



10 INDUSTRIAL AVE,  
SUITE 3  
MAHWAH NJ 07430

PHONE: 201.684.0055  
FAX: 201.684.0066

March 8, 2021

Members of the Siting Council  
Connecticut Siting Council  
Ten Franklin Square  
New Britain, CT 06051

RE: Notice of Exempt Modification  
Rocky Hill Road, Trumbull, CT 06611  
Latitude: 41.2315990000  
Longitude: -73.1900050000  
T-Mobile Site#: CT11080B – L700 CMP4

Dear Ms. Bachman:

T-Mobile currently maintains six (6) antennas at the 164-foot level and the 156-foot level of the existing 150-foot transmission tower at Rocky Hill Road, Trumbull, CT. The 150-foot transmission tower is owned and operated by Eversource Energy. The property is owned by Par Old Town LLC. T-Mobile now intends to replace the six (6) of its existing antennas with six (6) new 600/700/1900/2100 MHz antennas. The new antennas will be installed at the 160-foot level of the tower. The existing antenna pipe masts will also be replaced by a new antenna pipe masts to accommodate the new equipment.

**Planned Modifications:**

**Tower:**

Remove

N/A

Remove and Replace:

(3) APXV18-206516S (Remove) – (3) APX16DWV-16DWVS-E-A20 Antenna (Replace) 1900/2100 MHz

(3) APXV18-206516S (Remove) – (3) APXVAARR24\_43-U-NA20 Antenna (Replace) 600/700 MHz

7/8" flange bolts (Remove) – 1" flange bolts (Replace)

Install New:

(12) 1-1/4" coax cables

Ring Mount / Triple T-Arm Kit

Existing to Remain:

(12) 1-1/4" coax cables

**Ground:**

Install New: Equipment rack with:

- (3) Remote Radio Heads
- (6) TMA
- (6) Diplexers

This facility was initially approved by the CSC in Petition No. 400 dated July 23, 1998. The CSC subsequently approved further modifications to the facility in Petition No. 915 dated September 17, 2009. This modification complies with this approval. Please see the enclosed.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to First Selectman - Vicki Tesoro, Elected Official, and Douglas Wenz, Zoning Enforcement Officer for the Town of Trumbull, as well as the property owner and tower owner.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing structure.
2. The proposed modifications will not require the extension of the site boundary.
3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed state and local criteria.
4. The operation of the replacement antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard.
5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site.
6. The existing structure and its foundation can support the proposed loading.

For the foregoing reasons, T-Mobile respectfully submits that the proposed modifications to the above referenced telecommunications facility constitute an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

**Kyle Richers**

Transcend Wireless

Cell: 908-447-4716

Email: [krichers@transcendwireless.com](mailto:krichers@transcendwireless.com)

Attachments

cc: Vicki Tesoro – Town of Trumbull First Selectmen

Douglas Wenz – Town of Trumbull Zoning Enforcement Officer

Eversource Energy – tower owner

Par Old Town LLC- property owner

# View/Print Label

1. **Ensure there are no other shipping or tracking labels attached to your package.** Select the Print button on the print dialogue box that appears. Note: If your browser does not support this function, select Print from the File menu to print the label.

2. **Fold the printed label at the solid line below.** Place the label in a UPS Shipping Pouch. If you do not have a pouch, affix the folded label using clear plastic shipping tape over the entire label.

### 3. GETTING YOUR SHIPMENT TO UPS

#### Customers with a scheduled Pickup

- o Your driver will pickup your shipment(s) as usual.

#### Customers without a scheduled Pickup

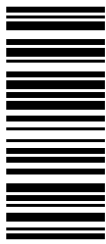
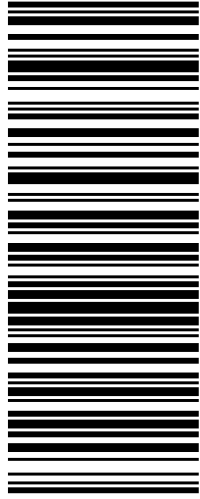

- o Schedule a Pickup on ups.com to have a UPS driver pickup all of your packages.
- o Take your package to any location of The UPS Store®, UPS Access Point(TM) location, UPS Drop Box, UPS Customer Center, Staples® or Authorized Shipping Outlet near you. To find the location nearest you, please visit the 'Locations' Quick link at ups.com.

UPS Access Point™  
 MICHAELS STORE # 7773  
 75 INTERSTATE SHOP CTR  
 RAMSEY NJ 07446-1130

UPS Access Point™  
 THE UPS STORE  
 115 FRANKLIN TPKE  
 MAHWAH NJ 07430-1325

UPS Access Point™  
 THE UPS STORE  
 120 E MAIN ST  
 RAMSEY NJ 07446-1925

FOLD HERE

<p>NEIL GUERRIERO          3473040176          TRANSCEND WIRELESS          10 INDUSTRIAL AVE          MAHWAH NJ 07430</p> <p><b>SHIP TO:</b>          PAR OLD TOWN LLC          SUITE 305          45 KNOLLWOOD ROAD  <b>ELMSFORD NY 10523</b></p>	<p style="text-align: right;"><b>1 LBS</b></p> <p style="text-align: right;"><b>1 OF 1</b></p> <p style="text-align: center;"><b>NY 106 9-03</b></p> 	<p style="text-align: center;"><b>UPS GROUND</b></p> <p>TRACKING #: 1Z V25 742 42 9308 5968</p> 	<p style="text-align: center;"><b>BILLING: P/P          SIGNATURE REQUIRED</b></p> <p>Reference #1: CT11080B CSC PO</p> <p style="text-align: right; font-size: small;">XOL 21.02.07    NV45 42.0A 01/2021*   TM</p>
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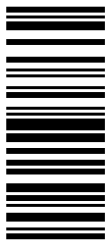
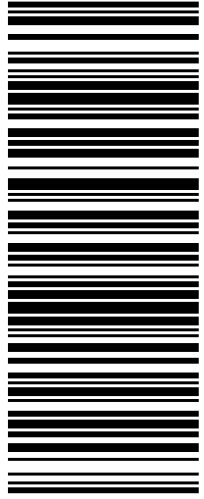

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<p>NEIL GUERRIERO          3473040176          TRANSCEND WIRELESS          10 INDUSTRIAL AVE          MAHWAH NJ 07430</p> <p><b>SHIP TO:</b>          CHRIS GELINAS          EVERSOURCE ENERGY          107 SELDEN STREET  <b>BERLIN CT 06037</b></p>	<p><b>1 LBS</b></p> <p><b>1 OF 1</b></p>	<p><b>CT 061 9-02</b></p> 	<p><b>UPS GROUND</b></p> <p>TRACKING #: 1Z V25 742 42 9247 5977</p> 	<p><b>BILLING: P/P</b>  <b>SIGNATURE REQUIRED</b></p> <p>Reference #1: CT11080B CSC TO</p> <p><small>XOL 21.02.07 NV45 42.0A 01/2021*</small></p> 
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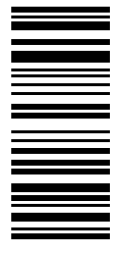
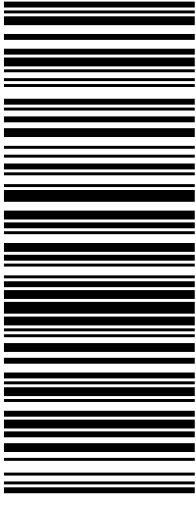

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FOLD HERE

<p>NEIL GUERRIERO        3473040176        TRANSCEND WIRELESS        10 INDUSTRIAL AVE        MAHWAH NJ 07430</p> <p><b>SHIP TO:</b>        VICKI TESORO        TOWN OF TRUMBULL        SECOND FLOOR        5866 MAIN STREET        TRUMBULL CT 06611</p>	<p><b>CT 066 9-07</b></p> 	<p><b>UPS GROUND</b></p> <p>TRACKING #: 1Z V25 742 42 9809 2978</p>		<p>BILLING: P/P        SIGNATURE REQUIRED</p> <p>Reference #1: CT11080B CSC EO</p> <p>XOL 21.02.07 NV45 42.0A 01/2021*</p> 
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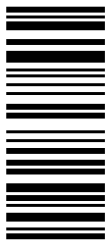
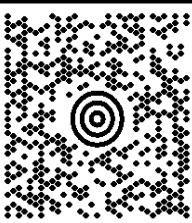
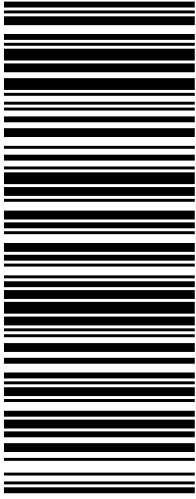

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<p>NEIL GUERRIERO          3473040176          TRANSCEND WIRELESS          10 INDUSTRIAL AVE          MAHWAH NJ 07430</p> <p><b>SHIP TO:</b>          DOUGLAS WENZ          TOWN OF TRUMBULL          SECOND FLOOR          5866 MAIN STREET  <b>TRUMBULL CT 06611</b></p>	<p style="text-align: right;"><b>1 LBS</b></p> <p style="text-align: right;"><b>1 OF 1</b></p> <p style="text-align: center;"><b>CT 066 9-07</b></p>  	<p style="text-align: center;"><b>UPS GROUND</b></p> <p>TRACKING #: 1Z V25 742 42 9906 2981</p> 	<p style="text-align: center;"><b>BILLING: P/P          SIGNATURE REQUIRED</b></p> <p>Reference #1: CT11080B CSC ZO</p> <p style="text-align: center;"></p> <p style="text-align: center; font-size: small;">XOL 21.02.07    NV45 42.0A 01/2021*</p>
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# 900 OLD TOWN ROAD

**Location** 900 OLD TOWN ROAD

**Mblu** H/11 / 00166/ 000/

**Acct#**

**Owner** PAR OLD TOWN LLC

**Assessment** \$44,178,260

**Appraisal** \$63,111,800

**PID** 406

**Building Count** 12

**Fire District** T

## Current Value

Appraisal	
Valuation Year	Total
2015	\$63,111,800

Assessment	
Valuation Year	Total
2015	\$44,178,260

## Owner of Record

**Owner** PAR OLD TOWN LLC  
**Co-Owner** C/O PAREDIM PARTNERS  
**Address** 45 KNOLLWOOD RD STE 305  
ELMSFORD, NY 10523

**Sale Price** \$70,250,000  
**Book & Page** 1709/ 123  
**Sale Date** 03/01/2016  
**Instrument**

## Ownership History

Ownership History				
Owner	Sale Price	Book & Page	Instrument	Sale Date
PAR OLD TOWN LLC	\$70,250,000	1709/ 123		03/01/2016
GATES FINANCING LLC	\$10	1491/ 7	04	04/27/2009
AVALON PROPERTIES INC	\$0	845/ 742		07/07/1994

## Building Information

### Building 1 : Section 1

**Year Built:** 1994  
**Living Area:** 25,774

Building Attributes	
Field	Description

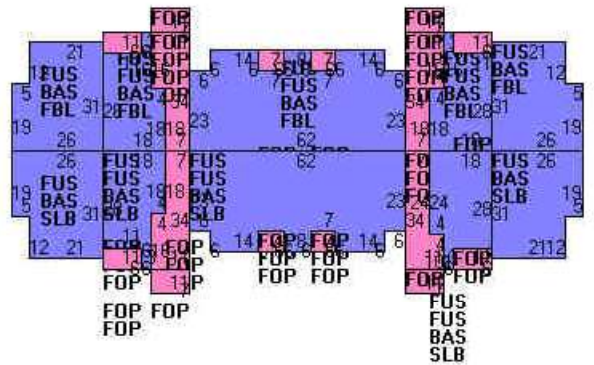
STYLE	Apartment Bldg
Stories:	3 Stories
Occupancy	24
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Linoleum
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Comn Wall	

### Building Photo



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//\00\00\13/>)

### Building Layout



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//Sketches/4/>)

Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	13,456	13,456
BAS	First Floor	8,220	8,220
FBL	Fin Bsmt Living Area	4,098	4,098
FOP	Open Porch	5,646	0
SLB	Slab	4,122	0
		35,542	25,774

### Building 2 : Section 1

**Year Built:** 1996  
**Living Area:** 28,953

Building Attributes : Bldg 2 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories

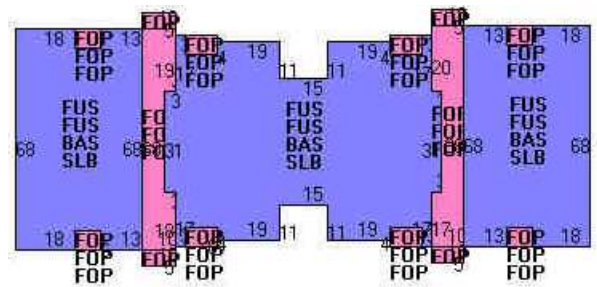
Occupancy	23
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Corn Wall	

### Building Photo



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//\00\00\13/>)

### Building Layout



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//Sketches/4/>)

Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	19,302	19,302
BAS	First Floor	9,651	9,651
FOP	Open Porch	5,018	0
SLB	Slab	9,651	0
		43,622	28,953

### Building 3 : Section 1

**Year Built:** 1996  
**Living Area:** 33,420

Building Attributes : Bldg 3 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories
Occupancy	36

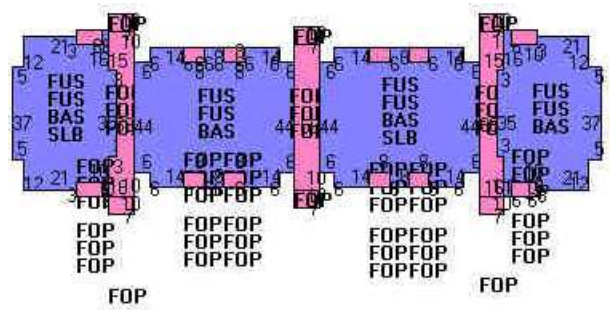
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Conn Wall	

### Building Photo



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//\00\00\13/>)

### Building Layout



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//Sketches/4/>)

Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	22,280	22,280
BAS	First Floor	11,140	11,140
FOP	Open Porch	7,362	0
SLB	Slab	5,570	0
		46,352	33,420

### Building 4 : Section 1

**Year Built:** 1997  
**Living Area:** 34,190

Building Attributes : Bldg 4 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories
Occupancy	42

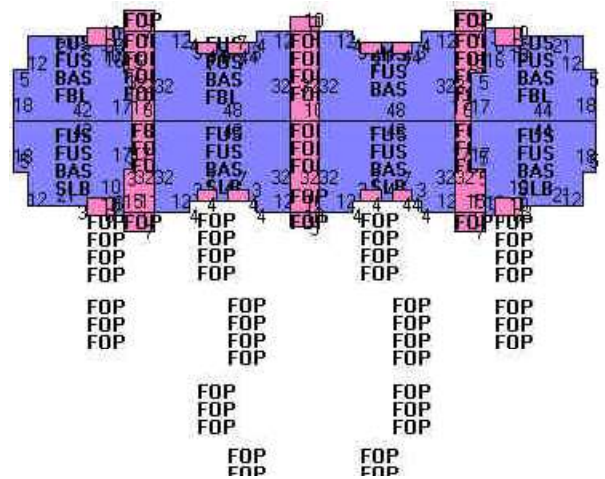
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Comn Wall	

### Building Photo



(<http://images.vgsi.com/photos2/TrumbullICTPhotos//00\00\13/>)

### Building Layout



(<http://images.vgsi.com/photos2/TrumbullICTPhotos//Sketches/4/>)

Building Sub-Areas (sq ft)			Legend	
Code	Description	Gross Area	Living Area	
FUS	Finished Upper Story	20,328	20,328	
BAS	First Floor	10,164	10,164	
FBL	Fin Bsmt Living Area	3,698	3,698	
FOP	Open Porch	8,248	0	
SLB	Slab	5,082	0	
		47,520	34,190	

### Building 5 : Section 1

**Year Built:** 1997  
**Living Area:** 28,953

Building Attributes : Bldg 5 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories



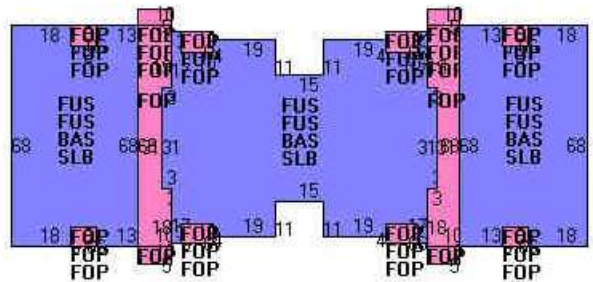
Occupancy	24
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Corn Wall	

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### Building Layout



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Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	19,302	19,302
BAS	First Floor	9,651	9,651
FOP	Open Porch	5,018	0
SLB	Slab	9,651	0
		43,622	28,953

### Building 6 : Section 1

**Year Built:** 1997  
**Living Area:** 35,574

Building Attributes : Bldg 6 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories
Occupancy	42



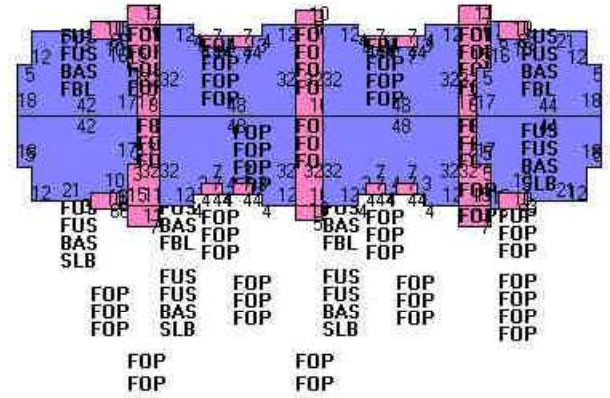
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Conn Wall	

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### Building Layout



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Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	20,328	20,328
BAS	First Floor	10,164	10,164
FBL	Fin Bsmt Living Area	5,082	5,082
FOP	Open Porch	8,248	0
SLB	Slab	5,082	0
		48,904	35,574

### Building 7 : Section 1

**Year Built:** 1997  
**Living Area:** 31,325

Building Attributes : Bldg 7 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories

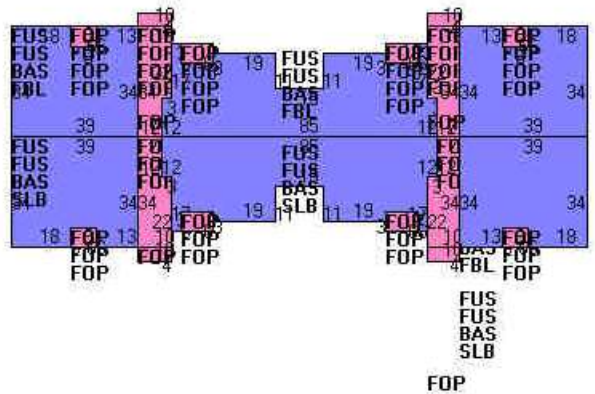
Occupancy	28
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Corn Wall	

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Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	17,900	17,900
BAS	First Floor	8,950	8,950
FBL	Fin Bsmt Living Area	4,475	4,475
FOP	Open Porch	5,928	0
SLB	Slab	4,475	0
		41,728	31,325

### Building 8 : Section 1

**Year Built:** 1997  
**Living Area:** 31,549

Building Attributes : Bldg 8 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories

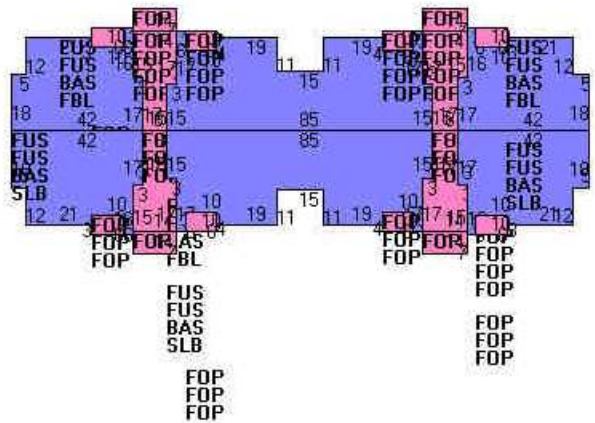
Occupancy	28
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Corn Wall	

### Building Photo



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### Building Layout



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//Sketches/4/>)

Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	18,028	18,028
BAS	First Floor	9,014	9,014
FBL	Fin Bsmt Living Area	4,507	4,507
FOP	Open Porch	7,000	0
SLB	Slab	4,507	0
		43,056	31,549

### Building 9 : Section 1

**Year Built:** 1997  
**Living Area:** 38,934

Building Attributes : Bldg 9 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories

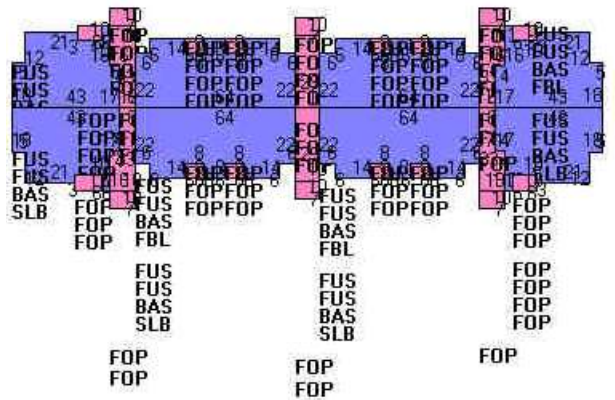
Occupancy	42
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Corn Wall	

### Building Photo



(<http://images.vgsi.com/photos2/TrumbullICTPhotos//\00\00\13/>)

### Building Layout



(<http://images.vgsi.com/photos2/TrumbullICTPhotos//Sketches/4/>)

Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	22,248	22,248
BAS	First Floor	11,124	11,124
FBL	Fin Bsmt Living Area	5,562	5,562
FOP	Open Porch	8,058	0
SLB	Slab	5,562	0
		52,554	38,934

### Building 10 : Section 1

**Year Built:** 1997  
**Living Area:** 30,409

Building Attributes : Bldg 10 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories

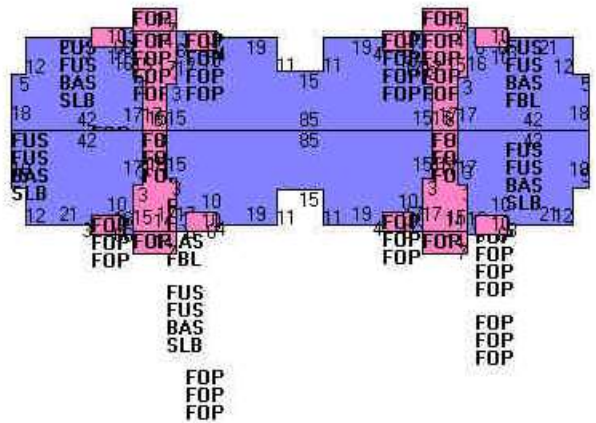
Occupancy	27
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Corn Wall	

### Building Photo



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//00\00\13/>)

### Building Layout



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//Sketches/4/>)

Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	18,028	18,028
BAS	First Floor	9,014	9,014
FBL	Fin Bsmt Living Area	3,367	3,367
FOP	Open Porch	7,000	0
SLB	Slab	5,647	0
		43,056	30,409

### Building 11 : Section 1

**Year Built:** 1997  
**Living Area:** 28,953

Building Attributes : Bldg 11 of 12	
Field	Description
STYLE	Apartment Bldg
Stories:	3 Stories



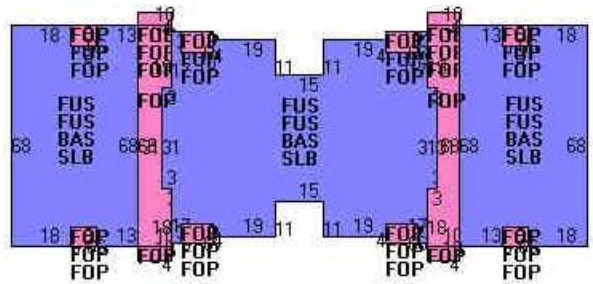
Occupancy	24
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	8
% Corn Wall	

### Building Photo



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//\00\00\13/>)

### Building Layout



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//Sketches/4/>)

Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
FUS	Finished Upper Story	19,302	19,302
BAS	First Floor	9,651	9,651
FOP	Open Porch	4,978	0
SLB	Slab	9,651	0
		43,582	28,953

### Building 12 : Section 1

**Year Built:** 1994  
**Living Area:** 7,701

Building Attributes : Bldg 12 of 12	
Field	Description
STYLE	Office Bldg
Stories:	2 Stories
Occupancy	1

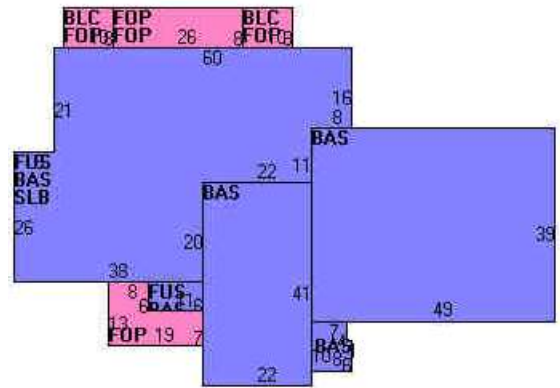
Exterior Wall 1	Vinyl Siding
Exterior Wall 2	
Roof Structure	Gable
Roof Cover	Asphalt
Interior Wall 1	Drywall
Interior Wall 2	
Interior Floor 1	Carpet
Interior Floor 2	Vinyl
Heating Fuel	Gas
Heating Type	Forced Air
AC Type	Central
Bldg Use	Apartments
1st Floor Use:	
Heat/AC	Heat/AC Pkgs
Frame Type	Wood Frame
Baths/Plumbing	Average
Ceiling/Walls	Ceil & Walls
Rooms/Prtns	Above Average
Wall Height	12
% Conn Wall	

### Building Photo



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### Building Layout



(<http://images.vgsi.com/photos2/TrumbullCTPhotos//Sketches/4/>

Building Sub-Areas (sq ft)		Legend	
Code	Description	Gross Area	Living Area
BAS	First Floor	5,295	5,295
FUS	Finished Upper Story	2,406	2,406
BLC	Balcony	160	0
FOP	Open Porch	757	0
SLB	Slab	2,340	0
		10,958	7,701

### Extra Features

Extra Features			Legend
Code	Description	Size	Bldg #
SPR	Sprinklers	28953 S.F.	2
SPR	Sprinklers	31325 S.F.	7
SPR	Sprinklers	34190 S.F.	4

SPR	Sprinklers	25774 S.F.	1
SPR	Sprinklers	35574 S.F.	6
SPR	Sprinklers	28593 S.F.	5
SPR	Sprinklers	28953 S.F.	11
SPR	Sprinklers	31549 S.F.	8
SPR	Sprinklers	7701 S.F.	12
SPR	Sprinklers	30409 S.F.	10
SPR	Sprinklers	33420 S.F.	3
SPR	Sprinklers	38934 S.F.	9

## Land

Land Use		Land Line Valuation	
<b>Use Code</b>	112	<b>Size (Acres)</b>	38.62
<b>Description</b>	Apartments	<b>Frontage</b>	
<b>Zone</b>		<b>Depth</b>	
<b>Neighborhood</b>	625		
<b>Alt Land Appr Category</b>	No		

## Outbuildings

Outbuildings					<u>Legend</u>
Code	Description	Sub Code	Sub Description	Size	Bldg #
FCP	Carport			3800 S.F.	9
FGR1	Garage	FR	Frame	2541 S.F.	5
FGR1	Garage	FR	Frame	2541 S.F.	11
FGR1	Garage	FR	Frame	924 S.F.	8
FGR1	Garage	FR	Frame	924 S.F.	10
FGR1	Garage	FR	Frame	966 S.F.	3
LT1	Light - 1			6 Units	6
LT1	Light - 1			8 Units	1
PAV2	Paving Concrct			2000 S.F.	12
CNP	Canopy			690 S.F.	5
CNP	Canopy			690 S.F.	11
FCP	Carport			1520 S.F.	8
FCP	Carport			1520 S.F.	9
FCP	Carport			1520 S.F.	10
FCP	Carport			3116 S.F.	3
LT1	Light - 1			6 Units	2
LT1	Light - 1			6 Units	7
LT1	Light - 1			8 Units	4
SPL4	Pool AG Rect.			2160 S.F.	12



FCP	Carport			1140 S.F.	8
FCP	Carport			1140 S.F.	10
FCP	Carport			1520 S.F.	9
GAZ1	Gazebo			150 S.F.	3
KSK1	Kiosk - Retail			64 S.F.	12
FCP	Carport			1140 S.F.	9
FGR1	Garage	FR	Frame	2373 S.F.	3
LT1	Light - 1			7 Units	5
LT1	Light - 1			8 Units	10
LT1	Light - 1			8 Units	11
CNP	Canopy			240 S.F.	9
LT1	Light - 1			4 Units	8
LT1	Light - 1			5 Units	12
LT1	Light - 1			6 Units	3
PAV1	Paving Asph.			204000 S.F.	9
LT1	Light - 1			7 Units	9

### Valuation History

Appraisal	
Valuation Year	Total
2017	\$63,111,800
2016	\$63,111,800
2015	\$63,111,800

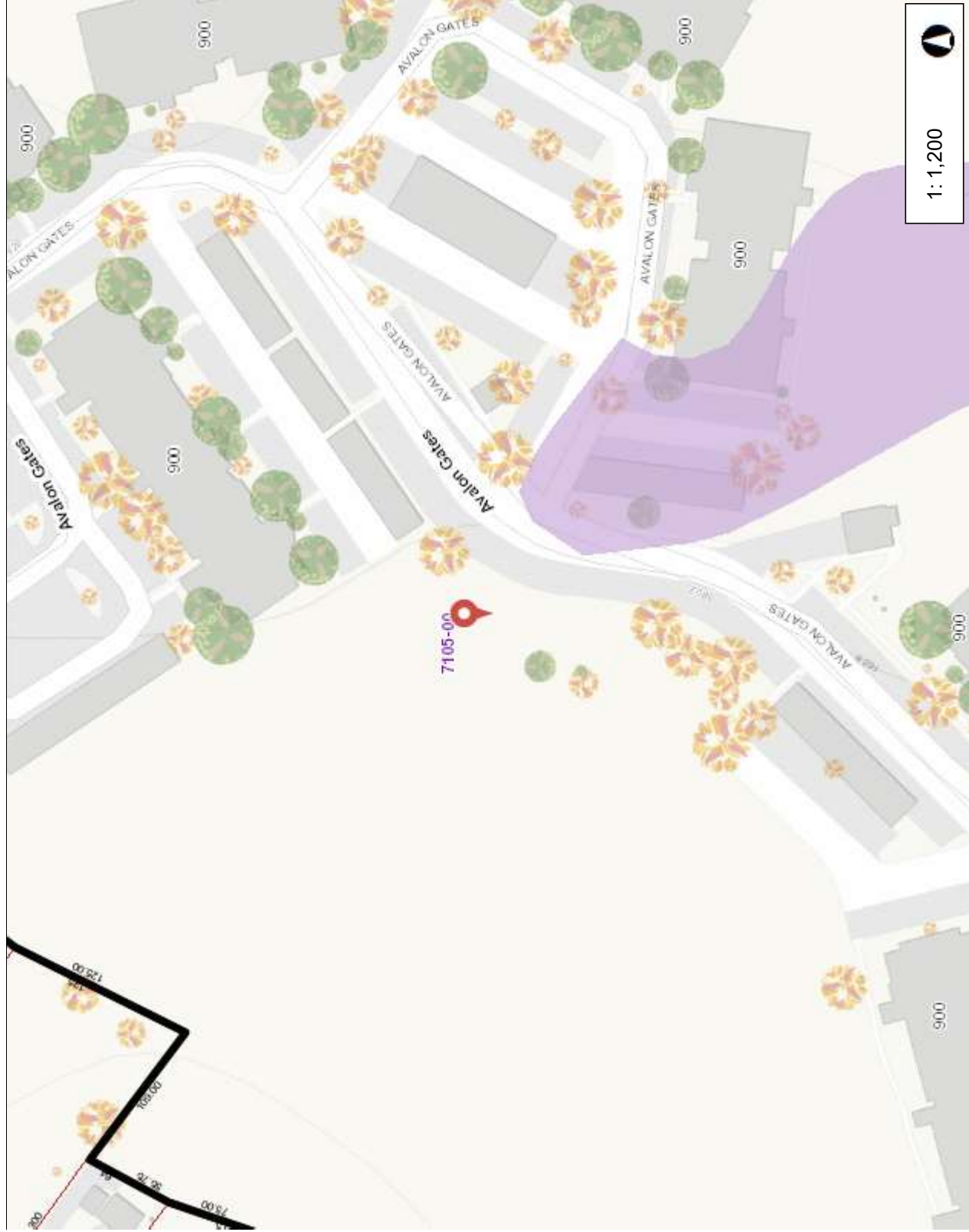
Assessment	
Valuation Year	Total
2017	\$44,178,260
2016	\$44,178,260
2015	\$44,178,260

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# Town of Trumbull

# Map Title



1:1,200

### Legend

- Streetname
- Roadways
  - Local
  - Collector
  - Minor Collector
  - Minor Arterial
  - Major Collector
  - PA Other
  - PA Other Expwy
  - PA Interstate
- Inland Wetland Soils
  - Poorly Drained and Very Poorly Dre
  - Alluvial and Floodplain Soils
- Local Basin Boundary
  - Major
  - Regional
  - Subregional
  - Local
- Local Basin Area
- Citations

200.0 0 100.00 200.0 Feet

WGS\_1984\_Web\_Mercator\_Auxiliary\_Sphere  
Created by Greater Bridgeport Regional Council

This map is a user generated static output from an Internet mapping site and is for reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable.  
**THIS MAP IS NOT TO BE USED FOR NAVIGATION**



Petition No. 915  
Staff Report  
T-Mobile USA, Inc.  
Rocky Hill Road, Trumbull  
September 17, 2009

On September 1, 2009, the Connecticut Siting Council (Council) received a Petition (Petition) from Omnipoint Communications Inc., a subsidiary of T-Mobile USA, Inc. (T-Mobile) for a Declaratory Ruling that no Certificate of Environmental Compatibility and Public Need is required for the proposed modifications to an existing 150-foot 115-kV electric transmission structure owned by the Connecticut Light and Power Company (CL&P).

Currently, T-Mobile has three panel antennas installed at the 156-foot level of the structure. The total height with appurtenances is approximately 158 feet. As part of its UMTS upgrade, T-Mobile would require three additional panel antennas. Since only three antennas can be flush-mounted at one level, T-Mobile seeks to install the three new antennas at a new height: the 164-foot level of the structure. This would require an approximately eight-foot pipe extension which would increase the total height with appurtenances to about 166-foot 2 inches. To be conservative, T-Mobile rounds the total height to a worst-case of 168 feet. T-Mobile would also install a RBS 3106 equipment cabinet on a new 5-foot 6-inch by 10-foot concrete pad at the base of the tower.

The structure is located in a CL&P right-of-way just southeast of Route 25. On the other three sides are residential properties. The closest property is approximately 150 feet southwest of the structure. The visual impact of the structure modification from this or other nearby properties is not expected to significantly increase because of the compact flush-mounted antenna configuration. In addition, the top of the tower is more difficult to see at close distances. The proposed equipment cabinet would not be located on the side of the structure facing the nearest residence. It would be located on the opposite site which would reduce its visibility.

The applicant submitted notice to abutting property owners on or about the time of filing with the Council. The due date for replies was Friday, September 11, 2009. No replies have been received. The underlying property owner (Town of Trumbull), and the electric transmission company (CL&P) were both provided notice on or about the time of filing.

This Petition was field reviewed by Council member Dr. Barbara C. Bell and Michael Perrone of the Council staff on September 9, 2009. Attorney Carrie L. Larson from Pullman and Comley LLC, and Tom F. Flynn from Maxton Technology, Inc. (both representing T-Mobile) and Fred Bietsch, Zoning Enforcement Officer from the Town of Trumbull also attended the field review.

At the field review, overgrown vegetation was found around T-Mobile's existing equipment cabinet. If approved, staff suggests including a condition that overgrown vegetation surrounding T-Mobile's equipment be removed.

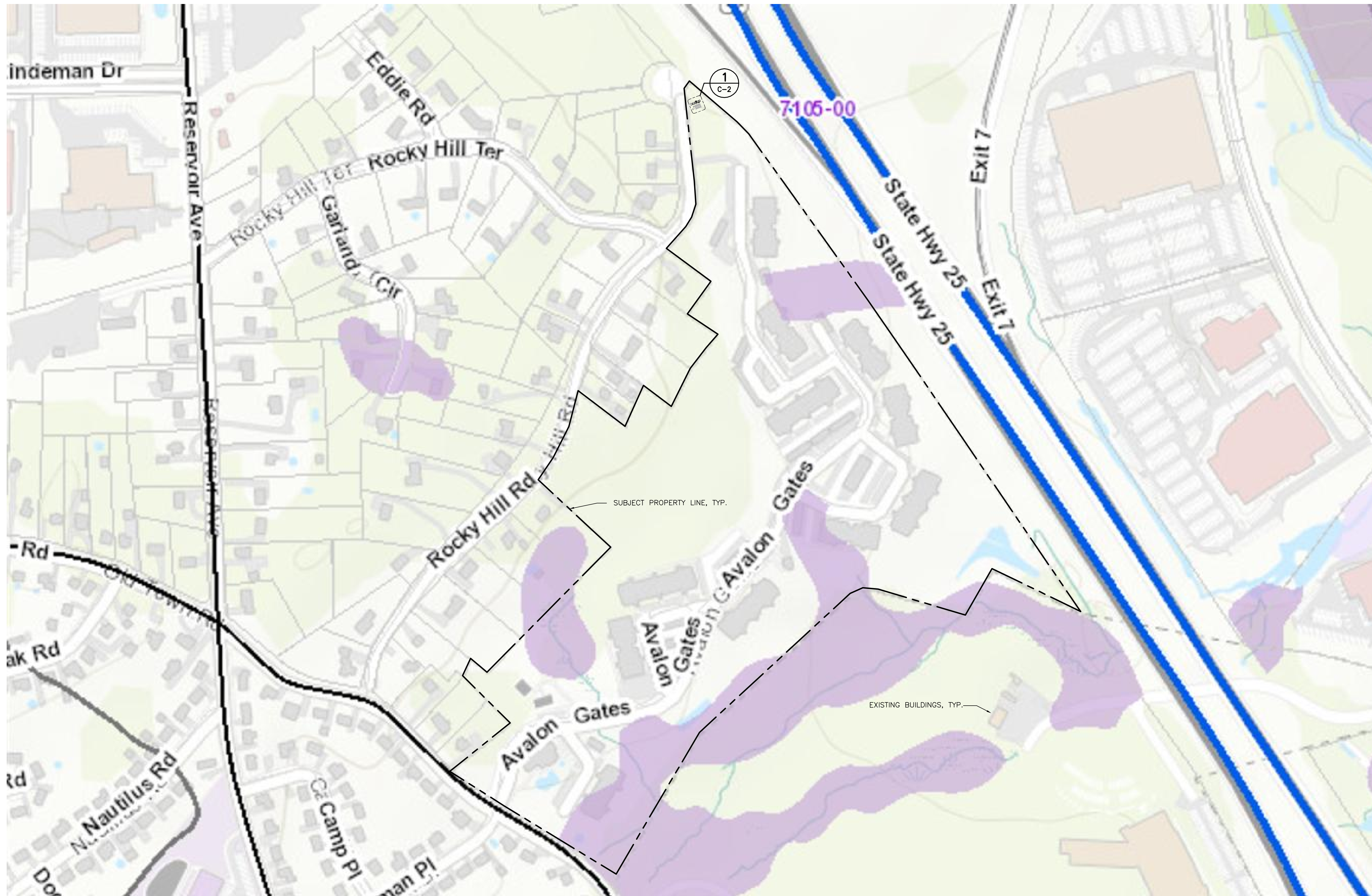




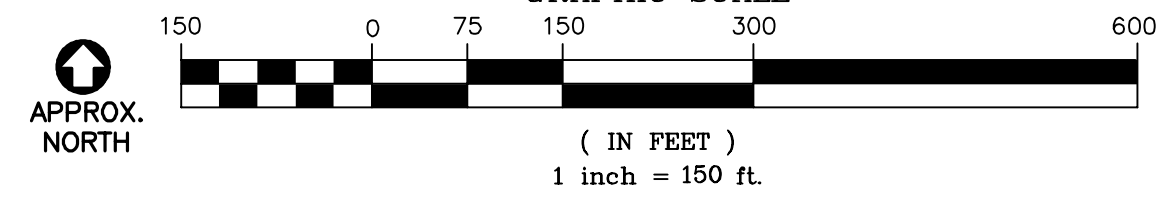




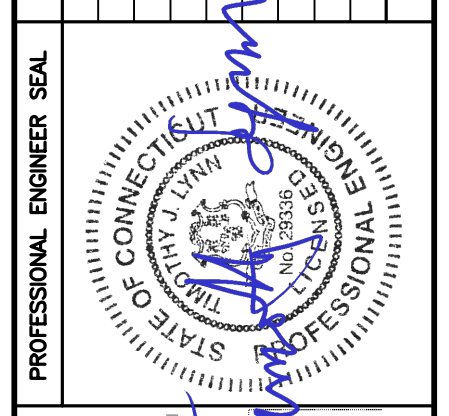




**1** SITE LOCATION PLAN  
 C-1 SCALE: 1" = 150'



REV.	DATE	BY	CHK'D BY	DESCRIPTION
1	6/20/19	TUL	CAG	ISSUED FOR CONSTRUCTION
0	4/29/19	TUL	CAG	ISSUED FOR CONSTRUCTION



**CEN TEK** engineering  
 Centered on Solutions  
 (203) 488-0380  
 (203) 488-3387 Fax  
 632 North Branford Road  
 Branford, CT 06405  
 www.CenTekEng.com

**T-MOBILE NORTHEAST LLC**  
 WIRELESS COMMUNICATIONS FACILITY  
**CL&P AT MP**  
**SITE ID: CT11080B**  
 ROCKY HILL ROAD (POLE 845)  
 TRUMBULL, CT 06611

DATE: 3/7/19  
 SCALE: AS NOTED  
 JOB NO. 18058.43

SITE LOCATION PLAN

**C-1**  
 Sheet No. 3 of 7

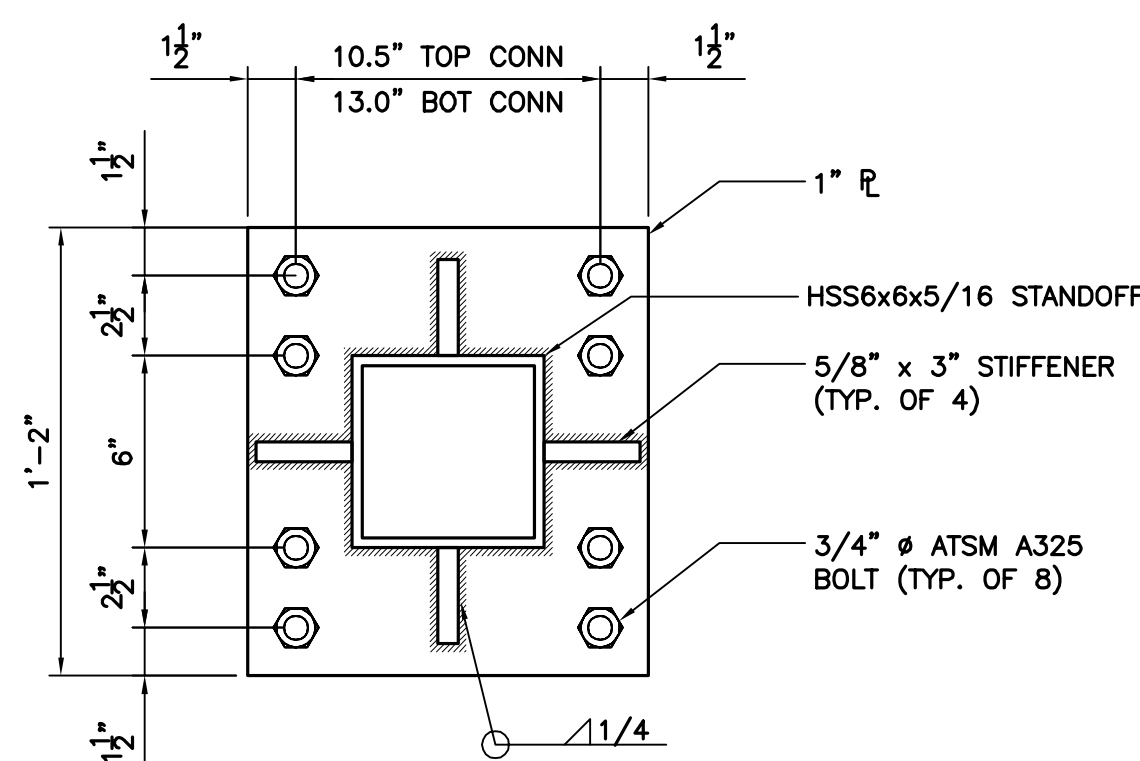




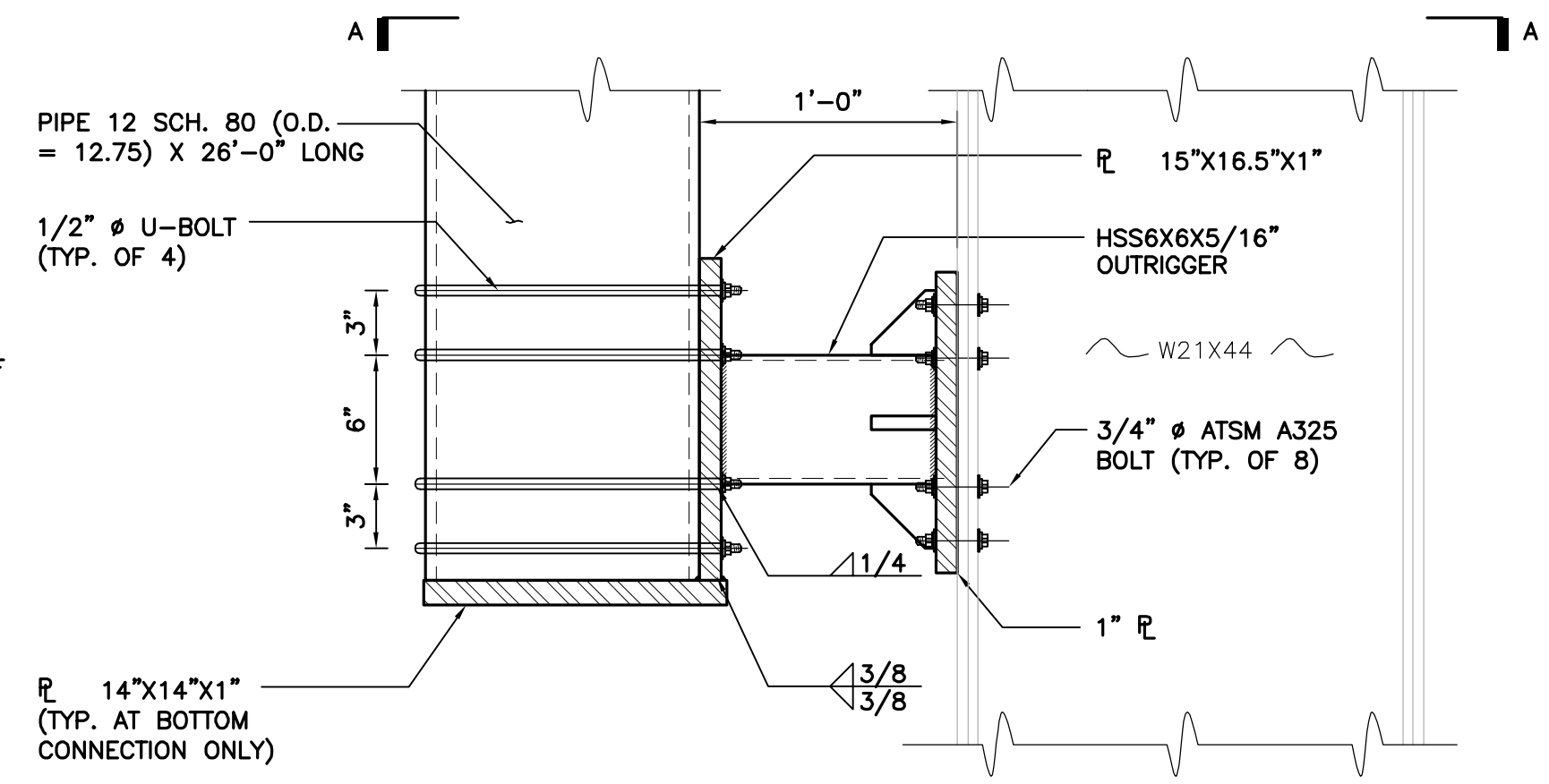
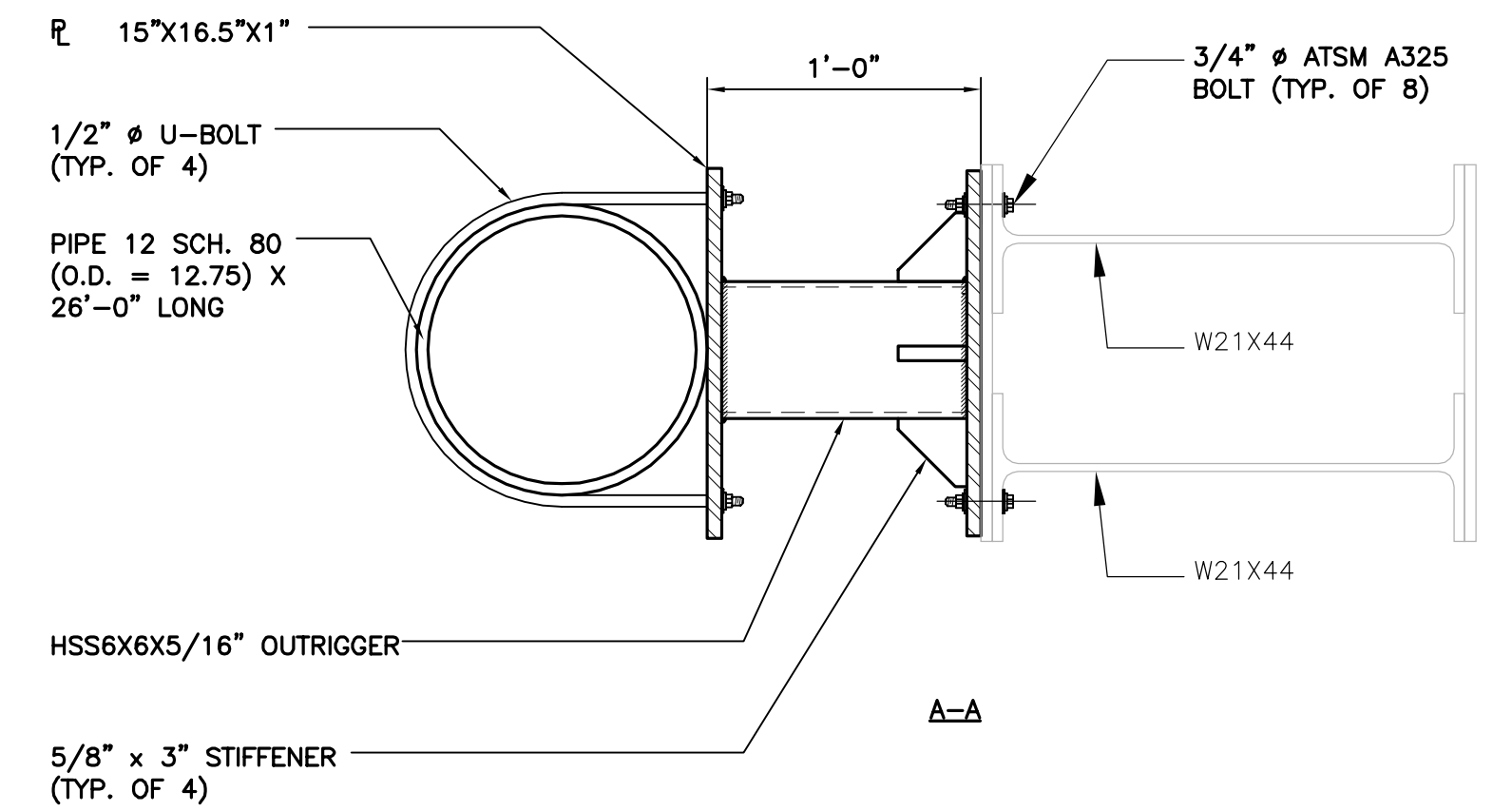








**2 CONNECTION PLATE DETAIL**  
S-1 SCALE: 2" = 1'-0"



**1 STANDOFF ARM DETAIL**  
S-1 SCALE: 1-1/2" = 1'-0"

		ISSUED FOR CONSTRUCTION CAG TUL 6/20/19
		ISSUED FOR CONSTRUCTION CAG TUL 4/29/19
		DRAWN BY CHK'D BY DATE
<b>T-MOBILE NORTHEAST LLC</b> WIRELESS COMMUNICATIONS FACILITY <b>CL&amp;P AT MP</b> <b>SITE ID: CT11080B</b> ROCKY HILL ROAD (POLE 845) TRUMBULL, CT 06611		REV. 1 0
DATE: 3/7/19 SCALE: AS NOTED JOB NO. 18058.43		DESCRIPTION
<b>MAST REPLACEMENT DETAILS</b>		
<b>S-1</b>		
Sheet No. 7 of 7		



**Structural Design of Antenna  
Mast and Tower Analysis**

*T-Mobile Site Ref: CT11080B*

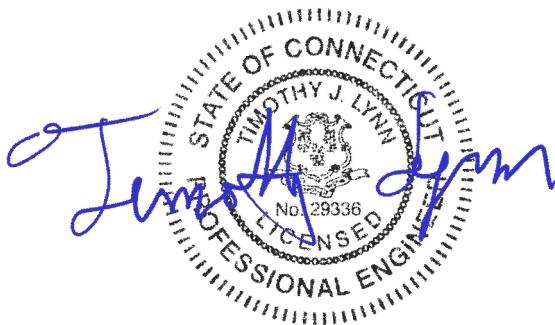
*Structure No. 845  
150' Electric Transmission Tower*

*Rocky Hill Road  
Trumbull, CT*

*CEN TEK Project No. 18058.43*

~~*Date: December 20, 2018*~~

*Rev 2: March 4, 2019*



**Prepared for:**  
*T-Mobile USA  
35 Griffin Road  
Bloomfield, CT 06002*

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## Introduction

The purpose of this report is to design an antenna mast and analyze the existing 150' tower located on Rocky Hill Road in Trumbull, CT for the proposed antenna and equipment upgrade by T-Mobile.

The proposed loads consist of the following:

- **T-MOBILE (Existing to Remain):**  
**Coax Cables:** Twelve (12) 1-1/4"  $\varnothing$  coax cables running on the exterior of the existing tower.
- **T-MOBILE (Existing to Remove):**  
**Antennas:** Three (3) RFS APXV18-206516S panel antennas mounted on an existing mast with a RAD center elevation of 164-ft above grade and three (3) RFS APXV18-206516S panel antennas mounted on an existing mast with a RAD center elevation of 156-ft above grade.
- **T-MOBILE (Proposed):**  
**Antennas:** Three (3) RFS APX16DWW-16DWVS and three (3) RFS APXVAARR24\_43 panel antennas mounted on a proposed mast with a RAD center elevation of 160-ft above grade.  
**Coax Cables:** Twelve (12) 1-1/4"  $\varnothing$  coax cables running on the exterior of the existing tower.
- **VERIZON (EXISTING):**  
**Antennas:** Three (3) Andrew SBNHH-1D65B panel antennas mounted on a proposed antenna mast with a RAD center elevation of  $\pm 90$ -ft above grade level.  
**Appurtenances:** Three (3) Alcatel-Lucent B13 RRH4x30-LTE remote radio heads, three (3) Alcatel-Lucent RRH4x45/2x90-AWS remote radio heads and one (1) RFS DB-T1-6Z-8AB-0Z distribution box mounted on a proposed antenna mast.  
**Coax Cables:** Two (2) 1-5/8"  $\varnothing$  fiber cables running on the exterior of the existing tower.

## Primary assumptions used in the analysis

- Design steel stresses are defined by AISC-LRFD 14th edition for design of the antenna Mast and antenna supporting elements.
- ASCE Manual No. 48-11, "Design of Steel Transmission Pole Structures", defines allowable steel stresses for evaluation of the utility pole.
- All utility pole members are adequately protected to prevent corrosion of steel members.
- All proposed antenna mounts are modeled as listed above.
- Pipe mast will be properly installed and maintained.
- No residual stresses exist due to incorrect pole erection.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds conform to the requirements of AWS D1.1.
- Pipe mast and utility pole will be in plumb condition.
- Utility pole was properly installed and maintained and all members were properly designed, detailed, fabricated, and installed and have been properly maintained since erection.
- Any deviation from the analyzed loading will require a new analysis for verification of structural adequacy.

## A n a l y s i s

Structural analysis of the existing antenna mast was independently completed using the current version of RISA-3D computer program licensed to CENTEK Engineering, Inc.

The existing mast was found to be structural inadequate to support the new equipment configuration and will need to be replaced with a 12-in x 26-ft long SCH. 80 pipe (O.D. = 12.75”) connected at two points to the existing tower. The proposed mast was designed to resist loads prescribed by the TIA-222G standard. Section 5 of this report details these gravity and lateral wind loads. NESC prescribed loads were also applied to the mast in order to obtain reactions needed for analyzing the utility pole structure. These loads are developed in Section 7 of this report. Load cases and combinations used in RISA-3D for TIA-222-G loading and for NESC/NU loading are listed in report Sections 6 and 8, respectively.

An envelope solution was first made to determine maximum and minimum forces, stresses, and deflections to confirm the selected section as adequate. Additional analyses were then made to determine the NESC forces to be applied to the pole structure.

The RISA-3D program contains a library of all AISC shapes and corresponding section properties are computed and applied directly within the program. The program’s Steel Code Check option was also utilized. The forces calculated in RISA-3D using NESC guidelines were then applied to the pole. Maximum usage for the pole was calculated considering the additional forces from the mast and associated appurtenances.

## D e s i g n B a s i s

Our analysis was performed in accordance with TIA-222-G, ASCE Manual No. 48-11, “Design of Steel Transmission Pole Structures”, NESC C2-2012 and Northeast Utilities Design Criteria.

### ▪ UTILITY TOWER ANALYSIS

The purpose of this analysis is to determine the adequacy of the existing utility structure to support the proposed antenna loads. The loading and design requirements were analyzed in accordance with the Eversource Design Criteria Table, NESC C2-2012 ~ Construction Grade B, and ASCE Manual No. 48-11, “Design of Steel Transmission Pole Structures”,

Load cases considered:

#### Load Case 1: NESC Heavy

Wind Pressure.....	4.0 psf
Radial Ice Thickness.....	0.5”
Vertical Overload Capacity Factor.....	1.50
Wind Overload Capacity Factor.....	2.50
Wire Tension Overload Capacity Factor.....	1.65

#### Load Case 2: NESC Extreme

Wind Speed.....	110 mph <sup>(1)</sup>
Radial Ice Thickness.....	0”

Note 1: NESC C2-2012, Section 25, Rule 250C: Extreme Wind Loading, 1.25 x Gust Response Factor (wind speed: 3-second gust)

▪ MAST ASSEMBLY ANALYSIS

Mast, appurtenances and connections to the utility tower were analyzed and designed in accordance with the Eversource Design Criteria Table, TIA-222-G and AISC standards.

