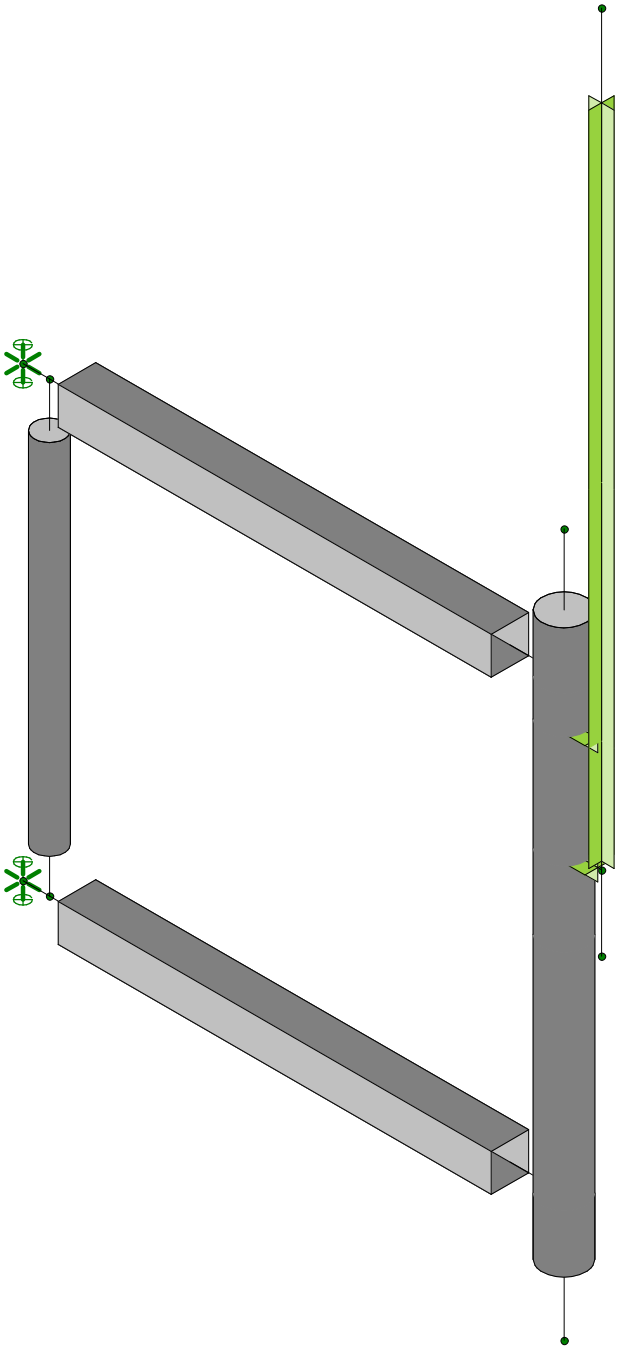
Seismic Loading

			Equations	TIA-222-H
Site Class =	D			
Spectral Response, S_s =	0.175	g	$S_{D1} = 2/3\ F_v S_1$	2.7.5
Max Spectral Response, S_1 =	0.065	g	$S_{DS} = 2/3\ F_a S_s \geq S_{D1}$	2.7.5
Accel. Site Coefficient, F_a =	1.60			
Vel. Site Coefficient, F_v =	2.40		$C_s = 1/2\ S_{DS}\ I \geq 0.03$	2.7.7.1.1
Design Spec. Response (1 sec), S_{D1} =	0.104			
Design Spec. Response, S_{DS} =	0.187		$E_H = A_s\ C_s\ W$	2.7.7
Importantance Factor, I =	1.25			
Seismic Response Coefficient, C_s =	0.117		$E_V = A_s\ 0.2\ S_{DS}\ W$	2.7.6
Amplification Factor, A_s =	3			

Appurtenance Seismic Loads

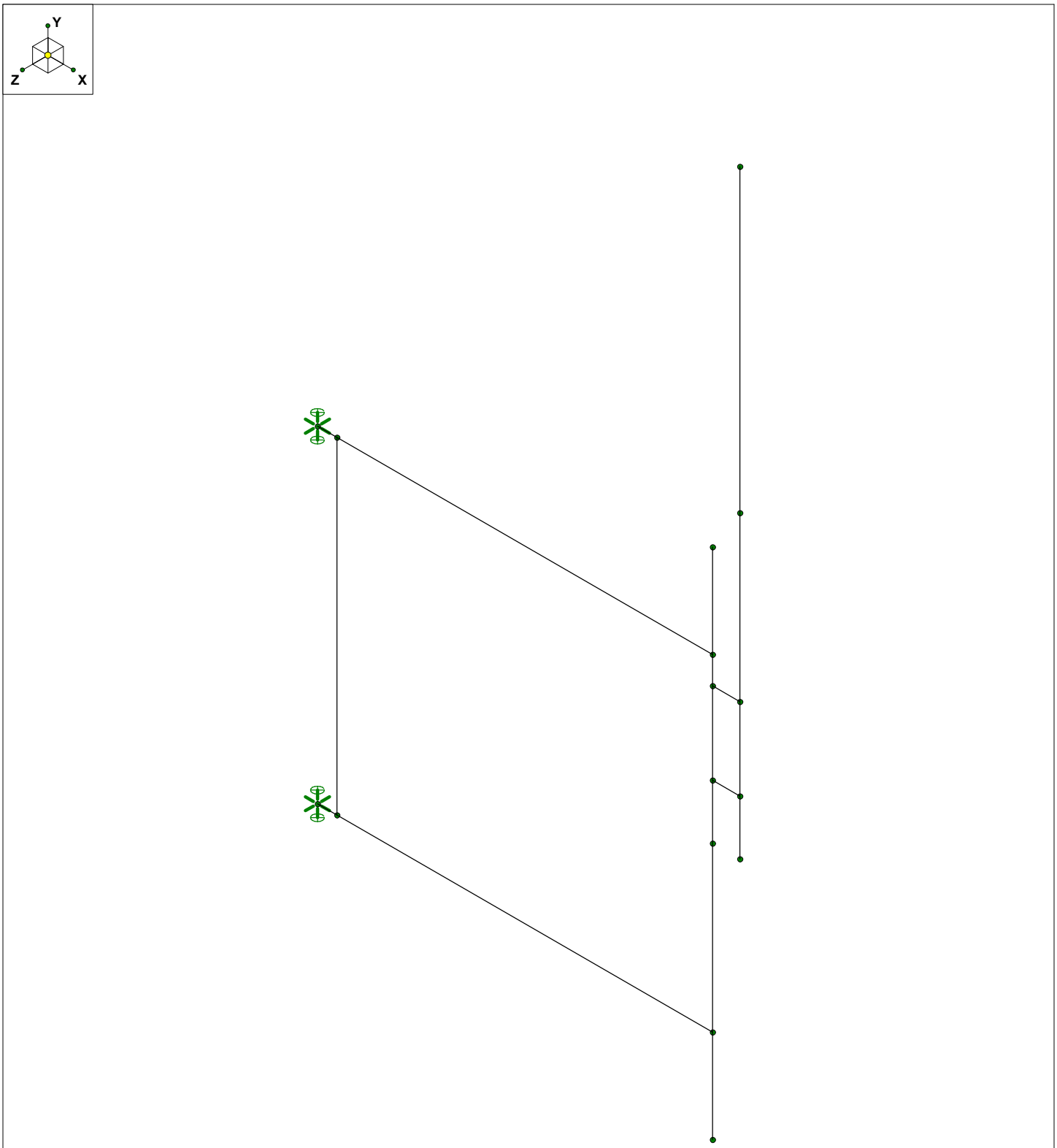
Name	Weight (lb)	E_H (lb)	E_V (lb)
871F-70-2	12.5	4.38	1.40

APPENDIX 2:
RISA PRINTOUTS



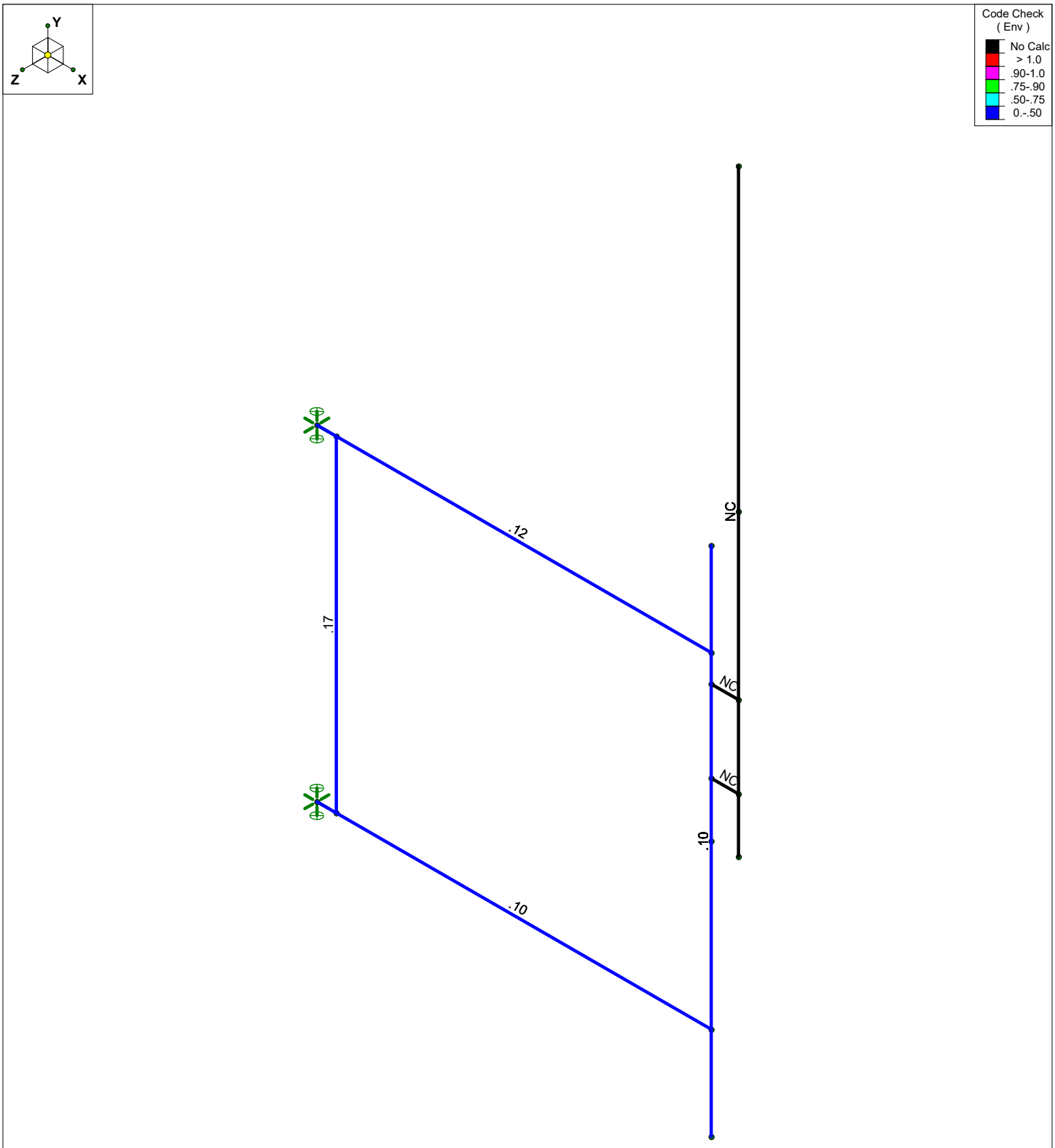
Envelope Only Solution

Black & Veatch	Whartland USF-4U Model	SK - 1
Joohwan Jung		Nov 13, 2020 at 11:18 AM
405025.2021.2200		Whartland USF-4U Model.r3d



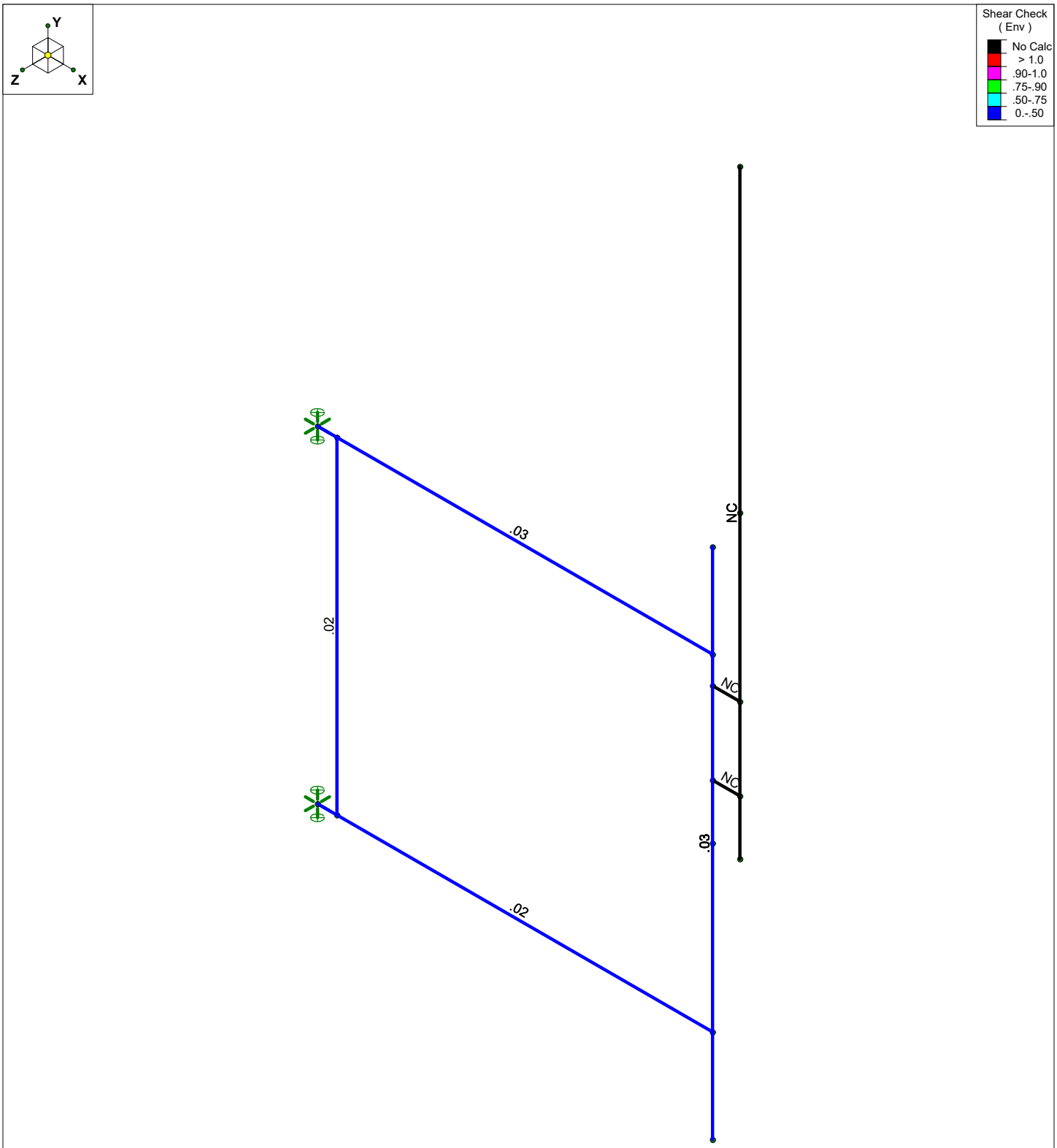
Envelope Only Solution

Black & Veatch	Whartland USF-4U Model	SK - 2
Joohwan Jung		Nov 13, 2020 at 11:18 AM
405025.2021.2200		Whartland USF-4U Model.r3d



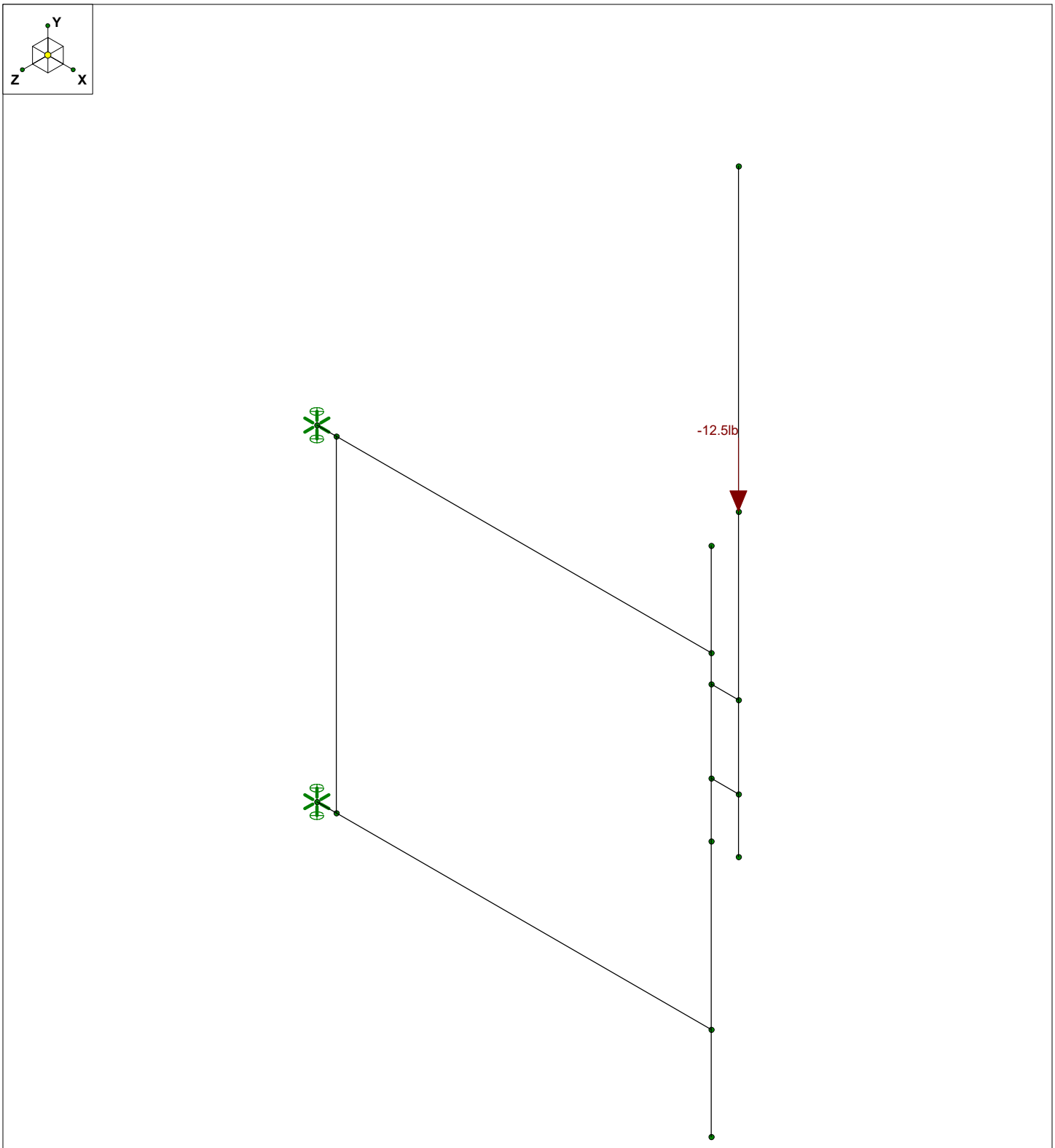
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	Whartland USF-4U Model	SK - 3
Joohwan Jung		Nov 13, 2020 at 11:18 AM
405025.2021.2200		Whartland USF-4U Model.r3d



Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	Whartland USF-4U Model	SK - 4
Joohwan Jung		Nov 13, 2020 at 11:18 AM
405025.2021.2200		Whartland USF-4U Model.r3d



Loads: BLC 1, DL
Envelope Only Solution

Black & Veatch	Whartland USF-4U Model	SK - 5
Joohwan Jung		Nov 13, 2020 at 11:18 AM
405025.2021.2200		Whartland USF-4U Model.r3d

(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
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.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 (in/sec^2)	386.4
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building
Stainless Steel Code	None

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
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

(Global) Model Settings, Continued

Seismic Code	ASCE 7-16
Seismic Base Elevation (in)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1...	Density[k/ft^3]	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	1.4	65	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Arm	HSS3X3X3	Beam	SquareTube	A53 Gr.B	Typical	1.89	2.46	2.46	4.03
2	Bracing	PIPE_2.0	Column	Pipe	A53 Gr.B	Typical	1.02	.627	.627	1.25
3	Mount Pipe	PIPE_3.0	Column	Pipe	A53 Gr.B	Typical	2.07	2.85	2.85	5.69

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]
1	gen_Conc3NW	3155	1372	.15	.6	.145
2	gen_Conc4NW	3644	1584	.15	.6	.145
3	gen_Conc3LW	2085	906	.15	.6	.11
4	gen_Conc4LW	2408	1047	.15	.6	.11
5	gen_Alum	10100	4077	.3	1.29	.173
6	gen_Steel	29000	11154	.3	.65	.49
7	gen_Plywood	1800	38	0	.3	.035
8	RIGID	1e+6		.3	0	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N1	Reaction	Reaction	Reaction		Reaction	
2	N3	Reaction	Reaction	Reaction		Reaction	

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2			Arm	Beam	SquareTube	A53 Gr.B	Typical
2	M2	N3	N4			Arm	Beam	SquareTube	A53 Gr.B	Typical
3	M3	N5	N6			Bracing	Column	Pipe	A53 Gr.B	Typical
4	M4	N8	N9			Mount Pipe	Column	Pipe	A53 Gr.B	Typical
5	M5	N10	N11			RIGID	None	None	RIGID	Typical
6	M6	N13	N15			RIGID	None	None	RIGID	Typical
7	M7	N14	N16			RIGID	None	None	RIGID	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
1	M1						Yes				None
2	M2						Yes				None
3	M3						Yes	** NA **			None
4	M4						Yes	** NA **			None
5	M5						Yes	** NA **			None
6	M6						Yes	** NA **			None
7	M7						Yes	** NA **			None

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	Arm	43.5			Lbyy						Lateral
2	M2	Arm	43.5			Lbyy						Lateral
3	M3	Bracing	36									Lateral
4	M4	Mount Pipe	56.5									Lateral

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
1	DL	DL		-1		1				
2	Maintenance LL - LV	LL				1				
3	Installation LL - LM	LL				1				
4	Wind - 0 Deg (X)	WL				1		4		
5	Wind - 30 Deg (X)	WL				1		4		
6	Wind - 60 Deg (X)	WL				1		4		
7	Wind - 90 Deg (X)	WL				1		4		
8	Wind - 120 Deg (X)	WL				1		4		
9	Wind - 150 Deg (X)	WL				1		4		
10	Wind - 180 Deg (X)	WL				1		4		
11	Wind - 210 Deg (X)	WL				1		4		
12	Wind - 240 Deg (X)	WL				1		4		
13	Wind - 270 Deg (X)	WL				1		4		
14	Wind - 300 Deg (X)	WL				1		4		
15	Wind - 330 Deg (X)	WL				1		4		
16	Wind - 0 Deg (Z)	WL				1		4		
17	Wind - 30 Deg (Z)	WL				1		4		
18	Wind - 60 Deg (Z)	WL				1		4		

Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
19	Wind - 90 Deg (Z)	WL				1		4		
20	Wind - 120 Deg (Z)	WL				1		4		
21	Wind - 150 Deg (Z)	WL				1		4		
22	Wind - 180 Deg (Z)	WL				1		4		
23	Wind - 210 Deg (Z)	WL				1		4		
24	Wind - 240 Deg (Z)	WL				1		4		
25	Wind - 270 Deg (Z)	WL				1		4		
26	Wind - 300 Deg (Z)	WL				1		4		
27	Wind - 330 Deg (Z)	WL				1		4		
28	Ice DL	DL				1		4		
29	Ice Wind - 0 Deg (X)	WL				1		4		
30	Ice Wind - 30 Deg (X)	WL				1		4		
31	Ice Wind - 60 Deg (X)	WL				1		4		
32	Ice Wind - 90 Deg (X)	WL				1		4		
33	Ice Wind - 120 Deg (X)	WL				1		4		
34	Ice Wind - 150 Deg (X)	WL				1		4		
35	Ice Wind - 180 Deg (X)	WL				1		4		
36	Ice Wind - 210 Deg (X)	WL				1		4		
37	Ice Wind - 240 Deg (X)	WL				1		4		
38	Ice Wind - 270 Deg (X)	WL				1		4		
39	Ice Wind - 300 Deg (X)	WL				1		4		
40	Ice Wind - 330 Deg (X)	WL				1		4		
41	Ice Wind - 0 Deg (Z)	WL				1		4		
42	Ice Wind - 30 Deg (Z)	WL				1		4		
43	Ice Wind - 60 Deg (Z)	WL				1		4		
44	Ice Wind - 90 Deg (Z)	WL				1		4		
45	Ice Wind - 120 Deg (Z)	WL				1		4		
46	Ice Wind - 150 Deg (Z)	WL				1		4		
47	Ice Wind - 180 Deg (Z)	WL				1		4		
48	Ice Wind - 210 Deg (Z)	WL				1		4		
49	Ice Wind - 240 Deg (Z)	WL				1		4		
50	Ice Wind - 270 Deg (Z)	WL				1		4		
51	Ice Wind - 300 Deg (Z)	WL				1		4		
52	Ice Wind - 330 Deg (Z)	WL				1		4		
53	Lateral Seismic - Eh (X)	ELX	.35			1				
54	Lateral Seismic - Eh (Z)	ELZ			.35	1				
55	Vertical Seismic - Ev (Y)	ELY		-.112		1				

