STATE OF CONNECTICUT

CONNECTICUT SITING COUNCIL

Ten Franklin Square, New Britain, CT 06051

Phone: (860) 827-2935 Fax: (860) 827-2950

E-Mail: siting.council@ct.gov

www.ct.gov/csc

VIA ELECTRONIC MAIL

July 19, 2018

Thomas White
TRM
16 Chestnut St.
Suite 420
Foxboro, MA 02035

RE: **EM-T-MOBILE-169-180712** - T-Mobile Northeast LLC notice of intent to install a temporary telecommunications facility located at 281 Route 169, Woodstock, Connecticut.

Dear Mr. White:

The Connecticut Siting Council (Council) is in receipt of your email correspondence of July 16, 2018, July 17, 2018, and July 18, 2018 submitted in response to the Council's July 16, 2018 notification of an incomplete request for exempt modification with regard to the above-referenced matter.

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

Thank you for your attention and cooperation.

Sincerely,

Melanie A. Bachman
Executive Director

MAB/FOC/jmb

From: Thomas White
To: Cunliffe, Fred
Subject: Woodstock Fair T-Mobile Exempt Mod
Date: Monday, July 16, 2018 2:36:03 PM
Attachments: WoodstockFairDelivery Verification.pdf
CTCOW1A_A and E_COLT_LE_071618_Rev1.pdf
Fred:
Please see new LE showing 35 kw generator and delivery verification. I will send to the Zoning/planning dept. today. I am having the structural show the MW dish. Thank you.
Thomas White
TRM
16 Chestnut St.
Suite 420
Foxboro, MA 02035
203-417-4446 cell
774-215-5423 fax
twhite@trmcom.com

From: Thomas White
To: Cunliffe, Fred
Subject: RE: Woodstock Fair T-Mobile Exempt Mod
Date: Tuesday, July 17, 2018 12:29:36 PM
Attachments: 18097.00 - CTCOW01A - Structural Analysis Rev.1 18.07.17.pdf
Fred:
Here is the revised structural that has the MW dish, thank you
Thomas White
TRM
16 Chestnut St.
Suite 420
Foxboro, MA 02035
203-417-4446 cell
774-215-5423 fax
twhite@trmcom.com

From: Thomas White
To: Cunliffe, Fred
Subject: FW: Woodstock Fair T-Mobile
Date: Tuesday, July 17, 2018 1:39:28 PM
Attachments: image001.png
Fred:
Please see below for verification for receipt of CSC package, thank you
Thomas White
TRM
16 Chestnut St.
Suite 420
Foxboro, MA 02035
203-417-4446 cell
774-215-5423 fax
twhite@trmcom.com

From: Thomas White
To: Cunliffe, Fred
Subject: Woodstock Fair Exempt Modification T-Mobile
Date: Wednesday, July 18, 2018 9:35:50 AM

Fred:

There is no RF report required for the microwave dish because it is receive only. I hope that completes the submission, if you need anything else please let me know.

Thomas White
TRM
16 Chestnut St.
Suite 420
Foxboro, MA 02035
203-417-4446 cell
774-215-5423 fax
twhite@trmcom.com

FOXBORO
15 WALL ST
FOXBORO
MA
02035-9998
2427710435
07/10/2018 (800)275-8777 12:11 PM

Product Description	Sale Qty	Final Price
PM 2-Day	1	$7.90
(Domestic)		
(NEW BRITAIN, CT 06051)		
(Weight:2 Lb 3.80 Oz)		
(Expected Delivery Date)		
(Thursday 07/12/2018)		
(USPS Tracking #)		
(9505 5105 5248 8191 2225 58)		
Insurance	1	$0.00
(Up to $50.00 included)		
PM 2-Day	1	$6.70
Flat Rate Env		
(Domestic)		
(SOUTH WOODSTOCK, CT 06267)		
(Flat Rate)		
(Expected Delivery Date)		
(Thursday 07/12/2018)		
(USPS Tracking #)		
(9505 5105 5248 8191 2225 65)		
Insurance	1	$0.00
(Up to $50.00 included)		
PM 2-Day	1	$6.70
Flat Rate Env		
(Domestic)		
(WOODSTOCK, CT 06281)		
(Flat Rate)		
(Expected Delivery Date)		
(Thursday 07/12/2018)		
(USPS Tracking #)		
(9505 5105 5248 8191 2225 72)		
Insurance	1	$0.00
(Up to $50.00 included)		

Total $21.30

Debit Card Remit'd $21.30
(Card Name:VISA)
(Account #:XXXXXXXXXXXX3767)
(Approval #:)
(Transaction #:786)
(Receipt #:015790)
(Debit Card Purchase:$21.30)
(Cash Back:$0.00)
(Entry Mode:Chip)
(AID:A0000000980840)
(Application Label:US DEBIT)
(PIN:Verified by PIN)
(Cryptogram:9C6BAA7E5940F63A)
(ARC:00)
(CVR:420000)
(IAD:06010A03600000)
(TSI:6800)
(TVR:8080048000)

Includes up to $50 insurance

Text your tracking number to 28777 (2USPS) to get the latest status. Standard Message and Data rates may apply. You may also visit www.usps.com USPS Tracking or call 1-800-222-1811.

Scanned by CamScanner

Thomas White

From: auto-reply@usps.com
Sent: Monday, July 16, 2018 2:24 PM
To: Thomas White
Subject: USPS® Item Delivered, PO Box 9505510552488191222565

Hello **White**,

Your item has been delivered and is available at a PO Box at 1:01 pm on July 12, 2018 in SOUTH WOODSTOCK, CT 06267.

Tracking Number:
9505510552488191222565

Delivered, PO Box

Visit USPS Tracking® to check the most up-to-date status of your package. Sign up for Informed Delivery® to digitally preview the address side of your incoming letter-sized mail and manage your packages scheduled to arrive soon! To update how frequently you receive emails from USPS, log in to your USPS.com account.

Want regular updates on your package? Set up text alerts.

Thomas White

From: auto-reply@usps.com
Sent: Monday, July 16, 2018 2:26 PM
To: Thomas White
Subject: USPS® Item Delivered, To Mail Room 9505510552488191222572

Hello **White**,

Your item has been delivered to the mail room at 10:48 am on July 12, 2018 in WOODSTOCK, CT 06281.

Tracking Number:
9505510552488191222572

Delivered, To Mail Room

Visit USPS Tracking® to check the most up-to-date status of your package. Sign up for Informed Delivery® to digitally preview the address side of your incoming letter-sized mail and manage your packages scheduled to arrive soon! To update how frequently you receive emails from USPS, log in to your USPS.com account.

Want regular updates on your package? Set up text alerts.

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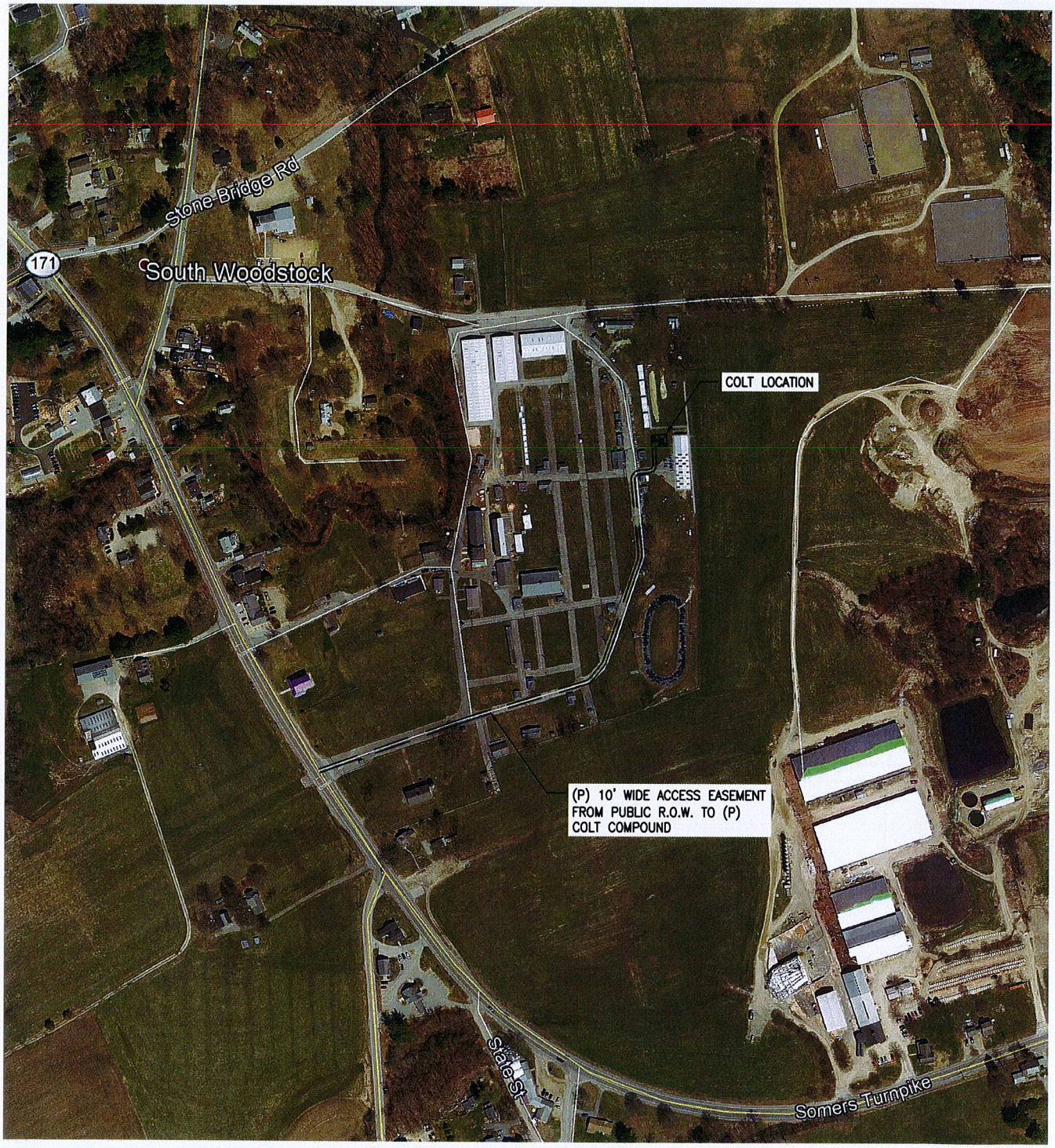


NORTH

1 / LE-1

COLT LOCATION MAP

SCALE: 1" = 400'

NOTES:

1. ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO APPROVAL BY T-MOBILE NORTHEAST, LLC STRUCTURAL & RF ENGINEERS. LOCATIONS OF POWER & TELEPHONE FACILITIES ARE SUBJECT TO APPROVAL BY UTILITY COMPANIES.