Load cases considered:

Load Case 1:

Wind Speed..... 97 mph <sup>(2016 CSBC Appendix-N)</sup>  
 Radial Ice Thickness..... 0”

Load Case 2:

Wind Pressure..... 50 mph wind pressure  
 Radial Ice Thickness..... 0.75”

R e s u l t s

▪ MAST ASSEMBLY

The existing mast was found to be structural inadequate to support the new equipment configuration and will need to be replaced with a 12-in x 26-ft long SCH. 80 pipe.

Component	Stress Ratio (percentage of capacity)	Result
12” Sch. 80 Pipe	53.4%	<b>PASS</b>
Outrigger	61.8%	<b>PASS</b>
Connection to Tower	66.4%	<b>PASS</b>

Horizontal Displacement (% of Cantilever Height)	Allowable	Result
0.28 %	1.5 %	<b>PASS</b>

▪ UTILITY TOWER

This analysis finds that the subject utility pole is adequate to support the proposed antenna mast and related appurtenances. The pole stresses meet the requirements set forth by the ASCE Manual No. 48-11, “Design of Steel Transmission Pole Structures”, for the applied NESC Heavy and Hi-Wind load cases. The detailed analysis results are provided in Section 6 of this report. The analysis results are summarized as follows:

A maximum usage of **99.5%** occurs in the utility pole under the **NESC Extreme** loading condition.

TOWER SECTION:

The utility structure was found to be within allowable limits.

Tower Section	Stress Ratio (% of capacity)	Result
0’ AGL	99.5%	<b>PASS</b>



▪ FOUNDATION AND ANCHORS

The existing foundation consists of a 4-ft x 7.5-ft x 14-ft long reinforced concrete pier and an 18-ft x 22-ft x 2.5-ft thick reinforced concrete pad. The base of the tower is connected to the foundation by means of (26) 2.25"Ø, ASTM A615 Grade 60 anchor bolts embedded into the concrete foundation structure.

Subgrade properties were taken from a soil investigation done by DR. Clarence Welti, P.E., P.C. dated July 7, 2009.

BASE REACTIONS:

From analysis of utility tower based on NESC/NU prescribed loads.

Load Case	Shear (kips)	Axial (kips)	Moment (k-ft)
NESC Heavy Wind x-dir	22.5	104.5	3151
NESC Extreme Wind x-dir	40.3	50.9	4788
NESC Heavy Wind z-dir	11.1	104.5	1347
NESC Extreme Wind z-dir	35.6	50.9	3542

Note 1 – 10% increase to be applied to the above tower base reactions for foundation verification per OTRM 051

FLANGE BOLTS / FLANGE PLATE:

**The flange bolts and plate were found to be within allowable limits with the replacement of the 7/8" bolts with 1" bolts.**

Component	Design Limit	Stress Ratio (percent of capacity)	Result
Flange Bolts	Tension	96.0%	<b>PASS</b>
Flange Plate	Bending	99.8%	<b>PASS</b>

ANCHOR BOLTS / BASE PLATE:

The bolts and plate was found to be within allowable limits.

Component	Design Limit	Stress Ratio (percent of capacity)	Result
Anchor Bolts	Tension	81.7%	<b>PASS</b>
Base Plate	Bending	94.5%	<b>PASS</b>

FOUNDATION:

The foundation was found to be within allowable limits.

Foundation	Design Limit	Allowable Limit	Proposed Loading <sup>(2)</sup>	Result
Reinforced Conc. Pad and Pier	Uplift	1.0 FS <sup>(1)</sup>	2.56 FS <sup>(1)</sup>	<b>PASS</b>

Note 1: FS denotes Factor of Safety

Note 2: 10% increase to PLS base reactions used in foundation analysis per OTRM 051.

Conclusion

This analysis shows that the subject utility tower **with the flange bolt replacement is adequate** to support the proposed equipment upgrade.

The analysis is based, in part on the information provided to this office by Eversource and T-Mobile Wireless. If the existing conditions are different than the information in this report, CENTEK engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE  
Structural Engineer



STANDARD CONDITIONS FOR FURNISHING OF  
PROFESSIONAL ENGINEERING SERVICES ON  
EXISTING STRUCTURES

All engineering services are performed on the basis that the information used is current and correct. This information may consist of, but is not necessarily limited to:

- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of CENTEK engineering, Inc. or generated by field inspections or measurements of the structure.
- It is the responsibility of the client to ensure that the information provided to CENTEK engineering, Inc. and used in the performance of our engineering services is correct and complete. In the absence of information to the contrary, we assume that all structures were constructed in accordance with the drawings and specifications and are in an un-corroded condition and have not deteriorated. It is therefore assumed that its capacity has not significantly changed from the “as new” condition.
- All services will be performed to the codes specified by the client, and we do not imply to meet any other codes or requirements unless explicitly agreed in writing. If wind and ice loads or other relevant parameters are to be different from the minimum values recommended by the codes, the client shall specify the exact requirement. In the absence of information to the contrary, all work will be performed in accordance with the latest revision of ANSI/ASCE10 & ANSI/EIA-222.
- All services are performed, results obtained, and recommendations made in accordance with generally accepted engineering principles and practices. CENTEK engineering, Inc. is not responsible for the conclusions, opinions and recommendations made by others based on the information we supply.

## GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ RISA - 3 D

RISA-3D Structural Analysis Program is an integrated structural analysis and design software package for buildings, bridges, tower structures, etc.

### Modeling Features:

- Comprehensive CAD-like graphic drawing/editing capabilities that let you draw, modify and load elements as well as snap, move, rotate, copy, mirror, scale, split, merge, mesh, delete, apply, etc.
- Versatile drawing grids (orthogonal, radial, skewed)
- Universal snaps and object snaps allow drawing without grids
- Versatile general truss generator
- Powerful graphic select/unselect tools including box, line, polygon, invert, criteria, spreadsheet selection, with locking
- Saved selections to quickly recall desired selections
- Modification tools that modify single items or entire selections
- Real spreadsheets with cut, paste, fill, math, sort, find, etc.
- Dynamic synchronization between spreadsheets and views so you can edit or view any data in the plotted views or in the spreadsheets
- Simultaneous view of multiple spreadsheets
- Constant in-stream error checking and data validation
- Unlimited undo/redo capability
- Generation templates for grids, disks, cylinders, cones, arcs, trusses, tanks, hydrostatic loads, etc.
- Support for all units systems & conversions at any time
- Automatic interaction with RISASection libraries
- Import DXF, RISA-2D, STAAD and ProSteel 3D files
- Export DXF, SDNF and ProSteel 3D files

### Analysis Features:

- Static analysis and P-Delta effects
- Multiple simultaneous dynamic and response spectra analysis using Gupta, CQC or SRSS mode combinations
- Automatic inclusion of mass offset (5% or user defined) for dynamic analysis
- Physical member modeling that does not require members to be broken up at intermediate joints
- State of the art 3 or 4 node plate/shell elements
- High-end automatic mesh generation — draw a polygon with any number of sides to create a mesh of well-formed quadrilateral (NOT triangular) elements.
- Accurate analysis of tapered wide flanges - web, top and bottom flanges may all taper independently
- Automatic rigid diaphragm modeling
- Area loads with one-way or two-way distributions
- Multiple simultaneous moving loads with standard AASHTO loads and custom moving loads for bridges, cranes, etc.
- Torsional warping calculations for stiffness, stress and design
- Automatic Top of Member offset modeling
- Member end releases & rigid end offsets
- Joint master-slave assignments
- Joints detachable from diaphragms
- Enforced joint displacements
- 1-Way members, for tension only bracing, slipping, etc.

- 1-Way springs, for modeling soils and other effects
- Euler members that take compression up to their buckling load, then turn off.
- Stress calculations on any arbitrary shape
- Inactive members, plates, and diaphragms allows you to quickly remove parts of structures from consideration
- Story drift calculations provide relative drift and ratio to height
- Automatic self-weight calculations for members and plates
- Automatic subgrade soil spring generator

Graphics Features:

- Unlimited simultaneous model view windows
- Extraordinary “true to scale” rendering, even when drawing
- High-speed redraw algorithm for instant refreshing
- Dynamic scrolling stops right where you want
- Plot & print virtually everything with color coding & labeling
- Rotate, zoom, pan, scroll and snap views
- Saved views to quickly restore frequent or desired views
- Full render or wire-frame animations of deflected model and dynamic mode shapes with frame and speed control
- Animation of moving loads with speed control
- High quality customizable graphics printing

Design Features:

- Designs concrete, hot rolled steel, cold formed steel and wood
- ACI 1999/2002, BS 8110-97, CSA A23.3-94, IS456:2000, EC 2-1992 with consistent bar sizes through adjacent spans
- Exact integration of concrete stress distributions using parabolic or rectangular stress blocks
- Concrete beam detailing (Rectangular, T and L)
- Concrete column interaction diagrams
- Steel Design Codes: AISC ASD 9th, LRFD 2nd & 3rd, HSS Specification, CAN/CSA-S16.1-1994 & 2004, BS 5950-1-2000, IS 800-1984, Euro 3-1993 including local shape databases
- AISI 1999 cold formed steel design
- NDS 1991/1997/2001 wood design, including Structural Composite Lumber, multi-ply, full sawn
- Automatic spectra generation for UBC 1997, IBC 2000/2003
- Generation of load combinations: ASCE, UBC, IBC, BOCA, SBC, ACI
- Unbraced lengths for physical members that recognize connecting elements and full lengths of members
- Automatic approximation of K factors
- Tapered wide flange design with either ASD or LRFD codes
- Optimization of member sizes for all materials and all design codes, controlled by standard or user-defined lists of available sizes and criteria such as maximum depths
- Automatic calculation of custom shape properties
- Steel Shapes: AISC, HSS, CAN, ARBED, British, Euro, Indian, Chilean
- Light Gage Shapes: AISI, SSMA, Dale / Incor, Dietrich, Marino\WARE
- Wood Shapes: Complete NDS species/grade database
- Full seamless integration with RISAFoot (Ver 2 or better) for advanced footing design and detailing
- Plate force summation tool

Results Features:

- Graphic presentation of color-coded results and plotted designs
- Color contours of plate stresses and forces with quadratic smoothing, the contours may also be animated
- Spreadsheet results with sorting and filtering of: reactions, member & joint deflections, beam & plate forces/stresses, optimized sizes, code designs, concrete reinforcing, material takeoffs, frequencies and mode shapes
- Standard and user-defined reports
- Graphic member detail reports with force/stress/deflection diagrams and detailed design calculations and expanded diagrams that display magnitudes at any dialed location
- Saved solutions quickly restore analysis and design results.

## GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ PLS - TOWER

PLS-TOWER is a Microsoft Windows program for the analysis and design of steel latticed towers used in electric power lines or communication facilities. Both self-supporting and guyed towers can be modeled. The program performs design checks of structures under user specified loads. For electric power structures it can also calculate maximum allowable wind and weight spans and interaction diagrams between different ratios of allowable wind and weight spans.

### Modeling Features:

- Powerful graphics module (stress usages shown in different colors)
- Graphical selection of joints and members allows graphical editing and checking
- Towers can be shown as lines, wire frames or can be rendered as 3-d polygon surfaces
- Can extract geometry and connectivity information from a DXF CAD drawing
- CAD design drawings, title blocks, drawing borders or photos can be tied to structure model
- XML based post processor interface
- Steel Detailing Neutral File (SDNF) export to link with detailing packages
- Can link directly to line design program PLS-CADD
- Automatic generation of structure files for PLS-CADD
- Databases of steel angles, rounds, bolts, guys, etc.
- Automatic generation of joints and members by symmetries and interpolations
- Automated mast generation (quickly builds model for towers that have regular repeating sections) via graphical copy/paste
- Steel angles and rounds modeled either as truss, beam or tension-only elements
- Guys are easily handled (can be modeled as exact cable elements)

### Analysis Features:

- Automatic handling of tension-only members
- Automatic distribution of loads in 2-part suspension insulators (v-strings, horizontal vees, etc.)
- Automatic calculation of tower dead, ice, and wind loads as well as drag coefficients according to:
  - ASCE 74-1991
  - NESC 2002
  - NESC 2007
  - IEC 60826:2003
  - EN50341-1:2001 (CENELEC)
  - EN50341-3-9:2001 (UK NNA)
  - EN50341-3-17:2001 (Portugal NNA)
  - ESAA C(b)1-2003 (Australia)
  - TPNZ (New Zealand)
  - REE (Spain)
  - EIA/TIA 222-F
  - ANSI/TIA 222-G
  - CSA S37-01
- Automated microwave antenna loading as per EIA/TIA 222-F and ANSI/TIA 222-G
- Minimization of problems caused by unstable joints and mechanisms
- Automatic bandwidth minimization and ability to solve large problems
- Design checks according to (other standards can be added easily):
  - ASCE Standard 10-90

- AS 3995 (Australian Standard 3995)
- BS 8100 (British Standard 8100)
- EN50341-1 (CENELEC, both empirical and analytical methods are available)
- ECCS 1985
- NGT-ECCS
- PN-90/B-03200
- EIA/TIA 222-F
- ANSI/TIA 222-G
- CSA S37-01
- EDF/RTE Resal
- IS 802 (India Standard 802)

Results Features:

- Design summaries printed for each group of members
  - Easy to interpret text, spreadsheet and graphics design summaries
  - Automatic determination of allowable wind and weight spans
  - Automatic determination of interaction diagrams between allowable wind and weight spans
  - Capability to batch run multiple tower configurations and consolidate the results
  - Automated optimum angle member size selection and bolt quantity determination
- Tool for interactive angle member sizing and bolt quantity determination.



*Criteria for Design of PCS Facilities On or  
Extending Above Metal Electric Transmission  
Towers & Analysis of Transmission Towers  
Supporting PCS Masts* <sup>(1)</sup>

*Introduction*

This criteria is the result from an evaluation of the methods and loadings specified by the separate standards, which are used in designing telecommunications towers and electric transmission towers. That evaluation is detailed elsewhere, but in summary; the methods and loadings are significantly different. This criteria specifies the manner in which the appropriate standard is used to design PCS facilities including masts and brackets (hereafter referred to as “masts”), and to evaluate the electric transmission towers to support PCS masts. The intent is to achieve an equivalent level of safety and security under the extreme design conditions expected in Connecticut and Massachusetts.

ANSI Standard TIA-222-G covering the design of telecommunications structures specifies a working strength/allowable stress design approach. This approach applies the loads from extreme weather loading conditions, and designs the structure so that it does not exceed some defined percentage of failure strength (allowable stress).

ANSI Standard C2-2012 (National Electrical Safety Code) covering the design of electric transmission metal structures is based upon an ultimate strength/yield stress design approach. This approach applies a multiplier (overload capacity factor) to the loads possible from extreme weather loading conditions, and designs the structure so that it does not exceed its ultimate strength (yield stress).

Each standard defines the details of how loads are to be calculated differently. Most of the NU effort in “unifying” both codes was to establish what level of strength each approach would provide, and then increasing the appropriate elements of each to achieve a similar level of security under extreme weather loadings.

Two extreme weather conditions are considered. The first is an extreme wind condition (hurricane) based upon a 50-year recurrence (2% annual probability). The second is a winter condition combining wind and ice loadings.

The following sections describe the design criteria for any PCS mast extending above the top of an electric transmission tower, and the analysis criteria for evaluating the loads on the transmission tower from such a mast from the lower portions of such a mast, and loads on the pre-existing electric lower portions of such a mast, and loads on the pre-existing electric transmission tower and the conductors it supports.

| Note 1: *Prepared from documentation provide from Northeast Utilities.*

## *A n t e n n a M a s t*

The PCS facility (mast, external cable/trays, including the initial and any planned future support platforms, antennas, etc. extending the full height above the top level of the electric transmission structure) shall be designed in accordance with the provisions of TIA-222-G:

## *E L E C T R I C T R A N S M I S S I O N T O W E R*

The electric transmission tower shall be analyzed using yield stress theory in accordance with the attached table titled “NU Design Criteria”. This specifies uniform loadings (different from the TIA loadings) on the each of the following components of the installed facility:

- PCS mast for its total height above ground level, including the initial and planned future support platforms, antennas, etc. above the top of an electric transmission structure.
- Conductors are related devices and hardware.
- Electric transmission structure. The loads from the PCS facility and from the electric conductors shall be applied to the structure at conductor and PCS mast attachment points, where those load transfer to the tower.

The uniform loadings and factors specified for the above components in the table are based upon the National Electrical Safety Code 2012 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to TIA and its loads and factors with the exceptions noted above. (Note that the NESC does not require the projected wind surfaces of structures and equipment to be increased by the ice covering.)

In the event that the electric transmission tower is not sufficient to support the additional loadings of the PCS mast, reinforcement will be necessary to upgrade the strength of the overstressed members.

# Eversource Overhead Transmission Standards

## Attachment A Eversource Design Criteria

Attachment A NU Design Criteria		Basic Wind Speed	Pressure	Height factor	Gust Factor	Load or Stress Factor	Force Coef. - Shape Factor	
		V (MPH)	Q (PSF)	Kz	Gh			
Ice Condition	TIA/EIA	Antenna Mount	TIA	TIA (0.75Wi )	TIA	TIA	TIA, Section 3.1.1.1 disallowed for connection design	TIA
	NESC Heavy	Tower/Pole Analysis with antennas extending above top of Tower/Pole (Yield Stress)	—	4	1	1	2.50	1.6 Flat Surfaces 1.3 Round Surfaces
		Tower/Pole Analysis with antennas below top of Tower/Pole (on two faces)	—	4	1	1	2.50	1.6 Flat Surfaces 1.3 Round Surfaces
Conductors:		Conductor Loads Provided by NU						
High Wind Condition	TIA/EIA	Antenna Mount	85	TIA	TIA	TIA	TIA, Section 3.1.1.1 disallowed for connection design	TIA
	NESC Extreme Wind	Tower/Pole Analysis with antennas extending above top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250C: Extreme Wind Loading Apply a 1.25 X Gust Response Factor to all telecommunication equipment projected above top of tower/pole and apply a 1.0 x Gust Response Factor to the tower/pole structure					1.6 Flat Surfaces 1.3 Round Surfaces
		Tower/Pole Analysis with antennas below top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250C: Extreme Wind Loading Height above ground is based on overall height to top of tower/pole					1.6 Flat Surfaces 1.3 Round Surfaces
Conductors:		Conductor Loads Provided by NU						
NESC Extreme Ice with Wind Condition *		Tower/Pole Analysis with antennas extending above top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250D: Extreme Ice with Wind Loading 4 PSF Wind Load 1.25 X Gust Response Factor Apply a 1.25 X Gust Response Factor to all telecommunication equipment projected above top of tower/pole and apply a 1.0 x Gust Response Factor to the tower/pole structure					1.6 Flat Surfaces 1.3 Round Surfaces
		Tower/Pole Analysis with antennas below top of Tower/Pole	For wind speed use OTRM 060 Map 1, Rule 250D: Extreme Ice with Wind Loading 4 PSF Wind Load Height above ground is based on overall height to top of tower/pole					1.6 Flat Surfaces 1.3 Round Surfaces
	Conductors:		Conductor Loads Provided by NU					
		* Only for structures installed after 2007						

### Communication Antennas on Transmission Structures

## Eversource Overhead Transmission Standards

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mount as specified below, and shall include the wireless communication mast and antenna loads per NESC criteria)

The strength reduction factor obtained from the field investigation shall be applied to the members or connections that are showing signs of deterioration from their original condition

With the written approval of Eversource Transmission Line Engineering on a case by case the existing structures may be analyzed initially using the current NESC code, then it is permitted to use the original design code with the original conductor load should the existing tower fail the current NESC code.

The structure shall be analyzed using yield stress theory in accordance with Attachment A, "Eversource Design Criteria." This specifies uniform loadings (different from the TIA loadings) on each of the following components of the installed facility:

- a) Wireless communication mast for its total height above ground level, including the initial and any planned future equipment (Support Platforms, Antennas, TMA's etc.) above the top of an electric transmission structure.
- b) Conductors and related devices and hardware (wire loads will be provided by Eversource).
- c) Electric Transmission Structure
  - i) The loads from the wireless communication equipment components based on NESC and Eversource Criteria in Attachment A, and from the electric conductors shall be applied to the structure at conductor and wireless communication mast attachment points, where those loads transfer to the tower.
  - ii) Shape Factor Multiplier:

NESC Structure Shape	Cd
Polyround (for polygonal steel poles)	1.3
Flat	1.6
Open Lattice	3.2
Pole with Coaxial Cable	1.6

- iii) When Coaxial Cables are mounted alongside the pole structure, the shape multiplier shall be:

Mount Type	Cable Cd	Pole Cd
Coaxial Cables on outside periphery (One layer)	1.45	1.45
Coaxial Cables mounted on stand offs	1.6	1.6

- d) The uniform loadings and factors specified for the above components in Attachment A, "Eversource Design Criteria" are based upon the National Electric Safety Code 2007 Edition Extreme Wind (Rule 250C) and Combined Ice and Wind (Rule 250B-Heavy) Loadings. These provide equivalent loadings compared to the TIA and its loads and factors with the exceptions noted above.

**Note:** The NESC does not require ice load be included in the supporting structure. (Ice on conductors and shield wire only, and Eversource will provide these loads).

- e) Mast reaction loads shall be evaluated for local effects on the transmission structure members at the attachment points.

### Communication Antennas on Transmission Structures

**Project:** *Lines 1714 & 1710, Structure 845*  
**Date:** *10/19/2018*  
**Engineer:** *TG*  
**Checked by:** *JS*  
**Purpose** *Recalculate wire loads.*

**1714 Line**

**Conductor:** *1590 Lapwing ACSR, sagged in PLS-CADD*  
**Shield Wire:** *FOCAS 0.738" OPGW, sagged in PLS-CADD*

**1710 Line**

**Conductor:** *1590 Lapwing ACSR, sagged in PLS-CADD*  
**Shield Wire:** *7#8 Alumoweld, sagged in PLS-CADD*

**NESC 250B**

	<i>Vertical</i>	<i>Transverse</i>	<i>Longitudinal</i>
<b>Conductor</b>	4759	2046	0
<b>Alumoweld</b>	1202	1101	0
<b>OPGW</b>	1973	1475	0

**HISTORICAL**

**NESC 250C**

	<i>Vertical</i>	<i>Transverse</i>	<i>Longitudinal</i>
<b>Conductor</b>	2109	2349	0
<b>Alumoweld</b>	329	607	0
<b>OPGW</b>	675	1185	0





## DESIGN BASIS

- GOVERNING CODE: 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CT STATE SUPPLEMENT.
- TIA-222-G, ASCE MANUAL NO. 48-11 - "DESIGN OF STEEL TRANSMISSION POLE STRUCTURES SECOND EDITION", NESC C2-2007 AND NORTHEAST UTILITIES DESIGN CRITERIA.
- DESIGN CRITERIA  
 WIND LOAD: (ANTENNA MAST)  
 NOMINAL DESIGN WIND SPEED (V) = 97 MPH (2018 CSBC: APPENDIX 'N')  
 WIND LOAD: (UTILITY POLE & FOUNDATION)  
 BASIC WIND SPEED (V) = 110 MPH (3-SECOND GUST) BASED ON NESC C2-2007, SECTION 25 RULE 250C.

## GENERAL NOTES

- REFER TO STRUCTURAL ANALYSIS PREPARED BY CENTEK ENGINEERING, INC., FOR T-MOBILE DATED 11/13/18.
- TOWER GEOMETRY AND STRUCTURE MEMBER SIZES WERE OBTAINED FROM THE ORIGINAL TOWER DESIGN DOCUMENTS PREPARED BY THE FINNEY STEEL POLE CO. JOB NO.: 1300.8 CIRCA 1971.
- THE TEMPORARY DETACHMENT AND/OR REPLACEMENT OF TOWER MEMBERS SHALL BE DONE ONE AT A TIME AND SHALL BE CONDUCTED ON DAYS WITH LESS THAN 15 MPH WIND PRESENT. NO MEMBER SHALL BE LEFT DISCONNECTED FOR THE NEXT WORKING DAY.
- ALL STEEL REINFORCEMENT SHOWN HEREIN APPLIES TO ALL SIDES OF THE TOWER.
- ALL REPLACEMENT STEEL MEMBERS SHALL BE INSTALLED WITH A325-N BOLTS (SIZE TO MATCH EXISTING). UNLESS OTHERWISE NOTED BELOW.
- THE TOWER STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER REINFORCEMENTS ARE COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE & SEQUENCE AND TO INSURE THE SAFETY OF THE TOWER STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES PROVIDING AND MAINTAINING ADEQUATE SHORING, BRACING, UNDERPINNING, TEMPORARY ANCHORS, GUYING, BARRICADES, ETC. AS MAY BE REQUIRED FOR THE PROTECTION OF EXISTING PROPERTY, CONSTRUCTION WORKERS, AND FOR PUBLIC SAFETY. MAINTAIN EXISTING SITE OPERATIONS AND COORDINATE WORK WITH TOWER OWNER.
- ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE GOVERNING BUILDING CODE.
- DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS SCOPE OF WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
- BEFORE BEGINNING THE WORK, THE CONTRACTOR IS RESPONSIBLE FOR MAKING SUCH INVESTIGATIONS CONCERNING PHYSICAL CONDITIONS (SURFACE AND SUBSURFACE) AT OR CONTIGUOUS TO THE SITE WHICH MAY AFFECT PERFORMANCE AND COST OF THE WORK. THIS INCLUDES VERIFYING ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA. CONTRACTOR SHALL TAKE FIELD MEASUREMENTS NECESSARY TO ASSURE PROPER FIT OF ALL FINISHED WORK.
- TOWER REINFORCEMENTS SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF TRANSMISSION STRUCTURES. ALL SAFETY PROCEDURES, RIGGING AND ERECTION METHODS SHALL BE STANDARD TO THE INDUSTRY AND IN COMPLIANCE WITH OSHA.
- EXISTING COAXIAL CABLES AND ALL ACCESSORIES SHALL BE RELOCATED AS NECESSARY AND REINSTALLED BY THE CONTRACTOR WITHOUT INTERRUPTION IN SERVICE WHERE THEY ARE IN CONFLICT WITH THE TOWER REINFORCEMENT WORK.
- IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
- ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
- NO DRILLING WELDING OR TAPING IS PERMITTED ON CL&P OWNED EQUIPMENT.

REV	DATE	BY	CHK'D	DESCRIPTION
1	12/12/19	TFL	CMG	ISSUED FOR CONSTRUCTION
2	11/13/18	TFL	CMG	ISSUED FOR CONSTRUCTION REVIEW



T-MOBILE  
 GENERAL NOTATION  
 STRUCTURE 845  
 ROCKY HILL ROAD  
 THUNDERBOLT, CT 06865

DATE: 11/13/18  
 SCALE: AS SHOWN  
 JOB NO.: 1805B-43

DESIGN BASIS AND  
 GENERAL NOTES



## STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD).
  2. MATERIAL SPECIFICATIONS
    - A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
    - B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI).
    - C. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
    - D. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
    - E. PIPE---ASTM A53 GRADE B (FY = 35 KSI)
  3. FASTENER SPECIFICATIONS
    - A. CONNECTION BOLTS---ASTM A325-N, UNLESS OTHERWISE SCHEDULED.
    - B. U-BOLTS---ASTM A307
    - C. ANCHOR RODS---ASTM F1554
    - D. WELDING ELECTRODES---ASTM E70XX FOR A36 & A572\_GR50 STEELS, ASTM E80XX FOR A572\_GR65 STEEL.
  4. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.
  5. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.
  6. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.
  7. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.
  8. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.
  9. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.
  10. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.
- 
11. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".
  12. CONTRACTOR SHALL COMPLY WITH AWS CODE FOR PROCEDURES APPEARANCE AND QUALITY OF WELDS, AND WELDING PROCESSES SHALL BE QUALIFIED IN ACCORDANCE WITH AWS "STANDARD QUALIFICATION PROCEDURES". ALL WELDING SHALL BE DONE USING THE SCHEDULED ELECTRODES AND WELDING SHALL CONFORM TO AISC AND D1.1 WHERE FILLET WELD SIZES ARE NOT SHOWN, PROVIDE THE MINIMUM SIZE PER TABLE J2.4 IN THE AISC "MANUAL OF STEEL CONSTRUCTION" 9TH EDITION. AT THE COMPLETION OF WELDING, ALL DAMAGE TO GALVANIZED COATING SHALL BE REPAIRED.
  13. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.
  14. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.
  15. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.
  16. LOCK WASHER ARE NOT PERMITTED FOR A325 BOLTED STEEL ASSEMBLIES.
  17. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.
  18. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.
  19. FABRICATE BEAMS WITH MILL CAMBER UP.
  20. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.
  21. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.

REV	DATE	BY	CHK'D BY	DESCRIPTION
1	12/12/19	TAL	CMG	ISSUED FOR CONSTRUCTION
0	11/13/18	TAL	CMG	ISSUED FOR ENGINEER REVIEW



T-MOBILE	MOBILE
CT11080B	STRUCTURE 845
MOBILE	MOBILE
DATE: 11/13/18	SCALE: AS SHOWN
JOB NO. 18058-43	

STRUCTURAL  
STEEL NOTES

SHEET NO.  
**N-2**  
Sheet No. 3 of 6



T-MOBILE (EXISTING TO REMOVE):  
 SIX (6) RFS APXV18-206516S PANEL  
 ANTENNAS MOUNTED TO EXISTING PIPE MAST.  
 T-MOBILE (PROPOSED):  
 THREE (3) RFS APX16DW-16DWS AND  
 THREE (3) RFS APXVAARR24\_43 PANEL  
 ANTENNAS MOUNTED ON TWO (2) SITE  
 MONOPOLE DOUBLE SUPPORT ARMS (P/N  
 ROS-284) SPACED 4' APART.

PROPOSED 12 SCH 80 PIPE  
 MAST X 26' LONG.

VERIZON (EXISTING): THREE (3) ANDREW  
 SBNHH-1D65B PANEL ANTENNAS, THREE  
 (3) B13 RRH4X30-LIE, THREE (3)  
 RRH4X45/2X90-AWS AND ONE (1)  
 DB-T1-6Z-8AB-OZ DISTRIBUTION BOXES  
 ON PROPOSED ANTENNA MAST

REPLACE EXISTING 7/8"  $\phi$  A490  
 FLANGE BOLTS WITH 1"  $\phi$  A490  
 BOLTS (TYP. OF 24) REAM HOLES  
 AS REQUIRED. REPLACE (1) BOLT  
 AT A TIME

T-MOBILE PROPOSED (12)  
 1-1/4" DIA. COAX CABLES  
 ROUTED TO EXTERIOR OF  
 TOWER ON EXISTING COAX  
 BRACKETS

T-MOBILE EXISTING (12)  
 1-1/4" DIA. COAX  
 CABLES ROUTED TO  
 EXTERIOR OF TOWER ON  
 EXISTING COAX BRACKETS

EXISTING 150' TALL  
 STEEL TRANSMISSION  
 STRUCTURE NO. 845

VERIZON EXISTING (2)  
 1-5/8" DIA. FIBER  
 CABLES ROUTED TO  
 EXTERIOR OF TOWER ON  
 EXISTING COAX BRACKETS

- ⊕ T-MOBILE ANTENNAS  
EL.  $\pm 160'-0"$  AGL
- ⊕ TOP CONNECTION  
EL.  $\pm 147'-0"$  AGL
- ⊕ BOT. CONNECTION  
EL.  $\pm 138'-0"$  AGL

LEGEND:  
 1. A.G.L.= ABOVE GROUND LEVEL  
 2. A.T.B.= ABOVE TOWER BASE

- ⊕ VERIZON ANTENNAS  
EL.  $\pm 90'-0"$  AGL

VERIZON EXISTING (2) 1-5/8"  
 DIA. FIBER CABLES ROUTED TO  
 EXTERIOR OF TOWER

EXISTING 150' TALL STEEL  
 TRANSMISSION  
 STRUCTURE  
 NO. 845

T-MOBILE EXISTING (12)  
 1-1/4" DIA. COAX CABLES  
 ROUTED TO EXTERIOR OF  
 TOWER ON EXISTING COAX  
 BRACKETS (BEHIND)

FINISHED GRADE

1 TOWER & ANTENNA MAST ELEVATION

SCALE: NOT TO SCALE

2 FEEDLINE PLAN

SCALE: 1" = 1'-0"

REV.	DATE	ISSUED BY	CHKD BY	DESCRIPTION
1	11/13/18	TAL	GMS	ISSUED FOR CONSTRUCTION
2	12/12/18	TAL	GMS	ISSUED FOR CONSTRUCTION

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T-MOBILE  
 CT11080B  
 STRUCTURE 845  
 ROCK HILL, SOUTH CAROLINA

DATE: 11/13/18  
 SCALE: AS SHOWN  
 SHEET NO.: 10058.43

TOWER ELEVATION  
 AND FEEDLINE  
 PLAN

SHEET NO. S-1  
 OF 5

REV.	DATE	BY	CHK'D BY	DESCRIPTION
1	11/13/18	TJL	CMS	ISSUED FOR CONSTRUCTION
0	11/13/18	TJL	CMS	ISSUED FOR RESOURCE REVIEW

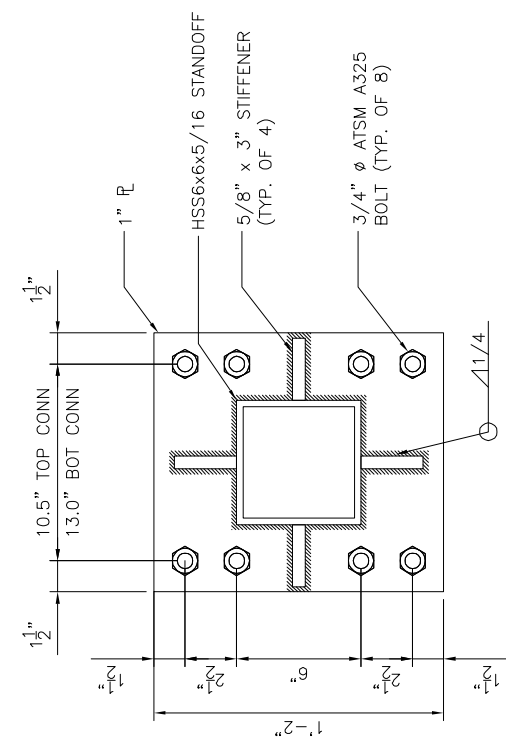
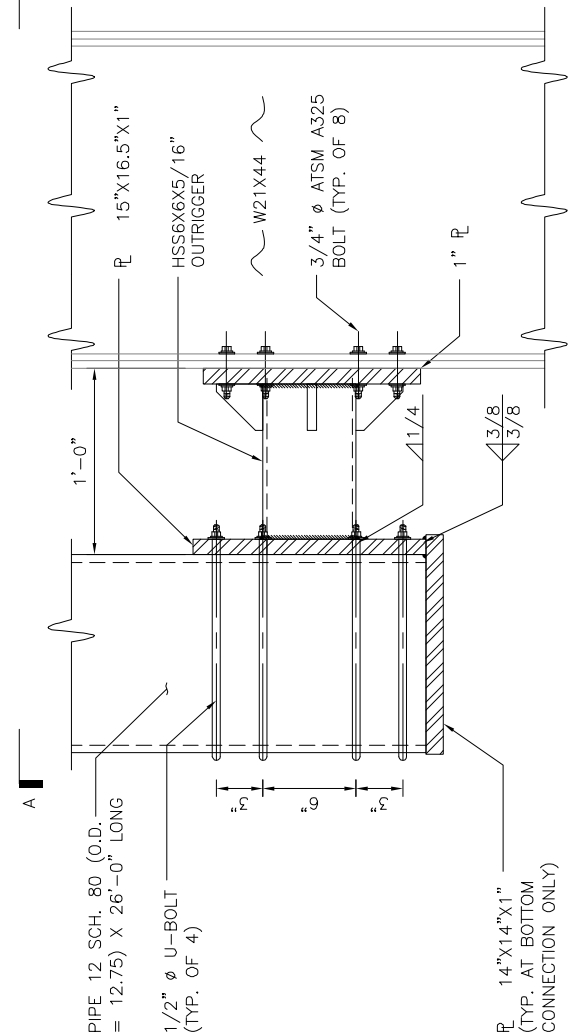
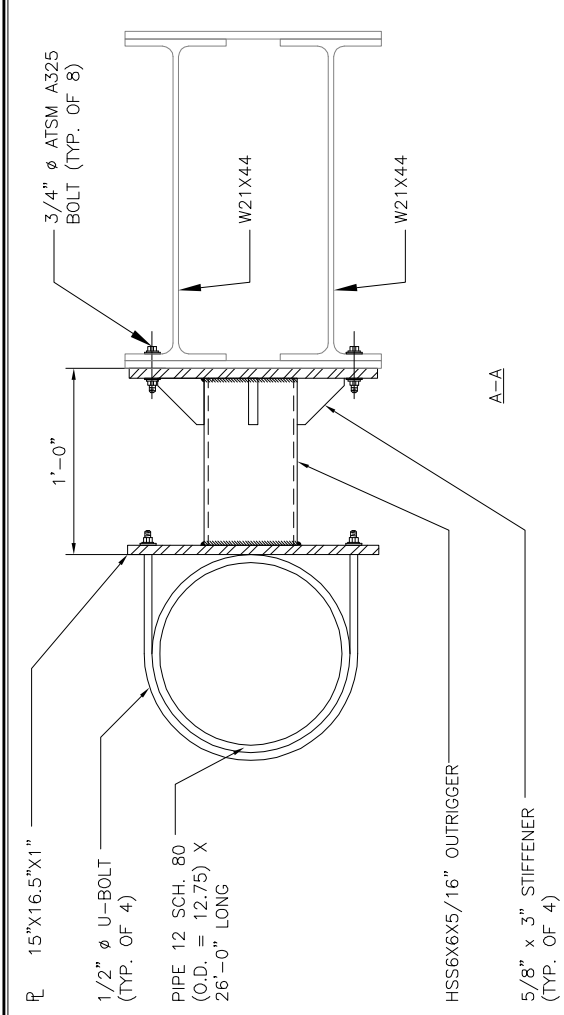
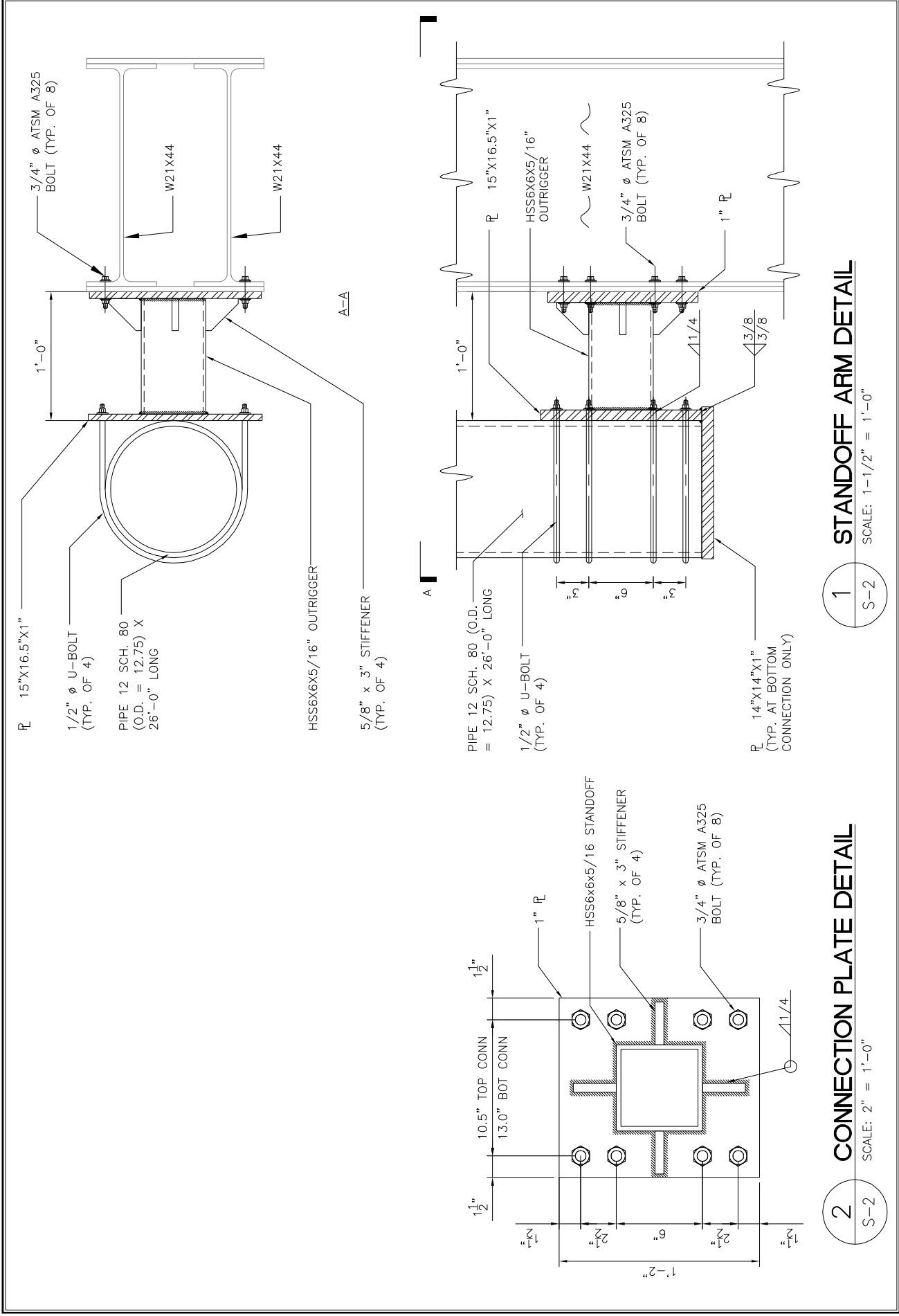
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T-MOBILE  
ANTENNA MAST  
STRUCTURE 845  
CT11080B  
TRUCKEE, CT 0960

DATE: 11/13/18  
SCALE: AS SHOWN  
JOB NO. 1805843

SHEET NO. **S-2**  
Sheet No. 5 of 5



**Development of Design Heights, Exposure Coefficients,  
 and Velocity Pressures Per TIA-222-G**

**Wind Speeds**

Basic Wind Speed	$V := 97$	mph	(User Input - 2018 CSBC Appendix N)
Basic Wind Speed with Ice	$V_i := 50$	mph	(User Input per Annex B of TIA-222-G)
Basic Wind Speed Service Loads	$V_{Ser} := 60$	mph	(User Input - TIA-222-G Section 2.8.3)

**Input**

Structure Type =	Structure_Type := Pole		(User Input)
Structure Category =	SC := III		(User Input)
Exposure Category =	Exp := C		(User Input)
Structure Height =	$h := 150$	ft	(User Input)
Height to Center of Antennas =	$z_{ant} := 160$	ft	(User Input)
Height to Center of Mast =	$z_{mast} := 151$	ft	(User Input)
Radial Ice Thickness =	$t_i := 0.75$	in	(User Input per Annex B of TIA-222-G)
Radial Ice Density =	$\rho_i := 56.00$	pcf	(User Input)
Topographic Factor =	$K_{zt} := 1.0$		(User Input)
	$K_a := 1.0$		(User Input)
Gust Response Factor =	$G_H := 1.35$		(User Input)

**Output**

Wind Direction Probability Factor =	$K_d := \begin{cases} 0.95 & \text{if Structure\_Type = Pole} \\ 0.85 & \text{if Structure\_Type = Lattice} \end{cases} = 0.95$	(Per Table 2-2 of TIA-222-G)
Importance Factors =	$I_{Wind} := \begin{cases} 0.87 & \text{if SC = 1} \\ 1.00 & \text{if SC = 2} \\ 1.15 & \text{if SC = 3} \end{cases} = 1.15$	(Per Table 2-3 of TIA-222-G)
	$I_{Wind\_w\_Ice} := \begin{cases} 0 & \text{if SC = 1} \\ 1.00 & \text{if SC = 2} \\ 1.00 & \text{if SC = 3} \end{cases} = 1$	
	$I_{ice} := \begin{cases} 0 & \text{if SC = 1} \\ 1.00 & \text{if SC = 2} \\ 1.25 & \text{if SC = 3} \end{cases} = 1.25$	
Wind Direction Probability Factor (Service) =	$K_{dSer} := 0.85$	(Per Section 2.8.3 of TIA-222-G)
Importance Factor (Service) =	$I_{Ser} := 1$	(Per Section 2.8.3 of TIA-222-G)

$$K_{iz} := \left( \frac{z_{ant}}{33} \right)^{0.1} = 1.171$$

Velocity Pressure Coefficient Antennas =

Velocity Pressure w/o Ice Antennas =

Velocity Pressure with Ice Antennas =

Velocity Pressure Service =

$$t_{iz,ant} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{iz} \cdot K_{zt}^{0.35} = 2.196$$

$$K_{z_{ant}} := 2.01 \left( \left( \frac{z_{ant}}{z_g} \right) \right)^{\frac{2}{\alpha}} = 1.397$$

$$q_{z_{ant}} := 0.00256 \cdot K_d \cdot K_{z_{ant}} \cdot V_{Wind}^2 \cdot I_{Wind} = 36.769$$

$$q_{z_{ice,ant}} := 0.00256 \cdot K_d \cdot K_{z_{ant}} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 8.495$$

$$q_{z_{ant, Ser}} := 0.00256 \cdot K_{dSer} \cdot K_{z_{ant}} \cdot V_{Ser}^2 \cdot I_{Ser} = 10.946$$

$$K_{izmast} := \left( \frac{z_{mast}}{33} \right)^{0.1} = 1.164$$

Velocity Pressure Coefficient Mast =

Velocity Pressure w/o Ice Mast =

Velocity Pressure with Ice Mast =

Velocity Pressure Service =

$$t_{izmast} := 2.0 \cdot t_i \cdot I_{ice} \cdot K_{izmast} \cdot K_{zt}^{0.35} = 2.183$$

$$K_{z_{mast}} := 2.01 \left( \left( \frac{z_{mast}}{z_g} \right) \right)^{\frac{2}{\alpha}} = 1.38$$

$$q_{z_{mast}} := 0.00256 \cdot K_d \cdot K_{z_{mast}} \cdot V_{Wind}^2 \cdot I_{Wind} = 36.323$$

$$q_{z_{ice,mast}} := 0.00256 \cdot K_d \cdot K_{z_{mast}} \cdot V_i^2 \cdot I_{Wind\_w\_Ice} = 8.392$$

$$q_{z_{mast, Ser}} := 0.00256 \cdot K_{dSer} \cdot K_{z_{mast}} \cdot V_{Ser}^2 \cdot I_{Ser} = 10.813$$

**Development of Wind & Ice Load on Mast**

**Mast Data:**

	(12" Sch. 80 Pipe)	(User Input)
Mast Shape =	Round	(User Input)
Mast Diameter =	$D_{mast} := 12.75$ in	(User Input)
Mast Length =	$L_{mast} := 26$ ft	(User Input)
Mast Thickness =	$t_{mast} := 0.5$ in	(User Input)
Velocity Coefficient =	$C := \sqrt{1 + Kz_{mast}} \cdot V \cdot \frac{D_{mast}}{12} = 121$	
Mast Force Coefficient =	$CF_{mast} = 0.6$	

**Wind Load (without ice)**

Mast Projected Surface Area =	$A_{mast} := \frac{D_{mast}}{12} = 1.063$	sf/ft
Total Mast Wind Force =	$qZ_{mast} \cdot G_H \cdot CF_{mast} \cdot A_{mast} = 31$	plf <b>BLC 5,7</b>

**Wind Load (with ice)**

Mast Projected Surface Area w/ Ice =	$A_{ICE_{mast}} := \frac{(D_{mast} + 2 \cdot t_{izmast})}{12} = 1.426$	sf/ft
Total Mast Wind Force w/ Ice =	$qZ_{ice.mast} \cdot G_H \cdot CF_{mast} \cdot A_{ICE_{mast}} = 10$	plf <b>BLC 4,6</b>

**Wind Load (Service)**

Total Mast Wind Force Service Loads =	$qZ_{mast.Ser} \cdot G_H \cdot CF_{mast} \cdot A_{mast} = 9$	plf <b>BLC 8</b>
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**Gravity Loads (without ice)**

Weight of the mast =	Self Weight (Computed internally by Risa-3D)	plf <b>BLC 1</b>
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**Gravity Loads (ice only)**

Ice Area per Linear Foot =	$A_{i_{mast}} := \frac{\pi}{4} [(D_{mast} + t_{izmast})^2 - D_{mast}^2] = 102.4$	sq in
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Weight of Ice on Mast =

	$W_{ICE_{mast}} := Id \cdot \frac{A_{i_{mast}}}{144} = 40$	plf <b>BLC 3</b>
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**Development of Wind & Ice Load on Antennas**

**Antenna Data:**

Antenna Model =	RFSAPX16DWV-16DWVS	
Antenna Shape =	Flat	(User Input)
Antenna Height =	$L_{ant} := 55.9$	in (User Input)
Antenna Width =	$W_{ant} := 13$	in (User Input)
Antenna Thickness =	$T_{ant} := 3.15$	in (User Input)
Antenna Weight =	$WT_{ant} := 45$	lbs (User Input)
Number of Antennas =	$N_{ant} := 3$	(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.3$	
Antenna Force Coefficient =	$Ca_{ant} = 1.28$	

**Wind Load (without ice)**

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 5$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 15.1$	sf
<b>Total Antenna Wind Force =</b>	<b><math>F_{ant} := qz_{ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 962</math></b>	lbs <b>BLC 5,7</b>

**Wind Load (with ice)**

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{iz,ant}) \cdot (W_{ant} + 2 \cdot t_{iz,ant})}{144} = 7.3$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 21.8$	sf
<b>Total Antenna Wind Force w/ Ice =</b>	<b><math>F_{ant} := qz_{ice,ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 321</math></b>	lbs <b>BLC 4,6</b>

**Wind Load (Service)**

<b>Total Antenna Wind Force Service Loads =</b>	<b><math>F_{ant, Ser} := qz_{ant, Ser} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 286</math></b>	lbs <b>BLC 8</b>
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**Gravity Load (without ice)**

<b>Weight of All Antennas =</b>	<b><math>WT_{ant} \cdot N_{ant} = 135</math></b>	lbs <b>BLC 2</b>
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**Gravity Loads (ice only)**

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2289$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 2 \cdot t_{iz,ant}) \cdot (W_{ant} + 2 \cdot t_{iz,ant}) \cdot (T_{ant} + 2 \cdot t_{iz,ant}) - V_{ant} = 5618$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot \rho_d = 182$	lbs
<b>Weight of Ice on All Antennas =</b>	<b><math>W_{ICEant} \cdot N_{ant} = 546</math></b>	lbs <b>BLC 3</b>



**Development of Wind & Ice Load on Antennas**

**Antenna Data:**

Antenna Model =	RFSAPXVAARR24_43	
Antenna Shape =	Flat	(User Input)
Antenna Height =	$L_{ant} := 95.9$	in (User Input)
Antenna Width =	$W_{ant} := 24$	in (User Input)
Antenna Thickness =	$T_{ant} := 8.7$	in (User Input)
Antenna Weight =	$WT_{ant} := 154$	lbs (User Input)
Number of Antennas =	$N_{ant} := 3$	(User Input)
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.0$	
Antenna Force Coefficient =	$Ca_{ant} = 1.27$	

**Wind Load (without ice)**

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 16$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 48$	sf

**Total Antenna Wind Force =**  $F_{ant} := qz_{ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 3014$  lbs **BLC 5,7**

**Wind Load (with ice)**

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 2 \cdot t_{iz,ant}) \cdot (W_{ant} + 2 \cdot t_{iz,ant})}{144} = 19.8$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 59.3$	sf

**Total Antenna Wind Force w/ Ice =**  $F_{ant} := qz_{ice,ant} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ICEant} = 862$  lbs **BLC 4,6**

**Wind Load (Service)**

**Total Antenna Wind Force Service Loads =**  $F_{ant, Ser} := qz_{ant, Ser} \cdot G_H \cdot Ca_{ant} \cdot K_a \cdot A_{ant} = 897$  lbs **BLC 8**

**Gravity Load (without ice)**

**Weight of All Antennas =**  $WT_{ant} \cdot N_{ant} = 462$  lbs **BLC 2**

**Gravity Loads (ice only)**

**Volume of Each Antenna =**  $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2 \times 10^4$  cu in

**Volume of Ice on Each Antenna =**  $V_{ice} := (L_{ant} + 2 \cdot t_{iz,ant}) \cdot (W_{ant} + 2 \cdot t_{iz,ant}) \cdot (T_{ant} + 2 \cdot t_{iz,ant}) - V_{ant} = 2 \times 10^4$  cu in

**Weight of Ice on Each Antenna =**  $W_{ICEant} := \frac{V_{ice}}{1728} \cdot \rho_d = 559$  lbs

**Weight of Ice on All Antennas =**  $W_{ICEant} \cdot N_{ant} = 1677$  lbs **BLC 3**

**Development of Wind & Ice Load on Antenna Mounts**

**Mount Data:**

Mount Type:	SitePro Double SupportArm RDS-284 (x2)		
Mount Shape =	Flat		(User Input)
Mount Projected Surface Area =	CaAa := 11	sf	(User Input)
Mount Projected Surface Area w/ Ice =	CaAa <sub>ice</sub> := 14	sf	(User Input)
Mount Weight =	WT <sub>mnt</sub> := 1080	lbs	(User Input)
Mount Weight w/ Ice =	WT <sub>mnt.ice</sub> := 1250	lbs	

**Wind Load (without ice)**

Total Mount Wind Force =  $F_{mnt} := q_{Z_{ant}} \cdot G_H \cdot CaAa = 546$  lbs **BLC 5,7**

**Wind Load (with ice)**

Total Mount Wind Force =  $F_{mnt} := q_{Z_{ice.ant}} \cdot G_H \cdot CaAa_{ice} = 161$  lbs **BLC 4,6**

**Wind Load (Service)**

Total Platform Wind Force Service Loads =  $F_{mnt.Ser} := q_{Z_{ant.Ser}} \cdot G_H \cdot CaAa = 163$  lbs **BLC 8**

**Gravity Loads (without ice)**

Weight of All Mounts =  $WT_{mnt} = 1080$  lbs **BLC 2**

**Gravity Loads (ice only)**

Weight of Ice on All Mounts =  $WT_{mnt.ice} - WT_{mnt} = 170$  lbs **BLC 3**

**Development of Wind & Ice Load on Coax Cables**

**Coax Cable Data:**

(138-ft - 150-ft AGL)

Coax Type =	HELIAX 1-1/4"	
Shape =	Round	(User Input)
Coax Outside Diameter =	$D_{\text{coax}} := 1.55$	in (User Input)
Coax Cable Length =	$L_{\text{coax}} := 12$	ft (User Input)
Weight of Coax per foot =	$W_{t_{\text{coax}}} := 0.66$	plf (User Input)
Total Number of Coax =	$N_{\text{coax}} := 12$	(User Input)
Total Number of Exterior Coax =	$N_{e_{\text{coax}}} := 12$	(User Input)
No. of Coax Projecting Outside Face of Mast =	$NP_{\text{coax}} := 2$	(User Input)
Coax aspect ratio,	$Ar_{\text{coax}} := \frac{(L_{\text{coax}} \cdot 12)}{D_{\text{coax}}} = 92.9$	
Coax Cable Force Factor Coefficient =	$Ca_{\text{coax}} = 1.2$	

**Wind Load (without ice)**

Coax projected surface area =  $A_{\text{coax}} := \frac{(NP_{\text{coax}} \cdot D_{\text{coax}})}{12} = 0.3$  s/ft

Total Coax Wind Force =  $F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{mast}} \cdot G_H \cdot A_{\text{coax}} = 15$  plf **BLC 5,7**

**Wind Load (with ice)**

Coax projected surface area w/ ice =  $AICE_{\text{coax}} := \frac{(NP_{\text{coax}} \cdot D_{\text{coax}} + 2 \cdot t_{\text{iz. ant}})}{12} = 0.6$  s/ft

Total Coax Wind Force w/ ice =  $F_{i_{\text{coax}}} := Ca_{\text{coax}} \cdot qz_{\text{ice.mast}} \cdot G_H \cdot AICE_{\text{coax}} = 8$  plf **BLC 4,6**

**Wind Load (Service)**

Total Coax Wind Force Service Loads =  $F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{mast.Ser}} \cdot G_H \cdot A_{\text{coax}} = 5$  plf **BLC 8**

**Gravity Loads (without ice)**

Weight of all cables w/o ice  $WT_{\text{coax}} := W_{t_{\text{coax}}} \cdot N_{\text{coax}} = 8$  plf **BLC 2**

**Gravity Loads (ice only)**

Ice Area per Linear Foot =  $A_{i_{\text{coax}}} := \frac{\pi}{4} \left[ (D_{\text{coax}} + 2 \cdot t_{\text{iz.mast}})^2 - D_{\text{coax}}^2 \right] = 25.6$  sq in

Ice Weight All Coax per foot =  $WT_{i_{\text{coax}}} := N_{\text{coax}} \cdot Id \cdot \frac{A_{i_{\text{coax}}}}{144} = 119$  plf **BLC 3**

**Development of Wind & Ice Load on Coax Cables**

**Coax Cable Data:**

(150-ft - 160-ftAGL)

Coax Type =	HELIX 1-1/4"	
Shape =	Round	(User Input)
Coax Outside Diameter =	$D_{\text{coax}} := 1.55$	in (User Input)
Coax Cable Length =	$L_{\text{coax}} := 10$	ft (User Input)
Weight of Coax per foot =	$Wt_{\text{coax}} := 0.66$	plf (User Input)
Total Number of Coax =	$N_{\text{coax}} := 24$	(User Input)
Total Number of Exterior Coax =	$Ne_{\text{coax}} := 24$	(User Input)
No. of Coax Projecting Outside Face of Mast =	$NP_{\text{coax}} := 4$	(User Input)
Coax aspect ratio,	$Ar_{\text{coax}} := \frac{(L_{\text{coax}} \cdot 12)}{D_{\text{coax}}} = 77.4$	
Coax Cable Force Factor Coefficient =	$Ca_{\text{coax}} = 1.2$	

**Wind Load (without ice)**

Coax projected surface area =  $A_{\text{coax}} := \frac{(NP_{\text{coax}} \cdot D_{\text{coax}})}{12} = 0.5$  sqft

Total Coax Wind Force =  $F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{mast}} \cdot G_H \cdot A_{\text{coax}} = 30$  plf **BLC 5,7**

**Wind Load (with ice)**

Coax projected surface area w/ Ice =  $AICE_{\text{coax}} := \frac{(NP_{\text{coax}} \cdot D_{\text{coax}} + 2 \cdot t_{\text{iz,ant}})}{12} = 0.9$  sqft

Total Coax Wind Force w/ Ice =  $Fi_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{ice,mast}} \cdot G_H \cdot AICE_{\text{coax}} = 12$  plf **BLC 4,6**

**Wind Load (Service)**

Total Coax Wind Force Service Loads =  $F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{mast, Ser}} \cdot G_H \cdot A_{\text{coax}} = 9$  plf **BLC 8**

**Gravity Loads (without ice)**

Weight of all cables w/o ice  $WT_{\text{coax}} := Wt_{\text{coax}} \cdot N_{\text{coax}} = 16$  plf **BLC 2**

**Gravity Loads (ice only)**

Ice Area per Linear Foot =  $Ai_{\text{coax}} := \frac{\pi}{4} [(D_{\text{coax}} + 2 \cdot t_{\text{iz,mast}})^2 - D_{\text{coax}}^2] = 25.6$  sq in

Ice Weight All Coax per foot =  $WTi_{\text{coax}} := N_{\text{coax}} \cdot Id \cdot \frac{Ai_{\text{coax}}}{144} = 239$  plf **BLC 3**

**(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?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
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 14th(360-10): LRFD
Adjust Stiffness?	Yes(Iterative)
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-11: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

**(Global) Model Settings, Continued**

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1.5
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

**Hot Rolled Steel Properties**

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2



### Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in <sup>2</sup> ]	I <sub>yy</sub> [in <sup>4</sup> ]	I <sub>zz</sub> [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	Mast	PIPE 12.0X	Column	Pipe	A53 Gr. B	Typical	17.5	339	339	678
2	Outrigger	HSS6X6X5	Beam	Tube	A500 Gr.46	Typical	6.43	34.3	34.3	55.4

### Hot Rolled Steel Design Parameters

	Label	Shape	Length[ft]	L <sub>byy</sub> [ft]	L <sub>bzz</sub> [ft]	L <sub>comp top</sub> [ft]	L <sub>comp bot</sub> [ft]	L-torqu...	K <sub>yy</sub>	K <sub>zz</sub>	C <sub>b</sub>	Function
1	M1	Mast	26			L <sub>byy</sub>						Lateral
2	M2	Outrigger	1.5			L <sub>byy</sub>						Lateral
3	M3	Outrigger	1.5			L <sub>byy</sub>						Lateral

### Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	BOTMA...	TOPMA...			Mast	Column	Pipe	A53 Gr. B	Typical
2	M2	TOPCO...	N4			Outrigger	Beam	Tube	A500 Gr...	Typical
3	M3	BOTMA...	N5			Outrigger	Beam	Tube	A500 Gr...	Typical

### Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	TOPCONNECTION	0	9	0	0	
2	TOPMAST	0	26	0	0	
3	BOTMAST	0	0	0	0	
4	N4	0	9	-1.5	0	
5	N5	0	0	-1.5	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	TOPCONNECTION						
2	BOTMAST						
3	N4	Reaction	Reaction	Reaction		Reaction	
4	N5	Reaction	Reaction	Reaction		Reaction	

### Member Point Loads (BLC 2 : Weight of Appurtenances)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-135	22
2	M1	Y	-462	22
3	M1	Y	-1.08	22

### Member Point Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-546	22
2	M1	Y	-1.677	22
3	M1	Y	-.17	22

### Member Point Loads (BLC 4 : (x) TIA Wind with Ice)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
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**Member Point Loads (BLC 4 : (x) TIA Wind with Ice) (Continued)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.321	22
2	M1	X	.862	22
3	M1	X	.161	22

**Member Point Loads (BLC 5 : (x) TIA Wind)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.962	22
2	M1	X	3.014	22
3	M1	X	.546	22

**Member Point Loads (BLC 6 : (z) TIA Wind with Ice)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Z	.321	22
2	M1	Z	.862	22
3	M1	Z	.161	22

**Member Point Loads (BLC 7 : (z) TIA Wind)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Z	.962	22
2	M1	Z	3.014	22
3	M1	Z	.546	22

**Member Point Loads (BLC 8 : TIA Service)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.286	22
2	M1	X	.897	22
3	M1	X	.163	22

**Member Distributed Loads (BLC 2 : Weight of Appurtenances)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.008	-.008	0	12
2	M1	Y	-.016	-.016	12	18

**Member Distributed Loads (BLC 3 : Weight of Ice Only)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.04	-.04	0	0
2	M1	Y	-.119	-.119	0	12
3	M1	Y	-.239	-.239	12	18

**Member Distributed Loads (BLC 4 : (x) TIA Wind with Ice)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.01	.01	0	18
2	M1	X	.008	.008	0	12
3	M1	X	.012	.012	12	18

**Member Distributed Loads (BLC 5 : (x) TIA Wind)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
--	--------------	-----------	-----------------------------	---------------------------	----------------------	--------------------



**Member Distributed Loads (BLC 5 : (x) TIA Wind) (Continued)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.031	.031	0	18
2	M1	X	.015	.015	0	12
3	M1	X	.03	.03	12	18

**Member Distributed Loads (BLC 6 : (z) TIA Wind with Ice)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.01	.01	0	18
2	M1	Z	.008	.008	0	12
3	M1	Z	.012	.012	12	18

**Member Distributed Loads (BLC 7 : (z) TIA Wind)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.031	.031	0	18
2	M1	Z	.015	.015	0	12
3	M1	Z	.03	.03	12	18

**Member Distributed Loads (BLC 8 : TIA Service)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.009	.009	0	18
2	M1	X	.005	.005	0	12
3	M1	X	.009	.009	12	18

**Basic Load Cases**

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...	Surface...
1	Self Weight (Mast)	None		-1						
2	Weight of Appurtenances	None					3	2		
3	Weight of Ice Only	None					3	3		
4	(x) TIA Wind with Ice	None					3	3		
5	(x) TIA Wind	None					3	3		
6	(z) TIA Wind with Ice	None					3	3		
7	(z) TIA Wind	None					3	3		
8	TIA Service	None					3	3		

**Load Combinations**

	Description	So...	P...	S...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...	BLCFac...
1	1.2D + 1.6W (X-direction)	Yes	Y		1	1.2	2	1.2	5	1.6				
2	0.9D + 1.6W (X-direction)	Yes	Y		1	.9	2	.9	5	1.6				
3	1.2D + 1.0Di + 1.0Wi (X-...	Yes	Y		1	1.2	2	1.2	3	1	4	1		
4	1.2D + 1.6W (Z-direction)	Yes	Y		1	1.2	2	1.2	7	1.6				
5	0.9D + 1.6W (Z-direction)	Yes	Y		1	.9	2	.9	7	1.6				
6	1.2D + 1.0Di + 1.0Wi (Z-d...	Yes	Y		1	1.2	2	1.2	3	1	6	1		
7	1.0D + 1.0WService	Yes	Y		1	1	2	1	8	1				

### Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N4	max	0	6	.032	6	-.517	2	0	7	0	6	0	7
2		min	-19.301	1	-.019	5	-19.987	4	0	1	-28.949	1	0	1
3	N5	max	10.597	1	10.45	3	11.283	4	0	7	15.898	1	0	7
4		min	0	4	3.119	2	.517	2	0	1	0	4	0	1
5	Totals:	max	0	6	10.474	6	0	7						
6		min	-8.704	1	3.135	2	-8.704	4						

### Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [rad]	LC	Y Rotatio...	LC	Z Rotatio...	LC
1	TOPCONNE...	max	.058	1	.031	5	.002	4	5.369e-03	5	0	6	0	6
2		min	0	4	-.049	3	0	2	-4.109e-04	3	-2.158e-03	1	-6.291e-03	1
3	TOPMAST	max	3.102	1	.03	5	2.856	5	1.682e-02	5	0	6	0	6
4		min	0	4	-.052	3	-.084	3	-4.154e-04	3	-2.158e-03	1	-1.777e-02	1
5	BOTMAST	max	0	6	.031	5	0	2	8.812e-04	3	0	6	1.729e-03	1
6		min	-.032	1	-.047	3	-.001	4	-2.254e-03	5	-2.158e-03	1	0	4
7	N4	max	0	7	0	7	0	7	2.749e-03	3	0	7	0	6
8		min	0	1	0	1	0	1	-1.694e-03	5	0	1	-6.291e-03	1
9	N5	max	0	7	0	7	0	7	3.007e-03	3	0	7	1.729e-03	1
10		min	0	1	0	1	0	1	-1.618e-03	5	0	1	0	4

### Envelope AISC 14th(360-10): LRFD Steel Code Checks

Member	Shape	Code Check	Lo...	LC	She...Lo...	phi*P...	phi*P...	phi*...	phi*...	Eqn
1	M1 PIPE 12.0X	.534	8.9...	1	.072 8.9...	4	426...	551.25	184...	184...
2	M2 HSS6X6X5	.618	1.5	1	.260 0 z 1	265...	266...	46.92	46.92	H1-...
3	M3 HSS6X6X5	.340	0	6	.143 0 z 1	265...	266...	46.92	46.92	H1-...



