



STATE OF CONNECTICUT  
*CONNECTICUT SITING COUNCIL*

Ten Franklin Square, New Britain, CT 06051

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E-Mail: [siting.council@ct.gov](mailto:siting.council@ct.gov)

Web Site: [portal.ct.gov/csc](http://portal.ct.gov/csc)

**VIA ELECTRONIC MAIL**

November 16, 2020

Kathleen M. Shanley  
Manager – Transmission Siting  
Eversource Energy  
56 Prospect Street  
P.O. Box 270  
Hartford, CT 06103

RE: **EM-EVER-029-201013** – The Connecticut Light and Power Company d/b/a Eversource Energy notice of intent to modify an existing telecommunications facility located at 35A Simons Pond Road, Colebrook, Connecticut.

Dear Ms. Shanley:

The Connecticut Siting Council (Council) is in receipt of your correspondence of November 10, 2020 submitted in response to the Council's November 9, 2020 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

The submission renders the request for exempt modification complete and the Council will process the request in accordance with the Federal Communications Commission 60-day timeframe.

Thank you for your attention and cooperation.

Sincerely,

*s/ Melanie A. Bachman*

Melanie A. Bachman  
Executive Director

MAB/IN/emr

c: Brian Gaudet, All-Points Technology Corporation, PC

**From:** Brian Gaudet <BGaudet@allpointstech.com>  
**Sent:** Tuesday, November 10, 2020 4:46 PM  
**To:** Fontaine, Lisa <Lisa.Fontaine@ct.gov>; CSC-DL Siting Council <Siting.Council@ct.gov>  
**Cc:** Lord, Andrew <andrew.lord@eversource.com>; Shanley, Kathleen M <kathleen.shanley@eversource.com>  
**Subject:** RE: Council 2nd Incomplete letter for EM-EVER-029-201013 Simons Pond Rd. Colebrook

EXTERNAL EMAIL: This email originated from outside of the organization. Do not click any links or open any attachments unless you trust the sender and know the content is safe.

Good afternoon,

Please see attached for the mount analysis in response to the incomplete letter. Let me know if you need anything else from our end.

Best Regards,



**Brian Gaudet**

Project Manager

**D:** 860.581.4482

**M:** 860.798.6597

**E:** [bgaudet@allpointstech.com](mailto: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*

November 9, 2020

**MOUNT EVALUATION LETTER**

**Site Number:** ES-028  
**Site Name:** COLEBROOK  
**Site Data:** 35A Simons Pond Road  
Colebrook, CT 06021  
**Latitude:** 42° 1' 16.5"  
**Longitude:** -73° 4' 42.6"

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 existing antenna mounting system to be: **SUFFICIENT**

|   |       |
|---|-------|
| <b>Structure Rating (max from all components) =</b> | 50.4% |
|---|-------|

| <b>Proposed Mounting System</b>   |  |
|---|--|
| SitePro 1 (USF-4U) 48" Ultimate Universal Stand-off Frame w/ 2.5" STD. (2.875" O.D.) Mount Pipe |  |

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

|   |       |
|---|-------|
| <b>Structure Rating (max from all components) =</b> | 19.8% |
|---|-------|

The existing and proposed mounting system will be capable of supporting the existing and proposed equipment, under 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 and 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.



11/10/2020



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## 2. ANALYSIS CRITERIA SUMMARY

| ANALYSIS CRITERIA  |                                       |
|--|---------------------------------------|
| STANDARD   | TIA-222-H                             |
| WIND SPEED   | Ultimate of 125 mph                   |
| WIND SPEED WITH ICE  | 40 mph with 1.5" radial ice thickness |
| EXPOSURE CATEGORY  | C                                     |
| RISK CATEGORY  | III                                   |
| TOPO CATEGORY  | Flat                                  |
| CREST HEIGHT   | N/A                                   |
| SPECTRAL RESPONSE FACTORS, S <sub>s</sub> & S <sub>1</sub> | 0.174 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 by PiROD Inc., dated 09/04/1997
- 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

### Existing Mount Result Summary

| Name                           | Bending Stress Ratio |      | Shear Stress Ratio |      |
|--------------------------------|----------------------|------|--------------------|------|
| Arm: Pipe 2.0 Std              | 36.6%                | Pass | 7.4%               | Pass |
| Vertical Bracing: Pipe 2.0 Std | 50.4%                | Pass | 15.2%              | Pass |
| Stiff Arm: Pipe 2.0 Std        | 15.9%                | Pass | 0.8%               | Pass |
| Mount Pipe: Pipe 2.0 Std       | 17.1%                | Pass | 4.8%               | Pass |
| Mount Pipe 2.5: Pipe 2.5 Std   | 6.5%                 | Pass | 1.4%               | Pass |
|                                |                      |      |                    |      |

### Proposed Mount Result Summary

| Name                         | Bending Stress Ratio |      | Shear Stress Ratio |      |
|------------------------------|----------------------|------|--------------------|------|
| Arm: HSS4X4X3                | 11.9%                | Pass | 2.1%               | Pass |
| Bracing: Pipe 2.5 Std        | 19.8%                | Pass | 3.1%               | Pass |
| Mount Pipe: Pipe 3.0 Std     | 16.8%                | Pass | 3.7%               | Pass |
| Mount Pipe 2.5: Pipe 2.5 Std | 9.2%                 | Pass | 1.7%               | Pass |
|                              |                      |      |                    |      |

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

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



**BLACK & VEATCH**

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*November 9, 2020*

*COLEBROOK*

**APPENDIX 1:  
EXISTING MOUNT ANALYSIS REPORT**





**BLACK & VEATCH**

Client: Eversource

Site Name: COLEBROOK (ES-028)

Computed By: JooHwan Jung

Date: 11/9/2020

Verified By: Josh Riley

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Dead and Live Loads**

Maintenance Live Load:  $L_V = 250$  lb

Installation Live Load:  $L_M = 500$  lb

| Appurtenance Dead Loads |             |
|-------------------------|-------------|
| Name                    | Weight (lb) |
| 470-70-220              | 39          |
|                         |             |





Client: Eversource  
 Site Name: COLEBROOK (ES-028)

Computed By: Joohwan Jung

Date: 11/9/2020

Verified By: Josh Riley

**BLACK & VEATCH**

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Member Wind Loading**

Exposure Category = C  
 Risk Category = III  
 Topographic Category = 1  
 Basic Wind Speed, V = 125 mph  
 Height Above Ground, z = 132 ft  
 Crest Height, H = N/A ft  
 Velocity Pressure Coefficient,  $K_z$  = 1.34  
 Topographic Factor,  $K_{zt}$  = 1.00  
 Wind Directionality Factor,  $K_d$  = 0.95  
 Shielding Factor,  $K_a$  = 0.90  
 Ground Elevation Factor,  $K_e$  = 0.954  
 Wind Velocity Pressure,  $q_z$  = 48.62 psf  
 Gust Effect Factor,  $G_h$  = 1.00

**Equations**

$K_z = 2.01 (z / z_g)^{2/\alpha}$   
 $K_h = e^{(f \cdot z / H)}$   
 $K_{zt} = [1 + K_c K_t / K_h]^2$   
 $K_e = e^{-0.0005z^2}$   
 $q_z = 0.00256 K_z K_{zt} K_e K_d V^2$   
 $F_A = q_z G_h (EPA)$   
 $F_M = q_z G_h C_f D_p$

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

| Member Wind Loads              |            |            |       |            |            |
|--------------------------------|------------|------------|-------|------------|------------|
| Name                           | Depth (ft) | Width (ft) | $C_f$ | $D_p$ (ft) | $F_M$ (lb) |
| Arm: Pipe 2.0 Std              | 0.20       |            | 1.2   | 0.20       | 11.55      |
| Vertical Bracing: Pipe 2.0 Std | 0.20       |            | 1.2   | 0.20       | 11.55      |
| Stiff Arm: Pipe 2.0 Std        | 0.20       |            | 1.2   | 0.20       | 11.55      |
| Mount Pipe: Pipe 2.0 Std       | 0.20       |            | 1.2   | 0.20       | 11.55      |
| Mount Pipe 2.5: Pipe 2.5 Std   | 0.24       |            | 1.2   | 0.24       | 13.98      |
|                                |            |            |       |            |            |



Client: Eversource  
 Site Name: COLEBROOK (ES-028)

Computed By: Joohwan Jung

Date: 11/9/2020

Verified By: Josh Riley

**BLACK & VEATCH**

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Appurtenance Ice Dead Loading**

Exposure Category = C  
 Risk Category = III  
 Topographic Category = 1  
 Height Above Ground, z = 132 ft  
 Crest Height, H = N/A ft  
 Design Ice Thickness, T<sub>i</sub> = 1.50 in  
 Importance Factor, I = 1.15  
 Topographic Factor, K<sub>zt</sub> = 1.00  
 Height Escalation Factor, K<sub>iz</sub> = 1.15  
 Factored Ice Thickness, T<sub>iz</sub> = 1.98 in  
 Grating Ice Dead Load, D<sub>Gice</sub> = 9.25 psf

**Equations**

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

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

$$K_{iz} = (z/33)^{u \cdot 10}$$

$$T_{iz} = T_i I K_{iz} (K_{zt})^{u \cdot 30}$$

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

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 <sub>ice</sub> (ft <sup>3</sup> ) | DL <sub>ice</sub> (lb) |
|------------|--------------------|------------------|-------------------|-------------------------------------|------------------------|
| 470-70-220 | 4.33               | 6.58             |                   | 5.33                                | 298.55                 |
|            |                    |                  |                   |                                     |                        |



**BLACK & VEATCH**

Client: Eversource

Site Name: COLEBROOK (ES-028)

Computed By: Joochan Jung

Date: 11/9/2020

Verified By: Josh Riley

Date: 11/9/2020

Title: MOUNT ANALYSIS REPORT

**Member Ice Dead Loading**

Exposure Category = C  
 Risk Category = III  
 Topographic Category = 1  
 Height Above Ground, z = 132 ft  
 Crest Height, H = N/A ft  
 Design Ice Thickness, T<sub>i</sub> = 1.50 in  
 Importance Factor, I = 1.15  
 Topographic Factor, K<sub>zt</sub> = 1.00  
 Height Escalation Factor, K<sub>iz</sub> = 1.15  
 Factored Ice Thickness, T<sub>iz</sub> = 1.98 in  
 Grating Ice Dead Load, D<sub>Gice</sub> = 9.25 psf

**Equations**

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

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

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

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

$$A_{iz} = \pi \cdot T_{iz} \cdot (D_c + T_{iz})$$

$$DL_{ice} = A_{iz} \cdot 56 \text{pcf}$$

TIA-222-H

2.6.6.2.1

2.6.6.2.1

2.6.10

2.6.10

2.6.10

| Member Ice Dead Loads          |                   |                   |         |                        |                           |
|--------------------------------|-------------------|-------------------|---------|------------------------|---------------------------|
| Name                           | Depth w/ ice (ft) | Width w/ ice (ft) | Dc (ft) | Aiz (ft <sup>2</sup> ) | DL <sub>ice</sub> (lb/ft) |
| Arm: Pipe 2.0 Std              | 0.53              |                   | 0.20    | 0.19                   | 10.55                     |
| Vertical Bracing: Pipe 2.0 Std | 0.53              |                   | 0.20    | 0.19                   | 10.55                     |
| Stiff Arm: Pipe 2.0 Std        | 0.53              |                   | 0.20    | 0.19                   | 10.55                     |
| Mount Pipe: Pipe 2.0 Std       | 0.53              |                   | 0.20    | 0.19                   | 10.55                     |
| Mount Pipe 2.5: Pipe 2.5 Std   | 0.57              |                   | 0.24    | 0.21                   | 11.76                     |
|                                |                   |                   |         |                        |                           |





Client: Eversource  
 Site Name: COLEBROOK (ES-028)