Load Combinations

	Description	S...	PDe...	SRSS	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	WIND LOAD COMBOS (125 MPH)																							
2	1.2DL + WL (0 DEG)	Y...	Y		1	1.2	4	1	16	1														
3	1.2DL + WL (30 DEG)	Y...	Y		1	1.2	5	1	17	1														
4	1.2DL + WL (60 DEG)	Y...	Y		1	1.2	6	1	18	1														
5	1.2DL + WL (90 DEG)	Y...	Y		1	1.2	7	1	19	1														
6	1.2DL + WL (120 DEG)	Y...	Y		1	1.2	8	1	20	1														
7	1.2DL + WL (150 DEG)	Y...	Y		1	1.2	9	1	21	1														
8	1.2DL + WL (180 DEG)	Y...	Y		1	1.2	10	1	22	1														
9	1.2DL + WL (210 DEG)	Y...	Y		1	1.2	11	1	23	1														
10	1.2DL + WL (240 DEG)	Y...	Y		1	1.2	12	1	24	1														
11	1.2DL + WL (270 DEG)	Y...	Y		1	1.2	13	1	25	1														
12	1.2DL + WL (300 DEG)	Y...	Y		1	1.2	14	1	26	1														
13	1.2DL + WL (330 DEG)	Y...	Y		1	1.2	15	1	27	1														
14																								
15	MOUNT LOAD COMBOS (30 MPH)																							

Load Combinations (Continued)

	Description	S...	PDe...	SRSS	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
16	1.4DL	Y...	Y		1	1.4																		
17	1.2DL + 1.5LV	Y...	Y		1	1.2	2	1.5																
18	1.2DL + 1.5LM + WL (0 DEG)	Y...	Y		1	1.2	3	1.5	4	.058	16	.058												
19	1.2DL + 1.5LM + WL (30 DEG)	Y...	Y		1	1.2	3	1.5	5	.058	17	.058												
20	1.2DL + 1.5LM + WL (60 DEG)	Y...	Y		1	1.2	3	1.5	6	.058	18	.058												
21	1.2DL + 1.5LM + WL (90 DEG)	Y...	Y		1	1.2	3	1.5	7	.058	19	.058												
22	1.2DL + 1.5LM + WL (120 DEG)	Y...	Y		1	1.2	3	1.5	8	.058	20	.058												
23	1.2DL + 1.5LM + WL (150 DEG)	Y...	Y		1	1.2	3	1.5	9	.058	21	.058												
24	1.2DL + 1.5LM + WL (180 DEG)	Y...	Y		1	1.2	3	1.5	10	.058	22	.058												
25	1.2DL + 1.5LM + WL (210 DEG)	Y...	Y		1	1.2	3	1.5	11	.058	23	.058												
26	1.2DL + 1.5LM + WL (240 DEG)	Y...	Y		1	1.2	3	1.5	12	.058	24	.058												
27	1.2DL + 1.5LM + WL (270 DEG)	Y...	Y		1	1.2	3	1.5	13	.058	25	.058												
28	1.2DL + 1.5LM + WL (300 DEG)	Y...	Y		1	1.2	3	1.5	14	.058	26	.058												
29	1.2DL + 1.5LM + WL (330 DEG)	Y...	Y		1	1.2	3	1.5	15	.058	27	.058												
30																								
31	ICE LOAD COMBOS (1.5", 50 MPH)																							
32	1.2DL + Ice DL + Ice WL (0 DEG)	Y...	Y		1	1.2	28	1	29	1	41	1												
33	1.2DL + Ice DL + Ice WL (30 DEG)	Y...	Y		1	1.2	28	1	30	1	42	1												
34	1.2DL + Ice DL + Ice WL (60 DEG)	Y...	Y		1	1.2	28	1	31	1	43	1												
35	1.2DL + Ice DL + Ice WL (90 DEG)	Y...	Y		1	1.2	28	1	32	1	44	1												
36	1.2DL + Ice DL + Ice WL (120 DEG)	Y...	Y		1	1.2	28	1	33	1	45	1												
37	1.2DL + Ice DL + Ice WL (150 DEG)	Y...	Y		1	1.2	28	1	34	1	46	1												
38	1.2DL + Ice DL + Ice WL (180 DEG)	Y...	Y		1	1.2	28	1	35	1	47	1												
39	1.2DL + Ice DL + Ice WL (210 DEG)	Y...	Y		1	1.2	28	1	36	1	48	1												
40	1.2DL + Ice DL + Ice WL (240 DEG)	Y...	Y		1	1.2	28	1	37	1	49	1												
41	1.2DL + Ice DL + Ice WL (270 DEG)	Y...	Y		1	1.2	28	1	38	1	50	1												
42	1.2DL + Ice DL + Ice WL (300 DEG)	Y...	Y		1	1.2	28	1	39	1	51	1												
43	1.2DL + Ice DL + Ice WL (330 DEG)	Y...	Y		1	1.2	28	1	40	1	52	1												
44																								
45	SEISMIC LOAD COMBOS																							
46	1.2DL + Ev (Y) + Eh (X)	Y...	Y		1	1.2	55	1	53	1														
47	1.2DL - Ev (Y) + Eh (X)	Y...	Y		1	1.2	55	-1	53	1														
48	1.2DL + Ev (Y) - Eh (X)	Y...	Y		1	1.2	55	1	53	-1														
49	1.2DL - Ev (Y) - Eh (X)	Y...	Y		1	1.2	55	-1	53	-1														
50	1.2DL + Ev (Y) + Eh (Z)	Y...	Y		1	1.2	55	1	54	1														
51	1.2DL - Ev (Y) + Eh (Z)	Y...	Y		1	1.2	55	-1	54	1														
52	1.2DL + Ev (Y) - Eh (Z)	Y...	Y		1	1.2	55	1	54	-1														
53	1.2DL - Ev (Y) - Eh (Z)	Y...	Y		1	1.2	55	-1	54	-1														
54																								

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N1	max	169.09	2	209.344	17	271.189	5	0	53	615.407	11	0	53
2		min	-586.385	17	17.148	2	-271.189	11	0	2	-615.407	5	0	2
3	N3	max	586.385	17	288.897	17	63.216	5	0	53	291.724	11	0	53
4		min	38.69	8	35.035	8	-63.216	11	0	2	-291.724	5	0	2
5	Totals:	max	334.407	2	498.241	17	334.405	5						
6		min	-334.407	8	111.741	47	-334.405	11						

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

	Member	Shape	Code Check	Loc[in]	LC	Shear...	Loc[...	Dir	LC	phi*Pn...	phi*Pnt...	phi*Mn...	phi*Mn...	Cb	Eqn
1	M1	HSS3X3X3	.121	2.266	11	.026	2.266	z	11	55265....	59535	5171.25	5171.25	2...	H1-1b
2	M2	HSS3X3X3	.097	43.5	17	.018	0	y	17	55265....	59535	5171.25	5171.25	2...	H1-1b
3	M3	PIPE_2.0	.169	0	17	.022	0		17	28843....	32130	1871.6...	1871.6...	2...	H1-1b

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

	Member	Shape	Code Check	Loc[in]	LC	Shear..	Loc[...	Dir	LC	phi*Pn...	phi*Pnt...	phi*Mn...	phi*Mn...	Cb	Eqn
4	M4	PIPE_3.0	.096	10.594	17	.025	22.3..		11	57908....	65205	5748.75	5748.75	2..	H1-1b

APPENDIX 3:
ATTACHMENTS

220MHz EXPOSED DIPOLES — 215-225 MHz

870 Series 220MHz Exposed Dipoles

The 870 Series 220MHz Exposed Dipoles are available in 1, 2, 4, 8 dipole configurations. All our antennas can be completely customized to your particular applications. Our antennas can be black anodized, adjustable, or fixed, side mount or top mount, and heavy-duty versions are available.

- Each antenna is offered in a 1/4, 3/8 or 1/2 wave spacing versions.
- The 87XA-70 has external cabling and a field-adjustable pattern.
- The 87XF-70 has internal cabling and fixed dipole-mast spacing.
- Heavy-duty versions are available. Please contact our Technical Support team for consultation.

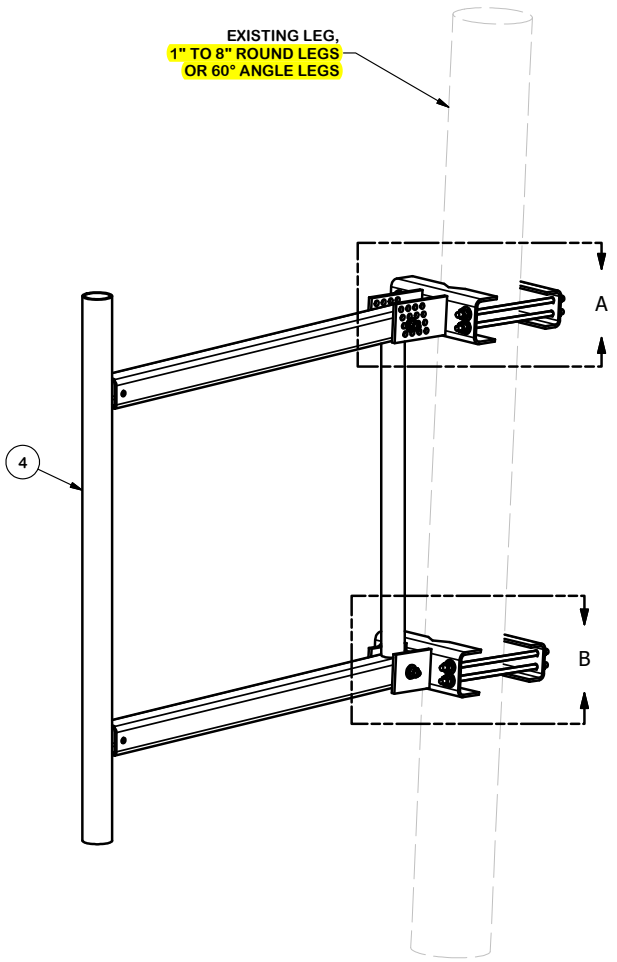
Electrical Specifications	871F-70-2	872F-70-2	874F-70-2
Frequency Range, MHz	215-225	215-225	215-225
Nominal Gain, dBd	2.0-2.5	5.0-5.5	8.0-8.5
Number of Dipoles	1	2	4
Bandwidth 1.5:1 VSWR, MHz	10	10	10
Polarization	Vertical	Vertical	Vertical
Pattern	Offset / bi	Offset / bi	Offset / bi
Power Rating, Watts	200	300	500
Nominal Impedance, Ohms	50	50	50
Lightning Protection	DC Ground	DC Ground	DC Ground
Standard Termination	Type DIN Male	Type N Male	Type N Male
Mechanical Specifications	**871F-70-2**	**872F-70-2**	**874F-70-2**
Length, in (mm)	66 (1676)	112 (2845)	200 (5080)
Width (1/2 Wave Spacing), in (mm)	31 (787)	31 (787)	32 (813)
Weight, lbs. (kg)	12.5 (5.7)	21 (9.5)	51 (23)
Rated Wind Velocity, No Ice, mph (km/h)	165 (266)	150 (241)	145 (233)
Rated Wind Velocity, 0.5" (13mm) ice, mph (km/h)	140 (225)	130 (209)	105 (177)
Lateral Thrust @ 100 mph, wind, lbs. (kg)	40 (18)	66 (30)	143 (65)
Bending Moment @ top clamp: 100 mph, ft.*lb (kg*m)	58 (8)	150 (21)	610 (84)
Projected Area, ft^2 (m^2)	1.5 (0.14)	2.6 (0.24)	5.5 (0.51)
Mounting Information Mast O.D. (mm)	1.9" (48)	1.9" (48)	2.4" (60)
* See next page for ordering information (page 3) *			

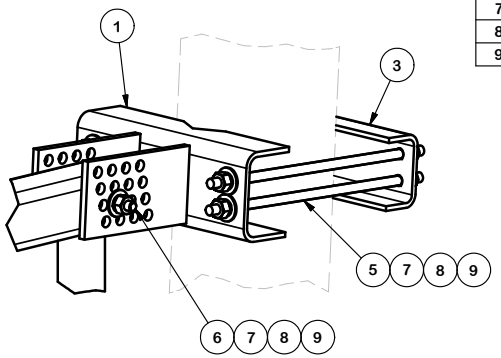
872F-70-2

ONE SITE PRO 1 P/N DCP12K CLAMP SET REQUIRED.

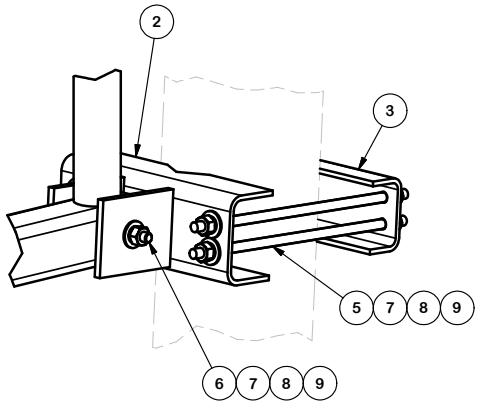
TOWER/MAST SIZE AT PROPOSED ANTENNA ATTACHMENT = 1.5" ± DIAMETER.

PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	1	CFM	UPPER GATE FOOT WELDMENT		13.90	13.90
2	1	CFS	LOWER GATE FOOT WELDMENT		12.72	12.72
3	2	GBB	GATE BACKING BAR		4.53	9.06
4	1	4PBG	48" PIPE MOUNT STANDOFF ARM		113.96	113.96
5	8	G12R-12	1/2" x 12" GALV. THREADED ROD		0.67	5.35
5	8	G12R-15	1/2" x 15" GALV. THREADED ROD		0.84	6.69
6	2	A1205	1/2" x 5" A325 HDG BOLT		0.34	0.69
7	18	G12FW	1/2" HDG USS FLATWASHER		0.03	0.61
8	18	G12LW	1/2" HDG LOCKWASHER		0.01	0.25
9	18	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	1.29
					TOTAL WT. #	164.53





DETAIL A



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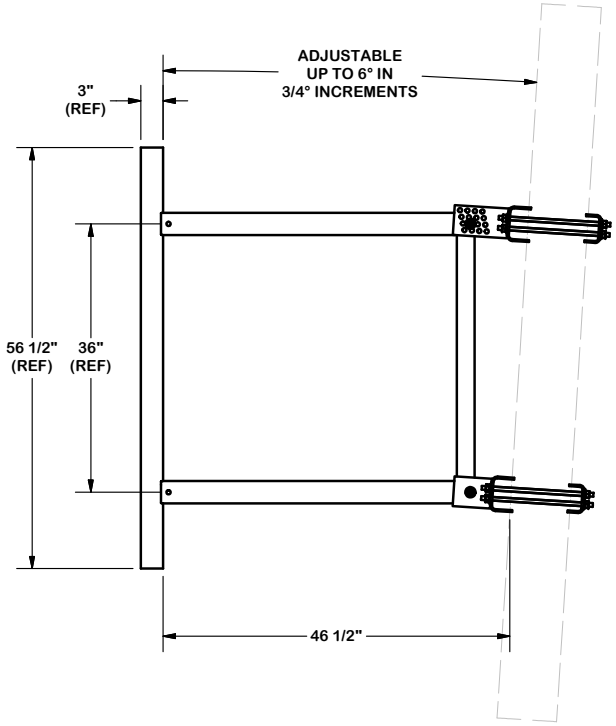

TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION: 48" ULTIMATE UNIVERSAL STANDOFF FRAME

SITE PRO 1 — A valmont COMPANY
Engineering Support Team: 1-888-753-7446
Locations: New York, NY; Atlanta, GA; Los Angeles, CA; Plymouth, IN; Salem, OR; Dallas, TX

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	RCH 2/4/2011		USF-4U	1 OF 1

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Building a world of difference.
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November 13, 2020

MOUNT EVALUATION LETTER

Site Number: ES-033
Site Name: WHartland
Site Data: 2 Center Hill Rd.
West Hartland, CT 06091
Latitude: 41° 58’ 43.5”
Longitude: -72° 58’ 56”

Black & Veatch Corporation is pleased to submit this “Mount Evaluation Letter” to determine the structural integrity of antenna mounting system on the above-mentioned site. The purpose of this evaluation is to determine the capacity of the system in supporting the final loading in the attached “Loading Summary”.

Proposed Mounting System
SitePro 1 (R5-LL) 72” Stand-off Pipe with custom microwave dish mount

Based on our evaluation we have determined the proposed antenna mounting system to be: **SUFFICIENT**

Structure Rating (max from all components) =	10.4%

Black & Veatch recommends installing the microwave dish mount in accordance with the attached Black & Veatch Drawing “MICROWAVE DISH MOUNT DETAIL (C-3)”. If the microwave dish mount is not installed as specified, this evaluation should be considered invalid. The proposed mounting system will be capable of supporting the proposed equipment, under the assumptions described in Section 4 of the report and the following conditions:

- Contractor shall be responsible for the means and methods of construction.
- Contractor shall inspect the condition of all existing and proposed structural members, all relevant members and connections and report any deficiencies to the engineer prior to installation of any new antennas and other equipment.

The scope of this evaluation pertains only to the proposed antenna mounting system and does not include examination of the loads imparted by the antenna mounting system to the existing tower and its structural components. This document was prepared based on information provided to Black & Veatch. If existing conditions do not reflect those represented, this analysis is no longer valid.

Please contact Josh Riley in our Overland Park Office
at 913-458-2522 if you have any questions or comments.

Sincerely,
Black & Veatch Corporation

Prepared By: Joohwan Jung
Submitted By: Josh Riley, P.E.

11/17/2020

TABLE OF CONTENTS

1. LOADING SUMMARY

2. ANALYSIS CRITERIA SUMMARY

3. REFERENCES

4. ASSUMPTIONS

5. RESULTS SUMMARY

APPENDICES

APPENDIX 1: MOUNT ANALYSIS REPORT

APPENDIX 2: RISA PRINTOUTS

APPENDIX 3: ATTACHMENTS

1. LOADING SUMMARY

Appurtenance								
Carrier	Position	Sector	Antenna RAD Center (ft)	Mount Centerline (ft)	Qty	Type	Manufacturer	Model
AT&T	1	A	124	124	1	Dish	RFS	PAD6-W59BC

2. ANALYSIS CRITERIA SUMMARY

ANALYSIS CRITERIA	
STANDARD	TIA-222-H
WIND SPEED	Ultimate of 125 mph
WIND SPEED WITH ICE	50 mph with 1.5" radial ice thickness
EXPOSURE CATEGORY	B
RISK CATEGORY	III
TOPO CATEGORY	Flat
CREST HEIGHT	N/A
SPECTRAL RESPONSE FACTORS, Ss & S1	0.175 g & 0.065 g

3. REFERENCES

- American Institute of Steel Construction, AISC 15th Edition
- Telecommunications Industry Association Standard, TIA-222-H & 2018 Connecticut State Building Code

4. ASSUMPTIONS

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

- The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
- The configuration of antennas, mounts, and other appurtenances are as specified in the Loading Summary and the referenced drawings.
- 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.
- Sector frame center line: located equidistant between top & bottom boom; Platform center line: located at the base perimeter of platform, unless otherwise specified.
- Steel grades have been assumed as follows, unless noted otherwise:

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

5. RESULTS SUMMARY

Name	Bending Stress Ratio		Shear Stress Ratio	
Face Pipe: Pipe 4.0 Std	3.8%	Pass	2.3%	Pass
Stand off pipe: Pipe 4.0 Std	5.4%	Pass	5.9%	Pass
Stiff Arm: Pipe 2.0 Std	7.4%	Pass	0.7%	Pass
Channel: C8X18.75	10.4%	Pass	6.2%	Pass

*Von Mises SR = (Max Von Mises Value From RISA-3D)/(0.9*Fy)

**Capacity rating per TIA-222-H Section 15.5.

APPENDIX 1:
MOUNT ANALYSIS REPORT

Dead and Live Loads

Maintenance Live Load: L_V = 250 lb
Installation Live Load: L_M = 0 lb

Appurtenance Dead Loads	
Name	Weight (lb)
PAD6-W59BC	141

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Appurtenance Wind Loading

			Equations	TIA-222-H
Exposure Category =	B		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Basic Wind Speed, V =	125	mph		
Height Above Ground, z =	124	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.05		$K_e = e^{-0.000032 z_s}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factor, K_e =	0.957		$F_A = q_z G_h (EPA)$	2.6.11.2
Wind Velocity Pressure, q_z =	38.20	psf		
Gust Effect Factor, G_h =	1.00		$F_M = q_z G_h C_f D_p$	2.6.11.2

Appurtenance Wind Loads

Name	Height (ft)	Width (ft)	Depth (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
PAD6-W59BC	6.58	6.58	1.19	1.26	42.95	1640.47	0.63	21.27	812.63

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Member Wind Loading

Exposure Category =	B	
Risk Category =	III	
Topographic Category =	1	
Basic Wind Speed, V =	125	mph
Height Above Ground, z =	124	ft
Crest Height, H =	N/A	ft
Velocity Pressure Coefficient, K_z =	1.05	
Topographic Factor, K_{zt} =	1.00	
Wind Directionality Factor, K_d =	0.95	
Shielding Factor, K_a =	0.90	
Ground Elevation Factor, K_e =	0.957	
Wind Velocity Pressure, q_z =	38.20	psf
Gust Effect Factor, G_h =	1.00	

Equations

	TIA-222-H
$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
$K_e = e^{-0.000032 z^{2.5}}$	2.6.8
$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
$F_A = q_z G_h (EPA)$	2.6.11.2
$F_M = q_z G_h C_f D_p$	2.6.11.2

Member Wind Loads

Name	Depth (ft)	Width (ft)	C_f	D_p (ft)	F_M (lb)
Face Pipe: Pipe 4.0 Std	0.38		1.2	0.38	17.19
Stand off pipe: Pipe 4.0 Std	0.38		1.2	0.38	17.19
Stiff Arm: Pipe 2.0 Std	0.20		1.2	0.20	9.07
Channel: C8X18.75	0.67	0.21	2	0.67	50.93

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Appurtenance Ice Dead Loading

			Equations	TIA-222-H
Exposure Category =	B			
Risk Category =	III		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Topographic Category =	1			
Height Above Ground, z =	124	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Design Ice Thickness, T_i =	1.50	in	$K_{iz} = (z/33)^{0.10}$	2.6.10
Importance Factor, I =	1.15			
Topographic Factor, K_{zt} =	1.00		$T_{iz} = T_i I K_{iz}(K_{zt})^{0.35}$	2.6.10
Height Escalation Factor, K_{iz} =	1.14			
Factored Ice Thickness, T_{iz} =	1.97	in	$DL_{ice}=[(H_{ice}*D_{ice}*W_{ice}) - (H*W*D)]*56pcf$	
Grating Ice Dead Load, D_{Gice} =	9.19	psf		

Appurtenance Ice Dead Loads

Name	Height w/ ice (ft)	Width w/ice (ft)	Depth w/ ice (ft)	V_{ice} (ft^3)	DL_{ice} (lb)
PAD6-W59BC	6.91	6.91	1.52	20.96	1173.50

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	WHartland (ES-033)	Date: 11/13/2020
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 11/16/2020

Member Ice Dead Loading

			Equations	TIA-222-H
Exposure Category =	B			
Risk Category =	III		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Topographic Category =	1			
Height Above Ground, z =	124	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Design Ice Thickness, T_i =	1.50	in	$K_{iz} = (z/33)^{0.10}$	2.6.10
Importance Factor, I =	1.15			
Topographic Factor, K_{zt} =	1.00		$T_{iz} = T_i I K_{iz} (K_{zt})^{0.35}$	2.6.10
Height Escalation Factor, K_{iz} =	1.14			
Factored Ice Thickness, T_{iz} =	1.97	in	Aiz = pi*Tiz*(Dc+Tiz)	2.6.10
Grating Ice Dead Load, D_{Gice} =	9.19	psf		
			DL_{ice}=Aiz*56pcf	

Member Ice Dead Loads

Name	Depth w/ ice (ft)	Width w/ ice (ft)	Dc (ft)	Aiz (ft^2)	DL_{ice} (lb/ft)
Face Pipe: Pipe 4.0 Std	0.70		0.38	0.28	15.56
Stand off pipe: Pipe 4.0 Std	0.70		0.38	0.28	15.56
Stiff Arm: Pipe 2.0 Std	0.53		0.20	0.19	10.45
Channel: C8X18.75	0.99	0.54	0.70	0.45	24.92

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Appurtenance Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	B		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	124	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.05	psf	$K_e = e^{-0.000032 z s}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	0.957		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	6.112			
Factored Ice Thickness, T_{iz} =	1.97	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Appurtenance Ice Wind Loads

Name	Height w/ Ice (ft)	Width w/ Ice (ft)	Depth w/ Ice (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
PAD6-W59BC	6.91	6.91	1.52	-	49.60	262.47	-	10.90	130.02

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Member Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	B		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	124	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.05	psf	$K_e = e^{-0.000032 z_s}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	0.957		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	6.112			
Factored Ice Thickness, T_{iz} =	1.97	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Member Ice Wind Loads

