September 30, 2016

VIA EMAIL AND OVERNIGHT DELIVERY

Ms. Melanie A. Bachman
Acting Executive Director
Connecticut Siting Council
Ten Franklin Square
New Britain, CT 06051

RE: T-Mobile Northeast LLC – CTNL801A
Notice of Exempt Modification
61-1 Buttonball Road, Old Lyme, CT
Assessor's Parcel# 8-11-1
LAT: 41-17-46.55" N
LNG: -72-1.73" W

Dear Ms. Bachman:

T-Mobile Northeast LLC ("T-Mobile") currently maintains three (3) antennas at the 97' level and three (3) antennas at the 87' level on the existing 100' tall monopole located at 61-1 Buttonball Road in Old Lyme, CT. The tower is owned by Bay Communications. T-Mobile now intends to remove the three (3) existing antennas located at the 87' level and replace them with three (3) new 2100 MHz and 700 MHz antennas. These antennas would be installed on a new flush mount at the 95' level of the tower. Additionally, T-Mobile would install three (3) RRU's below the new antennas.

The existing facility consists of a 100-foot monopole tower. The Connecticut Siting Council approved this tower on September 23, 2010 (Docket No. 393). The decision stipulated that the tower shall be constructed as a stealth monopole with flush-mounted antennas, the tower shall not exceed a height of 100 feet above ground level and the height at the top of T-Mobile's antennas shall not exceed 100 feet above ground level. T-Mobile's proposed equipment modifications meet these conditions as the proposed antennas will be flush-mounted and will not exceed the top of the existing 100' tower.

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 the First Selectman Bonnie Reemsnyder, Bay Communications as tower owner, and the property owner, Ron Swaney LLC.

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

1. The proposed modifications will not result in an increase in the height of the existing structure. T-Mobile proposes to replace three (3) existing antennas with

three (3) new antennas and install them at a centerline height of 95' on the existing 100' monopole.

2. The proposed modifications will not require the extension of the site boundary. T-Mobile will replace one (1) equipment cabinet on the existing 10' x 15' concrete pad. Thus, there will be no effect on the site compound or T-Mobile's leased area.

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. The incremental effect of the proposed changes will be negligible.

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. As indicated in the attached power density calculations, T-Mobile's operations at the site will result in a power density of 5.83%; the combined site operations will result in a total power density of 5.83%.

5. The proposed modifications will not cause a change or alteration in the physical or environmental characteristics of the site. The replacement antennas will be flush-mounted to the tower.

6. The existing structure and its foundation can support the proposed loading. As indicated in the attached structural analysis the subject tower is adequate to support the proposed T-Mobile equipment upgrade.

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).

Respectfully submitted,

By: _____

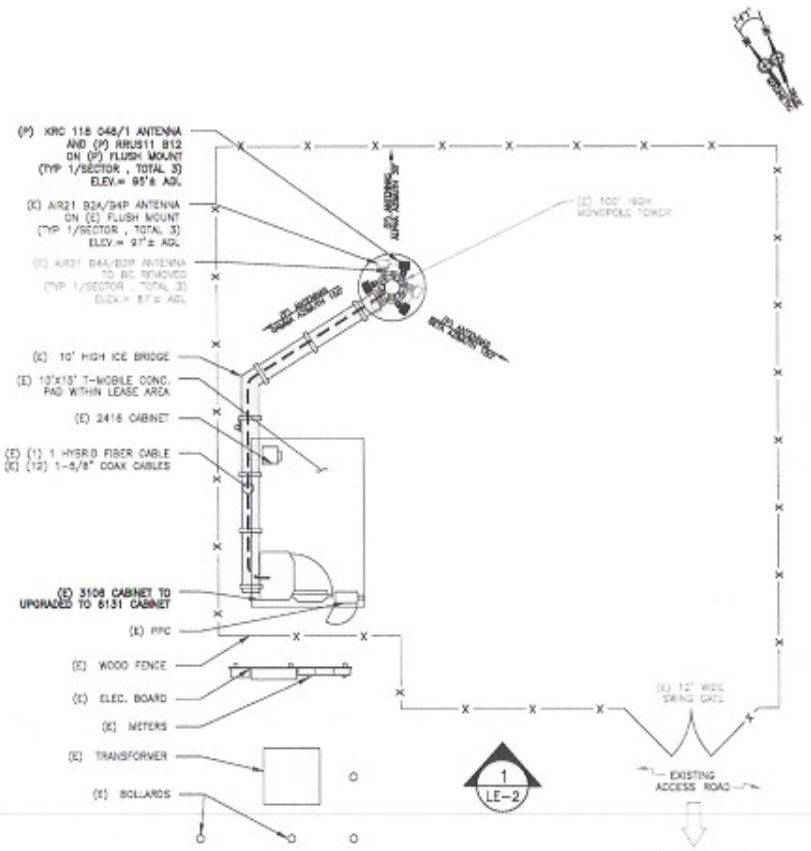
Eric Dahl, Agent for T-Mobile
860-227-1975
edahl@comcast.net

Attachments

cc: Town of Burlington, First Selectman Theodore Shafer
Ron Swaney LLC – as property owner
Bay Communications – as tower owner

(E) SITE LOCATION

KEY PLAN
N.T.S.
1 / LE-1



SITE PLAN
SCALE: 1" = 10'-0" (11x17)
2 / LE-1

0 10 20 30

CONFIGURATION
702CC

GENERAL SITE NOTES

1. SITE INFORMATION WAS OBTAINED FROM A FIELD INVESTIGATION PERFORMED BY ATLANTIS DESIGN GROUP, INC. CONTRACTOR TO FIELD VERIFY DIMENSIONS AS NECESSARY BEFORE CONSTRUCTION.