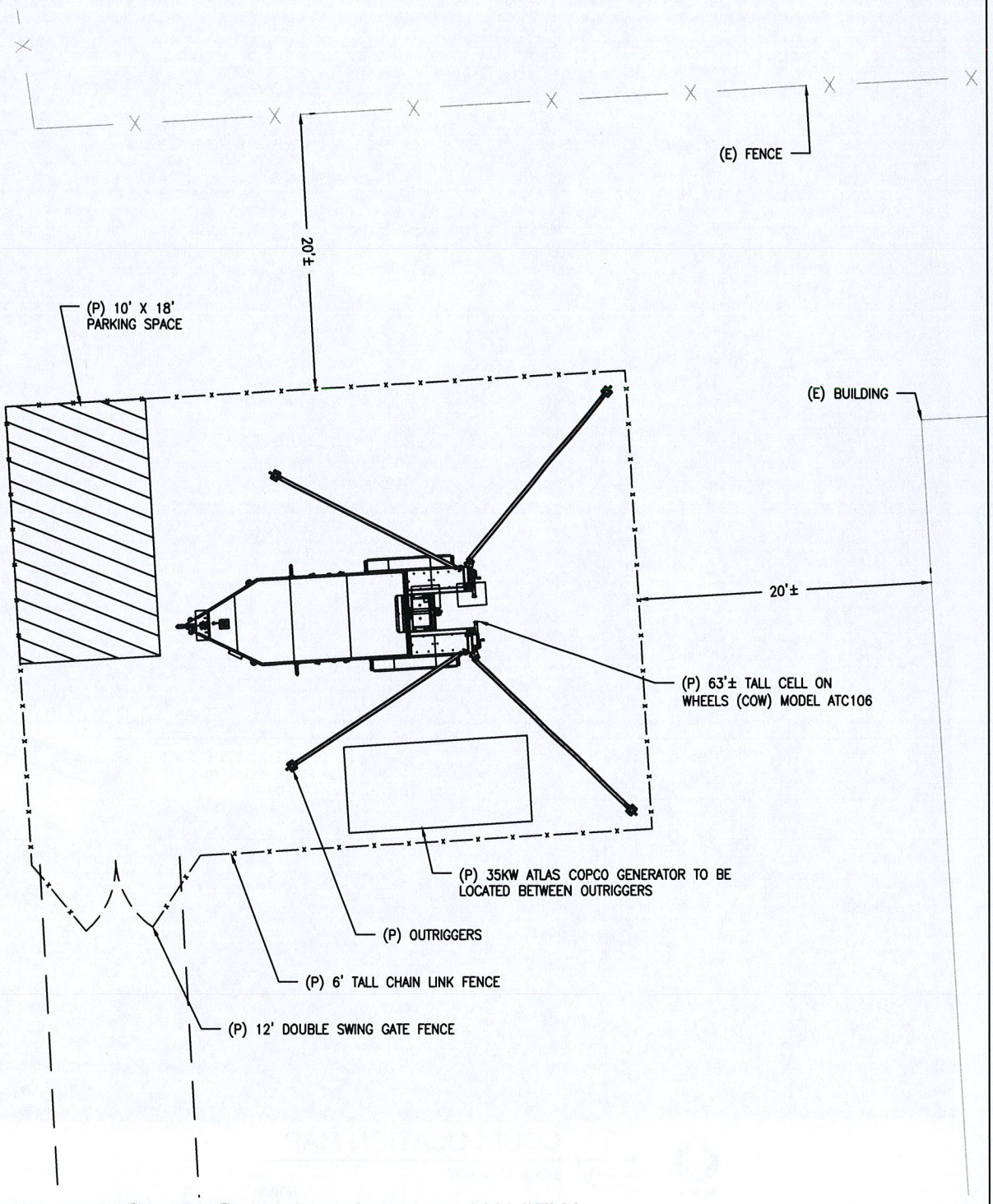
ADVANCED ENGINEERING GROUP, P.C.
Civil Engineering - Site Development - Surveying - Telecommunications
500 NORTH BROADWAY
EAST PROVIDENCE, RI 02914
TEL: (401) 354-2403
FAX: (401) 633-6354

T-MOBILE NORTHEAST LLC
15 COMMERCE WAY, SUITE B
NORTON, MA 02766
OFFICE: (508) 286-2700
FAX: (508) 286-2893

TITLE:	LEASE EXHIBIT
SITE NO:	CTCOW01A
SITE NAME:	WOODSTOCK FAIR COW
ADDRESS:	SOMERS TURNPIKE WOODSTOCK, CT 06281

DATE:	07/16/2018
DRAWN BY:	JWH
REVISION:	1
SCALE:	NOTED
SHEET:	LE-1

NOTE:
ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO APPROVAL BY T-MOBILE NORTHEAST, LLC STRUCTURAL & RF ENGINEERS.



NORTH

1 / LE-2 COMPOUND PLAN VIEW

SCALE: 3/32"= 1'-0"

ADVANCED ENGINEERING GROUP, P.C.
Civil Engineering - Site Development - Surveying - Telecommunications
500 NORTH BROADWAY
EAST PROVIDENCE, RI 02914
TEL: (401) 354-2403
FAX: (401) 633-6354

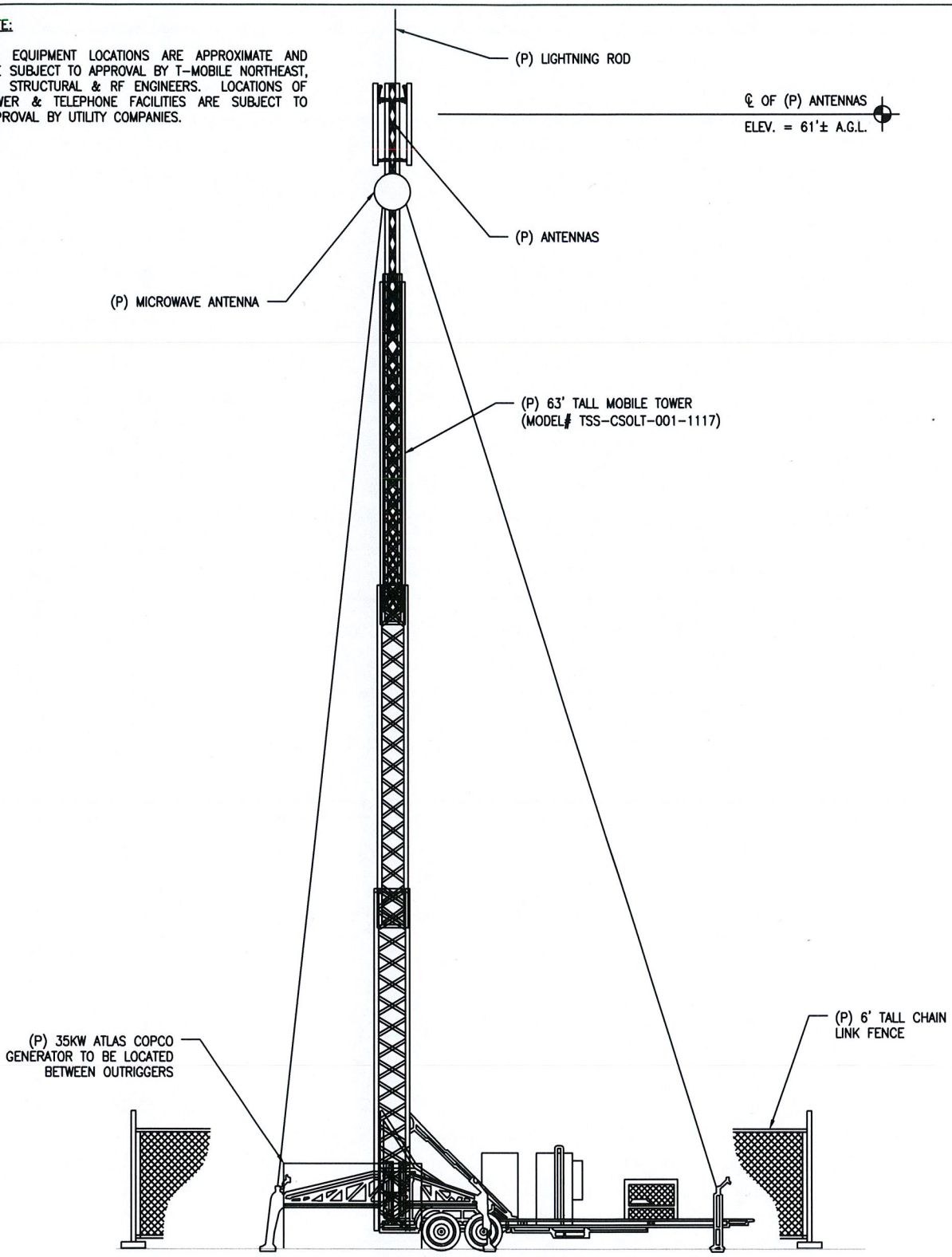
T-MOBILE NORTHEAST LLC
15 COMMERCE WAY, SUITE B
NORTON, MA 02766
OFFICE: (508) 286-2700
FAX: (508) 286-2893

TITLE: LEASE EXHIBIT
SITE NO: CTCOW01A
SITE NAME: WOODSTOCK FAIR COW
ADDRESS: SOMERS TURNPIKE
WOODSTOCK, CT 06281

DATE:	07/16/2018
DRAWN BY:	JWH
REVISION:	1
SCALE:	NOTED
SHEET:	LE-2

NOTE:

ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO APPROVAL BY T-MOBILE NORTHEAST, LLC STRUCTURAL & RF ENGINEERS. LOCATIONS OF POWER & TELEPHONE FACILITIES ARE SUBJECT TO APPROVAL BY UTILITY COMPANIES.



1 / LE-3 ELEVATION

SCALE: 1/8"=1'-0"

ADVANCED ENGINEERING GROUP, P.C.
Civil Engineering - Site Development - Surveying - Telecommunications
500 NORTH BROADWAY
EAST PROVIDENCE, RI 02914
TEL: (401) 354-2403
FAX: (401) 633-6354

T-MOBILE NORTHEAST LLC
15 COMMERCE WAY, SUITE B
NORTON, MA 02766
OFFICE: (508) 286-2700
FAX: (508) 286-2893

TITLE:	LEASE EXHIBIT
SITE NO:	CTCOW01A
SITE NAME:	WOODSTOCK FAIR COW
ADDRESS:	SOMERS TURNPIKE WOODSTOCK, CT 06281

DATE:	07/16/2018
DRAWN BY:	JWH
REVISION:	1
SCALE:	NOTED
SHEET:	LE-3

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

120-ft Portable Tower (extended at 61-ft)

Proposed Temporary
Antenna Installation

Site Ref: CTCOW01A

39 N Gate Road
Woodstock, CT

Centek Project No. 18097.00

~~Date: June 20, 2018~~
Rev 1: July 17, 2018

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

Prepared for:

T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

63-2 North Branford Road, Branford, CT 06405 203.488.0580 Fax 203.488.8587 www.CentekEng.com

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- ANALYSIS
- TOWER LOADING
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- CONCLUSION

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Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the temporary antenna/tower installation located in Woodstock, CT.

The host tower is a 120-ft tall, six section, telescoping lattice tower. Original design documents were unavailable for use in this report. The tower geometry was obtained from field verification conducted by Centek personnel on June 6, 2018.

Antenna and appurtenance information were obtained from an RF data sheet provided by T-Mobile.

The tower consists of six (6) telescoping vertical sections consisting of steel pipe legs and steel solid round diagonal and horizontal bracing. The width of the tower face is 0.8125-ft at the top and 2.5-ft at the base.

Antenna and Appurtenance Summary

- **T-MOBILE (Proposed):**
  Antennas: Three (3) RFS APX16DWV-16DWVS panel antennas and one (1) Fastback Networks IBR-1211 microwave dish leg mounted with a RAD center elevation of 60-ft above grade level.
  Coax Cables: Thirteen (13) 1/2" ∅ coax cables running on a leg/face of the tower as specified in Section 3 of this report.

Primary Assumptions Used in the Analysis

- The tower structure's theoretical capacity not including any assessment of the condition of the tower.
- The tower carries the horizontal and vertical loads due to the weight of antennas, ice load and wind.
- Tower is properly installed and maintained.
- Tower is in plumb condition.
- Tower loading for antennas and mounts as listed in this report.
- All bolts are appropriately tightened providing the necessary connection continuity.
- All welds are fabricated with ER-70S-6 electrodes.
- All members are assumed to be as specified in the original tower design documents.
- All members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
- All member protective coatings are in good condition.
- All tower members were properly designed, detailed, fabricated, installed and have been properly maintained since erection.
- Any deviation from the analyzed antenna loading will require a new analysis for verification of structural adequacy.

Analysis

The existing tower was analyzed using a comprehensive computer program entitled tnxTower. The program analyzes the tower, considering the worst case loading condition. The tower is considered as loaded by concentric forces along the tower, and the model assumes that the tower members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (3-second gust) with no ice and the applicable wind and ice combination to determine stresses in members as per guidelines of TIA-222-G-2005 entitled "Structural Standard for Antenna Support Structures and Antennas", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Load and Resistance Factor Design (LRFD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix N of the CSBC[1] and the wind speed data available in the TIA-222-G-2005 Standard.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-G-2005, gravity loads of the tower structure and its components, and the application of 0.75" radial ice on the tower structure and its components.