Computed By: JooHwan Jung

Date: 11/9/2020

Verified By: Josh Riley

**BLACK & VEATCH**

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Member Ice Wind Loading**

Exposure Category = C  
 Risk Category = III  
 Topographic Category = 1  
 Ice Wind Speed,  $V_{ice}$  = 40 mph  
 Height Above Ground,  $z$  = 132 ft  
 Crest Height,  $H$  = N/A ft  
 Velocity Pressure Coefficient,  $K_z$  = 1.34 psf  
 Topographic Factor,  $K_{zt}$  = 1.00  
 Wind Directionality Factor,  $K_d$  = 0.95  
 Shielding Factor,  $K_a$  = 0.90  
 Ground Elevation Factory,  $K_e$  = 0.954  
 Ice Wind Velocity Pressure,  $q_{z(ice)}$  = 4.979  
 Factored Ice Thickness,  $T_{iz}$  = 1.98 in  
 Gust Effect Factor,  $G_h$  = 1

**Equations**

$K_z = 2.01 (z / z_g)^{2/\alpha}$   
 $K_h = e^{(f \cdot z / H)}$   
 $K_{zt} = [1 + K_c K_t / K_h]^2$   
 $K_e = e^{-0.00003z^2}$   
 $q_z = 0.00256 K_z K_{zt} K_e K_d V^2$   
 $F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$   
 $F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$

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

| 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: Pipe 2.0 Std              | 0.53              |                   | 1.2   | 0.53              | 3.16                 |
| Vertical Bracing: Pipe 2.0 Std | 0.53              |                   | 1.2   | 0.53              | 3.16                 |
| Stiff Arm: Pipe 2.0 Std        | 0.53              |                   | 1.2   | 0.53              | 3.16                 |
| Mount Pipe: Pipe 2.0 Std       | 0.53              |                   | 1.2   | 0.53              | 3.16                 |
| Mount Pipe 2.5: Pipe 2.5 Std   | 0.57              |                   | 1.2   | 0.57              | 3.40                 |
|                                |                   |                   |       |                   |                      |



**BLACK & VEATCH**

Client: Eversource  
 Site Name: COLEBROOK (ES-028)

Computed By: Joohwan Jung

Date: 11/9/2020

Verified By: Josh Riley

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Seismic Loading**

**Equations**

TIA-222-H

Site Class = D  
 Spectral Response,  $S_s = 0.174$  g  
 Max Spectral Response,  $S_1 = 0.065$  g  
 Accel. Site Coefficient,  $F_a = 1.60$   
 Vel. Site Coefficient,  $F_v = 2.40$   
 Design Spec. Response (1 sec),  $S_{D1} = 0.104$   
 Design Spec. Response,  $S_{DS} = 0.186$   
 Importance Factor,  $I = 1.25$   
 Seismic Response Coefficient,  $C_s = 0.116$   
 Amplification Factor,  $A_s = 3$

$S_{D1} = 2/3 F_v S_1$   
 $S_{DS} = 2/3 F_a S_s \geq S_{D1}$   
 $C_s = 1/2 S_{DS} I \geq 0.03$   
 $E_H = A_s C_s W$   
 $E_V = A_s 0.2 S_{DS} W$

2.7.5  
 2.7.5  
 2.7.7.1.1  
 2.7.7  
 2.7.6

| Appurtenance Seismic Loads |             |            |            |
|----------------------------|-------------|------------|------------|
| Name                       | Weight (lb) | $E_H$ (lb) | $E_V$ (lb) |
| 470-70-220                 | 39          | 13.57      | 4.34       |
|                            |             |            |            |





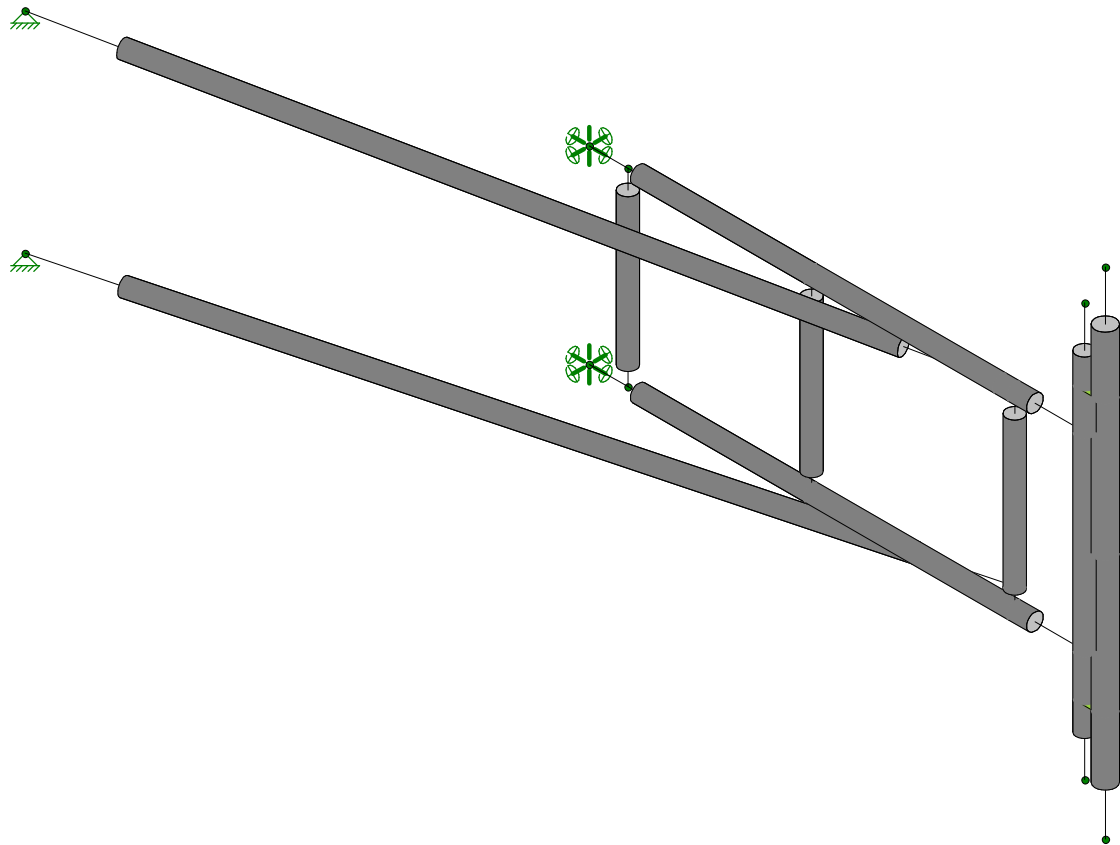
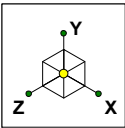
**BLACK & VEATCH**

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*November 9, 2020*

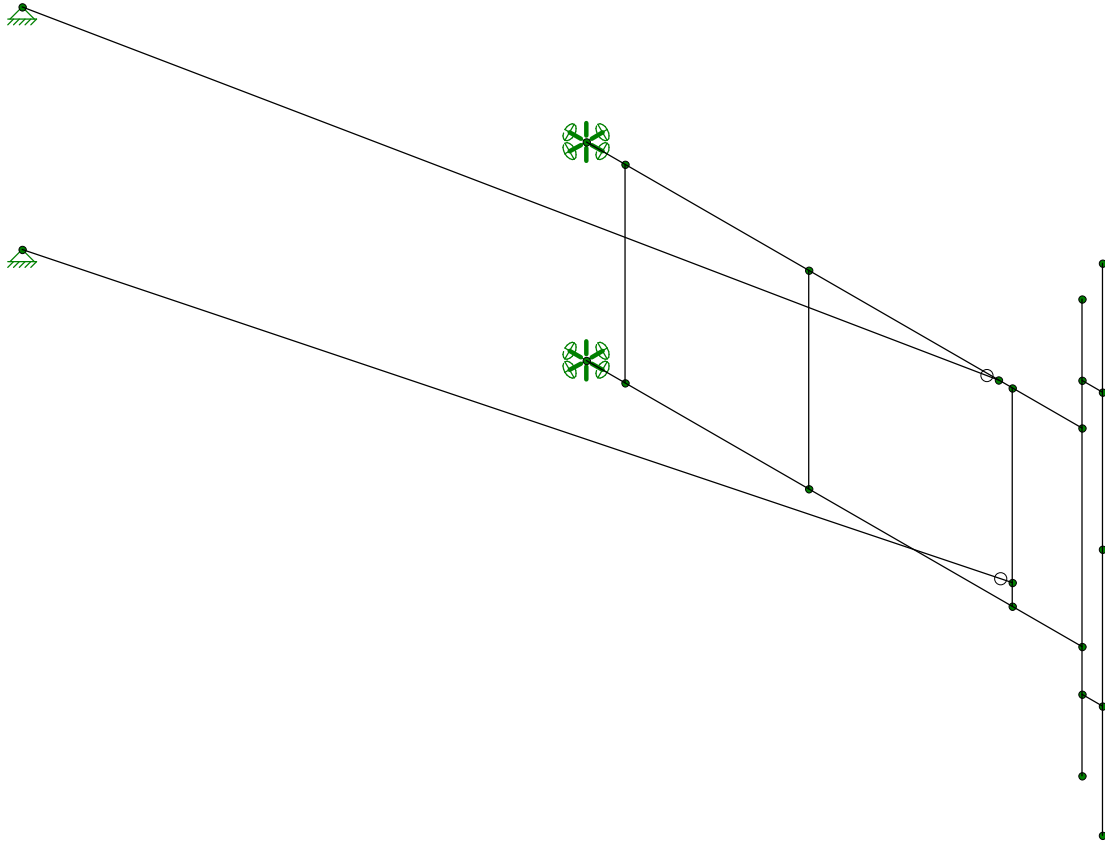
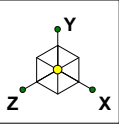
*COLEBROOK*

**APPENDIX 2:  
EXISTING MOUNT RISA PRINTOUTS**



Envelope Only Solution

|                  |                      |                          |
|------------------|----------------------|--------------------------|
| Black & Veatch   | Colebrook Risa Model | SK - 1                   |
| JooHwan Jung     |                      | Nov 9, 2020 at 10:01 AM  |
| 405025.2021.2200 |                      | colebrook risa model.r3d |