2. THE PROPOSED DEVELOPMENT DOES NOT INCLUDE SIGNS OF ADVERTISING.

3. THE PROPOSED DEVELOPMENT IS UNMANNED AND THEREFORE DOES NOT REQUIRE A MEANS OF WATER SUPPLY OR SEWAGE DISPOSAL.

4. NO LANDSCAPING WORK IS PROPOSED IN CONJUNCTION WITH THIS DEVELOPMENT OTHER THAN THAT WHICH IS SHOWN.

5. THE PROPOSED DEVELOPMENT DOES NOT INCLUDE OUTDOOR STORAGE OR ANY SOLID WASTE RECEPTACLES.

6. UTILITIES SHOWN ON PLAN ARE TAKEN FROM OWNERS RECORDS AND FIELD LOCATION OF VISIBLE SURFACE FEATURES. THE EXISTENCE, EXTENT AND EXACT HORIZONTAL AND VERTICAL LOCATIONS OF UTILITIES HAS NOT BEEN VERIFIED. ANY CONTRACTOR PERFORMING WORK ON THIS SITE MUST CONTACT CALL BEFORE YOU DIG THREE WORKING DAYS PRIOR TO COMMENCING WORK.

7. ALL OBSOLETE OR UNUSED FACILITIES SHALL BE REMOVED WITHIN 12 MONTHS OF CESSATION OF OPERATIONS.

SITE LEGEND

- SITE PROPERTY LINE
- STREET OR ROAD
- CHAIN LINK FENCE
- OPAQUE WOODEN FENCE
- BOARD ON BOARD FENCE
- DECIDUOUS TREES/SHRUBS
- EVERGREEN TREES/SHRUBS
- TREE LINE
- UTILITY POLE
- (E) EXISTING
- (N) NEW
- (P) PROPOSED
- (F) FUTURE
- PROP. LTE ANTENNA
- PROP. UMTS/GSM ANTENNA
- EX. GSM ANTENNA
- EX. UMTS ANTENNA

T-Mobile

T-MOBILE NORTHEAST, LLC
35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 692-7100
FAX: (860) 692-7119

ATLANTIS DESIGN GROUP, INC.
2013 MAIN CAMPUS DRIVE
LEXINGTON, MA 02421
Phone number: 617-863-3611
Fax Number : 781-742-2347

SUBMITTALS

DATE	DESCRIPTION	REVISION
06/15/11	ISSUED FOR REVIEW	A

DEPT.	INIT.	APP'D	REMARKS
RFE			
RF ENG.			
ZONING			
OPS			
CONSTR.			
SITE ACQ.			

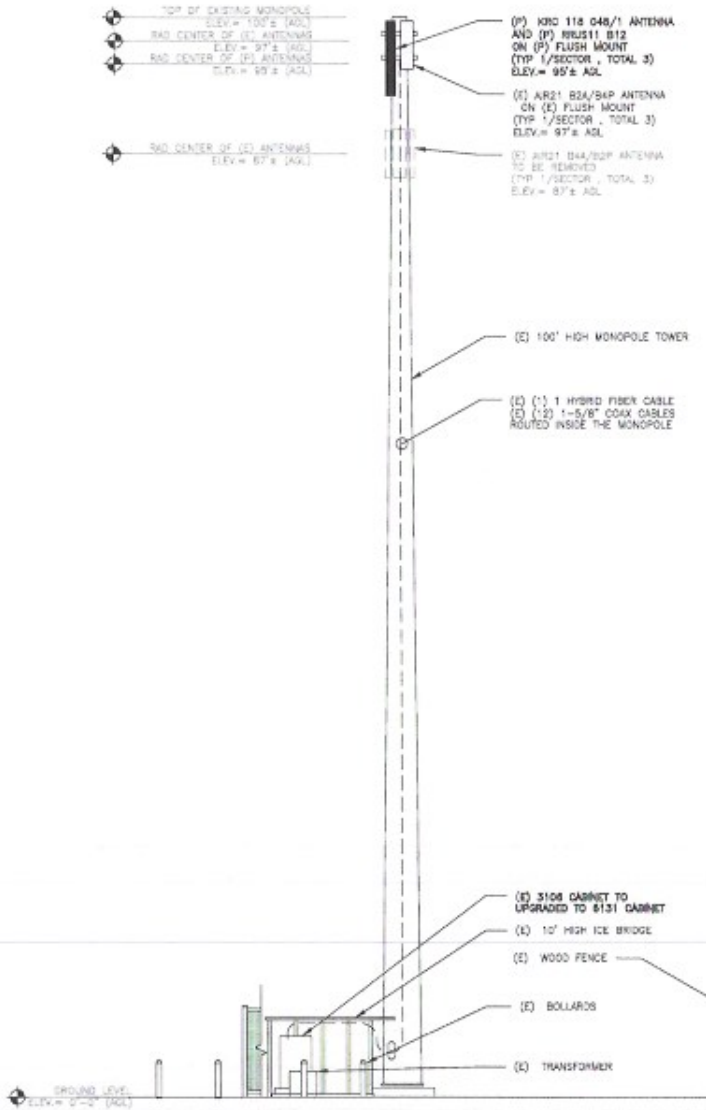
DRAWN BY: FG
CHECKED BY: KM

PROFESSIONAL SEAL

SITE NAME
CTNL801A
SITE NAME
AMTRAK -OLDLYME2
SITE ADDRESS
61-1 BUTTONBALL ROAD
OLD LYME, CT. 06371

SHEET TITLE
SITE PLAN

SHEET NUMBER
LE-1



ELEVATION

SCALE: 1/10" = 1'-0" (11x17)

1 / LE-2

0 10 20 30

SCALE: 1"=10' (11x17)
1"=5' (24x36)

CONFIGURATION

702CC

T-Mobile

T-MOBILE NORTHEAST, LLC
35 GRIFFITH ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 692-7100
FAX: (860) 692-7119

ATLANTIS DESIGN GROUP, INC.
2220 MAIN CAMPUS DRIVE
LEXINGTON, MA 02421
Phone number: 617-862-3010
Fax Number : 781-742-2247

SUBMITTALS

DATE	DESCRIPTION	REVISION
04/10/14	ISSUED FOR ISSUE	A

DEPT.	DATE	APP'D	REMARKS
RF			
RF MGR.			
SYSTEM			
OPS			
COUNSEL			
MKT. MGR.			