Basic Wind Speed:	Woodstock; v = 101 mph (3 second gust)	*[Appendix N of the 2016 CT Building Code]*
Load Cases:	Load Case 1; 101 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2016 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 0.75" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*

[1] The 2012 International Building Code as amended by the 2016 Connecticut State Building Code (CSBC).

Tower Capacity

- Calculated stresses **were found** to be within allowable limits. This tower was found to be at **91.6%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T2)	23'-0"-43'-0"	66.8%	**PASS**
Diagonal (T3)	2'-0"-23'-0"	72.5%	**PASS**
Guy C (T1)	61'	91.6%	**PASS**

- **Guy wires shall be 5/16" diameter EHS at 25' radius from the tower. Provide 8,000lbs of ballast block at each guy point.**

Conclusion

This analysis shows that the subject tower **is adequate** to support the proposed antenna configuration.

The analysis is based, in part, on the information provided to this office by T-Mobile. 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:

STATE OF CONNECTICUT
TIMOTHY J. LYNN
No. 29336
LICENSED
PROFESSIONAL ENGINEER

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 provide 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 performed, results obtained, and recommendations made are 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

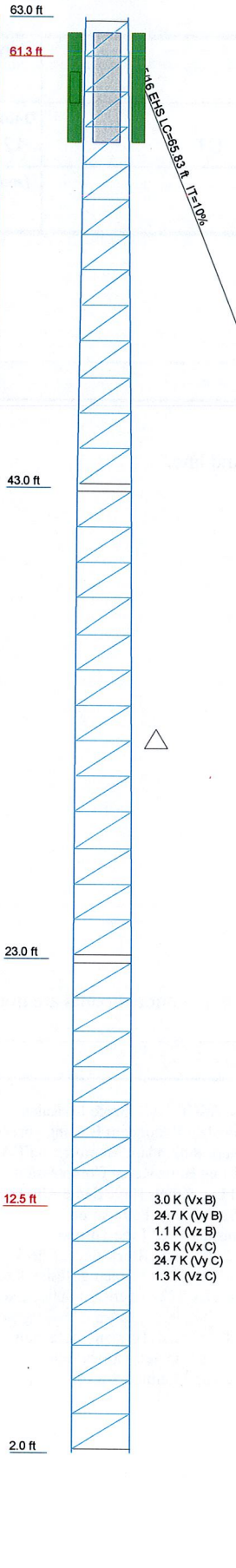
tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

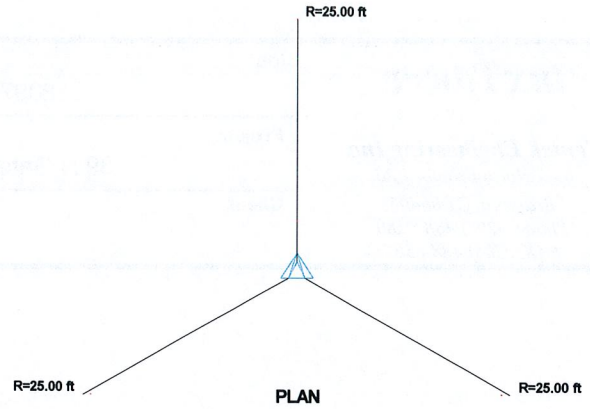
tnxTower Features:

- tnxTower can analyze and design 3- and 4-sided guyed towers, 3- and 4-sided self-supporting towers and either round or tapered ground mounted poles with or without guys.
- The program analyzes towers using the TIA-222-G (2005) standard or any of the previous TIA/EIA standards back to RS-222 (1959). Steel design is checked using the AISC ASD 9th Edition or the AISC LRFD specifications.
- Linear and non-linear (P-delta) analyses can be used in determining displacements and forces in the structure. Wind pressures and forces are automatically calculated.
- Extensive graphics plots include material take-off, shear-moment, leg compression, displacement, twist, feed line, guy anchor and stress plots.
- tnxTower contains unique features such as True Cable behavior, hog rod take-up, foundation stiffness and much more.

Section	T1	T2	T3
Legs	P1.25x.191	P1.5x.145	P2x.218
Leg Grade		A53-B-35	
Diagonals		SR 9/16	
Diagonal Grade		A36	
Top Girts		4x3/8	C8x11.5
Bottom Girts		4x3/8	C8x11.5
Horizontals		SR 9/16	
Face Width (ft)	1.78	2.25	2.5
# Panels @ (ft)	26 @ 1.51282		14 @ 1.47619
Weight (K)	1.2	0.4	0.7

2.2





DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
APX16DWV-16DWVS-E-A20 (T-Mobile - Proposed)	60	APX16DWV-16DWVS-E-A20 (T-Mobile - Proposed)	60
APX16DWV-16DWVS-E-A20 (T-Mobile - Proposed)	60	IRB-1211 Dish (T-Mobile - Proposed)	60

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A53-B-35	35 ksi	63 ksi	A36	36 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 101 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 91.6%

R=25.00 ft

Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job:	***18097.00 - CTCOW01A***		
Project:	***39 N Gate Road Woodstock, CT***		
Client: T-Mobile	Drawn by: TJL	App'd:	
Code: TIA-222-G	Date: 07/17/18	Scale: NTS	
Path: J:\Job\18097.00 W01 Structural\Backup Documentation\Rev (1)\tns\Tower\Woodstock Fairgrounds Cow.ed		Dwg No. E-1	

Tower Input Data

The main tower is a 3x guyed tower with an overall height of 63.00 ft above the ground line.
The base of the tower is set at an elevation of 2.00 ft above the ground line.
The face width of the tower is 1.78 ft at the top and 2.50 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Basic wind speed of 101 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 0.7500 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Pressures are calculated at each section.
Safety factor used in guy design is 1.
Stress ratio used in tower member design is 1.
Special horizontal and vertical support at 10.50 on leg B,C.
The support at the base was eliminated.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

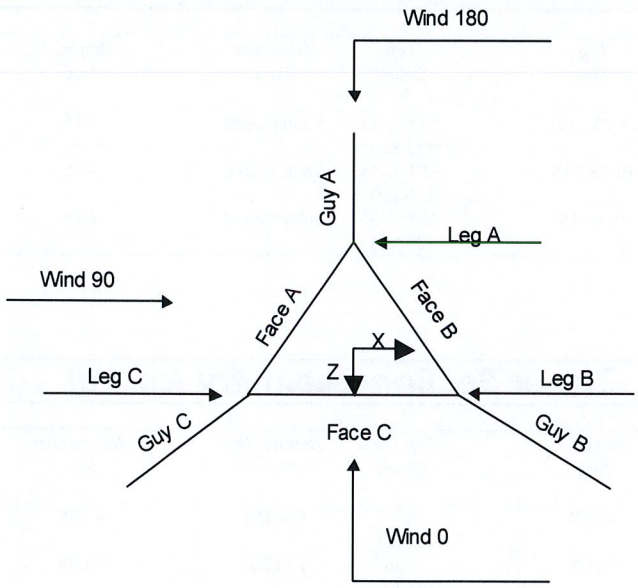
Consider Moments - Legs
Consider Moments - Horizontals
Consider Moments - Diagonals
Use Moment Magnification
√ Use Code Stress Ratios
√ Use Code Safety Factors - Guys
Escalate Ice
Always Use Max Kz
Use Special Wind Profile
√ Include Bolts In Member Capacity
Leg Bolts Are At Top Of Section
Secondary Horizontal Braces Leg
Use Diamond Inner Bracing (4 Sided)
SR Members Have Cut Ends
SR Members Are Concentric

Distribute Leg Loads As Uniform
Assume Legs Pinned
√ Assume Rigid Index Plate
√ Use Clear Spans For Wind Area
√ Use Clear Spans For KL/r
√ Retension Guys To Initial Tension
Bypass Mast Stability Checks
Use Azimuth Dish Coefficients
√ Project Wind Area of Appurt.
√ Autocalc Torque Arm Areas
Add IBC .6D+W Combination
Sort Capacity Reports By Component
Triangulate Diamond Inner Bracing
√ Treat Feed Line Bundles As Cylinder

Use ASCE 10 X-Brace Ly Rules
Calculate Redundant Bracing Forces
Ignore Redundant Members in FEA
SR Leg Bolts Resist Compression
√ All Leg Panels Have Same Allowable
Offset Girt At Foundation
√ Consider Feed Line Torque
Include Angle Block Shear Check
Use TIA-222-G Bracing Resist. Exemption
Use TIA-222-G Tension Splice Exemption

Poles

Include Shear-Torsion Interaction
Always Use Sub-Critical Flow
Use Top Mounted Sockets



Corner & Starmount Guyed Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	63.00-43.00			1.78	1	20.00
T2	43.00-23.00			2.25	1	20.00
T3	23.00-2.00			2.50	1	21.00

Tower Section Geometry *(cont'd)*

Tower Section	Tower Elevation ft	Diagonal Spacing ft	Bracing Type	Has K Brace End Panels	Has Horizontals	Top Girt Offset in	Bottom Girt Offset in
T1	63.00-43.00	1.51	Z Brace	No	Yes	2.0000	2.0000
T2	43.00-23.00	1.51	Z Brace	No	Yes	2.0000	2.0000
T3	23.00-2.00	1.48	Z Brace	No	Yes	2.0000	2.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Type	Leg Size	Leg Grade	Diagonal Type	Diagonal Size	Diagonal Grade
T1 63.00-43.00	Pipe	P1.25x.191	A53-B-35 (35 ksi)	Solid Round	9/16	A36 (36 ksi)
T2 43.00-23.00	Pipe	P1.5x.145	A53-B-35 (35 ksi)	Solid Round	9/16	A36 (36 ksi)
T3 23.00-2.00	Pipe	P2x.218	A53-B-35 (35 ksi)	Solid Round	9/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Top Girt Type	Top Girt Size	Top Girt Grade	Bottom Girt Type	Bottom Girt Size	Bottom Girt Grade
T1 63.00-43.00	Flat Bar	4x3/8	A36 (36 ksi)	Flat Bar	4x3/8	A36 (36 ksi)
T2 43.00-23.00	Flat Bar	4x3/8	A36 (36 ksi)	Flat Bar	4x3/8	A36 (36 ksi)
T3 23.00-2.00	Channel	C8x11.5	A36 (36 ksi)	Channel	C8x11.5	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 63.00-43.00	None	Flat Bar		A36 (36 ksi)	Solid Round	9/16	A36 (36 ksi)
T2 43.00-23.00	None	Flat Bar		A36 (36 ksi)	Solid Round	9/16	A36 (36 ksi)
T3 23.00-2.00	None	Flat Bar		A36 (36 ksi)	Solid Round	9/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 63.00-43.00	0.00	0.0000	A36 (36 ksi)	1	1	3	36.0000	36.0000	36.0000
T2 43.00-23.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T3 23.00-2.00	0.00	0.0000	A36	1	1	1	36.0000	36.0000	36.0000

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
			(36 ksi)						

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1 63.00-43.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 43.00-23.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 23.00-2.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

[1]*Note: K factors are applied to member segment lengths. K-braces without inner supporting members will have the K factor in the out-of-plane direction applied to the overall length.*

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Net Width Deduct in	Leg U	Diagonal Net Width Deduct in	Diagonal U	Top Girt Net Width Deduct in	Top Girt U	Bottom Girt Net Width Deduct in	Bottom Girt U	Mid Girt Net Width Deduct in	Mid Girt U	Long Horizontal Net Width Deduct in	Long Horizontal U	Short Horizontal Net Width Deduct in	Short Horizontal U
T1 63.00-43.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 43.00-23.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 23.00-2.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

Guy Data

Guy Elevation ft	Guy Grade		Guy Size	Initial Tension K	%	Guy Modulus ksi	Guy Weight plf	L_u ft	Anchor Radius ft	Anchor Azimuth Adj. °	Anchor Elevation ft	End Fitting Efficiency %
61.3205	EHS	A	5/16	1.12	10%	21000	0.205	65.77	25.00	0.0000	0.00	100%
		B	5/16	1.12	10%	21000	0.205	65.77	25.00	0.0000	0.00	100%
		C	5/16	1.12	10%	21000	0.205	65.77	25.00	0.0000	0.00	100%