Name	Depth w/ Ice (ft)	Width w/ Ice (ft)	C_f	$D_{p(ice)}$ (ft)	$F_{M(ice)}$ (lb/ft)
Face Pipe: Pipe 4.0 Std	0.70		1.2	0.70	5.16
Stand off pipe: Pipe 4.0 Std	0.70		1.2	0.70	5.16
Stiff Arm: Pipe 2.0 Std	0.53		1.2	0.53	3.86
Channel: C8X18.75	0.99	0.54	2	0.99	12.16

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	WHartland (ES-033)	Date: 11/13/2020
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 11/16/2020

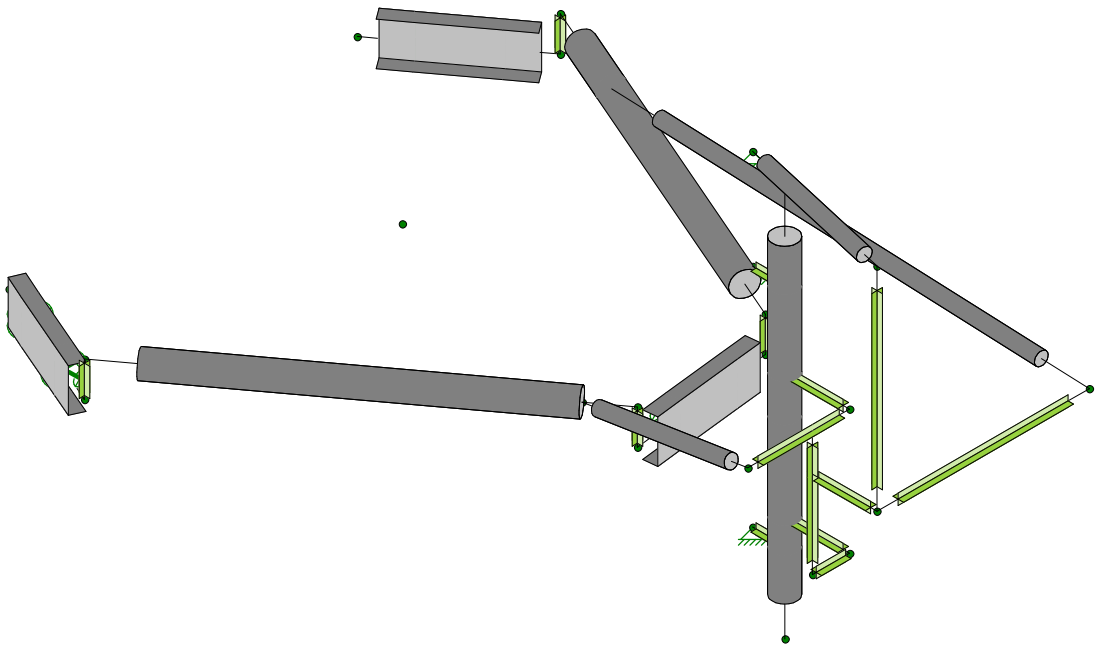
Seismic Loading

			Equations	TIA-222-H
Site Class =	D			
Spectral Response, S_s =	0.175	g	$S_{D1} = 2/3\ F_v S_1$	2.7.5
Max Spectral Response, S_1 =	0.065	g	$S_{DS} = 2/3\ F_a S_s \geq S_{D1}$	2.7.5
Accel. Site Coefficient, F_a =	1.60			
Vel. Site Coefficient, F_v =	2.40		$C_s = 1/2\ S_{DS}\ I \geq 0.03$	2.7.7.1.1
Design Spec. Response (1 sec), S_{D1} =	0.104			
Design Spec. Response, S_{DS} =	0.187		$E_H = A_s\ C_s\ W$	2.7.7
Importantance Factor, I =	1.25			
Seismic Response Coefficient, C_s =	0.117		$E_V = A_s\ 0.2\ S_{DS}\ W$	2.7.6
Amplification Factor, A_s =	3			

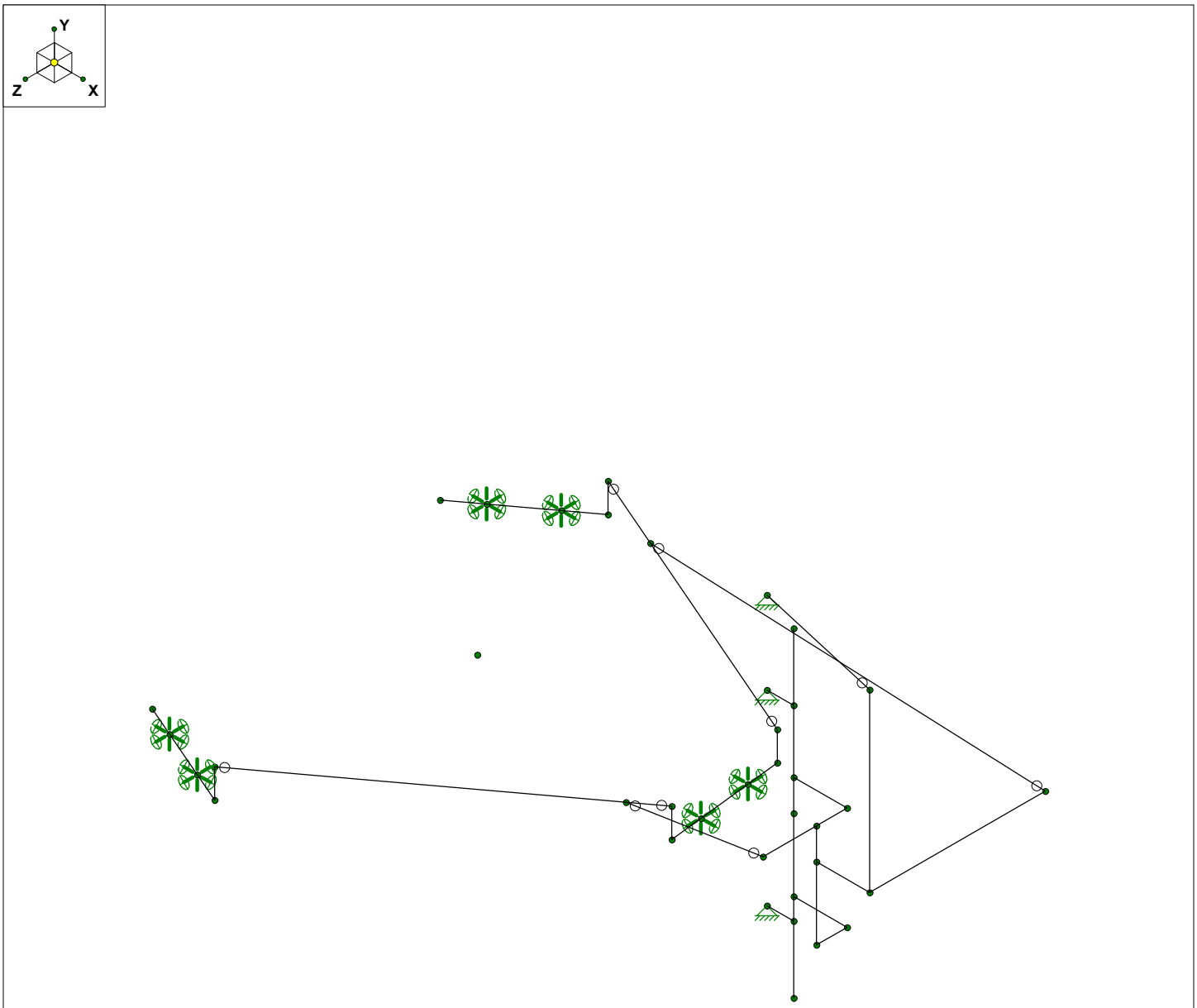
Appurtenance Seismic Loads

Name	Weight (lb)	E_H (lb)	E_V (lb)
PAD6-W59BC	141	49.35	15.79

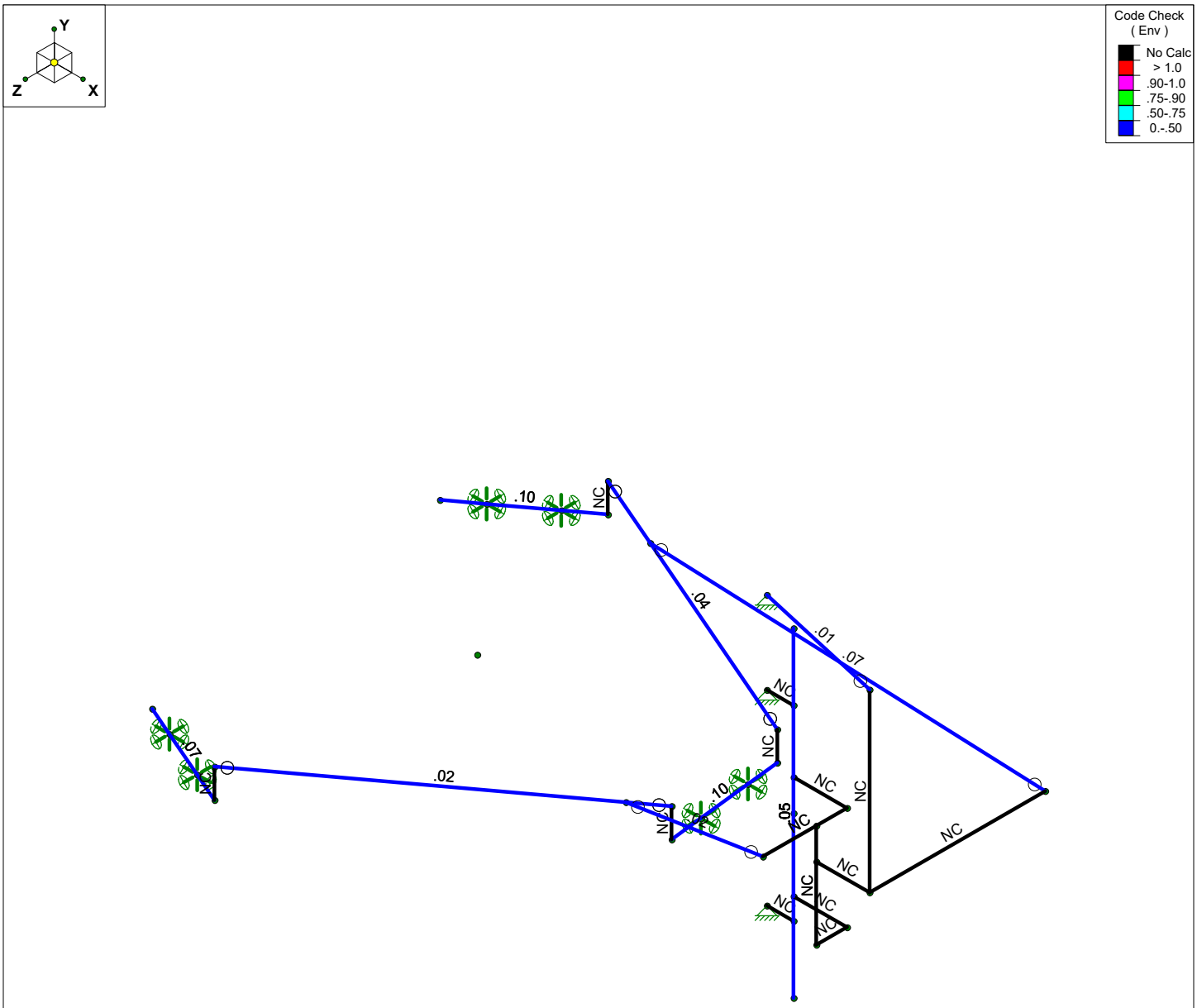
APPENDIX 2:
RISA PRINTOUTS



Black & Veatch	WHartland Risa Model_124ft	SK - 1
Joohwan Jung		Nov 13, 2020 at 1:33 PM
405025.2021.2200		WHartland Risa Model_124ft.r3d

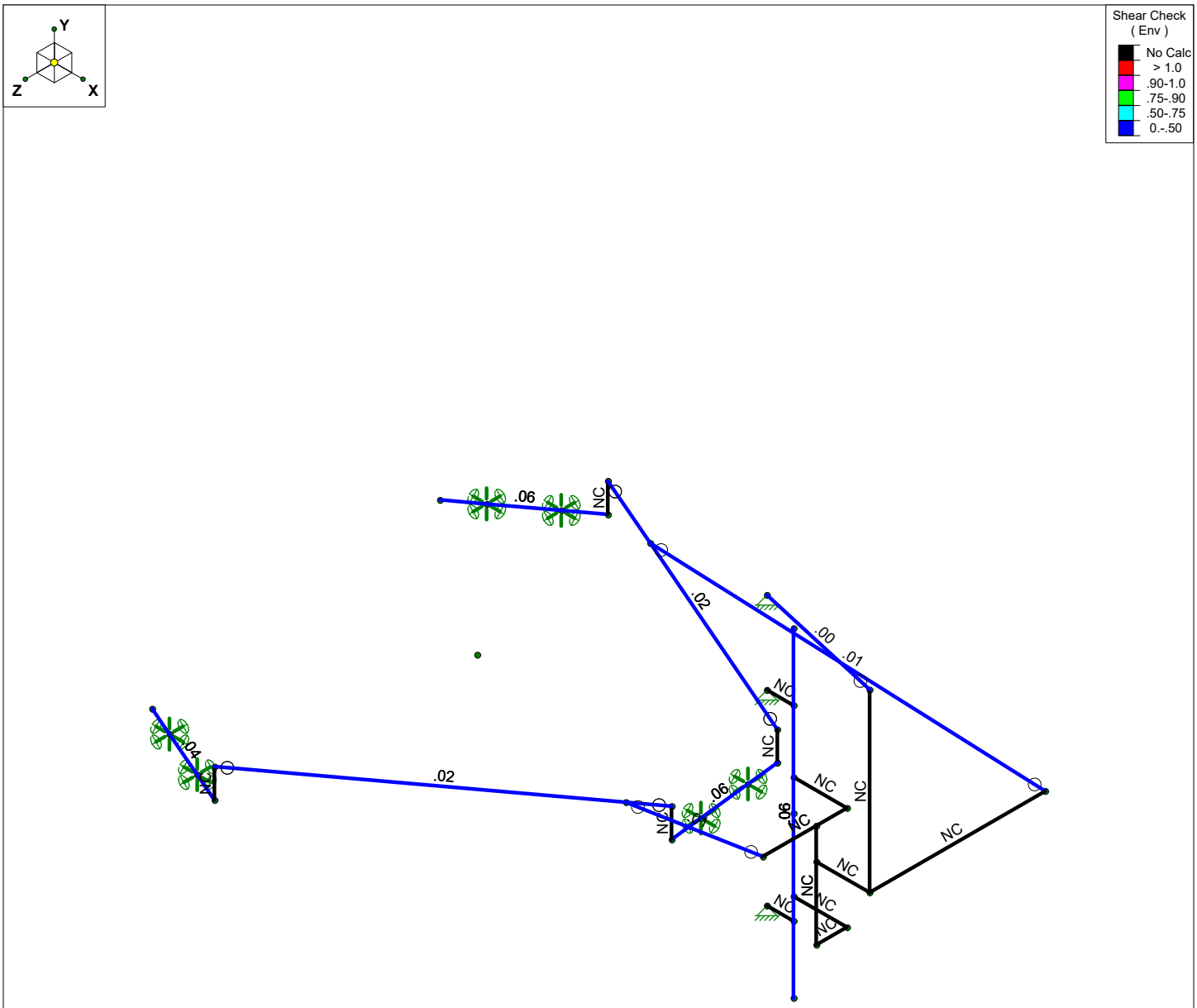


Black & Veatch	WHartland Risa Model_124ft	SK - 2
Joohwan Jung		Nov 13, 2020 at 1:33 PM
405025.2021.2200		WHartland Risa Model_124ft.r3d



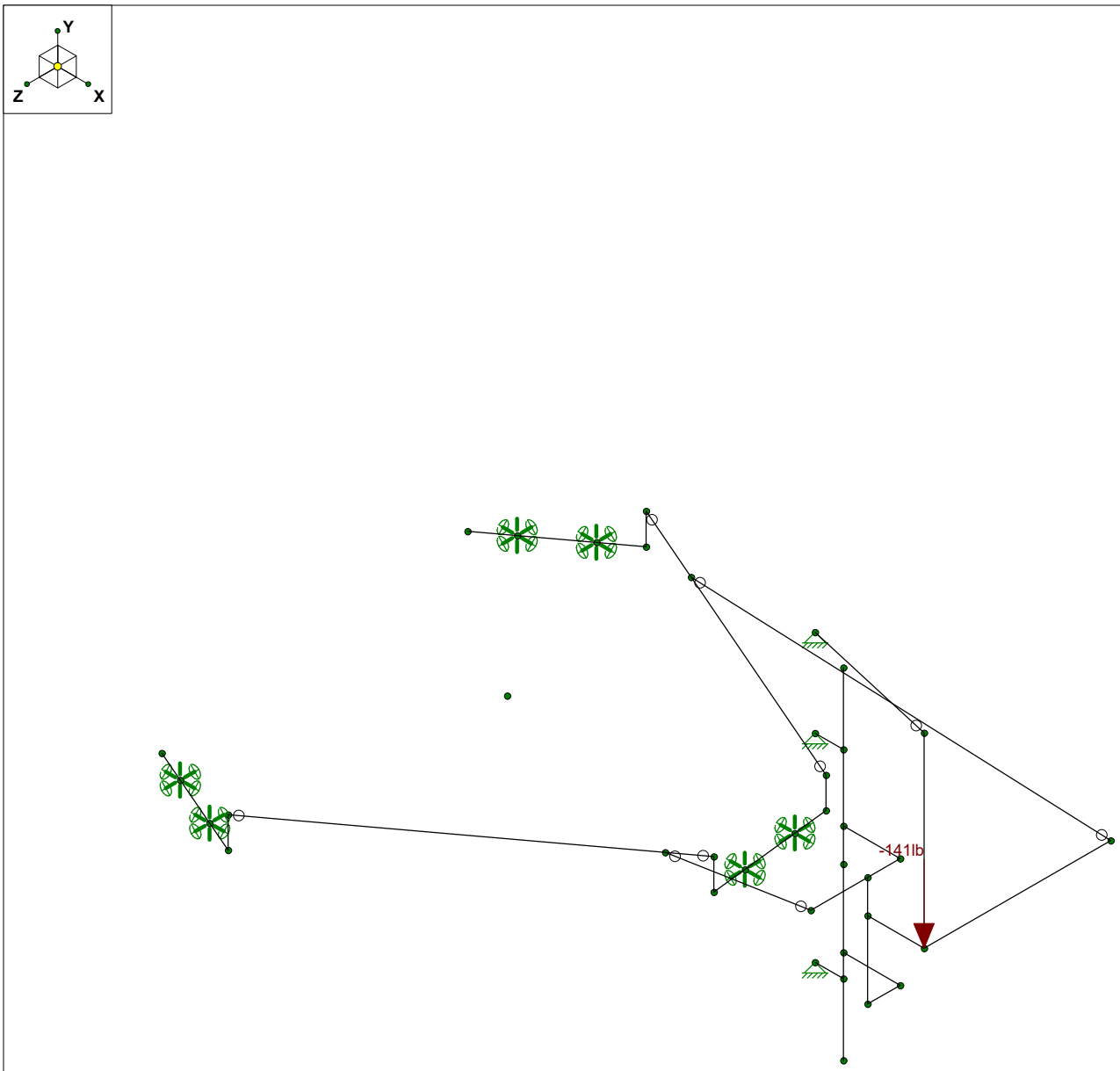
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	WHartland Risa Model_124ft	SK - 3
Joohwan Jung		Nov 13, 2020 at 1:33 PM
405025.2021.2200		WHartland Risa Model_124ft.r3d



Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	WHartland Risa Model_124ft	SK - 4
Joohwan Jung		Nov 13, 2020 at 1:33 PM
405025.2021.2200		WHartland Risa Model_124ft.r3d



Loads: BLC 1, DL
Envelope Only Solution

Black & Veatch	WHartland Risa Model_124ft	SK - 5
Joohwan Jung		Nov 13, 2020 at 1:33 PM
405025.2021.2200		WHartland Risa Model_124ft.r3d

(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
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.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 (in/sec^2)	386.4
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building
Stainless Steel Code	None

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
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

(Global) Model Settings, Continued

Seismic Code	ASCE 7-16
Seismic Base Elevation (in)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Face Pipe	PIPE_4.0	Beam	None	A53 Gr.B	Typical	2.96	6.82	6.82	13.6
2	Stand off pipe	PIPE_4.0	Beam	None	A53 Gr.B	Typical	2.96	6.82	6.82	13.6
3	Stiff Arm	PIPE_2.0	Beam	None	A53 Gr.B	Typical	1.02	.627	.627	1.25
4	Channel	C8X18.75	Beam	None	A36 Gr.36	Typical	5.51	1.97	43.9	.434

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]
1	gen_Conc3NW	3155	1372	.15	.6	.145
2	gen_Conc4NW	3644	1584	.15	.6	.145
3	gen_Conc3LW	2085	906	.15	.6	.11
4	gen_Conc4LW	2408	1047	.15	.6	.11
5	gen_Alum	10100	4077	.3	1.29	.173
6	gen_Steel	29000	11154	.3	.65	.49
7	gen_Plywood	1800	38	0	.3	.035
8	RIGID	1e+6		.3	0	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N18	Reaction	Reaction	Reaction			
2	N20	Reaction	Reaction	Reaction	Reaction		Reaction
3	N21	Reaction	Reaction	Reaction	Reaction		Reaction

Joint Boundary Conditions (Continued)

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
4	N1	Reaction	Reaction	Reaction			
5	N3	Reaction	Reaction	Reaction			
6	N23						
7	N24						
8	N25						
9	N26						
10	N27						
11	N28						
12	N29						
13	N31						
14	N32						
15	N34						
16	N35	Reaction	Reaction	Reaction	Reaction		Reaction
17	N36	Reaction	Reaction	Reaction	Reaction		Reaction
18	N37	Reaction	Reaction	Reaction	Reaction		Reaction
19	N38	Reaction	Reaction	Reaction	Reaction		Reaction

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N1	N2			RIGID	None	None	RIGID	Typical
2	M2	N3	N4			RIGID	None	None	RIGID	Typical
3	M3	N5	N6			Stand off pipe	Beam	None	A53 Gr.B	Typical
4	M4	N8	N9			RIGID	None	None	RIGID	Typical
5	M5	N9	N19			RIGID	None	None	RIGID	Typical
6	M6	N10	N13			RIGID	None	None	RIGID	Typical
7	M7	N11	N12			RIGID	None	None	RIGID	Typical
8	M8	N12	N17			RIGID	None	None	RIGID	Typical
9	M9	N12	N16			RIGID	None	None	RIGID	Typical
10	M10	N29	N26			Face Pipe	Beam	None	A53 Gr.B	Typical
11	M11	N25	N34			Face Pipe	Beam	None	A53 Gr.B	Typical
12	M12	N13	N14			RIGID	None	None	RIGID	Typical
13	M13	N14	N15			RIGID	None	None	RIGID	Typical
14	M14	N16	N39			Stiff Arm	Beam	None	A53 Gr.B	Typical
15	M15	N17	N18			Stiff Arm	Beam	None	A53 Gr.B	Typical
16	M16	N19	N40			Stiff Arm	Beam	None	A53 Gr.B	Typical
17	M17	N24	N23			Channel	Beam	None	A36 Gr.36	Typical
18	M18	N25	N23			RIGID	None	None	RIGID	Typical
19	M19	N26	N24			RIGID	None	None	RIGID	Typical
20	M20	N28	N27			Channel	Beam	None	A36 Gr.36	Typical
21	M21	N29	N27			RIGID	None	None	RIGID	Typical
22	M23	N32	N31			Channel	Beam	None	A36 Gr.36	Typical
23	M25	N34	N32			RIGID	None	None	RIGID	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
1	M1						Yes	** NA **			None
2	M2						Yes	** NA **			None
3	M3						Yes				None
4	M4						Yes	** NA **			None
5	M5						Yes	** NA **			None
6	M6						Yes	** NA **			None
7	M7						Yes	** NA **			None
8	M8						Yes	** NA **			None
9	M9						Yes	** NA **			None

Member Advanced Data (Continued)

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
10	M10	BenPIN	BenPIN				Yes				None
11	M11	BenPIN	BenPIN				Yes				None
12	M12						Yes	** NA **			None
13	M13						Yes	** NA **			None
14	M14	BenPIN	BenPIN				Yes				None
15	M15	BenPIN					Yes	Default			None
16	M16	BenPIN	BenPIN				Yes				None
17	M17						Yes				None
18	M18						Yes	** NA **			None
19	M19						Yes	** NA **			None
20	M20						Yes				None
21	M21						Yes	** NA **			None
22	M23						Yes				None
23	M25						Yes	** NA **			None

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	M3	Stand off pipe	72			Lbyy						Lateral
2	M10	Face Pipe	73.5			Lbyy						Lateral
3	M11	Face Pipe	73.5			Lbyy						Lateral
4	M14	Stiff Arm	92.512			Lbyy						Lateral
5	M15	Stiff Arm	30.783			Lbyy						Lateral
6	M16	Stiff Arm	33.485			Lbyy						Lateral
7	M17	Channel	27			Lbyy						Lateral
8	M20	Channel	27			Lbyy						Lateral
9	M23	Channel	27			Lbyy						Lateral