Envelope Only Solution

Black & Veatch

Joochan Jung

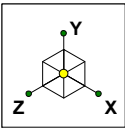
405025.2021.2200

Colebrook Risa Model

SK - 2

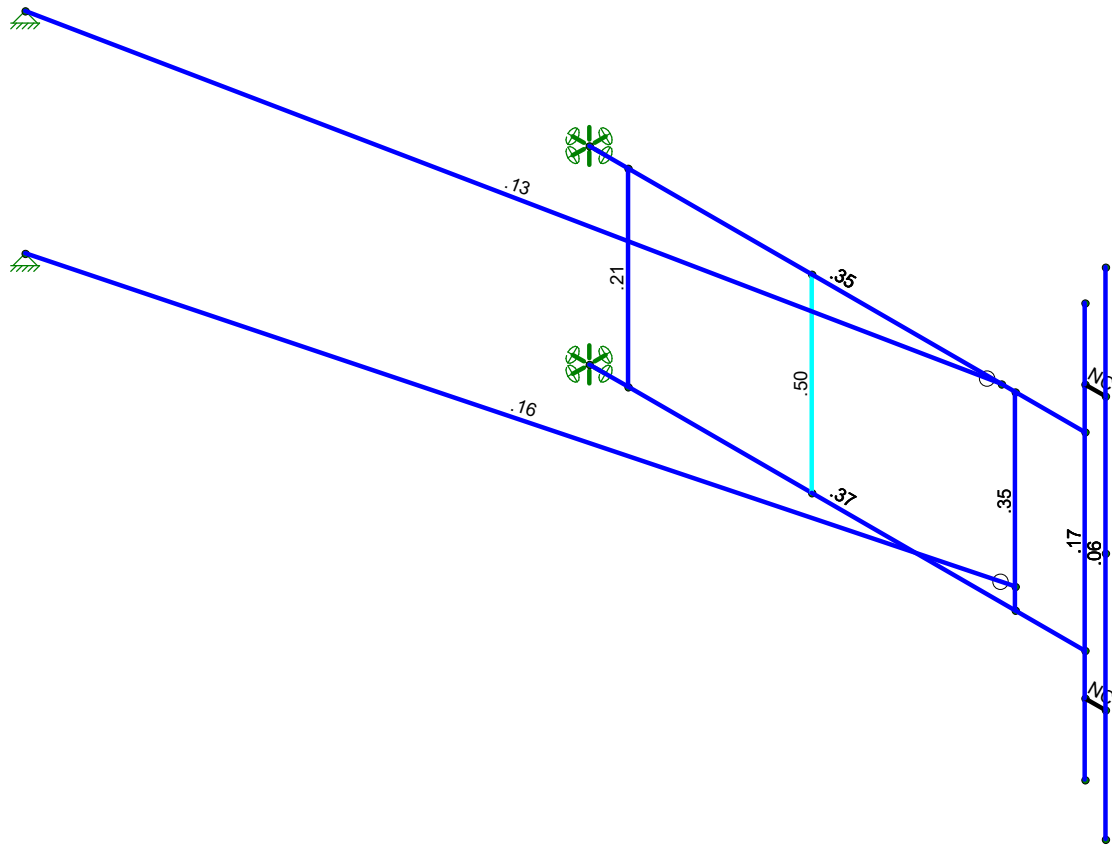
Nov 9, 2020 at 10:01 AM

colebrook\_risa\_model.r3d



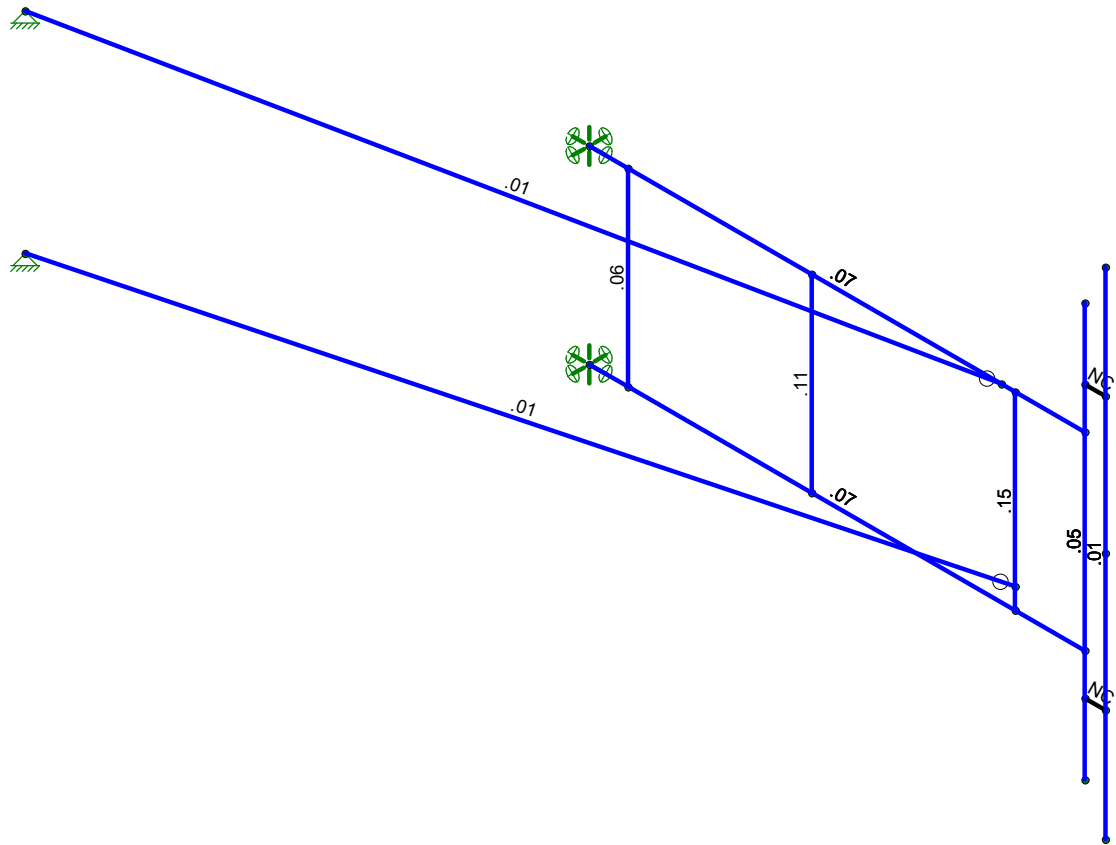
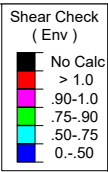
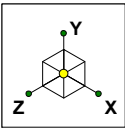
Code Check ( Env )

|       |         |
|-------|---------|
| Black | No Calc |
| Red   | > 1.0   |
| Pink  | .90-1.0 |
| Green | .75-.90 |
| Cyan  | .50-.75 |
| Blue  | 0-.50   |



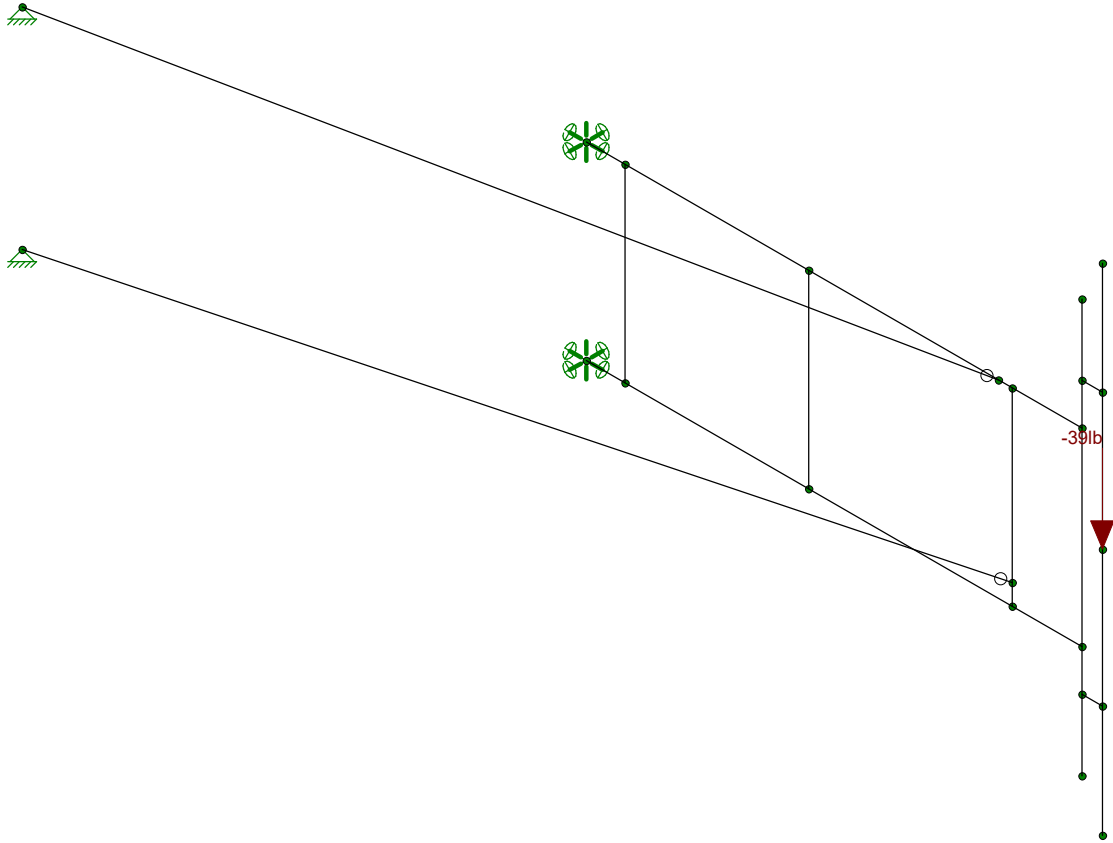
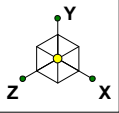
Member Code Checks Displayed (Enveloped)  
Envelope Only Solution

|                  |                      |                          |
|------------------|----------------------|--------------------------|
| Black & Veatch   | Colebrook Risa Model | SK - 3                   |
| Joochan Jung     |                      | Nov 9, 2020 at 10:01 AM  |
| 405025.2021.2200 |                      | colebrook risa model.r3d |



Member Shear Checks Displayed (Enveloped)  
Envelope Only Solution

|                  |                      |                          |
|------------------|----------------------|--------------------------|
| Black & Veatch   | Colebrook Risa Model | SK - 4                   |
| JooHwan Jung     |                      | Nov 9, 2020 at 10:02 AM  |
| 405025.2021.2200 |                      | colebrook risa model.r3d |



Loads: BLC 1, DL  
Envelope Only Solution

Black & Veatch

Joochan Jung

405025.2021.2200

Colebrook Risa Model

SK - 5

Nov 9, 2020 at 10:02 AM

colebrook risa 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              | PIPE 2.0 | Beam | Pipe        | A53 Gr.B | Typical    | 1.02    | .627      | .627      | 1.25    |
| 2 | Vertical Bracing | PIPE 2.0 | Beam | Pipe        | A53 Gr.B | Typical    | 1.02    | .627      | .627      | 1.25    |
| 3 | Stiff Arm        | PIPE 2.0 | Beam | Pipe        | A53 Gr.B | Typical    | 1.02    | .627      | .627      | 1.25    |
| 4 | Mount Pipe       | PIPE 2.0 | Beam | Pipe        | A53 Gr.B | Typical    | 1.02    | .627      | .627      | 1.25    |
| 5 | Mount Pipe 2.5   | PIPE 2.5 | Beam | Pipe        | A53 Gr.B | Typical    | 1.61    | 1.45      | 1.45      | 2.89    |

### 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         |                  | Reaction         |
| 2 | N3          | Reaction | Reaction | Reaction | Reaction         |                  | Reaction         |
| 3 | N20         | Reaction | Reaction | Reaction |                  |                  |                  |
| 4 | N21         | 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 | Pipe        | A53 Gr.B | Typical      |
| 2  | M2    | N3      | N4      |         |             | Arm              | Beam | Pipe        | A53 Gr.B | Typical      |
| 3  | M3    | N6      | N5      |         |             | Vertical Bracing | Beam | Pipe        | A53 Gr.B | Typical      |
| 4  | M4    | N10     | N9      |         |             | Vertical Bracing | Beam | Pipe        | A53 Gr.B | Typical      |
| 5  | M5    | N8      | N7      |         |             | Vertical Bracing | Beam | Pipe        | A53 Gr.B | Typical      |
| 6  | M6    | N11     | N12     |         |             | Mount Pipe       | Beam | Pipe        | A53 Gr.B | Typical      |
| 7  | M7    | N13     | N14     |         |             | Mount Pipe 2.5   | Beam | Pipe        | A53 Gr.B | Typical      |
| 8  | M8    | N15     | N17     |         |             | RIGID            | None | None        | RIGID    | Typical      |
| 9  | M9    | N16     | N18     |         |             | RIGID            | None | None        | RIGID    | Typical      |
| 10 | M10   | N19     | N21     |         |             | Stiff Arm        | Beam | Pipe        | A53 Gr.B | Typical      |
| 11 | M11   | N22     | N20     |         |             | Stiff Arm        | Beam | Pipe        | A53 Gr.B | 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      |            |              |          | None       |
| 4  | M4    |           |           |              |              |          | Yes      |            |              |          | None       |
| 5  | M5    |           |           |              |              |          | Yes      |            |              |          | None       |
| 6  | M6    |           |           |              |              |          | Yes      |            |              |          | None       |
| 7  | M7    |           |           |              |              |          | Yes      |            |              |          | None       |
| 8  | M8    |           |           |              |              |          | Yes      | ** NA **   |              |          | None       |
| 9  | M9    |           |           |              |              |          | Yes      | ** NA **   |              |          | None       |
| 10 | M10   | BenPIN    |           |              |              |          | Yes      |            |              |          | None       |
| 11 | M11   | BenPIN    |           |              |              |          | 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    | Arm             | 72         |          |          | Lbyy          |               |            |     |     |    | Lateral  |
| 2 | M2    | Arm             | 72         |          |          | Lbyy          |               |            |     |     |    | Lateral  |
| 3 | M3    | Vertical Bra... | 27.5       |          |          | Lbyy          |               |            |     |     |    | Lateral  |
| 4 | M4    | Vertical Bra... | 27.5       |          |          | Lbyy          |               |            |     |     |    | Lateral  |
| 5 | M5    | Vertical Bra... | 27.5       |          |          | Lbyy          |               |            |     |     |    | Lateral  |
| 6 | M6    | Mount Pipe      | 60         |          |          | Lbyy          |               |            |     |     |    | Lateral  |
| 7 | M7    | Mount Pipe ...  | 72         |          |          | Lbyy          |               |            |     |     |    | Lateral  |
| 8 | M10   | Stiff Arm       | 115.946    |          |          | Lbyy          |               |            |     |     |    | Lateral  |
| 9 | M11   | Stiff Arm       | 117.723    |          |          | Lbyy          |               |            |     |     |    | 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     |       |                        |             |