Guy Data *(cont'd)*

Guy Elevation ft	Mount Type	Torque-Arm Spread ft	Torque-Arm Leg Angle °	Torque-Arm Style	Torque-Arm Grade	Torque-Arm Type	Torque-Arm Size
61.3205	Corner						

Guy Data *(cont'd)*

Guy Elevation ft	Diagonal Grade	Diagonal Type	Upper Diagonal Size	Lower Diagonal Size	Is Strap.	Pull-Off Grade	Pull-Off Type	Pull-Off Size
61.32	A572-50 (50 ksi)	Solid Round				A572-50 (50 ksi)	Solid Round	

Guy Data *(cont'd)*

Guy Elevation ft	Cable Weight A K	Cable Weight B K	Cable Weight C K	Cable Weight D K	Tower Intercept A ft	Tower Intercept B ft	Tower Intercept C ft	Tower Intercept D ft
61.3205	0.01	0.01	0.01		0.39 1.1 sec/pulse	0.39 1.1 sec/pulse	0.39 1.1 sec/pulse	

Guy Data *(cont'd)*

Guy Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Torque Arm K_x	Torque Arm K_y	Pull Off K_x	Pull Off K_y	Diagonal K_x	Diagonal K_y
61.3205	No	No			1	1	1	1

Guy Data *(cont'd)*

Guy Elevation ft	Torque-Arm Bolt Size in	Torque-Arm Number	Torque-Arm Net Width Deduct in	Torque-Arm U	Pull Off Bolt Size in	Pull Off Number	Pull Off Net Width Deduct in	Pull Off U	Diagonal Bolt Size in	Diagonal Number	Diagonal Net Width Deduct in	Diagonal U
61.3205	0.6250 A325N	0	0.0000	0.75	0.6250 A325N	0	0.0000	0.75	0.6250 A325N	0	0.0000	0.75

Guy Pressures

Guy Elevation ft	Guy Location	z ft	q_z psf	q_z Ice psf	Ice Thickness in
61.3205	A	30.66	22	5	1.4890
	B	30.66	22	5	1.4890
	C	30.66	22	5	1.4890

Guy-Tensioning Information

				Temperature At Time Of Tensioning													
				0 F		20 F		40 F		60 F		80 F		100 F		120 F	
Guy Elevation ft		H ft	V ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft	Initial Tension K	Intercept ft
61.3205	A	23.95	61.32	1.184	0.37	1.163	0.38	1.141	0.39	1.120	0.39	1.099	0.40	1.077	0.41	1.056	0.42
	B	23.95	61.32	1.184	0.37	1.163	0.38	1.141	0.39	1.120	0.39	1.099	0.40	1.077	0.41	1.056	0.42
	C	23.95	61.32	1.184	0.37	1.163	0.38	1.141	0.39	1.120	0.39	1.099	0.40	1.077	0.41	1.056	0.42

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	Number Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1/2	A	Yes	Ar (CaAa)	57.00 - 10.00	13	13	0.5800	0.5800		0.25

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	63.00-43.00	A	0.000	0.000	10.556	0.000	0.05
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T2	43.00-23.00	A	0.000	0.000	15.080	0.000	0.07
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00
T3	23.00-2.00	A	0.000	0.000	9.802	0.000	0.04
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.00

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	63.00-43.00	A	1.573	0.000	0.000	31.560	0.000	0.37
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T2	43.00-23.00	A	1.500	0.000	0.000	44.656	0.000	0.50
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00
T3	23.00-2.00	A	1.361	0.000	0.000	28.496	0.000	0.30

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.00

Feed Line Shielding

Section	Elevation ft	Face	A_R ft^2	A_R Ice ft^2	A_F ft^2	A_F Ice ft^2
T1	63.00-43.00	A	0.583	9.538	0.293	0.686
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T2	43.00-23.00	A	0.808	12.600	0.419	0.972
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000
T3	23.00-2.00	A	0.533	7.519	0.519	1.185
		B	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	63.00-43.00	-0.9108	-0.5258	-0.4235	-0.2445
T2	43.00-23.00	-1.1220	-0.6478	-0.5750	-0.3320
T3	23.00-2.00	-0.8294	-0.4788	-0.4806	-0.2775

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	1/2	43.00 - 57.00	1.0000	1.0000
T2	1	1/2	23.00 - 43.00	1.0000	1.0000
T3	1	1/2	10.00 - 23.00	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
APX16DWV-16DWVS-E-A	A	From Leg	0.50	0.0000	60.00	No Ice	6.46	2.15	0.04
20			0.00			1/2" Ice	6.83	2.49	0.07
(T-Mobile - Proposed)			0.00			1" Ice	7.21	2.84	0.11
APX16DWV-16DWVS-E-A	B	From Leg	0.50	0.0000	60.00	No Ice	6.46	2.15	0.04
20			0.00			1/2" Ice	6.83	2.49	0.07
(T-Mobile - Proposed)			0.00			1" Ice	7.21	2.84	0.11
APX16DWV-16DWVS-E-A	C	From Leg	0.50	0.0000	60.00	No Ice	6.46	2.15	0.04
20			0.00			1/2" Ice	6.83	2.49	0.07
(T-Mobile - Proposed)			0.00			1" Ice	7.21	2.84	0.11
IRB-1211 Dish	C	From Leg	0.50	0.0000	60.00	No Ice	1.15	0.84	0.01
(T-Mobile - Proposed)			0.00			1/2" Ice	1.29	0.96	0.02
			0.00			1" Ice	1.44	1.09	0.03

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % 	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 63.00-43.00	53.00	1.107	31	43.067	A	0.958	7.437	5.534	65.92	10.556	0.000
					B	1.251	8.020		59.69	0.000	0.000
					C	1.251	8.020		59.69	0.000	0.000
T2 43.00-23.00	33.00	1.002	22	50.667	A	1.059	8.374	6.333	67.14	15.080	0.000
					B	1.478	9.182		59.41	0.000	0.000
					C	1.478	9.182		59.41	0.000	0.000
T3 23.00-2.00	12.50	0.85	19	56.656	A	2.551	10.936	8.313	61.63	9.802	0.000
					B	3.069	11.470		57.17	0.000	0.000
					C	3.069	11.470		57.17	0.000	0.000

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % 	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 63.00-43.00	53.00	1.107	8	1.5728	48.310	A	0.565	23.856	16.020	65.60	31.560	0.000
						B	1.251	33.393		46.24	0.000	0.000
						C	1.251	33.393		46.24	0.000	0.000
T2 43.00-23.00	33.00	1.002	5	1.5000	55.667	A	0.506	22.883	16.334	69.84	44.656	0.000
						B	1.478	35.483		44.19	0.000	0.000
						C	1.478	35.483		44.19	0.000	0.000
T3 23.00-2.00	12.50	0.85	5	1.3612	61.421	A	1.885	29.805	17.841	56.30	28.496	0.000
						B	3.069	37.324		44.17	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						C	3.069	37.324		44.17	0.000	0.000

Tower Pressure - Service

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 63.00-43.00	53.00	1.107	11	43.067	A	0.958	7.437	5.534	65.92	10.556	0.000
					B	1.251	8.020		59.69	0.000	0.000
					C	1.251	8.020		59.69	0.000	0.000
T2 43.00-23.00	33.00	1.002	8	50.667	A	1.059	8.374	6.333	67.14	15.080	0.000
					B	1.478	9.182		59.41	0.000	0.000
					C	1.478	9.182		59.41	0.000	0.000
T3 23.00-2.00	12.50	0.85	7	56.656	A	2.551	10.936	8.313	61.63	9.802	0.000
					B	3.069	11.470		57.17	0.000	0.000
					C	3.069	11.470		57.17	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	1.16	A	0.195	2.613	31	1	1	5.558	0.67	33.33	C
63.00-43.00			B	0.215	2.546		1	1	5.881			
			C	0.215	2.546		1	1	5.881			
T2	0.07	0.40	A	0.186	2.643	22	1	1	6.313	0.61	30.65	C
43.00-23.00			B	0.21	2.562		1	1	6.770			
			C	0.21	2.562		1	1	6.770			
T3 23.00-2.00	0.04	0.67	A	0.238	2.474	19	1	1	9.228	0.54	25.58	C
			B	0.257	2.418		1	1	9.798			
			C	0.257	2.418		1	1	9.798			
Sum Weight:	0.15	2.23								1.82		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	1.16	A	0.195	2.613	31	0.8	1	5.367	0.65	32.50	C
63.00-43.00			B	0.215	2.546		0.8	1	5.631			
			C	0.215	2.546		0.8	1	5.631			
T2	0.07	0.40	A	0.186	2.643	22	0.8	1	6.101	0.60	29.94	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
43.00-23.00			B	0.21	2.562		0.8	1	6.475			
			C	0.21	2.562		0.8	1	6.475			
T3 23.00-2.00	0.04	0.67	A	0.238	2.474	19	0.8	1	8.718	0.51	24.44	C
			B	0.257	2.418		0.8	1	9.184			
			C	0.257	2.418		0.8	1	9.184			
Sum Weight:	0.15	2.23								1.76		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	1.16	A	0.195	2.613	31	0.85	1	5.415	0.65	32.71	C
63.00-43.00			B	0.215	2.546		0.85	1	5.694			
			C	0.215	2.546		0.85	1	5.694			
T2	0.07	0.40	A	0.186	2.643	22	0.85	1	6.154	0.60	30.12	C
43.00-23.00			B	0.21	2.562		0.85	1	6.548			
			C	0.21	2.562		0.85	1	6.548			
T3 23.00-2.00	0.04	0.67	A	0.238	2.474	19	0.85	1	8.846	0.52	24.73	C
			B	0.257	2.418		0.85	1	9.338			
			C	0.257	2.418		0.85	1	9.338			
Sum Weight:	0.15	2.23								1.78		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	2.36	A	0.505	1.893	8	1	1	23.539	0.53	26.46	C
63.00-43.00			B	0.717	1.778		1	1	28.746			
			C	0.717	1.778		1	1	28.746			
T2	0.50	1.66	A	0.42	2.025	5	1	1	23.399	0.45	22.45	C
43.00-23.00			B	0.664	1.778		1	1	29.365			
			C	0.664	1.778		1	1	29.365			
T3 23.00-2.00	0.30	2.01	A	0.516	1.88	5	1	1	27.778	0.34	16.07	C
			B	0.658	1.78		1	1	32.243			
			C	0.658	1.78		1	1	32.243			
Sum Weight:	1.17	6.03								1.32		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	2.36	A	0.505	1.893	8	0.8	1	23.426	0.53	26.31	C
63.00-43.00			B	0.717	1.778		0.8	1	28.496			
			C	0.717	1.778		0.8	1	28.496			
T2	0.50	1.66	A	0.42	2.025	5	0.8	1	23.298	0.45	22.32	C
43.00-23.00			B	0.664	1.778		0.8	1	29.069			
			C	0.664	1.778		0.8	1	29.069			
T3 23.00-2.00	0.30	2.01	A	0.516	1.88	5	0.8	1	27.401	0.33	15.87	C
			B	0.658	1.78		0.8	1	31.629			
			C	0.658	1.78		0.8	1	31.629			
Sum Weight:	1.17	6.03								1.31		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.37	2.36	A	0.505	1.893	8	0.85	1	23.454	0.53	26.35	C
63.00-43.00			B	0.717	1.778		0.85	1	28.558			
			C	0.717	1.778		0.85	1	28.558			
T2	0.50	1.66	A	0.42	2.025	5	0.85	1	23.323	0.45	22.35	C
43.00-23.00			B	0.664	1.778		0.85	1	29.143			
			C	0.664	1.778		0.85	1	29.143			
T3 23.00-2.00	0.30	2.01	A	0.516	1.88	5	0.85	1	27.495	0.33	15.92	C
			B	0.658	1.78		0.85	1	31.782			
			C	0.658	1.78		0.85	1	31.782			
Sum Weight:	1.17	6.03								1.31		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	1.16	A	0.195	2.613	11	1	1	5.558	0.24	11.76	C
63.00-43.00			B	0.215	2.546		1	1	5.881			
			C	0.215	2.546		1	1	5.881			
T2	0.07	0.40	A	0.186	2.643	8	1	1	6.313	0.22	10.82	C
43.00-23.00			B	0.21	2.562		1	1	6.770			
			C	0.21	2.562		1	1	6.770			
T3 23.00-2.00	0.04	0.67	A	0.238	2.474	7	1	1	9.228	0.19	9.03	C
			B	0.257	2.418		1	1	9.798			
			C	0.257	2.418		1	1	9.798			
Sum Weight:	0.15	2.23								0.64		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	1.16	A	0.195	2.613	11	0.8	1	5.367	0.23	11.47	C
63.00-43.00			B	0.215	2.546		0.8	1	5.631			
			C	0.215	2.546		0.8	1	5.631			
T2	0.07	0.40	A	0.186	2.643	8	0.8	1	6.101	0.21	10.57	C
43.00-23.00			B	0.21	2.562		0.8	1	6.475			
			C	0.21	2.562		0.8	1	6.475			
T3 23.00-2.00	0.04	0.67	A	0.238	2.474	7	0.8	1	8.718	0.18	8.63	C
			B	0.257	2.418		0.8	1	9.184			
			C	0.257	2.418		0.8	1	9.184			
Sum Weight:	0.15	2.23								0.62		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.05	1.16	A	0.195	2.613	11	0.85	1	5.415	0.23	11.54	C
63.00-43.00			B	0.215	2.546		0.85	1	5.694			
			C	0.215	2.546		0.85	1	5.694			
T2	0.07	0.40	A	0.186	2.643	8	0.85	1	6.154	0.21	10.63	C
43.00-23.00			B	0.21	2.562		0.85	1	6.548			
			C	0.21	2.562		0.85	1	6.548			
T3 23.00-2.00	0.04	0.67	A	0.238	2.474	7	0.85	1	8.846	0.18	8.73	C
			B	0.257	2.418		0.85	1	9.338			
			C	0.257	2.418		0.85	1	9.338			
Sum Weight:	0.15	2.23								0.63		