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
1	DL	DL		-1		2				
2	Maintenance LL - LV	LL				1				
3	Installation LL - LM	LL				1				
4	Wind - 0 Deg (X)	WL				2		9		
5	Wind - 30 Deg (X)	WL				2		9		
6	Wind - 60 Deg (X)	WL				2		9		
7	Wind - 90 Deg (X)	WL				2		9		
8	Wind - 120 Deg (X)	WL				2		9		
9	Wind - 150 Deg (X)	WL				2		9		
10	Wind - 180 Deg (X)	WL				2		9		
11	Wind - 210 Deg (X)	WL				2		9		
12	Wind - 240 Deg (X)	WL				2		9		
13	Wind - 270 Deg (X)	WL				2		9		
14	Wind - 300 Deg (X)	WL				2		9		
15	Wind - 330 Deg (X)	WL				2		9		
16	Wind - 0 Deg (Z)	WL				2		9		
17	Wind - 30 Deg (Z)	WL				2		9		
18	Wind - 60 Deg (Z)	WL				2		9		
19	Wind - 90 Deg (Z)	WL				2		9		
20	Wind - 120 Deg (Z)	WL				2		9		
21	Wind - 150 Deg (Z)	WL				2		9		
22	Wind - 180 Deg (Z)	WL				2		9		
23	Wind - 210 Deg (Z)	WL				2		9		
24	Wind - 240 Deg (Z)	WL				2		9		
25	Wind - 270 Deg (Z)	WL				2		9		

Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
26	Wind - 300 Deg (Z)	WL				2		9		
27	Wind - 330 Deg (Z)	WL				2		9		
28	Ice DL	DL				2		9		
29	Ice Wind - 0 Deg (X)	WL				2		9		
30	Ice Wind - 30 Deg (X)	WL				2		9		
31	Ice Wind - 60 Deg (X)	WL				2		9		
32	Ice Wind - 90 Deg (X)	WL				2		9		
33	Ice Wind - 120 Deg (X)	WL				2		9		
34	Ice Wind - 150 Deg (X)	WL				2		9		
35	Ice Wind - 180 Deg (X)	WL				2		9		
36	Ice Wind - 210 Deg (X)	WL				2		9		
37	Ice Wind - 240 Deg (X)	WL				2		9		
38	Ice Wind - 270 Deg (X)	WL				2		9		
39	Ice Wind - 300 Deg (X)	WL				2		9		
40	Ice Wind - 330 Deg (X)	WL				2		9		
41	Ice Wind - 0 Deg (Z)	WL				2		9		
42	Ice Wind - 30 Deg (Z)	WL				2		9		
43	Ice Wind - 60 Deg (Z)	WL				2		9		
44	Ice Wind - 90 Deg (Z)	WL				2		9		
45	Ice Wind - 120 Deg (Z)	WL				2		9		
46	Ice Wind - 150 Deg (Z)	WL				2		9		
47	Ice Wind - 180 Deg (Z)	WL				2		9		
48	Ice Wind - 210 Deg (Z)	WL				2		9		
49	Ice Wind - 240 Deg (Z)	WL				2		9		
50	Ice Wind - 270 Deg (Z)	WL				2		9		
51	Ice Wind - 300 Deg (Z)	WL				2		9		
52	Ice Wind - 330 Deg (Z)	WL				2		9		
53	Lateral Seismic - Eh (X)	ELX	.35			2				
54	Lateral Seismic - Eh (Z)	ELZ			.35	2				
55	Vertical Seismic - Ev (Y)	ELY		-.112		2				

Load Combinations

	Description	S...	PDe...	SRSS	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	WIND LOAD COMBOS (125 MPH)																									
2	1.2DL + WL (0 DEG)	Y...	Y		1	1.2	4	1	16	1																
3	1.2DL + WL (30 DEG)	Y...	Y		1	1.2	5	1	17	1																
4	1.2DL + WL (60 DEG)	Y...	Y		1	1.2	6	1	18	1																
5	1.2DL + WL (90 DEG)	Y...	Y		1	1.2	7	1	19	1																
6	1.2DL + WL (120 DEG)	Y...	Y		1	1.2	8	1	20	1																
7	1.2DL + WL (150 DEG)	Y...	Y		1	1.2	9	1	21	1																
8	1.2DL + WL (180 DEG)	Y...	Y		1	1.2	10	1	22	1																
9	1.2DL + WL (210 DEG)	Y...	Y		1	1.2	11	1	23	1																
10	1.2DL + WL (240 DEG)	Y...	Y		1	1.2	12	1	24	1																
11	1.2DL + WL (270 DEG)	Y...	Y		1	1.2	13	1	25	1																
12	1.2DL + WL (300 DEG)	Y...	Y		1	1.2	14	1	26	1																
13	1.2DL + WL (330 DEG)	Y...	Y		1	1.2	15	1	27	1																
14																										
15	MOUNT LOAD COMBOS (30 MPH)																									
16	1.4DL	Y...	Y		1	1.4																				
17	1.2DL + 1.5LV	Y...	Y		1	1.2	2	1.5																		
18	1.2DL + 1.5LM + WL (0 DEG)	Y...	Y		1	1.2	3	1.5	4	.058	16	.058														
19	1.2DL + 1.5LM + WL (30 DEG)	Y...	Y		1	1.2	3	1.5	5	.058	17	.058														
20	1.2DL + 1.5LM + WL (60 DEG)	Y...	Y		1	1.2	3	1.5	6	.058	18	.058														
21	1.2DL + 1.5LM + WL (90 DEG)	Y...	Y		1	1.2	3	1.5	7	.058	19	.058														
22	1.2DL + 1.5LM + WL (120 DEG)	Y...	Y		1	1.2	3	1.5	8	.058	20	.058														

Load Combinations (Continued)

	Description	S...	PDe...	SRSS	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
23	1.2DL + 1.5LM + WL (150 DEG)	Y...	Y		1	1.2	3	1.5	9	.058	21	.058														
24	1.2DL + 1.5LM + WL (180 DEG)	Y...	Y		1	1.2	3	1.5	10	.058	22	.058														
25	1.2DL + 1.5LM + WL (210 DEG)	Y...	Y		1	1.2	3	1.5	11	.058	23	.058														
26	1.2DL + 1.5LM + WL (240 DEG)	Y...	Y		1	1.2	3	1.5	12	.058	24	.058														
27	1.2DL + 1.5LM + WL (270 DEG)	Y...	Y		1	1.2	3	1.5	13	.058	25	.058														
28	1.2DL + 1.5LM + WL (300 DEG)	Y...	Y		1	1.2	3	1.5	14	.058	26	.058														
29	1.2DL + 1.5LM + WL (330 DEG)	Y...	Y		1	1.2	3	1.5	15	.058	27	.058														
30																										
31	ICE LOAD COMBOS (1.5", 50 MPH)																									
32	1.2DL + Ice DL + Ice WL (0 DEG)	Y...	Y		1	1.2	28	1	29	1	41	1														
33	1.2DL + Ice DL + Ice WL (30 DEG)	Y...	Y		1	1.2	28	1	30	1	42	1														
34	1.2DL + Ice DL + Ice WL (60 DEG)	Y...	Y		1	1.2	28	1	31	1	43	1														
35	1.2DL + Ice DL + Ice WL (90 DEG)	Y...	Y		1	1.2	28	1	32	1	44	1														
36	1.2DL + Ice DL + Ice WL (120 DEG)	Y...	Y		1	1.2	28	1	33	1	45	1														
37	1.2DL + Ice DL + Ice WL (150 DEG)	Y...	Y		1	1.2	28	1	34	1	46	1														
38	1.2DL + Ice DL + Ice WL (180 DEG)	Y...	Y		1	1.2	28	1	35	1	47	1														
39	1.2DL + Ice DL + Ice WL (210 DEG)	Y...	Y		1	1.2	28	1	36	1	48	1														
40	1.2DL + Ice DL + Ice WL (240 DEG)	Y...	Y		1	1.2	28	1	37	1	49	1														
41	1.2DL + Ice DL + Ice WL (270 DEG)	Y...	Y		1	1.2	28	1	38	1	50	1														
42	1.2DL + Ice DL + Ice WL (300 DEG)	Y...	Y		1	1.2	28	1	39	1	51	1														
43	1.2DL + Ice DL + Ice WL (330 DEG)	Y...	Y		1	1.2	28	1	40	1	52	1														
44																										
45	SEISMIC LOAD COMBOS																									
46	1.2DL + Ev (Y) + Eh (X)	Y...	Y		1	1.2	55	1	53	1																
47	1.2DL - Ev (Y) + Eh (X)	Y...	Y		1	1.2	55	-1	53	1																
48	1.2DL + Ev (Y) - Eh (X)	Y...	Y		1	1.2	55	1	53	-1																
49	1.2DL - Ev (Y) - Eh (X)	Y...	Y		1	1.2	55	-1	53	-1																
50	1.2DL + Ev (Y) + Eh (Z)	Y...	Y		1	1.2	55	1	54	1																
51	1.2DL - Ev (Y) + Eh (Z)	Y...	Y		1	1.2	55	-1	54	1																
52	1.2DL + Ev (Y) - Eh (Z)	Y...	Y		1	1.2	55	1	54	-1																
53	1.2DL - Ev (Y) - Eh (Z)	Y...	Y		1	1.2	55	-1	54	-1																
54																										

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N18	max	427.327	3	18.764	37	101.831	3	0	53	0	53	0	53
2		min	-514.064	37	4.844	49	-114.783	37	0	2	0	2	0	2
3	N20	max	929.946	5	152.138	43	151.723	5	228.796	5	0	53	182.387	11
4		min	-893.781	11	60.106	53	-152.439	11	-168.344	11	0	2	-193.952	5
5	N21	max	790.308	11	173.951	11	100.605	4	64.416	5	0	53	127.367	5
6		min	-842.553	5	-47.882	5	-55.353	12	-116.345	11	0	2	-112.392	11
7	N1	max	1322.031	2	1014.012	43	540.808	5	0	53	0	53	0	53
8		min	-909.228	7	-185.327	7	-512.806	11	0	2	0	2	0	2
9	N3	max	376.281	13	736.022	36	432.019	5	0	53	0	53	0	53
10		min	-504.308	6	-315.449	13	-421.107	11	0	2	0	2	0	2
11	N35	max	146.285	11	53.347	43	140.397	11	-1.359	49	0	53	-1.836	49
12		min	-166.049	6	22.949	47	-145.72	5	-3.158	37	0	2	-4.268	37
13	N36	max	784.447	5	180.591	43	293.408	5	120.044	11	0	53	412.555	11
14		min	-761.838	11	67.368	53	-289.275	11	-84.07	5	0	2	-370.593	5
15	N37	max	308.449	11	140.108	42	422.999	5	20.094	5	0	53	225.101	6
16		min	-376.023	6	49.227	5	-397.792	11	-38.897	11	0	2	-156.195	11
17	N38	max	72.021	5	53.347	43	96.239	11	2.117	39	0	53	-2.095	49
18		min	-77.093	10	22.949	47	-111.874	6	.911	49	0	2	-4.87	39
19	Totals:	max	2416.465	2	2358.279	41	1588.621	5						
20		min	-2096.485	8	540.425	53	-1588.628	11						

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

	Member	Shape	Code Check	Loc[in]	LC	Shear..	Loc[...	Dir	LC	phi*Pn...	phi*Pnt...	phi*Mn...	phi*Mn...	Cb	Eqn
1	M3	PIPE_4.0	.054	57	43	.059	57		3	83097....	93240	10631....	10631....	2..	H1-1b
2	M10	PIPE_4.0	.038	18.375	5	.023	18.3...		5	82696....	93240	10631....	10631....	1..	H1-1b
3	M11	PIPE_4.0	.020	7.656	5	.023	6.891		5	82696....	93240	10631....	10631....	2..	H1-1b
4	M14	PIPE_2.0	.074	46.256	5	.007	92.5...		41	15755....	32130	1871.6...	1871.6...	1..	H1-1b
5	M15	PIPE_2.0	.015	30.783	3	.002	30.7...		41	29692....	32130	1871.6...	1871.6...	1..	H1-1b*
6	M16	PIPE_2.0	.020	33.485	11	.006	0		6	29266....	32130	1871.6...	1871.6...	1..	H1-1b*
7	M17	C8X18.75	.104	7.313	5	.062	7.313	z	5	160353..	178524	4330.9...	37530	2..	H1-1b
8	M20	C8X18.75	.103	19.688	5	.058	19.6...	z	5	160353..	178524	4330.9...	37530	2..	H1-1b
9	M23	C8X18.75	.071	7.313	5	.041	7.313	z	5	160353..	178524	4330.9...	37530	2..	H1-1b

APPENDIX 3:
ATTACHMENTS

RADIO FREQUENCY SYSTEMS
The Clear Choice®

TrunkLine Antenna, Standard (FCC 101, Cat A) , Single Polarized, 6 ft

RFS Microwave Antennas are designed for microwave systems in all common frequency ranges from 4 GHz to 24 GHz. This allows the use of antennas in areas where extreme wind conditions are normal. The antennas utilise a conventional feed system and are available in three performance classes offering complete flexibility when designing a network. Standard Performance antennas are economical solutions for systems where side lobe suppression is of less importance. These antennas are required for use in networks where there is a low interference potential. Antennas are available in 2 ft (0.6m) to 12 ft (3.7m) diameters. Antennas from 4ft up to 12 ft (3.7m) can be equipped with a moulded radome to reduce wind load and to protect the feed against the accumulation of ice and snow.

Antenna

FEATURES / BENEFITS

- Field-proven reliability and long life
- Withstanding winds up to 200 km/h (125 mph), an optional sway bar is available for added assurance in case mistakes are made during installation
- A single-piece configuration and compact packaging to reduce transportation costs
- Frequencies ranging from 4 GHz to 15 GHz with support for two wideband frequency ranges (5.725-6.875 and 7.125-8.5 GHz) to reduce antenna requirements and simplify logistics

Technical Features

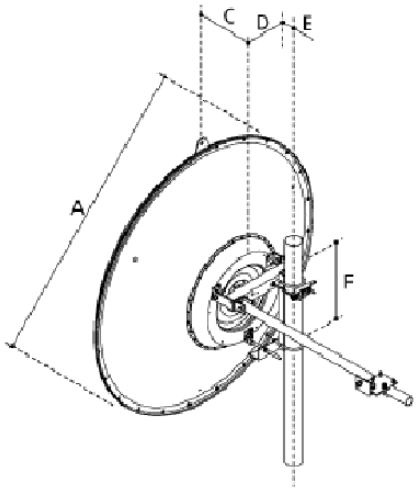
GENERAL SPECIFICATIONS		
Product Type		Point to point antennas
Profile		TrunkLine
Performance		Improved Performance
Polarization		Single
Antenna Input		CPR137G
Reflector		1-part
Radome		Optional
Antenna color		White RAL 9010
Swaybar		1: (2.0 m x Ø60 mm)
ELECTRICAL SPECIFICATIONS		
Frequency	GHz	5.925 - 6.875
3dB beamwidth	degrees	1.7
Low Band Gain	dBi	38.4
Mid Band Gain	dBi	39.1
High Band Gain	dBi	39.7
F/B Ratio	dB	55.0
XPD	dB	30.0
Max VSWR / R L	VSWR / dB	1.08 (28.3)
Regulatory Compliance		FCC Category A
MECHANICAL SPECIFICATIONS		
Diameter	ft (m)	6 (1.8)
Elevation Adjustment	degrees	± 5
Azimuth Adjustment	degrees	± 5
Polarization Adjustment	degrees	± 5
Mounting Pipe Diameter minimum	mm (in)	114 (4.5)
Mounting Pipe Diameter maximum	mm (in)	114 (4.5)
Approximate Weight	kg (lb)	65 (141)
Survival Windspeed	km/h (mph)	200 (125)
Operational Windspeed	km/h (mph)	190 (118)
STRUCTURE		
Radome Material		Fiberglass
FURTHER ACCESSORIES		
optional Swaybar		1: SMA-SK-60-2000A (2.0 m x Ø60mm)
Further Accessories		SMA-SKO-UNIVERSAL-L : Universal sway bar fixation kit

RADIO FREQUENCY SYSTEMS
The Clear Choice®

TrunkLine Antenna, Standard (FCC 101, Cat A) , Single Polarized, 6 ft

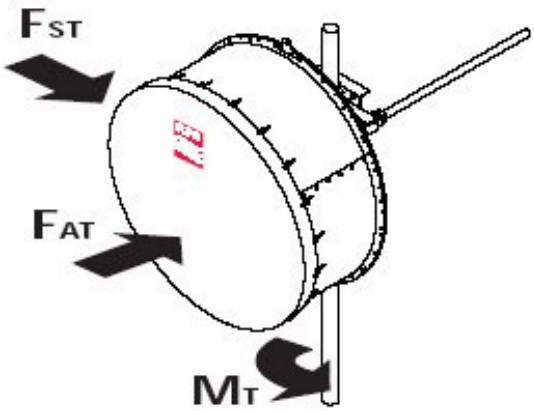
Mount Outline

Dimension A	mm (in)	2000 (79)
Dimension C	mm (in)	364 (14.3)
Dimension D for 114mm (4.5in) Pipe	mm (in)	175 (6.9)
Dimension E	mm (in)	283 (11.1)
Dimension F	mm (in)	590 (23.2)



Wind Load

FST Side force max. @ survival wind speed	N (lb)	2910 (651)
FAT Axial force max. @ survival wind speed	N (lb)	9900 (2217)
MT Torque maximum @ survival wind speed	Nm (lb ft)	3055 (2270)



External Document Links

Complete Antenna installation

RPE (IQ-Link format)

RPE (PDF format)

RPE (Pathloss format)

Notes

Only available in North America

(2) PERIMETER SWAY BARS REQUIRED (CONNECTIONS TO BE LOCATED ON THE TOP AND LEFT PERIMETER QUADRANTS)
NOTE: ANTENNA TO BE INSTALLED WITH A RIGHT OFFSET (WITH RESPECT TO THE T-MOUNT INCLUDED WITH THE ANTENNA) SO THAT THE INCLUDED SWAY BAR THAT ATTACHES TO THE T-MOUNT IS OFFSET RIGHT

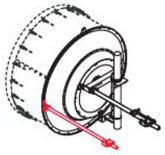
PRODUCT DATASHEET

SMA-SK-60-2000A

RADIO FREQUENCY SYSTEMS
The Clear Choice®

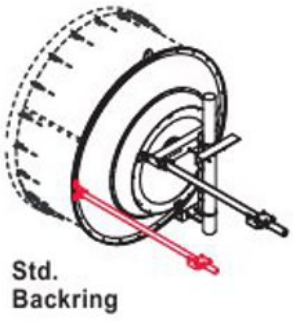
Perimeter Sway Bar for Parabolic Antennas 6ft

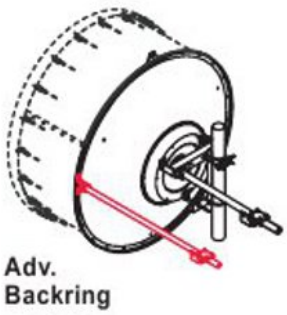
The perimeter sway bar reduces vibration of the reflector and increases stability of the antenna in worst case conditions.
If the perimeter sway bar is installed on a SU6/SUX6/UXA6 "high wind duty" antenna (survival windspeed = 155 mph or 252 km/h), then the operational wind speed of this antenna in increased up to 155 mph (252 km/h).



Technical Features

MECHANICAL PROPERTIES		
Diameter	m (ft)	1.8 (6)
Weight	kg (lb)	16 (35.3)
Sway bar length	m (ft)	1.9 (6.23)
Sway bar diameter	mm (in)	60 (2.4)
STRUCTURE		
Product Type		Reinforcement Hardware
Kit Type		Perimeter Sway Bar
Material		Hot-dip galvanised steel





External Document Links

Sway bar installation kit

Notes

The perimeter sway bar includes only the red marked parts and fixing hardware.

Only applicable for antennas PAD, PADX, DA, DAX, SU, SUX, UA, UDA, UXA antennas in 6ft.

Diameter of the sway bar: 60 mm (2.4 in)

Length of the sway bar: 1900 mm (74.8 in)

(3) SWAY BAR / TOWER CONNECTING KITS REQUIRED (1 PER SWAY BAR)

Addendum

Sway Bar / Tower Connecting Kit (SMA-SKO-UNIVERSAL-L)
6-8-10-12-15 ft antennas

NMT 758-00(e)

The sway bar / tower connecting kit allows the attachment of the sway bar extremity on tower with pipe or L-section structure profiles:

- Tower pipe compatibility: Ø 60 up to 114 mm
- Tower L-section compatibility: L 60x60 up to L 110x110 mm
- Sway bar compatibility: FS sway bar models (Ø 60 mm)
- Antenna compatibility: from 6Ft to 15Ft

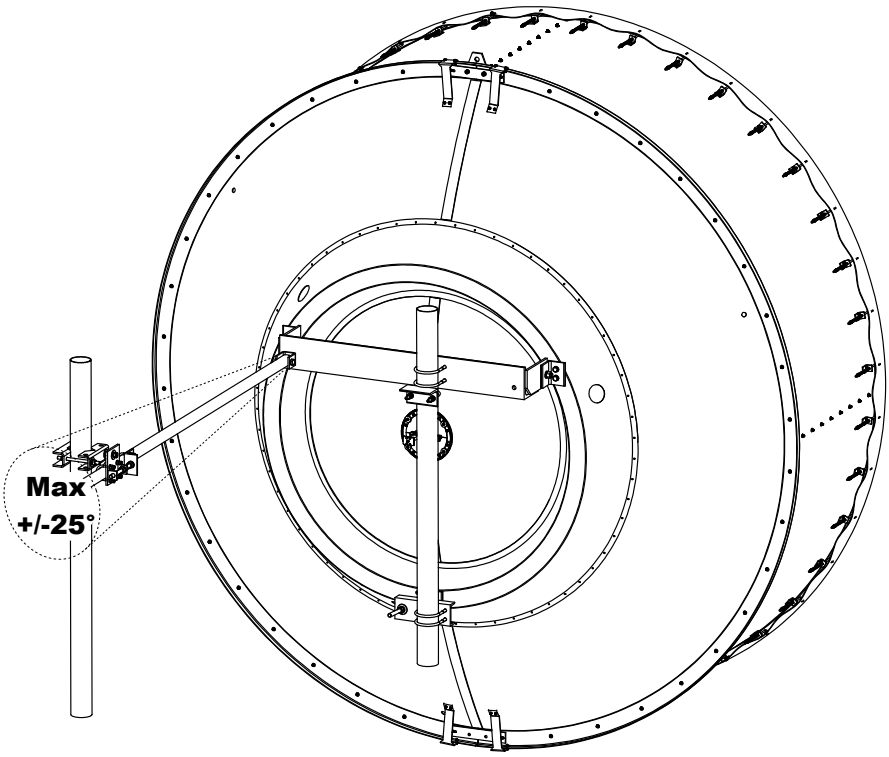
Notes:

For 6 ft antennas, fine azimuth and elevation adjustments have to be done before the sway bar attachment to the sway bar / tower connecting kit.

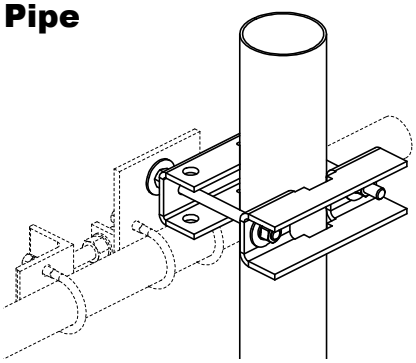
For 8, 10 and 12 ft antennas, as the fine azimuth adjustment system is integrated on the sway bar extremity, you must adjust fine elevation before sway bar attachment.

These installation instructions have been written for qualified, skilled personnel. The antenna shall be inspected once per year by qualified personnel to verify proper installation, maintenance, and condition of equipment. It is important to adhere precisely to all parts of the installation instructions. RFS disclaim any responsibility resulting from improper or unsafe installation. RFS reserves the right to alter details at any time, especially with respect to technical improvements.