**Basic Load Cases (Continued)**

| BLC Description              | Category | X Gravity | Y Gravity | Z Gravity | Joint | Point | Distributed Area(Me... | Surface(... |
|------------------------------|----------|-----------|-----------|-----------|-------|-------|------------------------|-------------|
| 4 Wind - 0 Deg (X)           | WL       |           |           |           | 1     |       | 9                      |             |
| 5 Wind - 30 Deg (X)          | WL       |           |           |           | 1     |       | 9                      |             |
| 6 Wind - 60 Deg (X)          | WL       |           |           |           | 1     |       | 9                      |             |
| 7 Wind - 90 Deg (X)          | WL       |           |           |           | 1     |       | 9                      |             |
| 8 Wind - 120 Deg (X)         | WL       |           |           |           | 1     |       | 9                      |             |
| 9 Wind - 150 Deg (X)         | WL       |           |           |           | 1     |       | 9                      |             |
| 10 Wind - 180 Deg (X)        | WL       |           |           |           | 1     |       | 9                      |             |
| 11 Wind - 210 Deg (X)        | WL       |           |           |           | 1     |       | 9                      |             |
| 12 Wind - 240 Deg (X)        | WL       |           |           |           | 1     |       | 9                      |             |
| 13 Wind - 270 Deg (X)        | WL       |           |           |           | 1     |       | 9                      |             |
| 14 Wind - 300 Deg (X)        | WL       |           |           |           | 1     |       | 9                      |             |
| 15 Wind - 330 Deg (X)        | WL       |           |           |           | 1     |       | 9                      |             |
| 16 Wind - 0 Deg (Z)          | WL       |           |           |           | 1     |       | 9                      |             |
| 17 Wind - 30 Deg (Z)         | WL       |           |           |           | 1     |       | 9                      |             |
| 18 Wind - 60 Deg (Z)         | WL       |           |           |           | 1     |       | 9                      |             |
| 19 Wind - 90 Deg (Z)         | WL       |           |           |           | 1     |       | 9                      |             |
| 20 Wind - 120 Deg (Z)        | WL       |           |           |           | 1     |       | 9                      |             |
| 21 Wind - 150 Deg (Z)        | WL       |           |           |           | 1     |       | 9                      |             |
| 22 Wind - 180 Deg (Z)        | WL       |           |           |           | 1     |       | 9                      |             |
| 23 Wind - 210 Deg (Z)        | WL       |           |           |           | 1     |       | 9                      |             |
| 24 Wind - 240 Deg (Z)        | WL       |           |           |           | 1     |       | 9                      |             |
| 25 Wind - 270 Deg (Z)        | WL       |           |           |           | 1     |       | 9                      |             |
| 26 Wind - 300 Deg (Z)        | WL       |           |           |           | 1     |       | 9                      |             |
| 27 Wind - 330 Deg (Z)        | WL       |           |           |           | 1     |       | 9                      |             |
| 28 Ice DL                    | DL       |           |           |           | 1     |       | 9                      |             |
| 29 Ice Wind - 0 Deg (X)      | WL       |           |           |           | 1     |       | 9                      |             |
| 30 Ice Wind - 30 Deg (X)     | WL       |           |           |           | 1     |       | 9                      |             |
| 31 Ice Wind - 60 Deg (X)     | WL       |           |           |           | 1     |       | 9                      |             |
| 32 Ice Wind - 90 Deg (X)     | WL       |           |           |           | 1     |       | 9                      |             |
| 33 Ice Wind - 120 Deg (X)    | WL       |           |           |           | 1     |       | 9                      |             |
| 34 Ice Wind - 150 Deg (X)    | WL       |           |           |           | 1     |       | 9                      |             |
| 35 Ice Wind - 180 Deg (X)    | WL       |           |           |           | 1     |       | 9                      |             |
| 36 Ice Wind - 210 Deg (X)    | WL       |           |           |           | 1     |       | 9                      |             |
| 37 Ice Wind - 240 Deg (X)    | WL       |           |           |           | 1     |       | 9                      |             |
| 38 Ice Wind - 270 Deg (X)    | WL       |           |           |           | 1     |       | 9                      |             |
| 39 Ice Wind - 300 Deg (X)    | WL       |           |           |           | 1     |       | 9                      |             |
| 40 Ice Wind - 330 Deg (X)    | WL       |           |           |           | 1     |       | 9                      |             |
| 41 Ice Wind - 0 Deg (Z)      | WL       |           |           |           | 1     |       | 9                      |             |
| 42 Ice Wind - 30 Deg (Z)     | WL       |           |           |           | 1     |       | 9                      |             |
| 43 Ice Wind - 60 Deg (Z)     | WL       |           |           |           | 1     |       | 9                      |             |
| 44 Ice Wind - 90 Deg (Z)     | WL       |           |           |           | 1     |       | 9                      |             |
| 45 Ice Wind - 120 Deg (Z)    | WL       |           |           |           | 1     |       | 9                      |             |
| 46 Ice Wind - 150 Deg (Z)    | WL       |           |           |           | 1     |       | 9                      |             |
| 47 Ice Wind - 180 Deg (Z)    | WL       |           |           |           | 1     |       | 9                      |             |
| 48 Ice Wind - 210 Deg (Z)    | WL       |           |           |           | 1     |       | 9                      |             |
| 49 Ice Wind - 240 Deg (Z)    | WL       |           |           |           | 1     |       | 9                      |             |
| 50 Ice Wind - 270 Deg (Z)    | WL       |           |           |           | 1     |       | 9                      |             |
| 51 Ice Wind - 300 Deg (Z)    | WL       |           |           |           | 1     |       | 9                      |             |
| 52 Ice Wind - 330 Deg (Z)    | WL       |           |           |           | 1     |       | 9                      |             |
| 53 Lateral Seismic - Eh (X)  | ELX      | .348      |           |           | 1     |       |                        |             |
| 54 Lateral Seismic - Eh (Z)  | ELZ      |           |           | .348      | 1     |       |                        |             |
| 55 Vertical Seismic - Ev (Y) | ELY      |           | -.111     |           | 1     |       |                        |             |



**Load Combinations**

|    | Description                       | S... | PDe... | SRSS | 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  |      |       |      |       |      |       |      |       |
| 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", 40 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 [k-in] | LC | MY [k-in] | LC | MZ [k-in] | LC |
|----|---------|-----|-----------|----|----------|----|----------|----|-----------|----|-----------|----|-----------|----|
| 1  | N1      | max | 1975.01   | 20 | 480.028  | 28 | 23.316   | 35 | -.06      | 11 | 0         | 53 | 5.486     | 27 |
| 2  |         | min | -946.05   | 10 | 83.239   | 6  | -1.07    | 11 | -.442     | 20 | 0         | 2  | .795      | 5  |
| 3  | N3      | max | 1234.141  | 4  | 488.017  | 27 | .236     | 13 | .007      | 11 | 0         | 53 | 5.493     | 27 |
| 4  |         | min | -1981.715 | 26 | 71.288   | 5  | -24.796  | 41 | -.451     | 21 | 0         | 2  | .796      | 5  |
| 5  | N20     | max | 1561.226  | 11 | 72.425   | 35 | 446.948  | 5  | 0         | 53 | 0         | 53 | 0         | 53 |
| 6  |         | min | -1478.317 | 5  | 18.452   | 51 | -467.269 | 11 | 0         | 2  | 0         | 2  | 0         | 2  |
| 7  | N21     | max | 1220.128  | 11 | 96.534   | 35 | 408.26   | 5  | 0         | 53 | 0         | 53 | 0         | 53 |
| 8  |         | min | -1312.508 | 5  | -46.245  | 11 | -382.466 | 11 | 0         | 2  | 0         | 2  | 0         | 2  |
| 9  | Totals: | max | 934.623   | 2  | 1093.212 | 41 | 853.907  | 5  |           |    |           |    |           |    |
| 10 |         | min | -934.623  | 8  | 242.032  | 53 | -853.906 | 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   | .366    | 6       | 19      | .073     | 6       | 29 | 20866.... | 32130      | 22.459    | 22.459      | 1...H1-1b  |
| 2      | M2    | PIPE 2.0   | .354    | 6       | 27      | .074     | 6       | 18 | 20866.... | 32130      | 22.459    | 22.459      | 1...H1-1b  |
| 3      | M3    | PIPE 2.0   | .213    | 27.5    | 28      | .056     | 27.5    | 18 | 30169.... | 32130      | 22.459    | 22.459      | 2...H1-1b  |
| 4      | M4    | PIPE 2.0   | .504    | 0       | 27      | .108     | 27.5    | 28 | 30169.... | 32130      | 22.459    | 22.459      | 2...H1-1b  |
| 5      | M5    | PIPE 2.0   | .350    | 0       | 27      | .152     | 24.6... | 5  | 30169.... | 32130      | 22.459    | 22.459      | 2...H1-1b  |
| 6      | M6    | PIPE 2.0   | .171    | 16.25   | 26      | .048     | 43.75   | 11 | 23808.... | 32130      | 22.459    | 22.459      | 3...H1-1b  |
| 7      | M7    | PIPE 2.5   | .065    | 55.5    | 18      | .014     | 55.5    | 2  | 37773.... | 50715      | 43.155    | 43.155      | 1...H1-1b  |
| 8      | M10   | PIPE 2.0   | .135    | 57.973  | 11      | .008     | 115...  | 41 | 10536.... | 32130      | 22.459    | 22.459      | 1...H1-1b  |
| 9      | M11   | PIPE 2.0   | .159    | 117.... | 11      | .008     | 117.... | 41 | 10220.... | 32130      | 22.459    | 22.459      | 1...H1-1b* |



**BLACK & VEATCH**

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*November 9, 2020*

*COLEBROOK*

**APPENDIX 3:  
PROPOSED MOUNT ANALYSIS REPORT**





Client: Eversouce  
 Site Name: COLEBROOK (ES-028)

Computed By: JooHwan Jung

Date: 11/9/2020

Verified By: Josh Riley

**BLACK & VEATCH**

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Member Wind Loading**

Exposure Category = C  
 Risk Category = III  
 Topographic Category = 1  
 Basic Wind Speed, V = 125 mph  
 Height Above Ground, z = 144.5 ft  
 Crest Height, H = N/A ft  
 Velocity Pressure Coefficient,  $K_z$  = 1.37  
 Topographic Factor,  $K_{zt}$  = 1.00  
 Wind Directionality Factor,  $K_d$  = 0.95  
 Shielding Factor,  $K_a$  = 0.90  
 Ground Elevation Factor,  $K_e$  = 0.954  
 Wind Velocity Pressure,  $q_z$  = 49.56 psf  
 Gust Effect Factor,  $G_h$  = 1.00

**Equations**

$K_z = 2.01 (z / z_g)^{2/\alpha}$   
 $K_h = e^{(f \cdot z / H)}$   
 $K_{zt} = [1 + K_c K_t / K_h]^2$   
 $K_e = e^{-0.0005z^2}$   
 $q_z = 0.00256 K_z K_{zt} K_e K_d V^2$   
 $F_A = q_z G_h (EPA)$   
 $F_M = q_z G_h C_f D_p$

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

| Member Wind Loads            |            |            |       |            |            |
|------------------------------|------------|------------|-------|------------|------------|
| Name                         | Depth (ft) | Width (ft) | $C_f$ | $D_p$ (ft) | $F_M$ (lb) |
| Arm: HSS4X4X3                | 0.33       | 0.33       | 2     | 0.33       | 33.04      |
| Bracing: Pipe 2.5 Std        | 0.24       |            | 1.2   | 0.24       | 14.25      |
| Mount Pipe: Pipe 3.0 Std     | 0.29       |            | 1.2   | 0.29       | 17.34      |
| Mount Pipe 2.5: Pipe 2.5 Std | 0.24       |            | 1.2   | 0.24       | 14.25      |
|                              |            |            |       |            |            |