Force Totals (Does not include forces on guys)

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Torques kip-ft
Leg Weight	1.02			
Bracing Weight	1.21			
Total Member Self-Weight	2.23			
Guy Weight	0.04			
Total Weight	2.56			
Wind 0 deg - No Ice		0.00	-2.19	-0.18
Wind 30 deg - No Ice		1.06	-1.83	-0.18
Wind 60 deg - No Ice		1.85	-1.07	-0.14
Wind 90 deg - No Ice		2.15	-0.00	-0.06
Wind 120 deg - No Ice		1.86	1.07	0.03
Wind 150 deg - No Ice		1.07	1.86	0.12
Wind 180 deg - No Ice		-0.00	2.11	0.17

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Torques kip-ft
Wind 210 deg - No Ice		-1.06	1.83	0.18
Wind 240 deg - No Ice		-1.90	1.10	0.15
Wind 270 deg - No Ice		-2.15	0.00	0.06
Wind 300 deg - No Ice		-1.85	-1.06	-0.03
Wind 330 deg - No Ice		-1.07	-1.86	-0.12
Member Ice	3.79			
Guy Ice	0.65			
Total Weight Ice	8.44			
Wind 0 deg - Ice		0.00	-1.43	-0.06
Wind 30 deg - Ice		0.67	-1.16	-0.06
Wind 60 deg - Ice		1.23	-0.71	-0.05
Wind 90 deg - Ice		1.43	-0.00	-0.02
Wind 120 deg - Ice		1.17	0.67	0.01
Wind 150 deg - Ice		0.71	1.23	0.04
Wind 180 deg - Ice		-0.00	1.34	0.06
Wind 210 deg - Ice		-0.67	1.16	0.06
Wind 240 deg - Ice		-1.24	0.72	0.05
Wind 270 deg - Ice		-1.43	0.00	0.02
Wind 300 deg - Ice		-1.23	-0.71	-0.01
Wind 330 deg - Ice		-0.71	-1.23	-0.04
Total Weight	2.56			
Wind 0 deg - Service		0.00	-0.77	-0.06
Wind 30 deg - Service		0.38	-0.65	-0.06
Wind 60 deg - Service		0.65	-0.38	-0.05
Wind 90 deg - Service		0.76	-0.00	-0.02
Wind 120 deg - Service		0.66	0.38	0.01
Wind 150 deg - Service		0.38	0.66	0.04
Wind 180 deg - Service		-0.00	0.74	0.06
Wind 210 deg - Service		-0.38	0.65	0.06
Wind 240 deg - Service		-0.67	0.39	0.05
Wind 270 deg - Service		-0.76	0.00	0.02
Wind 300 deg - Service		-0.65	-0.38	-0.01
Wind 330 deg - Service		-0.38	-0.66	-0.04

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy
3	1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy
4	1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy
5	1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy
6	1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy
7	1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy
8	1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy
9	1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy
10	1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy
11	1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy
12	1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy
13	1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy
14	1.2 Dead+1.0 Ice+1.0 Temp+Guy
15	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy
16	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy

Comb. No.	Description
17	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy
18	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy
19	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy
20	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy
21	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy
22	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp+1.0 Guy
23	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp+1.0 Guy
24	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy
25	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp+1.0 Guy
26	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp+1.0 Guy
27	Dead+Wind 0 deg - Service+Guy
28	Dead+Wind 30 deg - Service+Guy
29	Dead+Wind 60 deg - Service+Guy
30	Dead+Wind 90 deg - Service+Guy
31	Dead+Wind 120 deg - Service+Guy
32	Dead+Wind 150 deg - Service+Guy
33	Dead+Wind 180 deg - Service+Guy
34	Dead+Wind 210 deg - Service+Guy
35	Dead+Wind 240 deg - Service+Guy
36	Dead+Wind 270 deg - Service+Guy
37	Dead+Wind 300 deg - Service+Guy
38	Dead+Wind 330 deg - Service+Guy

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	63 - 43	Leg	Max Tension	2	7.38	-0.02	0.00
			Max. Compression	2	-10.28	0.01	-0.00
			Max. Mx	6	-3.45	-0.04	0.01
			Max. My	10	-5.57	0.02	0.06
			Max. Vy	6	-0.29	0.00	-0.00
			Max. Vx	10	0.28	-0.00	0.02
		Diagonal	Max Tension	2	1.27	0.00	0.00
			Max. Compression	2	-1.33	0.00	0.00
			Max. Mx	15	-0.16	0.01	0.00
			Max. My	15	-0.01	0.00	-0.00
			Max. Vy	15	-0.01	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
		Horizontal	Max Tension	2	1.30	0.00	0.00
			Max. Compression	2	-0.84	0.00	0.00
			Max. Mx	19	0.01	0.00	0.00
			Max. My	2	0.82	0.00	0.00
			Max. Vy	19	-0.01	0.00	0.00
			Max. Vx	2	-0.00	0.00	0.00
		Top Girt	Max Tension	6	0.01	0.00	0.00
			Max. Compression	10	-0.01	0.00	0.00
			Max. Mx	14	-0.00	0.01	0.00
			Max. My	15	-0.00	0.00	-0.00
			Max. Vy	14	-0.03	0.00	0.00
			Max. Vx	15	-0.00	0.00	0.00
		Bottom Girt	Max Tension	11	0.32	0.00	0.00
			Max. Compression	6	-0.30	0.00	0.00
			Max. Mx	19	-0.05	0.02	0.00
			Max. My	15	-0.06	0.00	-0.00
			Max. Vy	19	-0.03	0.00	0.00
			Max. Vx	15	-0.00	0.00	0.00
		Guy A	Bottom Tension	8	5.17		

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Top Tension	8	5.18		
			Top Cable Vert	8	4.83		
			Top Cable Norm	8	1.90		
			Top Cable Tan	8	0.00		
			Bot Cable Vert	8	-4.79		
			Bot Cable Norm	8	1.95		
			Bot Cable Tan	8	0.00		
		Guy B	Bottom Tension	2	6.09		
			Top Tension	2	6.10		
			Top Cable Vert	2	5.66		
			Top Cable Norm	2	2.27		
			Top Cable Tan	2	0.10		
			Bot Cable Vert	2	-5.64		
			Bot Cable Norm	2	2.29		
			Bot Cable Tan	2	0.15		
		Guy C	Bottom Tension	2	6.14		
			Top Tension	2	6.15		
			Top Cable Vert	2	5.71		
			Top Cable Norm	2	2.29		
			Top Cable Tan	2	0.10		
			Bot Cable Vert	2	-5.69		
			Bot Cable Norm	2	2.31		
			Bot Cable Tan	2	0.15		
T2	43 - 23	Leg	Max Tension	10	10.57	0.03	-0.03
			Max. Compression	11	-15.95	0.06	0.02
			Max. Mx	5	9.46	-0.08	-0.01
			Max. My	4	1.91	-0.01	-0.07
			Max. Vy	5	0.66	-0.08	-0.01
			Max. Vx	11	0.47	-0.04	-0.02
		Diagonal	Max Tension	5	1.39	0.00	0.00
			Max. Compression	11	-1.42	0.00	0.00
			Max. Mx	15	0.16	0.00	0.00
			Max. My	15	-0.02	0.00	-0.00
			Max. Vy	15	-0.01	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
		Horizontal	Max Tension	11	1.07	0.00	0.00
			Max. Compression	5	-1.08	0.00	0.00
			Max. Mx	15	0.03	0.00	0.00
			Max. My	15	0.11	0.00	0.00
			Max. Vy	15	-0.01	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
		Top Girt	Max Tension	11	0.33	0.00	0.00
			Max. Compression	6	-0.38	0.00	0.00
			Max. Mx	19	0.06	0.01	0.00
			Max. My	15	-0.03	0.00	-0.00
			Max. Vy	19	-0.02	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
		Bottom Girt	Max Tension	6	0.55	0.00	0.00
			Max. Compression	5	-0.49	0.00	0.00
			Max. Mx	15	-0.02	0.01	0.00
			Max. My	26	0.09	0.00	-0.00
			Max. Vy	15	0.02	0.00	0.00
			Max. Vx	26	0.00	0.00	0.00
T3	23 - 2	Leg	Max Tension	11	17.19	0.11	-0.04
			Max. Compression	6	-24.81	-0.13	-0.08
			Max. Mx	18	0.66	-0.22	-0.04
			Max. My	9	-17.93	0.11	-0.14
			Max. Vy	11	-0.78	0.19	-0.02
			Max. Vx	9	0.47	0.06	-0.12
		Diagonal	Max Tension	5	1.63	0.00	0.00
			Max. Compression	11	-1.60	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Mx	15	0.26	0.00	0.00
			Max. My	15	0.00	0.00	-0.00
			Max. Vy	15	-0.01	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
		Horizontal	Max Tension	14	2.34	0.00	0.00
			Max. Compression	5	-1.40	0.00	0.00
			Max. Mx	19	0.40	0.00	0.00
			Max. Vy	19	-0.01	0.00	0.00
			Max. Vx	2	-0.00	0.00	0.00
		Top Girt	Max Tension	11	0.83	0.00	0.00
			Max. Compression	6	-0.94	0.00	0.00
			Max. Mx	15	0.11	0.02	0.00
			Max. My	9	-0.72	0.00	0.00
			Max. Vy	15	-0.04	0.00	0.00
			Max. Vx	9	-0.00	0.00	0.00
		Bottom Girt	Max Tension	8	0.02	0.00	0.00
			Max. Compression	2	-0.02	0.00	0.00
			Max. Mx	23	0.00	0.02	0.00
			Max. My	2	-0.02	0.00	0.00
			Max. Vy	15	-0.04	0.00	0.00
			Max. Vx	2	-0.00	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg B Elev 12.5 ft	Max. Vert	6	24.74	-0.73	-1.02
	Max. H_x	25	-0.43	2.99	0.38
	Max. H_z	12	-10.87	0.65	1.15
	Min. Vert	11	-16.73	0.58	0.76
	Min. H_x	6	24.74	-0.73	-1.02
	Min. H_z	6	24.74	-0.73	-1.02
Leg C Elev 12.5 ft	Max. Vert	10	24.74	2.10	-1.11
	Max. H_x	10	24.74	2.10	-1.11
	Max. H_z	4	-10.58	-1.80	1.26
	Min. Vert	5	-16.65	-2.03	0.77
	Min. H_x	18	-1.26	-3.55	0.26
	Min. H_z	9	17.80	1.48	-1.12
Guy C @ 25 ft Elev 0 ft Azimuth 240 deg Elev 0.0 ft	Max. Vert	10	-0.21	-0.05	0.03
	Max. H_x	10	-0.21	-0.05	0.03
	Max. H_z	2	-5.69	-1.93	1.29
	Min. Vert	2	-5.69	-1.93	1.29
	Min. H_x	3	-5.62	-1.93	1.24
	Min. H_z	9	-0.23	-0.06	0.02
Guy B @ 25 ft Elev 0 ft Azimuth 120 deg Elev 0.0 ft	Max. Vert	6	-0.22	0.05	0.03
	Max. H_x	13	-5.57	1.91	1.23
	Max. H_z	2	-5.64	1.91	1.28
	Min. Vert	2	-5.64	1.91	1.28
	Min. H_x	6	-0.22	0.05	0.03
	Min. H_z	7	-0.23	0.07	0.02