Company : Centek  
Designer : TJL  
Job Number : 18058.43  
Model Name : Pole # 845 - T-Mobile Mast

Feb 12, 2019  
8:12 AM  
Checked By: CAG

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### **Joint Reactions (By Combination)**

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	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N4	-19.301	.02	-.689	0	-28.949	0
2	1	N5	10.597	4.159	.689	0	15.898	0
3	1	Totals:	-8.704	4.179	0			
4	1	COG (ft):	X: 0	Y: 17.035	Z: -.014			



Company : Centek  
Designer : TJL  
Job Number : 18058.43  
Model Name : Pole # 845 - T-Mobile Mast

Feb 12, 2019  
8:13 AM  
Checked By: CAG

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### ***Joint Reactions (By Combination)***

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	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	N4	-19.289	.015	-.517	0	-28.93	0
2	2	N5	10.585	3.119	.517	0	15.878	0
3	2	Totals:	-8.704	3.135	0			
4	2	COG (ft):	X: 0	Y: 17.035	Z: -.014			



Company : Centek  
Designer : TJL  
Job Number : 18058.43  
Model Name : Pole # 845 - T-Mobile Mast

Feb 12, 2019  
8:13 AM  
Checked By: CAG

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### **Joint Reactions (By Combination)**

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	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	N4	-3.673	.024	-1.736	0	-5.507	0
2	3	N5	1.981	10.45	1.736	0	2.972	0
3	3	Totals:	-1.692	10.474	0			
4	3	COG (ft):	X: 0	Y: 15.986	Z: -.006			



Company : Centek  
 Designer : TJL  
 Job Number : 18058.43  
 Model Name : Pole # 845 - T-Mobile Mast

Feb 12, 2019  
 8:14 AM  
 Checked By: CAG

**Joint Reactions (By Combination)**

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	N4	0	-.009	-19.987	0	0	0
2	4	N5	0	4.188	11.283	0	0	0
3	4	Totals:	0	4.179	-8.704			
4	4	COG (ft):	X: 0	Y: 17.035	Z: -.014			





Company : Centek  
Designer : TJL  
Job Number : 18058.43  
Model Name : Pole # 845 - T-Mobile Mast

Feb 12, 2019  
8:14 AM  
Checked By: CAG

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### **Joint Reactions (By Combination)**

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	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	5	N4	0	-.019	-19.804	0	0	0
2	5	N5	0	3.153	11.1	0	0	0
3	5	Totals:	0	3.135	-8.704			
4	5	COG (ft):	X: 0	Y: 17.035	Z: -.014			



Company : Centek  
 Designer : TJL  
 Job Number : 18058.43  
 Model Name : Pole # 845 - T-Mobile Mast

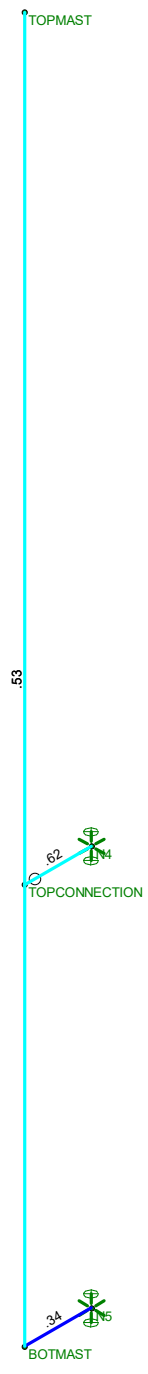
Feb 12, 2019  
 8:14 AM  
 Checked By: CAG

**Joint Reactions (By Combination)**

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	6	N4	0	.032	-5.405	0	0	0
2	6	N5	0	10.442	3.713	0	0	0
3	6	Totals:	0	10.474	-1.692			
4	6	COG (ft):	X: 0	Y: 15.986	Z: -.006			

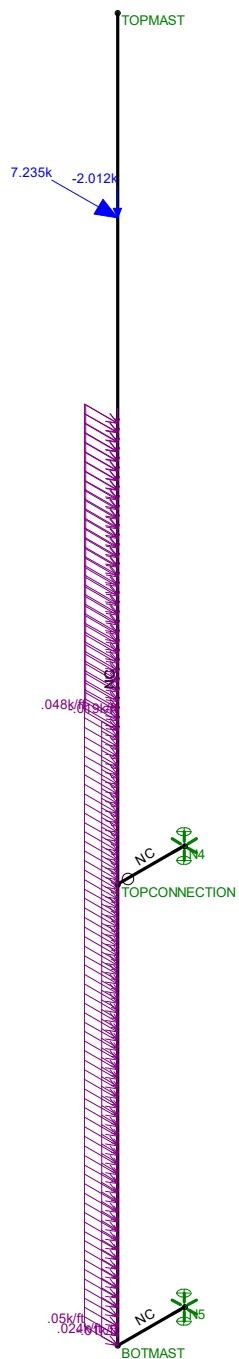


Code Check ( Env )	
Black	No Calc
Red	> 1.0
Magenta	.90-1.0
Green	.75-90
Cyan	.50-.75
Blue	0-.50



Member Code Checks Displayed (Enveloped)  
Envelope Only Solution

Centek	Pole # 845 - T-Mobile Mast Unity Check	
TJL		Feb 12, 2019 at 8:08 AM
18058.43		T-Mobile Antenna Mast - TIA.r3d



Member Code Checks Displayed  
Loads: LC 1, 1.2D + 1.6W (X-direction)

Centek	Pole # 845 - T-Mobile Mast LC #1 Loads	Feb 12, 2019 at 8:10 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		

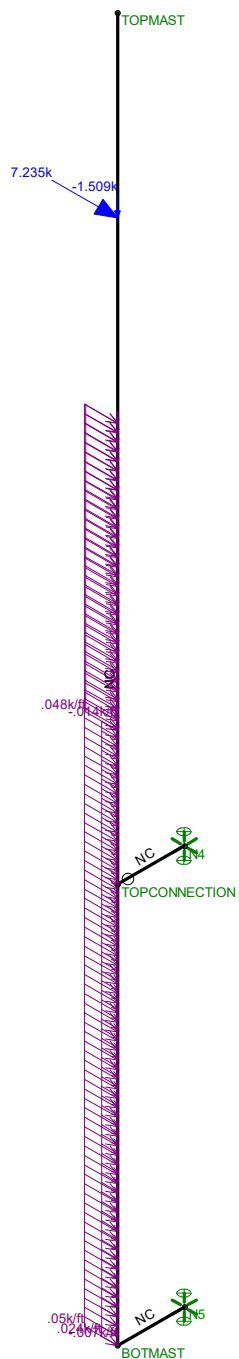


Code Check (LC 1)	
Black	No Calc
Red	> 1.0
Magenta	.90-1.0
Green	.75-.90
Cyan	.50-.75
Blue	0-.50



Member Code Checks Displayed  
Results for LC 1, 1.2D + 1.6W (X-direction)  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #1 Reactions and Deflected Shape	
TJL		Feb 12, 2019 at 8:12 AM
18058.43		T-Mobile Antenna Mast - TIA.r3d



Member Code Checks Displayed  
Loads: LC 2, 0.9D + 1.6W (X-direction)

Centek	Pole # 845 - T-Mobile Mast LC #2 Loads	Feb 12, 2019 at 8:10 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		



Code Check (LC 2)

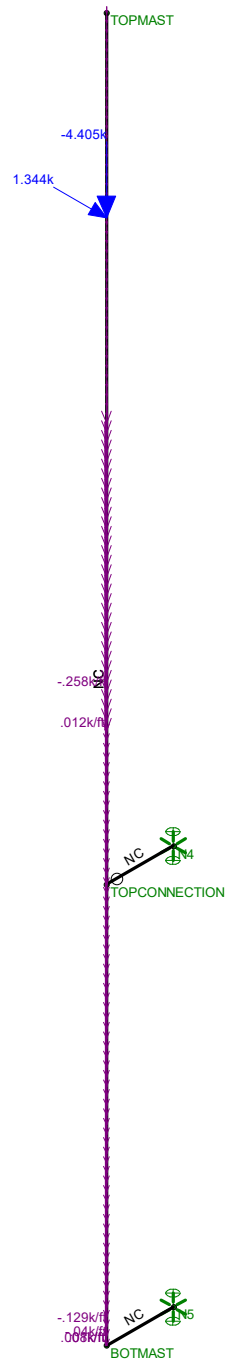
Black	No Calc
Red	> 1.0
Magenta	.90-1.0
Green	.75-90
Cyan	.50-.75
Blue	0-.50



Member Code Checks Displayed  
Results for LC 2, 0.9D + 1.6W (X-direction)  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #2 Reactions and Deflected Shape	
TJL		Feb 12, 2019 at 8:13 AM
18058.43		T-Mobile Antenna Mast - TIA.r3d





Member Code Checks Displayed  
Loads: LC 3, 1.2D + 1.0Di + 1.0Wi (X-direction)

Centek	Pole # 845 - T-Mobile Mast LC #3 Loads	Feb 12, 2019 at 8:11 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		

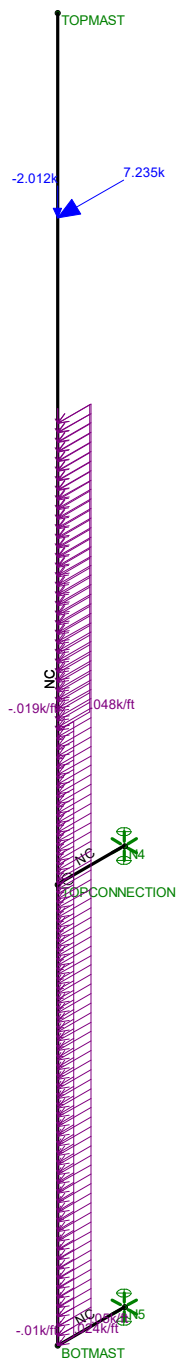


Code Check (LC 3)	
Black	No Calc
Red	> 1.0
Magenta	.90-1.0
Green	.75-90
Cyan	.50-.75
Blue	0-.50



Member Code Checks Displayed  
Results for LC 3, 1.2D + 1.0Di + 1.0Wi (X-direction)  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #3 Reactions and Deflected Shape	
TJL		Feb 12, 2019 at 8:13 AM
18058.43		T-Mobile Antenna Mast - TIA.r3d



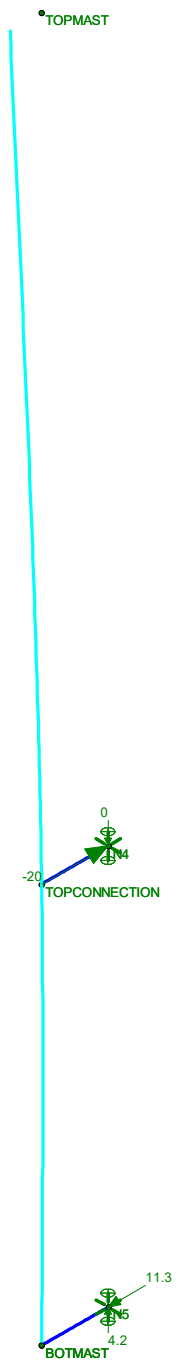
Member Code Checks Displayed  
Loads: LC 4, 1.2D + 1.6W (Z-direction)

Centek	Pole # 845 - T-Mobile Mast LC #4 Loads	Feb 12, 2019 at 8:11 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		



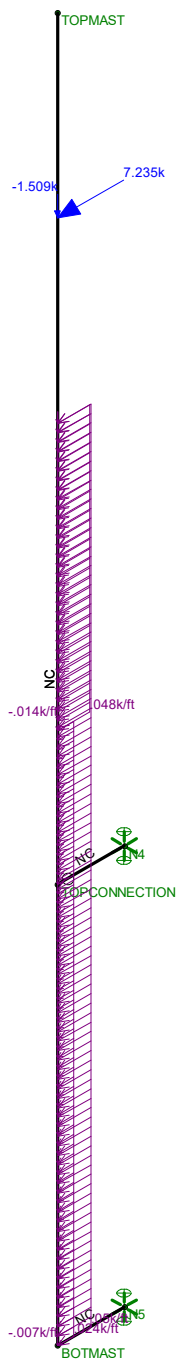
Code Check (LC 4)

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



Member Code Checks Displayed  
Results for LC 4, 1.2D + 1.6W (Z-direction)  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #4 Reactions and Deflected Shape	Feb 12, 2019 at 8:13 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		



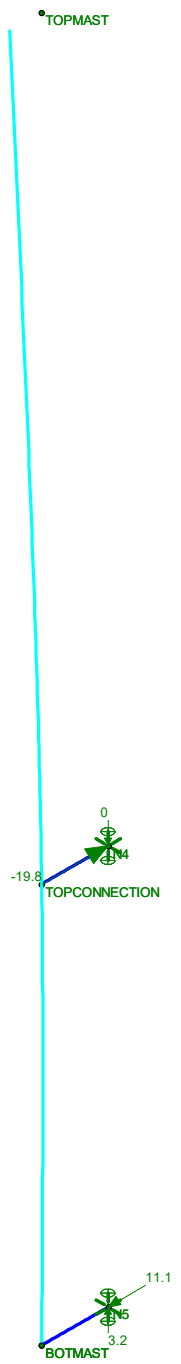
Member Code Checks Displayed  
Loads: LC 5, 0.9D + 1.6W (Z-direction)

Centek	Pole # 845 - T-Mobile Mast LC #5 Loads	Feb 12, 2019 at 8:11 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		



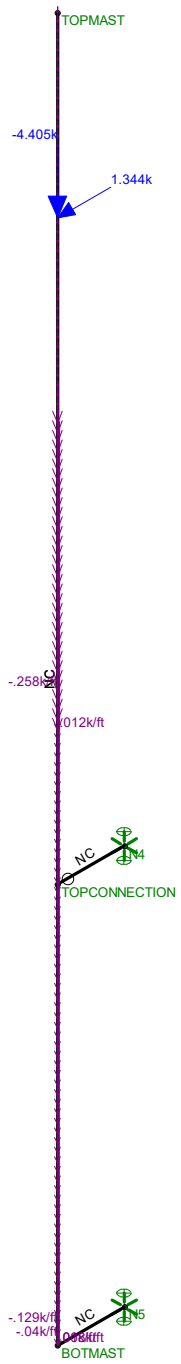
Code Check (LC 5)

No Calc
> 1.0
.90-1.0
.75-.90
.50-.75
0-.50



Member Code Checks Displayed  
Results for LC 5, 0.9D + 1.6W (Z-direction)  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #5 Reactions and Deflected Shape	
TJL		Feb 12, 2019 at 8:14 AM
18058.43		T-Mobile Antenna Mast - TIA.r3d



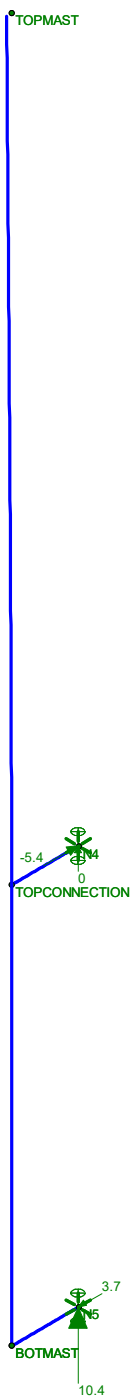
Member Code Checks Displayed  
 Loads: LC 6, 1.2D + 1.0Di + 1.0Wi (Z-direction)

Centek	Pole # 845 - T-Mobile Mast LC #6 Loads	Feb 12, 2019 at 8:11 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		



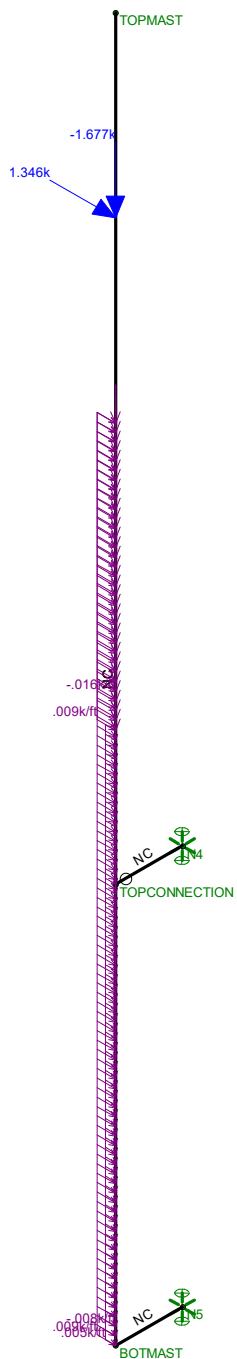


Code Check (LC 6)	
No Calc	> 1.0
> 1.0	.90-1.0
.90-1.0	.75-90
.75-90	.50-.75
.50-.75	0-.50



Member Code Checks Displayed  
Results for LC 6, 1.2D + 1.0Di + 1.0Wi (Z-direction)  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #6 Reactions and Deflected Shape	
TJL		Feb 12, 2019 at 8:14 AM
18058.43		T-Mobile Antenna Mast - TIA.r3d



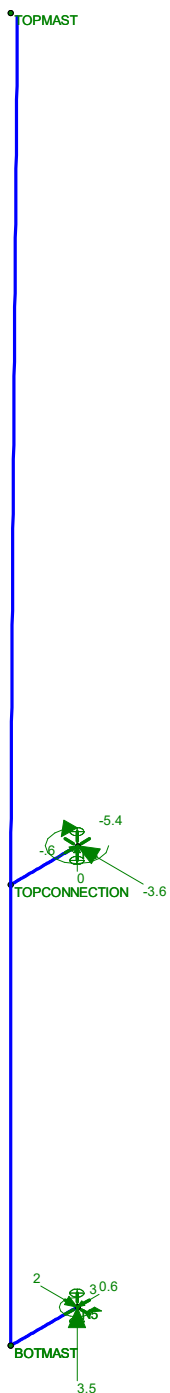
Member Code Checks Displayed  
Loads: LC 7, 1.0D + 1.0WService

Centek	Pole # 845 - T-Mobile Mast LC #7 Loads	Feb 12, 2019 at 8:11 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		



Code Check (LC 7)

No Calc
> 1.0
.90-1.0
.75-90
.50-.75
0-.50



Member Code Checks Displayed  
Results for LC 7, 1.0D + 1.0WService  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #7 Reactions and Deflected Shape	Feb 12, 2019 at 8:15 AM
TJL		T-Mobile Antenna Mast - TIA.r3d
18058.43		

Column: **M1**

Shape: **PIPE\_12.0X**

Material: **A53 Gr. B**

Length: **26 ft**

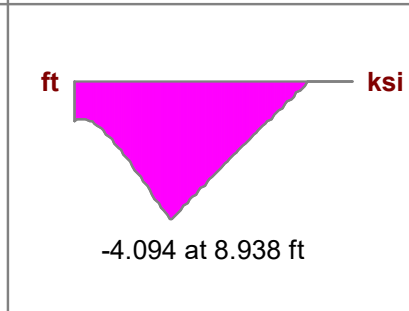
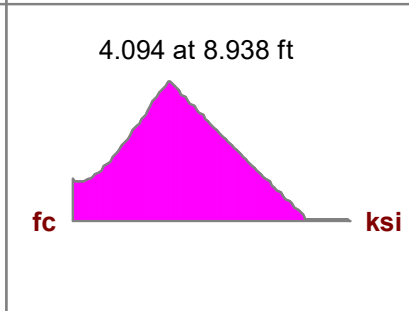
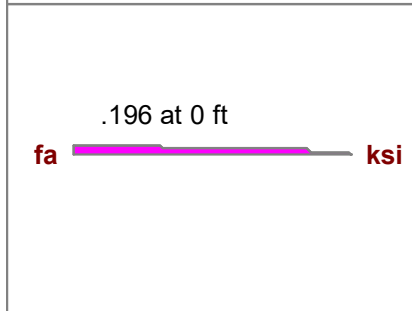
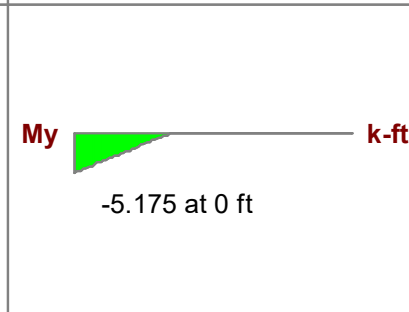
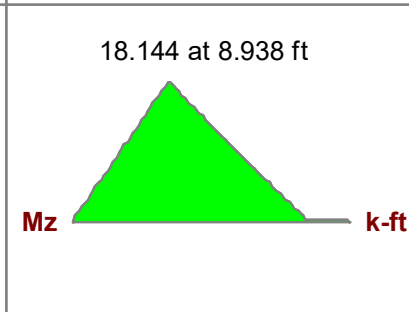
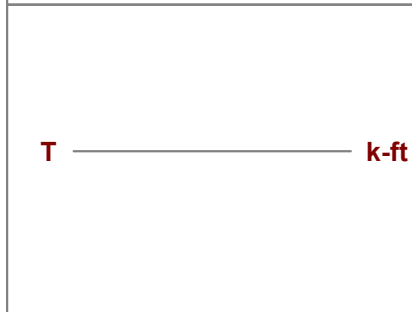
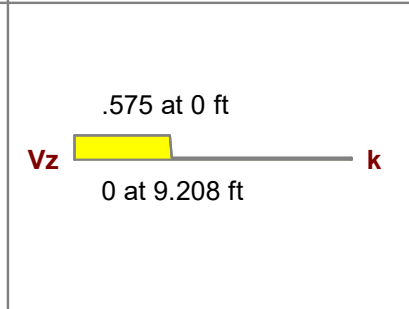
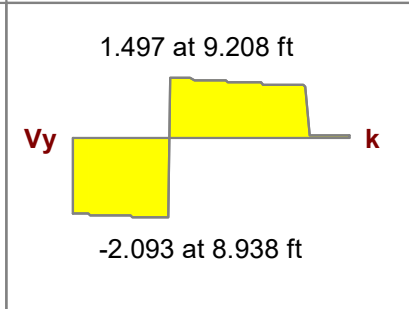
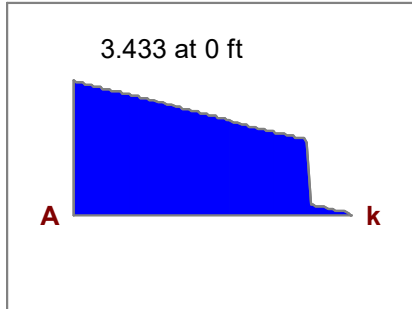
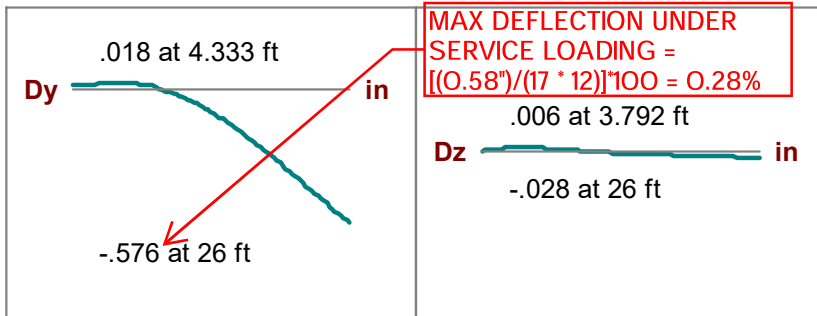
I Joint: **BOTMAST**

J Joint: **TOPMAST**

LC 7: **1.0D + 1.0W** Service

Code Check: **0.102 (bending)**

Report Based On 97 Sections



**AISC 14th(360-10): LRFD Code Check**

**Direct Analysis Method**

Max Bending Check **0.102**  
 Location **8.938 ft**  
 Equation **H1-1b**

Max Shear Check **0.013 (s)**  
 Location **8.938 ft**  
 Max Defl Ratio **L/535**

Bending **Compact**      Compression **Non-Slender**

Fy	<b>35 ksi</b>	Lb	<b>26 ft</b>	Z-z	<b>26 ft</b>
phi*Pnc	<b>426.235 k</b>	KL/r	<b>70.888</b>		<b>70.888</b>
phi*Pnt	<b>551.25 k</b>				
phi*Mny	<b>184.275 k-ft</b>	L Comp Flange	<b>26 ft</b>		
phi*Mnz	<b>184.275 k-ft</b>	L-torque	<b>26 ft</b>		
phi*Vny	<b>165.375 k</b>	Tau_b	<b>1</b>		
phi*Vnz	<b>165.375 k</b>				
phi*Tn	<b>173.622 k-ft</b>				
Cb	<b>1.571</b>				

**Antenna Mast Connection:**

**Anchor Data:**

3/4" Diameter A325 Bolt

Number of Bolts =	N := 8	(User Input)
Spacing X =	S <sub>x</sub> := 10.5-in	(User Input)
Spacing Y =	S <sub>y</sub> := 8.5-in	(User Input)
Design Tension Strength =	φF <sub>nt</sub> := 29.8-kips	(User Input)
Design Shear Strength =	φF <sub>nv</sub> := 17.9-kips	(User Input)

**Plate Data:**

Plate Width =	W <sub>plt</sub> := 14-in	(User Input)
Plate Thickness =	t <sub>plt</sub> := 1-in	(User Input)
Distance from Bolt to Collar =	d <sub>st</sub> := 2.25-in	(User Input)
Yield Strength =	F <sub>y</sub> := 36-ksi	(User Input)

**Design Reactions:**

Wind X-Direction

Force Y =	F <sub>y</sub> := 0-kips	(User Input)
Force X =	F <sub>x</sub> := 19.31-kips	(User Input)
Force Z =	F <sub>z</sub> := 0.69-kips	(User Input)
Moment X =	M <sub>x</sub> := 0-ft-kips	(User Input)
Moment Y =	M <sub>y</sub> := 28.95-ft-kips	(User Input)
Moment Z =	M <sub>z</sub> := 0-ft-kips	(User Input)

**Anchor Check:**

Max Tension Force = 
$$T_{Max} := \frac{F_z}{N} + \frac{M_x}{S_y \cdot \frac{N}{2}} + \frac{M_y}{S_x \cdot \frac{N}{2}} = 8.36 \cdot \text{kips}$$

Max Shear Force = 
$$V_{Max} := \frac{F_x + F_y}{N} + \frac{M_z}{S_x \cdot \frac{N}{2}} = 2.41 \cdot \text{kips}$$

Condition 1 = 
$$\text{Condition1} := \text{if} \left( \frac{T_{Max}}{\phi F_{nt}} \leq 1.00, "OK", "NG" \right) = "OK"$$

Condition 2 = 
$$\text{Condition2} := \text{if} \left( \frac{V_{Max}}{\phi F_{nv}} \leq 1.00, "OK", "NG" \right) = "OK"$$

Condition 3 = 
$$\text{Condition3} := \text{if} \left( \frac{T_{Max}}{\phi F_{nt}} + \frac{V_{Max}}{\phi F_{nv}} \leq 1.0, "OK", "NG" \right) = "OK"$$

% of Capacity = 
$$\max \left[ \frac{T_{Max}}{\phi F_{nt}}, \frac{V_{Max}}{\phi F_{nv}}, \left( \frac{\frac{T_{Max}}{\phi F_{nt}} + \frac{V_{Max}}{\phi F_{nv}}}{1.0} \right) \right] = 41.5\%$$

Check Plate:

Design Bending Strength =  $F_b := 0.9F_y = 32.4 \text{ ksi}$

Plate Section Modulus =  $Z_{plt} := \frac{1}{4} \cdot W_{plt} \cdot t_{plt}^2 = 3.5 \text{ in}^3$

Plate Bending Moment =  $M := \frac{T_{Max} \cdot N}{2} \cdot d_{st} = 75.219 \text{ in} \cdot \text{kips}$

Plate Bending Stress =  $f_b := \frac{M}{Z_{plt}} = 21.491 \text{ ksi}$

Plate\_Bending := if( $f_b < F_b$ , "OK", "Overstressed")

Plate\_Bending = "OK"

Design Reactions:

Wind Z-Direction

Force Y =  $F_y := 0.01 \cdot \text{kips}$  (User Input)

Force X =  $F_x := 0 \cdot \text{kips}$  (User Input)

Force Z =  $F_z := 20 \cdot \text{kips}$  (User Input)

Moment X =  $M_x := 0 \text{ ft} \cdot \text{kips}$  (User Input)

Moment Y =  $M_y := 0 \text{ ft} \cdot \text{kips}$  (User Input)

Moment Z =  $M_z := 0 \text{ ft} \cdot \text{kips}$  (User Input)

Anchor Check:

Max Tension Force =  $T_{Max} := \frac{F_z}{N} + \frac{M_x}{S_y \cdot \frac{N}{2}} + \frac{M_y}{S_x \cdot \frac{N}{2}} = 2.5 \cdot \text{kips}$

Max Shear Force =  $V_{Max} := \frac{F_x + F_y}{N} + \frac{M_z}{S_x \cdot \frac{N}{2}} = 1.25 \times 10^{-3} \cdot \text{kips}$

Condition 1 =  $\text{Condition1} := \text{if} \left( \frac{T_{Max}}{\phi F_{nt}} \leq 1.00, \text{"OK"}, \text{"NG"} \right) = \text{"OK"}$

Condition 2 =  $\text{Condition2} := \text{if} \left( \frac{V_{Max}}{\phi F_{nv}} \leq 1.00, \text{"OK"}, \text{"NG"} \right) = \text{"OK"}$

Condition 3 =  $\text{Condition3} := \text{if} \left( \frac{T_{Max}}{\phi F_{nt}} + \frac{V_{Max}}{\phi F_{nv}} \leq 1.0, \text{"OK"}, \text{"NG"} \right) = \text{"OK"}$

% of Capacity =  $\max \left[ \frac{T_{Max}}{\phi F_{nt}}, \frac{V_{Max}}{\phi F_{nv}}, \left( \frac{\frac{T_{Max}}{\phi F_{nt}} + \frac{V_{Max}}{\phi F_{nv}}}{1.0} \right) \right] = 8.4 \cdot \%$

Subject:

Connection to Tower

Location:

Trumbull, CT

Rev. 1: 2/12/19

Prepared by: T.J.L. Checked by: C.A.G.  
Job No. 18058.43

Check Plate:

Design Bending Strength =

$$F_b := 0.9F_y = 32.4 \text{ ksi}$$

Plate Section Modulus =

$$Z_{plt} := \frac{1}{4} \cdot W_{plt} \cdot t_{plt}^2 = 3.5 \text{ in}^3$$

Plate Bending Moment =

$$M := \frac{T_{Max} \cdot N}{2} \cdot d_{st} = 22.5 \text{ in} \cdot \text{kips}$$

Plate Bending Stress =

$$f_b := \frac{M}{Z_{plt}} = 6.429 \text{ ksi}$$

$$\text{Plate\_Bending} := \text{if}(f_b < F_b, \text{"OK"}, \text{"Overstressed"})$$

$$\text{Plate\_Bending} = \text{"OK"}$$

**Basic Components**

Heavy Wind Pressure =	p := 4.00	psf	(User Input NESC 2007 Figure 250-1 & Table 250-1)
Basic Windspeed =	V := 110	mph	(User Input NESC 2007 Figure 250-2(e) )
Radial Ice Thickness =	Ir := 0.50	in	(User Input)
Radial Ice Density =	Id := 56.0	pcf	(User Input)

**Factors for Extreme Wind Calculation**

Elevation of Top of Mast Above Grade =	TME := 163	ft	(User Input)
Multiplier Gust Response Factor =	m := 1.25		(User Input - Only for NESC Extreme wind case)
NESC Factor =	kv := 1.43		(User Input from NESC 2007 Table 250-3 equation)
Importance Factor =	I := 1.0		(User Input from NESC 2007 Section 250.C.2)
Velocity Pressure Coefficient =	$Kz := 2.01 \cdot \left( \frac{TME}{900} \right)^{\frac{2}{9.5}} = 1.403$		(NESC 2007 Table 250-2)
Exposure Factor =	$Es := 0.346 \left[ \frac{33}{(0.67 \cdot TME)} \right]^{\frac{1}{7}} = 0.292$		(NESC 2007 Table 250-3)
Response Term =	$Bs := \frac{1}{\left( 1 + 0.375 \cdot \frac{TME}{220} \right)} = 0.783$		(NESC 2007 Table 250-3)
Gust Response Factor =	$Grf := \frac{\left[ 1 + \left( 2.7 \cdot Es \cdot Bs \cdot \frac{1}{2} \right) \right]}{kv^2} = 0.83$		(NESC 2007 Table 250-3)
Wind Pressure =	qz := 0.00256 · Kz · V <sup>2</sup> · Grf · I = 36	psf	(NESC 2007 Section 250.C.2)

**Shape Factors**

Shape Factor for Round Members =	Cd <sub>R</sub> := 1.3	(User Input)
Shape Factor for Flat Members =	Cd <sub>F</sub> := 1.6	(User Input)
Shape Factor for Coax Cables Attached to Outside of Pole =	Cd <sub>coax</sub> := 1.6	(User Input)

**Overload Factors**

**Overload Factors for Wind Loads:**

NESC Heavy Wind Loading =	2.5	(User Input)
NESC Extreme Wind Loading =	1.0	(User Input)
NESC Extreme Ice w/Wind Loading =	1.0	(User Input)

**Overload Factors for Vertical Loads:**

NESC Heavy Wind Loading =	1.5	(User Input)
NESC Extreme Wind Loading =	1.0	(User Input)
NESC Extreme Ice w/Wind Loading =	1.0	(User Input)



**Development of Wind & Ice Load on Antenna Mast**

**Antenna Mast Data:**

(12" Sch. 80)

Mast Shape = Round (User Input)

Mast Diameter =  $D_{mast} := 12.75$  in (User Input)

Mast Length =  $L_{mast} := 26$  ft (User Input)

Mast Thickness =  $t_{mast} := 0.5$  in (User Input)

**Gravity Loads (without ice)**

Weight of the mast =

Self Weight (Computed internally by Risa-3D) plf **BLC 1**

**Gravity Loads (ice only)**

Ice Area per Linear Foot =

$A_{i,mast} := \frac{\pi}{4} [(D_{mast} + 1r \cdot 2)^2 - D_{mast}^2] = 20.8$  sq in

Weight of Ice on Mast =

$W_{ICE,mast} := Id \cdot \frac{A_{i,mast}}{144} = 8$  plf **BLC 3**

**Wind Load (NESC Heavy)**

Mast Projected Surface Area w/ Ice =

$A_{ICE,mast} := \frac{(D_{mast} + 2 \cdot 1r)}{12} = 1.146$  s/ft

Total Mast Wind Force w/ Ice (Above NU Structure) =

$F_{i,mast} := p \cdot C_d \cdot C_{coax} \cdot A_{ICE,mast} = 7$  plf **BLC 4**

**Wind Load (NESC Extreme)**

Mast Projected Surface Area =

$A_{mast} := \frac{D_{mast}}{12} = 1.063$  s/ft

Total Mast Wind Force (Above NU Structure) =

$F_{mast} := qz \cdot C_d \cdot C_{coax} \cdot A_{mast} \cdot m = 77$  plf **BLC 5**

Total Mast Wind Force (Below NU Structure) =

$F_{mast} := qz \cdot C_d \cdot C_{coax} \cdot A_{mast} = 61$  plf **BLC 5**

**Development of Wind & Ice Load on Antennas**

**Antenna Data:**

Antenna Model =	RFSAPX16DWV-16DWVS
Antenna Shape =	Flat (User Input)
Antenna Height =	$L_{ant} := 55.9$ in (User Input)
Antenna Width =	$W_{ant} := 13$ in (User Input)
Antenna Thickness =	$T_{ant} := 3.15$ in (User Input)
Antenna Weight =	$WT_{ant} := 41$ lbs (User Input)
Number of Antennas =	$N_{ant} := 3$ (User Input)

**Gravity Load (without ice)**

Weight of All Antennas =  $Wt_{ant1} := WT_{ant} \cdot N_{ant} = 123$  lbs

**Gravity Load (ice only)**

Volume of Each Antenna =  $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2289$  cu in

Volume of Ice on Each Antenna =  $V_{ice} := (L_{ant} + 2 \cdot Ir)(W_{ant} + 2 \cdot Ir)(T_{ant} + 2 \cdot Ir) - V_{ant} = 1017$  cu in

Weight of Ice on Each Antenna =  $W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 33$  lbs

Weight of Ice on All Antennas =  $Wt_{ice.ant1} := W_{ICEant} \cdot N_{ant} = 99$  lbs

**Wind Load (NESC Heavy)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna w/ Ice =  $SA_{ICEant} := \frac{(L_{ant} + 2 \cdot Ir) \cdot (W_{ant} + 2 \cdot Ir)}{144} = 5.5$  sf

Antenna Projected Surface Area w/ Ice =  $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 16.6$  sf

Total Antenna Wind Force w/ Ice =  $F_{ant1} := p \cdot C_d \cdot F \cdot A_{ICEant} = 106$  lbs

**Wind Load (NESC Extreme)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna =  $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 5$  sf

Antenna Projected Surface Area =  $A_{ant} := SA_{ant} \cdot N_{ant} = 15.1$  sf

Total Antenna Wind Force =  $F_{ant1} := qz \cdot C_d \cdot F \cdot A_{ant} = 1092$  lbs

**Development of Wind & Ice Load on Antennas**

**Antenna Data:**

Antenna Model =	RFSAPXVAARR24_43	
Antenna Shape =	Flat	(User Input)
Antenna Height =	$L_{ant} := 95.9$	in (User Input)
Antenna Width =	$W_{ant} := 24$	in (User Input)
Antenna Thickness =	$T_{ant} := 8.7$	in (User Input)
Antenna Weight =	$WT_{ant} := 154$	lbs (User Input)
Number of Antennas =	$N_{ant} := 3$	(User Input)

**Gravity Load (without ice)**

Weight of All Antennas =  $W_{t_{ant2}} := WT_{ant} \cdot N_{ant} = 462$  lbs

**Gravity Load (ice only)**

Volume of Each Antenna =  $V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2 \times 10^4$  cu in

Volume of Ice on Each Antenna =  $V_{ice} := (L_{ant} + 2 \cdot l_r)(W_{ant} + 2 \cdot l_r)(T_{ant} + 2 \cdot l_r) - V_{ant} = 3474$  cu in

Weight of Ice on Each Antenna =  $W_{ICEant} := \frac{V_{ice}}{1728} \cdot \rho_d = 113$  lbs

Weight of Ice on All Antennas =  $W_{t_{ice.ant2}} := W_{ICEant} \cdot N_{ant} = 338$  lbs

**Wind Load (NESC Heavy)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna w/ Ice =  $SA_{ICEant} := \frac{(L_{ant} + 2 \cdot l_r) \cdot (W_{ant} + 2 \cdot l_r)}{144} = 16.8$  sf

Antenna Projected Surface Area w/ Ice =  $A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 50.5$  sf

Total Antenna Wind Force w/ Ice =  $F_{ant2} := p \cdot C_d \cdot F \cdot A_{ICEant} = 323$  lbs

**Wind Load (NESC Extreme)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna =  $SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 16$  sf

Antenna Projected Surface Area =  $A_{ant} := SA_{ant} \cdot N_{ant} = 48$  sf

Total Antenna Wind Force =  $F_{ant2} := qz \cdot C_d \cdot F \cdot A_{ant} = 3457$  lbs

**Development of Wind & Ice Load on Platform**

**Platform Data:**

Platform Model =	SitePro Double SupportArm RDS-284 (x2)
Mount Shape =	Flat
Mount Projected Surface Area =	CdAa := 7 sf (User Input)
Mount Projected Surface Area w/ Ice =	CdAa <sub>ice</sub> := 11 sf (User Input)
Mount Weight =	WT <sub>mnt</sub> := 1080 lbs (User Input)
Mount Weight w/ Ice =	WT <sub>mnt.ice</sub> := 1250 lbs (User Input)

**Gravity Loads (without ice)**

Weight of All Mounts =  $W_{t\_mnt1} := W_{T\_mnt} = 1080$  lbs

**Gravity Load (ice only)**

Weight of Ice on All Mounts =  $W_{t\_ice.mnt1} := (W_{T\_mnt.ice} - W_{T\_mnt}) = 170$  lbs

**Wind Load (NESC Heavy)**

Total Mount Wind Force w/ Ice =  $F_{i\_mnt1} := p \cdot C_d A_{a\_ice} = 44$  lbs

**Wind Load (NESC Extreme)**

Total Mount Wind Force =  $F_{mnt1} := q_z \cdot C_d A_a \cdot m = 315$  lbs

**Development of Wind & Ice Load on Coax Cables**

**Coax Cable Data:**

(138-ft - 150-ftAGL)

Coax Type =	HELIAX 1-1/4"	
Shape =	Round	(User Input)
Coax Outside Diameter =	$D_{\text{coax}} := 1.55$	in (User Input)
Coax Cable Length =	$L_{\text{coax}} := 12$	ft (User Input)
Weight of Coax per foot =	$Wt_{\text{coax}} := 0.66$	plf (User Input)
Total Number of Coax =	$N_{\text{coax}} := 12$	(User Input)
No. of Coax Projecting Outside Face of Antenna Mast =	$NP_{\text{coax}} := 2$	(User Input)

**Gravity Loads (without ice)**

Weight of all cables w/o ice =

$WT_{\text{coax}} := Wt_{\text{coax}} \cdot N_{\text{coax}} = 8$

plf **BLC 2**

**Gravity Load (ice only)**

Ice Area per Linear Foot =

$A_{i_{\text{coax}}} := \frac{\pi}{4} \left[ (D_{\text{coax}} + 2 \cdot lr)^2 - D_{\text{coax}}^2 \right] = 3.2$

sq in

Ice Weight All Coax per foot =

$WT_{i_{\text{coax}}} := N_{\text{coax}} \cdot lr \cdot \frac{A_{i_{\text{coax}}}}{144} = 15$

plf **BLC 3**

**Wind Load (NESC Heavy)**

Coax projected surface area w/ Ice =

$A_{ICE_{\text{coax}}} := \frac{NP_{\text{coax}} \cdot D_{\text{coax}} + 2 \cdot lr}{12} = 0.3$

sf/ft

Total Coax Wind Force w/ Ice =

$F_{i_{\text{coax}}} := p \cdot Cd_{\text{coax}} \cdot A_{ICE_{\text{coax}}} = 2$

plf **BLC 4**

**Wind Load (NESC Extreme)**

Coax projected surface area =

$A_{\text{coax}} := \frac{(NP_{\text{coax}} \cdot D_{\text{coax}})}{12} = 0.3$

sf/ft

Total Coax Wind Force (Above NU Structure) =

$F_{\text{coax}} := qz \cdot Cd_{\text{coax}} \cdot A_{\text{coax}} \cdot m = 19$

plf **BLC 5**

Total Coax Wind Force (Below NU Structure) =

$F_{\text{coax}} := qz \cdot Cd_{\text{coax}} \cdot A_{\text{coax}} = 15$

plf **BLC 5**

**Development of Wind & Ice Load on Coax Cables**

**Coax Cable Data:**

(150-ft - 160-ft AGL)

Coax Type =	HELIAX 1-1/4"	
Shape =	Round	(User Input)
Coax Outside Diameter =	$D_{coax} := 1.55$	in (User Input)
Coax Cable Length =	$L_{coax} := 10$	ft (User Input)
Weight of Coax per foot =	$Wt_{coax} := 0.66$	plf (User Input)
Total Number of Coax =	$N_{coax} := 24$	(User Input)
No. of Coax Projecting Outside Face of Antenna Mast =	$NP_{coax} := 4$	(User Input)

**Gravity Loads (without ice)**

Weight of all cables w/o ice =

$WT_{coax} := Wt_{coax} \cdot N_{coax} = 16$

plf **BLC 2**

**Gravity Load (ice only)**

Ice Area per Linear Foot =

$A_{i_{coax}} := \frac{\pi}{4} \left[ (D_{coax} + 2 \cdot lr)^2 - D_{coax}^2 \right] = 3.2$

sq in

Ice Weight All Coax per foot =

$WT_{i_{coax}} := N_{coax} \cdot lr \cdot \frac{A_{i_{coax}}}{144} = 30$

plf **BLC 3**

**Wind Load (NESC Heavy)**

Coax projected surface area w/ Ice =

$AICE_{coax} := \frac{NP_{coax} \cdot D_{coax} + 2 \cdot lr}{12} = 0.6$

sf/ft

Total Coax Wind Force w/ Ice =

$F_{i_{coax}} := p \cdot Cd_{coax} \cdot AICE_{coax} = 4$

plf **BLC 4**

**Wind Load (NESC Extreme)**

Coax projected surface area =

$A_{coax} := \frac{(NP_{coax} \cdot D_{coax})}{12} = 0.5$

sf/ft

Total Coax Wind Force (Above NU Structure) =

$F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} \cdot m = 37$

plf **BLC 5**

Total Coax Wind Force (Below NU Structure) =

$F_{coax} := qz \cdot Cd_{coax} \cdot A_{coax} = 30$

plf **BLC 5**

**Basic Components**

Heavy Wind Pressure =	p := 4.00	psf	(User Input NESC 2007 Figure 250-1 & Table 250-1)
Basic Windspeed =	V := 110	mph	(User Input NESC 2007 Figure 250-2(e) )
Radial Ice Thickness =	Ir := 0.50	in	(User Input)
Radial Ice Density =	Id := 56.0	pcf	(User Input)

**Factors for Extreme Wind Calculation**

Elevation of Top of Mast Above Grade =	TME := 90	ft	(User Input)
Multiplier Gust Response Factor =	m := 1.25		(User Input - Only for NESC Extreme wind case)
NESC Factor =	kv := 1.43		(User Input from NESC 2007 Table 250-3 equation)
Importance Factor =	I := 1.0		(User Input from NESC 2007 Section 250.C.2)

Velocity Pressure Coefficient = 
$$Kz := 2.01 \cdot \left( \frac{TME}{900} \right)^{\frac{2}{9.5}} = 1.238 \quad \text{(NESC 2007 Table 250-2)}$$

Exposure Factor = 
$$Es := 0.346 \left[ \frac{33}{(0.67 \cdot TME)} \right]^{\frac{1}{7}} = 0.317 \quad \text{(NESC 2007 Table 250-3)}$$

Response Term = 
$$Bs := \frac{1}{\left( 1 + 0.375 \cdot \frac{TME}{220} \right)} = 0.867 \quad \text{(NESC 2007 Table 250-3)}$$

Gust Response Factor = 
$$Grf := \frac{\left[ 1 + \left( 2.7 \cdot Es \cdot Bs \cdot \frac{1}{2} \right) \right]}{kv^2} = 0.879 \quad \text{(NESC 2007 Table 250-3)}$$

Wind Pressure = 
$$qz := 0.00256 \cdot Kz \cdot V^2 \cdot Grf \cdot I = 33.7 \quad \text{psf} \quad \text{(NESC 2007 Section 250.C.2)}$$

**Shape Factors**

NUS Design Criteria Issued April 12, 2007

Shape Factor for Round Members =	Cd <sub>R</sub> := 1.3	(User Input)
Shape Factor for Flat Members =	Cd <sub>F</sub> := 1.6	(User Input)
Shape Factor for Coax Cables Attached to Outside of Pole =	Cd <sub>coax</sub> := 1.45	(User Input)

**Overload Factors**

NU Design Criteria Table

**Overload Factors for Wind Loads:**

NESC Heavy Loading =	2.5	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	1.0	(User Input)	Apply in Risa-3D Analysis

**Overload Factors for Vertical Loads:**

NESC Heavy Loading =	1.5	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	1.0	(User Input)	Apply in Risa-3D Analysis

**Development of Wind & Ice Load on Mast**

**Mast Data:**

(3" Sch. 80 Pipe)

Mast Shape =	Round	(User Input)
Mast Diameter =	$D_{mast} := 3.5$ in	(User Input)
Mast Length =	$L_{mast} := 8.5$ ft	(User Input)
Mast Thickness =	$t_{mast} := 0.3$ in	(User Input)

**Wind Load (NESC Extreme)**

Mast Projected Surface Area =  $A_{mast} := \frac{D_{mast}}{12} = 0.292$  s/ft

Total Mast Wind Force (Below NU Structure) =  $qz \cdot C_d R \cdot A_{mast} = 13$  plf **BLC 5,7**

**Wind Load (NESE Heavy)**

Mast Projected Surface Area w/ Ice =  $A_{ICE_{mast}} := \frac{(D_{mast} + 2 \cdot I_r)}{12} = 0.375$  s/ft

Total Mast Wind Force w/ Ice =  $p \cdot C_d R \cdot A_{ICE_{mast}} = 2$  plf **BLC 4,6**

**Gravity Loads (without ice)**

Weight of the Mast = Self Weight (Computed internally by Risa-3D) plf **BLC 1**

**Gravity Loads (ice only)**

Ice Area per Linear Foot =  $A_{i_{mast}} := \frac{\pi}{4} [(D_{mast} + I_r \cdot 2)^2 - D_{mast}^2] = 6.3$  sq in

Weight of Ice on Mast =  $W_{ICE_{mast}} := I_d \cdot \frac{A_{i_{mast}}}{144} = 2$  plf **BLC 3**



**Development of Wind & Ice Load on Antennas**

**Antenna Data:**

Antenna Model =	SBNHH-1D65B		
Antenna Shape =	Flat		(User Input)
Antenna Height =	$L_{ant} := 72$	in	(User Input)
Antenna Width =	$W_{ant} := 11.9$	in	(User Input)
Antenna Thickness =	$T_{ant} := 7.1$	in	(User Input)
Antenna Weight =	$WT_{ant} := 45$	lbs	(User Input)
Number of Antennas =	$N_{ant} := 1$		(User Input) (One per pipe mast / tot. of 3)

**Wind Load (NESC Extreme)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 6$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 6$	sf

**Total Antenna Wind Force =**

$F_{ant} := qz \cdot Cd_F \cdot A_{ant} = 321$  lbs **BLC 5,7**

**Wind Load (NESC Heavy)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.5$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 6.5$	sf

**Total Antenna Wind Force w/ Ice =**

$F_{i_{ant}} := p \cdot Cd_F \cdot A_{ICEant} = 42$  lbs **BLC 4,6**

**Gravity Load (without ice)**

**Weight of All Antennas =**

$WT_{ant} \cdot N_{ant} = 45$  lbs **BLC 2**

**Gravity Load (ice only)**

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 6083$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1544$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 50$	lbs
<b>Weight of Ice on All Antennas =</b>	$W_{ICEant} \cdot N_{ant} = 50$	lbs <b>BLC 3</b>

**Development of Wind & Ice Load on Antennas**

**Antenna Data:**

Antenna Model =	Alcatel-Lucent B13 RRH4x30/2x60-LTE	
Antenna Shape =	Flat	(User Input)
Antenna Height =	$L_{ant} := 21.6$	in (User Input)
Antenna Width =	$W_{ant} := 12$	in (User Input)
Antenna Thickness =	$T_{ant} := 9$	in (User Input)
Antenna Weight =	$WT_{ant} := 57$	lbs (User Input)
Number of Antennas =	$N_{ant} := 1$	(User Input) (One per pipe mast / tot. of 3)

**Wind Load (NESC Extreme)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot T_{ant}}{144} = 1.4$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 1.4$	sf

**Total Antenna Wind Force =**

$F_{ant} := qz \cdot Cd_F \cdot A_{ant} = 73$  lbs **BLC 5,7**

**Wind Load (NESC Heavy)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (T_{ant} + 1)}{144} = 1.6$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 1.6$	sf