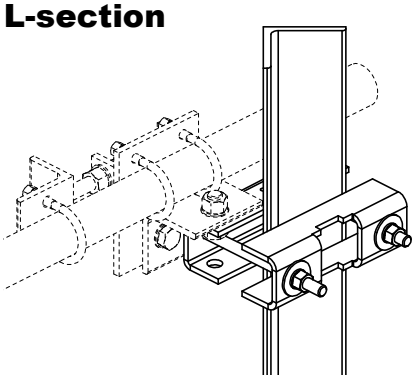
Sway bar kit installation overview (12ft antenna)



OPTION 1
Pipe



OPTION 2
L-section



Kit supplies

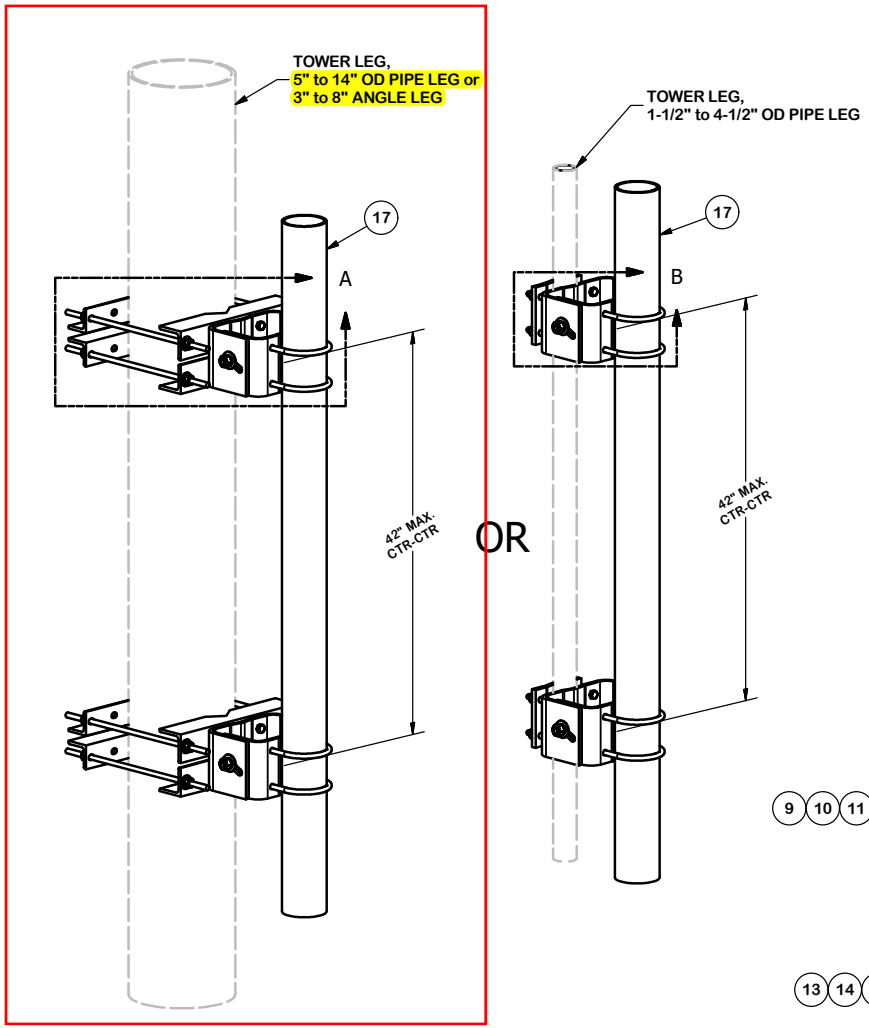
Description	Qty	Description	Qty
Clamp 1 Univ. Sway-bar Kit 6-15	1	Assembly grease	1
Clamp 2 Univ. Sway-bar Kit 6-15	1		
Equipped threaded rod 1 M16/250	1		
Equipped threaded rod 1 M16/250	1		
Strut Univ. Sway-bar Kit 6-15	1		

Tools and equipment required for installation

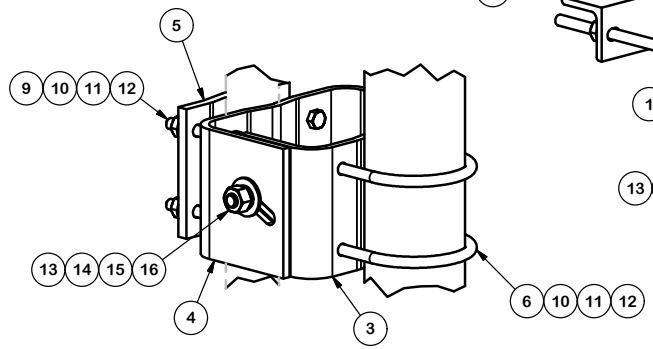
- Torque wrench 140 to 240 Nm with hex open/ring ends adapters M16(24), M20(30)
- Combination wrenches for hexagon bolts M16 (24), M20 (30)

( ) opening of spanner

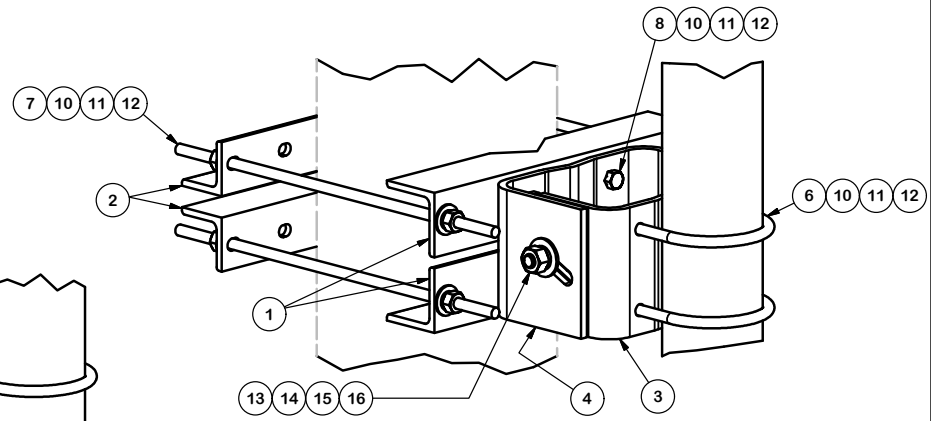
Sales department : Radio Frequency Systems
Kabelkamp 20, D-30179 Hannover (Germany) • Tel. +49-511 676-2520 • Fax +49-511 676-2521
Plant : RFS France Trignac (France) • Tel +33 (0)2 40 45 95 45 • Fax +33 (0)2 40 90 41 43



PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	4	X-158320	ANGLE CLAMP	16 1/2 in	8.51	34.03
2	4	X-126501	BRACKET ANGLE LEG MOUNTING	16 1/2 in	7.13	28.51
3	2	X-154463	UNIVERSAL PIPE MOUNTING PLATE (INNER)	16 11/32 in	10.52	21.03
4	2	X-155561	UNIVERSAL PIPE MOUNTING PLATE (OUTER)	20 9/32 in	13.16	26.31
5	2	X-159999	BACKING PLATE	6 9/16 in	5.73	11.46
6	4	X-UB1458	1/2" X 4-5/8" X 7" X 3" GALV U-BOLT		0.97	3.89
7	8	G12R-20	1/2" x 20" GALV. THREADED ROD		1.12	8.92
8	8	G1203	1/2" x 3" HDG HEX BOLT GR5 FULL THREAD	3 in	0.22	1.74
9	8	G1204	1/2" x 4" HDG HEX BOLT GR5 FULL THREAD	4 in	0.27	2.16
9	8	G12065	1/2" x 6-1/2" HDG HEX BOLT GR5 FULL THREAD	5 1/2 in	0.41	3.28
10	32	G12FW	1/2" HDG USS FLATWASHER	3/32 in	0.03	1.09
11	32	G12LW	1/2" HDG LOCKWASHER	1/8 in	0.01	0.44
12	32	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	2.29
13	4	G5802	5/8" x 2" HDG HEX BOLT GR5		0.27	1.08
14	8	G58FW	5/8" HDG USS FLATWASHER	1/8 in	0.07	0.56
15	4	G58LW	5/8" HDG LOCKWASHER		0.03	0.10
16	4	G58NUT	5/8" HDG HEAVY 2H HEX NUT		0.13	0.52
17	1	P472	4-1/2" X 72" SCH. 40 GALVANIZED PIPE	72 in	64.81	64.81
					TOTAL WT. #	148.00



DETAIL B
USED FOR 1-1/2" to 4-1/2" OD PIPE LEGS



DETAIL A
USED FOR 5" to 14" OD PIPE LEGS
& 3" to 8" ANGLE LEGS

TAPER NOTE:
THE MAXIMUM TAPER ADJUSTMENT IS 5.7° BASED UPON 30" SPACING OF ADJUSTABLE MOUNTING BRACKETS.

THE MAXIMUM TAPER ADJUSTMENT IS 3.8° BASED UPON 45" SPACING OF ADJUSTABLE MOUNTING BRACKET.

TOWER TRUSS LEG WIDTH AT PROPOSED ANTENNA ATTACHMENT = 13.5"± (1.25" SOLID ROUND MEMBERS IN A 12" TRUSS LEG)
NOTE: LARGE LEG ADAPTER INCLUDED SHALL BE USED TO MOUNT AROUND ENTIRE TRUSS LEG.

REVISION HISTORY				
REV	DESCRIPTION OF REVISIONS	CPD	BY	DATE
B	DESCRIPTION CHANGE: 10-3/4" OD TO 14" OD PIPE LEG. NO PART CHANGE		JT	2/27/2020
A	CHANGED THE AMOUNT OF 5/8" FLATWASHER FROM 4 TO 8		MS	12/18/2015

TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES (± 0.030")
DRILLED AND GAS CUT HOLES (± 0.030") - NO CONING OF HOLES
LASER CUT EDGES AND HOLES (± 0.010") - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING (± 0.030")
ALL OTHER ASSEMBLY (± 0.060")

DESCRIPTION
R5 PIPE MOUNT w/ LARGE LEG ADAPTER
FOR 1-1/2" to 14" OD PIPE LEGS &
3" TO 8" ANGLE LEGS

SITE PRO 1 — A valmont COMPANY

Engineering Support Team:
1-888-753-7446

Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
4718	RH18 3/30/2010		R5-LL	1 OF 1
CLASS / SUB	DRAWING USAGE	CHECKED BY	DWG. NO.	
81 / 01	CUSTOMER	BMC 4/21/2010	R5-LL	

BLACK & VEATCH
Building a world of difference.
BLACK & VEATCH CORPORATION
6800 W 115TH ST, SUITE 2292, OVERLAND PARK, KS 66211
+1 913-458-2522 | RILEYJJ@BV.COM

November 16, 2020

MOUNT EVALUATION LETTER

Site Number: ES-033
Site Name: WHartland
Site Data: 2 Center Hill Rd.
West Hartland, CT 06091
Latitude: 41° 58’ 43.5”
Longitude: -72° 58’ 56”

Black & Veatch Corporation is pleased to submit this “Mount Evaluation Letter” to determine the structural integrity of antenna mounting system on the above-mentioned site. The purpose of this evaluation is to determine the capacity of the system in supporting the final loading in the attached “Loading Summary”.

Based on our evaluation we have determined the proposed antenna mounting system to be: **SUFFICIENT**

Structure Rating (max from all components) =	69.4%

The existing mounting system will be capable of supporting the existing and proposed equipment, under the assumptions described in Section 4 of the report and the following conditions:

- Contractor shall be responsible for the means and methods of construction.
- Contractor shall inspect the condition of all existing and proposed structural members, all relevant members and connections and report any deficiencies to the engineer prior to installation of any new antennas and other equipment.

The scope of this evaluation pertains only to the existing antenna mounting system and does not include examination of the loads imparted by the antenna mounting system to the existing tower and its structural components. This document was prepared based on information provided to Black & Veatch. If existing conditions do not reflect those represented, this analysis is no longer valid.

Please contact Josh Riley in our Overland Park Office
at 913-458-2522 if you have any questions or comments.

Sincerely,
Black & Veatch Corporation

Prepared By: Joohwan Jung
Submitted By: Josh Riley, P.E.

11/17/2020

TABLE OF CONTENTS

1. LOADING SUMMARY

2. ANALYSIS CRITERIA SUMMARY

3. REFERENCES

4. ASSUMPTIONS

5. RESULTS SUMMARY

APPENDICES

APPENDIX 1: MOUNT ANALYSIS REPORT

APPENDIX 2: RISA PRINTOUTS

APPENDIX 3: ATTACHMENTS

1. LOADING SUMMARY

Appurtenance								
Carrier	Position	Sector	Antenna RAD Center (ft)	Mount Centerline (ft)	Qty	Type	Manufacturer	Model
-	-	-	189.5	177.5	1	Omni	-	20' Omni
-	-	-	185.5	177.5	1	Omni	Kreco	CO-41A
Eversource	-	-	182.75	180	1	Dipole	COMPROD	871F-70-2

2. ANALYSIS CRITERIA SUMMARY

ANALYSIS CRITERIA	
STANDARD	TIA-222-H
WIND SPEED	Ultimate of 125 mph
WIND SPEED WITH ICE	50 mph with 1.5" radial ice thickness
EXPOSURE CATEGORY	B
RISK CATEGORY	III
TOPO CATEGORY	Flat
CREST HEIGHT	N/A
SPECTRAL RESPONSE FACTORS, Ss & S1	0.175 g & 0.065 g

3. REFERENCES

- American Institute of Steel Construction, AISC 15th Edition
- Telecommunications Industry Association Standard, TIA-222-H & 2018 Connecticut State Building Code

4. ASSUMPTIONS

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

- The antenna mounting system was properly fabricated, installed and maintained in good condition in accordance with its original design and manufacturer's specifications.
- The configuration of antennas, mounts, and other appurtenances are as specified in the Loading Summary and the referenced drawings.
- 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.
- Sector frame center line: located equidistant between top & bottom boom; Platform center line: located at the base perimeter of platform, unless otherwise specified.
- Steel grades have been assumed as follows, unless noted otherwise:

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

5. RESULTS SUMMARY

Name	Bending Stress Ratio		Shear Stress Ratio	
Boom: Pipe 2.0 Std	36.4%	Pass	14.8%	Pass
Arm: Pipe 2.0 Std	31.5%	Pass	6.3%	Pass
Vertical Bracing: Pipe 2.0 Std	69.4%	Pass	34.3%	Pass
Diagonal Bracing: SR3/4	36.2%	Pass	2.4%	Pass
Tower Face: HSS2.5X2.5X3	18.9%	Pass	11.0%	Pass
Connection Plate 1: PL 4x3/16	58.5%	Pass	42.9%	Pass
Connection Plate 2: PL4x3/8	55.8%	Pass	4.1%	Pass

*Von Mises SR = (Max Von Mises Value From RISA-3D)/(0.9*Fy)

**Capacity rating per TIA-222-H Section 15.5.

APPENDIX 1:
MOUNT ANALYSIS REPORT

Dead and Live Loads

Maintenance Live Load: L_V = 250 lb
Installation Live Load: L_M = 500 lb

Appurtenance Dead Loads	
Name	Weight (lb)
871F-70-2	12.5
20' Omni	50
CO-41A	14

Client:	Eversource	Computed By:	Joohwan Jung
Site Name:	WHartland (ES-033)	Date:	11/13/2020
		Verified By:	JW
BLACK & VEATCH	Title: MOUNT ANALYSIS REPORT	Date:	11/16/2020

Appurtenance Wind Loading

Exposure Category =	B		
Risk Category =	III		
Topographic Category =	1		
Basic Wind Speed, V =	125	mph	
Height Above Ground, z =	189.5	ft	
Crest Height, H =	N/A	ft	
Velocity Pressure Coefficient, K_z =	1.19		
Topographic Factor, K_{zt} =	1.00		
Wind Directionality Factor, K_d =	0.95		
Shielding Factor, K_a =	0.90		
Ground Elevation Factor, K_e =	0.957		
Wind Velocity Pressure, q_z =	43.12	psf	
Gust Effect Factor, G_h =	1.00		

Equations

$K_z = 2.01\ (z / z_g)^{2/\alpha}$

$K_h = e^{(f \cdot z / H)}$

$K_{zt} = [1 + K_c K_t / K_h]^2$

$K_e = e^{-0.000032 z^{1.25}}$

$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$

$F_A = q_z G_h (EPA)$

$F_M = q_z G_h C_f D_p$

TIA-222-H
2.6.5.2
2.6.6.2.1
2.6.6.2.1
2.6.8
2.6.11.6
2.6.11.2
2.6.11.2

Appurtenance Wind Loads

Name	Height (ft)	Width (ft)	Depth (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
871F-70-2	5.50	2.58	0.16	1.66	3.07	132.51	1.66	3.07	132.51
20' Omni	20.00	0.17	0.17	2.00	6.00	258.71	2.00	6.00	258.71
CO-41A	12.00	0.22	0.22	2.00	4.73	204.12	2.00	4.73	204.12

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Member Wind Loading

Exposure Category =	B	
Risk Category =	III	
Topographic Category =	1	
Basic Wind Speed, V =	125	mph
Height Above Ground, z =	189.5	ft
Crest Height, H =	N/A	ft
Velocity Pressure Coefficient, K_z =	1.19	
Topographic Factor, K_{zt} =	1.00	
Wind Directionality Factor, K_d =	0.95	
Shielding Factor, K_a =	0.90	
Ground Elevation Factor, K_e =	0.957	
Wind Velocity Pressure, q_z =	43.12	psf
Gust Effect Factor, G_h =	1.00	

Equations

	TIA-222-H
$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
$K_e = e^{-0.000032 z^{2.5}}$	2.6.8
$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
$F_A = q_z G_h (EPA)$	2.6.11.2
$F_M = q_z G_h C_f D_p$	2.6.11.2

Member Wind Loads

Name	Depth (ft)	Width (ft)	C_f	D_p (ft)	F_M (lb)
Boom: Pipe 2.0 Std	0.20		1.2	0.20	10.24
Arm: Pipe 2.0 Std	0.20		1.2	0.20	10.24
Vertical Bracing: Pipe 2.0 Std	0.20		1.2	0.20	10.24
Diagonal Bracing: SR3/4	0.06		1.2	0.06	3.23
Tower Face: HSS2.5X2.5X3	0.21	0.21	2	0.21	17.97
Connection Plate 1: PL 4x3/16	0.02	0.33	2	0.02	1.35
Connection Plate 2: PL4x3/8	0.03	0.33	2	0.03	2.69

Client:	Eversource	Computed By:	Joohwan Jung
Site Name:	WHartland (ES-033)	Date:	11/13/2020
		Verified By:	JW
Title:	MOUNT ANALYSIS REPORT	Date:	11/16/2020

BLACK & VEATCH

Appurtenance Ice Dead Loading

Exposure Category =	B		
Risk Category =	III		
Topographic Category =	1		
Height Above Ground, z =	189.5	ft	
Crest Height, H =	N/A	ft	
Design Ice Thickness, T_i =	1.50	in	
Importance Factor, I =	1.15		
Topographic Factor, K_{zt} =	1.00		
Height Escalation Factor, K_{iz} =	1.19		
Factored Ice Thickness, T_{iz} =	2.05	in	
Grating Ice Dead Load, D_{Gice} =	9.59	psf	

Equations

$K_h = e^{(f \cdot z / H)}$

$K_{zt} = [1 + K_c K_t / K_h]^2$

$K_{iz} = (z/33)^{0.10}$

$T_{iz} = T_i I K_{iz}(K_{zt})^{0.35}$

$DL_{ice}=[(H_{ice}*D_{ice}*W_{ice}) - (H*W*D)]*56pcf$

TIA-222-H

2.6.6.2.1

2.6.6.2.1

2.6.10

2.6.10

Appurtenance Ice Dead Loads

Name	Height w/ ice (ft)	Width w/ice (ft)	Depth w/ ice (ft)	V_{ice} (ft^3)	DL_{ice} (lb)
871F-70-2	5.84	2.93	0.50	2.23	125.08
20' Omni	20.34	0.51	0.51	4.72	264.12
CO-41A	12.34	0.56	0.56	3.32	185.70

Member Ice Dead Loading

Exposure Category =	B	
Risk Category =	III	
Topographic Category =	1	
Height Above Ground, z =	189.5	ft
Crest Height, H =	N/A	ft
Design Ice Thickness, T_i =	1.50	in
Importance Factor, I =	1.15	
Topographic Factor, K_{zt} =	1.00	
Height Escalation Factor, K_{iz} =	1.19	
Factored Ice Thickness, T_{iz} =	2.05	in
Grating Ice Dead Load, D_{Gice} =	9.59	psf

Equations

	TIA-222-H
$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
$K_{iz} = (z/33)^{0.10}$	2.6.10
$T_{iz} = T_i I K_{iz} (K_{zt})^{0.35}$	2.6.10
Aiz = pi*Tiz*(Dc+Tiz)	2.6.10
DL_{ice}=Aiz*56pcf	

Member Ice Dead Loads

Name	Depth w/ ice (ft)	Width w/ ice (ft)	Dc (ft)	Aiz (ft^2)	DL_{ice} (lb/ft)
Boom: Pipe 2.0 Std	0.54		0.20	0.20	11.12
Arm: Pipe 2.0 Std	0.54		0.20	0.20	11.12
Vertical Bracing: Pipe 2.0 Std	0.54		0.20	0.20	11.12
Diagonal Bracing: SR3/4	0.40		0.06	0.13	7.04
Tower Face: HSS2.5X2.5X3	0.55	0.55	0.29	0.25	14.03
Connection Plate 1: PL 4x3/16	0.36	0.68	0.33	0.27	15.21
Connection Plate 2: PL4x3/8	0.37	0.68	0.33	0.27	15.24

BLACK & VEATCH	Client: Eversource		Computed By: Joohwan Jung
	Site Name: WHartland (ES-033)		Date: 11/13/2020
			Verified By: JW
	Title: MOUNT ANALYSIS REPORT		Date: 11/16/2020

Appurtenance Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	B		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	189.5	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.19	psf	$K_e = e^{-0.000032 z_s}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	0.957		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	6.899			
Factored Ice Thickness, T_{iz} =	2.05	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Appurtenance Ice Wind Loads

Name	Height w/ Ice (ft)	Width w/ Ice (ft)	Depth w/ Ice (ft)	Normal			Tangential		
				C_a	EPA FT2	F_A (lb)	C_a	EPA FT2	F_A (lb)
871F-70-2	5.84	2.93	0.50	-	4.25	29.33	-	4.25	29.33
20' Omni	20.34	0.51	0.51	-	13.58	93.72	-	13.58	93.72
CO-41A	12.34	0.56	0.56	-	8.88	61.27	-	8.88	61.27

Member Ice Wind Loading

			Equations	TIA-222-H
Exposure Category =	B		$K_z = 2.01\ (z / z_g)^{2/\alpha}$	2.6.5.2
Risk Category =	III			
Topographic Category =	1		$K_h = e^{(f \cdot z / H)}$	2.6.6.2.1
Ice Wind Speed, V_{ice} =	50	mph		
Height Above Ground, z =	189.5	ft	$K_{zt} = [1 + K_c K_t / K_h]^2$	2.6.6.2.1
Crest Height, H =	N/A	ft		
Velocity Pressure Coefficient, K_z =	1.19	psf	$K_e = e^{-0.000032 z_s}$	2.6.8
Topographic Factor, K_{zt} =	1.00			
Wind Directionality Factor, K_d =	0.95		$q_z = 0.00256\ K_z K_{zt} K_e K_d V^2$	2.6.11.6
Shielding Factor, K_a =	0.90			
Ground Elevation Factory, K_e =	0.957		$F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$	2.6.11.2
Ice Wind Velocity Pressure, $q_{z(ice)}$ =	6.899			
Factored Ice Thickness, T_{iz} =	2.05	in	$F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$	2.6.11.2
Gust Effect Factor, G_h =	1			

Member Ice Wind Loads

Name	Depth w/ Ice (ft)	Width w/ Ice (ft)	C_f	$D_{p(ice)}$ (ft)	$F_{M(ice)}$ (lb/ft)
Boom: Pipe 2.0 Std	0.54		1.2	0.54	4.47
Arm: Pipe 2.0 Std	0.54		1.2	0.54	4.47
Vertical Bracing: Pipe 2.0 Std	0.54		1.2	0.54	4.47
Diagonal Bracing: SR3/4	0.40		1.2	0.40	3.35
Tower Face: HSS2.5X2.5X3	0.55	0.55	2	0.55	7.60
Connection Plate 1: PL 4x3/16	0.36	0.68	2	0.36	4.94
Connection Plate 2: PL4x3/8	0.37	0.68	2	0.37	5.16

BLACK & VEATCH	Client:	Eversource	Computed By: Joohwan Jung
	Site Name:	WHartland (ES-033)	Date: 11/13/2020
			Verified By: JW
	Title:	MOUNT ANALYSIS REPORT	Date: 11/16/2020