DRAWN BY: PG
CHECKED BY: KM

PROFESSIONAL SEAL

SITE NAME
CTNL801A

SITE NAME
AMTRAK -OLDLYME2

SITE ADDRESS
61-1 BUTTONBALL ROAD
OLD LYME, CT, 06371

SHEET TITLE
ELEVATION

SHEET NUMBER
LE-2

Property Information

Property ID	8-11-1
Location	61-1 BUTTONBALL RD
Owner	RON SWANEY LLC

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

Town of Old Lyme, CT makes no claims and no warranties, expressed or implied, concerning the validity or accuracy of the GIS data presented on this map.

Parcels updated 2/1/2016
Properties updated 09/20/2016

EBI Consulting
environmental | engineering | due diligence

RADIO FREQUENCY EMISSIONS ANALYSIS REPORT
EVALUATION OF HUMAN EXPOSURE POTENTIAL TO NON-IONIZING EMISSIONS

T-Mobile Existing Facility

Site ID: CTNL801A

Amtrak -OldLyme2
61-1 Buttonball Road
Old Lyme, CT 06371

September 30, 2016

EBI Project Number: 6216004417

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general public allowable limit:	5.83 %

21 B Street · Burlington, MA 01803 · Tel: (781) 273.2500 · Fax: (781) 273.3311

EBI Consulting
environmental | engineering | due diligence

September 30, 2016

T-Mobile USA
Attn: Jason Overbey, RF Manager
35 Griffin Road South
Bloomfield, CT 06002

Emissions Analysis for Site: **CTNL801A – Amtrak -OldLyme2**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **61-1 Buttonball Road, Old Lyme, 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 97-01and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter (μW/cm2). The number of $\mu W/cm^2$ 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 public 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 public 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 ($\mu W/cm^2$). The general population exposure limit for the 700 MHz Band is approximately 467 $\mu W/cm^2$, and the general population exposure limit for the 1900 MHz (PCS) and 2100 MHz (AWS) bands is 1000 $\mu W/cm^2$. 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 **61-1 Buttonball Road, Old Lyme, 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, 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) 2 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

2) 2 UMTS channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.

3) 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

4) 1 LTE channel (700 MHz Band) was considered for each sector of the proposed installation. This channel has a transmit power of 30 Watts.

5) 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.

6) 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 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.

7) The antennas used in this modeling are the **Ericsson AIR21 B2A/B4P** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the & **Ericsson AIR21 B4A/B12P-8** for 2100 MHz (AWS) and 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **Ericsson AIR21 B2A/B4P** has a maximum gain of **15.9 dBd** at its main lobe at 1900 MHz and 2100 MHz. The **Ericsson AIR21 B4A/B12P-8** has a maximum gain of **15.9 dBd** at its main lobe at 2100 MHz and a maximum gain of **14.6 dBd** at its main lobe at 700 MHz. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, 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.

8) The antenna mounting height centerline of the proposed antennas are **97 feet and 95 feet** above ground level (AGL).

9) 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.

10) All calculations were done with respect to uncontrolled / general public threshold limits.

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T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	Ericsson AIR21 B2A/B4P	Make / Model:	Ericsson AIR21 B2A/B4P	Make / Model:	Ericsson AIR21 B2A/B4P
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	97	Height (AGL):	97	Height (AGL):	97
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	4	Channel Count	4	Channel Count	4
Total TX Power(W):	120	Total TX Power(W):	120	Total TX Power(W):	120
ERP (W):	4,668.54	ERP (W):	4,668.54	ERP (W):	4,668.54
Antenna A1 MPE%	2.03	Antenna B1 MPE%	2.03	Antenna C1 MPE%	2.03
Antenna #:	2	Antenna #:	2	Antenna #:	2
Make / Model:	Ericsson AIR21 B4A/B12P-8	Make / Model:	Ericsson AIR21 B4A/B12P-8	Make / Model:	Ericsson AIR21 B4A/B12P-8
Gain:	15.9 dBd / 14.6 dBd	Gain:	15.9 dBd / 14.6 dBd	Gain:	15.9 dBd / 14.6 dBd
Height (AGL):	95	Height (AGL):	95	Height (AGL):	95
Frequency Bands	2100 MHz (AWS) / 700 MHz	Frequency Bands	2100 MHz (AWS) / 700 MHz	Frequency Bands	2100 MHz (AWS) / 700 MHz
Channel Count	4	Channel Count	4	Channel Count	4
Total TX Power(W):	180	Total TX Power(W):	180	Total TX Power(W):	180
ERP (W):	6,398.96	ERP (W):	6,398.96	ERP (W):	6,398.96
Antenna A2 MPE%	3.80	Antenna B2 MPE%	3.80	Antenna C2 MPE%	3.80

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile (Per Sector Max)	**5.83 %**
No Additional Carriers On Site	NA
Site Total MPE %:	**5.83 %**

T-Mobile Sector A Total:	5.83 %
T-Mobile Sector B Total:	5.83 %
T-Mobile Sector C Total:	5.83 %
Site Total:	5.83 %

T-Mobile _per sector	# Channels	Watts ERP (Per Channel)	Height (feet)	Total Power Density ($\mu W/cm^2$)	Frequency (MHz)	Allowable MPE ($\mu W/cm^2$)	Calculated % MPE
T-Mobile PCS - 1900 MHz UMTS	2	1,167.14	97	10.13	PCS - 1900 MHz	1000	1.01%
T-Mobile PCS - 1900 MHz GSM	2	1,167.14	97	10.13	PCS - 1900 MHz	1000	1.01%
T-Mobile AWS - 2100 MHz LTE	2	2,334.27	95	21.19	AWS - 2100 MHz	1000	2.12%
T-Mobile 700 MHz LTE	2	865.21	95	7.85	700 MHz	1000	1.68%
						Total:	**5.83%**

21 B Street · Burlington, MA 01803 · Tel: (781) 273.2500 · Fax: (781) 273.3311

Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general public 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 public exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector A:	5.83 %
Sector B:	5.83 %
Sector C:	5.83 %
T-Mobile Per Sector Maximum:	5.83 %
Site Total:	5.83 %
Site Compliance Status:	COMPLIANT

The anticipated composite MPE value for this site assuming all carriers present is **5.83%** of the allowable FCC established general public 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.

STRUCTURAL ANALYSIS REPORT - REV. 1
MONOPOLE

ATLANTIS DESIGN GROUP, INC.