**Total Antenna Wind Force w/ Ice =**

$F_{i_{ant}} := p \cdot Cd_F \cdot A_{ICEant} = 10$  lbs **BLC 4,6**

**Gravity Load (without ice)**

**Weight of All Antennas =**

$WT_{ant} \cdot N_{ant} = 57$  lbs **BLC 2**

**Gravity Load (ice only)**

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2333$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 605$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 20$	lbs
<b>Weight of Ice on All Antennas =</b>	$W_{ICEant} \cdot N_{ant} = 20$	lbs <b>BLC 3</b>

**Development of Wind & Ice Load on Antennas**

**Antenna Data:**

Antenna Model =	Alcatel-Lucent RRH4x45/2x90-AWS
Antenna Shape =	Flat (User Input)
Antenna Height =	$L_{ant} := 25.8$ in (User Input)
Antenna Width =	$W_{ant} := 12$ in (User Input)
Antenna Thickness =	$T_{ant} := 7.6$ in (User Input)
Antenna Weight =	$WT_{ant} := 72$ lbs (User Input)
Number of Antennas =	$N_{ant} := 1$ (User Input) (One per pipe mast / tot. of 3)

**Wind Load (NESC Extreme)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna =

$$SA_{ant} := \frac{L_{ant} \cdot T_{ant}}{144} = 1.4 \quad \text{sf}$$

Antenna Projected Surface Area =

$$A_{ant} := SA_{ant} \cdot N_{ant} = 1.4 \quad \text{sf}$$

**Total Antenna Wind Force =**

$$F_{ant} := qz \cdot C_d \cdot A_{ant} = 73 \quad \text{lbs} \quad \text{BLC 5,7}$$

**Wind Load (NESC Heavy)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna w/ Ice =

$$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (T_{ant} + 1)}{144} = 1.6 \quad \text{sf}$$

Antenna Projected Surface Area w/ Ice =

$$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 1.6 \quad \text{sf}$$

**Total Antenna Wind Force w/ Ice =**

$$F_{ant} := p \cdot C_d \cdot A_{ICEant} = 10 \quad \text{lbs} \quad \text{BLC 4,6}$$

**Gravity Load (without ice)**

Weight of All Antennas =

$$WT_{ant} \cdot N_{ant} = 72 \quad \text{lbs} \quad \text{BLC 2}$$

**Gravity Load (ice only)**

Volume of Each Antenna =

$$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 2353 \quad \text{cu in}$$

Volume of Ice on Each Antenna =

$$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 643 \quad \text{cu in}$$

Weight of Ice on Each Antenna =

$$W_{ICEant} := \frac{V_{ice}}{1728} \cdot \rho_d = 21 \quad \text{lbs}$$

**Weight of Ice on All Antennas =**

$$W_{ICEant} \cdot N_{ant} = 21 \quad \text{lbs} \quad \text{BLC 3}$$

**Development of Wind & Ice Load on Antennas**

**Antenna Data:**

Antenna Model =	RFS DB-T1-6Z-8AB-0Z	
Antenna Shape =	Flat	(User Input)
Antenna Height =	$L_{ant} := 24$	in (User Input)
Antenna Width =	$W_{ant} := 24$	in (User Input)
Antenna Thickness =	$T_{ant} := 10$	in (User Input)
Antenna Weight =	$WT_{ant} := 45$	lbs (User Input)
Number of Antennas =	$N_{ant} := 1$	(User Input)

**Wind Load (NESC Extreme)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 4$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 4$	sf

**Total Antenna Wind Force =**

$F_{ant} := qz \cdot C_d \cdot A_{ant} = 216$  lbs **BLC 5,7**

**Wind Load (NESC Heavy)**

*Assumes Maximum Possible Wind Pressure Applied to all Antennas Simultaneously*

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 4.3$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 4.3$	sf

**Total Antenna Wind Force w/ Ice =**

$F_{i_{ant}} := p \cdot C_d \cdot A_{ICEant} = 28$  lbs **BLC 4,6**

**Gravity Load (without ice)**

**Weight of All Antennas =**

$WT_{ant} \cdot N_{ant} = 45$  lbs **BLC 2**

**Gravity Load (ice only)**

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5760$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1115$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot \rho_d = 36$	lbs

**Weight of Ice on All Antennas =**

$W_{ICEant} \cdot N_{ant} = 36$  lbs **BLC 3**

**(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?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
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	Standard Solver

Hot Rolled Steel Code	AISC 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-13: ASD
Aluminum Code	AA ADM1-15: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

**(Global) Model Settings, Continued**

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1.5
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

**Hot Rolled Steel Properties**

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

### Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Mast-new	PIPE 12.0X	Column	Pipe	A53 Gr. B	Typical	17.5	339	339	678
2	Outrigger	HSS6X6X5	Beam	Wide Flange	A500 Gr.46	Typical	6.43	34.3	34.3	55.4

### Hot Rolled Steel Design Parameters

	Label	Shape	Length...	Lbyy[ft]	Lbzz[ft]	Lcomp to...	Lcomp bo...	Kyy	Kzz	Cm-yy	Cm-zz	Cb	y swayz	sway	Function
1	M1	Mast-new	26			Lbyy									Lateral
2	M2	Outrigger	1.5			Lbyy									Lateral
3	M3	Outrigger	1.5			Lbyy									Lateral

### Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	BOT-MA...	TOP-MA...			Mast-new	Column	Pipe	A53 Gr. B	Typical
2	M2	TOP-BR...	N4			Outrigger	Beam	Wide Flange	A500 Gr...	Typical
3	M3	BOT-MA...	N5			Outrigger	Beam	Wide Flange	A500 Gr...	Typical

### Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	TOP-BRACE	0	9	0	0	
2	TOP-MAST	0	26	0	0	
3	BOT-MAST	0	0	0	0	
4	N4	0	9	-1.5	0	
5	N5	0	0	-1.5	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	TOP-BRACE						
2	BOT-MAST						
3	N4	Reaction	Reaction	Reaction		Reaction	
4	N5	Reaction	Reaction	Reaction		Reaction	

### Member Point Loads (BLC 2 : Weight of Equipment)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-123	22
2	M1	Y	-462	22
3	M1	Y	-1.08	22

### Member Point Loads (BLC 3 : Weight of Ice Only)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Y	-0.99	22
2	M1	Y	-338	22
3	M1	Y	-.17	22

### Member Point Loads (BLC 4 : NESC Heavy Wind X-Dir)

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
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**Member Point Loads (BLC 4 : NESC Heavy Wind X-Dir) (Continued)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	.106	22
2	M1	X	.323	22
3	M1	X	.044	22

**Member Point Loads (BLC 5 : NESC Extreme Wind X-Dir)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	X	1.092	22
2	M1	X	3.457	22
3	M1	X	.315	22

**Member Point Loads (BLC 6 : NESC Heavy Wind Z-Dir)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Z	.106	22
2	M1	Z	.323	22
3	M1	Z	.044	22

**Member Point Loads (BLC 7 : NESC Extreme Wind Z-Dir)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M1	Z	1.092	22
2	M1	Z	3.457	22
3	M1	Z	.315	22

**Member Distributed Loads (BLC 2 : Weight of Equipment)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.008	-.008	0	12
2	M1	Y	-.016	-.016	12	18

**Member Distributed Loads (BLC 3 : Weight of Ice Only)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.008	-.008	0	0
2	M1	Y	-.015	-.015	0	12
3	M1	Y	-.03	-.03	12	18

**Member Distributed Loads (BLC 4 : NESC Heavy Wind X-Dir)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.007	.007	0	18
2	M1	X	.002	.002	0	12
3	M1	X	.004	.004	12	18

**Member Distributed Loads (BLC 5 : NESC Extreme Wind X-Dir)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/ft,F,ksf]	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.061	.061	0	12
2	M1	X	.077	.077	12	18
3	M1	X	.015	.015	0	12
4	M1	X	.037	.037	12	18



**Member Distributed Loads (BLC 6 : NESC Heavy Wind Z-Dir)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.007	.007	0	18
2	M1	Z	.002	.002	0	12
3	M1	Z	.004	.004	12	18

**Member Distributed Loads (BLC 7 : NESC Extreme Wind Z-Dir)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.061	.061	0	12
2	M1	Z	.077	.077	12	18
3	M1	Z	.015	.015	0	12
4	M1	Z	.037	.037	12	18

**Basic Load Cases**

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...Surface...
1	Self Weight (Mast)	None		-1					
2	Weight of Equipment	None					3	2	
3	Weight of Ice Only	None					3	3	
4	NESC Heavy Wind X-Dir	None					3	3	
5	NESC Extreme Wind X-Dir	None					3	4	
6	NESC Heavy Wind Z-Dir	None					3	3	
7	NESC Extreme Wind Z-Dir	None					3	4	

**Load Combinations**

	Description	Solve	PDelta	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	NESC Heavy Wind X-Dir	Yes	Y		1	1.5	2	1.5	3	1.5	4	2.5								
2	NESC Extreme Wind X-Dir	Yes	Y		1	1	2	1	5	1										
3	NESC Heavy Wind Z-Dir	Yes	Y		1	1.5	2	1.5	3	1.5	6	2.5								
4	NESC Extreme Wind Z-Dir	Yes	Y		1	1	2	1	7	1										

**Envelope Joint Reactions**

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N4	max	0	4	.03	3	-573	2	0	4	0	4	0	4
2		min	-13.661	2	.008	4	-14.232	4	0	1	-20.49	2	0	1
3	N5	max	7.201	2	6.943	1	7.772	4	0	4	10.802	2	0	4
4		min	0	3	3.454	2	.573	2	0	1	0	3	0	1
5	Totals:	max	0	4	6.969	3	0	2						
6		min	-6.46	2	3.471	2	-6.46	4						



Company : Centek  
Designer : TJL  
Job Number : 18058.43  
Model Name : Pole # 845 - T-Mobile Mast

Mar 4, 2019  
1:21 PM  
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### Joint Reactions

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	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N4	-3.357	.026	-1.152	0	-5.035	0
2	1	N5	1.739	6.943	1.152	0	2.61	0
3	1	Totals:	-1.618	6.969	0			
4	1	COG (ft):	X: 0	Y: 16.984	Z: -.011			



Company : Centek  
 Designer : TJL  
 Job Number : 18058.43  
 Model Name : Pole # 845 - T-Mobile Mast

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### Joint Reactions

LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]	
1	2	N4	-13.661	.017	-.573	0	-20.49	0
2	2	N5	7.201	3.454	.573	0	10.802	0
3	2	Totals:	-6.46	3.471	0			
4	2	COG (ft):	X: 0	Y: 17.018	Z: -.014			

### **Joint Reactions**

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	N4	0	.03	-4.507	0	0	0
2	3	N5	0	6.939	2.89	0	0	0
3	3	Totals:	0	6.969	-1.617			
4	3	COG (ft):	X: 0	Y: 16.984	Z: -.011			



Company : Centek  
Designer : TJL  
Job Number : 18058.43  
Model Name : Pole # 845 - T-Mobile Mast

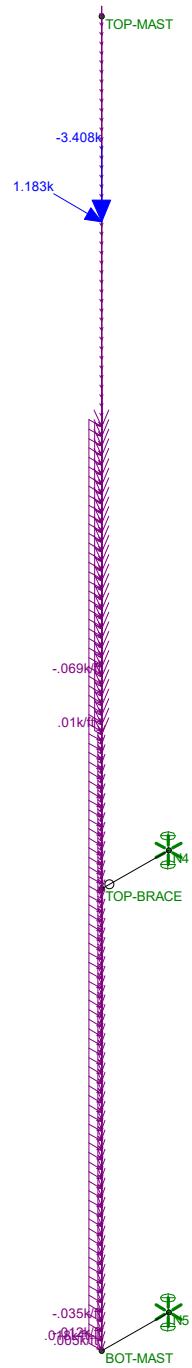
Mar 4, 2019  
1:23 PM  
Checked By: CAG

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### Joint Reactions

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	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	N4	0	.008	-14.232	0	0	0
2	4	N5	0	3.463	7.772	0	0	0
3	4	Totals:	0	3.471	-6.46			
4	4	COG (ft):	X: 0	Y: 17.018	Z: -.014			

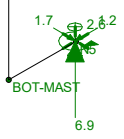
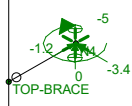


Loads: LC 1, NESC Heavy Wind X-Dir

Centek	Pole # 845 - T-Mobile Mast LC #1 Loads	
TJL		Mar 4, 2019 at 1:20 PM
18058.43		T-Mobile Antenna Mast - NESC.r3d

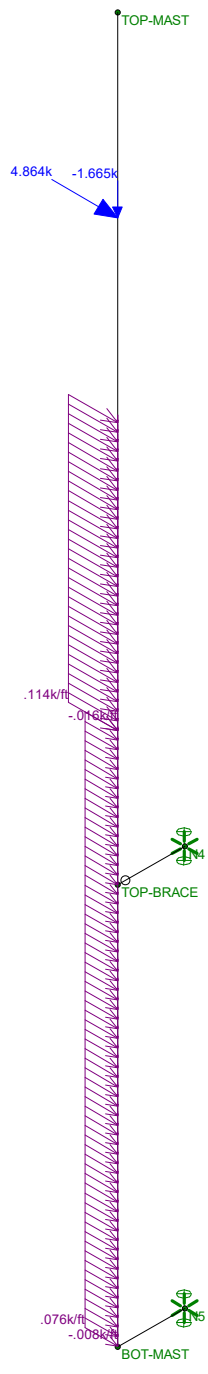


TOP-MAST



Results for LC 1, NESC Heavy Wind X-Dir  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #1 Reactions	
TJL		Mar 4, 2019 at 1:21 PM
18058.43		T-Mobile Antenna Mast - NESC.r3d



Loads: LC 2, NESC Extreme Wind X-Dir

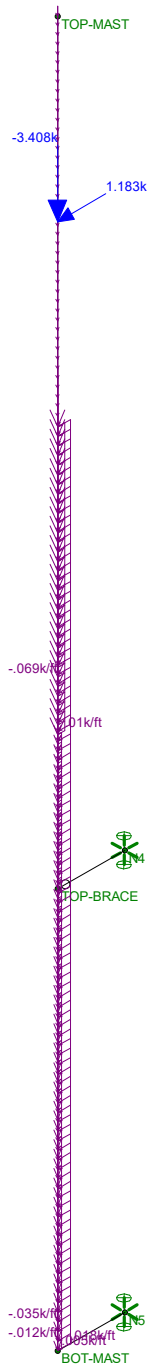
Centek	Pole # 845 - T-Mobile Mast LC #2 Loads	
TJL		Mar 4, 2019 at 1:20 PM
18058.43		T-Mobile Antenna Mast - NESC.r3d





Results for LC 2, NESC Extreme Wind X-Dir  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #2 Reactions	
TJL		Mar 4, 2019 at 1:21 PM
18058.43		T-Mobile Antenna Mast - NESC.r3d



Loads: LC 3, NESC Heavy Wind Z-Dir

Centek	Pole # 845 - T-Mobile Mast LC #3 Loads	
TJL		Mar 4, 2019 at 1:20 PM
18058.43		T-Mobile Antenna Mast - NESC.r3d



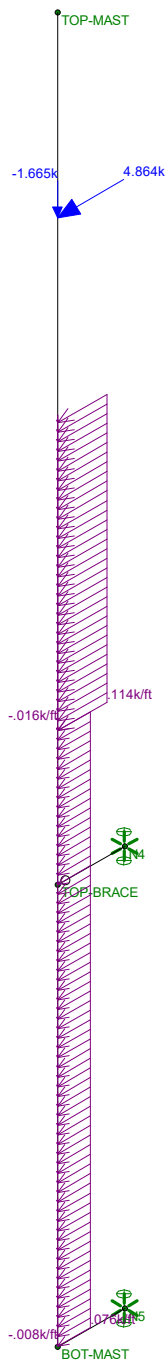
TOP-MAST

TOP-BRACE  
-4.5  
0  
5

BOT-MAST  
2.9  
5  
6.9

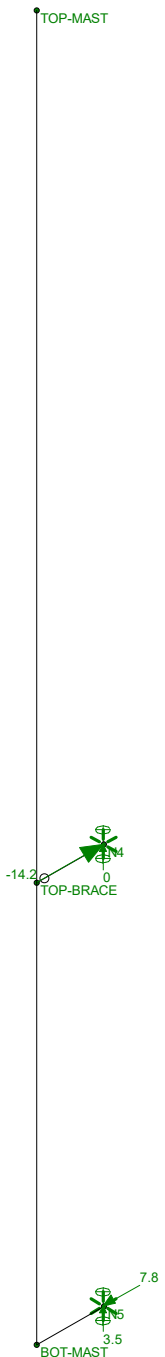
Results for LC 3, NESC Heavy Wind Z-Dir  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #3 Reactions	
TJL		Mar 4, 2019 at 1:22 PM
18058.43		T-Mobile Antenna Mast - NESC.r3d



Loads: LC 4, NESC Extreme Wind Z-Dir

Centek	Pole # 845 - T-Mobile Mast LC #4 Loads	
TJL		Mar 4, 2019 at 1:20 PM
18058.43		T-Mobile Antenna Mast - NESC.r3d



Results for LC 4, NESC Extreme Wind Z-Dir  
Reaction and Moment Units are k and k-ft

Centek	Pole # 845 - T-Mobile Mast LC #4 Reactions	
TJL		Mar 4, 2019 at 1:22 PM
18058.43		T-Mobile Antenna Mast - NESC.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?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
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 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

**(Global) Model Settings, Continued**

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1.5
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

**Hot Rolled Steel Properties**

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2

### Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in2]	Iyy [in4]	Izz [in4]	J [in4]
1	Horz Mast	PIPE 3.0X	Beam	Pipe	A53 Gr. B	Typical	2.83	3.7	3.7	7.4
2	Pipe Mast	PIPE 2.0	Column	Pipe	A53 Gr. B	Typical	1.02	.627	.627	1.25
3	Outrigger	HSS4X4X4	Beam	Tube	A500 Gr.46	Typical	3.37	7.8	7.8	12.8
4	Plate	6"X3/4" PL	Beam	Tube	A36 Gr.36	Typical	4.5	.211	13.5	.777

### Hot Rolled Steel Design Parameters

	Label	Shape	Length...	Lbyy[ft]	Lbzz[ft]	Lcomp to...	Lcomp bo...	Kyy	Kzz	Cm-yy	Cm-zz	Cb	y sway	z sway	Function
1	M1	Outrigger	1					Lbyy							Lateral
2	M2	Horz Mast	8.5					Lbyy							Lateral
3	M3	Plate	2					Lbyy							Lateral
4	M4	Pipe Mast	6					Lbyy							Lateral
5	M5	Pipe Mast	6					Lbyy							Lateral
6	M6	Pipe Mast	6					Lbyy							Lateral
7	M7	Pipe Mast	6					Lbyy							Lateral

### Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
1	M1	N3	N4			Outrigger	Beam	Tube	A500 Gr...	Typical
2	M2	N5	N9			Horz Mast	Beam	Pipe	A53 Gr. B	Typical
3	M3	N2	N1			Plate	Beam	Tube	A36 Gr.36	Typical
4	M4	N10	N11			Pipe Mast	Column	Pipe	A53 Gr. B	Typical
5	M5	N12	N13			Pipe Mast	Column	Pipe	A53 Gr. B	Typical
6	M6	N14	N15			Pipe Mast	Column	Pipe	A53 Gr. B	Typical
7	M7	N16	N17			Pipe Mast	Column	Pipe	A53 Gr. B	Typical

### Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	N1	1	0	0	0	
2	N2	-1	0	0	0	
3	N3	0	0	0	0	
4	N4	0	0	1	0	
5	N5	-4.5	0	1	0	
6	N6	-4	0	1	0	
7	N7	-2	0	1	0	
8	N8	2	0	1	0	
9	N9	4	0	1	0	
10	N10	-4	3	1	0	
11	N11	-4	-3	1	0	
12	N12	-2	3	1	0	
13	N13	-2	-3	1	0	
14	N14	2	3	1	0	
15	N15	2	-3	1	0	
16	N16	4	3	1	0	
17	N17	4	-3	1	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	N2	Reaction	Reaction	Reaction	Reaction		
2	N1	Reaction	Reaction	Reaction	Reaction		

**Member Point Loads (BLC 2 : Weight of Appurtenances)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	Y	-.022	.5
2	M5	Y	-.022	.5
3	M7	Y	-.022	.5
4	M4	Y	-.022	5.5
5	M5	Y	-.022	5.5
6	M7	Y	-.022	5.5
7	M4	Y	-.057	1
8	M5	Y	-.057	1
9	M7	Y	-.057	1
10	M4	Y	-.072	5
11	M5	Y	-.072	5
12	M7	Y	-.072	5
13	M6	Y	-.045	2

**Member Point Loads (BLC 3 : Weight of Ice Only)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	Y	-.025	.5
2	M5	Y	-.025	.5
3	M7	Y	-.025	.5
4	M4	Y	-.025	5.5
5	M5	Y	-.025	5.5
6	M7	Y	-.025	5.5
7	M4	Y	-.02	1
8	M5	Y	-.02	1
9	M7	Y	-.02	1
10	M4	Y	-.021	5
11	M5	Y	-.021	5
12	M7	Y	-.021	5
13	M6	Y	-.036	2

**Member Point Loads (BLC 4 : x-dir NESC Heavy Wind)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	X	.021	.5
2	M5	X	.021	.5
3	M7	X	.021	.5
4	M4	X	.021	5.5
5	M5	X	.021	5.5
6	M7	X	.021	5.5
7	M4	X	.01	1
8	M5	X	.01	1
9	M7	X	.01	1
10	M4	X	.01	5
11	M5	X	.01	5



**Member Point Loads (BLC 4 : x-dir NESC Heavy Wind) (Continued)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
12	M7	X	.01	5
13	M6	X	.028	2

**Member Point Loads (BLC 5 : x-dir NESC Extreme Wind)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	X	.161	.5
2	M5	X	.161	.5
3	M7	X	.161	.5
4	M4	X	.161	5.5
5	M5	X	.161	5.5
6	M7	X	.161	5.5
7	M4	X	.073	1
8	M5	X	.073	1
9	M7	X	.073	1
10	M4	X	.073	5
11	M5	X	.073	5
12	M7	X	.073	5
13	M6	X	.216	2

**Member Point Loads (BLC 6 : z-dir NESC Heavy Wind)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	Z	.021	.5
2	M5	Z	.021	.5
3	M7	Z	.021	.5
4	M4	Z	.021	5.5
5	M5	Z	.021	5.5
6	M7	Z	.021	5.5
7	M6	Z	.028	2

**Member Point Loads (BLC 7 : z-dir NESC Extreme Wind)**

	Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
1	M4	Z	.161	.5
2	M5	Z	.161	.5
3	M7	Z	.161	.5
4	M4	Z	.161	5.5
5	M5	Z	.161	5.5
6	M7	Z	.161	5.5
7	M6	Z	.216	2

**Member Distributed Loads (BLC 3 : Weight of Ice Only)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M2	Y	-.002	-.002	0	0

**Member Distributed Loads (BLC 6 : z-dir NESC Heavy Wind)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M2	Z	.002	.002	0	0



Company : CENTEK Engineering, Inc.  
 Designer : TJJ  
 Job Number : 18058.43  
 Model Name : Tower # 845 - Verizon Mast

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**Member Distributed Loads (BLC 7 : z-dir NESC Extreme Wind)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M2	Z	.013	.013	0	0

**Basic Load Cases**

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...	Surface...
1	Self Weigh	None		-1						
2	Weight of Appurtenances	None					13			
3	Weight of Ice Only	None					13	1		
4	x-dir NESC Heavy Wind	None					13			
5	x-dir NESC Extreme Wind	None					13			
6	z-dir NESC Heavy Wind	None					7	1		
7	z-dir NESC Extreme Wind	None					7	1		

**Load Combinations**

	Description	Solve	PDelta	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	
1	x-dir NESC Heavy Wind	Yes	Y		1	1.5	2	1.5	3	1.5	4	2.5									
2	x-dir NESC Extreme Wind	Yes	Y		1	1	2	1	5	1											
3	z-dir NESC Heavy Wind	Yes	Y		1	1.5	2	1.5	3	1.5	6	2.5									
4	z-dir NESC Extreme Wi...	Yes	Y		1	1	2	1	7	1											

**Envelope Joint Reactions**

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	N2	max	0	4	1.119	3	-.254	3	-.369	2	0	4	0	4
2		min	-.81	2	.421	2	-.812	2	-.831	3	0	1	0	1
3	N1	max	0	4	.564	1	.812	2	-.369	2	0	4	0	4
4		min	-.81	2	.248	4	-.527	4	-.831	3	0	1	0	1
5	Totals:	max	0	4	1.65	3	0	2						
6		min	-1.62	2	.774	2	-1.292	4						



Company : CENTEK Engineering, Inc.  
Designer : TJL  
Job Number : 18058.43  
Model Name : Tower # 845 - Verizon Mast

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### Joint Reactions

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	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	N2	-.267	1.086	-.268	-.798	0	0
2	1	N1	-.267	.564	.268	-.798	0	0
3	1	Totals:	-.535	1.65	0			
4	1	COG (ft):	X: -.357	Y: -.014	Z: .967			

### **Joint Reactions**

LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	N2	-.81	.421	-.812	-.369	0	0
2	N1	-.81	.353	.812	-.369	0	0
3	Totals:	-1.62	.774	0			
4	COG (ft):	X: -.36	Y: -.058	Z: .953			



Company : CENTEK Engineering, Inc.  
 Designer : TJL  
 Job Number : 18058.43  
 Model Name : Tower # 845 - Verizon Mast

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### Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	N2	0	1.119	-.254	-.831	0	0
2	3	N1	0	.531	-.174	-.831	0	0
3	3	Totals:	0	1.65	-.427			
4	3	COG (ft):	X: -.357	Y: -.014	Z: .967			



Company : CENTEK Engineering, Inc.  
Designer : TJL  
Job Number : 18058.43  
Model Name : Tower # 845 - Verizon Mast

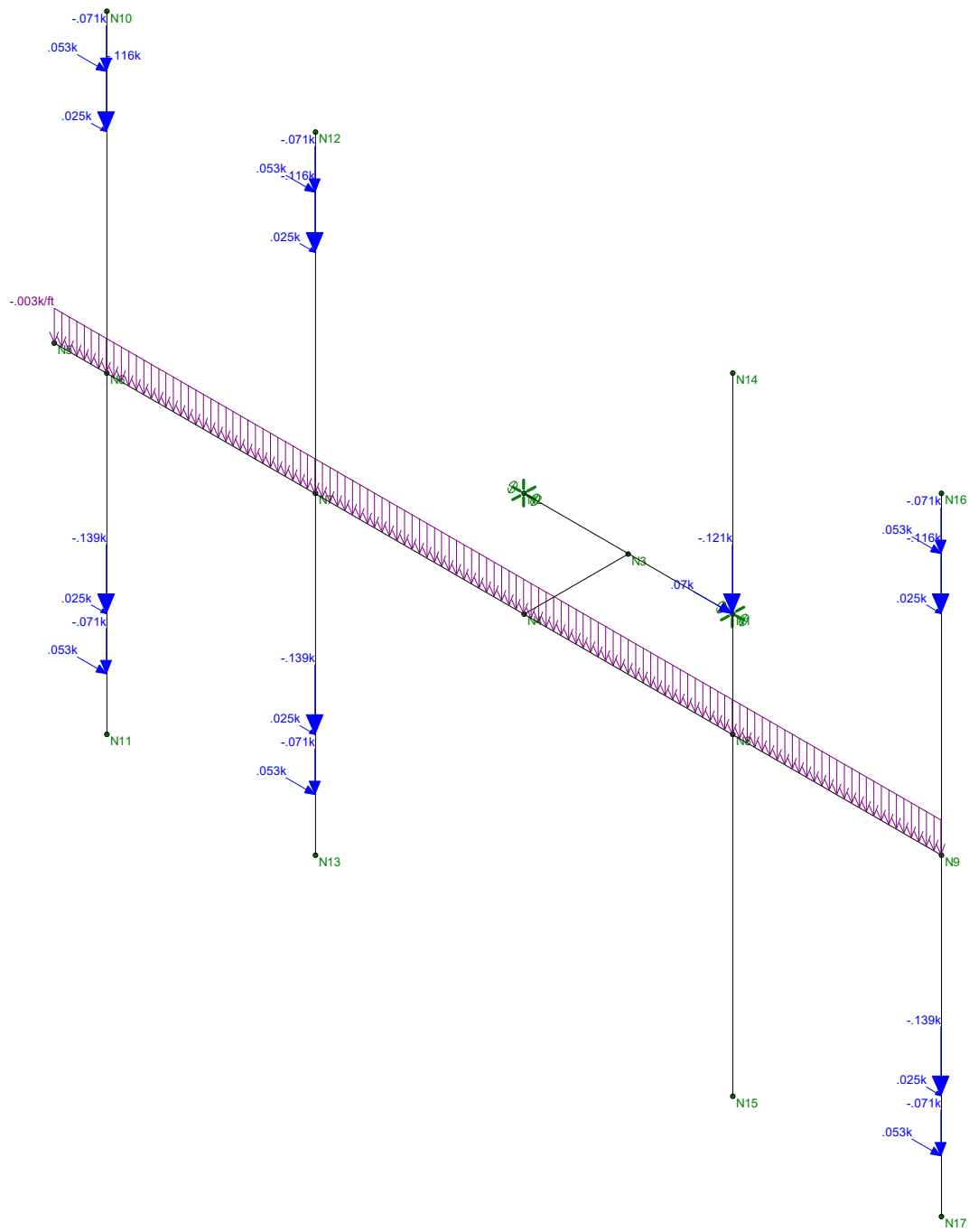
Mar 4, 2019  
1:50 PM  
Checked By: CAG

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### Joint Reactions

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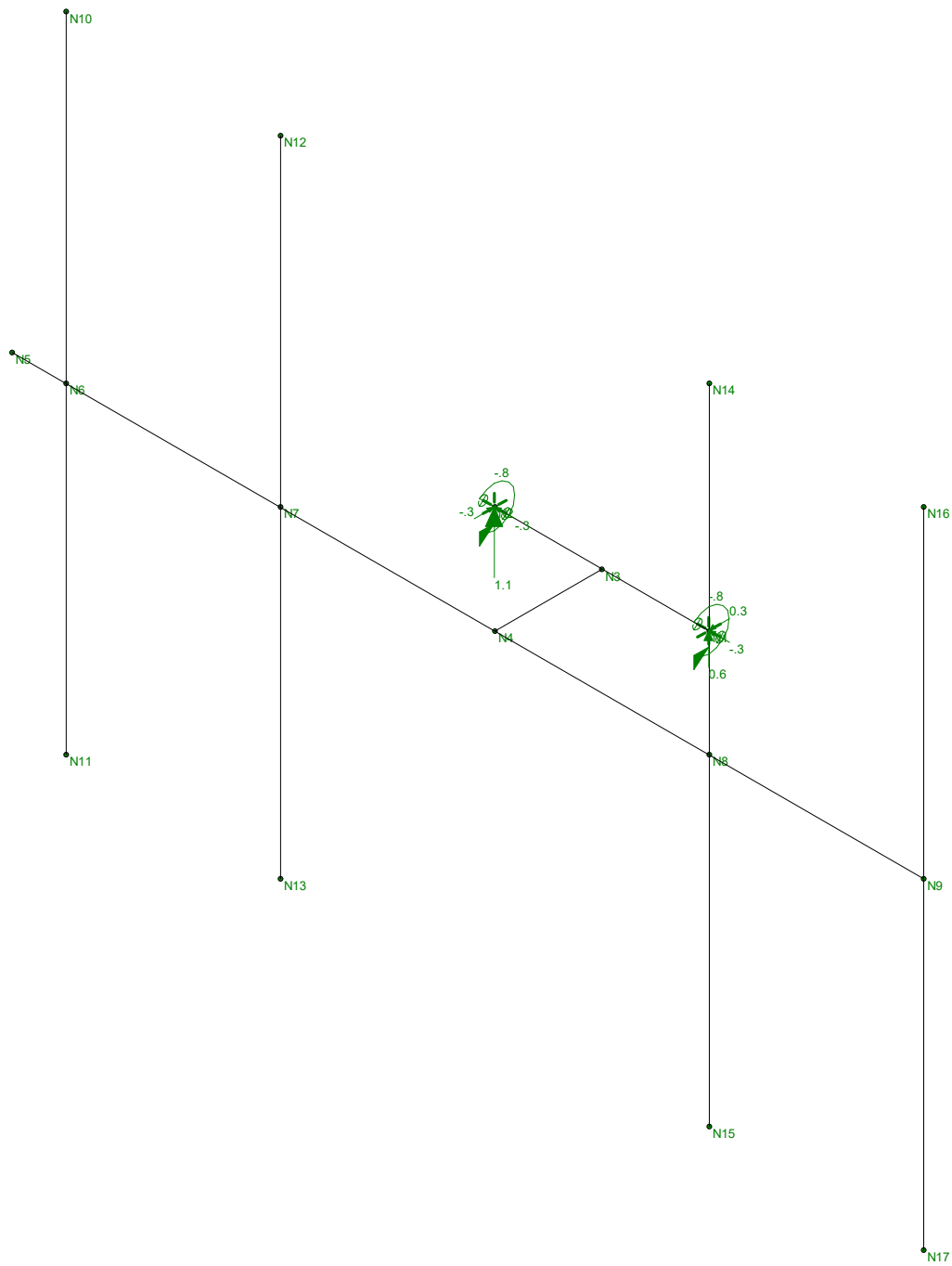
	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	N2	0	.526	-.765	-.473	0	0
2	4	N1	0	.248	-.527	-.473	0	0
3	4	Totals:	0	.774	-1.292			
4	4	COG (ft):	X: -.36	Y: -.058	Z: .953			



Loads: LC 1, x-dir NESC Heavy Wind

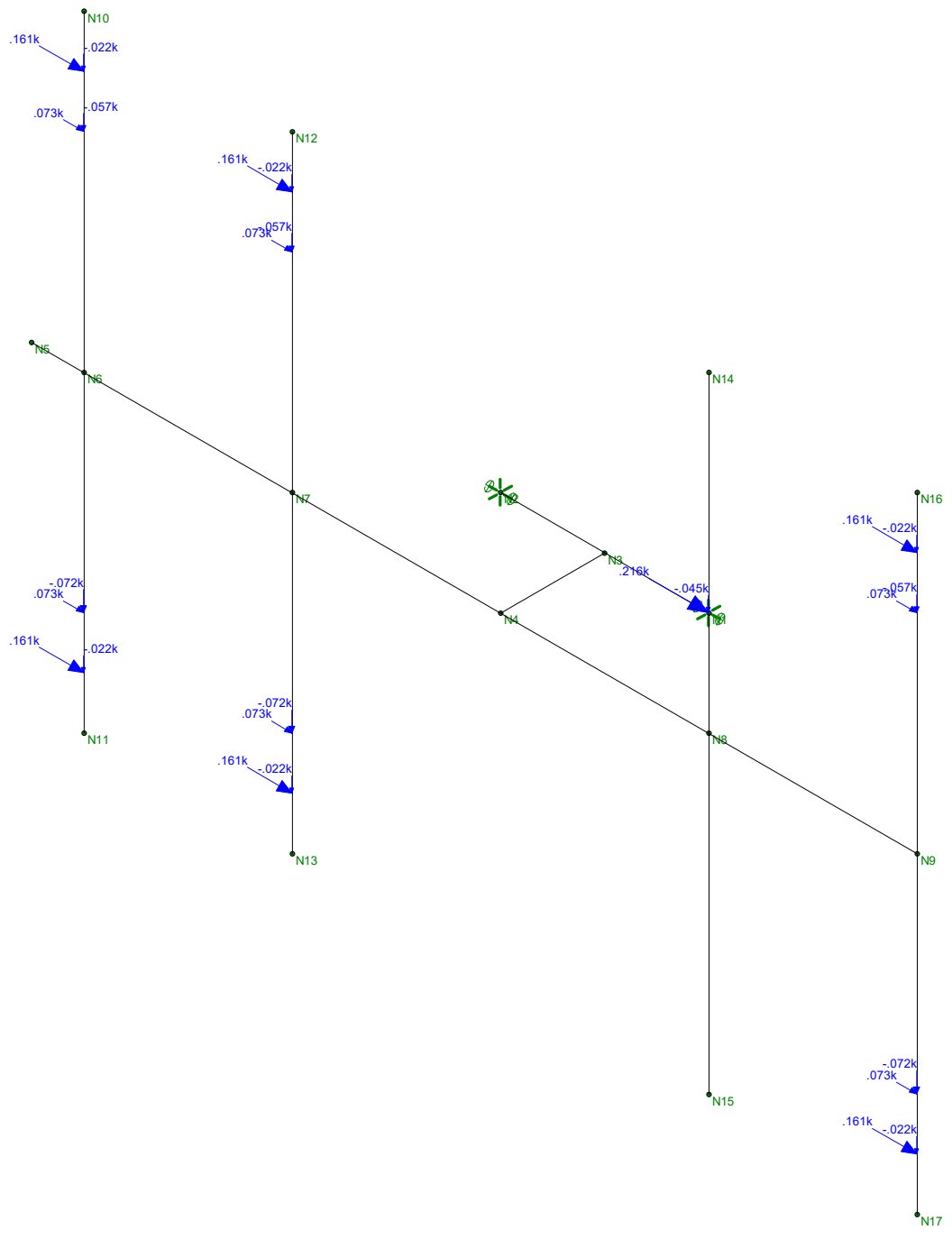
CENTEK Engineering, Inc.	Tower # 845 - Verizon Mast LC #1 Loads	
TJL		Mar 4, 2019 at 1:47 PM
18058.43		Verizon Antenna Mast - NESC.r3d





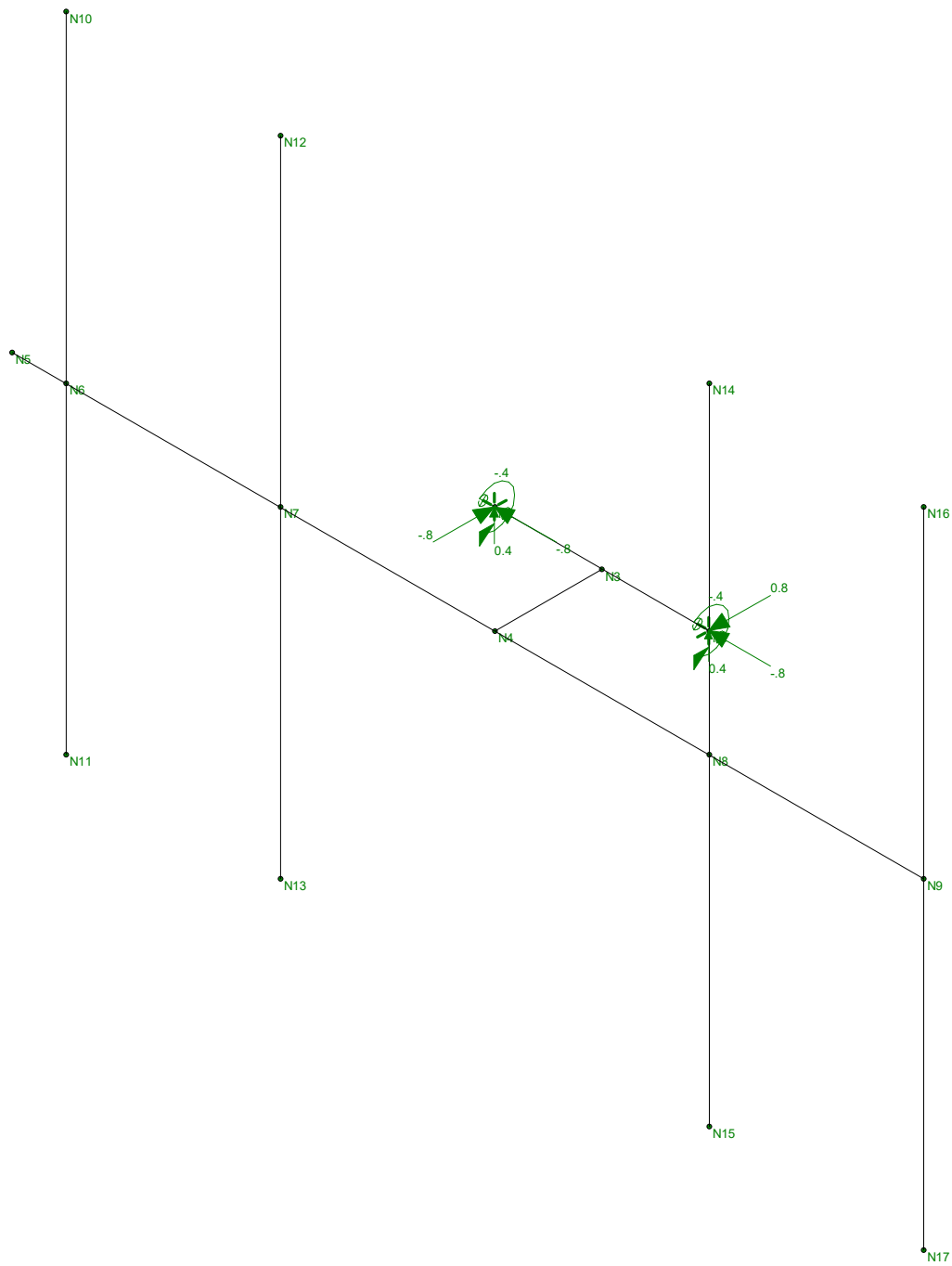
Results for LC 1, x-dir NESC Heavy Wind  
Reaction and Moment Units are k and k-ft

CENTEK Engineering, Inc.	Tower # 845 - Verizon Mast LC #1 Reactions	Mar 4, 2019 at 1:48 PM
TJL		Verizon Antenna Mast - NESC.r3d
18058.43		



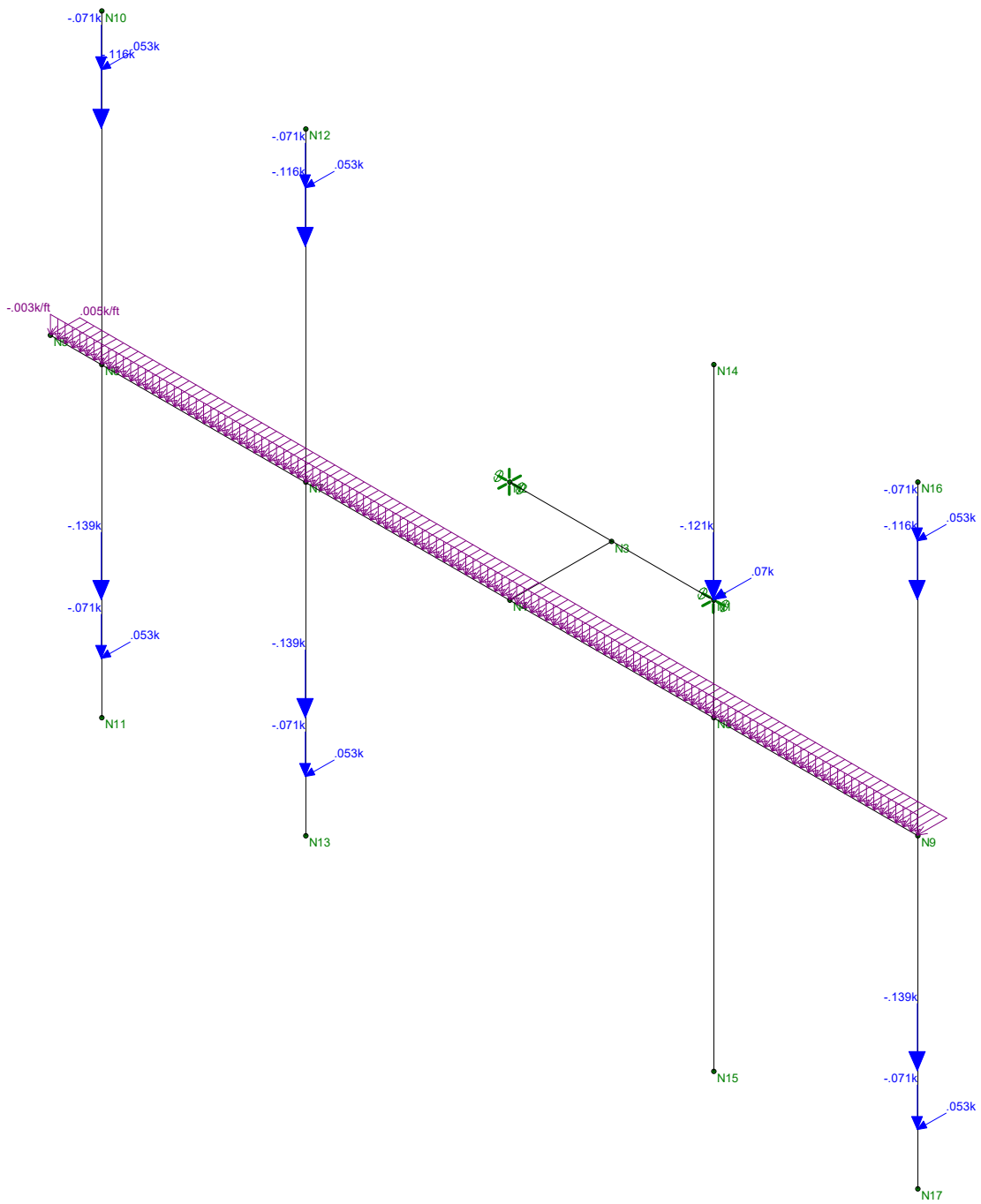
Loads: LC 2, x-dir NESC Extreme Wind

CENTEK Engineering, Inc.	Tower # 845 - Verizon Mast LC #2 Loads	
TJL		Mar 4, 2019 at 1:47 PM
18058.43		Verizon Antenna Mast - NESC.r3d



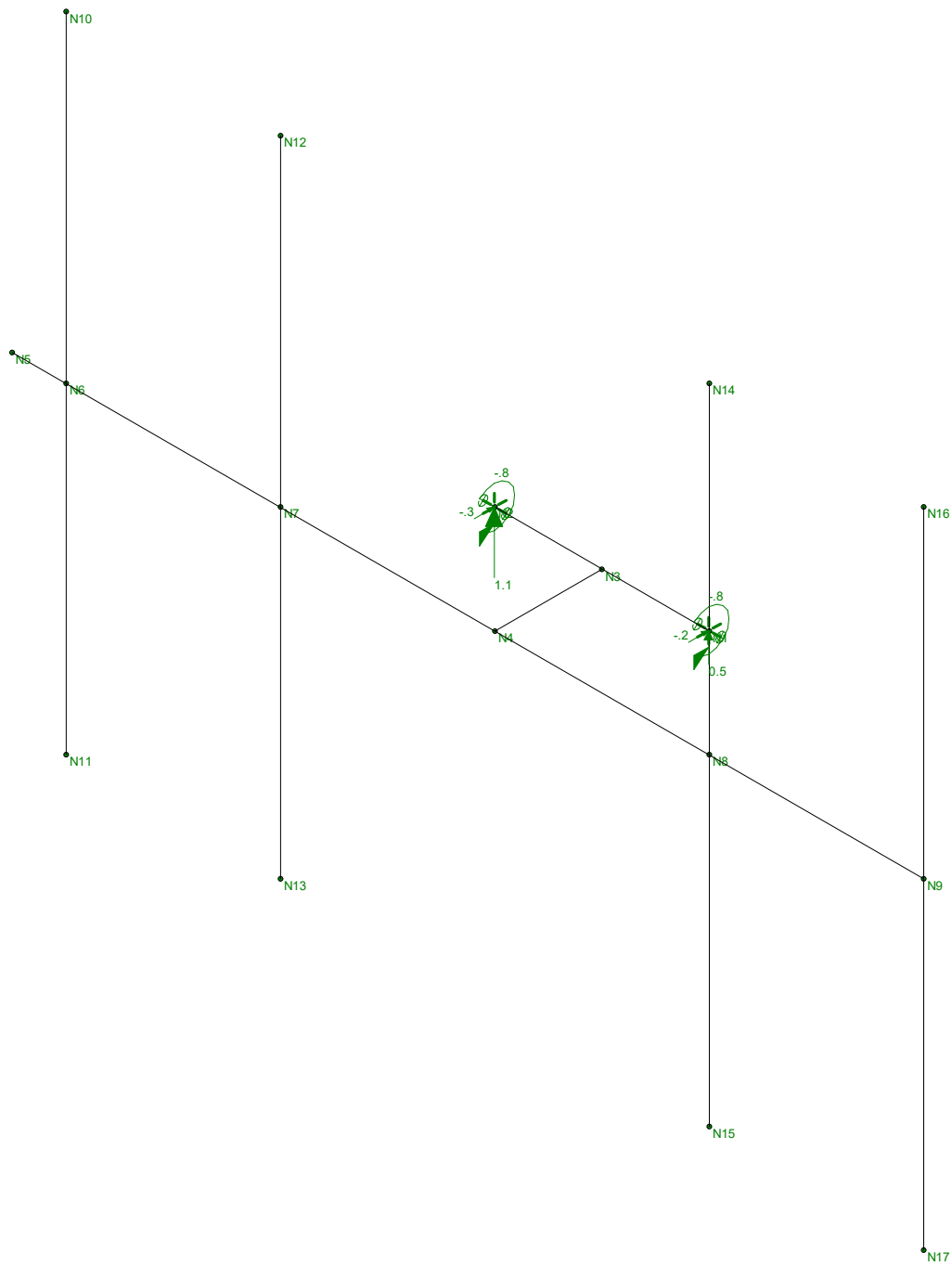
Results for LC 2, x-dir NESC Extreme Wind  
Reaction and Moment Units are k and k-ft

CENTEK Engineering, Inc.	Tower # 845 - Verizon Mast LC #2 Reactions	Mar 4, 2019 at 1:49 PM
TJL		Verizon Antenna Mast - NESC.r3d
18058.43		



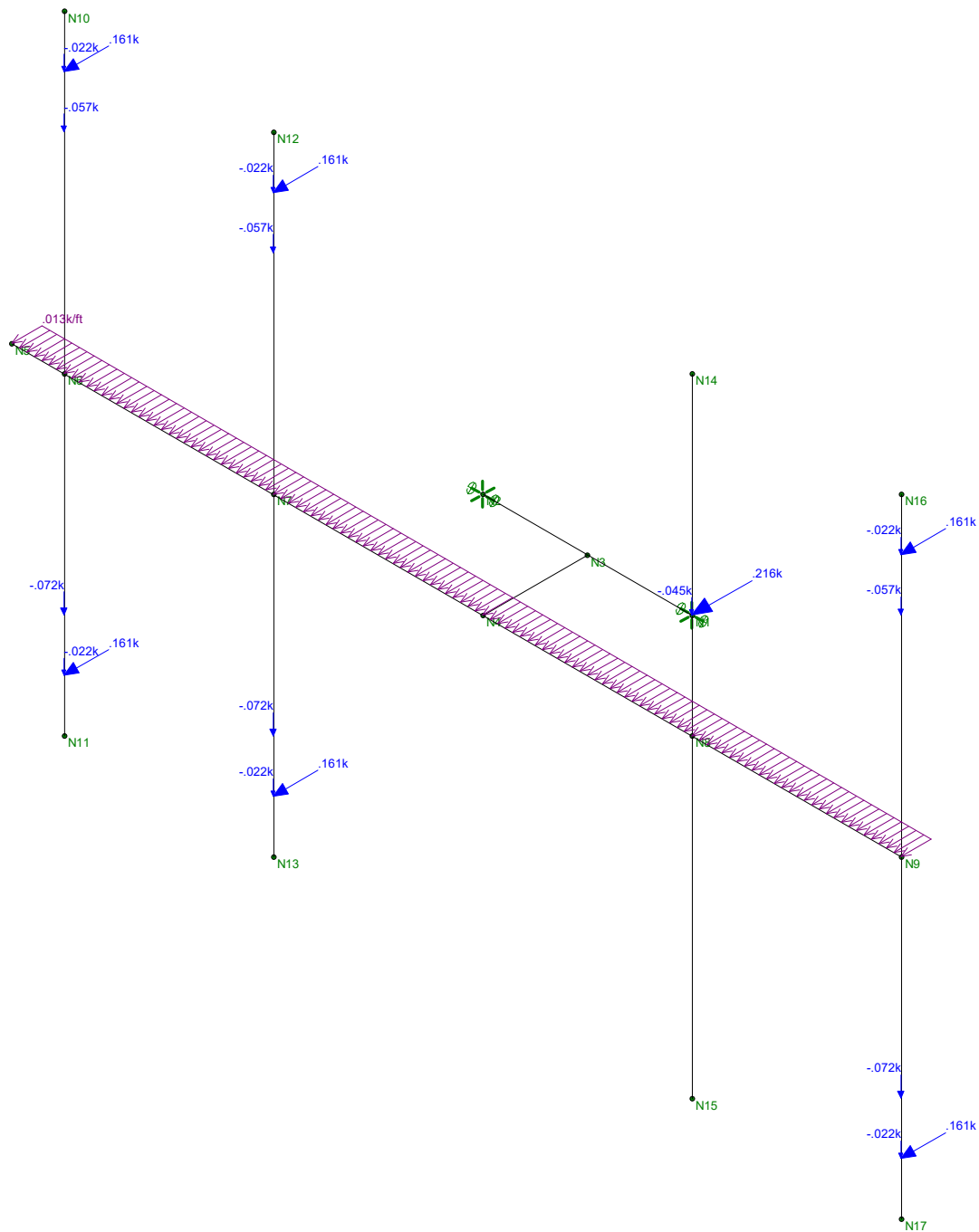
Loads: LC 3, z-dir NESC Heavy Wind

CENTEK Engineering, Inc.	Tower # 845 - Verizon Mast LC #3 Loads	
TJL		Mar 4, 2019 at 1:47 PM
18058.43		Verizon Antenna Mast - NESC.r3d



Results for LC 3, z-dir NESC Heavy Wind  
Reaction and Moment Units are k and k-ft

CENTEK Engineering, Inc.	Tower # 845 - Verizon Mast LC #3 Reactions	Mar 4, 2019 at 1:49 PM
TJL		Verizon Antenna Mast - NESC.r3d
18058.43		



Loads: LC 4, z-dir NESC Extreme Wind

CEN TEK Engineering, Inc.