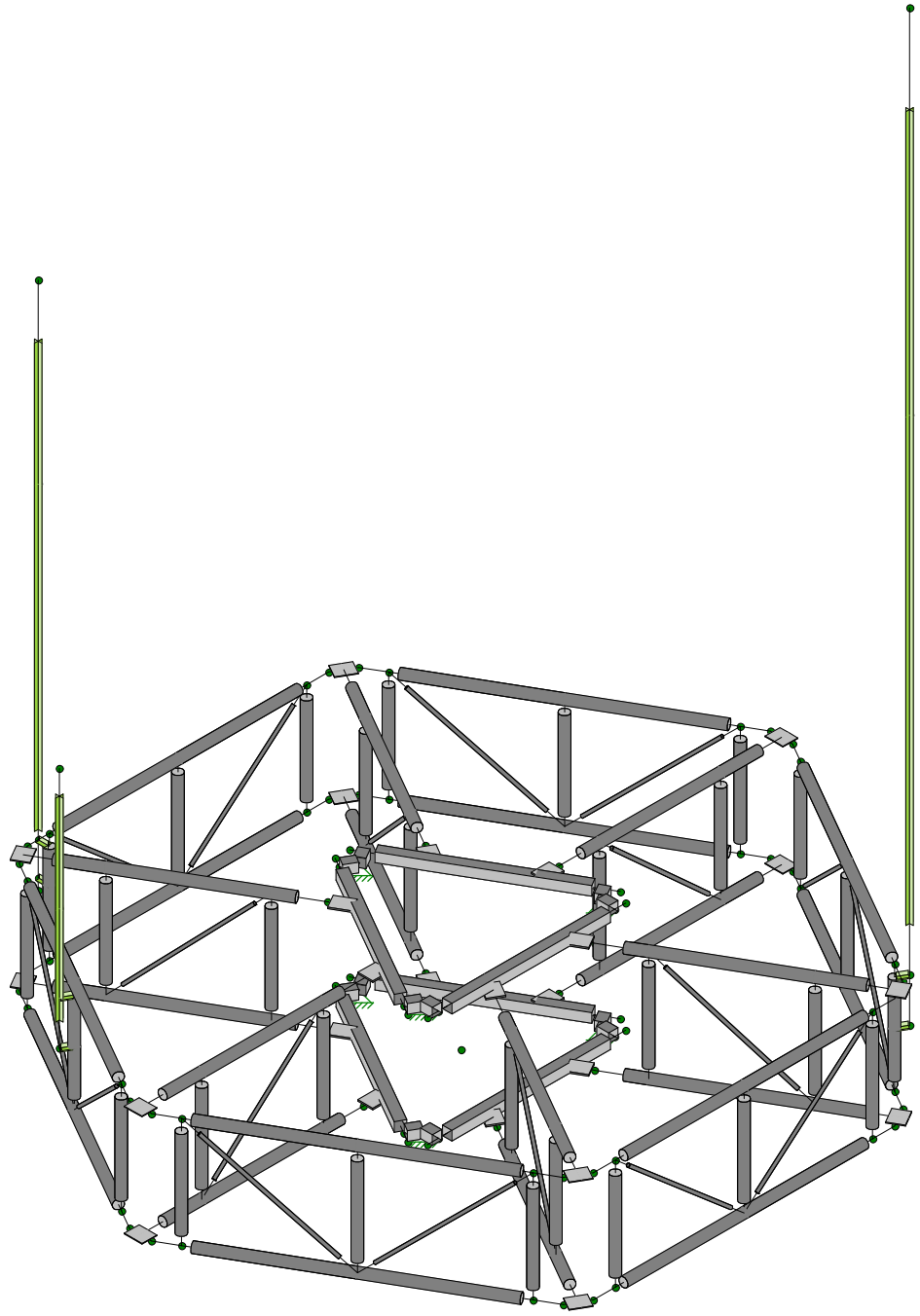
Seismic Loading

			Equations	TIA-222-H
Site Class =	D			
Spectral Response, S_s =	0.175	g	$S_{D1} = 2/3\ F_v S_1$	2.7.5
Max Spectral Response, S_1 =	0.065	g	$S_{DS} = 2/3\ F_a S_s \geq S_{D1}$	2.7.5
Accel. Site Coefficient, F_a =	1.60			
Vel. Site Coefficient, F_v =	2.40		$C_s = 1/2\ S_{DS}\ I \geq 0.03$	2.7.7.1.1
Design Spec. Response (1 sec), S_{D1} =	0.104			
Design Spec. Response, S_{DS} =	0.187		$E_H = A_s\ C_s\ W$	2.7.7
Importantance Factor, I =	1.25			
Seismic Response Coefficient, C_s =	0.117		$E_V = A_s\ 0.2\ S_{DS}\ W$	2.7.6
Amplification Factor, A_s =	3			

Appurtenance Seismic Loads

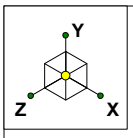
Name	Weight (lb)	E_H (lb)	E_V (lb)
871F-70-2	12.5	4.38	1.40
20' Omni	50	17.50	5.60
CO-41A	14	4.90	1.57

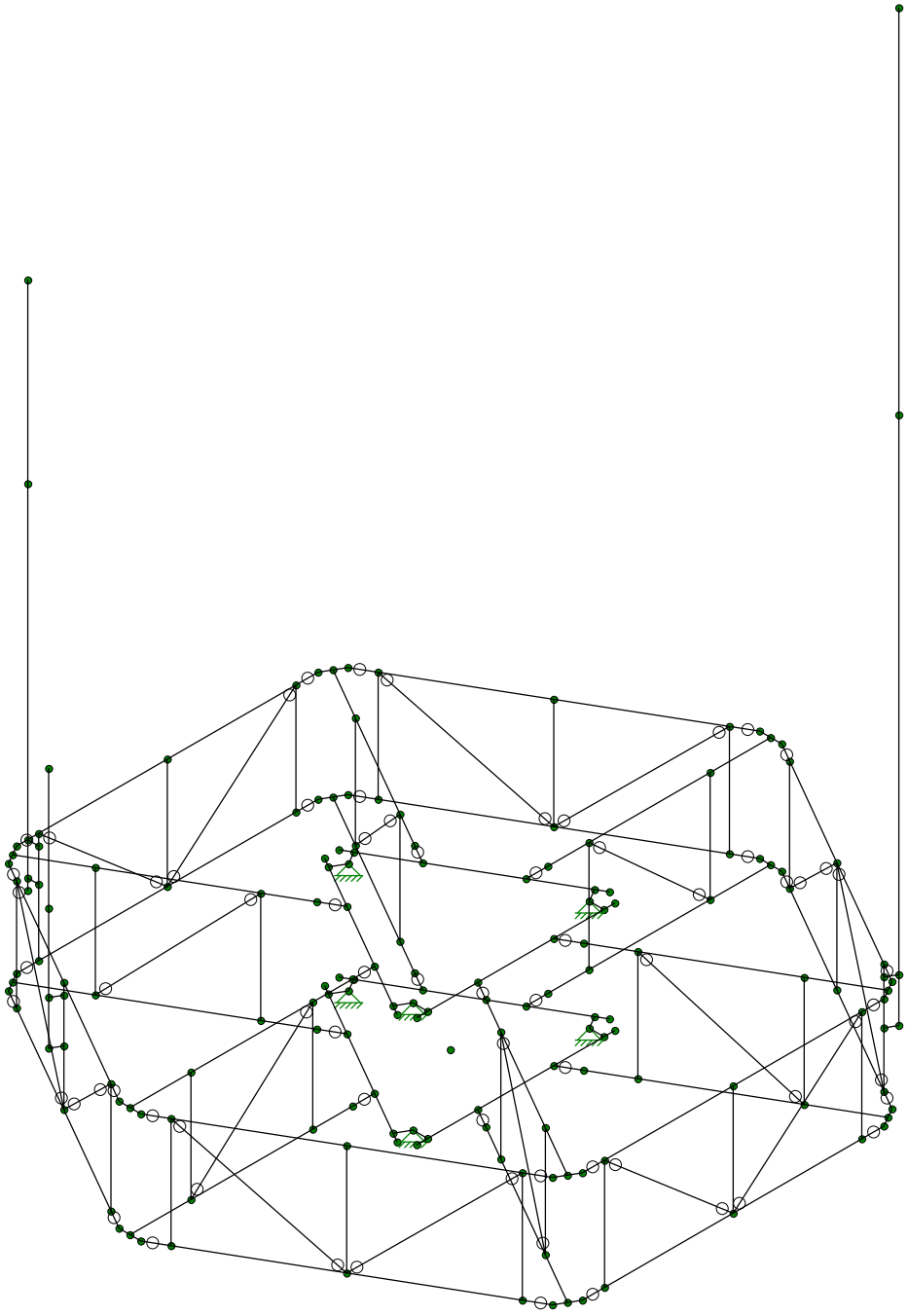
APPENDIX 2:
RISA PRINTOUTS



Envelope Only Solution

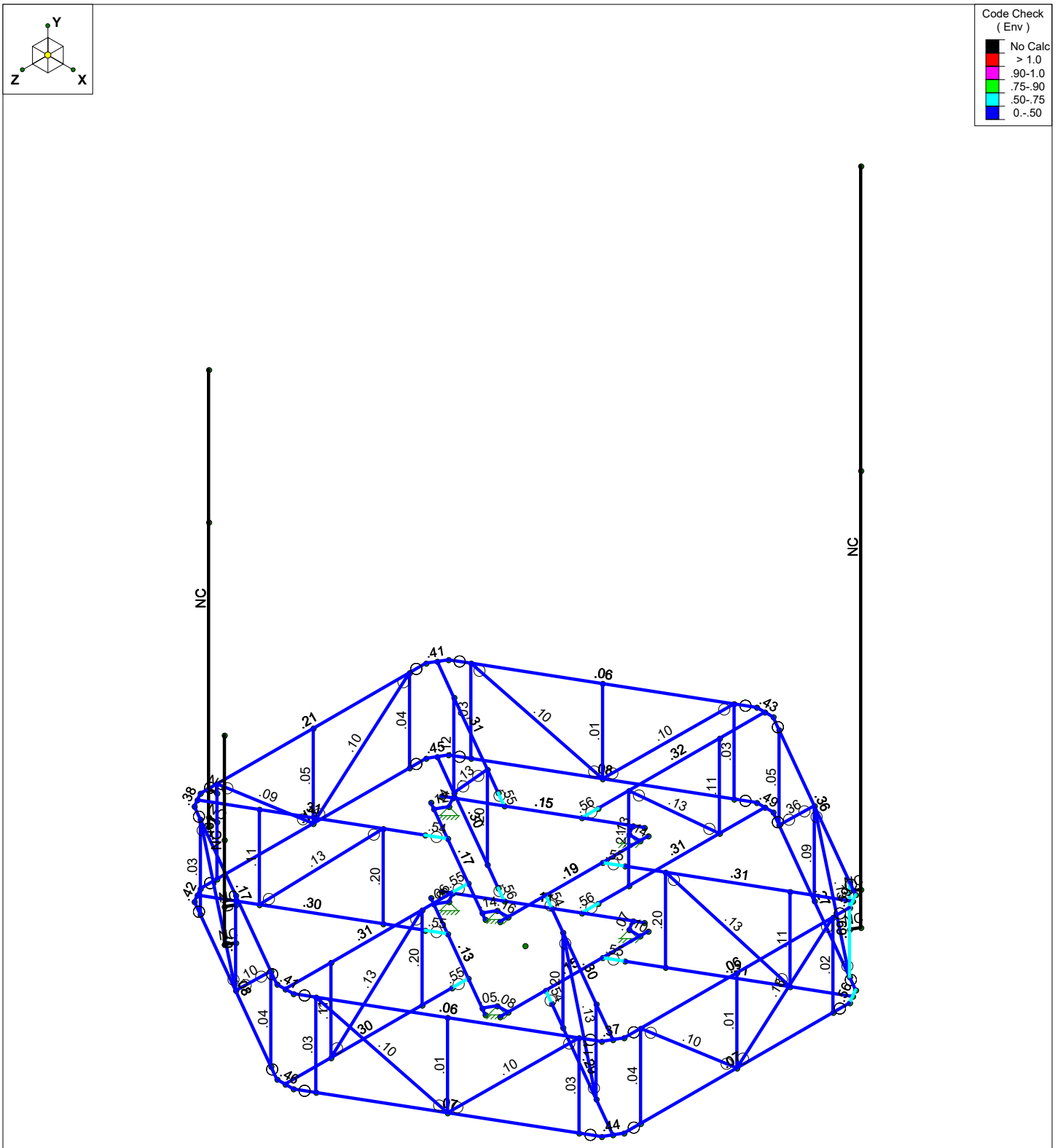
Black & Veatch	WHartland Risa Model_180ft	SK - 1
Joohwan Jung		Nov 16, 2020 at 1:00 PM
405025.2021.2200		WHartland Risa Model_180ft.r3d





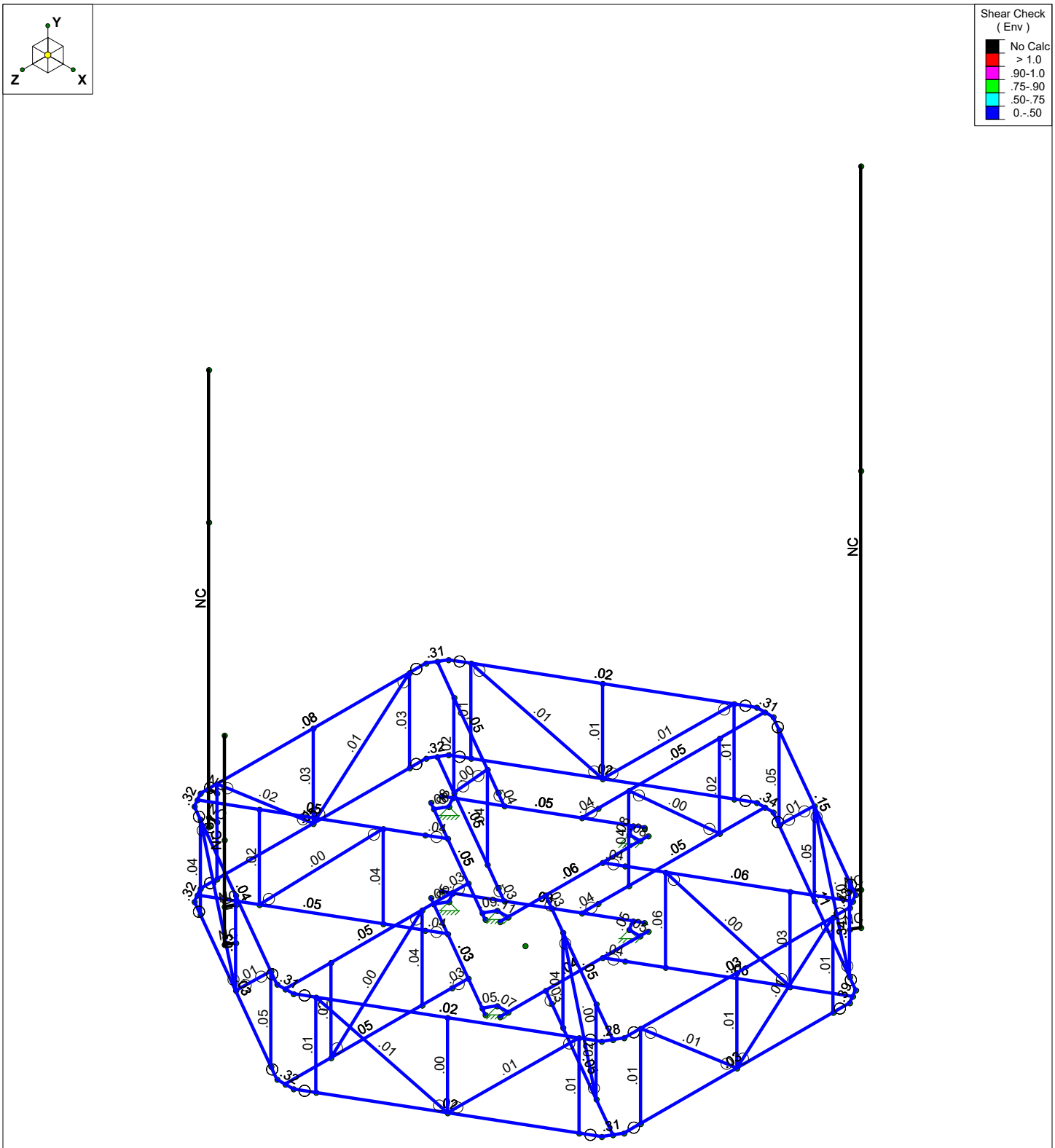
Envelope Only Solution

Black & Veatch	WHartland Risa Model_180ft	SK - 2
Joohwan Jung		Nov 16, 2020 at 1:00 PM
405025.2021.2200		WHartland Risa Model_180ft.r3d



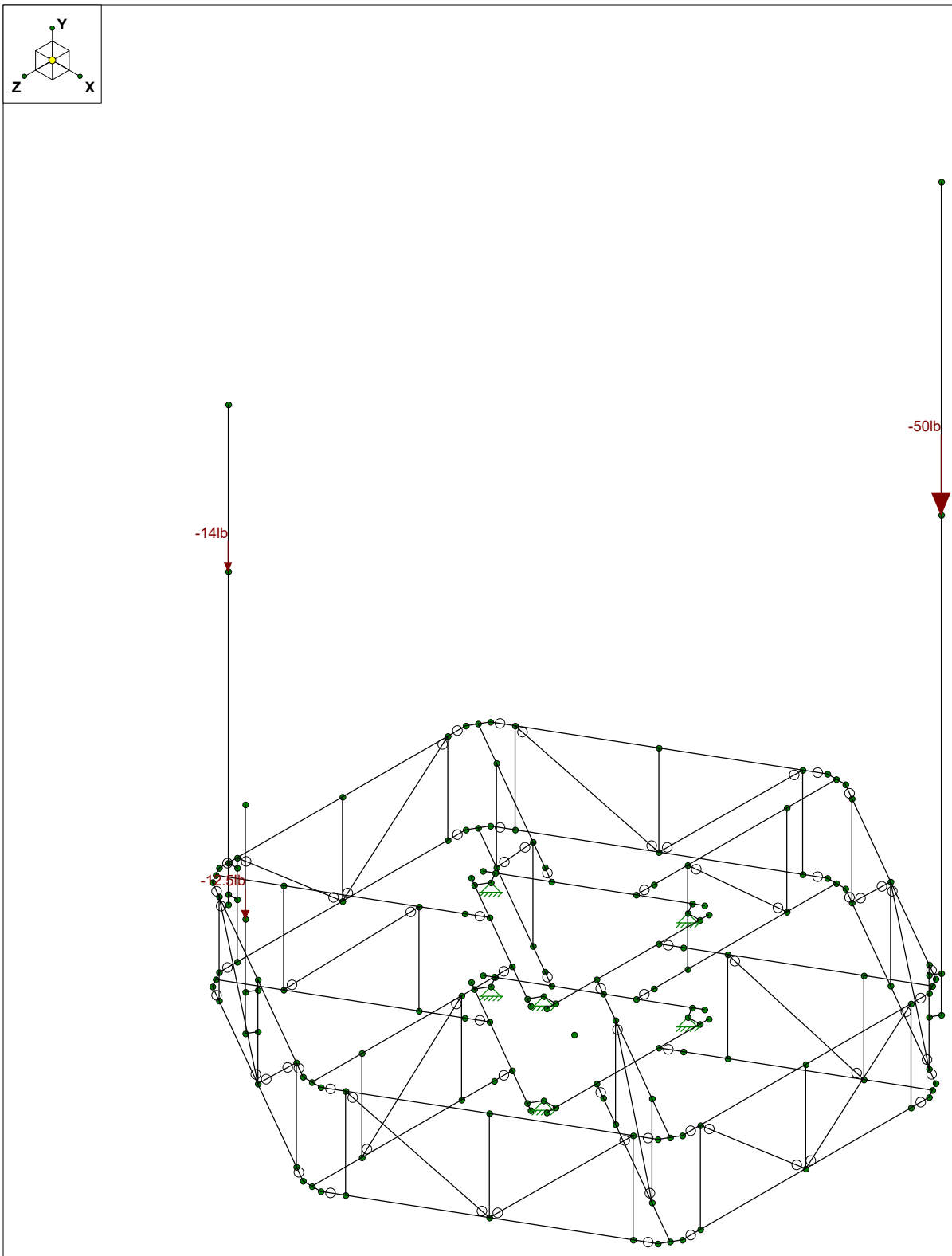
Member Code Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	WHartland Risa Model_180ft	SK - 3
Joohwan Jung		Nov 16, 2020 at 1:00 PM
405025.2021.2200		WHartland Risa Model_180ft.r3d



Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

Black & Veatch	WHartland Risa Model_180ft	SK - 4
Joohwan Jung		Nov 16, 2020 at 1:00 PM
405025.2021.2200		WHartland Risa Model_180ft.r3d



Loads: BLC 1, DL
Envelope Only Solution

Black & Veatch	WHartland Risa Model_180ft	SK - 5
Joohwan Jung		Nov 16, 2020 at 1:00 PM
405025.2021.2200		WHartland Risa Model_180ft.r3d

(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
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.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 (in/sec^2)	386.4
Wall Mesh Size (in)	24
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 15th(360-16): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	None
Cold Formed Steel Code	None
Wood Code	None
Wood Temperature	< 100F
Concrete Code	None
Masonry Code	None
Aluminum Code	None - Building
Stainless Steel Code	None

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	Exact Integration
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	No
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

(Global) Model Settings, Continued

Seismic Code	ASCE 7-16
Seismic Base Elevation (in)	Not Entered
Add Base Weight?	Yes
Ct X	.02
Ct Z	.02
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	3
R Z	3
Ct Exp. X	.75
Ct Exp. Z	.75
SD1	1
SDS	1
S1	1
TL (sec)	5
Risk Cat	I or II
Drift Cat	Other
Om Z	1
Om X	1
Cd Z	4
Cd X	4
Rho Z	1
Rho X	1

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1...	Density[k/ft^3]	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	1.4	65	1.3

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Boom	PIPE_2.0	Beam	Pipe	A53 Gr.B	Typical	1.02	.627	.627	1.25
2	Arm	PIPE_2.0	Beam	Pipe	A53 Gr.B	Typical	1.02	.627	.627	1.25
3	Vertical Bracing	PIPE_2.0	Column	Pipe	A53 Gr.B	Typical	1.02	.627	.627	1.25
4	Diagonal Bracing	SR3/4	VBrace	BAR	A36 Gr.36	Typical	.442	.016	.016	.031
5	Tower Face	HSS2.5X2.5X3	Beam	SquareTube	A500 Gr.B Rect	Typical	1.54	1.35	1.35	2.25
6	Connection Plate 1	PL 4x3/16	Beam	RECT	A36 Gr.36	Typical	.75	.002	1	.009
7	Connection Plate 2	PL4x3/8	Beam	RECT	A36 Gr.36	Typical	1.5	.018	2	.066

General Material Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]
1	gen_Conc3NW	3155	1372	.15	.6	.145
2	gen_Conc4NW	3644	1584	.15	.6	.145
3	gen_Conc3LW	2085	906	.15	.6	.11
4	gen_Conc4LW	2408	1047	.15	.6	.11
5	gen_Alum	10100	4077	.3	1.29	.173
6	gen_Steel	29000	11154	.3	.65	.49
7	gen_Plywood	1800	38	0	.3	.035

General Material Properties (Continued)

	Label	E [ksi]	G [ksi]	Nu	Therm (/1E5 F)	Density[k/ft^3]
8	RIGID	1e+6		.3	0	0

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
1	N14	Reaction	Reaction	Reaction			
2	N16	Reaction	Reaction	Reaction			
3	N18	Reaction	Reaction	Reaction			
4	N20	Reaction	Reaction	Reaction			
5	N57	Reaction	Reaction	Reaction			
6	N60	Reaction	Reaction	Reaction			

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
1	M1	N21	N22			Boom	Beam	Pipe	A53 Gr.B	Typical
2	M2	N2	N43			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
3	M3	N9	N7			Boom	Beam	Pipe	A53 Gr.B	Typical
4	M4	N22	N3		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
5	M5	N21	N4		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
6	M6	N5	N6			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
7	M7	N7	N8		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
8	M8	N9	N10		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
9	M9	N11	N12			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
10	M10	N13	N14			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
11	M11	N15	N16			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
12	M12	N17	N18			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
13	M13	N19	N20			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
14	M14	N23	N159			Arm	Beam	Pipe	A53 Gr.B	Typical
15	M15	N25	N160			Arm	Beam	Pipe	A53 Gr.B	Typical
16	M16	N27	N161			Arm	Beam	Pipe	A53 Gr.B	Typical
17	M17	N29	N162			Arm	Beam	Pipe	A53 Gr.B	Typical
18	M18	N31	N34			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
19	M19	N33	N32			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
20	M20	N33	N34			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
21	M21	N37	N35			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
22	M22	N36	N38			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
23	M23	N37	N38			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
24	M24	N42	N39			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
25	M25	N41	N40			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
26	M26	N41	N43			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
27	M27	N42	N43			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
28	M28	N61	N62			Boom	Beam	Pipe	A53 Gr.B	Typical
29	M29	N44	N83			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
30	M30	N51	N49			Boom	Beam	Pipe	A53 Gr.B	Typical
31	M31	N62	N45		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
32	M32	N61	N46		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
33	M33	N47	N48			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
34	M34	N49	N50		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
35	M35	N51	N52		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
36	M36	N53	N54			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
37	M37	N55	N16			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
38	M38	N56	N57			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
39	M39	N58	N20			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
40	M40	N59	N60			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
41	M41	N63	N163			Arm	Beam	Pipe	A53 Gr.B	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
42	M42	N65	N164			Arm	Beam	Pipe	A53 Gr.B	Typical
43	M43	N67	N165			Arm	Beam	Pipe	A53 Gr.B	Typical
44	M44	N69	N166			Arm	Beam	Pipe	A53 Gr.B	Typical
45	M45	N71	N74			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
46	M46	N73	N72			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
47	M47	N73	N74			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
48	M48	N77	N75			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
49	M49	N76	N78			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
50	M50	N77	N78			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
51	M51	N82	N79			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
52	M52	N81	N80			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
53	M53	N81	N83			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
54	M54	N82	N83			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
55	M55	N99	N100			Boom	Beam	Pipe	A53 Gr.B	Typical
56	M56	N84	N121			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
57	M57	N91	N89			Boom	Beam	Pipe	A53 Gr.B	Typical
58	M58	N100	N85		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
59	M59	N99	N86		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
60	M60	N87	N88			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
61	M61	N89	N90		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
62	M62	N91	N92		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
63	M63	N93	N94			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
64	M64	N95	N57			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
65	M65	N96	N14			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
66	M66	N97	N60			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
67	M67	N98	N18			Tower Face	Beam	SquareTube	A500 Gr.B...	Typical
68	M68	N101	N167			Arm	Beam	Pipe	A53 Gr.B	Typical
69	M69	N103	N168			Arm	Beam	Pipe	A53 Gr.B	Typical
70	M70	N105	N169			Arm	Beam	Pipe	A53 Gr.B	Typical
71	M71	N107	N170			Arm	Beam	Pipe	A53 Gr.B	Typical
72	M72	N109	N112			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
73	M73	N111	N110			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
74	M74	N111	N112			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
75	M75	N115	N113			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
76	M76	N114	N116			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
77	M77	N115	N116			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
78	M78	N120	N117			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
79	M79	N119	N118			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
80	M80	N119	N121			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
81	M81	N120	N121			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
82	M82	N3	N46			Boom	Beam	Pipe	A53 Gr.B	Typical
83	M83	N8	N52			Boom	Beam	Pipe	A53 Gr.B	Typical
84	M84	N45	N86			Boom	Beam	Pipe	A53 Gr.B	Typical
85	M85	N50	N92			Boom	Beam	Pipe	A53 Gr.B	Typical
86	M86	N85	N4			Boom	Beam	Pipe	A53 Gr.B	Typical
87	M87	N90	N10			Boom	Beam	Pipe	A53 Gr.B	Typical
88	M88	N122	N127			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
89	M89	N126	N123			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
90	M90	N125	N124			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
91	M91	N125	N127			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
92	M92	N126	N127			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
93	M93	N128	N133			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
94	M94	N132	N129			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
95	M95	N131	N130			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
96	M96	N130	N128			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
97	M97	N129	N128			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
98	M98	N134	N139			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical

Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(deg)	Section/Shape	Type	Design List	Material	Design Rules
99	M99	N138	N135			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
100	M100	N137	N136			Vertical Bracing	Column	Pipe	A53 Gr.B	Typical
101	M101	N137	N139			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
102	M102	N138	N139			Diagonal Braci...	VBrace	BAR	A36 Gr.36	Typical
103	M103	N147	N149			RIGID	None	None	RIGID	Typical
104	M104	N146	N142			RIGID	None	None	RIGID	Typical
105	M105	N147	N143			RIGID	None	None	RIGID	Typical
106	M106	N150	N154			RIGID	None	None	RIGID	Typical
107	M107	N145	N152			RIGID	None	None	RIGID	Typical
108	M108	N144	N151			RIGID	None	None	RIGID	Typical
109	M109	N140	N155			RIGID	None	None	RIGID	Typical
110	M110	N158	N156			RIGID	None	None	RIGID	Typical
111	M111	N141	N156			RIGID	None	None	RIGID	Typical
112	M112	N159	N24		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
113	M113	N160	N26		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
114	M114	N161	N28		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
115	M115	N162	N30		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
116	M116	N163	N64		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
117	M117	N164	N66		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
118	M118	N165	N68		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
119	M119	N166	N70		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
120	M120	N167	N102		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
121	M121	N168	N104		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
122	M122	N169	N106		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical
123	M123	N170	N108		90	Connection Pl...	Beam	RECT	A36 Gr.36	Typical

Member Advanced Data

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
1	M1	BenPIN	BenPIN				Yes				None
2	M2						Yes	** NA **			None
3	M3	BenPIN	BenPIN				Yes				None
4	M4						Yes				None
5	M5						Yes				None
6	M6						Yes				None
7	M7						Yes				None
8	M8						Yes				None
9	M9						Yes				None
10	M10						Yes				None
11	M11						Yes				None
12	M12						Yes				None
13	M13						Yes				None
14	M14						Yes				None
15	M15						Yes				None
16	M16						Yes				None
17	M17						Yes				None
18	M18						Yes	** NA **			None
19	M19						Yes	** NA **			None
20	M20	BenPIN	BenPIN				Yes	** NA **			None
21	M21						Yes	** NA **			None
22	M22						Yes	** NA **			None
23	M23	BenPIN	BenPIN				Yes	** NA **			None
24	M24						Yes	** NA **			None
25	M25						Yes	** NA **			None
26	M26	BenPIN	BenPIN				Yes	** NA **			None
27	M27	BenPIN	BenPIN				Yes	** NA **			None

Member Advanced Data (Continued)

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
28	M28	BenPIN	BenPIN				Yes				None
29	M29						Yes	** NA **			None
30	M30	BenPIN	BenPIN				Yes				None
31	M31						Yes				None
32	M32						Yes				None
33	M33						Yes				None
34	M34						Yes				None
35	M35						Yes				None
36	M36						Yes				None
37	M37						Yes				None
38	M38						Yes				None
39	M39						Yes				None
40	M40						Yes				None
41	M41						Yes				None
42	M42						Yes				None
43	M43						Yes				None
44	M44						Yes				None
45	M45						Yes	** NA **			None
46	M46						Yes	** NA **			None
47	M47	BenPIN	BenPIN				Yes	** NA **			None
48	M48						Yes	** NA **			None
49	M49						Yes	** NA **			None
50	M50	BenPIN	BenPIN				Yes	** NA **			None
51	M51						Yes	** NA **			None
52	M52						Yes	** NA **			None
53	M53	BenPIN	BenPIN				Yes	** NA **			None
54	M54	BenPIN	BenPIN				Yes	** NA **			None
55	M55	BenPIN	BenPIN				Yes				None
56	M56						Yes	** NA **			None
57	M57	BenPIN	BenPIN				Yes				None
58	M58						Yes				None
59	M59						Yes				None
60	M60						Yes				None
61	M61						Yes				None
62	M62						Yes				None
63	M63						Yes				None
64	M64						Yes				None
65	M65						Yes				None
66	M66						Yes				None
67	M67						Yes				None
68	M68						Yes				None
69	M69						Yes				None
70	M70						Yes				None
71	M71						Yes				None
72	M72						Yes	** NA **			None
73	M73						Yes	** NA **			None
74	M74	BenPIN	BenPIN				Yes	** NA **			None
75	M75						Yes	** NA **			None
76	M76						Yes	** NA **			None
77	M77	BenPIN	BenPIN				Yes	** NA **			None
78	M78						Yes	** NA **			None
79	M79						Yes	** NA **			None
80	M80	BenPIN	BenPIN				Yes	** NA **			None
81	M81	BenPIN	BenPIN				Yes	** NA **			None
82	M82	BenPIN	BenPIN				Yes				None
83	M83	BenPIN	BenPIN				Yes				None
84	M84	BenPIN	BenPIN				Yes				None

Member Advanced Data (Continued)

	Label	I Release	J Release	I Offset[in]	J Offset[in]	T/C Only	Physical	Defl Rat...	Analysis ...	Inactive	Seismic...
85	M85	BenPIN	BenPIN				Yes				None
86	M86	BenPIN	BenPIN				Yes				None
87	M87	BenPIN	BenPIN				Yes				None
88	M88						Yes	** NA **			None
89	M89						Yes	** NA **			None
90	M90						Yes	** NA **			None
91	M91	BenPIN	BenPIN				Yes	** NA **			None
92	M92	BenPIN	BenPIN				Yes	** NA **			None
93	M93						Yes	** NA **			None
94	M94						Yes	** NA **			None
95	M95						Yes	** NA **			None
96	M96	BenPIN	BenPIN				Yes	** NA **			None
97	M97	BenPIN	BenPIN				Yes	** NA **			None
98	M98						Yes	** NA **			None
99	M99						Yes	** NA **			None
100	M100						Yes	** NA **			None
101	M101	BenPIN	BenPIN				Yes	** NA **			None
102	M102	BenPIN	BenPIN				Yes	** NA **			None
103	M103						Yes	** NA **			None
104	M104						Yes	** NA **			None
105	M105						Yes	** NA **			None
106	M106						Yes	** NA **			None
107	M107						Yes	** NA **			None
108	M108						Yes	** NA **			None
109	M109						Yes	** NA **			None
110	M110						Yes	** NA **			None
111	M111						Yes	** NA **			None
112	M112		OOOOOO				Yes				None
113	M113		OOOOOO				Yes				None
114	M114		OOOOOO				Yes				None
115	M115		OOOOOO				Yes				None
116	M116		OOOOOO				Yes				None
117	M117		OOOOOO				Yes				None
118	M118		OOOOOO				Yes				None
119	M119		OOOOOO				Yes				None
120	M120		OOOOOO				Yes				None
121	M121		OOOOOO				Yes				None
122	M122		OOOOOO				Yes				None
123	M123		OOOOOO				Yes				None

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	Boom	82.067			Lbyy						Lateral
2	M2	Vertical Bra...	30			Lbyy						Lateral
3	M3	Boom	82.067			Lbyy						Lateral
4	M4	Connection ...	6			Lbyy						Lateral
5	M5	Connection ...	6			Lbyy						Lateral
6	M6	Tower Face	54			Lbyy						Lateral
7	M7	Connection ...	6			Lbyy						Lateral
8	M8	Connection ...	6			Lbyy						Lateral
9	M9	Tower Face	54			Lbyy						Lateral
10	M10	Tower Face	4			Lbyy						Lateral
11	M11	Tower Face	4			Lbyy						Lateral
12	M12	Tower Face	4			Lbyy						Lateral
13	M13	Tower Face	4			Lbyy						Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length[in]	Lbyy[in]	Lbzz[in]	Lcomp top[in]	Lcomp bot[in]	L-torqu...	Kyy	Kzz	Cb	Function
14	M14	Arm	60.644			Lbyy						Lateral
15	M15	Arm	60.644			Lbyy						Lateral
16	M16	Arm	60.644			Lbyy						Lateral
17	M17	Arm	60.644			Lbyy						Lateral
18	M18	Vertical Bra...	30			Lbyy						Lateral
19	M19	Vertical Bra...	30			Lbyy						Lateral
20	M20	Diagonal Br...	44.718			Lbyy						Lateral
21	M21	Vertical Bra...	30			Lbyy						Lateral
22	M22	Vertical Bra...	30			Lbyy						Lateral
23	M23	Diagonal Br...	44.598			Lbyy						Lateral
24	M24	Vertical Bra...	30			Lbyy						Lateral
25	M25	Vertical Bra...	30			Lbyy						Lateral
26	M26	Diagonal Br...	46.123			Lbyy						Lateral
27	M27	Diagonal Br...	46.123			Lbyy						Lateral
28	M28	Boom	82.067			Lbyy						Lateral
29	M29	Vertical Bra...	30			Lbyy						Lateral
30	M30	Boom	82.067			Lbyy						Lateral
31	M31	Connection ...	6			Lbyy						Lateral
32	M32	Connection ...	6			Lbyy						Lateral
33	M33	Tower Face	54			Lbyy						Lateral
34	M34	Connection ...	6			Lbyy						Lateral
35	M35	Connection ...	6			Lbyy						Lateral
36	M36	Tower Face	54			Lbyy						Lateral
37	M37	Tower Face	4			Lbyy						Lateral
38	M38	Tower Face	4			Lbyy						Lateral
39	M39	Tower Face	4			Lbyy						Lateral
40	M40	Tower Face	4			Lbyy						Lateral
41	M41	Arm	60.644			Lbyy						Lateral
42	M42	Arm	60.644			Lbyy						Lateral
43	M43	Arm	60.644			Lbyy						Lateral
44	M44	Arm	60.644			Lbyy						Lateral
45	M45	Vertical Bra...	30			Lbyy						Lateral
46	M46	Vertical Bra...	30			Lbyy						Lateral
47	M47	Diagonal Br...	44.718			Lbyy						Lateral
48	M48	Vertical Bra...	30			Lbyy						Lateral
49	M49	Vertical Bra...	30			Lbyy						Lateral
50	M50	Diagonal Br...	44.598			Lbyy						Lateral
51	M51	Vertical Bra...	30			Lbyy						Lateral
52	M52	Vertical Bra...	30			Lbyy						Lateral
53	M53	Diagonal Br...	46.123			Lbyy						Lateral
54	M54	Diagonal Br...	46.123			Lbyy						Lateral
55	M55	Boom	82.067			Lbyy						Lateral
56	M56	Vertical Bra...	30			Lbyy						Lateral
57	M57	Boom	82.067			Lbyy						Lateral
58	M58	Connection ...	6			Lbyy						Lateral
59	M59	Connection ...	6			Lbyy						Lateral
60	M60	Tower Face	54			Lbyy						Lateral
61	M61	Connection ...	6			Lbyy						Lateral
62	M62	Connection ...	6			Lbyy						Lateral
63	M63	Tower Face	54			Lbyy						Lateral
64	M64	Tower Face	4			Lbyy						Lateral
65	M65	Tower Face	4			Lbyy						Lateral
66	M66	Tower Face	4			Lbyy						Lateral
67	M67	Tower Face	4			Lbyy						Lateral
68	M68	Arm	60.644			Lbyy						Lateral
69	M69	Arm	60.644			Lbyy						Lateral
70	M70	Arm	60.644			Lbyy						Lateral

Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Length[in]	Lbyy[in]	Lbzz[in]	Lcomp top[in]	Lcomp bot[in]	L-torqu...	Kyy	Kzz	Cb	Function
71	M71	Arm	60.644			Lbyy						Lateral
72	M72	Vertical Bra...	30			Lbyy						Lateral
73	M73	Vertical Bra...	30			Lbyy						Lateral
74	M74	Diagonal Br...	44.718			Lbyy						Lateral
75	M75	Vertical Bra...	30			Lbyy						Lateral
76	M76	Vertical Bra...	30			Lbyy						Lateral
77	M77	Diagonal Br...	44.598			Lbyy						Lateral
78	M78	Vertical Bra...	30			Lbyy						Lateral
79	M79	Vertical Bra...	30			Lbyy						Lateral
80	M80	Diagonal Br...	46.123			Lbyy						Lateral
81	M81	Diagonal Br...	46.123			Lbyy						Lateral
82	M82	Boom	82.067			Lbyy						Lateral
83	M83	Boom	82.067			Lbyy						Lateral
84	M84	Boom	82.067			Lbyy						Lateral
85	M85	Boom	82.067			Lbyy						Lateral
86	M86	Boom	82.067			Lbyy						Lateral
87	M87	Boom	82.067			Lbyy						Lateral
88	M88	Vertical Bra...	30			Lbyy						Lateral
89	M89	Vertical Bra...	30			Lbyy						Lateral
90	M90	Vertical Bra...	30			Lbyy						Lateral
91	M91	Diagonal Br...	46.123			Lbyy						Lateral
92	M92	Diagonal Br...	46.123			Lbyy						Lateral
93	M93	Vertical Bra...	30			Lbyy						Lateral
94	M94	Vertical Bra...	30			Lbyy						Lateral
95	M95	Vertical Bra...	30			Lbyy						Lateral
96	M96	Diagonal Br...	46.123			Lbyy						Lateral
97	M97	Diagonal Br...	46.123			Lbyy						Lateral
98	M98	Vertical Bra...	30			Lbyy						Lateral
99	M99	Vertical Bra...	30			Lbyy						Lateral
100	M100	Vertical Bra...	30			Lbyy						Lateral
101	M101	Diagonal Br...	46.123			Lbyy						Lateral
102	M102	Diagonal Br...	46.123			Lbyy						Lateral
103	M112	Connection ...	6			Lbyy						Lateral
104	M113	Connection ...	6			Lbyy						Lateral
105	M114	Connection ...	6			Lbyy						Lateral
106	M115	Connection ...	6			Lbyy						Lateral
107	M116	Connection ...	6			Lbyy						Lateral
108	M117	Connection ...	6			Lbyy						Lateral
109	M118	Connection ...	6			Lbyy						Lateral
110	M119	Connection ...	6			Lbyy						Lateral
111	M120	Connection ...	6			Lbyy						Lateral
112	M121	Connection ...	6			Lbyy						Lateral
113	M122	Connection ...	6			Lbyy						Lateral
114	M123	Connection ...	6			Lbyy						Lateral

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
1	DL	DL		-1		3				
2	Maintenance LL - LV	LL				1				
3	Installation LL - LM	LL				1				
4	Wind - 0 Deg (X)	WL				3		114		
5	Wind - 30 Deg (X)	WL				3		114		
6	Wind - 60 Deg (X)	WL				3		114		
7	Wind - 90 Deg (X)	WL				3		114		
8	Wind - 120 Deg (X)	WL				3		114		

Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distributed	Area(Me...	Surface(...
9	Wind - 150 Deg (X)	WL				3		114		
10	Wind - 180 Deg (X)	WL				3		114		
11	Wind - 210 Deg (X)	WL				3		114		
12	Wind - 240 Deg (X)	WL				3		114		
13	Wind - 270 Deg (X)	WL				3		114		
14	Wind - 300 Deg (X)	WL				3		114		
15	Wind - 330 Deg (X)	WL				3		114		
16	Wind - 0 Deg (Z)	WL				3		114		
17	Wind - 30 Deg (Z)	WL				3		114		
18	Wind - 60 Deg (Z)	WL				3		114		
19	Wind - 90 Deg (Z)	WL				3		114		
20	Wind - 120 Deg (Z)	WL				3		114		
21	Wind - 150 Deg (Z)	WL				3		114		
22	Wind - 180 Deg (Z)	WL				3		114		
23	Wind - 210 Deg (Z)	WL				3		114		
24	Wind - 240 Deg (Z)	WL				3		114		
25	Wind - 270 Deg (Z)	WL				3		114		
26	Wind - 300 Deg (Z)	WL				3		114		
27	Wind - 330 Deg (Z)	WL				3		114		
28	Ice DL	DL				3		114		
29	Ice Wind - 0 Deg (X)	WL				3		114		
30	Ice Wind - 30 Deg (X)	WL				3		114		
31	Ice Wind - 60 Deg (X)	WL				3		114		
32	Ice Wind - 90 Deg (X)	WL				3		114		
33	Ice Wind - 120 Deg (X)	WL				3		114		
34	Ice Wind - 150 Deg (X)	WL				3		114		
35	Ice Wind - 180 Deg (X)	WL				3		114		
36	Ice Wind - 210 Deg (X)	WL				3		114		
37	Ice Wind - 240 Deg (X)	WL				3		114		
38	Ice Wind - 270 Deg (X)	WL				3		114		
39	Ice Wind - 300 Deg (X)	WL				3		114		
40	Ice Wind - 330 Deg (X)	WL				3		114		
41	Ice Wind - 0 Deg (Z)	WL				3		114		
42	Ice Wind - 30 Deg (Z)	WL				3		114		
43	Ice Wind - 60 Deg (Z)	WL				3		114		
44	Ice Wind - 90 Deg (Z)	WL				3		114		
45	Ice Wind - 120 Deg (Z)	WL				3		114		
46	Ice Wind - 150 Deg (Z)	WL				3		114		
47	Ice Wind - 180 Deg (Z)	WL				3		114		
48	Ice Wind - 210 Deg (Z)	WL				3		114		
49	Ice Wind - 240 Deg (Z)	WL				3		114		
50	Ice Wind - 270 Deg (Z)	WL				3		114		
51	Ice Wind - 300 Deg (Z)	WL				3		114		
52	Ice Wind - 330 Deg (Z)	WL				3		114		
53	Lateral Seismic - Eh (X)	ELX	.35			3				
54	Lateral Seismic - Eh (Z)	ELZ			.35	3				
55	Vertical Seismic - Ev (Y)	ELY		-.112		3				

Load Combinations

	Description	S...	PDe...	SRSS	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	WIND LOAD COMBOS (125 MPH)																									
2	1.2DL + WL (0 DEG)	Y...	Y		1	1.2	4	1	16	1																
3	1.2DL + WL (30 DEG)	Y...	Y		1	1.2	5	1	17	1																
4	1.2DL + WL (60 DEG)	Y...	Y		1	1.2	6	1	18	1																
5	1.2DL + WL (90 DEG)	Y...	Y		1	1.2	7	1	19	1																

Load Combinations (Continued)

	Description	S...	PDe...	SRSS	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
6	1.2DL + WL (120 DEG)	Y...	Y		1	1.2	8	1	20	1																
7	1.2DL + WL (150 DEG)	Y...	Y		1	1.2	9	1	21	1																
8	1.2DL + WL (180 DEG)	Y...	Y		1	1.2	10	1	22	1																
9	1.2DL + WL (210 DEG)	Y...	Y		1	1.2	11	1	23	1																
10	1.2DL + WL (240 DEG)	Y...	Y		1	1.2	12	1	24	1																
11	1.2DL + WL (270 DEG)	Y...	Y		1	1.2	13	1	25	1																
12	1.2DL + WL (300 DEG)	Y...	Y		1	1.2	14	1	26	1																
13	1.2DL + WL (330 DEG)	Y...	Y		1	1.2	15	1	27	1																
14																										
15	MOUNT LOAD COMBOS (30 MPH)																									
16	1.4DL	Y...	Y		1	1.4																				
17	1.2DL + 1.5LV	Y...	Y		1	1.2	2	1.5																		
18	1.2DL + 1.5LM + WL (0 DEG)	Y...	Y		1	1.2	3	1.5	4	.058	16	.058														
19	1.2DL + 1.5LM + WL (30 DEG)	Y...	Y		1	1.2	3	1.5	5	.058	17	.058														
20	1.2DL + 1.5LM + WL (60 DEG)	Y...	Y		1	1.2	3	1.5	6	.058	18	.058														
21	1.2DL + 1.5LM + WL (90 DEG)	Y...	Y		1	1.2	3	1.5	7	.058	19	.058														
22	1.2DL + 1.5LM + WL (120 DEG)	Y...	Y		1	1.2	3	1.5	8	.058	20	.058														
23	1.2DL + 1.5LM + WL (150 DEG)	Y...	Y		1	1.2	3	1.5	9	.058	21	.058														
24	1.2DL + 1.5LM + WL (180 DEG)	Y...	Y		1	1.2	3	1.5	10	.058	22	.058														
25	1.2DL + 1.5LM + WL (210 DEG)	Y...	Y		1	1.2	3	1.5	11	.058	23	.058														
26	1.2DL + 1.5LM + WL (240 DEG)	Y...	Y		1	1.2	3	1.5	12	.058	24	.058														
27	1.2DL + 1.5LM + WL (270 DEG)	Y...	Y		1	1.2	3	1.5	13	.058	25	.058														
28	1.2DL + 1.5LM + WL (300 DEG)	Y...	Y		1	1.2	3	1.5	14	.058	26	.058														
29	1.2DL + 1.5LM + WL (330 DEG)	Y...	Y		1	1.2	3	1.5	15	.058	27	.058														
30																										
31	ICE LOAD COMBOS (1.5", 50 MPH)																									
32	1.2DL + Ice DL + Ice WL (0 DEG)	Y...	Y		1	1.2	28	1	29	1	41	1														
33	1.2DL + Ice DL + Ice WL (30 DEG)	Y...	Y		1	1.2	28	1	30	1	42	1														
34	1.2DL + Ice DL + Ice WL (60 DEG)	Y...	Y		1	1.2	28	1	31	1	43	1														
35	1.2DL + Ice DL + Ice WL (90 DEG)	Y...	Y		1	1.2	28	1	32	1	44	1														
36	1.2DL + Ice DL + Ice WL (120 DEG)	Y...	Y		1	1.2	28	1	33	1	45	1														
37	1.2DL + Ice DL + Ice WL (150 DEG)	Y...	Y		1	1.2	28	1	34	1	46	1														
38	1.2DL + Ice DL + Ice WL (180 DEG)	Y...	Y		1	1.2	28	1	35	1	47	1														
39	1.2DL + Ice DL + Ice WL (210 DEG)	Y...	Y		1	1.2	28	1	36	1	48	1														
40	1.2DL + Ice DL + Ice WL (240 DEG)	Y...	Y		1	1.2	28	1	37	1	49	1														
41	1.2DL + Ice DL + Ice WL (270 DEG)	Y...	Y		1	1.2	28	1	38	1	50	1														
42	1.2DL + Ice DL + Ice WL (300 DEG)	Y...	Y		1	1.2	28	1	39	1	51	1														
43	1.2DL + Ice DL + Ice WL (330 DEG)	Y...	Y		1	1.2	28	1	40	1	52	1														
44																										
45	SEISMIC LOAD COMBOS																									
46	1.2DL + Ev (Y) + Eh (X)	Y...	Y		1	1.2	55	1	53	1																
47	1.2DL - Ev (Y) + Eh (X)	Y...	Y		1	1.2	55	-1	53	1																
48	1.2DL + Ev (Y) - Eh (X)	Y...	Y		1	1.2	55	1	53	-1																
49	1.2DL - Ev (Y) - Eh (X)	Y...	Y		1	1.2	55	-1	53	-1																
50	1.2DL + Ev (Y) + Eh (Z)	Y...	Y		1	1.2	55	1	54	1																
51	1.2DL - Ev (Y) + Eh (Z)	Y...	Y		1	1.2	55	-1	54	1																
52	1.2DL + Ev (Y) - Eh (Z)	Y...	Y		1	1.2	55	1	54	-1																
53	1.2DL - Ev (Y) - Eh (Z)	Y...	Y		1	1.2	55	-1	54	-1																
54																										

Envelope Joint Reactions

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
1	N14	max	20.709	17	943.255	32	2203.823	5	0	53	0	53	0	53
2		min	-170.283	32	194.06	8	-2243.187	11	0	2	0	2	0	2
3	N16	max	2049.397	13	933.451	40	1611.664	7	0	53	0	53	0	53

Envelope Joint Reactions (Continued)