**BLACK & VEATCH**

Client: Eversouce  
 Site Name: COLEBROOK (ES-028)

Computed By: JooHwan Jung

Date: 11/9/2020

Verified By: Josh Riley

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Appurtenance Ice Dead Loading**

Exposure Category = C  
 Risk Category = III  
 Topographic Category = 1  
 Height Above Ground, z = 144.5 ft  
 Crest Height, H = N/A ft  
 Design Ice Thickness, T<sub>i</sub> = 1.50 in  
 Importance Factor, I = 1.15  
 Topographic Factor, K<sub>zt</sub> = 1.00  
 Height Escalation Factor, K<sub>iz</sub> = 1.16  
 Factored Ice Thickness, T<sub>iz</sub> = 2.00 in  
 Grating Ice Dead Load, D<sub>Gice</sub> = 9.33 psf

**Equations**

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

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

$$K_{iz} = (z/33)^{u \cdot 10}$$

$$T_{iz} = T_i I K_{iz} (K_{zt})^{u \cdot 30}$$

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

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 <sub>ice</sub> (ft <sup>3</sup> ) | DL <sub>ice</sub> (lb) |
|------------|--------------------|------------------|-------------------|-------------------------------------|------------------------|
| 470-70-220 | 4.33               | 6.58             |                   | 5.39                                | 301.69                 |
|            |                    |                  |                   |                                     |                        |





**BLACK & VEATCH**

Client: Eversouce

Site Name: COLEBROOK (ES-028)

Computed By: Joohwan Jung

Date: 11/9/2020

Verified By: Josh Riley

Date: 11/9/2020

Title: MOUNT ANALYSIS REPORT

**Member Ice Dead Loading**

Exposure Category = C  
 Risk Category = III  
 Topographic Category = 1  
 Height Above Ground, z = 144.5 ft  
 Crest Height, H = N/A ft  
 Design Ice Thickness, T<sub>i</sub> = 1.50 in  
 Importance Factor, I = 1.15  
 Topographic Factor, K<sub>zt</sub> = 1.00  
 Height Escalation Factor, K<sub>iz</sub> = 1.16  
 Factored Ice Thickness, T<sub>iz</sub> = 2.00 in  
 Grating Ice Dead Load, D<sub>Gice</sub> = 9.33 psf

**Equations**

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

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

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

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

$$A_{iz} = \pi i T_{iz} (D_c + T_{iz})$$

$$DL_{ice} = A_{iz} * 56 \text{pcf}$$

TIA-222-H

2.6.6.2.1

2.6.6.2.1

2.6.10

2.6.10

2.6.10

**Member Ice Dead Loads**

| Name                         | Depth w/ ice (ft) | Width w/ ice (ft) | Dc (ft) | Aiz (ft <sup>2</sup> ) | DL <sub>ice</sub> (lb/ft) |
|------------------------------|-------------------|-------------------|---------|------------------------|---------------------------|
| Arm: HSS4X4X3                | 0.67              | 0.67              | 0.47    | 0.33                   | 18.70                     |
| Bracing: Pipe 2.5 Std        | 0.57              |                   | 0.24    | 0.21                   | 11.91                     |
| Mount Pipe: Pipe 3.0 Std     | 0.62              |                   | 0.29    | 0.24                   | 13.43                     |
| Mount Pipe 2.5: Pipe 2.5 Std | 0.57              |                   | 0.24    | 0.21                   | 11.91                     |
|                              |                   |                   |         |                        |                           |





Client: Eversouce  
 Site Name: COLEBROOK (ES-028)

Computed By: JooHwan Jung

Date: 11/9/2020

Verified By: Josh Riley

**BLACK & VEATCH**

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Member Ice Wind Loading**

Exposure Category = C  
 Risk Category = III  
 Topographic Category = 1  
 Ice Wind Speed,  $V_{ice}$  = 40 mph  
 Height Above Ground,  $z$  = 144.5 ft  
 Crest Height,  $H$  = N/A ft  
 Velocity Pressure Coefficient,  $K_z$  = 1.37 psf  
 Topographic Factor,  $K_{zt}$  = 1.00  
 Wind Directionality Factor,  $K_d$  = 0.95  
 Shielding Factor,  $K_a$  = 0.90  
 Ground Elevation Factory,  $K_e$  = 0.954  
 Ice Wind Velocity Pressure,  $q_{z(ice)}$  = 5.075  
 Factored Ice Thickness,  $T_{iz}$  = 2.00 in  
 Gust Effect Factor,  $G_h$  = 1

**Equations**

$K_z = 2.01 (z / z_g)^{2/\alpha}$   
 $K_h = e^{(f \cdot z / H)}$   
 $K_{zt} = [1 + K_c K_t / K_h]^2$   
 $K_e = e^{-0.0005z^2}$   
 $q_z = 0.00256 K_z K_{zt} K_e K_d V^2$   
 $F_{A(ice)} = q_{z(ice)} G_h (EPA)_{A(ice)}$   
 $F_{M(ice)} = q_{z(ice)} G_h C_f D_{p(ice)}$

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

| 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: HSS4X4X3                | 0.67              | 0.67              | 2     | 0.67              | 6.77                 |
| Bracing: Pipe 2.5 Std        | 0.57              |                   | 1.2   | 0.57              | 3.49                 |
| Mount Pipe: Pipe 3.0 Std     | 0.62              |                   | 1.2   | 0.62              | 3.81                 |
| Mount Pipe 2.5: Pipe 2.5 Std | 0.57              |                   | 1.2   | 0.57              | 3.49                 |
|                              |                   |                   |       |                   |                      |



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Client: Eversouce  
 Site Name: COLEBROOK (ES-028)

Computed By: Joohwan Jung

Date: 11/9/2020

Verified By: Josh Riley

Title: MOUNT ANALYSIS REPORT

Date: 11/9/2020

**Seismic Loading**

**Equations**

TIA-222-H

Site Class = D  
 Spectral Response,  $S_s = 0.174$  g  
 Max Spectral Response,  $S_1 = 0.065$  g  
 Accel. Site Coefficient,  $F_a = 1.60$   
 Vel. Site Coefficient,  $F_v = 2.40$   
 Design Spec. Response (1 sec),  $S_{D1} = 0.104$   
 Design Spec. Response,  $S_{DS} = 0.186$   
 Importance Factor,  $I = 1.25$   
 Seismic Response Coefficient,  $C_s = 0.116$   
 Amplification Factor,  $A_s = 3$

$S_{D1} = 2/3 F_v S_1$   
 $S_{DS} = 2/3 F_a S_s \geq S_{D1}$   
 $C_s = 1/2 S_{DS} I \geq 0.03$   
 $E_H = A_s C_s W$   
 $E_V = A_s 0.2 S_{DS} W$

2.7.5  
 2.7.5  
 2.7.7.1.1  
 2.7.7  
 2.7.6

| Appurtenance Seismic Loads |             |            |            |
|----------------------------|-------------|------------|------------|
| Name                       | Weight (lb) | $E_H$ (lb) | $E_V$ (lb) |
| 470-70-220                 | 39          | 13.57      | 4.34       |
|                            |             |            |            |



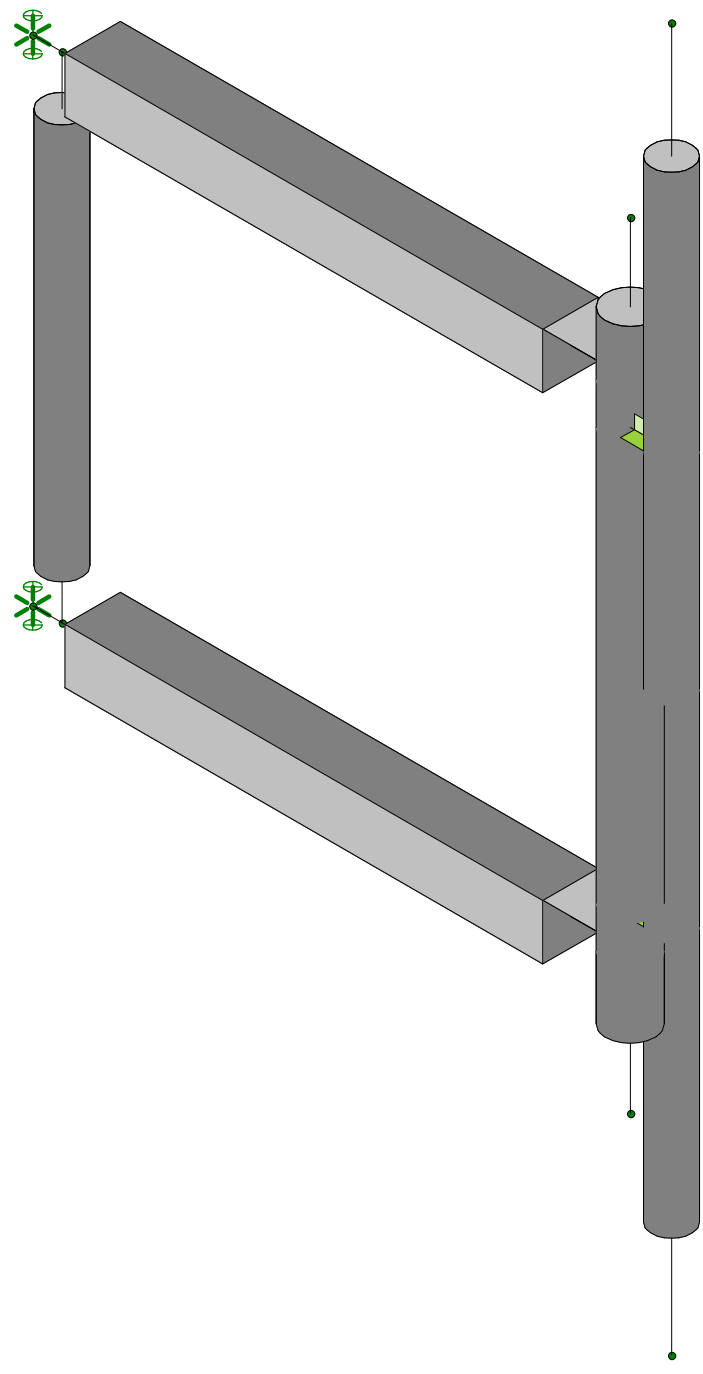
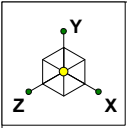
**BLACK & VEATCH**

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*November 9, 2020*

*COLEBROOK*

**APPENDIX 4:  
PROPOSED MOUNT RISA PRINTOUTS**

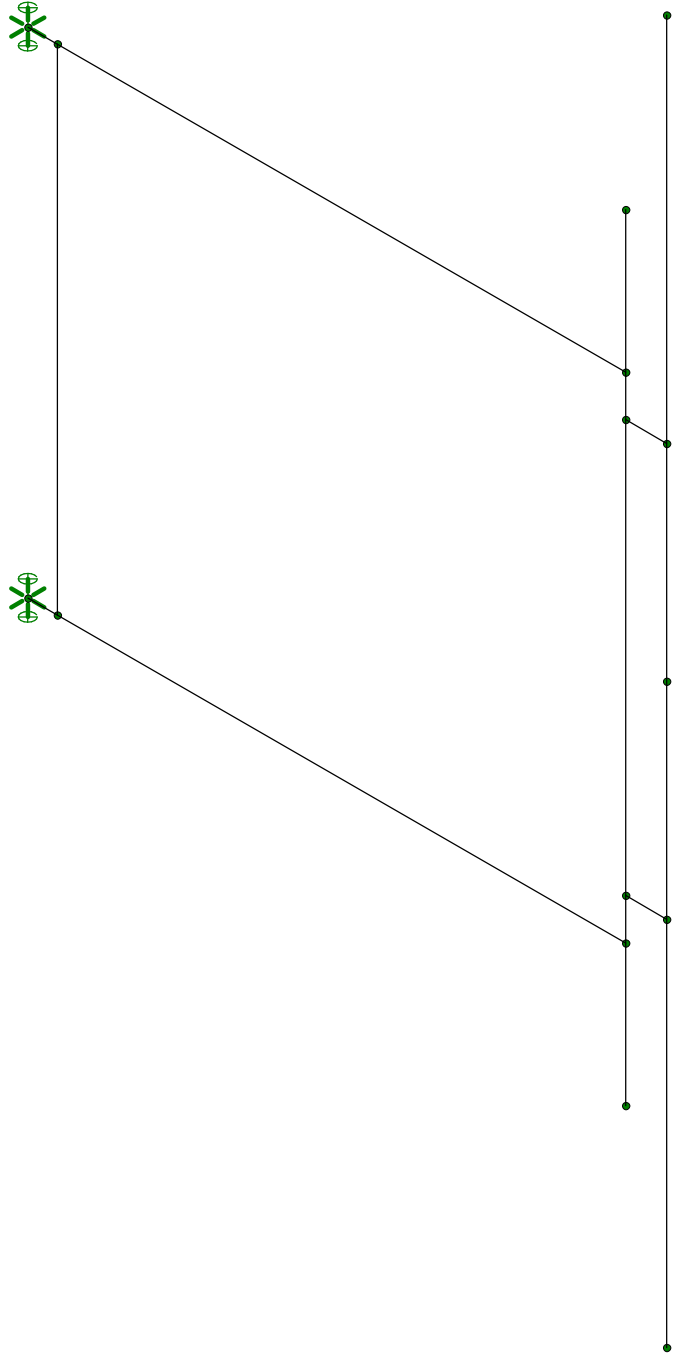
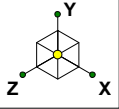