TJL

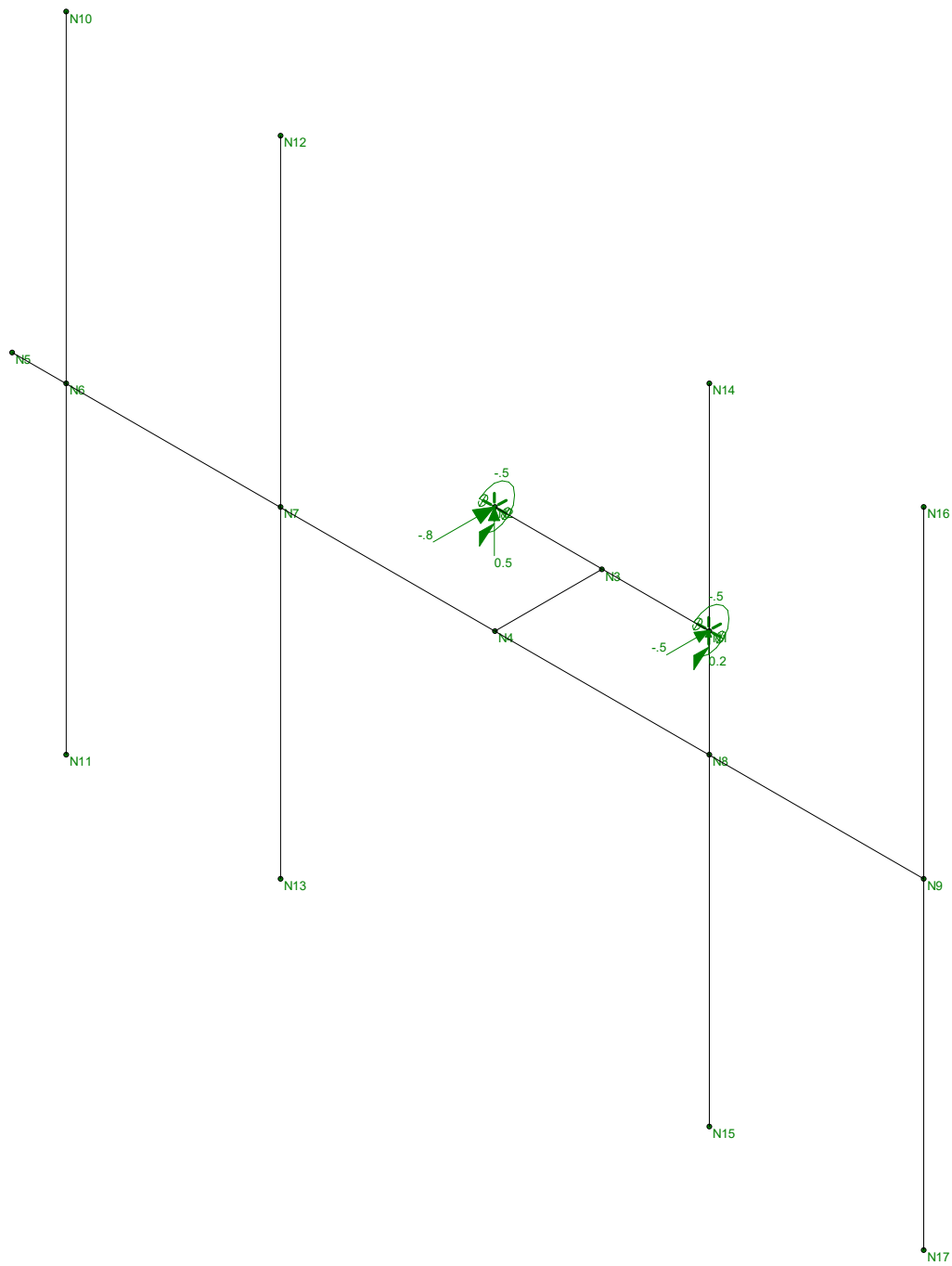
18058.43

Tower # 845 - Verizon Mast

LC #4 Loads

Mar 4, 2019 at 1:48 PM

Verizon Antenna Mast - NESC.r3d



Results for LC 4, z-dir NESC Extreme Wind  
Reaction and Moment Units are k and k-ft

CENTEK Engineering, Inc.
TJL
18058.43

Tower # 845 - Verizon Mast  
LC #4 Reactions

Mar 4, 2019 at 1:50 PM  
Verizon Antenna Mast - NESC.r3d

Scope : Verizon Antenna Installation on Eversource Pole

## Built-Up Section Properties

Description Pole #845 Section Properties @ Top

### General Information

Type...	Height	0.1875 in	Width	13.0000 in	X cg	0.0000 in	Y cg	10.4238 in
#1 Rectangular	Height	0.1875 in	Width	13.0000 in	X cg	0.0000 in	Y cg	10.4238 in
#2 Rectangular	Height	0.1875 in	Width	13.0000 in	X cg	0.0000 in	Y cg	-10.4238 in

### Steel Shapes

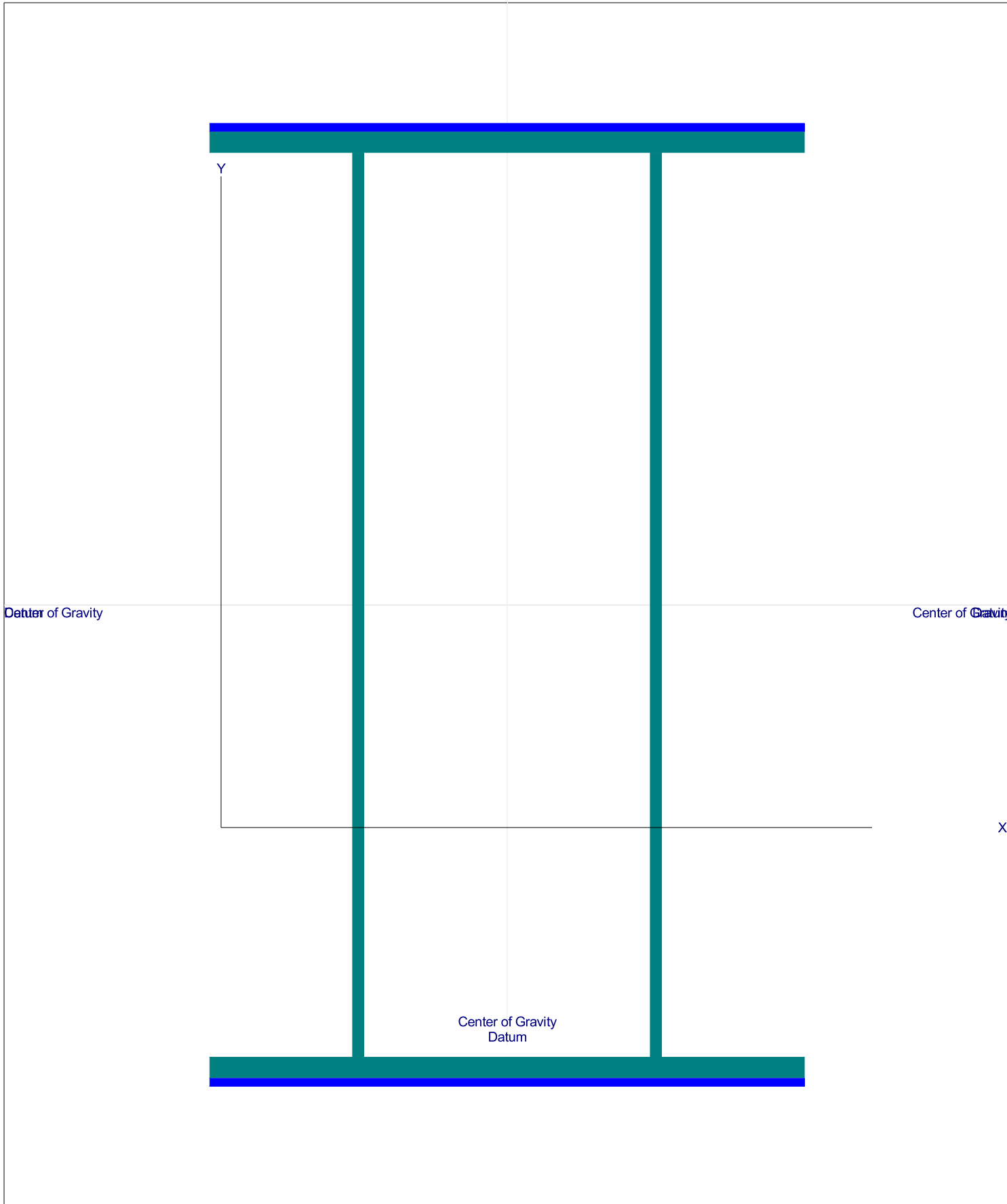
#1:	Name	<b>W21x44</b>	Angle	<b>0 deg</b>	Depth	20.6600 in	lxx	843.0000 in4
	Location of Centroid from Datum				Width	6.5000 in	lyy	20.7000 in4
	Xcg	<b>3.250 in</b>	Ycg	<b>0.000 in</b>	Area	13.0000 in2	Xbar	3.250 in
							Ybar	10.330 in
#2:	Name	<b>W21x44</b>	Angle	<b>0 deg</b>	Depth	20.6600 in	lxx	843.0000 in4
	Location of Centroid from Datum				Width	6.5000 in	lyy	20.7000 in4
	Xcg	<b>-3.250 in</b>	Ycg	<b>0.000 in</b>	Area	13.0000 in2	Xbar	3.250 in
							Ybar	10.330 in

### Summary

Total Area	30.8750 in2	lxx	2,215.710 in4	r xx	8.4714 in
X cg Dist.	0.0000 in	lyy	384.681 in4	r yy	3.5298 in
Y cg Dist.	0.0000 in	Edge Distances from CG...			
		+X	6.5000 in	S left	59.1817 in3
		-X	-6.5000 in	S right	59.1817 in3
		+Y	10.5176 in	S top	210.6679 in3
		-Y	-10.5176 in	S bottom	210.6679 in3



Datum  
Center of Gravity



Datum of Gravity

Center of Gravity

Center of Gravity  
Datum

Scope : Verizon Antenna Installation on Eversource Pole

## Built-Up Section Properties

### Description Pole #845 Section Properties @ Base

#### General Information

Type...	Height	Width	X cg	Y cg
#1 Rectangular	0.5000 in	54.0000 in	0.0000 in	10.5800 in
#2 Rectangular	0.5000 in	54.0000 in	0.0000 in	-10.5800 in

#### Steel Shapes

#1: Name	<b>W21x44</b>	Angle	<b>0 deg</b>	Depth	20.6600 in	lxx	843.0000 in4
Location of Centroid from Datum				Width	6.5000 in	lyy	20.7000 in4
Xcg	<b>23.750 in</b>	Ycg	<b>0.000 in</b>	Area	13.0000 in2	Xbar	3.250 in
						Ybar	10.330 in
#2: Name	<b>W21x44</b>	Angle	<b>0 deg</b>	Depth	20.6600 in	lxx	843.0000 in4
Location of Centroid from Datum				Width	6.5000 in	lyy	20.7000 in4
Xcg	<b>-23.750 in</b>	Ycg	<b>0.000 in</b>	Area	13.0000 in2	Xbar	3.250 in
						Ybar	10.330 in

#### Summary

Total Area	80.0000 in2	lxx	7,731.691 in4	r xx	9.8309 in
X cg Dist.	0.0000 in	lyy	27,829.025 in4	r yy	18.6511 in
Y cg Dist.	0.0000 in	Edge Distances from CG...			
		+X	27.0000 in	S left	1,030.7046 in3
		-X	-27.0000 in	S right	1,030.7046 in3
		+Y	10.8300 in	S top	713.9142 in3
		-Y	-10.8300 in	S bottom	713.9142 in3

Datum  
Center of Gravity

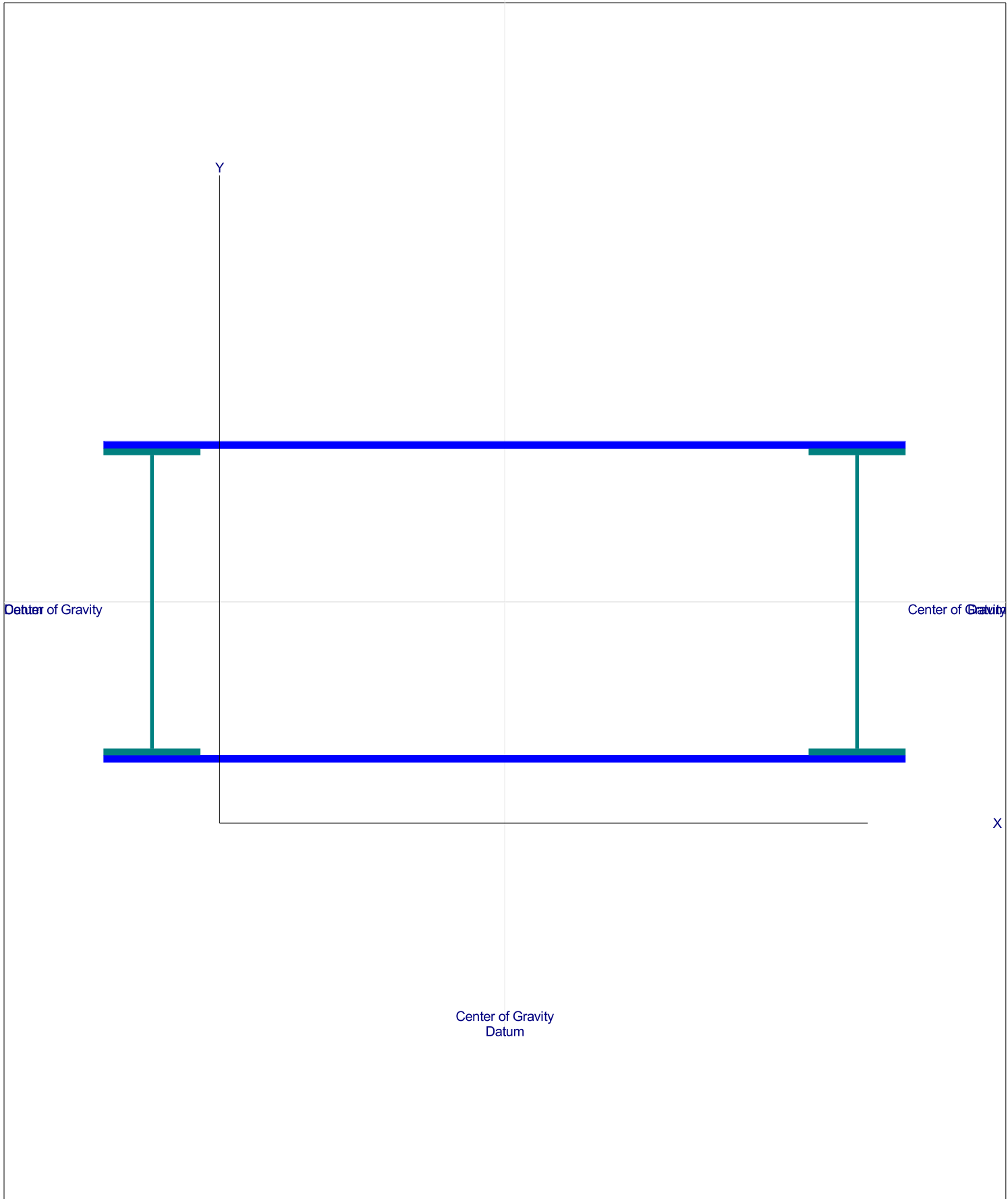
Y

Datum of Gravity

Center of Gravity

Center of Gravity  
Datum

X



**Basic Components**

Heavy Wind Pressure =	p := 4.00	psf	(User Input NESC 2007 Figure 250-1 & Table 250-1)
Basic Windspeed =	V := 110	mph	(User Input NESC 2007 Figure 250-2(e) )
Radial Ice Thickness =	Ir := 0.50	in	(User Input)
Radial Ice Density =	Id := 56.0	pcf	(User Input)

**Factors for Extreme Wind Calculation**

Elevation of Top of Pole Above Grade =	TME := 150	ft	(User Input)
Multiplier Gust Response Factor =	m := 1.25		(User Input - Only for NESC Extreme wind case)
NESC Factor =	kv := 1.43		(User Input from NESC 2007 Table 250-3 equation)
Importance Factor =	I := 1.0		(User Input from NESC 2007 Section 250.C.2)
Velocity Pressure Coefficient =	$Kz := 2.01 \cdot \left( 0.67 \cdot \frac{TME}{900} \right)^{\frac{2}{9.5}} = 1.267$ (NESC 2007 Table 250-2)		
Exposure Factor =	$Es := 0.346 \left[ \frac{33}{(0.67 \cdot TME)} \right]^{\frac{1}{7}} = 0.295$ (NESC 2007 Table 250-3)		
Response Term =	$Bs := \frac{1}{\left( 1 + 0.375 \cdot \frac{TME}{220} \right)} = 0.796$ (NESC 2007 Table 250-3)		
Gust Response Factor =	$Grf := \frac{\left[ 1 + \left( 2.7 \cdot Es \cdot Bs \cdot \frac{1}{2} \right) \right]}{kv^2} = 0.837$ (NESC 2007 Table 250-3)		
Wind Pressure =	qz := 0.00256 · Kz · V <sup>2</sup> · Grf · I = 32.8	psf	(NESC 2007 Section 250.C.2)

**Shape Factors**

Shape Factor for Round Members =	Cd <sub>R</sub> := 1.3	(User Input)
Shape Factor for Flat Members =	Cd <sub>F</sub> := 1.6	(User Input)
Shape Factor for Coax Cables Attached to Outside of Pole =	Cd <sub>coax</sub> := 1.6	(User Input)

**Overload Factors**

NU Design Criteria Table

**Overload Factors for Wind Loads:**

NESC Heavy Loading =	2.5	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	1.0	(User Input)	Apply in Risa-3D Analysis

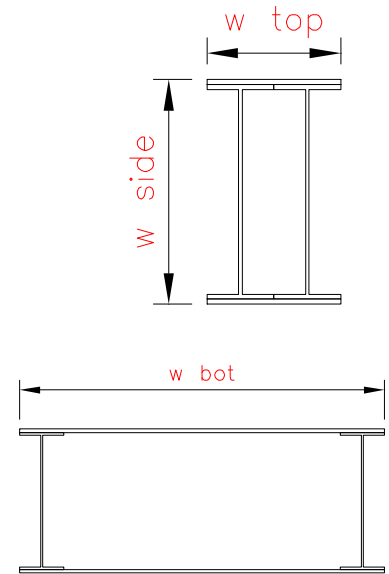
**Overload Factors for Vertical Loads:**

NESC Heavy Loading =	1.5	(User Input)	Apply in Risa-3D Analysis
NESC Extreme Loading =	1.0	(User Input)	Apply in Risa-3D Analysis

**Development of Wind & Ice Load on Pole**

**Pole Data:**

Shape =	Flat	
Width Side =	$W_{side} := 21.7$	in
Width Top =	$W_{top} := 13$	in
Width Bottom =	$W_{bot} := 54$	in
Length =	$L := 150$	ft
Area Top =	$A_{top} := 30.9$	sq in
Area Bottom =	$A_{bot} := 80.0$	sq in
Weight of Steel =	$W_{steel} := 490$	pcf
Area Ice Top =	$A_{i_{top}} := 40$	sq in
Area Ice Bottom =	$A_{i_{bot}} := 82$	sq in



**Gravity Loads (without ice)**

Weight Pole Top =

$$W_{t_{top}} := \frac{A_{top}}{144} \cdot W_{steel} = 105$$

plf

**BLC 2**

Weight Pole Bottom =

$$W_{t_{bot}} := \frac{A_{bot}}{144} \cdot W_{steel} = 272$$

plf

**BLC 2**

**Gravity Loads (ice only)**

Weight of Ice on Pole Top =

$$W_{ICE.top} := Id \cdot \frac{A_{i_{top}}}{144} = 16$$

plf

**BLC 3**

Weight of Ice on Pole Bottom =

$$W_{ICE.bot} := Id \cdot \frac{A_{i_{bot}}}{144} = 32$$

plf

**BLC 3**

**Wind Load (NESC Extreme)**

Pole Projected Surface Area Top =  $A_{top} := \frac{W_{top}}{12} = 1.083$  sq ft/ft

Pole Projected Surface Area Bottom =  $A_{bot} := \frac{W_{bot}}{12} = 4.5$  sq ft/ft

Pole Projected Surface Area Side =  $A_{side} := \frac{W_{side}}{12} = 1.808$  sq ft/ft

Total Pole Wind Force Top =  $qz \cdot C_d F \cdot A_{top} = 57$  plf **BLC 7**

Total Pole Wind Force Bottom =  $qz \cdot C_d F \cdot A_{bot} = 236$  plf **BLC 7**

Total Pole Wind Force Side =  $qz \cdot C_d F \cdot A_{side} = 95$  plf **BLC 5**

**Wind Load (NESE Heavy)**

Pole Projected Surface Area w/ Ice Top =  $A_{ICE_{top}} := \frac{(W_{top} + 2 \cdot I_r)}{12} = 1.167$  sq ft/ft

Pole Projected Surface Area w/ Ice Bottom =  $A_{ICE_{bot}} := \frac{(W_{bot} + 2 \cdot I_r)}{12} = 4.583$  sq ft/ft

Pole Projected Surface Area w/ Ice Side =  $A_{ICE_{side}} := \frac{(W_{side} + 2 \cdot I_r)}{12} = 1.892$  sq ft/ft

Total Pole Wind Force w/ Ice Top =  $p \cdot C_d F \cdot A_{ICE_{top}} = 7$  plf **BLC 6**

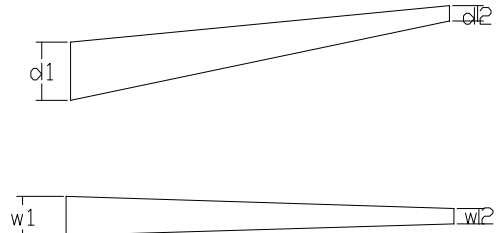
Total Pole Wind Force w/ Ice Bottom =  $p \cdot C_d F \cdot A_{ICE_{bot}} = 29$  plf **BLC 6**

Total Pole Wind Force w/ Ice Side =  $p \cdot C_d F \cdot A_{ICE_{side}} = 12$  plf **BLC 4**

**Development of Wind & Ice Load on Pole Arms**

**ARMData:**

Shape = Flat  
 Depth of Arm at Top =  $ARM_{d1} := 12$   
 Depth of Arm at Bottom =  $ARM_{d2} := 4$   
 Width of Arm at Top =  $ARM_{W1} := 8$   
 Width of Arm at Bottom =  $ARM_{W2} := 4$   
 Thickness of Arm Wall =  $ARM_t := 0.25$



**Gravity Loads (without ice)**

Arm Area Top =  $A_{armtop} := (ARM_{d1} \cdot ARM_{W1}) - [(ARM_{W1} - 2 \cdot ARM_t) \cdot (ARM_{d1} - 2 \cdot ARM_t)]$

Arm Area Bottom =  $A_{armbot} := (ARM_{d2} \cdot ARM_{W2}) - [(ARM_{W2} - 2 \cdot ARM_t) \cdot (ARM_{d2} - 2 \cdot ARM_t)]$

Weight Arm Top =  $W_{t_{top}} := \frac{A_{armtop}}{144} \cdot W_{steel} = 33$  plf **BLC 2**

Weight Arm Bottom =  $W_{t_{bot}} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$  plf **BLC 2**

**Gravity Loads (ice only)**

Arm Area w/ Ice Top =  $Ai_{armtop} := (ARM_{d1} + 2 \cdot lr) \cdot (ARM_{W1} + 2 \cdot lr) - ARM_{d1} \cdot ARM_{W1} = 21$

Arm Area w/ Ice Bottom =  $Ai_{armbot} := (ARM_{d2} + 2 \cdot lr) \cdot (ARM_{W2} + 2 \cdot lr) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top =  $W_{ICE.top} := Id \cdot \frac{Ai_{armtop}}{144} = 8$  plf **BLC 3**

Weight of Ice on Arm Bottom =  $W_{ICE.bot} := Id \cdot \frac{Ai_{armbot}}{144} = 4$  plf **BLC 3**

**Wind Load (NESC Extreme)**

Arm Projected Surface Area Top =  $A_{top} := \frac{ARM_{d1}}{12} = 1$  sq ft

Arm Projected Surface Area Bottom =  $A_{bot} := \frac{ARM_{d2}}{12} = 0.333$  sq ft

Total Arm Wind Force Top =  $qz \cdot Cd_F \cdot A_{top} = 53$  plf **BLC 7**

Total Arm Wind Force Bottom =  $qz \cdot Cd_F \cdot A_{bot} = 18$  plf **BLC 7**

**Wind Load (NESE Heavy)**

Arm Projected Surface Area w/ Ice Top =  $A_{ICE_{top}} := \frac{(ARM_{d1} + 2 \cdot lr)}{12} = 1.083$  sq ft

Arm Projected Surface Area w/ Ice Bottom =  $A_{ICE_{bot}} := \frac{(ARM_{d2} + 2 \cdot lr)}{12} = 0.417$  sq ft

Total Arm Wind Force w/ Ice Top =  $p \cdot Cd_F \cdot A_{ICE_{top}} = 7$  plf **BLC 6**

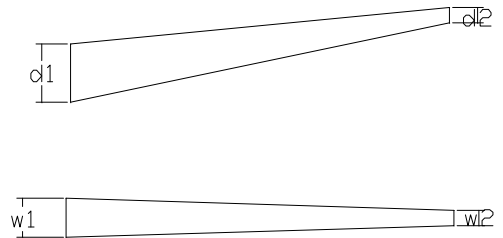
Total Arm Wind Force w/ Ice Bottom =  $p \cdot Cd_F \cdot A_{ICE_{bot}} = 3$  plf **BLC 6**



**Development of Wind & Ice Load on Pole Arms**

**ARMData:**

Shape =	Flat
Depth of Arm at Top =	$ARM_{d1} := 15$
Depth of Arm at Bottom =	$ARM_{d2} := 4$
Width of Arm at Top =	$ARM_{W1} := 10$
Width of Arm at Bottom =	$ARM_{W2} := 4$
Thickness of Arm Wall =	$ARM_t := 0.25$



**Gravity Loads (without ice)**

Arm Area Top =  $A_{armtop} := (ARM_{d1} \cdot ARM_{W1}) - [(ARM_{W1} - 2 \cdot ARM_t) \cdot (ARM_{d1} - 2 \cdot ARM_t)]$

Arm Area Bottom =  $A_{armbot} := (ARM_{d2} \cdot ARM_{W2}) - [(ARM_{W2} - 2 \cdot ARM_t) \cdot (ARM_{d2} - 2 \cdot ARM_t)]$

Weight Arm Top =  $W_{t_{top}} := \frac{A_{armtop}}{144} \cdot W_{steel} = 42$  plf **BLC 2**

Weight Arm Bottom =  $W_{t_{bot}} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$  plf **BLC 2**

**Gravity Loads (ice only)**

Arm Area w/ Ice Top =  $Ai_{armtop} := (ARM_{d1} + 2 \cdot lr) \cdot (ARM_{W1} + 2 \cdot lr) - ARM_{d1} \cdot ARM_{W1} = 26$

Arm Area w/ Ice Bottom =  $Ai_{armbot} := (ARM_{d2} + 2 \cdot lr) \cdot (ARM_{W2} + 2 \cdot lr) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top =  $W_{ICE.top} := Id \cdot \frac{Ai_{armtop}}{144} = 10$  plf **BLC 3**

Weight of Ice on Arm Bottom =  $W_{ICE.bot} := Id \cdot \frac{Ai_{armbot}}{144} = 4$  plf **BLC 3**

**Wind Load (NESC Extreme)**

Arm Projected Surface Area Top =

$$A_{top} := \frac{ARM_{d1}}{12} = 1.25 \quad \text{sq ft/ft}$$

Arm Projected Surface Area Bottom =

$$A_{bot} := \frac{ARM_{d2}}{12} = 0.333 \quad \text{sq ft/ft}$$

Total Arm Wind Force Top =

$$qz \cdot Cd_F \cdot A_{top} = 66 \quad \text{plf} \quad \text{BLC 7}$$

Total Arm Wind Force Bottom =

$$qz \cdot Cd_F \cdot A_{bot} = 18 \quad \text{plf} \quad \text{BLC 7}$$

**Wind Load (NESE Heavy)**

Arm Projected Surface Area w/ Ice Top =

$$A_{ICE_{top}} := \frac{(ARM_{d1} + 2 \cdot lr)}{12} = 1.333 \quad \text{sq ft/ft}$$

Arm Projected Surface Area w/ Ice Bottom =

$$A_{ICE_{bot}} := \frac{(ARM_{d2} + 2 \cdot lr)}{12} = 0.417 \quad \text{sq ft/ft}$$

Total Arm Wind Force w/ Ice Top =

$$p \cdot Cd_F \cdot A_{ICE_{top}} = 9 \quad \text{plf} \quad \text{BLC 6}$$

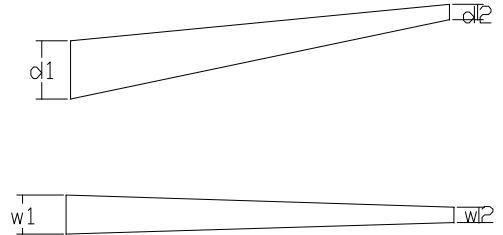
Total Arm Wind Force w/ Ice Bottom =

$$p \cdot Cd_F \cdot A_{ICE_{bot}} = 3 \quad \text{plf} \quad \text{BLC 6}$$

**Development of Wind & Ice Load on Pole Arms**

**ARMData:**

Shape = Flat  
 Depth of Arm at Top =  $ARM_{d1} := 18$   
 Depth of Arm at Bottom =  $ARM_{d2} := 4$   
 Width of Arm at Top =  $ARM_{W1} := 12$   
 Width of Arm at Bottom =  $ARM_{W2} := 4$   
 Thickness of Arm Wall =  $ARM_t := 0.25$



**Gravity Loads (without ice)**

Arm Area Top =  $A_{armtop} := (ARM_{d1} \cdot ARM_{W1}) - [(ARM_{W1} - 2 \cdot ARM_t) \cdot (ARM_{d1} - 2 \cdot ARM_t)]$

Arm Area Bottom =  $A_{armbot} := (ARM_{d2} \cdot ARM_{W2}) - [(ARM_{W2} - 2 \cdot ARM_t) \cdot (ARM_{d2} - 2 \cdot ARM_t)]$

Weight Arm Top =  $W_{ttop} := \frac{A_{armtop}}{144} \cdot W_{steel} = 50$  plf **BLC 2**

Weight Arm Bottom =  $W_{tbot} := \frac{A_{armbot}}{144} \cdot W_{steel} = 13$  plf **BLC 2**

**Gravity Loads (ice only)**

Arm Area w/ Ice Top =  $A_{iarmtop} := (ARM_{d1} + 2 \cdot lr) \cdot (ARM_{W1} + 2 \cdot lr) - ARM_{d1} \cdot ARM_{W1} = 31$

Arm Area w/ Ice Bottom =  $A_{iarmbot} := (ARM_{d2} + 2 \cdot lr) \cdot (ARM_{W2} + 2 \cdot lr) - ARM_{d2} \cdot ARM_{W2} = 9$

Weight of Ice on Arm Top =  $W_{ICE.top} := Id \cdot \frac{A_{iarmtop}}{144} = 12$  plf **BLC 3**

Weight of Ice on Arm Bottom =  $W_{ICE.bot} := Id \cdot \frac{A_{iarmbot}}{144} = 4$  plf **BLC 3**

**Wind Load (NESC Extreme)**

Arm Projected Surface Area Top =

$$A_{top} := \frac{ARM_{d1}}{12} = 1.5 \quad \text{sq ft/ft}$$

Arm Projected Surface Area Bottom =

$$A_{bot} := \frac{ARM_{d2}}{12} = 0.333 \quad \text{sq ft/ft}$$

Total Arm Wind Force Top =

$$qz \cdot Cd_F \cdot A_{top} = 79 \quad \text{plf} \quad \text{BLC 7}$$

Total Arm Wind Force Bottom =

$$qz \cdot Cd_F \cdot A_{bot} = 18 \quad \text{plf} \quad \text{BLC 7}$$

**Wind Load (NESE Heavy)**

Arm Projected Surface Area w/ Ice Top =

$$A_{ICE_{top}} := \frac{(ARM_{d1} + 2 \cdot lr)}{12} = 1.583 \quad \text{sq ft/ft}$$

Arm Projected Surface Area w/ Ice Bottom =

$$A_{ICE_{bot}} := \frac{(ARM_{d2} + 2 \cdot lr)}{12} = 0.417 \quad \text{sq ft/ft}$$

Total Arm Wind Force w/ Ice Top =

$$p \cdot Cd_F \cdot A_{ICE_{top}} = 10 \quad \text{plf} \quad \text{BLC 6}$$

Total Arm Wind Force w/ Ice Bottom =

$$p \cdot Cd_F \cdot A_{ICE_{bot}} = 3 \quad \text{plf} \quad \text{BLC 6}$$

**Development of Wind & Ice Load on Coax Cables**

**Coax Cable Data:**

	(0-ft to 140-ft)	
Coax Type =	HELIAX 1-5/8"	
Shape =	Round	(User Input)
Coax Outside Diameter =	D <sub>coax</sub> := 1.98 in	(User Input)
Coax Cable Length =	L <sub>coax</sub> := 100 ft	(User Input)
Weight of Coax per foot =	Wt <sub>coax</sub> := 1.04 plf	(User Input)
Total Number of Coax =	N <sub>coax</sub> := 26	(User Input) (24 T-Mobile & 2 Verizon)
No. of Coax Projecting Outside Face of Pole X-DIR =	NP <sub>coaxX</sub> := 2	(User Input)
No. of Coax Projecting Outside Face of Pole Z-DIR =	NP <sub>coaxZ</sub> := 2	(User Input)

**Wind Load (NESC Extreme)**

Coax projected surface area X-DIR =  $A_{coaxX} := \frac{(NP_{coaxX} \cdot D_{coax})}{12} = 0.3$  ft

Total Coax Wind Force X-DIR =  $F_{coaxX} := qz \cdot Cd_{coax} \cdot A_{coaxX} = 17$  plf **BLC 19**

Coax projected surface area Z-DIR =  $A_{coaxZ} := \frac{(NP_{coaxZ} \cdot D_{coax})}{12} = 0.3$  ft

Total Coax Wind Force Z-DIR =  $F_{coaxZ} := qz \cdot Cd_{coax} \cdot A_{coaxZ} = 17$  plf **BLC 21**

**Wind Load (NESC Heavy)**

Coax projected surface area w/ Ice X-DIR =  $A_{ICE_{coaxX}} := \frac{(NP_{coaxX} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.4$  ft

Total Coax Wind Force w/ Ice X-DIR =  $F_{i_{coaxX}} := p \cdot Cd_{coax} \cdot A_{ICE_{coaxX}} = 3$  plf **BLC 18**

Coax projected surface area w/ Ice Z-DIR =  $A_{ICE_{coaxZ}} := \frac{(NP_{coaxZ} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.4$  ft

Total Coax Wind Force w/ Ice Z-DIR =  $F_{i_{coaxZ}} := p \cdot Cd_{coax} \cdot A_{ICE_{coaxZ}} = 3$  plf **BLC 20**

**Gravity Loads (without ice)**

Weight of all cables w/o ice  $WT_{coax} := Wt_{coax} \cdot N_{coax} = 27$  plf **BLC 16**

**Gravity Load (ice only)**

Ice Area per Linear Foot =  $A_{i_{coax}} := \frac{\pi}{4} [(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^2] = 3.9$  sq in

Ice Weight All Coax per foot =  $WT_{i_{coax}} := N_{coax} \cdot Id \cdot \frac{A_{i_{coax}}}{144} = 39$  plf **BLC 17**

**Development of Wind & Ice Load on Coax Cables**

**Coax Cable Data:**

	(90-ft to 140-ft)	
Coax Type =	HELIAX 1-5/8"	
Shape =	Round	(User Input)
Coax Outside Diameter =	D <sub>coax</sub> := 1.98 in	(User Input)
Coax Cable Length =	L <sub>coax</sub> := 100 ft	(User Input)
Weight of Coax per foot =	Wt <sub>coax</sub> := 1.04 plf	(User Input)
Total Number of Coax =	N <sub>coax</sub> := 24	(User Input) (24 T-Mobile)
No. of Coax Projecting Outside Face of Pole X-DIR =	NP <sub>coaxX</sub> := 2	(User Input)
No. of Coax Projecting Outside Face of Pole Z-DIR =	NP <sub>coaxZ</sub> := 2	(User Input)

**Wind Load (NESC Extreme)**

Coax projected surface area X-DIR =  $A_{coaxX} := \frac{(NP_{coaxX} \cdot D_{coax})}{12} = 0.3$  ft

Total Coax Wind Force X-DIR =  $F_{coaxX} := qz \cdot Cd_{coax} \cdot A_{coaxX} = 17$  plf **BLC 19**

Coax projected surface area Z-DIR =  $A_{coaxZ} := \frac{(NP_{coaxZ} \cdot D_{coax})}{12} = 0.3$  ft

Total Coax Wind Force Z-DIR =  $F_{coaxZ} := qz \cdot Cd_{coax} \cdot A_{coaxZ} = 17$  plf **BLC 21**

**Wind Load (NESC Heavy)**

Coax projected surface area w/ Ice X-DIR =  $AICE_{coaxX} := \frac{(NP_{coaxX} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.4$  ft

Total Coax Wind Force w/ Ice X-DIR =  $Fi_{coaxX} := p \cdot Cd_{coax} \cdot AICE_{coaxX} = 3$  plf **BLC 18**

Coax projected surface area w/ Ice Z-DIR =  $AICE_{coaxZ} := \frac{(NP_{coaxZ} \cdot D_{coax} + 2 \cdot Ir)}{12} = 0.4$  ft

Total Coax Wind Force w/ Ice Z-DIR =  $Fi_{coaxZ} := p \cdot Cd_{coax} \cdot AICE_{coaxZ} = 3$  plf **BLC 20**

**Gravity Loads (without ice)**

Weight of all cables w/o ice  $WT_{coax} := Wt_{coax} \cdot N_{coax} = 25$  plf **BLC 16**

**Gravity Load (ice only)**

Ice Area per Linear Foot =  $Ai_{coax} := \frac{\pi}{4} [(D_{coax} + 2 \cdot Ir)^2 - D_{coax}^2] = 3.9$  sq in

Ice Weight All Coax per foot =  $WTi_{coax} := N_{coax} \cdot Id \cdot \frac{Ai_{coax}}{144} = 36$  plf **BLC 17**

**(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?	No
Max Iterations for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
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	None
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-91/97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-11: ASD
Aluminum Code	AA ADM1-10: ASD - Building
Stainless Steel Code	AISC 14th(360-10): ASD
Adjust Stiffness?	Yes(Iterative)

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8

**(Global) Model Settings, Continued**

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct X	.035
Ct Z	.035
T X (sec)	Not Entered
T Z (sec)	Not Entered
R X	8.5
R Z	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Om Z	1
Om X	1
Rho Z	1
Rho X	1
Footing Overturning Safety Factor	1.5
Optimize for OTM/Sliding	No
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lambda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

**Hot Rolled Steel Properties**

	Label	E [ksi]	G [ksi]	Nu	Therm (\1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1
6	A53 Gr. B	29000	11154	.3	.65	.49	35	1.5	58	1.2
7	A572 Gr.60	29000	11154	.3	.65	.49	60	1.5	75	1.2





Company : Centek  
 Designer : T.JL  
 Job Number : 18058.43 - CT11080B  
 Model Name : Pole # 845

Mar 4, 2019  
 2:03 PM  
 Checked By: CAG

### Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design ...	A [in <sup>2</sup> ]	Iyy [in <sup>4</sup> ]	Izz [in <sup>4</sup> ]	J [in <sup>4</sup> ]
1	Pole 0'	0'	Column	Wide Flange	A572 Gr.60	Typical	79.56	27580.7	7721	13783.6
2	Pole 5'	5'	Column	Wide Flange	A572 Gr.60	Typical	78.189	25786.2	7566.93	13245.5
3	Pole 10'	10'	Column	Wide Flange	A572 Gr.60	Typical	76.818	24065.1	7412.85	12710.5
4	Pole 15'	15'	Column	Wide Flange	A572 Gr.60	Typical	75.447	22416.3	7258.78	12178.9
5	Pole 20'	20'	Column	Wide Flange	A572 Gr.60	Typical	74.076	20881.3	7104.7	11681.1
6	Pole 25'	25'	Column	Wide Flange	A572 Gr.60	Typical	72.705	19330	6950.63	11125.1
7	Pole 30'	30'	Column	Wide Flange	A572 Gr.60	Typical	65.658	16898.9	6132.17	9804.67
8	Pole 35'	35'	Column	Wide Flange	A572 Gr.60	Typical	64.461	15617	5998.48	9340.72
9	Pole 40'	40'	Column	Wide Flange	A572 Gr.60	Typical	63.266	14395.7	5864.91	8880.99
10	Pole 45'	45'	Column	Wide Flange	A572 Gr.60	Typical	62.069	13233	5731.21	8424.68
11	Pole 50'	50'	Column	Wide Flange	A572 Gr.60	Typical	60.872	12128.2	5597.52	7972.03
12	Pole 55'	55'	Column	Wide Flange	A572 Gr.60	Typical	59.677	11080.5	5463.95	7522.82
13	Pole 60'	60'	Column	Wide Flange	A572 Gr.60	Typical	53.745	9530.9	4782.4	6497.85
14	Pole 65'	65'	Column	Wide Flange	A572 Gr.60	Typical	52.721	8652.01	4668.72	6107
15	Pole 70'	70'	Column	Wide Flange	A572 Gr.60	Typical	51.697	7821.92	4554.94	5720.13
16	Pole 75'	75'	Column	Wide Flange	A572 Gr.60	Typical	50.673	7040.29	4441.26	5337.17
17	Pole 80'	80'	Column	Wide Flange	A572 Gr.60	Typical	49.648	6305.72	4327.48	4958.93
18	Pole 85'	85'	Column	Wide Flange	A572 Gr.60	Typical	48.625	5617.66	4213.8	4585.5
19	Pole 90'	90'	Column	Wide Flange	A572 Gr.60	Typical	40.254	4445.95	3264.77	3431.03
20	Pole 95'	95'	Column	Wide Flange	A572 Gr.60	Typical	39.571	3917.71	3189.81	3161.77
21	Pole 100'	100'	Column	Wide Flange	A572 Gr.60	Typical	38.888	3426.45	3114.94	2895.62
22	Pole 105'	105'	Column	Wide Flange	A572 Gr.60	Typical	38.205	2971.38	3039.98	2632.46
23	Pole 110'	110'	Column	Wide Flange	A572 Gr.60	Typical	37.522	2551.93	2965.03	2373.18
24	Pole 115'	115'	Column	Wide Flange	A572 Gr.60	Typical	36.84	2167.55	2890.15	2117.95
25	Pole 120'	120'	Column	Wide Flange	A572 Gr.60	Typical	33.523	1718.78	2521.02	1659.03
26	Pole 125'	125'	Column	Wide Flange	A572 Gr.60	Typical	33.009	1420.3	2465	1457.02
27	Pole 130'	130'	Column	Wide Flange	A572 Gr.60	Typical	32.496	1152.64	2409.03	1259.46
28	Pole 135'	135'	Column	Wide Flange	A572 Gr.60	Typical	31.983	915.275	2353.07	1065.44
29	Pole 140'	140'	Column	Wide Flange	A572 Gr.60	Typical	31.47	707.682	2297.04	876.406
30	Pole 145'	145'	Column	Wide Flange	A572 Gr.60	Typical	30.956	529.465	2241.07	694.633
31	5' Arm Base	5' Arm Base	Beam	Tube	A36 Gr.36	Typical	9.75	107.703	201.453	215.555
32	5' Arm Mid	5' Arm Mid	Beam	Tube	A36 Gr.36	Typical	6.75	40.016	62.641	75.013
33	8' Arm Base	8' Arm Base	Beam	Tube	A36 Gr.36	Typical	12.25	214.005	399.005	426.748
34	8' Arm Mid	8' Arm Mid	Beam	Tube	A36 Gr.36	Typical	8	65.573	105.26	123.877
35	10.5' Arm Base	10.5' Arm Base	Beam	Tube	A36 Gr.36	Typical	14.75	374.057	695.932	743.994
36	10.5' Arm Mid	10.5' Arm Mid	Beam	Tube	A36 Gr.36	Typical	9.25	100.193	163.818	190.317

### Hot Rolled Steel Design Parameters

	Label	Shape	Length...	Lbyy[ft]	Lbzz[ft]	Lcomp to...	Lcomp bo...	Kyy	Kzz	Cm-yy	Cm-zz	Cb	y sway	z sway	Function
1	M1	Pole 0'	5					Lbyy							Lateral
2	M2	8' Arm Mid	4.482					Lbyy							Lateral
3	M3	8' Arm Mid	4.482					Lbyy							Lateral
4	M4	10.5 Arm...	5.672					Lbyy							Lateral
5	M5	10.5 Arm...	5.672					Lbyy							Lateral
6	M6	8' Arm Mid	4.349					Lbyy							Lateral
7	M7	8' Arm Mid	4.349					Lbyy							Lateral
8	M8	5' Arm Mid	2.795					Lbyy							Lateral
9	M9	5' Arm Mid	2.795					Lbyy							Lateral
10	M11	Pole 5'	5					Lbyy							Lateral

**Hot Rolled Steel Design Parameters (Continued)**

Label	Shape	Length...	Lbyy[ft]	Lbzz[ft]	Lcomp to...	Lcomp bo...	Kyy	Kzz	Cm-yy	Cm-zz	Cb	y sway	z sway	Function
11	M12	Pole 10'	5		Lbyy									Lateral
12	M13	Pole 15'	5		Lbyy									Lateral
13	M14	Pole 20'	5		Lbyy									Lateral
14	M15	Pole 25'	5		Lbyy									Lateral
15	M16	Pole 30'	5		Lbyy									Lateral
16	M17	Pole 35'	5		Lbyy									Lateral
17	M18	Pole 40'	5		Lbyy									Lateral
18	M19	Pole 45'	5		Lbyy									Lateral
19	M20	Pole 50'	5		Lbyy									Lateral
20	M21	Pole 55'	5		Lbyy									Lateral
21	M22	Pole 60'	5		Lbyy									Lateral
22	M23	Pole 65'	5		Lbyy									Lateral
23	M24	Pole 70'	5		Lbyy									Lateral
24	M25	Pole 75'	5		Lbyy									Lateral
25	M26	Pole 80'	5		Lbyy									Lateral
26	M27	Pole 85'	5		Lbyy									Lateral
27	M28	Pole 90'	5		Lbyy									Lateral
28	M29	Pole 95'	5		Lbyy									Lateral
29	M30	Pole 100'	5		Lbyy									Lateral
30	M31	Pole 105'	5		Lbyy									Lateral
31	M32	Pole 110'	5		Lbyy									Lateral
32	M33	Pole 115'	5		Lbyy									Lateral
33	M34	Pole 120'	5		Lbyy									Lateral
34	M35	Pole 125'	5		Lbyy									Lateral
35	M36	Pole 130'	5		Lbyy									Lateral
36	M37	Pole 135'	5		Lbyy									Lateral
37	M38	Pole 140'	5		Lbyy									Lateral
38	M39	Pole 145'	5		Lbyy									Lateral
39	M40	8' Arm B...	4.482		Lbyy									Lateral
40	M41	8' Arm B...	4.482		Lbyy									Lateral
41	M42	10.5' Arm...	5.672		Lbyy									Lateral
42	M43	10.5' Arm...	5.672		Lbyy									Lateral
43	M44	8' Arm B...	4.349		Lbyy									Lateral
44	M45	8' Arm B...	4.349		Lbyy									Lateral
45	M46	5' Arm B...	2.795		Lbyy									Lateral
46	M47	5' Arm B...	2.795		Lbyy									Lateral

**Member Primary Data**

Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...	
1	M1	BOTTO...	N21		90	Pole 0'	Column	Wide Flange	A572 Gr...	Typical
2	M2	ARM1-L...	N49			8' Arm Mid	Beam	Tube	A36 Gr.36	Typical
3	M3	ARM1-R...	N50			8' Arm Mid	Beam	Tube	A36 Gr.36	Typical
4	M4	ARM2-L...	N51			10.5 Arm Mid	Beam	Tube	A36 Gr.36	Typical
5	M5	ARM2-R...	N52			10.5 Arm Mid	Beam	Tube	A36 Gr.36	Typical
6	M6	ARM3-L...	N53			8' Arm Mid	Beam	Tube	A36 Gr.36	Typical
7	M7	ARM3-R...	N54			8' Arm Mid	Beam	Tube	A36 Gr.36	Typical
8	M8	ARM4-R...	N55			5' Arm Mid	Beam	Tube	A36 Gr.36	Typical
9	M9	ARM4-L...	N56			5' Arm Mid	Beam	Tube	A36 Gr.36	Typical
10	M10	N18	N19			RIGID	None	None	RIGID	Typical
11	M11	N21	N22		90	Pole 5'	Column	Wide Flange	A572 Gr...	Typical

**Member Primary Data (Continued)**

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design Rul...
12	M12	N22	N23		90	Pole 10'	Column	Wide Flange	A572 Gr...	Typical
13	M13	N23	N24		90	Pole 15'	Column	Wide Flange	A572 Gr...	Typical
14	M14	N24	N25		90	Pole 20'	Column	Wide Flange	A572 Gr...	Typical
15	M15	N25	N26		90	Pole 25'	Column	Wide Flange	A572 Gr...	Typical
16	M16	N26	N27		90	Pole 30'	Column	Wide Flange	A572 Gr...	Typical
17	M17	N27	N28		90	Pole 35'	Column	Wide Flange	A572 Gr...	Typical
18	M18	N28	N29		90	Pole 40'	Column	Wide Flange	A572 Gr...	Typical
19	M19	N29	N30		90	Pole 45'	Column	Wide Flange	A572 Gr...	Typical
20	M20	N30	N31		90	Pole 50'	Column	Wide Flange	A572 Gr...	Typical
21	M21	N31	N32		90	Pole 55'	Column	Wide Flange	A572 Gr...	Typical
22	M22	N32	N33		90	Pole 60'	Column	Wide Flange	A572 Gr...	Typical
23	M23	N33	N34		90	Pole 65'	Column	Wide Flange	A572 Gr...	Typical
24	M24	N34	N35		90	Pole 70'	Column	Wide Flange	A572 Gr...	Typical
25	M25	N35	N36		90	Pole 75'	Column	Wide Flange	A572 Gr...	Typical
26	M26	N36	N37		90	Pole 80'	Column	Wide Flange	A572 Gr...	Typical
27	M27	N37	POLE-C...		90	Pole 85'	Column	Wide Flange	A572 Gr...	Typical
28	M28	POLE-C...	N38		90	Pole 90'	Column	Wide Flange	A572 Gr...	Typical
29	M29	N38	N39		90	Pole 95'	Column	Wide Flange	A572 Gr...	Typical
30	M30	N39	N40		90	Pole 100'	Column	Wide Flange	A572 Gr...	Typical
31	M31	N40	N41		90	Pole 105'	Column	Wide Flange	A572 Gr...	Typical
32	M32	N41	N42		90	Pole 110'	Column	Wide Flange	A572 Gr...	Typical
33	M33	N42	N43		90	Pole 115'	Column	Wide Flange	A572 Gr...	Typical
34	M34	N43	N44		90	Pole 120'	Column	Wide Flange	A572 Gr...	Typical
35	M35	N44	N45		90	Pole 125'	Column	Wide Flange	A572 Gr...	Typical
36	M36	N45	N46		90	Pole 130'	Column	Wide Flange	A572 Gr...	Typical
37	M37	N46	N47		90	Pole 135'	Column	Wide Flange	A572 Gr...	Typical
38	M38	N47	N48		90	Pole 140'	Column	Wide Flange	A572 Gr...	Typical
39	M39	N48	TOP-PO...		90	Pole 145'	Column	Wide Flange	A572 Gr...	Typical
40	M40	N49	ARM1			8' Arm Base	Beam	Tube	A36 Gr.36	Typical
41	M41	N50	ARM1			8' Arm Base	Beam	Tube	A36 Gr.36	Typical
42	M42	N51	ARM2			10.5' Arm Base	Beam	Tube	A36 Gr.36	Typical
43	M43	N52	ARM2			10.5' Arm Base	Beam	Tube	A36 Gr.36	Typical
44	M44	N53	ARM3			8' Arm Base	Beam	Tube	A36 Gr.36	Typical
45	M45	N54	ARM3			8' Arm Base	Beam	Tube	A36 Gr.36	Typical
46	M46	N55	ARM4			5' Arm Base	Beam	Tube	A36 Gr.36	Typical
47	M47	N56	ARM4			5' Arm Base	Beam	Tube	A36 Gr.36	Typical

**Joint Coordinates and Temperatures**

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	BOTTOM-POLE	0	0	0	0	
2	POLE-CONNECTION	0	90	0	0	
3	ARM1-LEFT	-8.88	119.83	0	0	
4	ARM2-LEFT	-11.26	131.83	0	0	
5	ARM3-LEFT	-8.61	143.83	0	0	
6	ARM4-LEFT	-5.54	149.83	0	0	
7	TOP-POLE	0	150	0	0	
8	ARM1-RIGHT	8.88	119.83	0	0	
9	ARM2-RIGHT	11.26	131.83	0	0	
10	ARM3-RIGHT	8.61	143.83	0	0	
11	ARM4-RIGHT	5.54	149.83	0	0	

**Joint Coordinates and Temperatures (Continued)**

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
12	ARM1	0	118.6	0	0	
13	ARM2	0	130.45	0	0	
14	ARM3	0	142.6	0	0	
15	ARM4	0	149.08	0	0	
16	BOTTOM-BRACE	0	138	0	0	
17	TOP-BRACE	0	147	0	0	
18	N18	0.	89.75	1	0	
19	N19	-0.	89.75	-1	0	
20	N20	0	89.75	0	0	
21	N21	0	5	0	0	
22	N22	0	10	0	0	
23	N23	0	15	0	0	
24	N24	0	20	0	0	
25	N25	0	25	0	0	
26	N26	0	30	0	0	
27	N27	0	35	0	0	
28	N28	0	40	0	0	
29	N29	0	45	0	0	
30	N30	0	50	0	0	
31	N31	0	55	0	0	
32	N32	0	60	0	0	
33	N33	0	65	0	0	
34	N34	0	70	0	0	
35	N35	0	75	0	0	
36	N36	0	80	0	0	
37	N37	0	85	0	0	
38	N38	0	95	0	0	
39	N39	0	100	0	0	
40	N40	0	105	0	0	
41	N41	0	110	0	0	
42	N42	0	115	0	0	
43	N43	0	120	0	0	
44	N44	0	125	0	0	
45	N45	0	130	0	0	
46	N46	0	135	0	0	
47	N47	0	140	0	0	
48	N48	0	145	0	0	
49	N49	-4.44	119.215	0	0	
50	N50	4.44	119.215	0	0	
51	N51	-5.63	131.14	0	0	
52	N52	5.63	131.14	0	0	
53	N53	-4.305	143.215	0	0	
54	N54	4.305	143.215	0	0	
55	N55	2.77	149.455	0	0	
56	N56	-2.77	149.455	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	BOTTOM-POLE	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction
2	POLE-CONNECTION						



**Joint Boundary Conditions (Continued)**

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]
3	ARM2-LEFT						
4	ARM1-LEFT						

**Member Point Loads**

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

**Joint Loads and Enforced Displacements (BLC 8 : x-direction NESC Heavy Wire Load)**

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	ARM4-LEFT	L	Y	-1.973
2	ARM4-RIGHT	L	Y	-1.202
3	ARM3-LEFT	L	Y	-4.759
4	ARM3-RIGHT	L	Y	-4.759
5	ARM2-RIGHT	L	Y	-4.759
6	ARM2-LEFT	L	Y	-4.759
7	ARM1-LEFT	L	Y	-4.759
8	ARM1-RIGHT	L	Y	-4.759
9	ARM4-LEFT	L	X	1.475
10	ARM4-RIGHT	L	X	1.101
11	ARM3-LEFT	L	X	2.046
12	ARM3-RIGHT	L	X	2.046
13	ARM2-LEFT	L	X	2.046
14	ARM2-RIGHT	L	X	2.046
15	ARM1-LEFT	L	X	2.046
16	ARM1-RIGHT	L	X	2.046

**Joint Loads and Enforced Displacements (BLC 9 : x-driection NESC Extreme Wire Lo)**

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	ARM4-LEFT	L	Y	-0.675
2	ARM4-RIGHT	L	Y	-0.329
3	ARM3-LEFT	L	Y	-2.109
4	ARM3-RIGHT	L	Y	-2.109
5	ARM2-LEFT	L	Y	-2.109
6	ARM2-RIGHT	L	Y	-2.109
7	ARM1-RIGHT	L	Y	-2.109
8	ARM1-LEFT	L	Y	-2.109
9	ARM4-LEFT	L	X	1.185
10	ARM4-RIGHT	L	X	0.607
11	ARM3-LEFT	L	X	2.349
12	ARM3-RIGHT	L	X	2.349
13	ARM2-RIGHT	L	X	2.349
14	ARM2-LEFT	L	X	2.349
15	ARM1-LEFT	L	X	2.349
16	ARM1-RIGHT	L	X	2.349

**Joint Loads and Enforced Displacements (BLC 10 : z-direction NESC Heavy Wire Lo)**

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	ARM4-LEFT	L	Y	-1.973



***Joint Loads and Enforced Displacements (BLC 10 : z-direction NESC Heavy Wire Lo) (Continued)***

	Joint Label	L,D,M	Direction	Magnitude(k,k-ft), (in,rad), (k*s^2/f...
2	ARM4-RIGHT	L	Y	-1.202
3	ARM3-LEFT	L	Y	-4.759
4	ARM3-RIGHT	L	Y	-4.759
5	ARM2-LEFT	L	Y	-4.759
6	ARM2-RIGHT	L	Y	-4.759
7	ARM1-LEFT	L	Y	-4.759
8	ARM1-RIGHT	L	Y	-4.759

***Joint Loads and Enforced Displacements (BLC 11 : z-direction NESC Extreme Wire Lo)***

	Joint Label	L,D,M	Direction	Magnitude(k,k-ft), (in,rad), (k*s^2/f...
1	ARM4-LEFT	L	Y	-0.675
2	ARM4-RIGHT	L	Y	-0.329
3	ARM3-LEFT	L	Y	-2.109
4	ARM3-RIGHT	L	Y	-2.109
5	ARM2-LEFT	L	Y	-2.109
6	ARM2-RIGHT	L	Y	-2.109
7	ARM1-LEFT	L	Y	-2.109
8	ARM1-RIGHT	L	Y	-2.109

***Joint Loads and Enforced Displacements (BLC 12 : x-direction NESC Heavy Mast Reac)***

	Joint Label	L,D,M	Direction	Magnitude(k,k-ft), (in,rad), (k*s^2/f...
1	TOP-BRACE	L	X	3.357
2	TOP-BRACE	L	Y	-0.026
3	TOP-BRACE	L	Z	1.152
4	TOP-BRACE	L	My	5.035
5	BOTTOM-BRACE	L	X	-1.739
6	BOTTOM-BRACE	L	Y	-6.943
7	BOTTOM-BRACE	L	Z	-1.152
8	BOTTOM-BRACE	L	My	-2.61
9	N18	L	X	.254
10	N19	L	X	.174
11	N18	L	Y	-1.119
12	N19	L	Y	-.531
13	N18	L	Mz	-.831
14	N19	L	Mz	-.831

***Joint Loads and Enforced Displacements (BLC 13 : x-direction NESC Extreme Mast Re)***

	Joint Label	L,D,M	Direction	Magnitude(k,k-ft), (in,rad), (k*s^2/f...
1	TOP-BRACE	L	X	13.661
2	TOP-BRACE	L	Y	-0.17
3	TOP-BRACE	L	Z	.573
4	TOP-BRACE	L	My	20.49
5	BOTTOM-BRACE	L	X	-7.201
6	BOTTOM-BRACE	L	Y	-3.454
7	BOTTOM-BRACE	L	Z	-.573
8	BOTTOM-BRACE	L	My	-10.802
9	N18	L	X	.765
10	N19	L	X	.527
11	N18	L	Y	-.526
12	N19	L	Y	-.248





***Joint Loads and Enforced Displacements (BLC 13 : x-direction NESC Extreme Mast Re) (Continued)***

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
13	N18	L	Mz	-.473
14	N19	L	Mz	-.473

***Joint Loads and Enforced Displacements (BLC 14 : z-direction NESC Heavy Mast Reac)***

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	TOP-BRACE	L	X	0
2	TOP-BRACE	L	Y	-.03
3	TOP-BRACE	L	Z	4.507
4	TOP-BRACE	L	My	0
5	BOTTOM-BRACE	L	X	0
6	BOTTOM-BRACE	L	Y	-6.939
7	BOTTOM-BRACE	L	Z	-2.89
8	BOTTOM-BRACE	L	My	0
9	N18	L	Z	.267
10	N19	L	Z	.267
11	N18	L	X	.268
12	N19	L	X	-.268
13	N18	L	Y	-1.086
14	N19	L	Y	-.564
15	N18	L	Mz	.798
16	N19	L	Mz	.798

***Joint Loads and Enforced Displacements (BLC 15 : z-direction NESC Extreme Mast Re)***

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/f...
1	TOP-BRACE	L	X	0
2	TOP-BRACE	L	Y	-.008
3	TOP-BRACE	L	Z	14.232
4	TOP-BRACE	L	My	0
5	BOTTOM-BRACE	L	X	0
6	BOTTOM-BRACE	L	Y	-3.463
7	BOTTOM-BRACE	L	Z	-7.772
8	BOTTOM-BRACE	L	My	0
9	N18	L	Z	.81
10	N19	L	Z	.81
11	N18	L	X	.812
12	N19	L	X	-.812
13	N18	L	Y	-.421
14	N19	L	Y	-.353
15	N18	L	Mz	.369
16	N19	L	Mz	.369

***Member Distributed Loads (BLC 3 : Weight of Ice Only on Pole and A)***

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.032	-.031	0	0
2	M9	Y	-.004	-.006	0	0
3	M8	Y	-.004	-.006	0	0
4	M6	Y	-.004	-.007	0	0
5	M7	Y	-.004	-.007	0	0
6	M3	Y	-.004	-.007	0	0

**Member Distributed Loads (BLC 3 : Weight of Ice Only on Pole and A) (Continued)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
7	M2	Y	-.004	-.007	0	0
8	M4	Y	-.004	-.008	0	0
9	M5	Y	-.004	-.008	0	0
10	M11	Y	-.031	-.031	0	0
11	M12	Y	-.031	-.03	0	0
12	M13	Y	-.03	-.03	0	0
13	M14	Y	-.03	-.029	0	0
14	M15	Y	-.029	-.029	0	0
15	M16	Y	-.029	-.028	0	0
16	M17	Y	-.028	-.028	0	0
17	M18	Y	-.028	-.027	0	0
18	M19	Y	-.027	-.027	0	0
19	M20	Y	-.027	-.026	0	0
20	M21	Y	-.026	-.026	0	0
21	M22	Y	-.026	-.025	0	0
22	M23	Y	-.025	-.025	0	0
23	M24	Y	-.025	-.024	0	0
24	M25	Y	-.024	-.023	0	0
25	M26	Y	-.023	-.023	0	0
26	M27	Y	-.023	-.022	0	0
27	M28	Y	-.022	-.022	0	0
28	M29	Y	-.022	-.021	0	0
29	M30	Y	-.021	-.021	0	0
30	M31	Y	-.021	-.02	0	0
31	M32	Y	-.02	-.02	0	0
32	M33	Y	-.02	-.019	0	0
33	M34	Y	-.019	-.019	0	0
34	M35	Y	-.019	-.018	0	0
35	M36	Y	-.018	-.018	0	0
36	M37	Y	-.018	-.017	0	0
37	M38	Y	-.017	-.017	0	0
38	M39	Y	-.017	-.016	0	0
39	M40	Y	-.007	-.01	0	0
40	M41	Y	-.007	-.01	0	0
41	M42	Y	-.008	-.012	0	0
42	M43	Y	-.008	-.012	0	0
43	M44	Y	-.007	-.01	0	0
44	M45	Y	-.007	-.01	0	0
45	M46	Y	-.006	-.008	0	0
46	M47	Y	-.006	-.008	0	0

**Member Distributed Loads (BLC 4 : x-direction NESC Heavy Wind on P)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.012	.012	0	0
2	M11	X	.012	.012	0	0
3	M12	X	.012	.012	0	0
4	M13	X	.012	.012	0	0
5	M14	X	.012	.012	0	0
6	M15	X	.012	.012	0	0
7	M16	X	.012	.012	0	0
8	M17	X	.012	.012	0	0