	Joint		X [lb]	LC	Y [lb]	LC	Z [lb]	LC	MX [lb-ft]	LC	MY [lb-ft]	LC	MZ [lb-ft]	LC
4		min	-2021.617	7	181.996	4	-1397.354	13	0	2	0	2	0	2
5	N18	max	200.251	2	918.726	33	552.719	36	0	53	0	53	0	53
6		min	-125.519	8	197.134	9	-286.778	29	0	2	0	2	0	2
7	N20	max	760.364	26	907.451	40	232.489	13	0	53	0	53	0	53
8		min	-444.006	37	186.315	4	-1108.136	23	0	2	0	2	0	2
9	N57	max	2104.622	3	942.466	36	1180.334	3	0	53	0	53	0	53
10		min	-2185.648	9	201.321	12	-1279.07	9	0	2	0	2	0	2
11	N60	max	918.917	24	917.302	35	222.698	26	0	53	0	53	0	53
12		min	-229.072	2	203.912	11	-76.285	4	0	2	0	2	0	2
13	Totals:	max	3627.115	2	5482.179	36	3627.108	5						
14		min	-3627.115	8	1257.387	51	-3627.108	11						

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

	Member	Shape	Code Check	Loc[in]	LC	Shear...	Loc[...	Dir	LC	phi*Pn...	phi*Pnt...	phi*Mn...	phi*Mn...	Cb	Eqn
1	M1	PIPE_2.0	.167	41.033	12	.040	75.2...		12	18338....	32130	1871.6...	1871.6...	3..	H1-1b
2	M2	PIPE_2.0	.071	2.813	12	.035	0		3	29810....	32130	1871.6...	1871.6...	2..	H1-1b
3	M3	PIPE_2.0	.076	41.033	12	.030	82.0...		38	18338....	32130	1871.6...	1871.6...	2..	H1-1b
4	M4	PL 4x3/16	.406	3	36	.306	3	y	36	12724....	24300	94.921	2025	1..	H1-1b
5	M5	PL 4x3/16	.382	3	39	.319	3	y	38	12724....	24300	94.921	2025	1..	H1-1b
6	M6	HSS2.5X2.5X3	.169	16.313	42	.053	3.375	z	12	50973....	63756	4554	4554	1..	H1-1b
7	M7	PL 4x3/16	.455	3	40	.319	3	y	39	12724....	24300	94.921	2025	1..	H1-1b
8	M8	PL 4x3/16	.416	3	34	.316	3	y	33	12724....	24300	94.921	2025	1..	H1-1b
9	M9	HSS2.5X2.5X3	.130	16.313	34	.027	50.6...	y	42	50973....	63756	4554	4554	1..	H1-1b
10	M10	HSS2.5X2.5X3	.122	0	12	.077	4	z	11	63677....	63756	4554	4554	1..	H1-1b
11	M11	HSS2.5X2.5X3	.142	0	12	.088	4	z	13	63677....	63756	4554	4554	1..	H1-1b
12	M12	HSS2.5X2.5X3	.060	0	36	.050	4	z	35	63677....	63756	4554	4554	1..	H1-1b
13	M13	HSS2.5X2.5X3	.050	0	36	.052	4	z	37	63677....	63756	4554	4554	1..	H1-1b
14	M14	PIPE_2.0	.303	49.905	33	.046	60.6...		33	23655....	32130	1871.6...	1871.6...	2..	H1-1b
15	M15	PIPE_2.0	.300	49.905	40	.046	60.6...		40	23655....	32130	1871.6...	1871.6...	2..	H1-1b
16	M16	PIPE_2.0	.311	49.905	32	.048	60.6...		32	23655....	32130	1871.6...	1871.6...	2..	H1-1b
17	M17	PIPE_2.0	.309	49.905	40	.047	60.6...		41	23655....	32130	1871.6...	1871.6...	2..	H1-1b
18	M18	PIPE_2.0	.111	0	40	.022	0		43	29810....	32130	1871.6...	1871.6...	2..	H1-1b
19	M19	PIPE_2.0	.200	0	40	.036	0		41	29810....	32130	1871.6...	1871.6...	2..	H1-1b
20	M20	SR3/4	.131	22.359	35	.003	0		38	1754.6...	14313....	178.924	178.924	1..	H1-1b
21	M21	PIPE_2.0	.203	0	33	.045	0		32	29810....	32130	1871.6...	1871.6...	2..	H1-1b
22	M22	PIPE_2.0	.108	30	34	.024	0		42	29810....	32130	1871.6...	1871.6...	2..	H1-1b
23	M23	SR3/4	.132	22.299	37	.003	0		38	1764.0...	14313....	178.924	178.924	1..	H1-1b
24	M24	PIPE_2.0	.031	30	32	.044	0		12	29810....	32130	1871.6...	1871.6...	2..	H1-1b
25	M25	PIPE_2.0	.043	30	40	.046	0		12	29810....	32130	1871.6...	1871.6...	2..	H1-1b
26	M26	SR3/4	.104	23.062	39	.013	46.1...		12	1649.3...	14313....	178.924	178.924	1..	H1-1b
27	M27	SR3/4	.099	23.062	33	.013	46.1...		12	1649.3...	14313....	178.924	178.924	1..	H1-1b
28	M28	PIPE_2.0	.061	41.033	2	.029	0		40	18338....	32130	1871.6...	1871.6...	2..	H1-1b
29	M29	PIPE_2.0	.005	18.75	2	.006	30		11	29810....	32130	1871.6...	1871.6...	1..	H1-1b
30	M30	PIPE_2.0	.074	5.984	36	.029	0		40	18338....	32130	1871.6...	1871.6...	2..	H1-1b*
31	M31	PL 4x3/16	.585	3	24	.429	3	y	41	12724....	24300	94.921	2025	1..	H1-1b
32	M32	PL 4x3/16	.372	3	40	.281	0	y	40	12724....	24300	94.921	2025	1..	H1-1b
33	M33	HSS2.5X2.5X3	.189	37.125	37	.062	50.6...	z	8	50973....	63756	4554	4554	1..	H1-1b
34	M34	PL 4x3/16	.556	3	22	.390	3	y	35	12724....	24300	94.921	2025	1..	H1-1b
35	M35	PL 4x3/16	.440	3	40	.308	3	y	40	12724....	24300	94.921	2025	1..	H1-1b
36	M36	HSS2.5X2.5X3	.145	37.125	37	.044	37.6...	z	23	50973....	63756	4554	4554	1..	H1-1b
37	M37	HSS2.5X2.5X3	.158	0	8	.110	4	z	7	63677....	63756	4554	4554	1..	H1-1b
38	M38	HSS2.5X2.5X3	.142	0	8	.085	4	z	9	63677....	63756	4554	4554	1..	H1-1b
39	M39	HSS2.5X2.5X3	.077	0	24	.072	0	z	24	63677....	63756	4554	4554	2..	H1-1b
40	M40	HSS2.5X2.5X3	.097	0	23	.048	4	y	35	63677....	63756	4554	4554	1..	H1-1b
41	M41	PIPE_2.0	.294	49.905	40	.045	60.6...		39	23655....	32130	1871.6...	1871.6...	2..	H1-1b

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

	Member	Shape	Code Check	Loc[in]	LC	Shear..	Loc[...	Dir	LC	phi*Pn...	phi*Pnt...	phi*Mn...	phi*Mn...	Cb	Eqn
42	M42	PIPE_2.0	.305	49.905	34	.061	16.4...		29	23655....	32130	1871.6...	1871.6...	2...	H1-1b
43	M43	PIPE_2.0	.303	49.905	39	.046	60.6...		39	23655....	32130	1871.6...	1871.6...	2...	H1-1b
44	M44	PIPE_2.0	.312	49.905	36	.063	16.4...		26	23655....	32130	1871.6...	1871.6...	2...	H1-1b
45	M45	PIPE_2.0	.113	30	32	.029	0		38	29810....	32130	1871.6...	1871.6...	2...	H1-1b
46	M46	PIPE_2.0	.200	0	34	.056	0		6	29810....	32130	1871.6...	1871.6...	2...	H1-1b
47	M47	SR3/4	.134	22.359	43	.003	44.7...		32	1754.6...	14313....	178.924	178.924	1...	H1-1b
48	M48	PIPE_2.0	.200	0	39	.039	0		38	29810....	32130	1871.6...	1871.6...	2...	H1-1b
49	M49	PIPE_2.0	.107	0	39	.023	0		37	29810....	32130	1871.6...	1871.6...	2...	H1-1b
50	M50	SR3/4	.130	22.299	33	.004	0		4	1764.0...	14313....	178.924	178.924	1...	H1-1b
51	M51	PIPE_2.0	.041	30	40	.012	30		42	29810....	32130	1871.6...	1871.6...	2...	H1-1b
52	M52	PIPE_2.0	.021	30	34	.010	30		4	29810....	32130	1871.6...	1871.6...	2...	H1-1b
53	M53	SR3/4	.182	46.123	26	.007	46.1...		8	1649.3...	14313....	178.924	178.924	1...	H1-1b*
54	M54	SR3/4	.103	23.062	41	.007	0		8	1649.3...	14313....	178.924	178.924	1...	H1-1b
55	M55	PIPE_2.0	.064	41.033	10	.023	82.0...		32	18338....	32130	1871.6...	1871.6...	2...	H1-1b
56	M56	PIPE_2.0	.005	19.063	10	.006	30		7	29810....	32130	1871.6...	1871.6...	1...	H1-1b
57	M57	PIPE_2.0	.077	0	38	.023	82.0...		32	18338....	32130	1871.6...	1871.6...	2...	H1-1b*
58	M58	PL 4x3/16	.411	3	39	.311	3	y	38	12724....	24300	94.921	2025	1...	H1-1b
59	M59	PL 4x3/16	.428	3	21	.315	3	y	43	12724....	24300	94.921	2025	1...	H1-1b
60	M60	HSS2.5X2.5X3	.146	16.312	34	.052	3.375	z	4	50973....	63756	4554	4554	1...	H1-1b
61	M61	PL 4x3/16	.446	3	36	.316	3	y	35	12724....	24300	94.921	2025	1...	H1-1b
62	M62	PL 4x3/16	.492	3	35	.338	3	y	34	12724....	24300	94.921	2025	1...	H1-1b
63	M63	HSS2.5X2.5X3	.115	16.875	43	.028	3.375	y	36	50973....	63756	4554	4554	1...	H1-1b
64	M64	HSS2.5X2.5X3	.133	0	4	.082	4	z	3	63677....	63756	4554	4554	1...	H1-1b
65	M65	HSS2.5X2.5X3	.137	0	3	.082	4	z	4	63677....	63756	4554	4554	1...	H1-1b
66	M66	HSS2.5X2.5X3	.070	4	22	.049	4	y	35	63677....	63756	4554	4554	1...	H1-1b
67	M67	HSS2.5X2.5X3	.058	4	38	.049	4	y	33	63677....	63756	4554	4554	1...	H1-1b
68	M68	PIPE_2.0	.307	49.905	36	.048	60.6...		36	23655....	32130	1871.6...	1871.6...	2...	H1-1b
69	M69	PIPE_2.0	.305	49.905	32	.047	60.6...		32	23655....	32130	1871.6...	1871.6...	2...	H1-1b
70	M70	PIPE_2.0	.315	49.905	36	.049	60.6...		36	23655....	32130	1871.6...	1871.6...	2...	H1-1b
71	M71	PIPE_2.0	.313	49.905	32	.048	60.6...		33	23655....	32130	1871.6...	1871.6...	2...	H1-1b
72	M72	PIPE_2.0	.115	0	32	.021	0		35	29810....	32130	1871.6...	1871.6...	2...	H1-1b
73	M73	PIPE_2.0	.204	0	32	.039	0		33	29810....	32130	1871.6...	1871.6...	2...	H1-1b
74	M74	SR3/4	.132	22.359	39	.003	44.7...		9	1754.6...	14313....	178.924	178.924	1...	H1-1b
75	M75	PIPE_2.0	.209	0	36	.040	0		35	29810....	32130	1871.6...	1871.6...	1...	H1-1b
76	M76	PIPE_2.0	.115	0	36	.022	0		33	29810....	32130	1871.6...	1871.6...	1...	H1-1b
77	M77	SR3/4	.132	22.299	41	.003	44.5...		42	1764.0...	14313....	178.924	178.924	1...	H1-1b
78	M78	PIPE_2.0	.031	30	38	.011	30		8	29810....	32130	1871.6...	1871.6...	2...	H1-1b
79	M79	PIPE_2.0	.032	30	32	.010	30		13	29810....	32130	1871.6...	1871.6...	2...	H1-1b
80	M80	SR3/4	.099	23.062	43	.007	46.1...		4	1649.3...	14313....	178.924	178.924	1...	H1-1b
81	M81	SR3/4	.098	23.062	37	.007	46.1...		4	1649.3...	14313....	178.924	178.924	1...	H1-1b
82	M82	PIPE_2.0	.064	41.033	4	.021	82.0...		35	18338....	32130	1871.6...	1871.6...	2...	H1-1b
83	M83	PIPE_2.0	.072	82.067	36	.023	82.0...		35	18338....	32130	1871.6...	1871.6...	2...	H1-1b*
84	M84	PIPE_2.0	.364	5.984	6	.148	0		12	18338....	32130	1871.6...	1871.6...	2...	H1-1b
85	M85	PIPE_2.0	.275	5.984	6	.112	5.984		6	18338....	32130	1871.6...	1871.6...	2...	H1-1b
86	M86	PIPE_2.0	.211	76.083	8	.085	82.0...		8	18338....	32130	1871.6...	1871.6...	2...	H1-1b
87	M87	PIPE_2.0	.133	76.083	2	.054	76.0...		2	18338....	32130	1871.6...	1871.6...	2...	H1-1b
88	M88	PIPE_2.0	.005	19.063	4	.003	0		8	29810....	32130	1871.6...	1871.6...	1...	H1-1b
89	M89	PIPE_2.0	.027	30	42	.007	30		34	29810....	32130	1871.6...	1871.6...	2...	H1-1b
90	M90	PIPE_2.0	.030	30	35	.009	30		34	29810....	32130	1871.6...	1871.6...	2...	H1-1b
91	M91	SR3/4	.098	23.062	37	.007	46.1...		10	1649.3...	14313....	178.924	178.924	1...	H1-1b
92	M92	SR3/4	.097	23.062	43	.007	0		10	1649.3...	14313....	178.924	178.924	1...	H1-1b
93	M93	PIPE_2.0	.088	30	6	.051	30		6	29810....	32130	1871.6...	1871.6...	2...	H1-1b
94	M94	PIPE_2.0	.694	15	6	.343	0		6	29810....	32130	1871.6...	1871.6...	1...	H1-1b
95	M95	PIPE_2.0	.051	0	36	.054	0		6	29810....	32130	1871.6...	1871.6...	2...	H1-1b
96	M96	SR3/4	.362	21.62	21	.013	0		6	1649.3...	14313....	178.924	178.924	1...	H1-1a
97	M97	SR3/4	.134	0	9	.024	46.1...		6	1649.3...	14313....	178.924	178.924	1...	H1-1b*
98	M98	PIPE_2.0	.049	30	2	.028	30		2	29810....	32130	1871.6...	1871.6...	1...	H1-1b

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

	Member	Shape	Code Check	Loc[in]	LC	Shear..	Loc[...	Dir	LC	phi*Pn...	phi*Pnt...	phi*Mn...	phi*Mn...	Cb	Eqn
99	M99	PIPE_2.0	.042	0	43	.029	0		2	29810....	32130	1871.6...	1871.6...	2...	H1-1b
100	M100	PIPE_2.0	.401	12.187	2	.177	0		3	29810....	32130	1871.6...	1871.6...	1...	H1-1b
101	M101	SR3/4	.092	23.062	41	.022	46.1...		2	1649.3...	14313....	178.924	178.924	1...	H1-1b
102	M102	SR3/4	.103	23.062	35	.010	0		2	1649.3...	14313....	178.924	178.924	1...	H1-1b
103	M112	PL4x3/8	.549	0	34	.035	6	z	32	41342....	48600	379.688	4050	1...	H1-1b
104	M113	PL4x3/8	.548	0	39	.032	6	z	40	41342....	48600	379.688	4050	1...	H1-1b
105	M114	PL4x3/8	.544	0	42	.035	6	z	43	41342....	48600	379.688	4050	1...	H1-1b
106	M115	PL4x3/8	.551	0	41	.033	6	z	42	41342....	48600	379.688	4050	1...	H1-1b
107	M116	PL4x3/8	.540	0	40	.033	6	z	39	41342....	48600	379.688	4050	1...	H1-1b
108	M117	PL4x3/8	.553	0	33	.039	6	z	36	41342....	48600	379.688	4050	1...	H1-1b
109	M118	PL4x3/8	.545	0	38	.034	6	z	37	41342....	48600	379.688	4050	1...	H1-1b
110	M119	PL4x3/8	.547	0	34	.041	6	y	36	41342....	48600	379.688	4050	1...	H1-1b
111	M120	PL4x3/8	.558	0	37	.035	6	z	36	41342....	48600	379.688	4050	1...	H1-1b
112	M121	PL4x3/8	.556	0	43	.034	6	z	33	41342....	48600	379.688	4050	1...	H1-1b
113	M122	PL4x3/8	.557	0	37	.035	6	z	35	41342....	48600	379.688	4050	1...	H1-1b
114	M123	PL4x3/8	.554	0	33	.035	6	z	34	41342....	48600	379.688	4050	1...	H1-1b

APPENDIX 3:
ATTACHMENTS

220MHz EXPOSED DIPOLES 215-225 MHz

870 Series 220MHz Exposed Dipoles

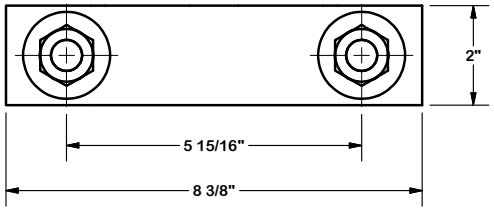
The 870 Series 220MHz Exposed Dipoles are available in 1, 2, 4, 8 dipole configurations. All our antennas can be completely customized to your particular applications. Our antennas can be black anodized, adjustable, or fixed, side mount or top mount, and heavy-duty versions are available.

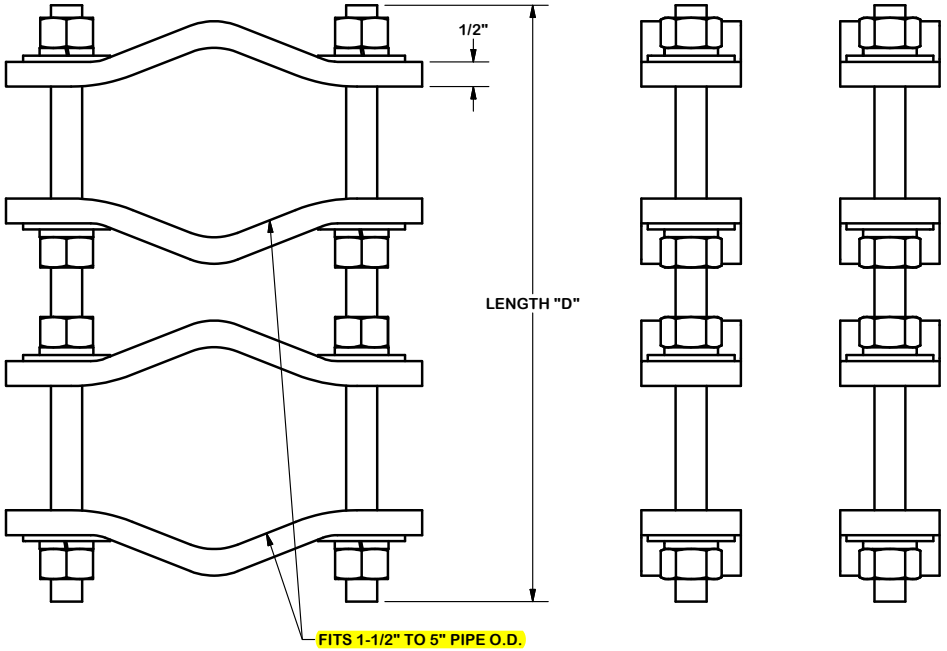
- Each antenna is offered in a 1/4, 3/8 or 1/2 wave spacing versions.
- The 87XA-70 has external cabling and a field-adjustable pattern.
- The 87XF-70 has internal cabling and fixed dipole-mast spacing.
- Heavy-duty versions are available. Please contact our Technical Support team for consultation.

Electrical Specifications	871F-70-2	872F-70-2	874F-70-2
Frequency Range, MHz	215-225	215-225	215-225
Nominal Gain, dBd	2.0-2.5	5.0-5.5	8.0-8.5
Number of Dipoles	1	2	4
Bandwidth 1.5:1 VSWR, MHz	10	10	10
Polarization	Vertical	Vertical	Vertical
Pattern	Offset / bi	Offset / bi	Offset / bi
Power Rating, Watts	200	300	500
Nominal Impedance, Ohms	50	50	50
Lightning Protection	DC Ground	DC Ground	DC Ground
Standard Termination	Type DIN Male	Type N Male	Type N Male
Mechanical Specifications	**871F-70-2**	**872F-70-2**	**874F-70-2**
Length, in (mm)	66 (1676)	112 (2845)	200 (5080)
Width (1/2 Wave Spacing), in (mm)	31 (787)	31 (787)	32 (813)
Weight, lbs. (kg)	12.5 (5.7)	21 (9.5)	51 (23)
Rated Wind Velocity, No Ice, mph (km/h)	165 (266)	150 (241)	145 (233)
Rated Wind Velocity, 0.5" (13mm) ice, mph (km/h)	140 (225)	130 (209)	105 (177)
Lateral Thrust @ 100 mph, wind, lbs. (kg)	40 (18)	66 (30)	143 (65)
Bending Moment @ top clamp: 100 mph, ft.*lb (kg*m)	58 (8)	150 (21)	610 (84)
Projected Area, ft^2 (m^2)	1.5 (0.14)	2.6 (0.24)	5.5 (0.51)
Mounting Information Mast O.D. (mm)	1.9" (48)	1.9" (48)	2.4" (60)
* See next page for ordering information (page 3) *			

872F-70-2

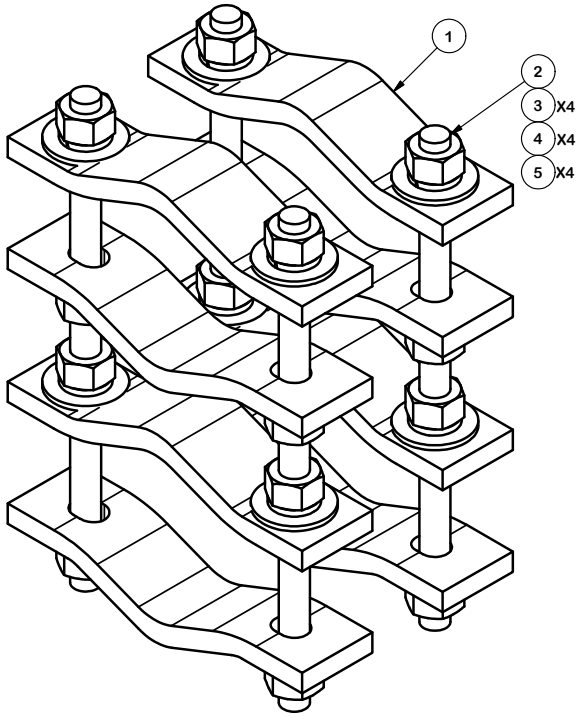
ONE SITE PRO 1 P/N DCP12K CLAMP SET REQUIRED.





PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	8	DCP	CLAMP HALF, 1/2" THICK, 8-3/8"		2.40	19.20
2	B	C	5/8" THREADED ROD	D	E	F
3	16	G58NUT	5/8" HDG HEAVY 2H HEX NUT		0.13	2.08
4	16	G58LW	5/8" HDG LOCKWASHER		0.03	0.42
5	16	G58FW	5/8" HDG USS FLATWASHER		0.07	1.13

VARIABLE PARTS TABLE						
ASSEMBLY "A"	QTY "B"	PART "C"	LENGTH "D"	UNIT WT. "E"	NET WT. "F"	TOTAL WEIGHT
DCP12K	4	G58R-12	12"	1.05	4.18	27.01
DCP18K	4	G58R-18	18"	1.57	6.27	29.10



TOLERANCE NOTES

TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
SAWED, SHEARED AND GAS CUT EDGES *(± 0.030")*
DRILLED AND GAS CUT HOLES *(± 0.030")* - NO CONING OF HOLES
LASER CUT EDGES AND HOLES *(± 0.010")* - NO CONING OF HOLES
BENDS ARE ± 1/2 DEGREE
ALL OTHER MACHINING *(± 0.030")*
ALL OTHER ASSEMBLY *(± 0.060")*

DESCRIPTION
PIPE TO PIPE CLAMP SET
1-1/2" TO 5" PIPE
1/2" THICK CLAMP

SITE PRO 1 — A valmont COMPANY

Engineering Support Team: 1-888-753-7446

Locations:
New York, NY
Atlanta, GA
Los Angeles, CA
Plymouth, IN
Salem, OR
Dallas, TX

CPD NO.	DRAWN BY	ENG. APPROVAL	PART NO.	PAGE
	KC8 8/21/2012		SEE ASSEMBLY "A"	1 OF 1

CLASS	SUB	DRAWING USAGE	CHECKED BY	DWG. NO.
81	01	CUSTOMER	CEK 1/22/2013	DCPxxK