Envelope Only Solution

Black & Veatch  
JooHwan Jung  
405025.2021.2200

colebrook USF-4U Model

SK - 1  
Nov 9, 2020 at 1:25 PM  
colebrook USF-4U Model.r3d

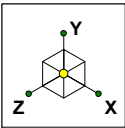


Envelope Only Solution

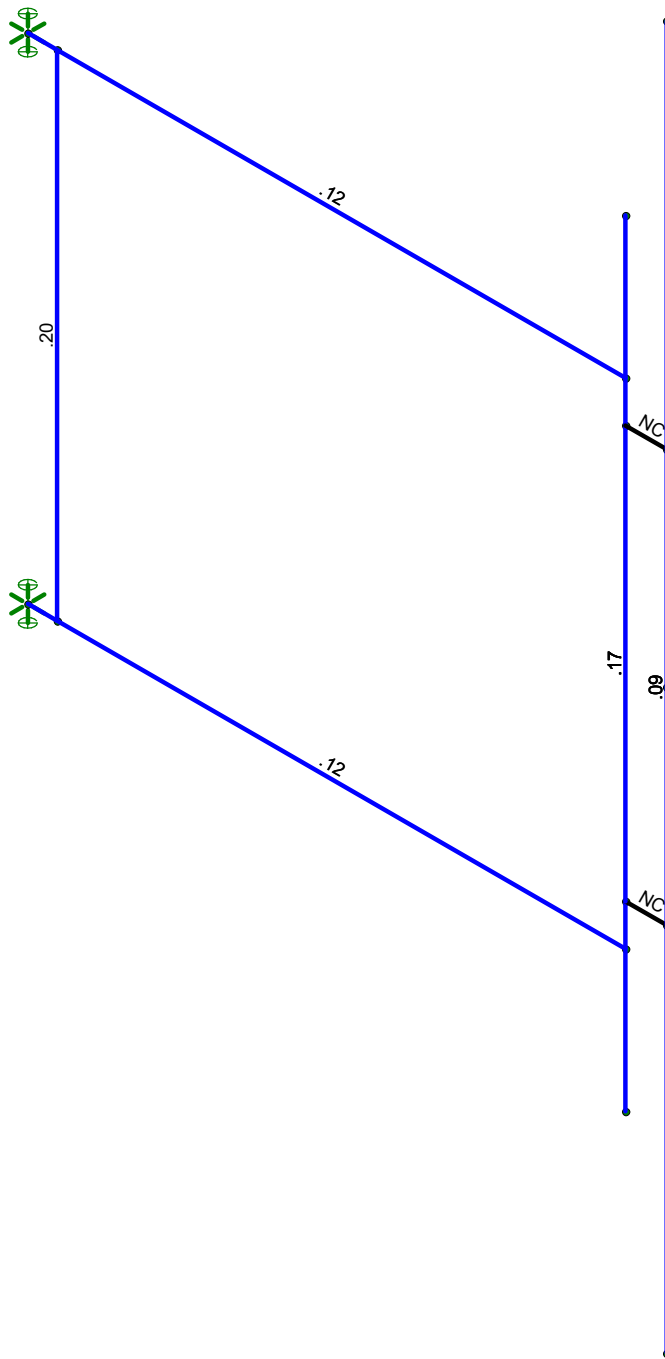
Black & Veatch  
Joohwan Jung  
405025.2021.2200

colebrook USF-4U Model

SK - 2  
Nov 9, 2020 at 1:25 PM  
colebrook USF-4U Model.r3d



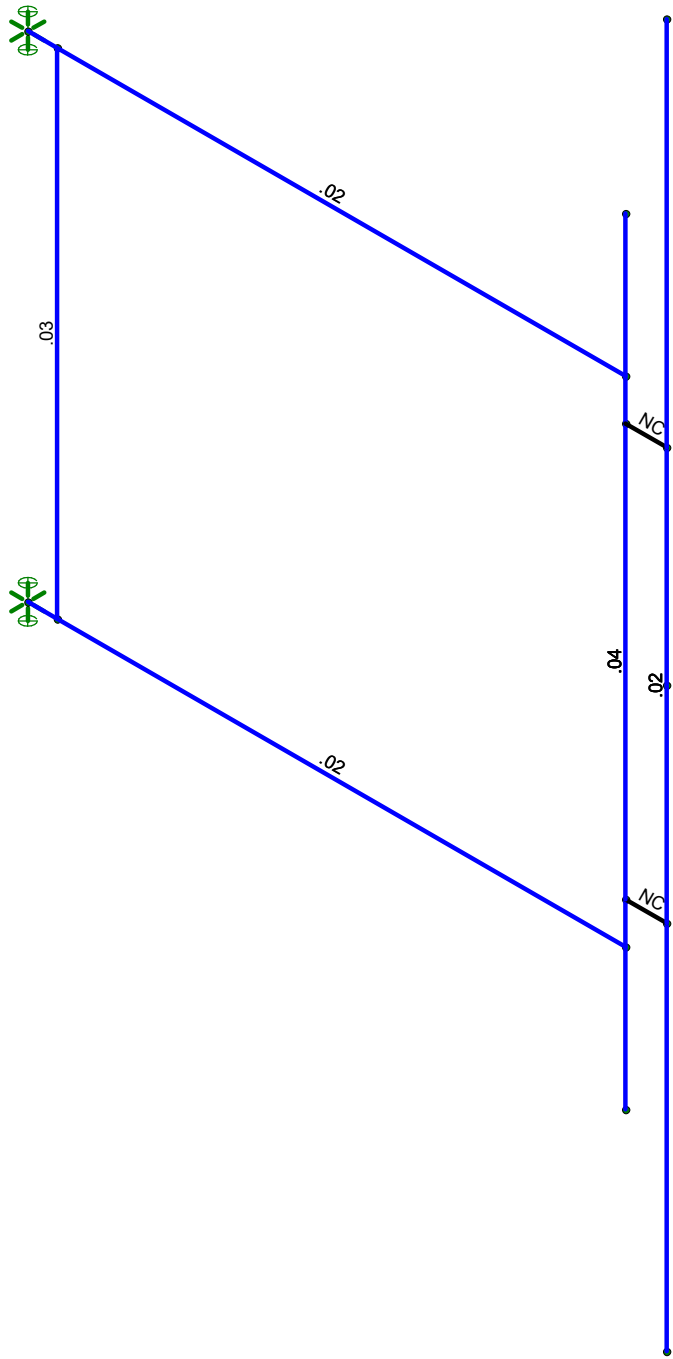
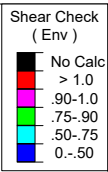
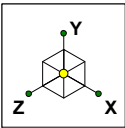
| Code Check ( Env ) |  |
|--------------------|--|
| No Calc            |  |
| > 1.0              |  |
| .90-1.0            |  |
| .75-.90            |  |
| .50-.75            |  |
| 0-.50              |  |



Member Code Checks Displayed (Enveloped)  
Envelope Only Solution

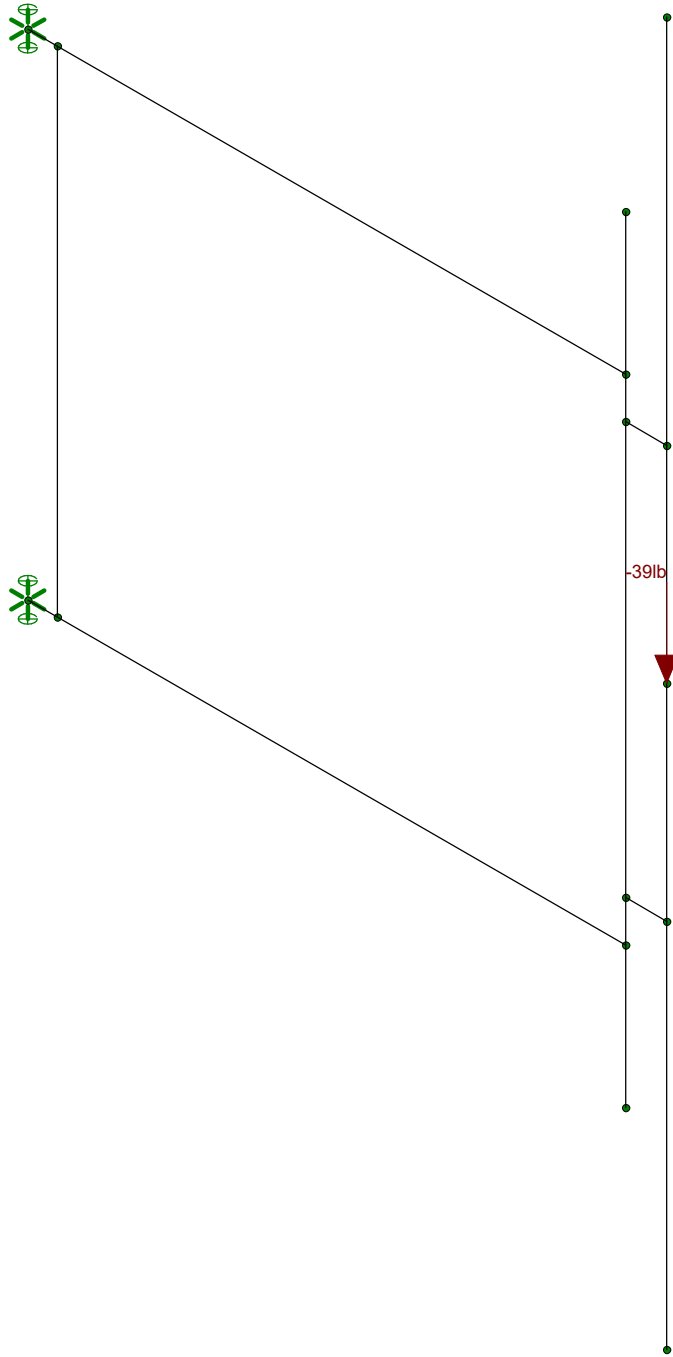
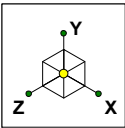
|                  |                        |                            |
|------------------|------------------------|----------------------------|
| Black & Veatch   | colebrook USF-4U Model | SK - 3                     |
| Joochan Jung     |                        | Nov 9, 2020 at 1:25 PM     |
| 405025.2021.2200 |                        | colebrook USF-4U Model.r3d |





Member Shear Checks Displayed (Enveloped)  
Envelope Only Solution

|                  |                        |                            |
|------------------|------------------------|----------------------------|
| Black & Veatch   | colebrook USF-4U Model | SK - 4                     |
| JooHwan Jung     |                        | Nov 9, 2020 at 1:25 PM     |
| 405025.2021.2200 |                        | colebrook USF-4U Model.r3d |