Prepared For:

T-Mobile

35 Griffin Road South
Bloomfield, CT 06002

Site ID: CTNL801A
Site Name: Amtrak_OldLyme2
61-1 Buttonball Road
Old Lyme, CT 06371

September 8, 2016

Submitted By:
Atlantis Design Group, Inc.
3210 Main Campus Drive
Lexington, MA 02421
Phone: 617-852-3611

STRUCTURAL ANALYSIS REPORT - REV. 1
MONOPOLE

Prepared For:

T-Mobile

35 Griffin Road South
Bloomfield, CT 06002

RESULT: PASS

Site ID: CTNL801A
Site Name: Amtrak_OldLyme2
61-1 Buttonball Road
Old Lyme, CT 06371

Prepared By:

Destek Engineering, LLC
Professional Engineering Corporation
License # PEC 001429

09-08-2016

Ahmet Colakoglu, P.E.
Connecticut Professional Engineer
License No: 27057

DESTEK ENGINEERING, LLC
1281 Kennestone Circle, Ste 100, Marietta, GA 30066 -Tel: (770) 693-0835

CONTENTS

DESTEK ENGINEERING, LLC
1281 Kennestone Circle, Ste 100, Marietta, GA 30066 -Tel: (770) 693-0835

1.0 SUBJECT AND REFERENCES

The purpose of this analysis is to evaluate the structural capacity of the existing 100' Sabre monopole, located at 61-1 Buttonball Road, Old Lyme, CT 06371, for additions and alterations proposed by T-Mobile.

The structural analysis is based on the following documentation provided to Destek Engineering, LLC (Destek):

- RFDS provided by T-Mobile, dated 8/19/2016.
- Construction Drawings prepared by Atlantis Design Group, Inc., dated 7/11/2016.
- Structural Design Report prepared by Sabre Industries, dated 10/18/2013.

1.1 STRUCTURE

The structure is a 100' Sabre monopole consisting of slip-jointed 18-sided bent plate tubes. Flat-to-flat dimensions range from 1'-9" at the top to 3'-1.46" at the base. The monopole tower is attached to the foundation with a base plate and anchor bolts. It is formed by the following sections:

Section Length (Feet)	Lap Splice (Inches)	Shaft Thickness (Inches)	Top Diameter (Inches)	Bottom Diameter (Inches)	Yield Strength (ksi)
24	0.00	0.1875	21.0000	25.0800	65
26	51.00	0.1875	25.0800	29.5000	65
53.25	-	0.2500	28.4100	37.4600	65

2.0 EXISTING AND PROPOSED APPURTENANCES

Existing Configuration of T-Mobile Appurtenances:

Sector	RAD Center (ft.)	Appurtenances	Mount
Alpha	97	(1) AIR21 B2A/B4P	(2) Existing Flush Mounts
	87	(1) AIR21 B4A/B2P	
Beta	97	(1) AIR21 B2A/B4P	
	87	(1) AIR21 B4A/B2P	
Gamma	97	(1) AIR21 B2A/B4P	
	87	(1) AIR21 B4A/B2P	

DESTEK ENGINEERING, LLC
1281 Kennestone Circle, Ste 100, Marietta, GA 30066 -Tel: (770) 693-0835

Proposed and Final Configuration of T-Mobile Appurtenances:

Sector	RAD Center (ft.)	Appurtenances	Mount	Feedlines
Alpha	97	(1) AIR21 B2A/B4P	(1) Existing Flush Mount & (1) New Flush Mount	(1) 3/8* (12) 1-5/8*
	95	(1) KRC 118 048/1 (1) RRUS11 B12		
Beta	97	(1) AIR21 B2A/B4P		
	95	(1) KRC 118 048/1 (1) RRUS11 B12		
Gamma	97	(1) AIR21 B2A/B4P		
	95	(1) KRC 118 048/1 (1) RRUS11 B12		

***Feedlines are located inside monopole.**

3.0 CODES AND LOADING

The monopole was analyzed per *TIA/EIA-222-F* as referenced by the *2005 State Building Code* with all of the adopted Addendums and Supplements. The following wind loading was used in compliance with the standard for Old Lyme, CT:

- Basic wind speed 85 mph without ice (W)
- Basic wind speed 38 mph with 1/2" radial escalating ice (W_i)

The following load combinations were used with wind blowing at 0°, 60°, and 90°, measured from a line normal to the face of the tower.

- $D + W_0$
- $D + W_i + I$

D: Dead Load
W_0: Wind Load without ice
W_i: Wind Load with ice
I: Ice Gravity Load

DESTEK ENGINEERING, LLC
1281 Kennestone Circle, Ste 100, Marietta, GA 30066 -Tel: (770) 693-0835

4.0 STANDARD CONDITIONS FOR ENGINEERING SERVICES ON EXISTING STRUCTURES

The analysis is based on the information provided to Destek and is assumed to be current and correct. Unless otherwise noted, the structure and the foundation system are assumed to be in good condition, free of defects and can achieve theoretical strength.

It is assumed that the structure has been maintained and shall be maintained during its service. The superstructure and the foundation system are assumed to be designed with proper engineering practice and fabricated, constructed and erected in accordance with the design documents. Destek will accept no liability which may arise due to any existing deficiency in design, material, fabrication, erection, construction, etc. or lack of maintenance.

The analysis does not include a qualification of the mounts attached to the structure or their connections. The analysis is performed to verify the capacity of the main structural members, which is the current practice in the tower industry.

The analysis results presented in this report are only applicable for the previously mentioned existing and proposed additions and alterations. Any deviation of the proposed equipment and placement, etc., will require Destek to generate an additional structural analysis.

5.0 ANALYSIS AND ASSUMPTIONS

The structure is considered to have adequate strength for the proposed loading if the existing structural members that will be used to support the proposed equipment are structurally adequate per the applicable Code criteria or if the additions or alterations to the existing structure do not increase the force in any structural element by more than 5%, in accordance with the applicable referenced Code.

The structure was analyzed by utilizing tnxTower, a non-linear 3-Dimensional finite element software, a product of Tower Numerics, Inc. Software output for this analysis is provided in Appendix A of this report.