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Guy A @ 25 ft Elev 0 ft Azimuth 0 deg Elev 0.0 ft	Max. Vert	15	-0.00	0.00	0.00
	Max. H_x	24	-0.96	0.05	-0.42
	Max. H_z	15	-0.00	0.00	0.00
	Min. Vert	8	-4.79	0.00	-1.95
	Min. H_x	18	-0.96	-0.05	-0.42
	Min. H_z	8	-4.79	0.00	-1.95

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
Dead Only	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Ice+1.0 Temp+Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy	0.00	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 210	0.00	0.00	0.00	0.00	0.00	0.00

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft
deg+1.0 Ice+1.0 Temp+1.0 Guy 1.2 Dead+1.0 Wind 240	0.00	0.00	0.00	0.00	0.00	0.00
deg+1.0 Ice+1.0 Temp+1.0 Guy 1.2 Dead+1.0 Wind 270	0.00	0.00	0.00	0.00	0.00	0.00
deg+1.0 Ice+1.0 Temp+1.0 Guy 1.2 Dead+1.0 Wind 300	0.00	0.00	0.00	0.00	0.00	0.00
deg+1.0 Ice+1.0 Temp+1.0 Guy 1.2 Dead+1.0 Wind 330	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 30 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 60 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 90 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 120 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 150 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 180 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 210 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 240 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 270 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 300 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00
Dead+Wind 330 deg - Service+Guy	0.00	0.00	0.00	0.00	0.00	0.00

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-2.56	0.00	0.00	2.56	-0.00	0.004%
2	0.01	-3.06	-3.67	-0.01	3.06	3.67	0.014%
3	1.81	-3.06	-3.12	-1.81	3.06	3.12	0.006%
4	3.11	-3.06	-1.79	-3.11	3.06	1.79	0.005%
5	3.61	-3.06	-0.01	-3.61	3.06	0.01	0.003%
6	3.18	-3.06	1.83	-3.18	3.06	-1.83	0.003%
7	1.80	-3.06	3.12	-1.80	3.06	-3.11	0.003%
8	-0.01	-3.06	3.58	0.01	3.06	-3.58	0.003%
9	-1.81	-3.06	3.12	1.81	3.06	-3.12	0.002%
10	-3.18	-3.06	1.84	3.18	3.06	-1.84	0.002%
11	-3.61	-3.06	0.01	3.61	3.06	-0.01	0.002%
12	-3.10	-3.06	-1.78	3.10	3.06	1.78	0.007%
13	-1.80	-3.06	-3.12	1.80	3.06	3.11	0.012%
14	0.00	-8.94	0.00	0.00	8.94	-0.00	0.003%
15	0.00	-8.94	-1.70	-0.00	8.94	1.70	0.006%
16	0.85	-8.94	-1.47	-0.85	8.94	1.47	0.005%
17	1.47	-8.94	-0.85	-1.47	8.94	0.85	0.003%
18	1.69	-8.94	-0.00	-1.69	8.94	0.00	0.002%
19	1.47	-8.95	0.85	-1.47	8.95	-0.85	0.002%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
20	0.85	-8.94	1.47	-0.85	8.94	-1.47	0.001%
21	-0.00	-8.94	1.69	0.00	8.94	-1.69	0.002%
22	-0.85	-8.94	1.47	0.85	8.94	-1.47	0.002%
23	-1.47	-8.95	0.85	1.47	8.95	-0.85	0.003%
24	-1.69	-8.94	0.00	1.69	8.94	-0.00	0.002%
25	-1.46	-8.94	-0.84	1.46	8.94	0.84	0.004%
26	-0.85	-8.94	-1.47	0.85	8.94	1.46	0.006%
27	0.00	-2.56	-0.81	-0.00	2.56	0.81	0.004%
28	0.40	-2.56	-0.69	-0.40	2.56	0.69	0.003%
29	0.69	-2.56	-0.40	-0.69	2.56	0.40	0.004%
30	0.80	-2.56	-0.00	-0.80	2.56	0.00	0.003%
31	0.70	-2.56	0.40	-0.70	2.56	-0.40	0.004%
32	0.40	-2.56	0.69	-0.40	2.56	-0.69	0.004%
33	-0.00	-2.56	0.79	0.00	2.56	-0.79	0.003%
34	-0.40	-2.56	0.69	0.40	2.56	-0.69	0.002%
35	-0.70	-2.56	0.41	0.70	2.56	-0.41	0.004%
36	-0.80	-2.56	0.00	0.80	2.56	-0.00	0.005%
37	-0.68	-2.56	-0.39	0.68	2.56	0.39	0.004%
38	-0.40	-2.56	-0.69	0.40	2.56	0.69	0.006%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	13	0.00000001	0.00011930
2	Yes	36	0.00000001	0.00012263
3	Yes	37	0.00000001	0.00011624
4	Yes	33	0.00000001	0.00011403
5	Yes	20	0.00000001	0.00011200
6	Yes	20	0.00000001	0.00011516
7	Yes	20	0.00000001	0.00010425
8	Yes	19	0.00000001	0.00008880
9	Yes	21	0.00000001	0.00012193
10	Yes	21	0.00000001	0.00011020
11	Yes	21	0.00000001	0.00010025
12	Yes	32	0.00000001	0.00011099
13	Yes	35	0.00000001	0.00014164
14	Yes	17	0.00000001	0.00013907
15	Yes	34	0.00000001	0.00010690
16	Yes	32	0.00000001	0.00011753
17	Yes	27	0.00000001	0.00010969
18	Yes	19	0.00000001	0.00014048
19	Yes	13	0.00000001	0.00012275
20	Yes	17	0.00000001	0.00009876
21	Yes	17	0.00000001	0.00011800
22	Yes	17	0.00000001	0.00011811
23	Yes	13	0.00000001	0.00014524
24	Yes	19	0.00000001	0.00011193
25	Yes	26	0.00000001	0.00011195
26	Yes	31	0.00000001	0.00011538
27	Yes	17	0.00000001	0.00008479
28	Yes	16	0.00000001	0.00008636
29	Yes	14	0.00000001	0.00012528
30	Yes	12	0.00000001	0.00009360
31	Yes	12	0.00000001	0.00010685
32	Yes	13	0.00000001	0.00014237

33	Yes	14	0.00000001	0.00009858
34	Yes	14	0.00000001	0.00008258
35	Yes	12	0.00000001	0.00012581
36	Yes	11	0.00000001	0.00013207
37	Yes	14	0.00000001	0.00010399
38	Yes	15	0.00000001	0.00013748

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	63 - 43	1.621	27	0.0714	0.1940
T2	43 - 23	1.288	27	0.1265	0.1228
T3	23 - 2	0.534	27	0.2282	0.0332

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
61.32	Guy	27	1.603	0.0727	0.1887	24986
60.00	APX16DWV-16DWVS-E-A20	27	1.590	0.0738	0.1845	24986

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	63 - 43	19.359	2	1.4175	0.4429
T2	43 - 23	12.949	2	1.7296	0.2978
T3	23 - 2	4.792	2	2.1259	0.0970

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
61.32	Guy	2	18.879	1.4287	0.4325	4588
60.00	APX16DWV-16DWVS-E-A20	2	18.500	1.4380	0.4243	4588

Guy Design Data

Section No.	Elevation ft	Size	Initial Tension K	Breaking Load K	Actual T_u K	Allowable ϕT_n K	Required S.F.	Actual S.F.
T1	61.32 (A) (261)	5/16 EHS	1.12	11.20	5.18	6.72	1.000	1.296 ✔
	61.32 (B) (260)	5/16 EHS	1.12	11.20	6.10	6.72	1.000	1.102 ✔
	61.32 (C) (259)	5/16 EHS	1.12	11.20	6.15	6.72	1.000	1.092 ✔

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	Mast Stability Index	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	P1.25x.191	20.00	1.51	34.7 K=1.00	0.8815	0.99	-10.28	25.90	0.397 [1] ✔
T2	43 - 23	P1.5x.145	20.00	1.51	29.2 K=1.00	0.7995	0.99	-15.95	23.87	0.668 [1] ✔
T3	23 - 2	P2x.218	21.00	1.48	23.1 K=1.00	1.4773	0.99	-24.81	44.86	0.553 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	9/16	2.38	2.21	132.2 K=0.70	0.2485	-1.33	3.21	0.415 [1] ✔
T2	43 - 23	9/16	2.91	2.73	162.9 K=0.70	0.2485	-1.42	2.12	0.670 [1] ✔
T3	23 - 2	9/16	2.90	2.67	159.7 K=0.70	0.2485	-1.60	2.20	0.725 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	9/16	1.86	1.72	102.5	0.2485	-0.84	4.63	0.182 [1]

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
					K=0.70				✔
T2	43 - 23	9/16	2.48	2.32	138.6 K=0.70	0.2485	-1.08	2.92	0.369 [1] ✔
T3	23 - 2	9/16	2.50	2.30	137.5 K=0.70	0.2485	-1.40	2.97	0.472 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	4x3/8	1.78	1.65	182.4 K=1.00	1.5000	-0.01	10.18	0.001 [1] ✔
T2	43 - 23	4x3/8	2.25	2.09	232.1 K=1.00	1.5000	-0.38	6.29	0.060 [1] ✔
T3	23 - 2	KL/R > 200 (C) - 88 C8x11.5	2.50	2.30	44.2 K=1.00	3.3800	-0.94	98.81	0.009 [1] ✔

[1] P_u / ϕP_n controls

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	4x3/8	2.25	2.11	233.6 K=1.00	1.5000	-0.30	6.21	0.049 [1] ✔
T2	43 - 23	KL/R > 200 (C) - 7 4x3/8	2.50	2.34	259.3 K=1.00	1.5000	-0.49	5.04	0.096 [1] ✔
T3	23 - 2	KL/R > 200 (C) - 91 C8x11.5	2.50	2.30	44.2 K=1.00	3.3800	-0.02	98.81	0.000 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	P1.25x.191	20.00	1.51	34.7	0.8815	7.38	27.77	0.266 [1] ✔
T2	43 - 23	P1.5x.145	20.00	1.51	29.2	0.7995	10.57	25.18	0.420 [1] ✔
T3	23 - 2	P2x.218	21.00	1.48	23.1	1.4773	17.19	46.53	0.369 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	9/16	2.38	2.21	188.8	0.2485	1.27	8.05	0.158 [1] ✔
T2	43 - 23	9/16	2.91	2.73	232.7	0.2485	1.39	8.05	0.172 [1] ✔
T3	23 - 2	9/16	2.90	2.67	228.1	0.2485	1.63	8.05	0.203 [1] ✔