Loads: BLC 1, DL  
Envelope Only Solution

|                  |                        |                            |
|------------------|------------------------|----------------------------|
| Black & Veatch   | colebrook USF-4U Model | SK - 5                     |
| JooHwan Jung     |                        | Nov 9, 2020 at 1:26 PM     |
| 405025.2021.2200 |                        | colebrook 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  |
| Parame 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            | HSS4X4X3 | Beam   | SquareTube  | A53 Gr.B | Typical    | 2.58    | 6.21      | 6.21      | 10      |
| 2 | Bracing        | PIPE 2.5 | Column | Pipe        | A53 Gr.B | Typical    | 1.61    | 1.45      | 1.45      | 2.89    |
| 3 | Mount Pipe     | PIPE 3.0 | Column | Pipe        | A53 Gr.B | Typical    | 2.07    | 2.85      | 2.85      | 5.69    |
| 4 | Mount Pipe 2.5 | PIPE 2.5 | Column | Pipe        | A53 Gr.B | Typical    | 1.61    | 1.45      | 1.45      | 2.89    |

### 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    | N7      | N8      |         |             | Mount Pipe     | Column | Pipe        | A53 Gr.B | Typical      |
| 5 | M5    | N9      | N11     |         |             | RIGID          | None   | None        | RIGID    | Typical      |
| 6 | M6    | N10     | N12     |         |             | RIGID          | None   | None        | RIGID    | Typical      |
| 7 | M7    | N13     | N14     |         |             | Mount Pipe 2.5 | Column | Pipe        | A53 Gr.B | 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  |
| 5 | M7    | Mount Pipe ... | 84         |          |          |               |               |            |     |     |    | 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     |       | 5                      |             |
| 5  | Wind - 30 Deg (X)    | WL       |           |           |           | 1     |       | 5                      |             |
| 6  | Wind - 60 Deg (X)    | WL       |           |           |           | 1     |       | 5                      |             |
| 7  | Wind - 90 Deg (X)    | WL       |           |           |           | 1     |       | 5                      |             |
| 8  | Wind - 120 Deg (X)   | WL       |           |           |           | 1     |       | 5                      |             |
| 9  | Wind - 150 Deg (X)   | WL       |           |           |           | 1     |       | 5                      |             |
| 10 | Wind - 180 Deg (X)   | WL       |           |           |           | 1     |       | 5                      |             |
| 11 | Wind - 210 Deg (X)   | WL       |           |           |           | 1     |       | 5                      |             |
| 12 | Wind - 240 Deg (X)   | WL       |           |           |           | 1     |       | 5                      |             |
| 13 | Wind - 270 Deg (X)   | WL       |           |           |           | 1     |       | 5                      |             |
| 14 | Wind - 300 Deg (X)   | WL       |           |           |           | 1     |       | 5                      |             |
| 15 | Wind - 330 Deg (X)   | WL       |           |           |           | 1     |       | 5                      |             |
| 16 | Wind - 0 Deg (Z)     | WL       |           |           |           | 1     |       | 5                      |             |
| 17 | Wind - 30 Deg (Z)    | WL       |           |           |           | 1     |       | 5                      |             |



**Basic Load Cases (Continued)**

| BLC Description              | Category | X Gravity | Y Gravity | Z Gravity | Joint | Point | Distributed Area(Me... Surface(... |
|------------------------------|----------|-----------|-----------|-----------|-------|-------|------------------------------------|
| 18 Wind - 60 Deg (Z)         | WL       |           |           |           | 1     |       | 5                                  |
| 19 Wind - 90 Deg (Z)         | WL       |           |           |           | 1     |       | 5                                  |
| 20 Wind - 120 Deg (Z)        | WL       |           |           |           | 1     |       | 5                                  |
| 21 Wind - 150 Deg (Z)        | WL       |           |           |           | 1     |       | 5                                  |
| 22 Wind - 180 Deg (Z)        | WL       |           |           |           | 1     |       | 5                                  |
| 23 Wind - 210 Deg (Z)        | WL       |           |           |           | 1     |       | 5                                  |
| 24 Wind - 240 Deg (Z)        | WL       |           |           |           | 1     |       | 5                                  |
| 25 Wind - 270 Deg (Z)        | WL       |           |           |           | 1     |       | 5                                  |
| 26 Wind - 300 Deg (Z)        | WL       |           |           |           | 1     |       | 5                                  |
| 27 Wind - 330 Deg (Z)        | WL       |           |           |           | 1     |       | 5                                  |
| 28 Ice DL                    | DL       |           |           |           | 1     |       | 5                                  |
| 29 Ice Wind - 0 Deg (X)      | WL       |           |           |           | 1     |       | 5                                  |
| 30 Ice Wind - 30 Deg (X)     | WL       |           |           |           | 1     |       | 5                                  |
| 31 Ice Wind - 60 Deg (X)     | WL       |           |           |           | 1     |       | 5                                  |
| 32 Ice Wind - 90 Deg (X)     | WL       |           |           |           | 1     |       | 5                                  |
| 33 Ice Wind - 120 Deg (X)    | WL       |           |           |           | 1     |       | 5                                  |
| 34 Ice Wind - 150 Deg (X)    | WL       |           |           |           | 1     |       | 5                                  |
| 35 Ice Wind - 180 Deg (X)    | WL       |           |           |           | 1     |       | 5                                  |
| 36 Ice Wind - 210 Deg (X)    | WL       |           |           |           | 1     |       | 5                                  |
| 37 Ice Wind - 240 Deg (X)    | WL       |           |           |           | 1     |       | 5                                  |
| 38 Ice Wind - 270 Deg (X)    | WL       |           |           |           | 1     |       | 5                                  |
| 39 Ice Wind - 300 Deg (X)    | WL       |           |           |           | 1     |       | 5                                  |
| 40 Ice Wind - 330 Deg (X)    | WL       |           |           |           | 1     |       | 5                                  |
| 41 Ice Wind - 0 Deg (Z)      | WL       |           |           |           | 1     |       | 5                                  |
| 42 Ice Wind - 30 Deg (Z)     | WL       |           |           |           | 1     |       | 5                                  |
| 43 Ice Wind - 60 Deg (Z)     | WL       |           |           |           | 1     |       | 5                                  |
| 44 Ice Wind - 90 Deg (Z)     | WL       |           |           |           | 1     |       | 5                                  |
| 45 Ice Wind - 120 Deg (Z)    | WL       |           |           |           | 1     |       | 5                                  |
| 46 Ice Wind - 150 Deg (Z)    | WL       |           |           |           | 1     |       | 5                                  |
| 47 Ice Wind - 180 Deg (Z)    | WL       |           |           |           | 1     |       | 5                                  |
| 48 Ice Wind - 210 Deg (Z)    | WL       |           |           |           | 1     |       | 5                                  |
| 49 Ice Wind - 240 Deg (Z)    | WL       |           |           |           | 1     |       | 5                                  |
| 50 Ice Wind - 270 Deg (Z)    | WL       |           |           |           | 1     |       | 5                                  |
| 51 Ice Wind - 300 Deg (Z)    | WL       |           |           |           | 1     |       | 5                                  |
| 52 Ice Wind - 330 Deg (Z)    | WL       |           |           |           | 1     |       | 5                                  |
| 53 Lateral Seismic - Eh (X)  | ELX      | .348      |           |           | 1     |       |                                    |
| 54 Lateral Seismic - Eh (Z)  | ELZ      |           |           | .348      | 1     |       |                                    |
| 55 Vertical Seismic - Ev (Y) | ELY      |           | -.111     |           | 1     |       |                                    |

**Load Combinations**

| Description                  | S...PDe... | SRSS | 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                           |            |      |      |       |      |       |      |       |      |       |      |       |      |       |      |       |      |       |



**Load Combinations (Continued)**

|    | Description                       | S... | PDe... | SRSS | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... | B... | Fa... |
|----|-----------------------------------|------|--------|------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|------|-------|
| 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", 40 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    | 194.699   | 2      | 492.082 | 18     | 369.121  | 5          | 0  | 53         | 1093.797  | 11         | 0  | 53 |
| 2     |         | min    | -1207.753 | 24     | 95.31   | 8      | -369.121 | 11         | 0  | 2          | -1093.797 | 5          | 0  | 2  |
| 3     | N3      | max    | 1207.91   | 18     | 488.851 | 24     | 369.11   | 5          | 0  | 53         | 1094.299  | 11         | 0  | 53 |
| 4     |         | min    | -195.216  | 8      | 95.181  | 2      | -369.11  | 11         | 0  | 2          | -1094.299 | 5          | 0  | 2  |
| 5     | Totals: | max    | 820.493   | 2      | 978.716 | 18     | 738.231  | 5          |    |            |           |            |    |    |
| 6     |         | min    | -820.493  | 8      | 207.495 | 47     | -738.231 | 11         |    |            |           |            |    |    |



Company : Black & Veatch  
 Designer : Joochwan Jung  
 Job Number : 405025.2021.2200  
 Model Name : colebrook USF-4U Model

Nov 9, 2020  
 1:26 PM  
 Checked By: Josh Riley

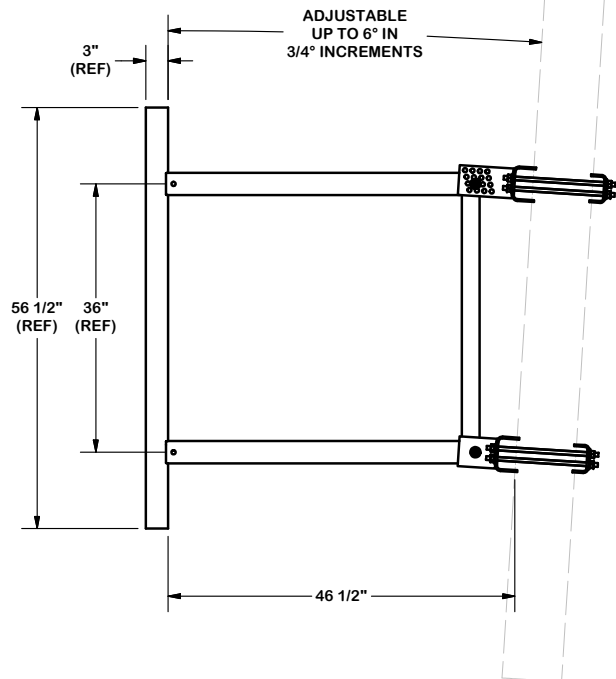
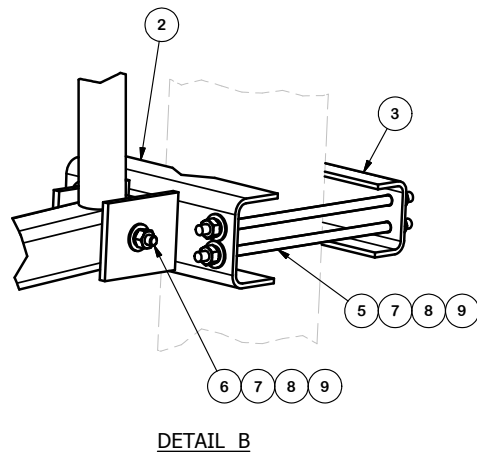
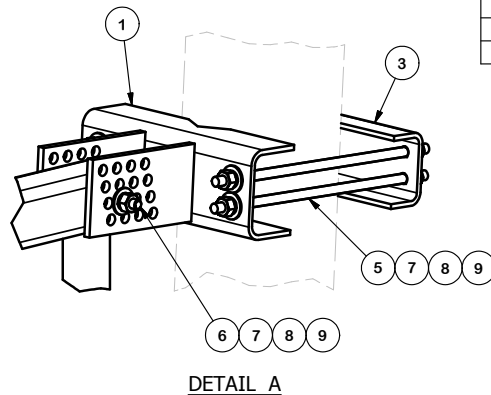
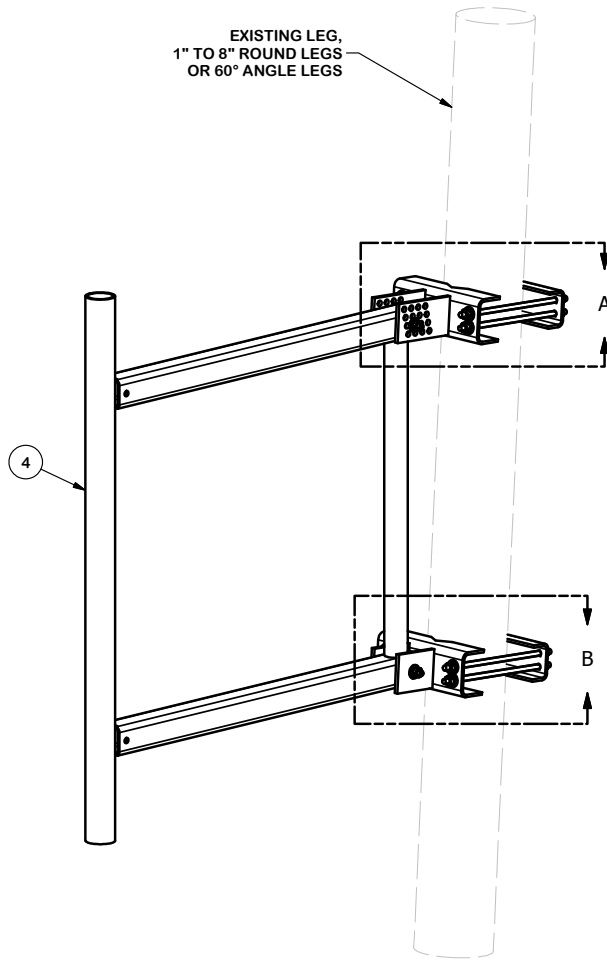
**Envelope AISC 15th(360-16): LRFD Steel Code Checks**