**Member Distributed Loads (BLC 4 : x-direction NESC Heavy Wind on P) (Continued)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft, %]	End Location[ft, %]
9	M18	X	.012	.012	0	0
10	M19	X	.012	.012	0	0
11	M20	X	.012	.012	0	0
12	M21	X	.012	.012	0	0
13	M22	X	.012	.012	0	0
14	M23	X	.012	.012	0	0
15	M24	X	.012	.012	0	0
16	M25	X	.012	.012	0	0
17	M26	X	.012	.012	0	0
18	M27	X	.012	.012	0	0
19	M28	X	.012	.012	0	0
20	M29	X	.012	.012	0	0
21	M30	X	.012	.012	0	0
22	M31	X	.012	.012	0	0
23	M32	X	.012	.012	0	0
24	M33	X	.012	.012	0	0
25	M34	X	.012	.012	0	0
26	M35	X	.012	.012	0	0
27	M36	X	.012	.012	0	0
28	M37	X	.012	.012	0	0
29	M38	X	.012	.012	0	0
30	M39	X	.012	.012	0	0

**Member Distributed Loads (BLC 5 : x-direction NESC Extreme Wind on)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft, %]	End Location[ft, %]
1	M1	X	.095	.095	0	0
2	M11	X	.095	.095	0	0
3	M12	X	.095	.095	0	0
4	M13	X	.095	.095	0	0
5	M14	X	.095	.095	0	0
6	M15	X	.095	.095	0	0
7	M16	X	.095	.095	0	0
8	M17	X	.095	.095	0	0
9	M18	X	.095	.095	0	0
10	M19	X	.095	.095	0	0
11	M20	X	.095	.095	0	0
12	M21	X	.095	.095	0	0
13	M22	X	.094	.094	0	0
14	M23	X	.094	.094	0	0
15	M24	X	.094	.094	0	0
16	M25	X	.094	.094	0	0
17	M26	X	.094	.094	0	0
18	M27	X	.094	.094	0	0
19	M28	X	.093	.093	0	0
20	M29	X	.093	.093	0	0
21	M30	X	.093	.093	0	0
22	M31	X	.093	.093	0	0
23	M32	X	.093	.093	0	0
24	M33	X	.093	.093	0	0
25	M34	X	.092	.092	0	0
26	M35	X	.092	.092	0	0

**Member Distributed Loads (BLC 5 : x-direction NESC Extreme Wind on) (Continued)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
27	M36	X	.092	.092	0	0
28	M37	X	.092	.092	0	0
29	M38	X	.092	.092	0	0
30	M39	X	.092	.092	0	0

**Member Distributed Loads (BLC 6 : z-direction NESC Heavy Wind)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.029	.028	0	0
2	M8	Z	.003	.005	0	0
3	M9	Z	.003	.005	0	0
4	M7	Z	.003	.006	0	0
5	M6	Z	.003	.006	0	0
6	M3	Z	.003	.006	0	0
7	M2	Z	.003	.006	0	0
8	M5	Z	.003	.006	0	0
9	M4	Z	.003	.006	0	0
10	M11	Z	.028	.028	0	0
11	M12	Z	.028	.027	0	0
12	M13	Z	.027	.026	0	0
13	M14	Z	.026	.025	0	0
14	M15	Z	.025	.025	0	0
15	M16	Z	.025	.024	0	0
16	M17	Z	.024	.023	0	0
17	M18	Z	.023	.022	0	0
18	M19	Z	.022	.022	0	0
19	M20	Z	.022	.021	0	0
20	M21	Z	.021	.02	0	0
21	M22	Z	.02	.019	0	0
22	M23	Z	.019	.019	0	0
23	M24	Z	.019	.018	0	0
24	M25	Z	.018	.017	0	0
25	M26	Z	.017	.017	0	0
26	M27	Z	.017	.016	0	0
27	M28	Z	.016	.015	0	0
28	M29	Z	.015	.014	0	0
29	M30	Z	.014	.014	0	0
30	M31	Z	.014	.013	0	0
31	M32	Z	.013	.012	0	0
32	M33	Z	.012	.011	0	0
33	M34	Z	.011	.011	0	0
34	M35	Z	.011	.01	0	0
35	M36	Z	.01	.009	0	0
36	M37	Z	.009	.008	0	0
37	M38	Z	.008	.008	0	0
38	M39	Z	.008	.007	0	0
39	M40	Z	.006	.009	0	0
40	M41	Z	.006	.009	0	0
41	M42	Z	.006	.01	0	0
42	M43	Z	.006	.01	0	0
43	M44	Z	.006	.009	0	0
44	M45	Z	.006	.009	0	0



Company : Centek  
 Designer : TJJ  
 Job Number : 18058.43 - CT11080B  
 Model Name : Pole # 845

Mar 4, 2019  
 2:03 PM  
 Checked By: CAG

**Member Distributed Loads (BLC 6 : z-direction NESC Heavy Wind) (Continued)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
45	M46	Z	.005	.007	0	0
46	M47	Z	.005	.007	0	0

**Member Distributed Loads (BLC 7 : z-direction NESC Extreme Wind)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.236	.23	0	0
2	M8	Z	.018	.035	0	0
3	M9	Z	.018	.035	0	0
4	M7	Z	.018	.042	0	0
5	M6	Z	.018	.042	0	0
6	M2	Z	.018	.042	0	0
7	M3	Z	.018	.042	0	0
8	M5	Z	.018	.049	0	0
9	M4	Z	.018	.049	0	0
10	M11	Z	.23	.224	0	0
11	M12	Z	.224	.218	0	0
12	M13	Z	.218	.212	0	0
13	M14	Z	.212	.206	0	0
14	M15	Z	.206	.2	0	0
15	M16	Z	.2	.194	0	0
16	M17	Z	.194	.188	0	0
17	M18	Z	.188	.182	0	0
18	M19	Z	.182	.176	0	0
19	M20	Z	.176	.17	0	0
20	M21	Z	.17	.164	0	0
21	M22	Z	.164	.158	0	0
22	M23	Z	.158	.152	0	0
23	M24	Z	.152	.146	0	0
24	M25	Z	.146	.141	0	0
25	M26	Z	.141	.135	0	0
26	M27	Z	.135	.129	0	0
27	M28	Z	.129	.123	0	0
28	M29	Z	.123	.117	0	0
29	M30	Z	.117	.111	0	0
30	M31	Z	.111	.105	0	0
31	M32	Z	.105	.099	0	0
32	M33	Z	.099	.093	0	0
33	M34	Z	.093	.087	0	0
34	M35	Z	.087	.081	0	0
35	M36	Z	.081	.075	0	0
36	M37	Z	.075	.069	0	0
37	M38	Z	.069	.063	0	0
38	M39	Z	.063	.057	0	0
39	M40	Z	.042	.066	0	0
40	M41	Z	.042	.066	0	0
41	M42	Z	.049	.079	0	0
42	M43	Z	.049	.079	0	0
43	M44	Z	.042	.066	0	0
44	M45	Z	.042	.066	0	0
45	M46	Z	.035	.053	0	0
46	M47	Z	.035	.053	0	0

**Member Distributed Loads (BLC 16 : Weight of Coax Cables)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.027	-.027	0	0
2	M28	Y	-.025	-.025	0	0
3	M11	Y	-.027	-.027	0	0
4	M12	Y	-.027	-.027	0	0
5	M13	Y	-.027	-.027	0	0
6	M14	Y	-.027	-.027	0	0
7	M15	Y	-.027	-.027	0	0
8	M16	Y	-.027	-.027	0	0
9	M17	Y	-.027	-.027	0	0
10	M18	Y	-.027	-.027	0	0
11	M19	Y	-.027	-.027	0	0
12	M20	Y	-.027	-.027	0	0
13	M21	Y	-.027	-.027	0	0
14	M22	Y	-.027	-.027	0	0
15	M23	Y	-.027	-.027	0	0
16	M24	Y	-.027	-.027	0	0
17	M25	Y	-.027	-.027	0	0
18	M26	Y	-.027	-.027	0	0
19	M27	Y	-.027	-.027	0	5
20	M29	Y	-.025	-.025	0	0
21	M30	Y	-.025	-.025	0	0
22	M31	Y	-.025	-.025	0	0
23	M32	Y	-.025	-.025	0	0
24	M33	Y	-.025	-.025	0	0
25	M34	Y	-.025	-.025	0	0
26	M35	Y	-.025	-.025	0	0
27	M36	Y	-.025	-.025	0	0
28	M37	Y	-.025	-.025	0	0
29	M38	Y	-.025	-.025	0	0
30	M39	Y	-.025	-.025	0	5

**Member Distributed Loads (BLC 17 : Weight of Ice on Coax Cables)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Y	-.039	-.039	0	0
2	M28	Y	-.036	-.036	0	0
3	M11	Y	-.039	-.039	0	0
4	M12	Y	-.039	-.039	0	0
5	M13	Y	-.039	-.039	0	0
6	M14	Y	-.039	-.039	0	0
7	M15	Y	-.039	-.039	0	0
8	M16	Y	-.039	-.039	0	0
9	M17	Y	-.039	-.039	0	0
10	M18	Y	-.039	-.039	0	0
11	M19	Y	-.039	-.039	0	0
12	M20	Y	-.039	-.039	0	0
13	M21	Y	-.039	-.039	0	0
14	M22	Y	-.039	-.039	0	0
15	M23	Y	-.039	-.039	0	0
16	M24	Y	-.039	-.039	0	0
17	M25	Y	-.039	-.039	0	0
18	M26	Y	-.039	-.039	0	0



**Member Distributed Loads (BLC 17 : Weight of Ice on Coax Cables) (Continued)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
19	M27	Y	-.039	-.039	0	5
20	M29	Y	-.036	-.036	0	0
21	M30	Y	-.036	-.036	0	0
22	M31	Y	-.036	-.036	0	0
23	M32	Y	-.036	-.036	0	0
24	M33	Y	-.036	-.036	0	0
25	M34	Y	-.036	-.036	0	0
26	M35	Y	-.036	-.036	0	0
27	M36	Y	-.036	-.036	0	0
28	M37	Y	-.036	-.036	0	0
29	M38	Y	-.036	-.036	0	0
30	M39	Y	-.036	-.036	0	5

**Member Distributed Loads (BLC 18 : x-direction NESC Heavy Coax)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.003	.003	0	0
2	M11	X	.003	.003	0	0
3	M12	X	.003	.003	0	0
4	M13	X	.003	.003	0	0
5	M14	X	.003	.003	0	0
6	M15	X	.003	.003	0	0
7	M16	X	.003	.003	0	0
8	M17	X	.003	.003	0	0
9	M18	X	.003	.003	0	0
10	M19	X	.003	.003	0	0
11	M20	X	.003	.003	0	0
12	M21	X	.003	.003	0	0
13	M22	X	.003	.003	0	0
14	M23	X	.003	.003	0	0
15	M24	X	.003	.003	0	0
16	M25	X	.003	.003	0	0
17	M26	X	.003	.003	0	0
18	M27	X	.003	.003	0	0
19	M28	X	.003	.003	0	0
20	M29	X	.003	.003	0	0
21	M30	X	.003	.003	0	0
22	M31	X	.003	.003	0	0
23	M32	X	.003	.003	0	0
24	M33	X	.003	.003	0	0
25	M34	X	.003	.003	0	0
26	M35	X	.003	.003	0	0
27	M36	X	.003	.003	0	0
28	M37	X	.003	.003	0	0
29	M38	X	.003	.003	0	0
30	M39	X	.003	.003	0	5

**Member Distributed Loads (BLC 19 : x-direction NESC Extreme Coax)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	X	.017	.017	0	0
2	M11	X	.017	.017	0	0
3	M12	X	.017	.017	0	0



**Member Distributed Loads (BLC 19 : x-direction NESC Extreme Coax) (Continued)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
4	M13	X	.017	.017	0	0
5	M14	X	.017	.017	0	0
6	M15	X	.017	.017	0	0
7	M16	X	.017	.017	0	0
8	M17	X	.017	.017	0	0
9	M18	X	.017	.017	0	0
10	M19	X	.017	.017	0	0
11	M20	X	.017	.017	0	0
12	M21	X	.017	.017	0	0
13	M22	X	.017	.017	0	0
14	M23	X	.017	.017	0	0
15	M24	X	.017	.017	0	0
16	M25	X	.017	.017	0	0
17	M26	X	.017	.017	0	0
18	M27	X	.017	.017	0	0
19	M28	X	.017	.017	0	0
20	M29	X	.017	.017	0	0
21	M30	X	.017	.017	0	0
22	M31	X	.017	.017	0	0
23	M32	X	.017	.017	0	0
24	M33	X	.017	.017	0	0
25	M34	X	.017	.017	0	0
26	M35	X	.017	.017	0	0
27	M36	X	.017	.017	0	0
28	M37	X	.017	.017	0	0
29	M38	X	.017	.017	0	0
30	M39	X	.017	.017	0	5

**Member Distributed Loads (BLC 20 : z-direction NESC Heavy Coax)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.003	.003	0	0
2	M11	Z	.003	.003	0	0
3	M12	Z	.003	.003	0	0
4	M13	Z	.003	.003	0	0
5	M14	Z	.003	.003	0	0
6	M15	Z	.003	.003	0	0
7	M16	Z	.003	.003	0	0
8	M17	Z	.003	.003	0	0
9	M18	Z	.003	.003	0	0
10	M19	Z	.003	.003	0	0
11	M20	Z	.003	.003	0	0
12	M21	Z	.003	.003	0	0
13	M22	Z	.003	.003	0	0
14	M23	Z	.003	.003	0	0
15	M24	Z	.003	.003	0	0
16	M25	Z	.003	.003	0	0
17	M26	Z	.003	.003	0	0
18	M27	Z	.003	.003	0	0
19	M28	Z	.003	.003	0	0
20	M29	Z	.003	.003	0	0
21	M30	Z	.003	.003	0	0



**Member Distributed Loads (BLC 20 : z-direction NESC Heavy Coax) (Continued)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
22	M31	Z	.003	.003	0	0
23	M32	Z	.003	.003	0	0
24	M33	Z	.003	.003	0	0
25	M34	Z	.003	.003	0	0
26	M35	Z	.003	.003	0	0
27	M36	Z	.003	.003	0	0
28	M37	Z	.003	.003	0	0
29	M38	Z	.003	.003	0	0
30	M39	Z	.003	.003	0	5

**Member Distributed Loads (BLC 21 : z-direction NESC Extreme Coax)**

	Member Label	Direction	Start Magnitude[k/ft,F,ksf]	End Magnitude[k/...	Start Location[ft,%]	End Location[ft,%]
1	M1	Z	.017	.017	0	0
2	M11	Z	.017	.017	0	0
3	M12	Z	.017	.017	0	0
4	M13	Z	.017	.017	0	0
5	M14	Z	.017	.017	0	0
6	M15	Z	.017	.017	0	0
7	M16	Z	.017	.017	0	0
8	M17	Z	.017	.017	0	0
9	M18	Z	.017	.017	0	0
10	M19	Z	.017	.017	0	0
11	M20	Z	.017	.017	0	0
12	M21	Z	.017	.017	0	0
13	M22	Z	.017	.017	0	0
14	M23	Z	.017	.017	0	0
15	M24	Z	.017	.017	0	0
16	M25	Z	.017	.017	0	0
17	M26	Z	.017	.017	0	0
18	M27	Z	.017	.017	0	0
19	M28	Z	.017	.017	0	0
20	M29	Z	.017	.017	0	0
21	M30	Z	.017	.017	0	0
22	M31	Z	.017	.017	0	0
23	M32	Z	.017	.017	0	0
24	M33	Z	.017	.017	0	0
25	M34	Z	.017	.017	0	0
26	M35	Z	.017	.017	0	0
27	M36	Z	.017	.017	0	0
28	M37	Z	.017	.017	0	0
29	M38	Z	.017	.017	0	0
30	M39	Z	.017	.017	0	5

**Basic Load Cases**

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...Surface...
1	Self Weight	None		-1					
2	Weight Pole and Arms	None							
3	Weight of Ice Only on Pole and A	None						46	
4	x-direction NESC Heavy Wind on P	None						30	
5	x-direction NESC Extreme Wind on	None						30	

### Basic Load Cases (Continued)

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribu...	Area(M...	Surface...
6	z-direction NESC Heavy Wind	None						46		
7	z-direction NESC Extreme Wind	None						46		
8	x-direction NESC Heavy Wire Load	None				16				
9	x-direction NESC Extreme Wire Lo	None				16				
10	z-direction NESC Heavy Wire Lo	None				8				
11	z-direction NESC Extreme Wire Lo	None				8				
12	x-direction NESC Heavy Mast Reac	None				14				
13	x-direction NESC Extreme Mast Re	None				14				
14	z-direction NESC Heavy Mast Reac	None				16				
15	z-direction NESC Extreme Mast Re	None				16				
16	Weight of Coax Cables	None						30		
17	Weight of Ice on Coax Cables	None						30		
18	x-direction NESC Heavy Coax	None						30		
19	x-direction NESC Extreme Coax	None						30		
20	z-direction NESC Heavy Coax	None						30		
21	z-direction NESC Extreme Coax	None						30		

### Load Combinations

	Description	Solve	PDelta	S...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	
1	x-direction NESC Heavy...	Yes	Y		1	1.5	3	1.5	4	2.5	8	1	12	1	16	1.5	17	1.5	18	2.5			
2	x-direction NESC Extre...	Yes	Y		1	1	5	1	9	1	13	1	16	1	19	1							
3	z-direction NESC Heavy...	Yes	Y		1	1.5	3	1.5	6	2.5	10	1	14	1	16	1.5	17	1.5	20	2.5			
4	z-direction NESC Extre...	Yes	Y		1	1	7	1	11	1	15	1	16	1	21	1							

### Envelope Joint Reactions

	Joint		X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	BOTTOM-POLE	max	0	4	104.508	3	0	2	-7.107	2	-.546	3	4787.518	2
2		min	-40.258	2	50.911	2	-35.597	4	-3541.86	4	-10.045	2	-7.737	3
3	Totals:	max	0	4	104.508	3	0	2						
4		min	-40.258	2	50.911	2	-35.597	4						



### Joint Reactions

LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]	
1	1	BOTTOM-POLE	-22.523	104.508	0	-20.122	-2.595	3151.144
2	1	Totals:	-22.523	104.508	0			
3	1	COG (ft):	X: -.041	Y: 94.066	Z: .006			

### Member Section Stresses (By Combination)

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
1	1	M28	1	1.52	-.006	-1.571	.585	-.585	42.295	-42.295
2			2	1.51	-.006	-1.568	.581	-.581	41.151	-41.151
3			3	1.499	-.006	-1.565	.576	-.576	40.01	-40.01
4			4	1.489	-.006	-1.562	.572	-.572	38.871	-38.871
5			5	1.479	-.006	-1.559	.568	-.568	37.735	-37.735
6	1	M22	1	1.39	-.005	-.832	.484	-.484	41.916	-41.916
7			2	1.381	-.005	-.831	.482	-.482	41.222	-41.222
8			3	1.371	-.005	-.829	.48	-.48	40.531	-40.531
9			4	1.362	-.005	-.827	.477	-.477	39.84	-39.84
10			5	1.352	-.005	-.826	.475	-.475	39.151	-39.151
11	1	M23	1	1.378	-.005	-.866	.487	-.487	41.562	-41.562
12			2	1.369	-.005	-.864	.484	-.484	40.825	-40.825
13			3	1.359	-.005	-.862	.482	-.482	40.089	-40.089
14			4	1.349	-.005	-.86	.479	-.479	39.354	-39.354
15			5	1.34	-.005	-.859	.476	-.476	38.621	-38.621
16	1	M24	1	1.366	-.005	-.901	.488	-.488	41.109	-41.109
17			2	1.357	-.005	-.899	.486	-.486	40.323	-40.323
18			3	1.347	-.005	-.897	.483	-.483	39.538	-39.538
19			4	1.337	-.005	-.896	.48	-.48	38.755	-38.755
20			5	1.328	-.005	-.894	.477	-.477	37.973	-37.973
21	1	M29	1	1.505	-.006	-1.65	.581	-.581	40.833	-40.833
22			2	1.494	-.006	-1.646	.576	-.576	39.594	-39.594
23			3	1.484	-.006	-1.643	.571	-.571	38.358	-38.358
24			4	1.474	-.006	-1.64	.567	-.567	37.124	-37.124
25			5	1.463	-.006	-1.636	.562	-.562	35.893	-35.893
26	1	M25	1	1.355	-.005	-.939	.49	-.49	40.537	-40.537
27			2	1.345	-.005	-.937	.487	-.487	39.697	-39.697
28			3	1.335	-.005	-.935	.484	-.484	38.858	-38.858
29			4	1.326	-.005	-.933	.481	-.481	38.021	-38.021
30			5	1.316	-.005	-.932	.478	-.478	37.186	-37.186
31	1	M17	1	1.336	-.003	-.597	.418	-.418	40.135	-40.135
32			2	1.327	-.003	-.595	.417	-.417	39.64	-39.64
33			3	1.318	-.003	-.594	.416	-.416	39.147	-39.147
34			4	1.309	-.003	-.593	.414	-.414	38.655	-38.655
35			5	1.3	-.003	-.592	.413	-.413	38.163	-38.163
36	1	M18	1	1.324	-.003	-.617	.423	-.423	40.128	-40.128
37			2	1.315	-.003	-.616	.421	-.421	39.607	-39.607
38			3	1.306	-.003	-.615	.42	-.42	39.087	-39.087
39			4	1.297	-.003	-.613	.418	-.418	38.567	-38.567
40			5	1.288	-.003	-.612	.417	-.417	38.049	-38.049
41	1	M16	1	1.348	-.003	-.577	.413	-.413	40.103	-40.103
42			2	1.339	-.003	-.576	.412	-.412	39.634	-39.634
43			3	1.33	-.003	-.575	.411	-.411	39.165	-39.165

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
44		4	1.321	-.003	-.573	.41	-.41	38.698	-38.698	
45		5	1.312	-.003	-.572	.409	-.409	38.231	-38.231	
46	1	M19	1	1.312	-.004	-.639	.427	-.427	40.079	-40.079
47		2	1.303	-.004	-.638	.425	-.425	39.528	-39.528	
48		3	1.294	-.004	-.636	.424	-.424	38.979	-38.979	
49		4	1.285	-.004	-.635	.422	-.422	38.431	-38.431	
50		5	1.276	-.004	-.634	.421	-.421	37.884	-37.884	
51	1	M20	1	1.301	-.004	-.662	.431	-.431	39.98	-39.98
52		2	1.292	-.004	-.661	.429	-.429	39.398	-39.398	
53		3	1.282	-.004	-.659	.427	-.427	38.817	-38.817	
54		4	1.273	-.004	-.658	.425	-.425	38.237	-38.237	
55		5	1.264	-.004	-.657	.424	-.424	37.659	-37.659	
56	1	M26	1	1.343	-.006	-.98	.49	-.49	39.824	-39.824
57		2	1.333	-.006	-.978	.487	-.487	38.923	-38.923	
58		3	1.323	-.006	-.976	.484	-.484	38.024	-38.024	
59		4	1.314	-.006	-.974	.481	-.481	37.127	-37.127	
60		5	1.304	-.006	-.972	.477	-.477	36.232	-36.232	
61	1	M21	1	1.289	-.004	-.686	.434	-.434	39.824	-39.824
62		2	1.28	-.004	-.685	.432	-.432	39.207	-39.207	
63		3	1.271	-.004	-.684	.43	-.43	38.591	-38.591	
64		4	1.261	-.004	-.682	.428	-.428	37.977	-37.977	
65		5	1.252	-.004	-.681	.426	-.426	37.364	-37.364	
66	1	M30	1	1.489	-.007	-1.735	.575	-.575	39.04	-39.04
67		2	1.479	-.007	-1.732	.57	-.57	37.692	-37.692	
68		3	1.468	-.007	-1.728	.565	-.565	36.347	-36.347	
69		4	1.458	-.007	-1.725	.56	-.56	35.004	-35.004	
70		5	1.448	-.007	-1.721	.555	-.555	33.664	-33.664	
71	1	M27	1	1.331	-.006	-1.023	.49	-.49	38.941	-38.941
72		2	1.322	-.006	-1.021	.487	-.487	37.973	-37.973	
73		3	1.312	-.006	-1.019	.484	-.484	37.007	-37.007	
74		4	1.302	-.006	-1.017	.48	-.48	36.042	-36.042	
75		5	1.258	-.006	-.996	.459	-.459	35.029	-35.029	
76	1	M15	1	1.253	-.002	-.489	.37	-.37	37.79	-37.79
77		2	1.244	-.002	-.488	.369	-.369	37.369	-37.369	
78		3	1.235	-.002	-.487	.368	-.368	36.948	-36.948	
79		4	1.226	-.002	-.486	.367	-.367	36.528	-36.528	
80		5	1.217	-.002	-.485	.366	-.366	36.11	-36.11	
81	1	M14	1	1.265	-.002	-.473	.364	-.364	37.659	-37.659
82		2	1.256	-.002	-.472	.363	-.363	37.258	-37.258	
83		3	1.247	-.002	-.471	.363	-.363	36.858	-36.858	
84		4	1.238	-.002	-.47	.362	-.362	36.458	-36.458	
85		5	1.23	-.002	-.469	.362	-.362	36.06	-36.06	
86	1	M13	1	1.277	-.001	-.46	.358	-.358	37.537	-37.537
87		2	1.268	-.001	-.459	.358	-.358	37.154	-37.154	
88		3	1.259	-.001	-.458	.357	-.357	36.773	-36.773	
89		4	1.251	-.001	-.457	.357	-.357	36.392	-36.392	
90		5	1.242	-.001	-.456	.356	-.356	36.012	-36.012	
91	1	M12	1	1.289	-.001	-.446	.352	-.352	37.38	-37.38
92		2	1.28	-.001	-.445	.352	-.352	37.015	-37.015	
93		3	1.272	-.001	-.444	.352	-.352	36.651	-36.651	
94		4	1.263	-.001	-.443	.351	-.351	36.288	-36.288	
95		5	1.254	-.001	-.442	.351	-.351	35.926	-35.926	

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
96	1	M11	1	1.301	0	-.433	.346	-.346	37.206	-37.206
97			2	1.293	0	-.432	.346	-.346	36.858	-36.858
98			3	1.284	0	-.431	.346	-.346	36.511	-36.511
99			4	1.275	0	-.43	.345	-.345	36.164	-36.164
100			5	1.266	0	-.429	.345	-.345	35.818	-35.818
101	1	M1	1	1.314	0	-.42	.339	-.339	37.018	-37.018
102			2	1.305	0	-.419	.339	-.339	36.685	-36.685
103			3	1.296	0	-.418	.339	-.339	36.353	-36.353
104			4	1.288	0	-.417	.339	-.339	36.022	-36.022
105			5	1.279	0	-.416	.339	-.339	35.691	-35.691
106	1	M31	1	1.474	-.007	-1.828	.569	-.569	36.831	-36.831
107			2	1.463	-.007	-1.824	.564	-.564	35.357	-35.357
108			3	1.453	-.007	-1.821	.558	-.558	33.886	-33.886
109			4	1.442	-.007	-1.817	.553	-.553	32.418	-32.418
110			5	1.432	-.007	-1.813	.548	-.548	30.953	-30.953
111	1	M32	1	1.458	-.007	-1.93	.562	-.562	34.094	-34.094
112			2	1.448	-.007	-1.926	.556	-.556	32.473	-32.473
113			3	1.437	-.007	-1.922	.55	-.55	30.855	-30.855
114			4	1.427	-.007	-1.918	.545	-.545	29.24	-29.24
115			5	1.416	-.007	-1.914	.539	-.539	27.629	-27.629
116	1	M33	1	1.443	-.007	-2.039	.553	-.553	30.672	-30.672
117			2	1.432	-.007	-2.035	.547	-.547	28.878	-28.878
118			3	1.422	-.007	-2.031	.541	-.541	27.088	-27.088
119			4	1.123	-.006	-1.573	.535	-.535	24.963	-24.963
120			5	1.112	-.006	-1.568	.531	-.531	23.58	-23.58
121	1	M34	1	1.222	-.006	-2.225	.605	-.605	27.936	-27.936
122			2	1.211	-.006	-2.219	.599	-.599	26.299	-26.299
123			3	1.2	-.006	-2.213	.594	-.594	24.667	-24.667
124			4	1.19	-.006	-2.207	.588	-.588	23.039	-23.039
125			5	1.179	-.006	-2.201	.583	-.583	21.415	-21.415
126	1	M35	1	1.197	-.006	-2.356	.596	-.596	24.245	-24.245
127			2	1.186	-.006	-2.35	.591	-.591	22.409	-22.409
128			3	1.175	-.006	-2.344	.585	-.585	20.578	-20.578
129			4	1.164	-.006	-2.337	.579	-.579	18.751	-18.751
130			5	1.153	-.006	-2.331	.574	-.574	16.93	-16.93
131	1	M36	1	1.172	-.006	-2.503	.587	-.587	19.425	-19.425
132			2	.817	-.004	-1.722	.582	-.582	17.068	-17.068
133			3	.806	-.004	-1.716	.578	-.578	15.635	-15.635
134			4	.795	-.004	-1.709	.574	-.574	14.208	-14.208
135			5	.784	-.004	-1.702	.57	-.57	12.786	-12.786
136	1	M37	1	.797	-.004	-1.828	.583	-.583	14.911	-14.911
137			2	.786	-.004	-1.821	.579	-.579	13.268	-13.268
138			3	.775	-.004	-1.814	.575	-.575	11.631	-11.631
139			4	.546	-.081	-1.943	.525	-.525	9.927	-9.927
140			5	.536	-.081	-1.936	.445	-.445	8.181	-8.181
141	1	M38	1	.544	-.081	-2.094	.455	-.455	9.736	-9.736
142			2	.533	-.081	-2.086	.373	-.373	7.675	-7.675
143			3	.522	-.081	-2.078	.291	-.291	5.622	-5.622
144			4	.174	-.079	-1.153	.21	-.21	3.552	-3.552
145			5	.163	-.079	-1.145	.13	-.13	2.419	-2.419
146	1	M39	1	.166	-.079	-1.241	.133	-.133	2.953	-2.953
147			2	.155	-.079	-1.232	.051	-.051	1.594	-1.594

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
148		3	.143	0	-.589	.001	-.001	.524	-.524
149		4	.132	0	-.58	0	0	-.119	.119
150		5	0	0	-.003	0	0	0	0
151	1 M6	1	.337	-.865	.001	0	0	0	0
152		2	.338	-.876	.001	-2.433	2.433	.003	-.003
153		3	.339	-.886	.001	-4.897	4.897	.007	-.007
154		4	.34	-.898	.001	-7.392	7.392	.01	-.01
155		5	.341	-.909	.001	-9.918	9.918	.014	-.014
156	1 M44	1	.223	-.575	.001	-4.131	4.131	.006	-.006
157		2	.224	-.585	.001	-5.198	5.198	.008	-.008
158		3	.225	-.596	.001	-6.284	6.284	.009	-.009
159		4	.226	-.607	.001	-7.389	7.389	.011	-.011
160		5	.227	-.618	.001	-8.515	8.515	.012	-.012
161	1 M9	1	.256	-.388	.001	0	0	0	0
162		2	.256	-.395	.001	-.839	.839	.002	-.002
163		3	.257	-.402	.001	-1.692	1.692	.005	-.005
164		4	.257	-.41	.001	-2.562	2.562	.007	-.007
165		5	.258	-.417	.001	-3.447	3.447	.01	-.01
166	1 M47	1	.179	-.277	0	-1.608	1.608	.005	-.005
167		2	.179	-.284	0	-2.029	2.029	.006	-.006
168		3	.18	-.291	0	-2.46	2.46	.007	-.007
169		4	.18	-.298	0	-2.901	2.901	.008	-.008
170		5	.181	-.305	0	-3.354	3.354	.01	-.01
171	1 M4	1	.282	-.762	0	0	0	0	0
172		2	.283	-.775	0	-2.415	2.415	.002	-.002
173		3	.284	-.79	0	-4.874	4.874	.004	-.004
174		4	.285	-.804	0	-7.378	7.378	.007	-.007
175		5	.286	-.819	0	-9.928	9.928	.009	-.009
176	1 M2	1	.335	-.878	0	0	0	0	0
177		2	.336	-.889	0	-2.546	2.546	.002	-.002
178		3	.337	-.9	0	-5.125	5.125	.004	-.004
179		4	.338	-.912	0	-7.736	7.736	.006	-.006
180		5	.339	-.924	0	-10.381	10.381	.008	-.008
181	1 M42	1	.18	-.499	0	-3.824	3.824	.004	-.004
182		2	.181	-.513	0	-4.827	4.827	.004	-.004
183		3	.182	-.527	0	-5.857	5.857	.005	-.005
184		4	.183	-.541	0	-6.915	6.915	.006	-.006
185		5	.184	-.556	0	-8.002	8.002	.007	-.007
186	1 M40	1	.221	-.584	0	-4.324	4.324	.003	-.003
187		2	.222	-.595	0	-5.441	5.441	.004	-.004
188		3	.223	-.606	0	-6.579	6.579	.005	-.005
189		4	.224	-.617	0	-7.738	7.738	.006	-.006
190		5	.225	-.628	0	-8.918	8.918	.007	-.007
191	1 M3	1	-.172	-1.022	0	0	0	0	0
192		2	-.171	-1.033	0	-2.961	2.961	0	0
193		3	-.17	-1.044	0	-5.954	5.954	0	0
194		4	-.169	-1.056	0	-8.98	8.98	-.001	.001
195		5	-.168	-1.068	0	-12.04	12.04	-.002	.002
196	1 M5	1	-.157	-.874	0	0	0	0	0
197		2	-.156	-.888	0	-2.768	2.768	0	0
198		3	-.155	-.902	0	-5.581	5.581	-.001	.001
199		4	-.154	-.917	0	-8.438	8.438	-.002	.002

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
200		5	-.153	-.932	0	-11.342	11.342	-.003	.003	
201	1	M7	1	-.169	-1.018	0	0	0	0	
202		2	-.168	-1.029	0	-2.863	2.863	-.001	.001	
203		3	-.167	-1.04	0	-5.756	5.756	-.002	.002	
204		4	-.166	-1.051	0	-8.68	8.68	-.003	.003	
205		5	-.165	-1.063	0	-11.637	11.637	-.004	.004	
206	1	M8	1	-.138	-.307	0	0	0	0	
207		2	-.137	-.314	0	-.665	.665	0	0	
208		3	-.137	-.321	0	-1.346	1.346	-.002	.002	
209		4	-.136	-.329	0	-2.042	2.042	-.003	.003	
210		5	-.135	-.336	0	-2.754	2.754	-.003	.003	
211	1	M10	1	0	0	0	0	0	0	
212		2	0	0	0	0	0	0	0	
213		3	0	0	0	0	0	0	0	
214		4	0	0	0	0	0	0	0	
215		5	0	0	0	0	0	0	0	
216	1	M41	1	-.11	-.677	0	-5.015	5.015	0	0
217		2	-.109	-.688	0	-6.309	6.309	0	0	
218		3	-.108	-.699	0	-7.623	7.623	-.001	.001	
219		4	-.107	-.71	0	-8.959	8.959	-.001	.001	
220		5	-.106	-.722	0	-10.316	10.316	-.001	.001	
221	1	M43	1	-.096	-.57	0	-4.369	4.369	-.001	.001
222		2	-.095	-.584	0	-5.512	5.512	-.001	.001	
223		3	-.094	-.598	0	-6.683	6.683	-.002	.002	
224		4	-.093	-.612	0	-7.881	7.881	-.002	.002	
225		5	-.092	-.627	0	-9.109	9.109	-.002	.002	
226	1	M46	1	-.094	-.225	0	-1.284	1.284	-.002	.002
227		2	-.093	-.231	0	-1.626	1.626	-.002	.002	
228		3	-.093	-.238	0	-1.978	1.978	-.003	.003	
229		4	-.092	-.245	0	-2.34	2.34	-.003	.003	
230		5	-.091	-.252	0	-2.713	2.713	-.003	.003	
231	1	M45	1	-.108	-.674	0	-4.847	4.847	-.002	.002
232		2	-.107	-.685	0	-6.097	6.097	-.002	.002	
233		3	-.106	-.695	0	-7.366	7.366	-.003	.003	
234		4	-.105	-.706	0	-8.655	8.655	-.003	.003	
235		5	-.104	-.717	0	-9.964	9.964	-.004	.004	

### Joint Reactions

LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1 2	BOTTOM-POLE	-40.258	50.911	0	-7.107	-10.045	4787.518
2 2	Totals:	-40.258	50.911	0			
3 2	COG (ft):	X: -.038	Y: 90.963	Z: .005			

### Member Section Stresses (By Combination)

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
1 2	M22	1	.653	0	-1.267	.182	-.182	59.294	-59.294
2		2	.649	0	-1.262	.181	-.181	58.24	-58.24
3		3	.644	0	-1.258	.181	-.181	57.189	-57.189
4		4	.639	0	-1.253	.18	-.18	56.143	-56.143
5		5	.634	0	-1.248	.18	-.18	55.101	-55.101
6 2	M16	1	.645	0	-.951	.148	-.148	58.707	-58.707
7		2	.64	0	-.947	.148	-.148	57.934	-57.934
8		3	.635	0	-.944	.148	-.148	57.164	-57.164
9		4	.63	0	-.94	.147	-.147	56.396	-56.396
10		5	.626	0	-.937	.147	-.147	55.632	-55.632
11 2	M23	1	.646	0	-1.3	.184	-.184	58.494	-58.494
12		2	.641	0	-1.295	.184	-.184	57.387	-57.387
13		3	.636	0	-1.29	.183	-.183	56.285	-56.285
14		4	.632	0	-1.285	.183	-.183	55.188	-55.188
15		5	.627	0	-1.28	.183	-.183	54.094	-54.094
16 2	M28	1	.703	-.001	-2.165	.236	-.236	58.445	-58.445
17		2	.698	-.001	-2.155	.235	-.235	56.872	-56.872
18		3	.693	-.001	-2.146	.235	-.235	55.305	-55.305
19		4	.688	-.001	-2.137	.234	-.234	53.745	-53.745
20		5	.683	-.001	-2.127	.233	-.233	52.192	-52.192
21 2	M17	1	.637	0	-.97	.151	-.151	58.402	-58.402
22		2	.632	0	-.967	.15	-.15	57.598	-57.598
23		3	.628	0	-.963	.15	-.15	56.798	-56.798
24		4	.623	0	-.96	.15	-.15	56	-56
25		5	.618	0	-.956	.15	-.15	55.206	-55.206
26 2	M18	1	.63	0	-.991	.153	-.153	58.048	-58.048
27		2	.625	0	-.987	.153	-.153	57.212	-57.212
28		3	.62	0	-.983	.153	-.153	56.379	-56.379
29		4	.615	0	-.98	.152	-.152	55.549	-55.549
30		5	.611	0	-.976	.152	-.152	54.722	-54.722
31 2	M19	1	.622	0	-1.012	.156	-.156	57.641	-57.641
32		2	.618	0	-1.008	.156	-.156	56.77	-56.77
33		3	.613	0	-1.005	.155	-.155	55.902	-55.902
34		4	.608	0	-1.001	.155	-.155	55.037	-55.037
35		5	.603	0	-.997	.155	-.155	54.176	-54.176
36 2	M24	1	.639	0	-1.335	.187	-.187	57.578	-57.578
37		2	.634	0	-1.33	.187	-.187	56.414	-56.414
38		3	.629	0	-1.325	.186	-.186	55.255	-55.255
39		4	.624	0	-1.319	.186	-.186	54.1	-54.1
40		5	.619	0	-1.314	.185	-.185	52.95	-52.95
41 2	M20	1	.615	0	-1.035	.158	-.158	57.174	-57.174
42		2	.61	0	-1.031	.158	-.158	56.265	-56.265
43		3	.605	0	-1.027	.158	-.158	55.359	-55.359



**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
44		4	.601	0	-1.023	.158	-.158	54.457	-54.457	
45		5	.596	0	-1.019	.157	-.157	53.558	-53.558	
46	2	M21	1	.608	0	-1.059	.161	-.161	56.636	-56.636
47		2	.603	0	-1.055	.161	-.161	55.686	-55.686	
48		3	.598	0	-1.051	.16	-.16	54.739	-54.739	
49		4	.593	0	-1.047	.16	-.16	53.795	-53.795	
50		5	.589	0	-1.043	.16	-.16	52.856	-52.856	
51	2	M25	1	.632	0	-1.373	.19	-.19	56.525	-56.525
52		2	.627	0	-1.367	.189	-.189	55.297	-55.297	
53		3	.622	0	-1.362	.189	-.189	54.075	-54.075	
54		4	.617	0	-1.356	.188	-.188	52.857	-52.857	
55		5	.612	0	-1.351	.188	-.188	51.645	-51.645	
56	2	M29	1	.695	-.001	-2.24	.238	-.238	56.477	-56.477
57		2	.69	-.001	-2.23	.238	-.238	54.797	-54.797	
58		3	.685	-.001	-2.221	.237	-.237	53.125	-53.125	
59		4	.68	-.001	-2.211	.236	-.236	51.459	-51.459	
60		5	.675	-.001	-2.201	.235	-.235	49.801	-49.801	
61	2	M1	1	.64	0	-.748	.12	-.12	56.241	-56.241
62		2	.635	0	-.745	.12	-.12	55.649	-55.649	
63		3	.631	0	-.742	.12	-.12	55.059	-55.059	
64		4	.626	0	-.74	.12	-.12	54.472	-54.472	
65		5	.621	0	-.737	.12	-.12	53.886	-53.886	
66	2	M11	1	.632	0	-.76	.122	-.122	56.173	-56.173
67		2	.627	0	-.758	.122	-.122	55.561	-55.561	
68		3	.623	0	-.755	.122	-.122	54.952	-54.952	
69		4	.618	0	-.752	.122	-.122	54.345	-54.345	
70		5	.613	0	-.75	.122	-.122	53.74	-53.74	
71	2	M12	1	.624	0	-.774	.125	-.125	56.083	-56.083
72		2	.62	0	-.771	.125	-.125	55.451	-55.451	
73		3	.615	0	-.768	.125	-.125	54.821	-54.821	
74		4	.61	0	-.765	.124	-.124	54.193	-54.193	
75		5	.606	0	-.763	.124	-.124	53.568	-53.568	
76	2	M13	1	.617	0	-.787	.127	-.127	55.969	-55.969
77		2	.612	0	-.785	.127	-.127	55.315	-55.315	
78		3	.607	0	-.782	.127	-.127	54.663	-54.663	
79		4	.602	0	-.779	.127	-.127	54.013	-54.013	
80		5	.598	0	-.776	.127	-.127	53.366	-53.366	
81	2	M14	1	.609	0	-.801	.129	-.129	55.806	-55.806
82		2	.604	0	-.798	.129	-.129	55.128	-55.128	
83		3	.599	0	-.795	.129	-.129	54.453	-54.453	
84		4	.595	0	-.792	.129	-.129	53.78	-53.78	
85		5	.59	0	-.789	.129	-.129	53.11	-53.11	
86	2	M15	1	.601	0	-.817	.132	-.132	55.659	-55.659
87		2	.596	0	-.814	.132	-.132	54.956	-54.956	
88		3	.592	0	-.811	.132	-.132	54.255	-54.255	
89		4	.587	0	-.808	.131	-.131	53.557	-53.557	
90		5	.582	0	-.805	.131	-.131	52.861	-52.861	
91	2	M26	1	.625	0	-1.413	.193	-.193	55.309	-55.309
92		2	.62	0	-1.408	.192	-.192	54.011	-54.011	
93		3	.615	0	-1.402	.192	-.192	52.718	-52.718	
94		4	.61	0	-1.396	.191	-.191	51.431	-51.431	
95		5	.605	0	-1.39	.191	-.191	50.149	-50.149	

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
96	2	M30	1	.687	-.001	-2.323	.241	-.241	54.167	-54.167
97			2	.682	-.001	-2.312	.24	-.24	52.365	-52.365
98			3	.677	-.001	-2.302	.239	-.239	50.571	-50.571
99			4	.672	-.001	-2.292	.238	-.238	48.785	-48.785
100			5	.666	-.001	-2.281	.237	-.237	47.007	-47.007
101	2	M27	1	.618	-.001	-1.457	.196	-.196	53.899	-53.899
102			2	.613	-.001	-1.451	.195	-.195	52.522	-52.522
103			3	.608	-.001	-1.445	.195	-.195	51.151	-51.151
104			4	.603	-.001	-1.439	.194	-.194	49.785	-49.785
105			5	.582	-.001	-1.376	.185	-.185	48.405	-48.405
106	2	M31	1	.678	-.001	-2.413	.243	-.243	51.428	-51.428
107			2	.673	-.001	-2.402	.242	-.242	49.485	-49.485
108			3	.668	-.001	-2.391	.241	-.241	47.55	-47.55
109			4	.663	-.001	-2.38	.24	-.24	45.624	-45.624
110			5	.658	-.001	-2.37	.239	-.239	43.707	-43.707
111	2	M32	1	.67	-.001	-2.513	.245	-.245	48.143	-48.143
112			2	.665	-.001	-2.501	.244	-.244	46.034	-46.034
113			3	.66	-.001	-2.49	.244	-.244	43.936	-43.936
114			4	.655	-.001	-2.478	.243	-.243	41.847	-41.847
115			5	.65	-.001	-2.467	.242	-.242	39.767	-39.767
116	2	M33	1	.662	-.001	-2.622	.248	-.248	44.147	-44.147
117			2	.657	-.001	-2.61	.247	-.247	41.844	-41.844
118			3	.652	-.001	-2.597	.246	-.246	39.552	-39.552
119			4	.515	-.001	-2.109	.244	-.244	36.912	-36.912
120			5	.51	-.001	-2.097	.243	-.243	35.06	-35.06
121	2	M34	1	.561	-.001	-2.972	.277	-.277	41.537	-41.537
122			2	.555	-.001	-2.955	.276	-.276	39.354	-39.354
123			3	.55	-.001	-2.938	.275	-.275	37.183	-37.183
124			4	.545	-.001	-2.921	.274	-.274	35.025	-35.025
125			5	.54	-.001	-2.904	.273	-.273	32.88	-32.88
126	2	M35	1	.548	-.001	-3.107	.279	-.279	37.226	-37.226
127			2	.543	-.001	-3.088	.278	-.278	34.809	-34.809
128			3	.538	-.001	-3.07	.277	-.277	32.406	-32.406
129			4	.533	-.001	-3.052	.276	-.276	30.017	-30.017
130			5	.527	-.001	-3.034	.275	-.275	27.643	-27.643
131	2	M36	1	.536	-.001	-3.258	.282	-.282	31.716	-31.716
132			2	.372	0	-2.44	.28	-.28	28.716	-28.716
133			3	.367	0	-2.421	.279	-.279	26.69	-26.69
134			4	.362	0	-2.401	.278	-.278	24.68	-24.68
135			5	.357	0	-2.382	.277	-.277	22.687	-22.687
136	2	M37	1	.362	0	-2.566	.284	-.284	26.458	-26.458
137			2	.357	0	-2.545	.283	-.283	24.157	-24.157
138			3	.352	0	-2.524	.282	-.282	21.874	-21.874
139			4	.239	-.039	-3.527	.259	-.259	19.058	-19.058
140			5	.233	-.039	-3.506	.22	-.22	15.891	-15.891
141	2	M38	1	.237	-.039	-3.804	.225	-.225	18.911	-18.911
142			2	.232	-.039	-3.781	.185	-.185	15.171	-15.171
143			3	.227	-.039	-3.758	.145	-.145	11.455	-11.455
144			4	.068	-.039	-2.791	.104	-.104	7.723	-7.723
145			5	.063	-.039	-2.768	.064	-.064	4.982	-4.982
146	2	M39	1	.064	-.039	-3.022	.066	-.066	6.082	-6.082
147			2	.059	-.039	-2.997	.025	-.025	2.774	-2.774





**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
148		3	.053	0	-.433	0	0	.61	-.61	
149		4	.048	0	-.408	0	0	.148	-.148	
150		5	0	0	-.002	0	0	0	0	
151	2	M6	1	.328	-.274	.004	0	0	0	
152		2	.328	-.28	.004	-.776	.776	.011	-.011	
153		3	.329	-.287	.004	-1.569	1.569	.022	-.022	
154		4	.33	-.293	.004	-2.379	2.379	.033	-.033	
155		5	.33	-.299	.004	-3.206	3.206	.044	-.044	
156	2	M44	1	.216	-.189	.003	-1.336	1.336	.019	-.019
157		2	.216	-.195	.003	-1.688	1.688	.024	-.024	
158		3	.217	-.201	.003	-2.051	2.051	.029	-.029	
159		4	.217	-.207	.003	-2.426	2.426	.034	-.034	
160		5	.218	-.213	.003	-2.811	2.811	.038	-.038	
161	2	M4	1	.28	-.253	.002	0	0	0	
162		2	.28	-.261	.002	-.809	.809	.007	-.007	
163		3	.281	-.27	.002	-1.643	1.643	.014	-.014	
164		4	.282	-.278	.002	-2.503	2.503	.02	-.02	
165		5	.282	-.286	.002	-3.388	3.388	.027	-.027	
166	2	M9	1	.187	-.072	.003	0	0	0	
167		2	.188	-.076	.003	-.159	.159	.006	-.006	
168		3	.188	-.08	.003	-.326	.326	.012	-.012	
169		4	.188	-.084	.003	-.502	.502	.018	-.018	
170		5	.189	-.088	.003	-.687	.687	.024	-.024	
171	2	M47	1	.131	-.058	.002	-.32	.32	.012	-.012
172		2	.131	-.062	.002	-.411	.411	.015	-.015	
173		3	.131	-.066	.002	-.507	.507	.018	-.018	
174		4	.132	-.07	.002	-.609	.609	.021	-.021	
175		5	.132	-.074	.002	-.717	.717	.024	-.024	
176	2	M42	1	.177	-.174	.002	-1.305	1.305	.011	-.011
177		2	.178	-.182	.002	-1.657	1.657	.014	-.014	
178		3	.178	-.19	.002	-2.025	2.025	.016	-.016	
179		4	.179	-.197	.002	-2.408	2.408	.019	-.019	
180		5	.179	-.205	.002	-2.807	2.807	.022	-.022	
181	2	M2	1	.327	-.293	.002	0	0	0	
182		2	.328	-.299	.002	-.854	.854	.005	-.005	
183		3	.328	-.306	.002	-1.726	1.726	.011	-.011	
184		4	.329	-.312	.002	-2.617	2.617	.016	-.016	
185		5	.329	-.319	.002	-3.526	3.526	.022	-.022	
186	2	M40	1	.215	-.201	.002	-1.469	1.469	.01	-.01
187		2	.215	-.207	.002	-1.856	1.856	.012	-.012	
188		3	.216	-.213	.002	-2.255	2.255	.014	-.014	
189		4	.216	-.22	.002	-2.665	2.665	.017	-.017	
190		5	.217	-.226	.002	-3.087	3.087	.019	-.019	
191	2	M3	1	-.255	-.446	-.002	0	0	0	
192		2	-.254	-.452	-.002	-1.294	1.294	-.004	.004	
193		3	-.254	-.458	-.002	-2.605	2.605	-.008	.008	
194		4	-.253	-.465	-.002	-3.936	3.936	-.012	.012	
195		5	-.253	-.471	-.002	-5.284	5.284	-.016	.016	
196	2	M5	1	-.224	-.372	-.002	0	0	0	
197		2	-.224	-.38	-.002	-1.181	1.181	-.005	.005	
198		3	-.223	-.388	-.002	-2.388	2.388	-.01	.01	
199		4	-.223	-.396	-.002	-3.619	3.619	-.015	.015	

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
200		5	-.222	-.404	-.002	-4.876	4.876	-.02	.02	
201	2	M7	1	-.253	-.435	-.003	0	0	0	
202		2	-.253	-.442	-.003	-1.226	1.226	-.008	.008	
203		3	-.252	-.448	-.003	-2.47	2.47	-.016	.016	
204		4	-.252	-.454	-.003	-3.73	3.73	-.024	.024	
205		5	-.251	-.46	-.003	-5.008	5.008	-.032	.032	
206	2	M8	1	-.083	-.078	-.001	0	0	0	
207		2	-.082	-.082	-.001	-.171	.171	-.002	.002	
208		3	-.082	-.086	-.001	-.35	.35	-.005	.005	
209		4	-.082	-.09	-.001	-.538	.538	-.007	.007	
210		5	-.081	-.094	-.001	-.734	.734	-.01	.01	
211	2	M10	1	0	0	0	0	0	0	
212		2	0	0	0	0	0	0	0	
213		3	0	0	0	0	0	0	0	
214		4	0	0	0	0	0	0	0	
215		5	0	0	0	0	0	0	0	
216	2	M46	1	-.056	-.063	0	-.342	.342	-.005	.005
217		2	-.056	-.067	0	-.439	.439	-.006	.006	
218		3	-.056	-.07	0	-.542	.542	-.007	.007	
219		4	-.055	-.074	0	-.65	.65	-.009	.009	
220		5	-.055	-.078	0	-.764	.764	-.01	.01	
221	2	M41	1	-.165	-.299	-.001	-2.201	2.201	-.007	.007
222		2	-.164	-.305	-.001	-2.774	2.774	-.008	.008	
223		3	-.164	-.311	-.001	-3.358	3.358	-.01	.01	
224		4	-.163	-.318	-.001	-3.954	3.954	-.012	.012	
225		5	-.163	-.324	-.001	-4.562	4.562	-.014	.014	
226	2	M43	1	-.139	-.248	-.001	-1.878	1.878	-.008	.008
227		2	-.139	-.256	-.001	-2.377	2.377	-.01	.01	
228		3	-.138	-.263	-.001	-2.891	2.891	-.012	.012	
229		4	-.137	-.271	-.001	-3.42	3.42	-.014	.014	
230		5	-.137	-.279	-.001	-3.965	3.965	-.016	.016	
231	2	M45	1	-.164	-.292	-.002	-2.086	2.086	-.014	.014
232		2	-.164	-.298	-.002	-2.629	2.629	-.017	.017	
233		3	-.163	-.304	-.002	-3.183	3.183	-.021	.021	
234		4	-.163	-.31	-.002	-3.747	3.747	-.024	.024	
235		5	-.162	-.316	-.002	-4.323	4.323	-.028	.028	

### Joint Reactions

LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]	
1	3	BOTTOM-POLE	0	104.508	-11.069	-1347.382	-.546	-7.737
2	3	Totals:	0	104.508	-11.069			
3	3	COG (ft):	X: -.041	Y: 94.066	Z: .005			

### Member Section Stresses (By Combination)

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
1	3	M1	1	1.314	-.744	0	22.721	-22.721	-.091	.091
2			2	1.305	-.737	0	22.484	-22.484	-.091	.091
3			3	1.296	-.731	0	22.249	-22.249	-.091	.091
4			4	1.288	-.724	0	22.016	-22.016	-.091	.091
5			5	1.279	-.718	0	21.785	-21.785	-.091	.091
6	3	M11	1	1.301	-.745	0	22.229	-22.229	-.095	.095
7			2	1.293	-.739	0	21.986	-21.986	-.095	.095
8			3	1.284	-.732	0	21.746	-21.746	-.095	.095
9			4	1.275	-.726	0	21.508	-21.508	-.095	.095
10			5	1.266	-.72	0	21.272	-21.272	-.095	.095
11	3	M12	1	1.289	-.745	0	21.714	-21.714	-.099	.099
12			2	1.28	-.738	0	21.467	-21.467	-.099	.099
13			3	1.272	-.732	0	21.221	-21.221	-.099	.099
14			4	1.263	-.726	0	20.978	-20.978	-.099	.099
15			5	1.254	-.72	0	20.737	-20.737	-.099	.099
16	3	M16	1	1.348	-.735	0	21.425	-21.425	-.125	.125
17			2	1.339	-.729	0	21.133	-21.133	-.125	.125
18			3	1.33	-.724	0	20.843	-20.843	-.124	.124
19			4	1.321	-.718	0	20.556	-20.556	-.124	.124
20			5	1.312	-.713	0	20.271	-20.271	-.124	.124
21	3	M13	1	1.277	-.743	0	21.177	-21.177	-.103	.103
22			2	1.268	-.737	0	20.925	-20.925	-.103	.103
23			3	1.259	-.731	0	20.675	-20.675	-.103	.103
24			4	1.251	-.725	0	20.427	-20.427	-.103	.103
25			5	1.242	-.719	0	20.182	-20.182	-.103	.103
26	3	M17	1	1.336	-.731	0	20.723	-20.723	-.13	.13
27			2	1.327	-.725	0	20.426	-20.426	-.13	.13
28			3	1.318	-.72	0	20.132	-20.132	-.13	.13
29			4	1.309	-.714	0	19.84	-19.84	-.13	.13
30			5	1.3	-.709	0	19.55	-19.55	-.13	.13
31	3	M14	1	1.265	-.74	0	20.619	-20.619	-.108	.108
32			2	1.256	-.734	0	20.363	-20.363	-.108	.108
33			3	1.247	-.728	0	20.108	-20.108	-.108	.108
34			4	1.238	-.722	0	19.856	-19.856	-.107	.107
35			5	1.23	-.716	0	19.606	-19.606	-.107	.107
36	3	M15	1	1.253	-.735	0	20.041	-20.041	-.113	.113
37			2	1.244	-.73	0	19.78	-19.78	-.112	.112
38			3	1.235	-.724	0	19.521	-19.521	-.112	.112
39			4	1.226	-.718	0	19.265	-19.265	-.112	.112
40			5	1.217	-.712	0	19.011	-19.011	-.112	.112
41	3	M18	1	1.324	-.725	0	19.995	-19.995	-.137	.137
42			2	1.315	-.719	0	19.694	-19.694	-.137	.137
43			3	1.306	-.714	0	19.396	-19.396	-.136	.136