[1] P_u / ϕP_n controls

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	9/16	1.82	1.68	143.5	0.2485	1.30	8.05	0.162 [1] ✔
T2	43 - 23	9/16	2.48	2.32	198.0	0.2485	1.07	8.05	0.133 [1] ✔
T3	23 - 2	9/16	2.50	2.30	196.4	0.2485	2.34	8.05	0.291 [*1] ✔

[*] DL controls
[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	4x3/8	1.78	1.65	182.4	1.5000	0.01	48.60	0.000 [1] ✔
T2	43 - 23	4x3/8	2.25	2.09	232.1	1.5000	0.33	48.60	0.007 [1] ✔
T3	23 - 2	C8x11.5	2.50	2.30	44.2	3.3800	0.83	109.51	0.008 [1] ✔

[1] P_u / ϕP_n controls

Bottom Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	63 - 43	4x3/8	2.25	2.11	233.6	1.5000	0.32	48.60	0.007 [1] ✔
T2	43 - 23	4x3/8	2.50	2.34	259.3	1.5000	0.55	48.60	0.011 [1] ✔
T3	23 - 2	C8x11.5	2.50	2.30	44.2	3.3800	0.02	109.51	0.000 [1] ✔

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	63 - 43	Leg	P1.25x.191	1	-10.28	25.90	39.7	Pass
		Diagonal	9/16	77	-1.33	3.21	41.5	Pass
		Horizontal	9/16	75	-0.84	4.63	18.2	Pass
		Top Girt	4x3/8	6	-0.01	10.18	0.1	Pass
		Bottom Girt	4x3/8	7	-0.30	6.21	4.9	Pass
		Guy A@61.3205	5/16	261	5.18	6.72	77.2	Pass
		Guy B@61.3205	5/16	260	6.10	6.72	90.8	Pass
		Guy C@61.3205	5/16	259	6.15	6.72	91.6	Pass
T2	43 - 23	Leg	P1.5x.145	85	-15.95	23.87	66.8	Pass
		Diagonal	9/16	94	-1.42	2.12	67.0	Pass
		Horizontal	9/16	97	-1.08	2.92	36.9	Pass
		Top Girt	4x3/8	88	-0.38	6.29	6.0	Pass
		Bottom Girt	4x3/8	91	-0.49	5.04	9.6	Pass
T3	23 - 2	Leg	P2x.218	170	-24.81	44.86	55.3	Pass
		Diagonal	9/16	256	-1.60	2.20	72.5	Pass
		Horizontal	9/16	229	-1.40	2.97	47.2	Pass
		Top Girt	C8x11.5	172	-0.94	98.81	0.9	Pass
		Bottom Girt	C8x11.5	175	-0.01	98.81	0.1	Pass
							Summary	
						Leg (T2)	66.8	Pass
						Diagonal (T3)	72.5	Pass

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$øP_{allow}$ K	% Capacity	Pass Fail
						Horizontal (T3)	47.2	Pass
						Top Girt (T2)	6.0	Pass
						Bottom Girt (T2)	9.6	Pass
						Guy A (T1)	77.2	Pass
						Guy B (T1)	90.8	Pass
						Guy C (T1)	91.6	Pass
						RATING =	**91.6**	**Pass**

RAN Template:	A&L Template:	Power System Template:
4E-U19	4E-U19_2DP	Custom

CTCOW01A_Modernization_0.1_draft

Section 1 - Site Information

Site ID: CTCOW01A
Status: Draft
Version: R0.1
Project Type: Modernization
Approved: Not Approved
Approved By: Not Approved
Last Modified: 3/15/2018 3:35:08 PM
Last Modified By: GSM1900\MLow1

Site Name: CTCOW01A
Site Class: <undefined>
Site Type: <undefined>
Solution Type:
Plan Year:
Market: CONNECTICUT
Vendor: Ericsson
Landlord: Not Specified

Latitude: 41.9377390000
Longitude: -71.9542410000
Address: 39 N Gate Rd
City, State: Woodstock, CT
Region: NORTHEAST

RAN Template: 4E-U19			AL Template: 4E-U19_2DP	
Sector Count: 3	Antenna Count: 3	Coax Line Count: 12	TMA Count: 0	RRU Count: 0

Section 2 - Existing Template Images

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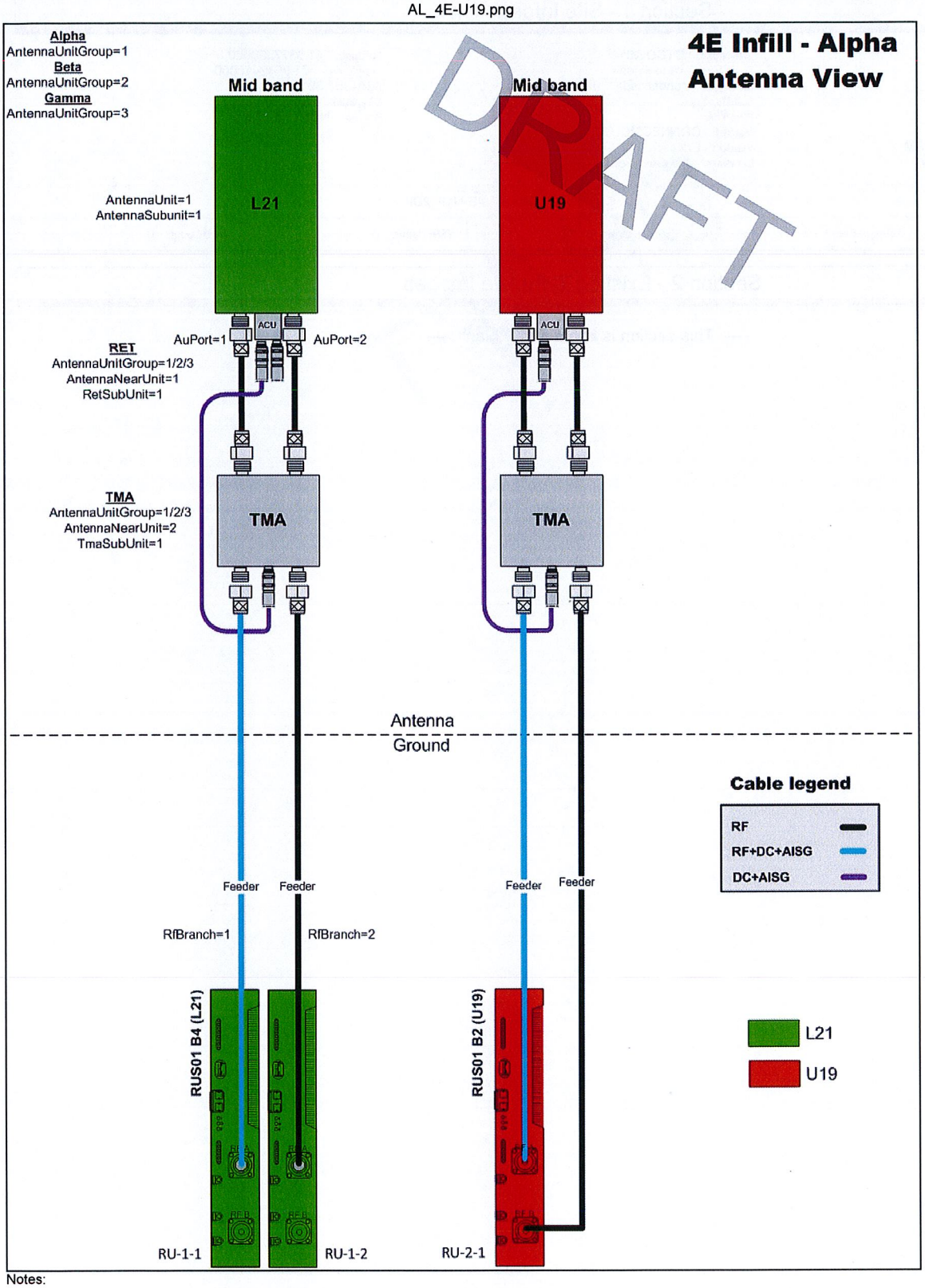
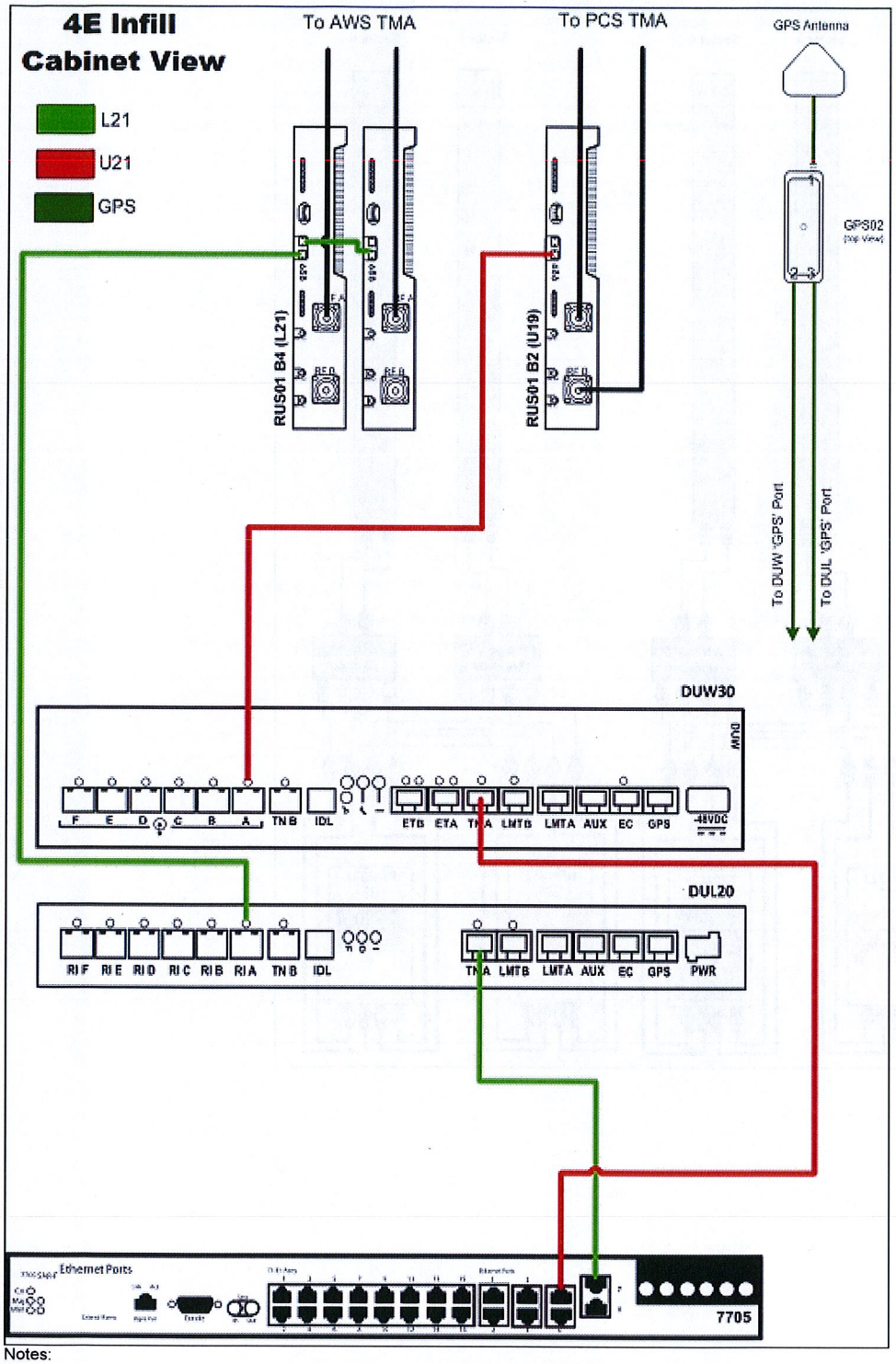
Section 3 - Proposed Template Images