DESTEK ENGINEERING, LLC
1281 Kennestone Circle, Ste 100, Marietta, GA 30066 -Tel: (770) 693-0835

6.0 RESULTS AND CONCLUSION

Based on an analysis per *TIA/EIA-222-F*, the existing tower **has adequate** structural capacity for the proposed modifications by T-Mobile. For the aforementioned load combinations and as a maximum, the monopole shaft is stressed to **48.5%** of capacity. The flange plate at 75' is stressed to **49.5%** of capacity. The base plate is stressed to **48.8%** of capacity. The anchor rods are stressed to **39.4%** of capacity.

The proposed mount should be composed of a Valmont Lightweight Ring Mount with Flush Mount Adapter Kits (Part #: UGLM & (3) FMA1-2) and (3) 10' long 3.0 STD pipe mounts. The mount should be installed just below the existing mount and the new mount pipes should be located vertically to meet the desired 95' RAD center. The proposed RRU should be placed on the new mount pipe, below the proposed antenna.

The foundation **has adequate** capacity for the proposed loading by T-Mobile. For the aforementioned load combinations and as a maximum, the foundation is stressed to **55.3%** of capacity.

Therefore, the proposed additions and alterations by T-Mobile **can** be implemented as intended and with the conditions outlined in this report.

Should you have any questions about this report, please contact us at (770) 693-0835.

DESTEK ENGINEERING, LLC
1281 Kennestone Circle, Ste 100, Marietta, GA 30066 -Tel: (770) 693-0835

APPENDIX A
SOFTWARE OUTPUT

Section	1	2	3
Length (ft)	24.00	26.00	53.25
Number of Sides	18	18	18
Thickness (in)	0.1875	0.1875	0.2500
Socket Length (ft)		4.25	
Top Dia (in)	21.0000	25.0800	28.4026
Bot Dia (in)	25.0800	29.5000	37.4600
Grade		A572-65	
Weight (K)	1.1	1.4	4.7

Total Weight (K): 7.2

DESIGNED APPURTENANCE LOADING

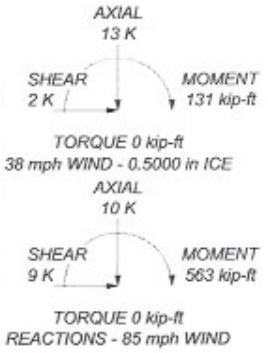
TYPE	ELEVATION	TYPE	ELEVATION
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	98	RRUS 11 B12	93
		RRUS 11 B12	93
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	98	RRUS 11 B12	93
		KRC 118 048/1 w/ Mount Pipe	93
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	98	KRC 118 048/1 w/ Mount Pipe	93
		KRC 118 048/1 w/ Mount Pipe	93
Side Arm Mount [SO 104-3]	98	Side Arm Mount [SO 104-3]	93

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A572-65	65 ksi	80 ksi			

TOWER DESIGN NOTES

1. Tower is located in New London County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 38 mph basic wind with 0.50 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 50 mph wind.
5. TOWER RATING: 48.5%



Destek Engineering, LLC
1281 Kennestone Circle, Ste. 100
Marietta, GA 30066
Phone: (770) 693-0835
FAX:

Job: CTNL801A			
Project: Amtrak_OldLyme2			
Client: T-Mobile	Drawn by: Ahmet Colakoglu		App'd:
Code: TIA/EIA-222-F	Date: 09/07/16		Scale: NTS
Path:			Dwg No. E-1

Tower Input Data

There is a pole section.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in New London County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 38 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 50 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.333.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

Consider Moments - Legs	Distribute Leg Loads As Uniform	Use ASCE 10 X-Brace Ly Rules
Consider Moments - Horizontals	Assume Legs Pinned	Calculate Redundant Bracing Forces
Consider Moments - Diagonals	√ Assume Rigid Index Plate	Ignore Redundant Members in FEA
Use Moment Magnification	√ Use Clear Spans For Wind Area	SR Leg Bolts Resist Compression
√ Use Code Stress Ratios	Use Clear Spans For KL/r	All Leg Panels Have Same Allowable
√ Use Code Safety Factors - Guys	Retension Guys To Initial Tension	Offset Girt At Foundation
√ Escalate Ice	√ Bypass Mast Stability Checks	√ Consider Feed Line Torque
Always Use Max Kz	√ Use Azimuth Dish Coefficients	Include Angle Block Shear Check
Use Special Wind Profile	√ Project Wind Area of Appurt.	Use TIA-222-G Bracing Resist. Exemption
Include Bolts In Member Capacity	Autocalc Torque Arm Areas	Use TIA-222-G Tension Splice Exemption
Leg Bolts Are At Top Of Section	Add IBC .6D+W Combination	Poles
Secondary Horizontal Braces Leg	Sort Capacity Reports By Component	√ Include Shear-Torsion Interaction
Use Diamond Inner Bracing (4 Sided)	Triangulate Diamond Inner Bracing	Always Use Sub-Critical Flow
SR Members Have Cut Ends	Treat Feed Line Bundles As Cylinder	Use Top Mounted Sockets
SR Members Are Concentric		

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	100.00-76.00	24.00	0.00	18	21.0000	25.0800	0.1875	0.7500	A572-65 (65 ksi)
L2	76.00-50.00	26.00	4.25	18	25.0800	29.5000	0.1875	0.7500	A572-65 (65 ksi)
L3	50.00-1.00	53.25		18	28.4025	37.4600	0.2500	1.0000	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	21.3240	12.3860	677.8263	7.3884	10.6680	63.5383	1356.5444	6.1942	3.3660	17.952
	25.4669	14.8141	1159.7148	8.8368	12.7406	91.0248	2320.9555	7.4085	4.0841	21.782
L2	25.4669	14.8141	1159.7148	8.8368	12.7406	91.0248	2320.9555	7.4085	4.0841	21.782
	29.9551	17.4446	1893.6697	10.4059	14.9860	126.3626	3789.8311	8.7240	4.8620	25.931
L3	29.5747	22.3390	2236.8419	9.9941	14.4285	155.0297	4476.6270	11.1716	4.5588	18.235
	38.0379	29.5261	5164.9175	13.2096	19.0297	271.4138	10336.6312	14.7659	6.1530	24.612