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
44		4	1.297	-.709	0	19.099	-19.099	-.136	.136	
45		5	1.288	-.703	0	18.805	-18.805	-.136	.136	
46	3	M19	1	1.312	-.718	0	19.244	-19.244	-.143	.143
47		2	1.303	-.712	0	18.939	-18.939	-.143	.143	
48		3	1.294	-.707	0	18.636	-18.636	-.143	.143	
49		4	1.285	-.702	0	18.335	-18.335	-.143	.143	
50		5	1.276	-.697	0	18.037	-18.037	-.143	.143	
51	3	M22	1	1.39	-.695	0	18.666	-18.666	-.176	.176
52		2	1.381	-.69	0	18.316	-18.316	-.176	.176	
53		3	1.371	-.685	0	17.969	-17.969	-.176	.176	
54		4	1.362	-.68	0	17.624	-17.624	-.176	.176	
55		5	1.352	-.676	0	17.281	-17.281	-.175	.175	
56	3	M20	1	1.301	-.709	0	18.468	-18.468	-.151	.151
57		2	1.292	-.704	0	18.159	-18.159	-.15	.15	
58		3	1.282	-.699	0	17.853	-17.853	-.15	.15	
59		4	1.273	-.694	0	17.549	-17.549	-.15	.15	
60		5	1.264	-.689	0	17.247	-17.247	-.15	.15	
61	3	M23	1	1.378	-.685	0	17.702	-17.702	-.186	.186
62		2	1.369	-.681	0	17.349	-17.349	-.186	.186	
63		3	1.359	-.676	0	16.998	-16.998	-.185	.185	
64		4	1.349	-.671	0	16.649	-16.649	-.185	.185	
65		5	1.34	-.667	0	16.303	-16.303	-.185	.185	
66	3	M21	1	1.289	-.7	0	17.668	-17.668	-.158	.158
67		2	1.28	-.695	0	17.356	-17.356	-.158	.158	
68		3	1.271	-.69	0	17.046	-17.046	-.158	.158	
69		4	1.261	-.685	0	16.739	-16.739	-.158	.158	
70		5	1.252	-.681	0	16.433	-16.433	-.157	.157	
71	3	M24	1	1.366	-.675	0	16.71	-16.71	-.196	.196
72		2	1.357	-.67	0	16.354	-16.354	-.196	.196	
73		3	1.347	-.666	0	15.999	-15.999	-.196	.196	
74		4	1.337	-.661	0	15.647	-15.647	-.195	.195	
75		5	1.328	-.657	0	15.298	-15.298	-.195	.195	
76	3	M25	1	1.355	-.663	0	15.689	-15.689	-.208	.208
77		2	1.345	-.659	0	15.33	-15.33	-.207	.207	
78		3	1.335	-.655	0	14.973	-14.973	-.207	.207	
79		4	1.326	-.65	0	14.618	-14.618	-.206	.206	
80		5	1.316	-.646	0	14.265	-14.265	-.206	.206	
81	3	M28	1	1.52	-.589	.001	15.445	-15.445	-.216	.216
82		2	1.51	-.585	.001	15.02	-15.02	-.215	.215	
83		3	1.499	-.581	.001	14.599	-14.599	-.215	.215	
84		4	1.489	-.577	.001	14.18	-14.18	-.214	.214	
85		5	1.479	-.574	.001	13.764	-13.764	-.213	.213	
86	3	M26	1	1.343	-.651	0	14.64	-14.64	-.22	.22
87		2	1.333	-.647	0	14.278	-14.278	-.22	.22	
88		3	1.323	-.643	0	13.918	-13.918	-.219	.219	
89		4	1.314	-.638	0	13.561	-13.561	-.219	.219	
90		5	1.304	-.634	0	13.206	-13.206	-.218	.218	
91	3	M29	1	1.505	-.577	.001	14.088	-14.088	-.23	.23
92		2	1.494	-.573	.001	13.662	-13.662	-.229	.229	
93		3	1.484	-.57	.001	13.239	-13.239	-.228	.228	
94		4	1.474	-.566	.001	12.82	-12.82	-.227	.227	
95		5	1.463	-.562	.001	12.402	-12.402	-.226	.226	

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
96	3	M27	1	1.331	-.638	0	13.562	-13.562	-.234	.234
97			2	1.322	-.633	0	13.198	-13.198	-.234	.234
98			3	1.312	-.629	0	12.836	-12.836	-.233	.233
99			4	1.302	-.626	0	12.476	-12.476	-.232	.232
100			5	1.258	-.58	0	12.107	-12.107	-.179	.179
101	3	M30	1	1.489	-.564	.002	12.7	-12.7	-.246	.246
102			2	1.479	-.561	.002	12.274	-12.274	-.245	.245
103			3	1.468	-.557	.002	11.851	-11.851	-.243	.243
104			4	1.458	-.553	.002	11.431	-11.431	-.242	.242
105			5	1.448	-.55	.002	11.013	-11.013	-.241	.241
106	3	M31	1	1.474	-.55	.002	11.284	-11.284	-.264	.264
107			2	1.463	-.547	.002	10.859	-10.859	-.262	.262
108			3	1.453	-.544	.002	10.435	-10.435	-.261	.261
109			4	1.442	-.54	.002	10.015	-10.015	-.259	.259
110			5	1.432	-.537	.002	9.597	-9.597	-.258	.258
111	3	M32	1	1.458	-.536	.002	9.839	-9.839	-.284	.284
112			2	1.448	-.533	.002	9.414	-9.414	-.282	.282
113			3	1.437	-.529	.002	8.992	-8.992	-.281	.281
114			4	1.427	-.526	.002	8.572	-8.572	-.279	.279
115			5	1.416	-.523	.002	8.154	-8.154	-.277	.277
116	3	M33	1	1.443	-.521	.002	8.366	-8.366	-.308	.308
117			2	1.432	-.518	.002	7.942	-7.942	-.306	.306
118			3	1.422	-.515	.002	7.52	-7.52	-.304	.304
119			4	1.123	-.437	.002	7.101	-7.101	-.301	.301
120			5	1.112	-.434	.002	6.745	-6.745	-.3	.3
121	3	M34	1	1.222	-.435	.003	7.688	-7.688	-.355	.355
122			2	1.211	-.432	.003	7.287	-7.287	-.353	.353
123			3	1.2	-.429	.003	6.889	-6.889	-.351	.351
124			4	1.19	-.426	.003	6.494	-6.494	-.349	.349
125			5	1.179	-.423	.003	6.102	-6.102	-.347	.347
126	3	M35	1	1.197	-.418	.003	6.241	-6.241	-.393	.393
127			2	1.186	-.415	.003	5.846	-5.846	-.39	.39
128			3	1.175	-.413	.003	5.455	-5.455	-.387	.387
129			4	1.164	-.41	.003	5.066	-5.066	-.385	.385
130			5	1.153	-.407	.003	4.68	-4.68	-.382	.382
131	3	M36	1	1.172	-.404	.004	4.788	-4.788	-.438	.438
132			2	.817	-.314	.003	4.441	-4.441	-.435	.435
133			3	.806	-.311	.003	4.139	-4.139	-.433	.433
134			4	.795	-.308	.003	3.839	-3.839	-.43	.43
135			5	.784	-.306	.003	3.542	-3.542	-.428	.428
136	3	M37	1	.797	-.301	.003	3.626	-3.626	-.499	.499
137			2	.786	-.298	.003	3.329	-3.329	-.496	.496
138			3	.775	-.296	.003	3.035	-3.035	-.493	.493
139			4	.547	-.448	.002	2.651	-2.651	-.491	.491
140			5	.536	-.446	.002	2.208	-2.208	-.489	.489
141	3	M38	1	.544	-.442	.003	2.262	-2.262	-.582	.582
142			2	.533	-.44	.003	1.814	-1.814	-.579	.579
143			3	.522	-.438	.003	1.369	-1.369	-.577	.577
144			4	.175	-.356	0	.992	-.992	-.574	.574
145			5	.164	-.354	0	.631	-.631	-.573	.573
146	3	M39	1	.166	-.35	0	.647	-.647	-.699	.699
147			2	.155	-.348	0	.284	-.284	-.698	.698

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
148		3	.143	-.037	0	.051	-.051	-.697	.697
149		4	.132	-.035	0	.013	-.013	-.696	.696
150		5	0	0	0	0	0	0	0
151	3 M2	1	.082	-.993	.002	0	0	0	0
152		2	.083	-1.004	.005	-2.878	2.878	.008	-.008
153		3	.083	-1.015	.008	-5.788	5.788	.024	-.024
154		4	.084	-1.027	.012	-8.732	8.732	.049	-.049
155		5	.085	-1.039	.016	-11.709	11.709	.085	-.085
156	3 M3	1	.082	-.993	-.002	0	0	0	0
157		2	.083	-1.004	-.005	-2.878	2.878	-.008	.008
158		3	.083	-1.015	-.008	-5.788	5.788	-.024	.024
159		4	.084	-1.027	-.012	-8.731	8.731	-.049	.049
160		5	.085	-1.039	-.016	-11.707	11.707	-.084	.084
161	3 M4	1	.063	-.859	.001	0	0	0	0
162		2	.064	-.873	.005	-2.722	2.722	.008	-.008
163		3	.065	-.887	.008	-5.487	5.487	.025	-.025
164		4	.066	-.902	.013	-8.298	8.298	.054	-.054
165		5	.067	-.917	.018	-11.155	11.155	.096	-.096
166	3 M5	1	.063	-.859	-.001	0	0	0	0
167		2	.064	-.873	-.004	-2.721	2.721	-.008	.008
168		3	.065	-.887	-.008	-5.486	5.486	-.025	.025
169		4	.066	-.902	-.013	-8.297	8.297	-.054	.054
170		5	.067	-.917	-.018	-11.153	11.153	-.096	.096
171	3 M6	1	.084	-.992	.002	0	0	0	0
172		2	.085	-1.003	.005	-2.79	2.79	.009	-.009
173		3	.086	-1.014	.008	-5.611	5.611	.024	-.024
174		4	.087	-1.025	.012	-8.463	8.463	.048	-.048
175		5	.088	-1.037	.016	-11.346	11.346	.083	-.083
176	3 M7	1	.084	-.992	-.002	0	0	0	0
177		2	.085	-1.003	-.005	-2.789	2.789	-.009	.009
178		3	.086	-1.014	-.008	-5.609	5.609	-.024	.024
179		4	.087	-1.025	-.012	-8.46	8.46	-.048	.048
180		5	.088	-1.037	-.016	-11.343	11.343	-.082	.082
181	3 M8	1	.024	-.298	0	0	0	0	0
182		2	.024	-.305	-.002	-.645	.645	-.003	.003
183		3	.025	-.312	-.005	-1.306	1.306	-.01	.01
184		4	.026	-.319	-.007	-1.982	1.982	-.021	.021
185		5	.026	-.327	-.01	-2.674	2.674	-.037	.037
186	3 M9	1	.039	-.489	0	0	0	0	0
187		2	.04	-.496	.003	-1.055	1.055	.004	-.004
188		3	.04	-.503	.005	-2.125	2.125	.011	-.011
189		4	.041	-.511	.008	-3.211	3.211	.023	-.023
190		5	.042	-.518	.01	-4.312	4.312	.04	-.04
191	3 M10	1	0	0	0	0	0	0	0
192		2	0	0	0	0	0	0	0
193		3	0	0	0	0	0	0	0
194		4	0	0	0	0	0	0	0
195		5	0	0	0	0	0	0	0
196	3 M46	1	.018	-.218	-.007	-1.247	1.247	-.018	.018
197		2	.019	-.225	-.01	-1.579	1.579	-.029	.029
198		3	.019	-.232	-.012	-1.921	1.921	-.043	.043
199		4	.02	-.239	-.015	-2.273	2.273	-.06	.06

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
200		5	.02	-.246	-.018	-2.636	2.636	-.08	.08	
201	3	M47	1	.029	-.345	.008	-2.011	2.011	.02	-.02
202		2	.029	-.352	.01	-2.534	2.534	.031	-.031	
203		3	.03	-.359	.013	-3.067	3.067	.045	-.045	
204		4	.03	-.366	.015	-3.61	3.61	.062	-.062	
205		5	.031	-.373	.018	-4.164	4.164	.083	-.083	
206	3	M43	1	.042	-.56	-.012	-4.296	4.296	-.039	.039
207		2	.043	-.574	-.016	-5.419	5.419	-.062	.062	
208		3	.044	-.588	-.021	-6.569	6.569	-.092	.092	
209		4	.045	-.602	-.026	-7.748	7.748	-.131	.131	
210		5	.046	-.617	-.032	-8.954	8.954	-.178	.178	
211	3	M42	1	.042	-.56	.012	-4.297	4.297	.039	-.039
212		2	.043	-.574	.016	-5.42	5.42	.062	-.062	
213		3	.044	-.588	.021	-6.57	6.57	.093	-.093	
214		4	.045	-.602	.026	-7.749	7.749	.131	-.131	
215		5	.046	-.617	.032	-8.956	8.956	.178	-.178	
216	3	M45	1	.057	-.656	-.011	-4.725	4.725	-.036	.036
217		2	.058	-.667	-.015	-5.942	5.942	-.056	.056	
218		3	.059	-.678	-.019	-7.178	7.178	-.082	.082	
219		4	.06	-.688	-.023	-8.434	8.434	-.113	.113	
220		5	.061	-.7	-.028	-9.711	9.711	-.152	.152	
221	3	M44	1	.057	-.657	.011	-4.726	4.726	.036	-.036
222		2	.058	-.667	.015	-5.943	5.943	.056	-.056	
223		3	.059	-.678	.019	-7.18	7.18	.082	-.082	
224		4	.06	-.689	.023	-8.437	8.437	.114	-.114	
225		5	.061	-.7	.028	-9.713	9.713	.152	-.152	
226	3	M41	1	.056	-.658	-.012	-4.877	4.877	-.037	.037
227		2	.057	-.669	-.015	-6.134	6.134	-.058	.058	
228		3	.058	-.68	-.019	-7.411	7.411	-.085	.085	
229		4	.059	-.691	-.024	-8.71	8.71	-.118	.118	
230		5	.06	-.702	-.028	-10.031	10.031	-.159	.159	
231	3	M40	1	.056	-.658	.012	-4.877	4.877	.037	-.037
232		2	.057	-.669	.015	-6.134	6.134	.058	-.058	
233		3	.058	-.68	.019	-7.412	7.412	.085	-.085	
234		4	.059	-.691	.024	-8.712	8.712	.118	-.118	
235		5	.06	-.702	.028	-10.032	10.032	.159	-.159	



### Joint Reactions

LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]	
1	4	BOTTOM-POLE	0	50.911	-35.597	-3541.86	-1.635	-2.997
2	4	Totals:	0	50.911	-35.597			
3	4	COG (ft):	X: -.038	Y: 90.961	Z: .001			

### Member Section Stresses (By Combination)

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
1	4	M1	1	.64	-2.363	0	59.727	-59.727	-.035	.035
2			2	.635	-2.342	0	58.974	-58.974	-.035	.035
3			3	.631	-2.321	0	58.227	-58.227	-.035	.035
4			4	.626	-2.301	0	57.487	-57.487	-.035	.035
5			5	.621	-2.281	0	56.753	-56.753	-.035	.035
6	4	M11	1	.632	-2.315	0	57.909	-57.909	-.037	.037
7			2	.627	-2.295	0	57.156	-57.156	-.037	.037
8			3	.623	-2.274	0	56.41	-56.41	-.037	.037
9			4	.618	-2.254	0	55.67	-55.67	-.037	.037
10			5	.613	-2.235	0	54.937	-54.937	-.037	.037
11	4	M12	1	.624	-2.266	0	56.078	-56.078	-.038	.038
12			2	.62	-2.246	0	55.326	-55.326	-.038	.038
13			3	.615	-2.226	0	54.58	-54.58	-.038	.038
14			4	.61	-2.207	0	53.841	-53.841	-.038	.038
15			5	.606	-2.187	0	53.109	-53.109	-.038	.038
16	4	M13	1	.617	-2.215	0	54.236	-54.236	-.04	.04
17			2	.612	-2.196	0	53.485	-53.485	-.04	.04
18			3	.607	-2.177	0	52.74	-52.74	-.04	.04
19			4	.602	-2.158	0	52.002	-52.002	-.04	.04
20			5	.598	-2.139	0	51.27	-51.27	-.04	.04
21	4	M16	1	.645	-2.073	0	53.604	-53.604	-.049	.049
22			2	.64	-2.055	0	52.781	-52.781	-.048	.048
23			3	.635	-2.038	0	51.965	-51.965	-.048	.048
24			4	.63	-2.02	0	51.157	-51.157	-.048	.048
25			5	.626	-2.002	0	50.355	-50.355	-.048	.048
26	4	M14	1	.609	-2.164	0	52.382	-52.382	-.042	.042
27			2	.604	-2.146	0	51.632	-51.632	-.042	.042
28			3	.599	-2.127	0	50.889	-50.889	-.042	.042
29			4	.595	-2.108	0	50.152	-50.152	-.042	.042
30			5	.59	-2.09	0	49.421	-49.421	-.042	.042
31	4	M17	1	.637	-2.023	0	51.477	-51.477	-.051	.051
32			2	.632	-2.006	0	50.657	-50.657	-.051	.051
33			3	.628	-1.988	0	49.843	-49.843	-.051	.051
34			4	.623	-1.971	0	49.037	-49.037	-.051	.051
35			5	.618	-1.954	0	48.237	-48.237	-.051	.051
36	4	M15	1	.601	-2.112	0	50.517	-50.517	-.044	.044
37			2	.596	-2.094	0	49.769	-49.769	-.044	.044
38			3	.592	-2.076	0	49.027	-49.027	-.044	.044
39			4	.587	-2.058	0	48.292	-48.292	-.044	.044
40			5	.582	-2.04	0	47.563	-47.563	-.044	.044
41	4	M18	1	.63	-1.972	0	49.336	-49.336	-.053	.053
42			2	.625	-1.955	0	48.517	-48.517	-.053	.053
43			3	.62	-1.938	0	47.706	-47.706	-.053	.053





**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
44		4	.615	-1.922	0	46.902	-46.902	-.053	.053	
45		5	.611	-1.905	0	46.105	-46.105	-.053	.053	
46	4	M19	1	.622	-1.921	0	47.18	-47.18	-.056	.056
47		2	.618	-1.904	0	46.365	-46.365	-.056	.056	
48		3	.613	-1.888	0	45.556	-45.556	-.056	.056	
49		4	.608	-1.872	0	44.755	-44.755	-.056	.056	
50		5	.603	-1.856	0	43.96	-43.96	-.056	.056	
51	4	M20	1	.615	-1.869	0	45.01	-45.01	-.059	.059
52		2	.61	-1.853	0	44.197	-44.197	-.059	.059	
53		3	.605	-1.837	0	43.392	-43.392	-.059	.059	
54		4	.601	-1.822	0	42.593	-42.593	-.059	.059	
55		5	.596	-1.806	0	41.801	-41.801	-.059	.059	
56	4	M22	1	.653	-1.777	0	45.01	-45.01	-.07	.07
57		2	.649	-1.762	0	44.116	-44.116	-.07	.07	
58		3	.644	-1.747	0	43.23	-43.23	-.07	.07	
59		4	.639	-1.732	0	42.351	-42.351	-.07	.07	
60		5	.634	-1.717	0	41.48	-41.48	-.069	.069	
61	4	M21	1	.608	-1.817	0	42.823	-42.823	-.062	.062
62		2	.603	-1.802	0	42.014	-42.014	-.062	.062	
63		3	.598	-1.786	0	41.211	-41.211	-.062	.062	
64		4	.593	-1.771	0	40.416	-40.416	-.062	.062	
65		5	.589	-1.756	0	39.627	-39.627	-.062	.062	
66	4	M23	1	.646	-1.727	0	42.49	-42.49	-.074	.074
67		2	.641	-1.713	0	41.6	-41.6	-.074	.074	
68		3	.636	-1.698	0	40.718	-40.718	-.074	.074	
69		4	.632	-1.684	0	39.843	-39.843	-.074	.074	
70		5	.627	-1.67	0	38.975	-38.975	-.073	.073	
71	4	M24	1	.639	-1.678	0	39.949	-39.949	-.078	.078
72		2	.634	-1.663	0	39.063	-39.063	-.078	.078	
73		3	.629	-1.65	0	38.184	-38.184	-.078	.078	
74		4	.624	-1.636	0	37.313	-37.313	-.078	.078	
75		5	.619	-1.622	0	36.45	-36.45	-.078	.078	
76	4	M25	1	.632	-1.628	0	37.383	-37.383	-.083	.083
77		2	.627	-1.614	0	36.501	-36.501	-.083	.083	
78		3	.622	-1.601	0	35.626	-35.626	-.083	.083	
79		4	.617	-1.588	0	34.759	-34.759	-.083	.083	
80		5	.612	-1.574	0	33.899	-33.899	-.083	.083	
81	4	M28	1	.703	-1.382	0	36.65	-36.65	-.085	.085
82		2	.698	-1.37	0	35.656	-35.656	-.084	.084	
83		3	.693	-1.358	0	34.67	-34.67	-.084	.084	
84		4	.688	-1.346	0	33.693	-33.693	-.084	.084	
85		5	.683	-1.334	0	32.725	-32.725	-.084	.084	
86	4	M26	1	.625	-1.579	0	34.791	-34.791	-.089	.089
87		2	.62	-1.565	0	33.913	-33.913	-.089	.089	
88		3	.615	-1.553	0	33.043	-33.043	-.088	.088	
89		4	.61	-1.54	0	32.18	-32.18	-.088	.088	
90		5	.605	-1.527	0	31.324	-31.324	-.088	.088	
91	4	M29	1	.695	-1.337	0	33.494	-33.494	-.091	.091
92		2	.69	-1.325	0	32.509	-32.509	-.091	.091	
93		3	.685	-1.314	0	31.533	-31.533	-.09	.09	
94		4	.68	-1.302	0	30.565	-30.565	-.09	.09	
95		5	.675	-1.291	0	29.606	-29.606	-.09	.09	

**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
96	4	M27	1	.618	-1.529	0	32.169	-32.169	-.095	.095
97			2	.613	-1.517	0	31.296	-31.296	-.095	.095
98			3	.608	-1.504	0	30.43	-30.43	-.095	.095
99			4	.603	-1.492	0	29.571	-29.571	-.094	.094
100			5	.582	-1.364	0	28.731	-28.731	-.07	.07
101	4	M30	1	.687	-1.292	0	30.318	-30.318	-.098	.098
102			2	.682	-1.281	0	29.343	-29.343	-.098	.098
103			3	.677	-1.27	0	28.377	-28.377	-.098	.098
104			4	.672	-1.259	0	27.419	-27.419	-.097	.097
105			5	.666	-1.248	0	26.469	-26.469	-.097	.097
106	4	M31	1	.678	-1.248	0	27.122	-27.122	-1.106	.106
107			2	.673	-1.237	0	26.157	-26.157	-1.106	.106
108			3	.668	-1.227	0	25.201	-25.201	-1.106	.106
109			4	.663	-1.216	0	24.253	-24.253	-1.105	.105
110			5	.658	-1.206	0	23.312	-23.312	-1.105	.105
111	4	M32	1	.67	-1.205	0	23.902	-23.902	-1.116	.116
112			2	.665	-1.194	0	22.947	-22.947	-1.116	.116
113			3	.66	-1.184	0	22.001	-22.001	-1.115	.115
114			4	.655	-1.174	0	21.062	-21.062	-1.115	.115
115			5	.65	-1.165	0	20.131	-20.131	-1.115	.115
116	4	M33	1	.662	-1.162	0	20.653	-20.653	-1.127	.127
117			2	.657	-1.152	0	19.708	-19.708	-1.127	.127
118			3	.652	-1.143	0	18.771	-18.771	-1.126	.126
119			4	.651	-1.143	0	17.836	-17.836	-1.126	.126
120			5	.651	-1.143	0	17.007	-17.007	-1.126	.126
121	4	M34	1	.561	-1.013	0	19.383	-19.383	-1.149	.149
122			2	.555	-1.004	0	18.45	-18.45	-1.149	.149
123			3	.55	-.995	0	17.525	-17.525	-1.148	.148
124			4	.545	-.986	0	16.609	-16.609	-1.148	.148
125			5	.54	-.977	0	15.701	-15.701	-1.147	.147
126	4	M35	1	.548	-.972	0	16.058	-16.058	-1.167	.167
127			2	.543	-.963	0	15.143	-15.143	-1.166	.166
128			3	.538	-.955	0	14.235	-14.235	-1.166	.166
129			4	.533	-.946	0	13.336	-13.336	-1.165	.165
130			5	.527	-.938	0	12.445	-12.445	-1.165	.165
131	4	M36	1	.536	-.935	0	12.734	-12.734	-1.189	.189
132			2	.372	-.78	0	11.892	-11.892	-1.189	.189
133			3	.367	-.772	0	11.14	-11.14	-1.188	.188
134			4	.362	-.764	0	10.396	-10.396	-1.188	.188
135			5	.357	-.756	0	9.66	-9.66	-1.187	.187
136	4	M37	1	.362	-.751	0	9.89	-9.89	-2.218	.218
137			2	.357	-.743	0	9.15	-9.15	-2.218	.218
138			3	.352	-.736	0	8.417	-8.417	-2.217	.217
139			4	.238	-1.205	0	7.409	-7.409	-2.217	.217
140			5	.233	-1.197	0	6.219	-6.219	-2.217	.217
141	4	M38	1	.237	-1.193	0	6.37	-6.37	-2.258	.258
142			2	.232	-1.186	0	5.163	-5.163	-2.257	.257
143			3	.226	-1.179	0	3.962	-3.962	-2.257	.257
144			4	.068	-1.053	0	2.858	-2.858	-2.256	.256
145			5	.063	-1.046	0	1.792	-1.792	-2.256	.256
146	4	M39	1	.064	-1.043	0	1.837	-1.837	-3.313	.313
147			2	.059	-1.036	0	.756	-.756	-3.313	.313

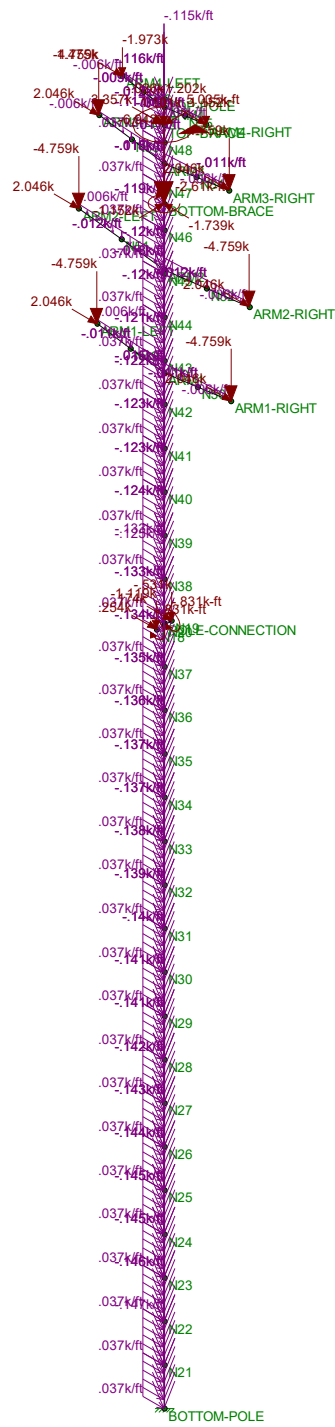


**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...
148		3	.053	-.061	0	.084	-.084	-.312	.312
149		4	.048	-.054	0	.024	-.024	-.312	.312
150		5	0	0	0	0	0	0	0
151	4 M2	1	.036	-.44	.002	0	0	0	0
152		2	.037	-.446	.009	-1.277	1.277	.014	-.014
153		3	.037	-.453	.018	-2.573	2.573	.047	-.047
154		4	.038	-.459	.028	-3.887	3.887	.104	-.104
155		5	.038	-.465	.041	-5.219	5.219	.19	-.19
156	4 M3	1	.036	-.44	-.002	0	0	0	0
157		2	.037	-.446	-.009	-1.277	1.277	-.014	.014
158		3	.037	-.453	-.018	-2.573	2.573	-.046	.046
159		4	.038	-.459	-.028	-3.886	3.886	-.103	.103
160		5	.038	-.465	-.041	-5.218	5.218	-.189	.189
161	4 M4	1	.028	-.381	.002	0	0	0	0
162		2	.028	-.389	.009	-1.209	1.209	.014	-.014
163		3	.029	-.397	.02	-2.443	2.443	.053	-.053
164		4	.029	-.405	.033	-3.703	3.703	.124	-.124
165		5	.03	-.413	.049	-4.987	4.987	.235	-.235
166	4 M5	1	.028	-.381	-.002	0	0	0	0
167		2	.028	-.389	-.009	-1.209	1.209	-.014	.014
168		3	.029	-.397	-.02	-2.443	2.443	-.053	.053
169		4	.029	-.405	-.033	-3.702	3.702	-.124	.124
170		5	.03	-.413	-.049	-4.987	4.987	-.234	.234
171	4 M6	1	.037	-.44	.002	0	0	0	0
172		2	.038	-.446	.009	-1.238	1.238	.014	-.014
173		3	.038	-.452	.017	-2.493	2.493	.045	-.045
174		4	.039	-.458	.028	-3.766	3.766	.1	-.1
175		5	.039	-.464	.04	-5.056	5.056	.182	-.182
176	4 M7	1	.037	-.44	-.002	0	0	0	0
177		2	.038	-.446	-.009	-1.238	1.238	-.014	.014
178		3	.038	-.452	-.017	-2.493	2.493	-.045	.045
179		4	.039	-.458	-.028	-3.766	3.766	-.1	.1
180		5	.039	-.464	-.04	-5.055	5.055	-.181	.181
181	4 M8	1	.007	-.082	0	0	0	0	0
182		2	.007	-.085	-.005	-.179	.179	-.005	.005
183		3	.007	-.089	-.011	-.366	.366	-.02	.02
184		4	.007	-.093	-.018	-.562	.562	-.047	.047
185		5	.008	-.097	-.025	-.766	.766	-.087	.087
186	4 M9	1	.013	-.167	0	0	0	0	0
187		2	.014	-.171	.006	-.362	.362	.006	-.006
188		3	.014	-.175	.011	-.733	.733	.022	-.022
189		4	.014	-.179	.018	-1.113	1.113	.049	-.049
190		5	.015	-.183	.026	-1.501	1.501	.09	-.09
191	4 M10	1	0	0	0	0	0	0	0
192		2	0	0	0	0	0	0	0
193		3	0	0	0	0	0	0	0
194		4	0	0	0	0	0	0	0
195		5	0	0	0	0	0	0	0
196	4 M46	1	.005	-.065	-.019	-.357	.357	-.043	.043
197		2	.006	-.069	-.026	-.458	.458	-.071	.071
198		3	.006	-.073	-.033	-.564	.564	-.107	.107
199		4	.006	-.076	-.041	-.675	.675	-.153	.153

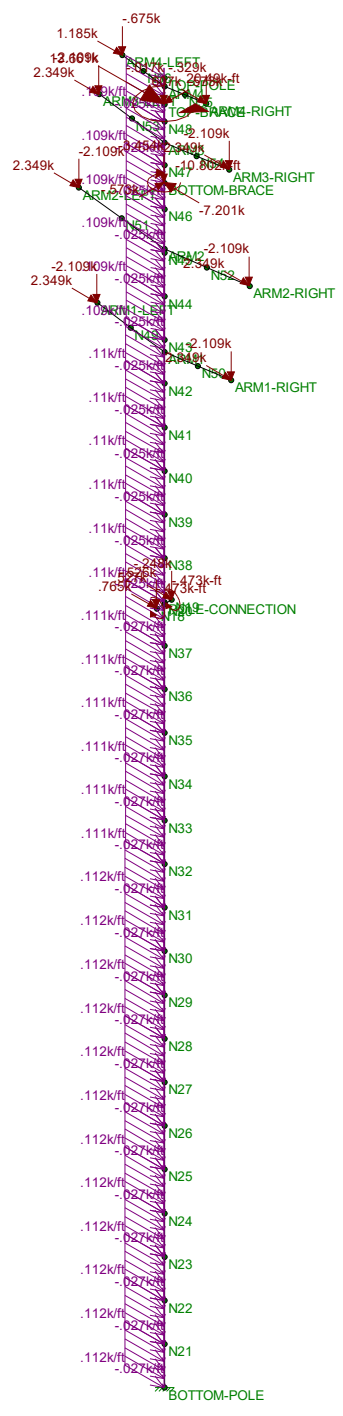
**Member Section Stresses (By Combination) (Continued)**

LC	Member Label	Sec	Axial[ksi]	y Shear[ksi]	z Shear[ksi]	y top Bendin...	y bot Bendin...	z top Bendin...	z bot Bendin...	
200		5	.007	-.08	-.05	-.793	.793	-.21	.21	
201	4	M47	1	.01	-.122	.019	-.7	.7	.045	-.045
202		2	.01	-.126	.026	-.886	.886	.073	-.073	
203		3	.011	-.13	.033	-1.078	1.078	.11	-.11	
204		4	.011	-.134	.041	-1.275	1.275	.156	-.156	
205		5	.011	-.137	.05	-1.478	1.478	.213	-.213	
206	4	M43	1	.019	-.252	-.033	-1.921	1.921	-.094	.094
207		2	.019	-.26	-.045	-2.428	2.428	-.157	.157	
208		3	.02	-.268	-.059	-2.951	2.951	-.242	.242	
209		4	.021	-.276	-.075	-3.49	3.49	-.352	.352	
210		5	.021	-.284	-.093	-4.044	4.044	-.489	.489	
211	4	M42	1	.019	-.252	.033	-1.921	1.921	.094	-.094
212		2	.019	-.26	.045	-2.429	2.429	.158	-.158	
213		3	.02	-.268	.059	-2.952	2.952	.243	-.243	
214		4	.021	-.276	.075	-3.49	3.49	.352	-.352	
215		5	.021	-.284	.093	-4.044	4.044	.49	-.49	
216	4	M45	1	.026	-.294	-.028	-2.106	2.106	-.079	.079
217		2	.026	-.3	-.038	-2.652	2.652	-.129	.129	
218		3	.027	-.306	-.049	-3.209	3.209	-.195	.195	
219		4	.027	-.312	-.061	-3.777	3.777	-.279	.279	
220		5	.028	-.318	-.075	-4.357	4.357	-.382	.382	
221	4	M44	1	.026	-.294	.028	-2.106	2.106	.08	-.08
222		2	.026	-.3	.038	-2.652	2.652	.129	-.129	
223		3	.027	-.306	.049	-3.21	3.21	.195	-.195	
224		4	.027	-.312	.061	-3.778	3.778	.279	-.279	
225		5	.028	-.318	.075	-4.357	4.357	.383	-.383	
226	4	M41	1	.025	-.295	-.029	-2.174	2.174	-.083	.083
227		2	.026	-.301	-.039	-2.738	2.738	-.135	.135	
228		3	.026	-.307	-.05	-3.314	3.314	-.205	.205	
229		4	.027	-.313	-.063	-3.902	3.902	-.293	.293	
230		5	.027	-.319	-.077	-4.502	4.502	-.403	.403	
231	4	M40	1	.025	-.295	.029	-2.174	2.174	.083	-.083
232		2	.026	-.301	.039	-2.738	2.738	.136	-.136	
233		3	.026	-.307	.05	-3.314	3.314	.205	-.205	
234		4	.027	-.313	.063	-3.902	3.902	.294	-.294	
235		5	.027	-.319	.077	-4.502	4.502	.403	-.403	



Loads: LC 1, x-direction NESG Heavy Wind

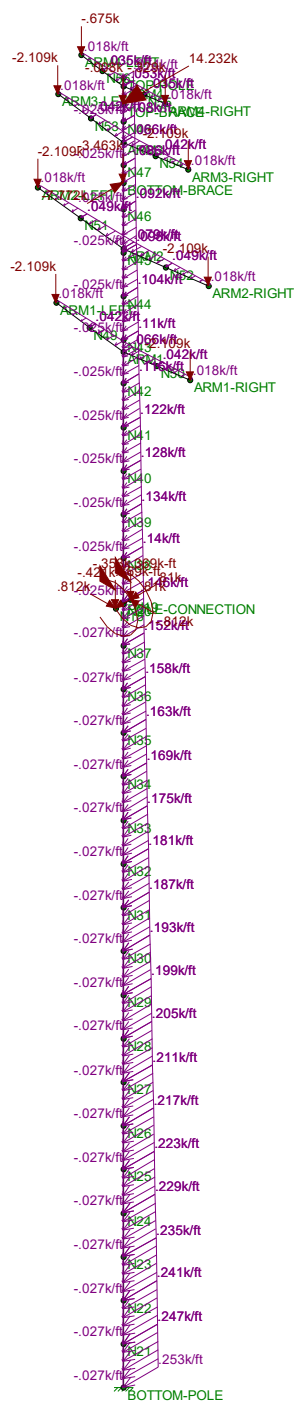
Centek		
TJL	Pole # 845 LC #1 Loads	Mar 4, 2019 at 2:06 PM
18058.43 - CT11080B		Utility Pole.r3d



Loads: LC 2, x-direction NESC Extreme Wind

Centek	Pole # 845 LC #2 Loads	Mar 4, 2019 at 2:07 PM
TJL		Utility Pole.r3d
18058.43 - CT11080B		





Loads: LC 4, z-direction NESC Extreme Wind

Centek		
TJL	Pole # 845 LC #4 Loads	Mar 4, 2019 at 2:07 PM
18058.43 - CT11080B		Utility Pole.r3d



**Pole Analysis:**

Pole Properties:

Wide Flange Moment of Inertia I <sub>y</sub> =	$I_{yy} := 20.7 \cdot \text{in}^4$	(User Input)
Wide Flange Moment of Inertia I <sub>x</sub> =	$I_{xx} := 843 \cdot \text{in}^4$	(User Input)
Wide Flange Area =	$A_{wf} := 13.0 \cdot \text{in}^2$	(User Input)
Flange Width =	$b_f := 6.5 \cdot \text{in}$	(User Input)
Wide Flange Depth =	$d_{wf} := 20.7 \cdot \text{in}$	(User Input)
Tower Width Top =	$W_{TTop} := 13 \cdot \text{in}$	(User Input)
Tower Width Base =	$W_{TBase} := 54 \cdot \text{in}$	(User Input)
Plate Thickness Top =	$Plt_{tTop} := 0.1875 \cdot \text{in}$	(User Input)
Plate Thickness Base =	$Plt_{tBase} := 0.5 \cdot \text{in}$	(User Input)
Length of Pole =	$L_{pole} := 150 \cdot \text{ft}$	(User Input)
Nominal Bending Stress =	$F_b := 60 \cdot \text{ksi}$	(User Input)
Modulus of Elasticity =	$E := 29000 \cdot \text{ksi}$	(User Input)

Member Forces:

Maximum Bending Stress x-direction =	$f_{bxmax} := 59.3 \cdot \text{ksi}$	From Risa3D
Percent Stressed =	$\frac{f_{bxmax}}{F_b} = 98.8 \cdot \%$	
	$Bending\_Check\_x := \text{if}(f_{bxmax} < F_b, "OK", "NG")$	

Bending\_Check\_x = "OK"

Maximum Bending Stress y-direction =	$f_{bymax} := 59.7 \cdot \text{ksi}$	From Risa3D
Percent Stressed =	$\frac{f_{bymax}}{F_b} = 99.5 \cdot \%$	
	$Bending\_Check\_y := \text{if}(f_{bymax} < F_b, "OK", "NG")$	

Bending\_Check\_y = "OK"

**Flange Bolts and Plate Analysis:****Input Data:**Tower Reactions:

Overturing Moment =	OM := 1474-ft-kips	(Input From Risa-3D)
Shear Force =	Shear := 28.3-kips	(Input From Risa-3D)
Axial Force =	Axial := 31.8-kips	(Input From Risa-3D)

Flange Bolt Data:

UseAST MA490

Number of Flange Bolts =	N := 24	(User Input)
Bolt Ultimate Strength =	$F_u := 150$ -ksi	(User Input)
Bolt Yield Strength =	$F_y := 125$ -ksi	(User Input)
Bolt Modulus =	E := 29000-ksi	(User Input)
Diameter of Flange Bolts =	D := 1-in	(User Input)
Threads per Inch =	n := 8	(User Input)

Flange Plate Data:

UseAST MA572 Gr 60

Plate Yield Strength =	$F_{y_{bp}} := 60$ -ksi	(User Input)
Flange Plate Thickness =	$t_{bp} := 1.75$ -in	(User Input)

**Geometric Layout Data:**

Distance from Bolts to Centroid of Pole:

$d_1 := 2.0\text{in}$  (User Input)

$d_2 := 7.0\text{in}$  (User Input)

$d_3 := 12.0\text{in}$  (User Input)

$d_4 := 15.5\text{in}$  (User Input)

$d_5 := 17.0\text{in}$  (User Input)

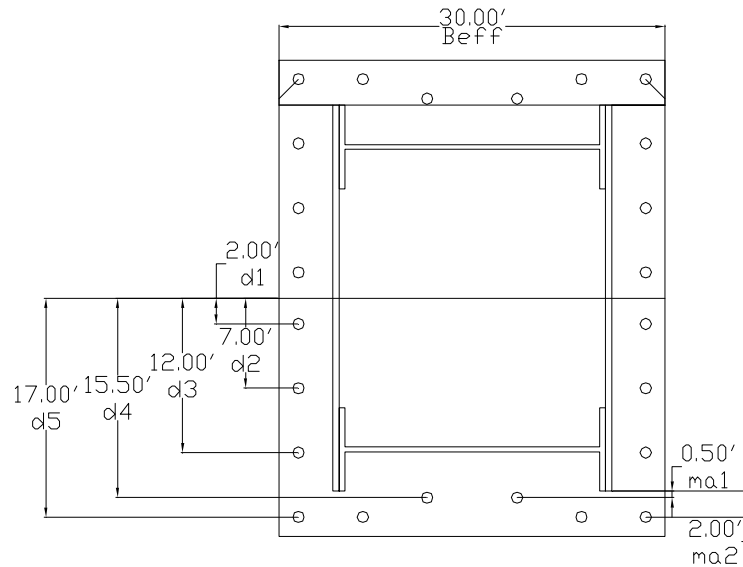
Critical Distances For Bending in Plate:

$ma_1 := 0.5\text{in}$  (User Input)

$ma_2 := 2.0\text{in}$  (User Input)

Effective Width of Flange Plate for Bending =

$B_{eff} := 30.0\text{in}$  (User Input)



**FLANGE BOLT AND PLATE GEOMETRY**

**Flange Bolt Analysis:**

Calculated Flange Bolt Properties:

Polar Moment of Inertia =  $I_p := [(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 + (d_5)^2 \cdot 8] = 4061 \cdot \text{in}^2$

Gross Area of Bolt =  $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot \text{in}^2$

Net Area of Bolt =  $A_n := \frac{\pi}{4} \cdot \left( D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 = 0.606 \cdot \text{in}^2$

Net Diameter =  $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.878 \cdot \text{in}$

Radius of Gyration of Bolt =  $r := \frac{D_n}{4} = 0.22 \cdot \text{in}$

Section Modulus of Bolt =  $S_x := \frac{\pi \cdot D_n^3}{32} = 0.066 \cdot \text{in}^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force =  $T_{\text{Max}} := OM \cdot \frac{d_5}{I_p} - \frac{\text{Axial}}{N} = 72.7 \cdot \text{kips}$

Design Tensile Force =  $T_S := F_y \cdot A_n = 75.7 \cdot \text{kips}$

Bolt Tension % of Capacity =  $\frac{T_{\text{Max}}}{T_S} \cdot 100 = 96$

Condition1 =  $\text{Condition1} := \text{if} \left( \frac{T_{\text{Max}}}{T_S} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$

Condition1 = "OK"

**Flange Plate Analysis:**

Force from Bolts =  $C_1 := \frac{OM \cdot d_4}{I_p} + \frac{Axial}{N} = 68.8 \text{ kips}$

$C_2 := \frac{OM \cdot d_5}{I_p} + \frac{Axial}{N} = 75.4 \text{ kips}$

Applied Bending Stress in Plate =  $f_{bp} := \frac{6 \cdot (2C_1 \cdot ma_1 + 4C_2 \cdot ma_2)}{B_{eff} \cdot t_{bp}^2} = 43.87 \text{ ksi}$

Allowable Bending Stress in Plate =  $F_{bp} := 0.9 \cdot F_{y_{bp}} = 54 \text{ ksi}$

Plate Bending Stress % of Capacity =  $\frac{f_{bp}}{F_{bp}} \cdot 100 = 81.2$

Condition3 =  $Condition2 := \text{if} \left( \frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed" \right)$

Condition2 = "Ok"

**Flange Bolts and Plate Analysis:****Input Data:**Tower Reactions:

Overturing Moment =	OM := 941-ft-kips	(Input From Risa-3D)
Shear Force =	Shear := 20.5-kips	(Input From Risa-3D)
Axial Force =	Axial := 28.3-kips	(Input From Risa-3D)

Flange Bolt Data:

UseAST MA490

Number of Flange Bolts =	N := 24	(User Input)
Bolt Ultimate Strength =	$F_u := 150$ -ksi	(User Input)
Bolt Yield Strength =	$F_y := 125$ -ksi	(User Input)
Bolt Modulus =	E := 29000-ksi	(User Input)
Diameter of Flange Bolts =	D := 1-in	(User Input)
Threads per Inch =	n := 8	(User Input)

Flange Plate Data:

UseAST MA572 Gr 60

Plate Yield Strength =	$F_{y_{bp}} := 60$ -ksi	(User Input)
Flange Plate Thickness =	$t_{bp} := 1.75$ -in	(User Input)

**Geometric Layout Data:**

Distance from Bolts to Centroid of Pole:

$d_1 := 3.5\text{in}$  (User Input)

$d_2 := 8.5\text{in}$  (User Input)

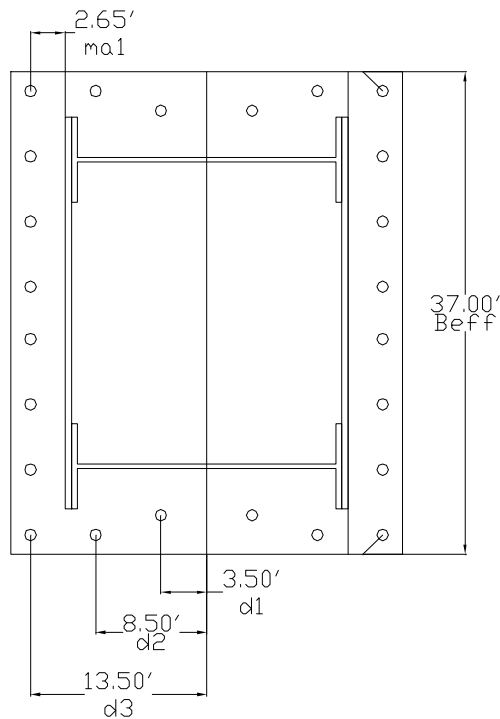
$d_3 := 13.5\text{in}$  (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.65\text{in}$  (User Input)

Effective Width of Flange Plate for Bending =

$B_{\text{eff}} := 37.0\text{in}$  (User Input)



**FLANGE BOLT AND PLATE GEOMETRY**

**Flange Bolt Analysis:**

Calculated Flange Bolt Properties:

Polar Moment of Inertia =  $I_p := [(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 16] = 3254 \cdot \text{in}^2$

Gross Area of Bolt =  $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot \text{in}^2$

Net Area of Bolt =  $A_n := \frac{\pi}{4} \cdot \left( D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 = 0.606 \cdot \text{in}^2$

Net Diameter =  $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.878 \cdot \text{in}$

Radius of Gyration of Bolt =  $r := \frac{D_n}{4} = 0.22 \cdot \text{in}$

Section Modulus of Bolt =  $S_x := \frac{\pi \cdot D_n^3}{32} = 0.066 \cdot \text{in}^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force =  $T_{\text{Max}} := OM \cdot \frac{d_3}{I_p} - \frac{\text{Axial}}{N} = 45.7 \cdot \text{kips}$

Design Tensile Force =  $T_S := F_y \cdot A_n = 75.7 \cdot \text{kips}$

Bolt Tension % of Capacity =  $\frac{T_{\text{Max}}}{T_S} \cdot 100 = 60.3$

Condition1 =  $\text{Condition1} := \text{if} \left( \frac{T_{\text{Max}}}{T_S} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$

Condition1 = "OK"



**Flange Plate Analysis:**

Force from Bolts =  $C_1 := \frac{OM \cdot d_3}{I_p} + \frac{Axial}{N} = 48 \cdot \text{kips}$

Applied Bending Stress in Plate =  $f_{bp} := \frac{6 \cdot (8C_1 \cdot m a_1)}{B_{eff} t_{bp}^2} = 53.91 \cdot \text{ksi}$

Allowable Bending Stress in Plate =  $F_{bp} := 0.9 \cdot F_{y_{bp}} = 54 \cdot \text{ksi}$

Plate Bending Stress % of Capacity =  $\frac{f_{bp}}{F_{bp}} \cdot 100 = 99.8$

Condition3 =  $\text{Condition2} := \text{if} \left( \frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed" \right)$

Condition2 = "Ok"

Subject:

Anchor Bolts and Base Plate Analysis x-  
direction Pole #845

Location:

Trumbull, CT

Rev. 2: 3/4/19

Prepared by: T.J.L. Checked by: C.A.G.  
Job No. 18058.43**Anchor Bolt and Base Plate Analysis:****Input Data:**Tower Reactions:

Overturning Moment =	OM := 4788-ft-kips	(Input From Risa3D)
Shear Force =	Shear := 40.3-kips	(Input From Risa3D)
Axial Force =	Axial := 50.9-kips	(Input From Risa3D)

Anchor Bolt Data:

UseAST MA615 Grade 60		
Number of Anchor Bolts =	N := 26	(User Input)
Bolt "Column" Distance =	l := 3.0-in	(User Input)
Bolt Ultimate Strength =	$F_u := 90$ -ksi	(User Input)
Bolt Yield Strength =	$F_y := 60$ -ksi	(User Input)
Bolt Modulus =	E := 29000-ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25-in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

UseAST MA572 Grade 42		
Plate Yield Strength =	$F_{y_{bp}} := 42$ -ksi	(User Input)
Base Plate Thickness =	$t_{bp} := 3.0$ -in	(User Input)

**Geometric Layout Data:**

Distance from Bolts to Centroid of Pole:

$d_1 := 7.5\text{in}$  (User Input)

$d_2 := 15.0\text{in}$  (User Input)

$d_3 := 22.5\text{in}$  (User Input)

$d_4 := 27.0\text{in}$  (User Input)

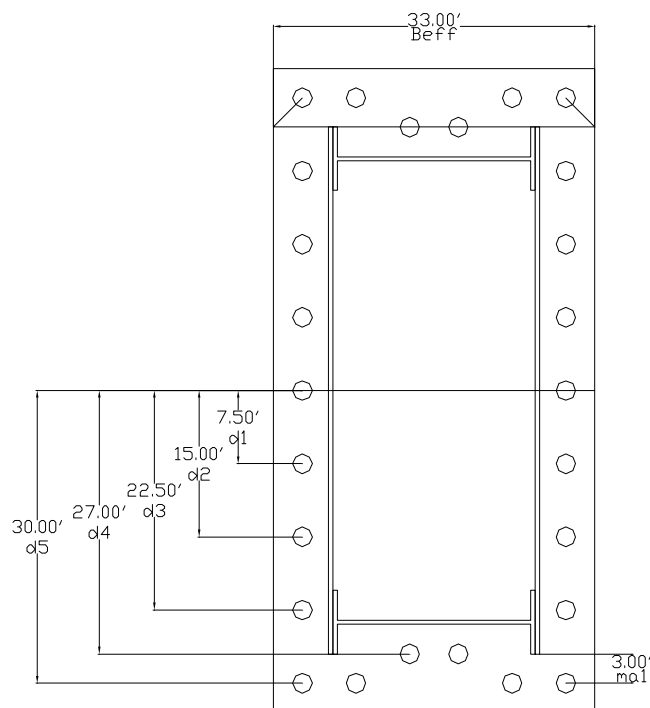
$d_5 := 30\text{in}$  (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 3.0\text{in}$  (User Input)

Effective Width of Baseplate for Bending =

$B_{eff} := 33.0\text{in}$  (User Input)



**ANCHOR BOLT AND PLATE GEOMETRY**

**Anchor Bolt Analysis:**

Calculated Anchor Bolt Properties:

Polar Moment of Inertia =  $I_p := [(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 4 + (d_4)^2 \cdot 4 + (d_5)^2 \cdot 8] = 1.327 \times 10^4 \cdot \text{in}^2$

Gross Area of Bolt =  $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot \text{in}^2$

Net Area of Bolt =  $A_n := \frac{\pi}{4} \cdot \left( D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 = 3.248 \cdot \text{in}^2$

Net Diameter =  $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot \text{in}$

Radius of Gyration of Bolt =  $r := \frac{D_n}{4} = 0.508 \cdot \text{in}$

Section Modulus of Bolt =  $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot \text{in}^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force =  $T_{\text{Max}} := OM \cdot \frac{d_5}{I_p} - \frac{\text{Axial}}{N} = 128 \cdot \text{kips}$

Allowable Tensile Force (Gross Area) =  $T_{\text{ALL}} := (A_n \cdot F_y) = 194.9 \cdot \text{kips}$

Bolt Tension % of Capacity =  $\frac{T_{\text{Max}}}{T_{\text{ALL}}} \cdot 100 = 65.7$

Condition1 =  $\text{Condition1} := \text{if} \left( \frac{T_{\text{Max}}}{T_{\text{ALL}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$

Condition1 = "OK"

Note Shear stress is negligible

**Base Plate Analysis:**

Force from Bolts =  $C_1 := \frac{OM \cdot d_5}{I_p} + \frac{Axial}{N} = 131.9 \text{ kips}$

Applied Bending Stress in Plate =  $f_{bp} := \frac{6 \cdot (4C_1 \cdot m a_1)}{B_{eff} t_{bp}^2} = 31.97 \text{ ksi}$

Allowable Bending Stress in Plate =  $F_{bp} := F_{ybp} = 42 \text{ ksi}$

Plate Bending Stress % of Capacity =  $\frac{f_{bp}}{F_{bp}} \cdot 100 = 76.1$

Condition3 =  $Condition2 := \text{if} \left( \frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed" \right)$

Condition2 = "Ok"

**Anchor Bolt and Base Plate Analysis:****Input Data:**Tower Reactions:

Overturning Moment =	OM := 3542-ft-kips	(Input From RISA-3D)
Shear Force =	Shear := 35.6-kips	(Input From Risa-3D)
Axial Force =	Axial := 50.9-kips	(Input From Risa-3D)

Anchor Bolt Data:

UseAST MA615 Grade 60		
Number of Anchor Bolts =	N := 26	(User Input)
Bolt "Column" Distance =	l := 3.0-in	(User Input)
Bolt Ultimate Strength =	$F_u := 90$ -ksi	(User Input)
Bolt Yield Strength =	$F_y := 60$ -ksi	(User Input)
Bolt Modulus =	E := 29000-ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25-in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

UseAST MA572 Grade 42		
Plate Yield Strength =	$F_{y_{bp}} := 42$ -ksi	(User Input)
Base Plate Thickness =	$t_{bp} := 3.0$ -in	(User Input)

**Geometric Layout Data:**

Distance from Bolts to Centroid of Pole:

$d_1 := 2.5\text{in}$  (User Input)

$d_2 := 8.0\text{in}$  (User Input)

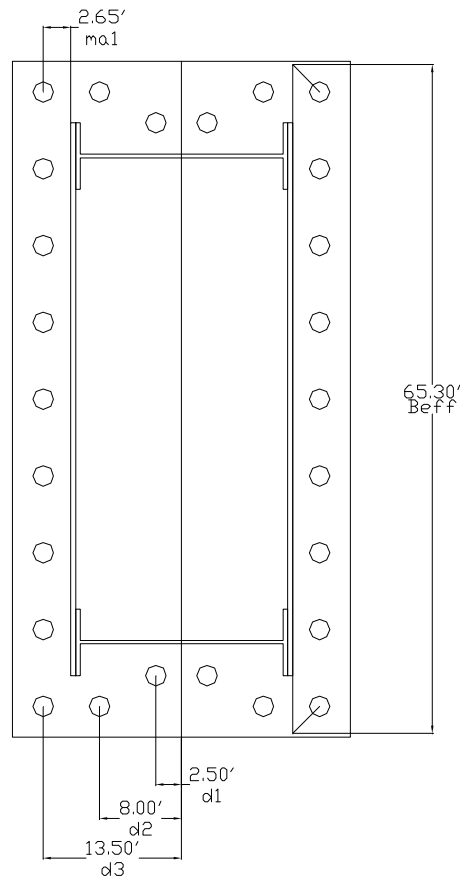
$d_3 := 13.5\text{in}$  (User Input)

Critical Distances For Bending in Plate:

$ma_1 := 2.65\text{in}$  (User Input)

Effective Width of Baseplate for Bending =

$B_{\text{eff}} := 65.3\text{in}$  (User Input)



**ANCHOR BOLT AND PLATE GEOMETRY**

**Anchor Bolt Analysis:**

Calculated Anchor Bolt Properties:

Polar Moment of Inertia =  $I_p := [(d_1)^2 \cdot 4 + (d_2)^2 \cdot 4 + (d_3)^2 \cdot 18] = 3.562 \times 10^3 \cdot \text{in}^2$

Gross Area of Bolt =  $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot \text{in}^2$

Net Area of Bolt =  $A_n := \frac{\pi}{4} \cdot \left( D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 = 3.248 \cdot \text{in}^2$

Net Diameter =  $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot \text{in}$

Radius of Gyration of Bolt =  $r := \frac{D_n}{4} = 0.508 \cdot \text{in}$

Section Modulus of Bolt =  $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot \text{in}^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force =  $T_{\text{Max}} := OM \cdot \frac{d_3}{I_p} - \frac{\text{Axial}}{N} = 159.2 \cdot \text{kips}$

Allowable Tensile Force (Gross Area) =  $T_{\text{ALL}} := (A_n \cdot F_y) = 194.9 \cdot \text{kips}$

Bolt Tension % of Capacity =  $\frac{T_{\text{Max}}}{T_{\text{ALL}}} \cdot 100 = 81.7$

Condition1 =  $\text{Condition1} := \text{if} \left( \frac{T_{\text{Max}}}{T_{\text{ALL}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$

Condition1 = "OK"

Note Shear stress is negligible



**Base Plate Analysis:**

Force from Bolts =  $C_1 := \frac{OM \cdot d_3}{I_p} + \frac{Axial}{N} = 163.071 \cdot \text{kips}$

Applied Bending Stress in Plate =  $f_{bp} := \frac{6 \cdot (9C_1 \cdot m a_1)}{B_{eff} t_{bp}^2} = 39.71 \cdot \text{ksi}$

Allowable Bending Stress in Plate =  $F_{bp} := F_{Y_{bp}} = 42 \cdot \text{ksi}$

Plate Bending Stress % of Capacity =  $\frac{f_{bp}}{F_{bp}} \cdot 100 = 94.5$

Condition3 =  $\text{Condition3} := \text{if} \left( \frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"} \right)$

Condition3 = "Ok"

**Foundation:**

**Input Data:**

Tower Data

Overturning Moment = OM := 4788-ft-kips · 1.1 = 5267-ft-kips (User Input)  
 Shear Force = Shear := 40.3-kip · 1.1 = 44.33-kips (User Input)  
 Axial Force = Axial := 50.9-kip · 1.1 = 55.99-kips (User Input)  
 Tower Height =  $H_t := 150$ -ft (User Input)

Footing Data:

Overall Depth of Footing =  $D_f := 16$ -ft (User Input)  
 Length of Pier =  $L_p := 14$ -ft (User Input)  
 Extension of Pier Above Grade =  $L_{pag} := 0.5$ -ft (User Input)  
 Width of Pier =  $W_{p1} := 7.5$ -ft (User Input)  
 Width of Pier =  $W_{p2} := 4$ -ft (User Input)  
 Thickness of Footing =  $T_f := 2.5$ -ft (User Input)  
 Width of Footing =  $W_{f1} := 22$ -ft (User Input)  
 Width of Footing =  $W_{f2} := 18$ -ft (User Input)

Material Properties:

Concrete Compressive Strength =  $f_c := 3500$ -psi (User Input)  
 Steel Reinforcement Yield Strength =  $f_y := 60000$ -psi (User Input)  
 Internal Friction Angle of Soil =  $\Phi_s := 30$ -deg (User Input)  
 Allowable Soil Bearing Capacity =  $q_a := 6000$ -psf (User Input)  
 Ultimate Soil Bearing Capacity =  $q_s := 2 \cdot q_a = 12000$ -psf (User Input)  
 Unit Weight of Soil =  $\gamma_{soil} := 120$ -pcf (User Input)  
 Unit Weight of Concrete =  $\gamma_{conc} := 150$ -pcf (User Input)  
 Foundation Bouyancy = Bouyancy := 0 (User Input) (Yes=1 / No=0)  
 Depth to Neglect =  $n := 0$ -ft (User Input)  
 Cohesion of Clay Type Soil =  $c := 0$ -ksf (User Input) (Use 0 for Sandy Soil)  
 Seismic Zone Factor =  $Z := 2$  (User Input) (UBC-1997 Fig 23-2)  
 Coefficient of Friction Between Concrete =  $\mu := 0.45$  (User Input)  
 Coefficient of Lateral Soil Pressure =  $K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