AL_4E-U19.png



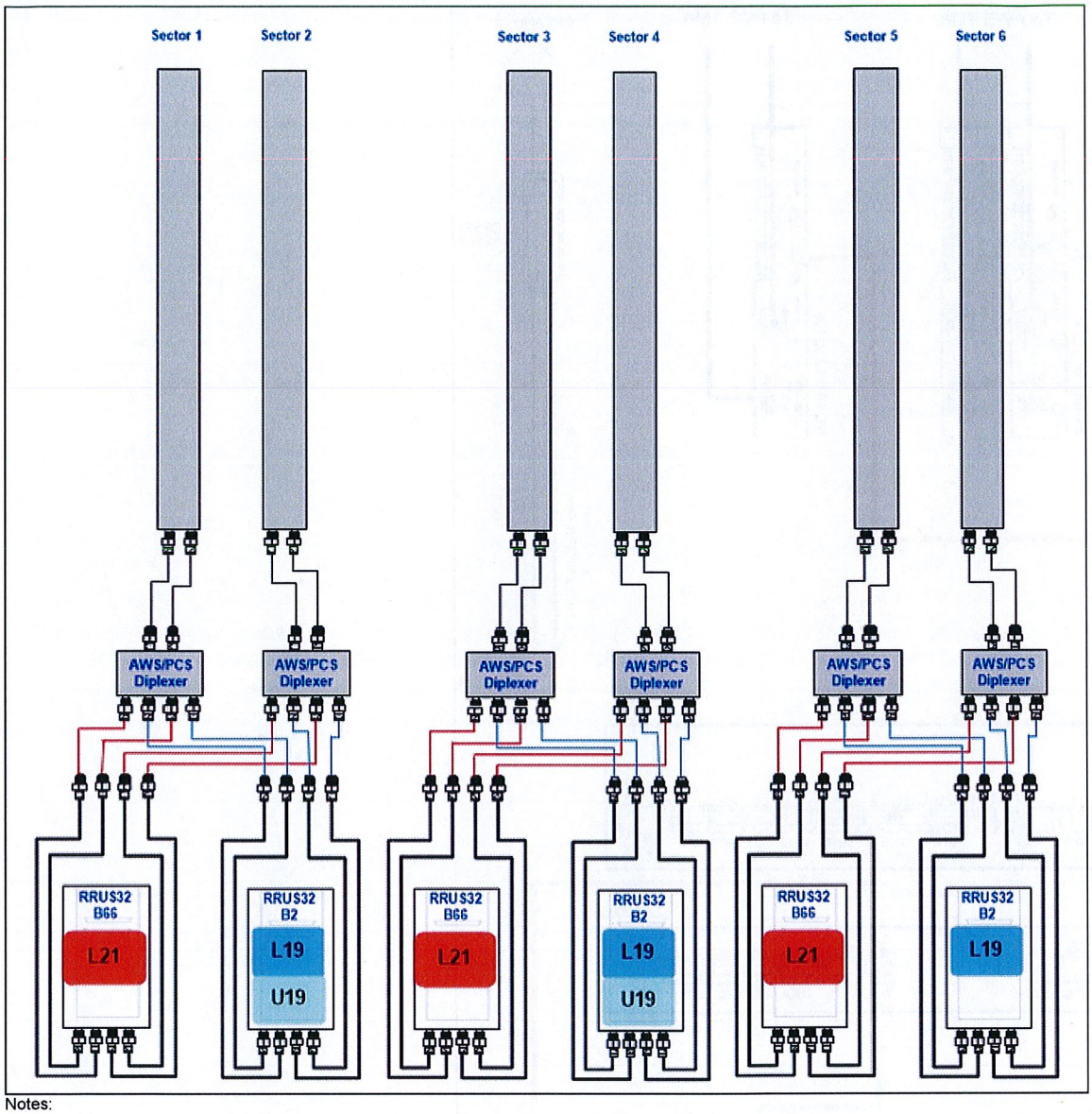
Notes:

RAN_4E-U19.png



Notes:

HC2 U19.png


Sector 1
Sector 2
Sector 3
Sector 4
Sector 5
Sector 6
AWS/PCS Diplexer
AWS/PCS Diplexer
AWS/PCS Diplexer
AWS/PCS Diplexer
AWS/PCS Diplexer
AWS/PCS Diplexer
RRUS32 B66
L21
RRUS32 B2
L19
U19
RRUS32 B66
L21
RRUS32 B2
L19
U19
RRUS32 B66
L21
RRUS32 B2
L19

Notes:

Section 4 - Siteplan Images

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RAN Template:	A&L Template:	Power System Template:
4E-U19	4E-U19_2DP	Custom

CTCOW01A_Modernization_0.1_draft

Section 5 - RAN Equipment

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Existing RAN Equipment

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Proposed RAN Equipment

Template: 4E-U19

Enclosure	1
Enclosure Type	RBS 6201
Baseband	DUW30 U1900; DUS41 L2100
Radio	RUS01 B2 (x3) U1900; RUS01 B4 (x6) L2100

RAN Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4E-U19	4E-U19_2DP	Custom

CTCOW01A_Modernization_0.1_draft

Section 6 - A&L Equipment

Existing Template: Custom
Proposed Template: 4E-U19_2DP

DRAFT

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro	
Antenna	1	
Antenna Model	RFS - APX16DWV-16DWV-S-E-A20 (Quad)	
Azimuth	40	
M. Tilt	0	
Height	35	
Ports	**P1**	**P2**
Active Tech.	L2100	U1900
Dark Tech.		
Restricted Tech.		
Decomm. Tech.		
E. Tilt	2	2
Cables	1/2" Coax - 40 ft. (x2)	1/2" Coax - 40 ft. (x2)
TMAs		
Diplexers / Combiners		
Radio		
Sector Equipment		

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4E-U19	4E-U19_2DP	Custom

CTCOW01A_Modernization_0.1_draft

Sector 2 (Proposed) view from behind		
Coverage Type	A - Outdoor Macro	
Antenna	1	
Antenna Model	RFS - APX16DWV-16DWV-S-E-A20 (Quad)	
Azimuth	180	
M. Tilt	0	
Height	35	
Ports	P1	P2
Active Tech.	L2100	U1900
Dark Tech.		
Restricted Tech.		
Decomm. Tech.		
E. Tilt	2	2
Cables	1/2" Coax - 40 ft. (x2)	1/2" Coax - 40 ft. (x2)
TMAs		
Diplexers / Combiners		
Radio		
Sector Equipment		

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4E-U19	4E-U19_2DP	Custom

CTCOW01A_Modernization_0.1_draft

Sector 3 (Proposed) view from behind		
Coverage Type	A - Outdoor Macro	
Antenna	1	
Antenna Model	RFS - APX16DWV-16DWV-S-E-A20 (Quad)	
Azimuth	280	
M. Tilt	0	
Height	35	
Ports	P1	P2
Active Tech.	L2100	U1900
Dark Tech.		
Restricted Tech.		
Decomm. Tech.		
E. Tilt	1	1
Cables	1/2" Coax - 40 ft. (x2)	1/2" Coax - 40 ft. (x2)
TMAs		
Diplexers / Combiners		
Radio		
Sector Equipment		

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:	Power System Template:
4E-U19	4E-U19_2DP	Custom

CTCOW01A_Modernization_0.1_draft

Section 7 - Power Systems Equipment

Existing Power Systems Equipment

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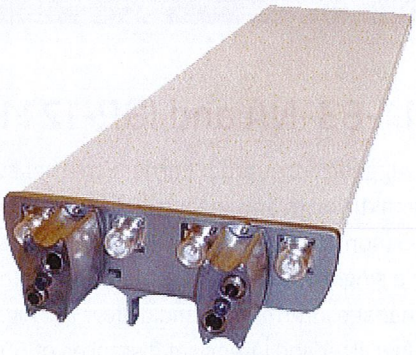
Proposed Power Systems Equipment

DRAFT

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).



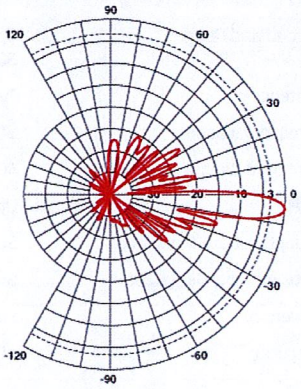
Features/Benefits

- **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

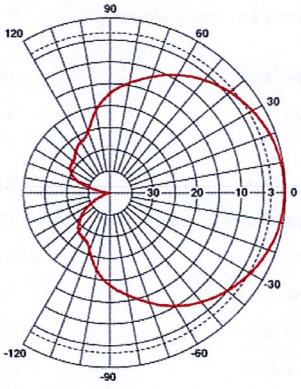
Frequency Range, MHz	1710-2200
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	5.9 to 7.7
Electrical Downtilt, deg	0-10
Gain, dBi (dBd)	18.4 (16.3)
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)
Front-To-Back Ratio, dB	>26 (typically 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



Vertical Pattern

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, m² (ft²)	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)



Horizontal Pattern

Ordering Information

Mounting Hardware	APM40-2 + APM40-E2

All information contained in the present datasheet is subject to confirmation at time of ordering

IBR Intelligent Backhaul Radio™

Fastback NETWORKS
intelligent wireless transport

IBR-1211-83-NA and IBR-1211-38-NA Specifications

The IBR is a ruggedized, outdoor Carrier Ethernet switch with a wireless port that uses Fastback's breakthrough any line of sight (AnyLOS™) radio technology to simultaneously support NLOS (non line of sight), nLOS (near line of sight) and LOS (line of sight) operating conditions in a single device. The IBR builds on state-of-the-art RF building blocks and features to manage interference and deliver the highest sustained throughput while maintaining low jitter and latency at distances of 500m or more (NLOS) and 13km (LOS).

Specifications

Specifications	IBR
RADIO	
Speed and Range	Typical: Scalable up to 800Mbps at 500m range (NLOS) and 3km range (LOS), 300Mbps at 13km range (LOS)
Latency	Typical: <500µsec
Frequency bands	5GHz UNII/ISM
Antenna Beamwidth	40-degree
EIRP	Up to 42 dBm
Adaptive Rate Modulation	Supported via proprietary adaptive algorithms
Interference Mitigation	Supported via proprietary avoidance and cancellation algorithms
Diversity	Supported via proprietary antenna array signal processing
Security	AES-256 OTA Encryption
SWITCH	
Carrier Ethernet Features	Y.1731 and 802.1ag (QinQ) OAM, RFC 2544 reflection, QoS, Broadcast, Unknown, Multicast (BUM) filter, Configurable latency per queue
Interfaces	1 x GbE (Cu), 2 x GbE (SFP) 1 ALOS radio interface (see above), 1 console
QoS	802.1p classification, strict priority scheduling, WDRR scheduling
Management	HTTPS, ssh, Telnet, serial, SNMP v2c & v3, IPv6, Dying Gasp
Dimensions (W x H x D)	15.2" x 9.1" x 6.6", 388 x 232 x 169 mm
Volume	5 liters
Weight	<4 kg
Power Input	802.3at
Temperature	-40C to +60C operating -55C to +85C storage
Environmental	IP66

Certifications	IBR
Radiated	FCC Part 15, IC RSS-210
Safety	UL/cUL (UL60950-1, UL60950-22)
EMC/EMI	FCC Part 15 Class B
Environmental	GR-3108

Patented Wireless Extension of Existing Network Architecture

- Fiber performance in any line of sight (AnyLOS™)
- Scalable in capacity: 800 Mbps at 500m range (NLOS) and 3km range (LOS), 300 Mbps at 13km range (LOS)
- <500 µsec latency
- UNI, NTE-Demarc, SLA on a light pole: monitor, manage and deliver an SLA to any location
- Carrier Ethernet services:
  - *Transport:* full layer 2
  - *SLA assurance:* via full-featured OAM capability
  - *Network synchronization:* support in any location
  - *Service uptime:* carrier-grade physical link and network layer redundancy
  - *Security:* service protection and reliability

Fastback Networks, Intelligent Wireless Transport, Intelligent Backhaul Radio, and Any Line of Sight (AnyLOS) are registered trademarks or trademarks of Fastback Networks. Copyright 03/2015

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