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
L1				1	1	1			
100.00-76.00									
L2 76.00-50.00				1	1	1			
L3 50.00-1.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
AVA7-50(1-5/8")	C	No	Inside Pole	98.00 - 96.00	6	No Ice	0.00	0.70
						1/2" Ice	0.00	0.70
						1" Ice	0.00	0.70
						2" Ice	0.00	0.70
						4" Ice	0.00	0.70
AVA7-50(1-5/8")	C	No	Inside Pole	96.00 - 1.00	12	No Ice	0.00	0.70
						1/2" Ice	0.00	0.70
						1" Ice	0.00	0.70
						2" Ice	0.00	0.70
						4" Ice	0.00	0.70
FSJ2-50(3/8")	C	No	Inside Pole	98.00 - 1.00	1	No Ice	0.00	0.08
						1/2" Ice	0.00	0.08
						1" Ice	0.00	0.08
						2" Ice	0.00	0.08
						4" Ice	0.00	0.08
***								
Step Pegs (CaAa)	C	No	CaAa (Out Of Face)	100.00 - 1.00	1	No Ice	0.08	2.72
						1/2" Ice	0.18	3.51
						1" Ice	0.28	4.30
						2" Ice	0.48	5.88
						4" Ice	0.88	9.04
Safety Line 3/8	C	No	CaAa (Out Of Face)	100.00 - 1.00	1	No Ice	0.04	0.22
						1/2" Ice	0.14	0.75
						1" Ice	0.24	1.28
						2" Ice	0.44	2.34
						4" Ice	0.84	4.46

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
L1	100.00-76.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	2.820	0.25
L2	76.00-50.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	3.055	0.30
L3	50.00-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	5.758	0.56

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
L1	100.00-76.00	A	0.562	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	8.217	0.28
L2	76.00-50.00	A	0.540	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	8.671	0.33
L3	50.00-1.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	16.341	0.63

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	100.00-76.00	-0.1438	0.0830	-0.3624	0.2093
L2	76.00-50.00	-0.1451	0.0838	-0.3652	0.2109
L3	50.00-1.00	-0.1464	0.0845	-0.3758	0.2170

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	A	From Face	1.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81

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
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	B	From Face	1.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81
ERICSSON AIR 21 B2A B4P w/ Mount Pipe	C	From Face	1.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	6.83 7.35 7.86 8.93 11.18	5.64 6.48 7.26 8.86 12.29	0.11 0.17 0.23 0.38 0.81
Side Arm Mount [SO 104-3]	C	None		0.0000	98.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.30 4.13 4.96 6.62 9.94	3.30 4.13 4.96 6.62 9.94	0.29 0.32 0.35 0.41 0.53
**********									
RRUS 11 B12	A	From Face	1.00 0.00 3.00	0.0000	93.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.31 3.55 3.80 4.33 5.50	1.36 1.54 1.73 2.13 3.04	0.05 0.07 0.10 0.15 0.31
RRUS 11 B12	B	From Face	1.00 0.00 3.00	0.0000	93.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.31 3.55 3.80 4.33 5.50	1.36 1.54 1.73 2.13 3.04	0.05 0.07 0.10 0.15 0.31
RRUS 11 B12	C	From Face	1.00 0.00 3.00	0.0000	93.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.31 3.55 3.80 4.33 5.50	1.36 1.54 1.73 2.13 3.04	0.05 0.07 0.10 0.15 0.31
KRC 118 048/1 w/ Mount Pipe	A	From Face	1.00 0.00 3.00	0.0000	93.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.78 12.50 13.23 14.74 18.00	11.04 12.56 14.12 16.47 21.36	0.15 0.25 0.36 0.60 1.27
KRC 118 048/1 w/ Mount Pipe	B	From Face	1.00 0.00 3.00	0.0000	93.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.78 12.50 13.23 14.74 18.00	11.04 12.56 14.12 16.47 21.36	0.15 0.25 0.36 0.60 1.27
KRC 118 048/1 w/ Mount Pipe	C	From Face	1.00 0.00 3.00	0.0000	93.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	11.78 12.50 13.23 14.74 18.00	11.04 12.56 14.12 16.47 21.36	0.15 0.25 0.36 0.60 1.27
Side Arm Mount [SO 104-3]	C	None		0.0000	93.00	No Ice 1/2" Ice 1" Ice 2" Ice 4" Ice	3.30 4.13 4.96 6.62 9.94	3.30 4.13 4.96 6.62 9.94	0.29 0.32 0.35 0.41 0.53

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice
9	Dead+Wind 210 deg - No Ice
10	Dead+Wind 240 deg - No Ice
11	Dead+Wind 270 deg - No Ice
12	Dead+Wind 300 deg - No Ice
13	Dead+Wind 330 deg - No Ice
14	Dead+Ice+Temp
15	Dead+Wind 0 deg+Ice+Temp
16	Dead+Wind 30 deg+Ice+Temp
17	Dead+Wind 60 deg+Ice+Temp
18	Dead+Wind 90 deg+Ice+Temp
19	Dead+Wind 120 deg+Ice+Temp
20	Dead+Wind 150 deg+Ice+Temp
21	Dead+Wind 180 deg+Ice+Temp
22	Dead+Wind 210 deg+Ice+Temp
23	Dead+Wind 240 deg+Ice+Temp
24	Dead+Wind 270 deg+Ice+Temp
25	Dead+Wind 300 deg+Ice+Temp
26	Dead+Wind 330 deg+Ice+Temp
27	Dead+Wind 0 deg - Service
28	Dead+Wind 30 deg - Service
29	Dead+Wind 60 deg - Service
30	Dead+Wind 90 deg - Service
31	Dead+Wind 120 deg - Service
32	Dead+Wind 150 deg - Service
33	Dead+Wind 180 deg - Service
34	Dead+Wind 210 deg - Service
35	Dead+Wind 240 deg - Service
36	Dead+Wind 270 deg - Service
37	Dead+Wind 300 deg - Service
38	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	100 - 76	Pole	Max Tension	5	0.00	0.00	0.00
			Max. Compression	14	-3.98	0.09	-0.05
			Max. Mx	11	-2.72	75.40	-0.03
			Max. My	8	-2.72	0.06	-75.37
			Max. Vy	11	-4.28	75.40	-0.03
			Max. Vx	8	4.28	0.06	-75.37
			Max. Torque	13			0.02
L2	76 - 50	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-5.84	0.18	-0.10
			Max. Mx	11	-4.15	182.32	-0.07
			Max. My	8	-4.15	0.12	-182.26
			Max. Vy	11	-5.57	182.32	-0.07