**Stability of Footing:**

Adjusted Concrete Unit Weight =

$$\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{\text{conc}} - 62.4\text{pcf}, \gamma_{\text{conc}}) = 150\text{-pcf}$$

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{\text{soil}} - 62.4\text{pcf}, \gamma_{\text{soil}}) = 120\text{-pcf}$$

Passive Pressure =

$$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0\text{-ksf}$$

$$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 4.86\text{-ksf}$$

$$P_{top} := \text{if}[n < (D_f - T_f), P_{pt}, P_{pn}] = 4.86\text{-ksf}$$

$$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 5.76\text{-ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 5.31\text{-ksf}$$

$$T_p := \text{if}[n < (D_f - T_f), T_f, (D_f - n)] = 2.5$$

$$A_p := W_{f2} \cdot T_p = 45$$

Ultimate Shear =

$$S_u := P_{ave} \cdot A_p = 238.95\text{-kip}$$

Weight of Concrete Pad =

$$WT_c := (W_{f1} \cdot W_{f2} \cdot T_f + W_{p1} \cdot W_{p2} \cdot L_p) \cdot \gamma_c = 211.5\text{-kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := [(W_{f1} \cdot W_{f2} - W_{p1} \cdot W_{p2}) \cdot (L_p - L_{pag} - n)] \cdot \gamma_s = 592.92\text{-kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left[ \frac{(L_p - L_{pag})^2 \cdot \tan(\Phi_s)}{2} \cdot W_{f2} \right] \cdot \gamma_s = 113.64\text{-kip}$$

Weight of Soil Wedge at back face Corners =

$$WT_{s3} := 2 \cdot \left[ \frac{(L_p - L_{pag})^3 \cdot \tan(\Phi_s)}{3} \right] \cdot \gamma_s = 113.64\text{-kips}$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 860.41\text{-kip}$$

Resisting Moment =

$$M_r := (WT_{tot}) \cdot \frac{W_{f1}}{2} + S_u \cdot \frac{T_f}{3} + \left[ (WT_{s2} + WT_{s3}) \cdot \left( W_{f1} + \frac{D_f \cdot \tan(\Phi_s)}{3} \right) \right] = 15364\text{-kip-ft}$$

Overtuning Moment =

$$M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 5998\text{-kip-ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 2.56$$

Factor of Safety Required =

$$FS_{req} := 1$$

$$\text{OverTurning\_Moment\_Check} := \text{if}(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"})$$

OverTurning\_Moment\_Check = "Okay"

**Bearing Pressure Caused by Footing:**

Area of the Mat =

$$A_{mat} := W_{f1} \cdot W_{f2} = 396$$

Section Modulus of Mat =

$$S := \frac{W_{f1}^2 \cdot W_{f2}}{6} = 1452 \cdot \text{ft}^3$$

Maximum Pressure in Mat =

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 6.304 \cdot \text{ksf}$$

$$\text{Max\_Pressure\_Check} := \text{if}(P_{max} < q_s, \text{"Okay"}, \text{"No Good"})$$

Max\_Pressure\_Check = "Okay"

Minimum Pressure in Mat =

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -1.958 \cdot \text{ksf}$$

$$\text{Min\_Pressure\_Check} := \text{if}[(P_{min} \geq 0) \cdot (P_{min} < q_s), \text{"Okay"}, \text{"No Good"}]$$

Min\_Pressure\_Check = "No Good"

Eccentricity =

$$e := \frac{M_{ot}}{WT_{tot}} = 6.971$$

Adjusted Soil Pressure =

$$P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_{f2} \cdot \left(\frac{W_{f1}}{2} - e\right)} = 7.91 \cdot \text{ksf}$$

$$q_{adj} := \text{if}(P_{min} < 0, P_a, P_{max}) = 7.91 \cdot \text{ksf}$$

$$\text{Pressure\_Check} := \text{if}(q_{adj} < q_s, \text{"Okay"}, \text{"No Good"})$$

Pressure\_Check = "Okay"

**Foundation:**

**Input Data:**

Tower Data

Overturning Moment =	OM := 3542-ft-kips · 1.1 = 3896-ft-kips	(User Input)
Shear Force =	Shear := 35.6-kip · 1.1 = 39.16-kips	(User Input)
Axial Force =	Axial := 50.9-kip · 1.1 = 55.99-kips	(User Input)
Tower Height =	H <sub>t</sub> := 150-ft	(User Input)

Footing Data:

Overall Depth of Footing =	D <sub>f</sub> := 16-ft	(User Input)
Length of Pier =	L <sub>p</sub> := 14-ft	(User Input)
Extension of Pier Above Grade =	L <sub>pag</sub> := 0.5-ft	(User Input)
Width of Pier =	W <sub>p1</sub> := 7.5-ft	(User Input)
Width of Pier =	W <sub>p2</sub> := 4-ft	(User Input)
Thickness of Footing =	T <sub>f</sub> := 2.5-ft	(User Input)
Width of Footing =	W <sub>f1</sub> := 18-ft	(User Input)
Width of Footing =	W <sub>f2</sub> := 22-ft	(User Input)

Material Properties:

Concrete Compressive Strength =	f <sub>c</sub> := 3500-psi	(User Input)
Steel Reinforcement Yield Strength =	f <sub>y</sub> := 60000-psi	(User Input)
Internal Friction Angle of Soil =	Φ <sub>s</sub> := 30-deg	(User Input)
Allowable Soil Bearing Capacity =	q <sub>a</sub> := 6000-psf	(User Input)
Ultimate Soil Bearing Capacity =	q <sub>s</sub> := 2 · q <sub>a</sub> = 12000-psf	(User Input)
Unit Weight of Soil =	γ <sub>soil</sub> := 120-pcf	(User Input)
Unit Weight of Concrete =	γ <sub>conc</sub> := 150-pcf	(User Input)
Foundation Bouyancy =	Bouyancy := 0	(User Input) (Yes=1 / No=0)
Depth to Neglect =	n := 0-ft	(User Input)
Cohesion of Clay Type Soil =	c := 0-ksf	(User Input) (Use 0 for Sandy Soil)
Seismic Zone Factor =	Z := 2	(User Input) (UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	μ := 0.45	(User Input)
Coefficient of Lateral Soil Pressure =	K <sub>p</sub> := $\frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$	

**Stability of Footing:**

Adjusted Concrete Unit Weight =

$$\gamma_c := \text{if}(\text{Bouyancy} = 1, \gamma_{\text{conc}} - 62.4\text{pcf}, \gamma_{\text{conc}}) = 150\text{-pcf}$$

Adjusted Soil Unit Weight =

$$\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{\text{soil}} - 62.4\text{pcf}, \gamma_{\text{soil}}) = 120\text{-pcf}$$

Passive Pressure =

$$P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0\text{-ksf}$$

$$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 4.86\text{-ksf}$$

$$P_{top} := \text{if}[n < (D_f - T_f), P_{pt}, P_{pn}] = 4.86\text{-ksf}$$

$$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 5.76\text{-ksf}$$

$$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 5.31\text{-ksf}$$

$$T_p := \text{if}[n < (D_f - T_f), T_f, (D_f - n)] = 2.5$$

$$A_p := W_{f2} \cdot T_p = 55$$

Ultimate Shear =

$$S_u := P_{ave} \cdot A_p = 292.05\text{-kip}$$

Weight of Concrete Pad =

$$WT_c := (W_{f1} \cdot W_{f2} \cdot T_f + W_{p1} \cdot W_{p2} \cdot L_p) \cdot \gamma_c = 211.5\text{-kip}$$

Weight of Soil Above Footing =

$$WT_{s1} := [(W_{f1} \cdot W_{f2} - W_{p1} \cdot W_{p2}) \cdot (L_p - L_{pag} - n)] \cdot \gamma_s = 592.92\text{-kip}$$

Weight of Soil Wedge at Back Face =

$$WT_{s2} := \left[ \frac{(L_p - L_{pag})^2 \cdot \tan(\Phi_s)}{2} \cdot W_{f2} \right] \cdot \gamma_s = 138.893\text{-kip}$$

Weight of Soil Wedge at back face Corners =

$$WT_{s3} := 2 \cdot \left[ \frac{(L_p - L_{pag})^3 \cdot \tan(\Phi_s)}{3} \right] \cdot \gamma_s = 113.64\text{-kips}$$

Total Weight =

$$WT_{tot} := WT_c + WT_{s1} + \text{Axial} = 860.41\text{-kip}$$

Resisting Moment =

$$M_r := (WT_{tot}) \cdot \frac{W_{f1}}{2} + S_u \cdot \frac{T_f}{3} + [(WT_{s2} + WT_{s3}) \cdot (W_{f1} + \frac{D_f \cdot \tan(\Phi_s)}{3})] = 13310\text{-kip-ft}$$

Overtuning Moment =

$$M_{ot} := OM + \text{Shear} \cdot (L_p + T_f) = 4542\text{-kip-ft}$$

Factor of Safety Actual =

$$FS := \frac{M_r}{M_{ot}} = 2.93$$

Factor of Safety Required =

$$FS_{req} := 1$$

$$\text{OverTurning\_Moment\_Check} := \text{if}(FS \geq FS_{req}, \text{"Okay"}, \text{"No Good"})$$

OverTurning\_Moment\_Check = "Okay"

**Bearing Pressure Caused by Footing:**

Area of the Mat =

$$A_{mat} := W_{f1} \cdot W_{f2} = 396$$

Section Modulus of Mat =

$$S := \frac{W_{f1}^2 \cdot W_{f2}}{6} = 1188 \cdot \text{ft}^3$$

Maximum Pressure in Mat =

$$P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 5.996 \cdot \text{ksf}$$

$$\text{Max\_Pressure\_Check} := \text{if}(P_{max} < q_s, \text{"Okay"}, \text{"No Good"})$$

Max\_Pressure\_Check = "Okay"

Minimum Pressure in Mat =

$$P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -1.651 \cdot \text{ksf}$$

$$\text{Min\_Pressure\_Check} := \text{if}[(P_{min} \geq 0) \cdot (P_{min} < q_s), \text{"Okay"}, \text{"No Good"}]$$

Min\_Pressure\_Check = "No Good"

Eccentricity =

$$e := \frac{M_{ot}}{WT_{tot}} = 5.279$$

Adjusted Soil Pressure =

$$P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_{f2} \cdot \left(\frac{W_{f1}}{2} - e\right)} = 7.008 \cdot \text{ksf}$$

$$q_{adj} := \text{if}(P_{min} < 0, P_a, P_{max}) = 7.008 \cdot \text{ksf}$$

$$\text{Pressure\_Check} := \text{if}(q_{adj} < q_s, \text{"Okay"}, \text{"No Good"})$$

Pressure\_Check = "Okay"

<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
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CT11080B\_L600\_2.1\_draft

## Section 1 - Site Information

<b>Site ID:</b> CT11080B	<b>Site Name:</b> CL&P at MP	<b>Latitude:</b> 41.2315990000
<b>Status:</b> Draft	<b>Site Class:</b> Utility Lattice Tower	<b>Longitude:</b> -73.1900050000
<b>Version:</b> 2.1	<b>Site Type:</b> Structure Non Building	<b>Address:</b> Rocky Hill Road (Pole 845)
<b>Project Type:</b> L600	<b>Solution Type:</b>	<b>City, State:</b> Trumbull, CT
<b>Approved:</b> Not Approved	<b>Plan Year:</b>	<b>Region:</b> NORTHEAST
<b>Approved By:</b> Not Approved	<b>Market:</b> CONNECTICUT	
<b>Last Modified:</b> 5/1/2018 12:23:45 PM	<b>Vendor:</b> Ericsson	
<b>Last Modified By:</b> GSM1900MSEDDIK	<b>Landlord:</b> CL&P	

<b>RAN Template:</b> 67D94B Outdoor		<b>AL Template:</b> 67D94B_1DP+1QP+1OP		
<b>Sector Count:</b> 3	<b>Antenna Count:</b> 6	<b>Coax Line Count:</b> 24	<b>TMA Count:</b> 0	<b>RRU Count:</b> 3

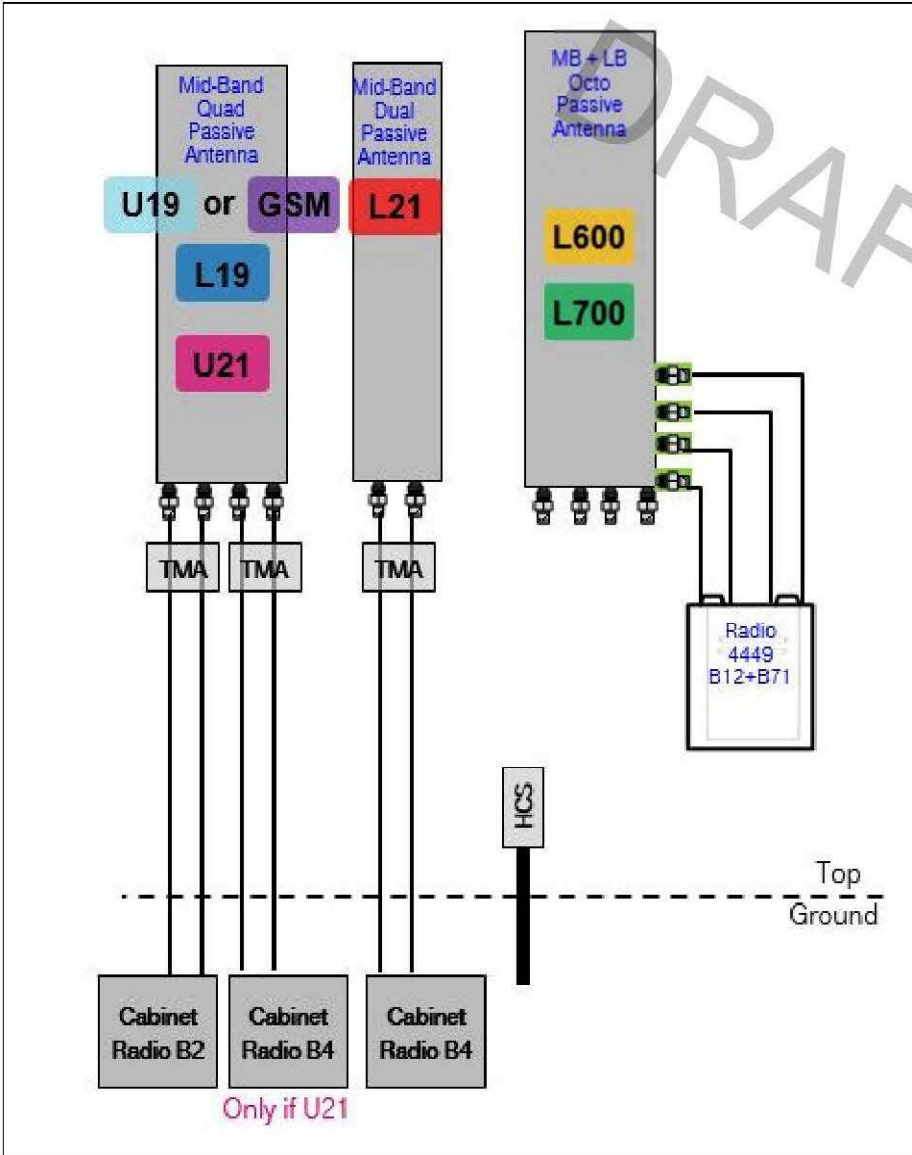
## Section 2 - Existing Template Images

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Section 3 - Proposed Template Images

67D94B\_1DP+1QP+1OP.JPG



Notes:

Section 4 - Siteplan Images

---- This section is intentionally blank. ----

DRAFT

<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
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Section 5 - RAN Equipment

Existing RAN Equipment

Template: 4B

Enclosure	1	2
<b>Enclosure Type</b>	RBS 6102	RBS 3106
<b>Baseband</b>	DUW30 DUL20 DUG20	
<b>Radio</b>	RUS01 B2 (x6) RUS01 B4 (x6)	

Proposed RAN Equipment

Template: 67D94B Outdoor

Enclosure	1	2
<b>Enclosure Type</b>	RBS 6102	Ancillary Equipment
<b>Baseband</b>	BB 5216 L2100 U2100 G1900 L1900 L700 I 600 DUW30 DUG20	
<b>Hybrid Cable System</b>		Ericsson 6x12 HCS *Select Length & AWG*
<b>Multiplexer</b>	XMU	
<b>Radio</b>	RUS01 B2 (x3) L1900 RUS01 B2 (x3) U1900 L1900 RUS01 B4 (x6) L2100	

RAN Scope of Work:

<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
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**Section 6 - A&L Equipment**

Existing Template: 4B  
Proposed Template: 67D94B\_1DP+1QP+1OP

**Sector 1 (Existing) view from behind**

<b>Coverage Type</b>	A - Outdoor Macro	
<b>Antenna</b>	1	2
<b>Antenna Model</b>	RFS - APXV18-206516S-C-A20 (Dual)	RFS - APXV18-206516S-C-A20 (Dual)
<b>Azimuth</b>	30	30
<b>M. Tilt</b>	0	0
<b>Height</b>	164	156
<b>Ports</b>	P1	P2
<b>Active Tech.</b>	G1900	U2100 L2100
<b>Dark Tech.</b>		
<b>Restricted Tech.</b>		
<b>Decomm. Tech.</b>	U1900	
<b>E. Tilt</b>	3	3
<b>Cables</b>	1-1/4" Coax - 193 ft. (x2)	1-1/4" Coax - 193 ft. (x2)
<b>TMA's</b>		
<b>Diplexers / Combiners</b>		
<b>Radio</b>		
<b>Sector Equipment</b>		

Unconnected Equipment:

Scope of Work:

<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
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Sector 1 (Proposed) view from behind						
<b>Coverage Type</b>	A - Outdoor Macro					
<b>Antenna</b>	1			2		
<b>Antenna Model</b>	RFS - APX16DWV-16DWV-S-E-A20 (Quad)			RFS - APXVAARR24_43-U-NA20 (Octo)		
<b>Azimuth</b>	30			30		
<b>M. Tilt</b>						
<b>Height</b>	164			154		
<b>Ports</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>P5</b>	<b>P6</b>
<b>Active Tech.</b>	U2100 L1900 G1900	L2100			L700 L600	L700 L600
<b>Dark Tech.</b>						
<b>Restricted Tech.</b>						
<b>Decomm. Tech.</b>						
<b>E. Tilt</b>						
<b>Cables</b>	1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)	1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)			JUMPER 6' DIN MALE-DIN MALE (x2) 1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)	JUMPER 6' DIN MALE-DIN MALE (x2) 1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)
<b>TMA's</b>	RFS Twin Style 3CX - ATMA4P4DBP-1A20 (AtCabinet)	Ericsson Twin Style 1BX - KRY 112 144/2 (AtCabinet)				
<b>Diplexers / Combiners</b>	Ericsson Double AWS/PCS - KRF 102 267/2 (AtCabinet) (x2)					
<b>Radio</b>					Radio 4449 B71+B12 (At Cabinet)	
<b>Sector Equipment</b>						
<b>Unconnected Equipment:</b>						
<b>Scope of Work:</b>						
swap and add total of 24 coax						

<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
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Sector 2 (Existing) view from behind		
<b>Coverage Type</b>	A - Outdoor Macro	
<b>Antenna</b>	1	2
<b>Antenna Model</b>	RFS - APXV18-206516S-C-A20 (Dual)	RFS - APXV18-206516S-C-A20 (Dual)
<b>Azimuth</b>	120	120
<b>M. Tilt</b>	0	0
<b>Height</b>	164	156
<b>Ports</b>	P1	P2
<b>Active Tech.</b>	G1900	U2100 L2100
<b>Dark Tech.</b>		
<b>Restricted Tech.</b>		
<b>Decomm. Tech.</b>	U1900	
<b>E. Tilt</b>	7	7
<b>Cables</b>	1-1/4" Coax - 193 ft. (x2)	1-1/4" Coax - 193 ft. (x2)
<b>TMA's</b>		
<b>Diplexers / Combiners</b>		
<b>Radio</b>		
<b>Sector Equipment</b>		
<b>Unconnected Equipment:</b>		
<b>Scope of Work:</b>		

<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
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Sector 2 (Proposed) view from behind						
<b>Coverage Type</b>	A - Outdoor Macro					
<b>Antenna</b>	1			2		
<b>Antenna Model</b>	RFS - APX16DWV-16DWV-S-E-A20 (Quad)			RFS - APXVAARR24_43-U-NA20 (Octo)		
<b>Azimuth</b>	120			120		
<b>M. Tilt</b>						
<b>Height</b>	164			154		
<b>Ports</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>P5</b>	<b>P6</b>
<b>Active Tech.</b>	U2100 L1900 G1900	L2100			L700 L600	L700 L600
<b>Dark Tech.</b>						
<b>Restricted Tech.</b>						
<b>Decomm. Tech.</b>						
<b>E. Tilt</b>						
<b>Cables</b>	1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)	1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)			JUMPER 6' DIN MALE-DIN MALE (x2) 1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)	JUMPER 6' DIN MALE-DIN MALE (x2) 1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)
<b>TMA's</b>	RFS Twin Style 3CX - ATMA4P4DBP-1A20 (AtCabinet)	Ericsson Twin Style 1BX - KRY 112 144/2 (AtCabinet)				
<b>Diplexers / Combiners</b>	Ericsson Double AWS/PCS - KRF 102 267/2 (AtCabinet) (x2)					
<b>Radio</b>					Radio 4449 B71+B12 (At Cabinet)	
<b>Sector Equipment</b>						
<b>Unconnected Equipment:</b>						
<b>Scope of Work:</b>						
swap and add total of 24 coax						

<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
--	--	---

Sector 3 (Existing) view from behind		
<b>Coverage Type</b>	A - Outdoor Macro	
<b>Antenna</b>	1	2
<b>Antenna Model</b>	RFS - APXV18-206516S-C-A20 (Dual)	RFS - APXV18-206516S-C-A20 (Dual)
<b>Azimuth</b>	300	300
<b>M. Tilt</b>	0	0
<b>Height</b>	164	156
<b>Ports</b>	P1	P2
<b>Active Tech.</b>	G1900	U2100 L2100
<b>Dark Tech.</b>		
<b>Restricted Tech.</b>		
<b>Decomm. Tech.</b>	U1900	
<b>E. Tilt</b>	0	0
<b>Cables</b>	1-1/4" Coax - 193 ft. (x2)	1-1/4" Coax - 193 ft. (x2)
<b>TMA's</b>		
<b>Diplexers / Combiners</b>		
<b>Radio</b>		
<b>Sector Equipment</b>		
<b>Unconnected Equipment:</b>		
<b>Scope of Work:</b>		



<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
--	--	---

Sector 3 (Proposed) view from behind						
<b>Coverage Type</b>	A - Outdoor Macro					
<b>Antenna</b>	1			2		
<b>Antenna Model</b>	RFS - APX16DWV-16DWV-S-E-A20 (Quad)			RFS - APXVAARR24_43-U-NA20 (Octo)		
<b>Azimuth</b>	300			300		
<b>M. Tilt</b>						
<b>Height</b>	164			154		
<b>Ports</b>	<b>P1</b>	<b>P2</b>	<b>P3</b>	<b>P4</b>	<b>P5</b>	<b>P6</b>
<b>Active Tech.</b>	U2100 L1900 G1900	L2100			L700 L600	L700 L600
<b>Dark Tech.</b>						
<b>Restricted Tech.</b>						
<b>Decomm. Tech.</b>						
<b>E. Tilt</b>						
<b>Cables</b>	1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)	1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)			JUMPER 6' DIN MALE-DIN MALE (x2) 1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)	JUMPER 6' DIN MALE-DIN MALE (x2) 1 1/4In AVA COAX CABLE 50 OHM - 193 ft. (x2)
<b>TMA's</b>	RFS Twin Style 3CX - ATMA4P4DBP-1A20 (AtCabinet)	Ericsson Twin Style 1BX - KRY 112 144/2 (AtCabinet)				
<b>Diplexers / Combiners</b>	Ericsson Double AWS/PCS - KRF 102 267/2 (AtCabinet) (x2)					
<b>Radio</b>					Radio 4449 B71+B12 (At Cabinet)	
<b>Sector Equipment</b>						
<b>Unconnected Equipment:</b>						
<b>Scope of Work:</b>						
swap and add total of 24 coax						

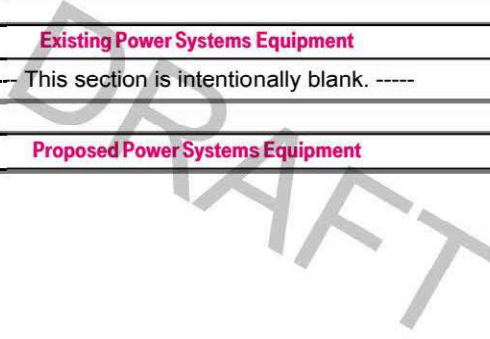
<b>RAN Template:</b> 67D94B Outdoor	<b>A&amp;L Template:</b> 67D94B_1DP+1QP+1OP	<b>Power System Template:</b> Custom
--	--	---

**Section 7 - Power Systems Equipment**

**Existing Power Systems Equipment**

---- This section is intentionally blank. ----

**Proposed Power Systems Equipment**





**Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 15/15/18/18dBi, 2.4m (8ft), VET, RET, 0-12°/0-12°/2-12°/2-12°**

**FEATURES / BENEFITS**

This antenna provides a 8 Port multi-band flexible platform for advanced use for flexible use in deployment scenarios for encompassing 600MHz, 700MHz, AWS & PCS applications.



- 24 Inch Width For Easier Zoning
- Field Replaceable (Integrated) AISG RET platform for reduced environmental exposure and long lasting quality
- Superior elevation pattern performance across the entire electrical down tilt range
- Includes three AISG RET motors - Includes 0.5m AISG jumper for optional diasy chain of two high band RET motors for one single AISG point of high band tilt control.
- Low band arrays driven by a single RET motor

**Technical Features**

**LOW BAND LEFT ARRAY (617-746 MHZ) [R1]**

Frequency Band	MHz	617-698	698-746
Gain	dBi	15.1	15.5
Horizontal Beamwidth @3dB	Deg	65	62
Vertical Beamwidth @3dB	Deg	11.4	10.4
Electrical Downtilt Range	Deg	0-12	0-12
Upper Side Lobe Suppression 0 to +20	dB	19	20
Front-to-Back, at +/-30°, Copolar	dB	25	24
Cross Polar Discrimination (XPD) @ Boresight	dB	19	19
Cross Polar Discrimination (XPD) @ +/-60	dB	5	3
3rd Order PIM 2 x 43dBm	dBc		-153
VSWR	-	1.5:1	1.5:1
Cross Polar Isolation	dB	25	25
Maximum Effective Power per Port	Watt	250	250

**LOW BAND RIGHT ARRAY (617-746 MHZ) [R2]**

Frequency Band	MHz	617-698	698-746
Gain	dBi	14.8	15.1
Horizontal Beamwidth @3dB	Deg	65	62
Vertical Beamwidth @3dB	Deg	11.4	10.3
Electrical Downtilt Range	Deg	0-12	0-12
Upper Side Lobe Suppression 0 to +20	dB	19	20
Front-to-Back, at +/-30°, Copolar	dB	25	23
Cross Polar Discrimination (XPD) @ Boresight	dB	19	19
Cross Polar Discrimination (XPD) @ +/-60	dB	5	3
3rd Order PIM 2 x 43dBm	dBc		-153
VSWR	-	1.5:1	1.5:1
Cross Polar Isolation	dB	25	25
Maximum Effective Power per Port	Watt	250	250



**Dual Slant Polarized Quad Band (8 Port) Antenna, 617-746/617-746/1695-2200/1695-2200MHz, 65deg, 15/15/18/18dBi, 2.4m (8ft), VET, RET, 0-12°/0-12°/2-12°/2-12°**

**ELECTRICAL SPECIFICATIONS**

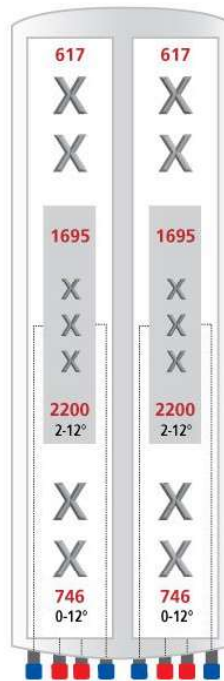
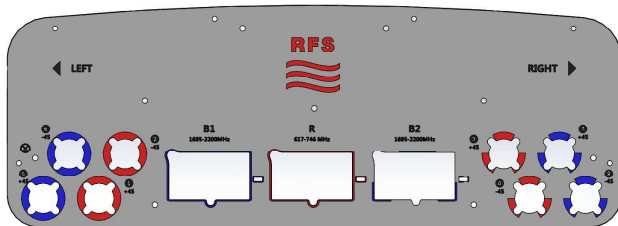
<b>Impedance</b>	Ohm	50.0
<b>Polarization</b>	Deg	±45°

**MECHANICAL SPECIFICATIONS**

<b>Dimensions - H x W x D</b>	mm (in)	2436 x 609 x 222 (95.9 x 24 x 8.7)
<b>Weight (Antenna Only)</b>	kg (lb)	58 (128)
<b>Weight (Mounting Hardware only)</b>	kg (lb)	11.5 (25.3)
<b>Shipping Weight</b>	kg (lb)	80 (176)
<b>Connector type</b>		8 x 4.3-10 female at bottom + 6 AISG connectors (3 male, 3 female)
<b>Adjustment mechanism</b>		Integrated RET solution AISG compliant (Field Replaceable) + Manual Override + External Tilt Indicator
<b>Mounting Hardware Material</b>		Galvanized steel
<b>Radome Material / Color</b>		Fiber Glass / Light Grey RAL7035

**TESTING AND ENVIRONMENTAL**

<b>Temperature Range</b>	°C (°F)	-40 to 60 (-40 to 140)
<b>Lightning protection</b>		IEC 61000-4-5
<b>Survival/Rated Wind Velocity</b>	km/h	241 (150)
<b>Environmental</b>		ETSI 300-019-2-4 Class 4.1E



**ORDERING INFORMATION**

Order No.	Configuration	Mounting Hardware	Mounting pipe Diameter	Shipping Weight
APXVAARR24_43-U-NA20	Field Replace RET included (3)	APM40-5E Beam tilt kit (included)	60-120mm	80 Kg



Optimizer® Side-by-Side Dual Polarized Antenna, 1710-2200, 65deg, 18.4dBi, 1.4m, VET, 0-10deg RET

**Product Description**

A combination of two X-Polarized antennas in a single radome, this pair of variable tilt antennas provides exceptional suppression of all upper sidelobes at all downtilt angles. It also features a wide downtilt range. This antenna is optimized for performance across the entire frequency band (1710-2200 MHz). The antenna comes pre-connected with two antenna control units (ACU).

**Features/Benefits**

- Variable electrical downtilt - provides enhanced precision in controlling intercell interference. The tilt is infield adjustable 0-10 deg.
- High Suppression of all Upper Sidelobes (Typically <-20dB).
- Gain tracking – difference between AWS UL (1710-1755 MHz) and DL (2110-2155 MHz) <1dB.
- Two X-Polarised panels in a single radome.
- Azimuth horizontal beamwidth difference <4deg between AWS UL (1710-1755 MHz) and DL (2110-2155 MHz).
- Low profile for low visual impact.
- Dual polarization; Broadband design.
- Includes (2) AISG 2.0 Compatible ACU-A20-N antenna control units.



**Technical Specifications**

**Electrical Specifications**

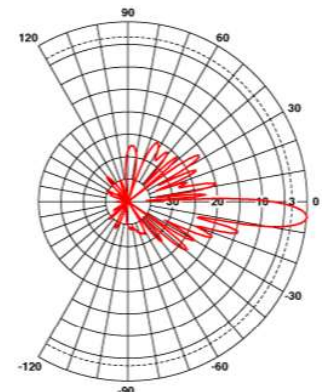
Frequency Range, MHz	1710-2200
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	5.9 to 7.7
Electrical Downtilt, deg	0-10
Gain, dBi (dBd)	18.4 (16.3)
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)
Front-To-Back Ratio, dB	>26 (typically 28)
Polarization	Dual pol +/-45°
VSWR	< 1.5:1
Isolation between Ports, dB	> 30
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (155 Typical)
Impedance, Ohms	50
Maximum Power Input, W	300
Lightning Protection	Direct Ground
Connector Type	(4) 7-16 Long Neck Female

**Mechanical Specifications**

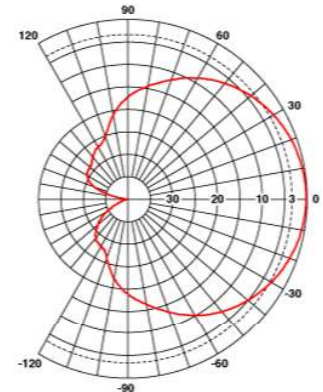
Dimensions - HxWxD, mm (in)	1420 x 331 x 80 (55.9 x 13 x 3.15)
Weight w/o Mtg Hardware, kg (lb)	18.5 (40.7)
Survival Wind Speed, km/h (mph)	200 (125)
Rated Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m <sup>2</sup> (ft <sup>2</sup> )	0.47 (5.03)
Front Thrust @ Rated Wind, N (lbf)	756 (170)
Maximum Thrust @ Rated Wind, N (lbf)	756 (170)
Wind Load - Side @ Rated Wind, N (lbf)	231 (52)
Wind Load - Rear @ Rated Wind, N (lbf)	408 (92)
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Mounting Hardware Material	Diecasted Aluminum
Shipping Weight, kg (lb)	24.5 (53.9)
Packing Dimensions, HxWxD, mm (in)	1520 x 408 x 198 (59.8 x 16 x 7.8)

**Ordering Information**

Mounting Hardware APM40-2 + APM40-E2



Vertical Pattern



Horizontal Pattern

All information contained in the present datasheet is subject to confirmation at time of ordering

**DR. CLARENCE WELTI, P.E., P.C.**

GEOTECHNICAL ENGINEERING

227 Williams Street • P.O. Box 397

Glastonbury, CT 06033

July 7, 2009

(860) 633-4623 / FAX (860) 657-2514

Mr. Jason Mead, Structural Engineer  
Natcomm, Inc.  
63-2 North Branford Road  
Branford, CT 06405

**Re: CL&P Tower - Pole #845, Rocky Hill Terrace, Trumbull, CT - Geotechnical Study to Evaluate the Existing Monopole Foundation for Supporting Additional Loads**

Dear Mr. Mead:

**1.0** Herewith is the data from the test boring taken at the above referenced site. One boring was drilled thru the existing tower foundation and to the depth of 24 feet. The boring was cored 5 feet into the bedrock. The boring was located about 4 feet from the existing foundation pier. *The boring was drilled by Clarence Welti Associates, Inc. and sampling was conducted by this firm solely to obtain indications of subsurface conditions as part of a geotechnical exploration program. No services were performed to evaluate subsurface environmental conditions.*

**2.0** The **Subject Project** will include placing the additional loading on the existing CL&P transmission pole. The existing monopole and foundation will be analyzed for the increased loads. The top of the existing monopole is 150± feet above the ground surface elevation. Based on the CL&P foundation plan dated October 1, 1975, the existing foundation consist of a 18' x 22' x 2.5' thick footing supporting a 4' x 7.5' x 14' high pier. The pier extends about 6" above the existing grades, which places the bottom of foundation at 16± feet below the existing ground surface. The test boring, which was taken thru the tower foundation, confirmed the depth and thickness of the foundation.

**3.0** The **Soils Cross Section** from the boring is generally as follows:

FILL; Fine to coarse SAND, some Gravel and Cobbles, little Silt to 13.5 feet, medium compact

Concrete Foundation from 13.5 to 16 feet

Fine to coarse SAND and GRAVEL, few Cobbles, little Silt to the top of bedrock at 19 feet, dense

Bedrock; Granitic Gneiss

**3.1** The **Ground Water Table** was not evident above the bedrock at the completion of the boring. For design it should be assumed that the high water table could be at 16 feet below grade.

**4.0** In general the criteria for tower support is that the foundation capacity would exceed the loads, which might collapse the tower. **Movements from strains in the soils should be limited to differential settlement (or lateral movements of less than ½").**

**5.0** Based on the test boring the existing foundation is atop 3 feet of sand and gravel overlying the bedrock. Resistance to uplift and shear forces would be provided by the weight of the foundation and soil backfill. The allowable bearing pressure used to evaluate the existing foundation can be 3 Tons/sf.

**5.1** The foundation design parameters used to evaluate the existing mat foundation can be as follows:

<b>Design Parameter</b>	<b>Value</b>
Allowable Bearing Pressure at Existing Foundation Subgrade	3 Tons/sf
Soil Unit Weight of Backfill (0 to 13.5 ft below grade)	125 pcf
Soil Unit Weight (16 to 19 ft below grade)	135 pcf
Internal Friction Angle (0 to 13.5ft below grade)	32°
Internal Friction Angle (16 to 19 feet)	36°
Ultimate Sliding Factor, concrete on soil	0.50
Frost Protection Depth	3.5 feet
Water Table (Design)	16 feet below grade

**6.0** The soils at the subject site are generally in OSHA class C which would require excavations that exceed 5 feet high, to have the slopes cut back to 34° from the horizontal.

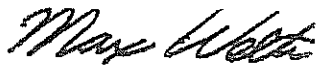
**7.0** This report has been prepared for specific a application to the subject project in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made. In the event that any changes in the nature, design and location of structures are planned, the conclusions and recommendations contained in this report should not be considered valid unless the changes are reviewed and conclusions of this report modified or verified in writing.

The analyses and recommendations submitted in this report are based in part upon data obtained from referenced explorations. The extent of variations between explorations may not become evident until construction. If variations then appear evident, it will be necessary to re-evaluate the recommendations of this report.

Dr. Clarence Welti, P.E., P.C., should perform a general review of the final design and specifications in order that geotechnical design recommendations may be properly interpreted and implemented as they were intended.

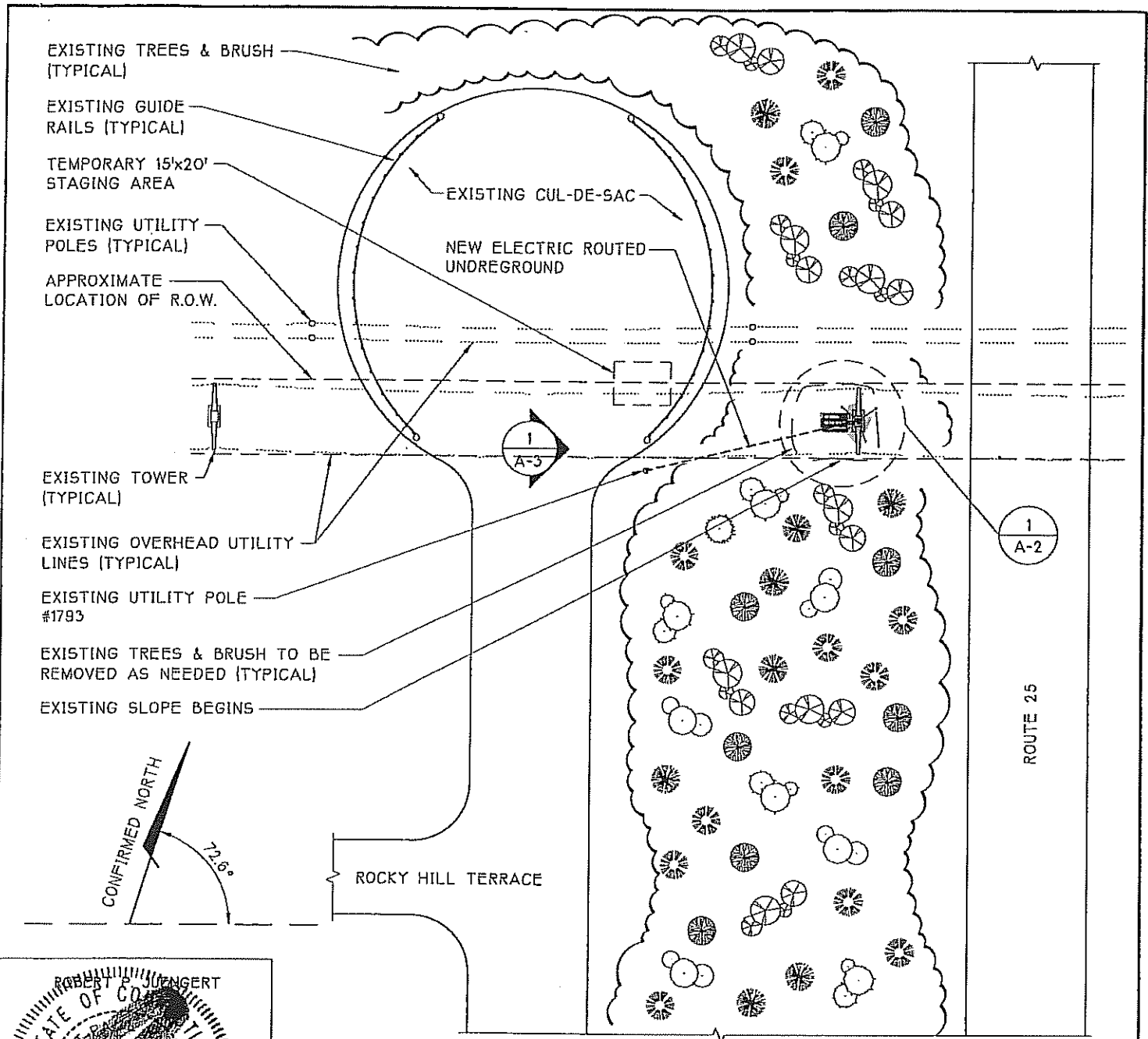
If you have any questions please call me.

Very truly yours,

A handwritten signature in cursive script that reads "Max Welti".

Max Welti, P. E.

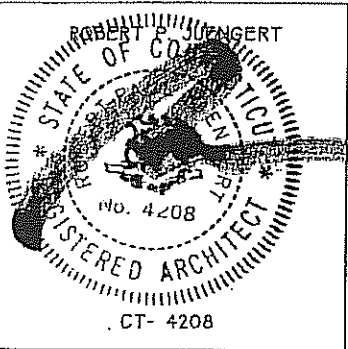




1 SITE LAYOUT  
A-1 SCALE: 1" = 50'-0"

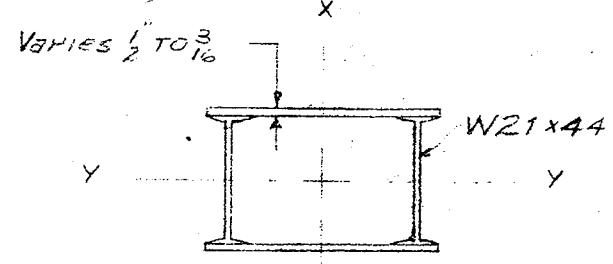
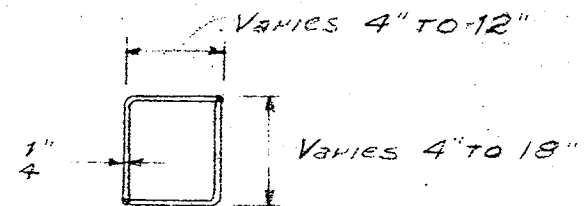
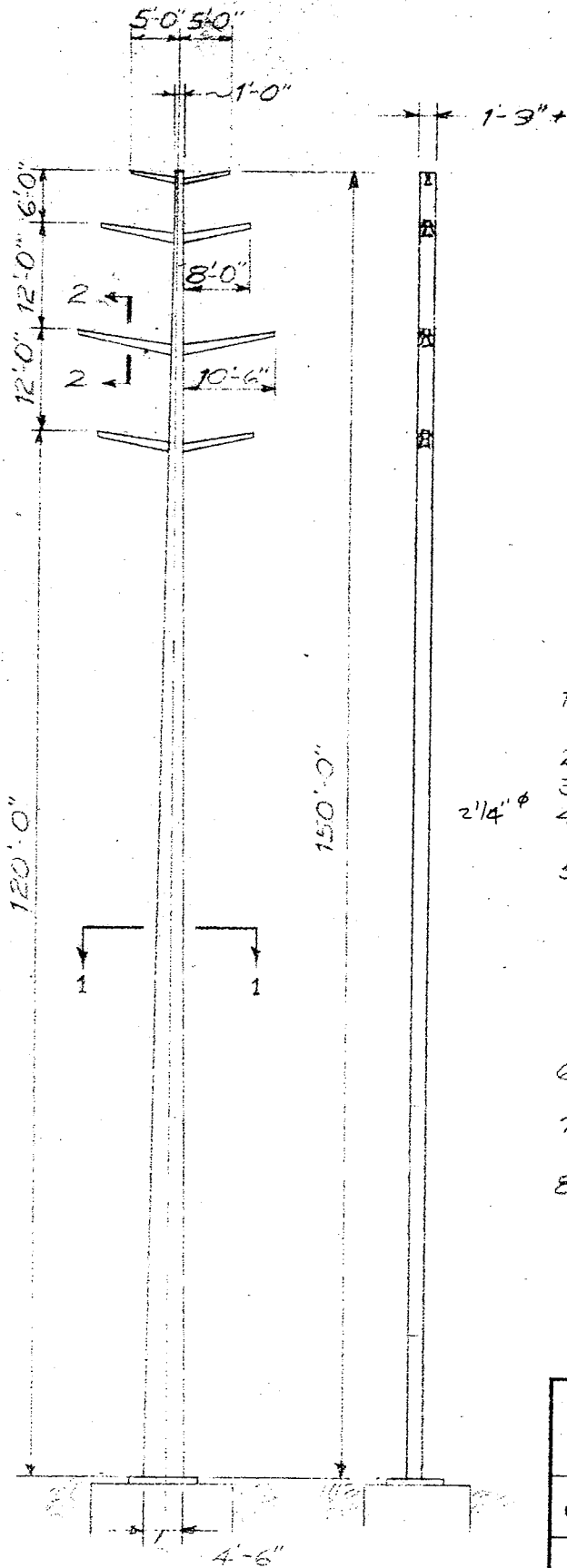
**NOTE:**  
FOR ITEMS SUPPLIED BY OTHERS  
SEE GENERAL NOTES DRAWING A-14,  
A-15 & A-16

**NOTE:**  
ALL NEW EQUIPMENT SHALL NOT  
OBSTRUCT ANY EXISTING EQUIPMENT  
OR CLIMBING APPARATUS.



<p>670 North Beers Street, Building 2, Holmdel, NJ 07733 Tel: 732.739.3200 Fax: 732.739.0440</p>	Drawing Title <b>SITE LAYOUT</b>		Project: <b>CL&amp;P TOWER - POLE #845</b> Address: <b>ROCKY HILL TERRACE TRUMBULL, C.T.</b>		REV.1 DCa 7/1/98
	Client:		Approved By: PROJ. MGR: _____ DATE: _____ R.F. ENGR: _____ DATE: _____ SAC: _____ DATE: _____ OWNER: _____ DATE: _____		Revision No. Date: Drawing No. <b>A-1</b>
Search Area: CL&P-TRUMBULL/MPX49 Site ID No: CT-11-080B	P.C.: GMC	Ck'd. by:	ARCHNET Project No. A96,506.728B	Drawn: DCa Date: 5/21/98	

<b>CLARENCE WELTI ASSOC., INC.</b> P.O. BOX 397 GLASTONBURY, CONN 06033				CLIENT  NATCOMM, INC.		PROJECT NAME CL&P TOWER #845	
						LOCATION ROCKY HILL TERRACE, TRUMBULL, CT	
	AUGER	CASING	SAMPLER	CORE BAR.	OFFSET	SURFACE ELEV.	HOLE NO. <b>B-1</b>
TYPE	HSA		SS	NQ	LINE & STA.	GROUND WATER OBSERVATIONS	
SIZE I.D.	3.75"		1.375"	2.0"	N. COORDINATE	AT none FT. AFTER 0 HOURS	START DATE 7/1/09
HAMMER WT.			140lbs		E. COORDINATE	AT FT. AFTER HOURS	FINISH DATE 7/1/09
HAMMER FALL			30"				
DEPTH	SAMPLE			A	STRATUM DESCRIPTION + REMARKS	ELEV.	
	NO.	BLOWS/6"	DEPTH				
0	1	2-6-7-10	0.00'-2.00'	[Dotted Pattern]	BR.FINE-CRS.SAND, SOME GRAVEL & COBBLES, LITTLE SILT - FILL		
	2	6-3-2-2	2.00'-4.00'				
5	3	6-9-8-8	4.00'-6.00'				
	4	5-7-7-7	6.00'-8.00'				
	5	6-7-7-18	8.00'-10.00'				
10	6	30-20-7-6	10.00'-12.00'				
	7	7-7-60	12.00'-13.50'				
					CONCRETE FOUNDATION	13.5	
15					CORED - BR.FINE-CRS.SAND AND GRAVEL, FEW COBBLES, LITTLE SILT	16.0	
20					CORED BEDROCK - GRANITIC GNEISS	19.0	
					RUN#1 19.0'- 24.0' RECOVERED 36" RQD=25%		
25					BOTTOM OF BORING @ 24'	24.0	
30							
35							
<b>LEGEND: COL. A:</b> SAMPLE TYPE: D=DRY A=AUGER C=CORE U=UNDISTURBED PISTON S=SPLIT SPOON PROPORTIONS USED: TRACE=0-10% LITTLE=10-20% SOME=20-35% AND=35-50%						DRILLER: LINDENBERGER INSPECTOR:	
						SHEET 1 OF 1	HOLE NO. <b>B-1</b>



- NOTES:
1. ALL STEEL ASTM A572 GR. 60 EXCEPT AS NOTED.
  2. CROSS-ARM STEEL IS ASTM A36.
  3. BASE PLATE ASTM A572 GR. 42.
  4. ALL ANCHOR BOLTS 185 ASTM A615 GR. 60.
  5. WEIGHTS:
    - a) POLE - 13.2 TONS
    - b) CROSS-ARMS - 1.78<sup>T</sup>
    - c) BASE PLATE - 0.93<sup>T</sup>
    - d) ANCHOR BOLTS - 1.38<sup>T</sup>
    - e) MISCELLANEOUS - 0.25<sup>T</sup>
 TOTAL ASSEMBLY WEIGHT - 16.7 TONS
  6. CONTROLLING LOAD CONDITION IS N.E.S.C. HEAVY WITH TOP CONDUCTOR BROKEN.
  7. MAX. GROUND LINE MOMENTS:
    - $M_{x-x} = 2166.2 \text{ ft-k}$   $M_{y-y} = 1656.0 \text{ ft-k}$
  8. POLES ARE ALSO CAPABLE OF RESISTING THE ADDED MOMENTS DUE TO DISPLACED VERTICAL LOADS, WITHOUT EXCEEDING THE YIELD POINT OF THE MATERIAL.

QUOTATION OUTLINE DRAWING

THE FINNEY STEEL POLE CO., INC. 1500 SHAWSHEEN ST. P.O. BOX 306 TEWKSBURY, MASS. 01876	
CUSTOMER <u>NORTHEAST UTILITIES</u>	P.O. _____
<u>150' TANGENT POLE - 115 KV.</u> (2 REQ'D)	
JOB NO. <u>1300.8</u>	DWG NO. <u>B-150-1</u>

	Issue	Rev. 1	Rev. 2	Rev. 3	Rev. 4
DWN	4-14-71				
CKD					
APPD					
SHOP					



## RADIO FREQUENCY EMISSIONS ANALYSIS REPORT EVALUATION OF HUMAN EXPOSURE POTENTIAL TO NON-IONIZING EMISSIONS

T-Mobile Existing Facility

Site ID: CT11080B

CL&P at MP (Pole 845)  
Rocky Hill Road  
Trumbull, CT 06611

**March 11, 2019**

**EBI Project Number: 6219000720**

Site Compliance Summary	
Compliance Status:	<b>COMPLIANT</b>
Site total MPE% of FCC general population allowable limit:	<b>3.46 %</b>



March 11, 2019

T-Mobile USA  
Attn: Jason Overbey, RF Manager  
35 Griffin Road South  
Bloomfield, CT 06002

## Emissions Analysis for Site: **CT11080B** –

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **Rocky Hill Road, Trumbull, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The number of  $\mu\text{W}/\text{cm}^2$  calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general population may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general population would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ( $\mu\text{W}/\text{cm}^2$ ). The general population exposure limits for the 600 MHz and 700 MHz frequency bands are approximately  $400 \mu\text{W}/\text{cm}^2$  and  $467 \mu\text{W}/\text{cm}^2$  respectively. The general population exposure limit for the 1900 MHz (PCS) and 2100 MHz (AWS) frequency bands is  $1000 \mu\text{W}/\text{cm}^2$ . Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.



Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

## CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **Rocky Hill Road, Trumbull, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, was focused at the base of the tower. For this report the sample point is the top of a 6-foot person standing at the base of the tower.

For all calculations, all equipment was calculated using the following assumptions:

- 1) 1 GSM channels (PCS Band - 1900 MHz) was considered for each sector of the proposed installation. These Channels have a transmit power of 15 Watts per Channel.
- 2) 1 UMTS channel (AWS Band – 2100 MHz) was considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.
- 3) 2 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.
- 4) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.
- 5) 2 LTE channels (600 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 40 Watts per Channel.
- 6) 2 LTE channels (700 MHz Band) were considered for each sector of the proposed installation. These Channels have a transmit power of 20 Watts per Channel.



- 7) Cable losses were factored in the calculations for this site. Since all of the proposed radios are ground mounted the following cable loss values were used. For each ground mounted 600 MHz radio there was 1.24 dB of cable loss calculated into the system gains / losses for this site. For each ground mounted 700 MHz radio there was 1.35 dB of cable loss calculated into the system gains / losses for this site. For each ground mounted 1900 MHz (PCS) radio there was 2.35 dB of cable loss calculated into the system gains / losses for this site. For each ground mounted 2100 MHz (AWS) radio there was 2.49 dB of cable loss calculated into the system gains / losses for this site. These values were calculated based upon the manufacturers specifications for 193 feet of 1-1/4" coax
- 8) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.
- 9) For the following calculations the sample point was the top of a 6-foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 10) The antennas used in this modeling are the **RFS APX16DWV-16DWVS-E-A20** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **RFS APXVAARR24\_43-U-NA20** for 600 MHz and 700 MHz channels. This is based on feedback from the carrier with regard to anticipated antenna selection. All Antenna gain values and associated transmit power levels are shown in the Site Inventory and Power Data table below. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB for directional panel antennas, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 11) The antenna mounting height centerline of the proposed antennas is **160 feet** above ground level (AGL).
- 12) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.
- 13) All calculations were done with respect to uncontrolled / general population threshold limits.



**T-Mobile Site Inventory and Power Data**

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	RFS APX16DWW-16DWVS-E-A20	Make / Model:	RFS APX16DWW-16DWVS-E-A20	Make / Model:	RFS APX16DWW-16DWVS-E-A20
Gain:	16.3 dBd	Gain:	16.3 dBd	Gain:	16.3 dBd
Height (AGL):	160 feet	Height (AGL):	160 feet	Height (AGL):	160 feet
Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)	Frequency Bands	1900 MHz (PCS) / 2100 MHz (AWS)
Channel Count	7	Channel Count	7	Channel Count	7
Total TX Power(W):	295	Total TX Power(W):	295	Total TX Power(W):	295
ERP (W):	7,167.70	ERP (W):	7,167.70	ERP (W):	7,167.70
Antenna A1 MPE%	1.09	Antenna B1 MPE%	1.09	Antenna C1 MPE%	1.09
Antenna #:	2	Antenna #:	2	Antenna #:	2
Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20	Make / Model:	RFS APXVAARR24_43-U-NA20
Gain:	12.95 / 13.35 dBd	Gain:	12.95 / 13.35 dBd	Gain:	12.95 / 13.35 dBd
Height (AGL):	160 feet	Height (AGL):	160 feet	Height (AGL):	160 feet
Frequency Bands	600 MHz / 700 MHz	Frequency Bands	600 MHz / 700 MHz	Frequency Bands	600 MHz / 700 MHz
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power(W):	120	Total TX Power(W):	120	Total TX Power(W):	120
ERP (W):	1,819.97	ERP (W):	1,819.97	ERP (W):	1,819.97
Antenna A2 MPE%	0.65	Antenna B2 MPE%	0.65	Antenna C2 MPE%	0.65

Site Composite MPE%	
Carrier	MPE%
T-Mobile (Per Sector Max)	1.74 %
Verizon Wireless	1.72 %
<b>Site Total MPE %:</b>	<b>3.46 %</b>

T-Mobile Sector A Total:	1.74 %
T-Mobile Sector B Total:	1.74 %
T-Mobile Sector C Total:	1.74 %
<b>Site Total:</b> 3.46 %	

**T-Mobile Maximum MPE Power Values (Per Sector)**

T-Mobile Frequency Band / Technology (Per Sector)	# Channel	Watts ERP (Per Channel)	Height (feet)	Total Power Density (µW/cm²)	Frequency (MHz)	Allowable MPE (µW/cm²)	Calculated % MPE
T-Mobile PCS - 1900 MHz GSM	1	372.47	160	0.56	PCS - 1900 MHz	1000.00	0.06%
T-Mobile PCS - 1900 MHz LTE	2	993.25	160	3.01	PCS - 1900 MHz	1000.00	0.30%
T-Mobile AWS - 2100 MHz UMTS	2	961.75	160	2.92	AWS - 2100 MHz	1000.00	0.29%
T-Mobile AWS - 2100 MHz LTE	2	1,442.62	160	4.37	AWS - 2100 MHz	1000.00	0.44%
T-Mobile 600 MHz LTE	2	593.01	160	1.80	600 MHz	400.00	0.44%
T-Mobile 700 MHz LTE	2	316.98	160	0.96	700 MHz	467.00	0.21%
<b>Total:</b>						<b>1.74</b>	





## Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general population exposure to RF Emissions.

The anticipated maximum composite contributions from the T-Mobile facility as well as the site composite emissions value with regards to compliance with FCC's allowable limits for general population exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector A:	1.74 %
Sector B:	1.74 %
Sector C:	1.74 %
T-Mobile Maximum MPE % (Per Sector):	1.74 %
Site Total:	3.46 %
Site Compliance Status:	<b>COMPLIANT</b>

The anticipated composite MPE value for this site assuming all carriers present is **3.46%** of the allowable FCC established general population limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.

June 21, 2019

Mr. Mark Richard  
T-Mobile  
35 Griffin Rd. South  
Bloomfield, CT 06002

RE: T-Mobile Antenna Site CT-11080B, Rocky Hill Road, Trumbull CT, Eversource Structure 845

Dear Mr. Richard:

Based on our reviews of the site drawings, the structural analysis and foundation review provided by Centek Engineering, along with a third party review performed by Paul J. Ford and Company, we accept the proposed modification.

Please work with Christopher Gelinias of Eversource Real Estate to process the site lease amendment. Please do not hesitate to contact us with questions or concerns. Christopher can be contacted at 860-665-2008, and I can be contacted at 860-728-4503.

Sincerely,



Joel Szarkowicz  
Transmission Line Engineering

Ref: 18058.43 - CT11080B Structural Analysis Rev2 19.03.04.pdf  
18058.43 - CT11080B CD Rev1 19.06.20 (SS).pdf