| Member | Shape | Code Check | Loc[in] | LC     | Shear.. | Loc[...] | Dir     | LC | phi*Pn... | phi*Pnt... | phi*Mn... | phi*Mn...Cb | Eqn     |            |
|--------|-------|------------|---------|--------|---------|----------|---------|----|-----------|------------|-----------|-------------|---------|------------|
| 1      | M1    | HSS4X4X3   | .119    | 2.266  | 11      | .021     | 0       | y  | 18        | 78064....  | 81270     | 9633.75     | 9633.75 | 2... H1-1b |
| 2      | M2    | HSS4X4X3   | .119    | 2.266  | 11      | .021     | 0       | y  | 24        | 78064....  | 81270     | 9633.75     | 9633.75 | 2... H1-1b |
| 3      | M3    | PIPE 2.5   | .198    | 36     | 18      | .031     | 36      |    | 18        | 47114....  | 50715     | 3596.25     | 3596.25 | 2... H1-1b |
| 4      | M4    | PIPE 3.0   | .168    | 45.906 | 18      | .037     | 10.5... |    | 25        | 57908....  | 65205     | 5748.75     | 5748.75 | 2... H1-1b |
| 5      | M7    | PIPE 2.5   | .092    | 56.875 | 18      | .017     | 56.8... |    | 18        | 33961....  | 50715     | 3596.25     | 3596.25 | 4... H1-1b |



**APPENDIX 5:  
ATTACHMENTS**

EXISTING LEG,  
1" TO 8" ROUND LEGS  
OR 60° ANGLE LEGS



| 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  |

**TOLERANCE NOTES**

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

PROPRIETARY NOTE:  
 THE DATA AND TECHNIQUES CONTAINED IN THIS DRAWING ARE PROPRIETARY INFORMATION OF VALMONT INDUSTRIES AND CONSIDERED A TRADE SECRET. ANY USE OR DISCLOSURE WITHOUT THE CONSENT OF VALMONT INDUSTRIES IS STRICTLY PROHIBITED.

DESCRIPTION

48" ULTIMATE UNIVERSAL  
STANDOFF FRAME

|         |               |               |
|---------|---------------|---------------|
| CPD NO. | DRAWN BY      | ENG. APPROVAL |
| CLASS   | DRAWING USAGE | CHECKED BY    |
| 81      | 01            | CUSTOMER      |
|         |               | BMC 2/16/2011 |



Engineering  
Support Team:  
1-888-753-7446

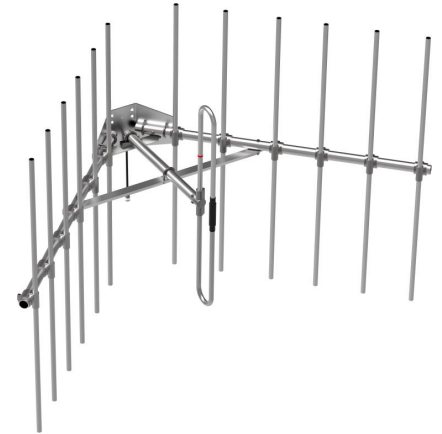
Locations:  
New York, NY  
Atlanta, GA  
Los Angeles, CA  
Plymouth, IN  
Salem, OR  
Dallas, TX

|          |        |        |
|----------|--------|--------|
| PART NO. | USF-4U | PAGE   |
| DWG. NO. | USF-4U | 1 OF 1 |

### 220MHz Corner Reflector Antenna Series

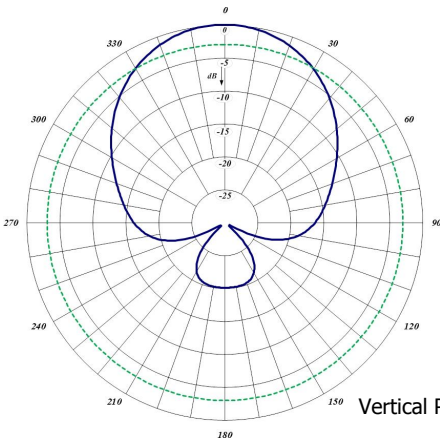
The Corner Reflector Antennas are available in VHF, UHF, 700/800/900 MHz configurations. These antennas have an extremely good front-to-back ratio. They are broadband and are ideal for point-to-point applications. Performance is constant throughout the band.

- Each antenna has a rugged design to withstand harsh environmental conditions.
- Single or Dual Dipole mounted in the front of a 90° reflector, providing good directivity and a very high front-to-back ratio.
- These antennas have ultra-low VSWR ratings, and will not exceed 2.0:1 VSWR ratio with 0.5" (13 mm) of radial ice.
- The supplied mounting hardware allows either vertical or horizontal polarization.
- DC ground for lightning protection.
- Heavy Duty versions are available. Please contact a Comprod Inc. Technical support technician for consultation. **\*ORDER MODEL # 470-70-2D, WHICH HAS HAS DIN MALE TERMINATION\***

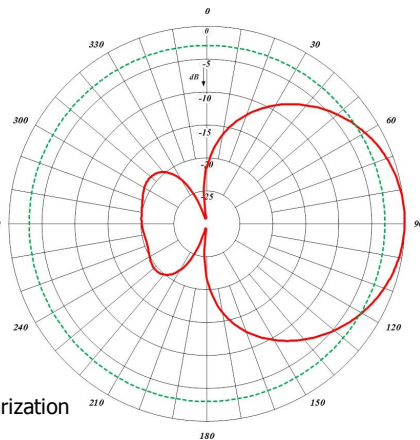


470-70-220

| Electrical Specifications   | 470-70-220      | 470-70-220HD    | 471-70-220      |
|---|-----------------|-----------------|-----------------|
| Frequency Range, MHz  | 215-225         | 215-225         | 215-225         |
| Nominal Gain, dBd   | 7.0             | 7.0             | 10.0            |
| Bandwidth: 1.5:1 VSWR, MHz  | 10              | 10              | 10              |
| Polarization  | Vert. or Horiz. | Vert. or Horiz. | Vert. or Horiz. |
| Horizontal Beamwidth (Vert. Pol.)                                 | 67°             | 67°             | 50°             |
| Vertical Beamwidth (Vert. Pol.)                                   | 75°             | 75°             | 66°             |
| Front to Back, dB   | 30              | 30              | 30              |
| Pattern   | Directional     | Directional     | Directional     |
| Power Rating, Watts   | 250             | 250             | 250             |
| 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     |
| Electrical Specifications   | 470-70-220      | 470-70-220HD    | 471-70-220      |
| Length, in (mm)   | 48 (1219)       | 48 (1219)       | 72 (1829)       |
| Width, in (mm)  | 75 (1905)       | 75 (1905)       | 120 (3048)      |
| Weight, lbs. (kg)   | 39 (17.7)       | 57 (25.8)       | 55 (30)         |
| Rated Wind Velocity, No Ice, mph (km/h)                           | 100 (161)       | 140 (225)       | 100 (161)       |
| Rated Wind Velocity, 0.5" (13mm) ice, mph (km/h)                  | 85 (137)        | 100 (161)       | 85 (137)        |
| Lateral Thrust @ 100 mph, wind, lbs. (kg)                         | 144 (65)        | 236 (107)       | 320 (145)       |
| Projected Area, ft <sup>2</sup> (m <sup>2</sup> )                 | 5.3 (0.5)       | 8.8 (0.82)      | 11.9 (1.10)     |
| Mounting Information: (clamp included) for pipe size O.D. in (mm) | 2.9 (73)        | 2.9 (73)        | 2.9 (73)        |



Horizontal Pattern



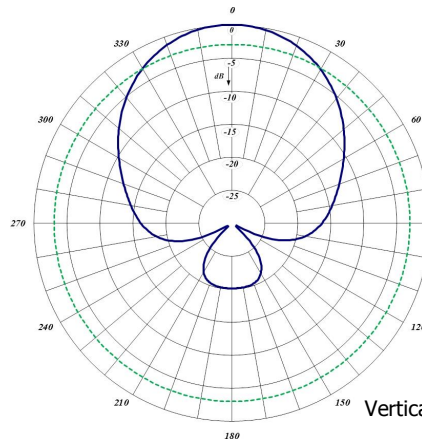
Vertical Pattern



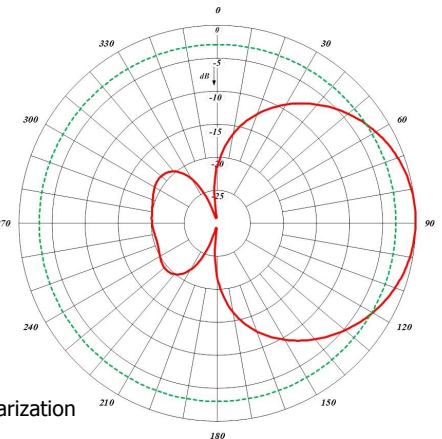
470-70-220



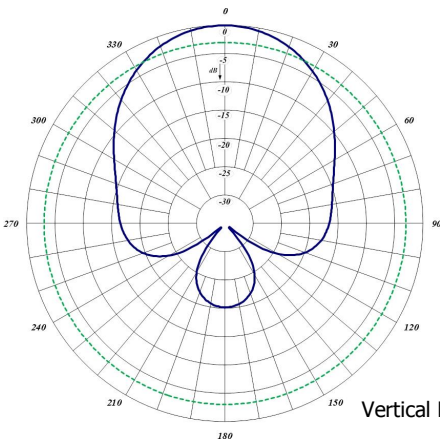
470-70-220HD



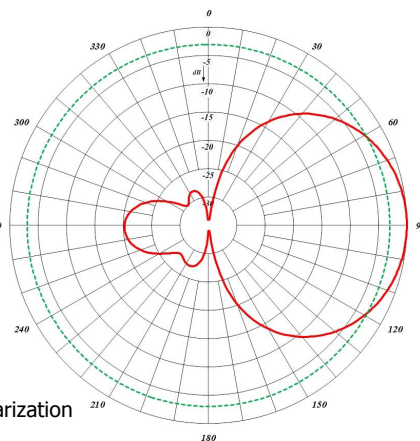
Horizontal Pattern



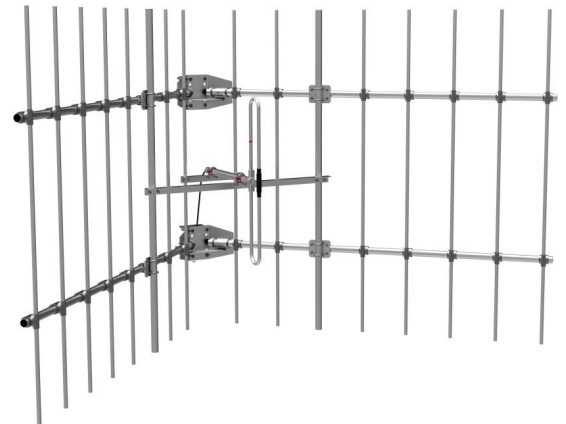
Vertical Pattern



Horizontal Pattern



Vertical Pattern



471-70-220