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	8	5.57	0.12	-182.26
			Max. Torque	13			0.04
L3	50 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	14	-12.66	0.46	-0.26
			Max. Mx	11	-9.84	562.85	-0.18
			Max. My	8	-9.84	0.31	-562.71
			Max. Vy	11	-8.74	562.85	-0.18
			Max. Vx	8	8.74	0.31	-562.71
			Max. Torque	13			0.08

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	23	12.66	1.74	-1.01
	Max. H_x	11	9.85	8.73	0.00
	Max. H_z	2	9.85	0.00	8.73
	Max. M_x	2	562.35	0.00	8.73
	Max. M_z	5	562.22	-8.73	0.00
	Max. Torsion	13	0.08	4.37	7.56
	Min. Vert	1	9.85	0.00	0.00
	Min. H_x	5	9.85	-8.73	0.00
	Min. H_z	8	9.85	0.00	-8.73
	Min. M_x	8	-562.71	0.00	-8.73
	Min. M_z	11	-562.85	8.73	0.00
	Min. Torsion	7	-0.08	-4.37	-7.56

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	9.85	0.00	0.00	0.18	0.31	0.00
Dead+Wind 0 deg - No Ice	9.85	0.00	-8.73	-562.35	0.31	-0.07
Dead+Wind 30 deg - No Ice	9.85	4.37	-7.56	-486.99	-280.96	-0.04
Dead+Wind 60 deg - No Ice	9.85	7.56	-4.37	-281.09	-486.86	-0.00
Dead+Wind 90 deg - No Ice	9.85	8.73	0.00	0.18	-562.22	0.04
Dead+Wind 120 deg - No Ice	9.85	7.56	4.37	281.45	-486.86	0.07
Dead+Wind 150 deg - No Ice	9.85	4.37	7.56	487.35	-280.96	0.08
Dead+Wind 180 deg - No Ice	9.85	0.00	8.73	562.71	0.31	0.07
Dead+Wind 210 deg - No Ice	9.85	-4.37	7.56	487.35	281.58	0.04
Dead+Wind 240 deg - No Ice	9.85	-7.56	4.37	281.45	487.48	-0.00
Dead+Wind 270 deg - No Ice	9.85	-8.73	0.00	0.18	562.85	-0.04
Dead+Wind 300 deg - No Ice	9.85	-7.56	-4.37	-281.09	487.48	-0.07
Dead+Wind 330 deg - No Ice	9.85	-4.37	-7.56	-486.99	281.58	-0.08
Dead+Ice+Temp	12.66	0.00	0.00	0.26	0.46	0.00
Dead+Wind 0 deg+Ice+Temp	12.66	0.00	-2.01	-130.48	0.47	-0.04
Dead+Wind 30 deg+Ice+Temp	12.66	1.01	-1.74	-112.96	-64.91	-0.02
Dead+Wind 60 deg+Ice+Temp	12.66	1.74	-1.01	-65.10	-112.76	0.00
Dead+Wind 90 deg+Ice+Temp	12.66	2.01	0.00	0.27	-130.28	0.02
Dead+Wind 120 deg+Ice+Temp	12.66	1.74	1.01	65.64	-112.76	0.04
Dead+Wind 150 deg+Ice+Temp	12.66	1.01	1.74	113.50	-64.91	0.05

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_z	Overturning Moment, M_x	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead+Wind 180 deg+Ice+Temp	12.66	0.00	2.01	131.02	0.47	0.04
Dead+Wind 210 deg+Ice+Temp	12.66	-1.01	1.74	113.50	65.84	0.02
Dead+Wind 240 deg+Ice+Temp	12.66	-1.74	1.01	65.64	113.70	0.00
Dead+Wind 270 deg+Ice+Temp	12.66	-2.01	0.00	0.27	131.21	-0.02
Dead+Wind 300 deg+Ice+Temp	12.66	-1.74	-1.01	-65.10	113.70	-0.04
Dead+Wind 330 deg+Ice+Temp	12.66	-1.01	-1.74	-112.96	65.84	-0.05
Dead+Wind 0 deg - Service	9.85	0.00	-3.02	-194.51	0.31	-0.02
Dead+Wind 30 deg - Service	9.85	1.51	-2.62	-168.43	-97.03	-0.01
Dead+Wind 60 deg - Service	9.85	2.62	-1.51	-97.17	-168.30	-0.00
Dead+Wind 90 deg - Service	9.85	3.02	0.00	0.18	-194.38	0.01
Dead+Wind 120 deg - Service	9.85	2.62	1.51	97.53	-168.30	0.02
Dead+Wind 150 deg - Service	9.85	1.51	2.62	168.79	-97.03	0.03
Dead+Wind 180 deg - Service	9.85	0.00	3.02	194.87	0.31	0.02
Dead+Wind 210 deg - Service	9.85	-1.51	2.62	168.79	97.66	0.01
Dead+Wind 240 deg - Service	9.85	-2.62	1.51	97.53	168.92	-0.00
Dead+Wind 270 deg - Service	9.85	-3.02	0.00	0.18	195.00	-0.01
Dead+Wind 300 deg - Service	9.85	-2.62	-1.51	-97.17	168.92	-0.02
Dead+Wind 330 deg - Service	9.85	-1.51	-2.62	-168.43	97.66	-0.03

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-9.85	0.00	0.00	9.85	0.00	0.000%
2	0.00	-9.85	-8.73	0.00	9.85	8.73	0.000%
3	4.37	-9.85	-7.56	-4.37	9.85	7.56	0.000%
4	7.56	-9.85	-4.37	-7.56	9.85	4.37	0.000%
5	8.73	-9.85	0.00	-8.73	9.85	0.00	0.000%
6	7.56	-9.85	4.37	-7.56	9.85	-4.37	0.000%
7	4.37	-9.85	7.56	-4.37	9.85	-7.56	0.000%
8	0.00	-9.85	8.73	0.00	9.85	-8.73	0.000%
9	-4.37	-9.85	7.56	4.37	9.85	-7.56	0.000%
10	-7.56	-9.85	4.37	7.56	9.85	-4.37	0.000%
11	-8.73	-9.85	0.00	8.73	9.85	0.00	0.000%
12	-7.56	-9.85	-4.37	7.56	9.85	4.37	0.000%
13	-4.37	-9.85	-7.56	4.37	9.85	7.56	0.000%
14	0.00	-12.66	0.00	0.00	12.66	0.00	0.000%
15	0.00	-12.66	-2.01	0.00	12.66	2.01	0.000%
16	1.01	-12.66	-1.74	-1.01	12.66	1.74	0.000%
17	1.74	-12.66	-1.01	-1.74	12.66	1.01	0.000%
18	2.01	-12.66	0.00	-2.01	12.66	0.00	0.000%
19	1.74	-12.66	1.01	-1.74	12.66	-1.01	0.000%
20	1.01	-12.66	1.74	-1.01	12.66	-1.74	0.000%
21	0.00	-12.66	2.01	0.00	12.66	-2.01	0.000%
22	-1.01	-12.66	1.74	1.01	12.66	-1.74	0.000%
23	-1.74	-12.66	1.01	1.74	12.66	-1.01	0.000%
24	-2.01	-12.66	0.00	2.01	12.66	0.00	0.000%
25	-1.74	-12.66	-1.01	1.74	12.66	1.01	0.000%
26	-1.01	-12.66	-1.74	1.01	12.66	1.74	0.000%
27	0.00	-9.85	-3.02	0.00	9.85	3.02	0.000%
28	1.51	-9.85	-2.62	-1.51	9.85	2.62	0.000%
29	2.62	-9.85	-1.51	-2.62	9.85	1.51	0.000%
30	3.02	-9.85	0.00	-3.02	9.85	0.00	0.000%
31	2.62	-9.85	1.51	-2.62	9.85	-1.51	0.000%
32	1.51	-9.85	2.62	-1.51	9.85	-2.62	0.000%
33	0.00	-9.85	3.02	0.00	9.85	-3.02	0.000%
34	-1.51	-9.85	2.62	1.51	9.85	-2.62	0.000%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
35	-2.62	-9.85	1.51	2.62	9.85	-1.51	0.000%
36	-3.02	-9.85	0.00	3.02	9.85	0.00	0.000%
37	-2.62	-9.85	-1.51	2.62	9.85	1.51	0.000%
38	-1.51	-9.85	-2.62	1.51	9.85	2.62	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00002512
3	Yes	5	0.00000001	0.00002323
4	Yes	5	0.00000001	0.00002334
5	Yes	4	0.00000001	0.00001905
6	Yes	5	0.00000001	0.00002355
7	Yes	5	0.00000001	0.00002317
8	Yes	4	0.00000001	0.00002513
9	Yes	5	0.00000001	0.00002353
10	Yes	5	0.00000001	0.00002343
11	Yes	4	0.00000001	0.00001907
12	Yes	5	0.00000001	0.00002322
13	Yes	5	0.00000001	0.00002360
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00044424
16	Yes	4	0.00000001	0.00047167
17	Yes	4	0.00000001	0.00047159
18	Yes	4	0.00000001	0.00044345
19	Yes	4	0.00000001	0.00047331
20	Yes	4	0.00000001	0.00047360
21	Yes	4	0.00000001	0.00044632
22	Yes	4	0.00000001	0.00047651
23	Yes	4	0.00000001	0.00047657
24	Yes	4	0.00000001	0.00044705
25	Yes	4	0.00000001	0.00047490
26	Yes	4	0.00000001	0.00047464
27	Yes	4	0.00000001	0.00000001
28	Yes	4	0.00000001	0.00008315
29	Yes	4	0.00000001	0.00008401
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00008593
32	Yes	4	0.00000001	0.00008268
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00008592
35	Yes	4	0.00000001	0.00008503
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00008318
38	Yes	4	0.00000001	0.00008646

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L_u	Kl/r	F_a	A	Actual P	Allow. P_a	Ratio $\frac{P}{P_a}$
	ft		ft	ft		ksi	in^2	K	K	
L1	100 - 76 (1)	TP25.08x21x0.1875	24.00	0.00	0.0	39.000	14.8141	-2.72	577.75	0.005
L2	76 - 50 (2)	TP29.5x25.08x0.1875	26.00	0.00	0.0	38.731	17.0146	-4.15	658.99	0.006
L3	50 - 1 (3)	TP37.46x28.4025x0.25	53.25	0.00	0.0	39.000	29.5261	-9.84	1151.52	0.009

Pole Bending Design Data

Section No.	Elevation	Size	Actual M_x	Actual f_{bx}	Allow. F_{bx}	Ratio $\frac{f_{bx}}{F_{bx}}$	Actual M_y	Actual f_{by}	Allow. F_{by}	Ratio $\frac{f_{by}}{F_{by}}$
	ft		kip-ft	ksi	ksi		kip-ft	ksi	ksi	
L1	100 - 76 (1)	TP25.08x21x0.1875	75.41	9.941	39.000	0.255	0.00	0.000	39.000	0.000
L2	76 - 50 (2)	TP29.5x25.08x0.1875	182.34	18.204	38.731	0.470	0.00	0.000	38.731	0.000
L3	50 - 1 (3)	TP37.46x28.4025x0.25	562.89	24.887	39.000	0.638	0.00	0.000	39.000	0.000

Pole Shear Design Data

Section No.	Elevation	Size	Actual V	Actual f_v	Allow. F_v	Ratio $\frac{f_v}{F_v}$	Actual T	Actual f_{vt}	Allow. F_{vt}	Ratio $\frac{f_{vt}}{F_{vt}}$
	ft		K	ksi	ksi		kip-ft	ksi	ksi	
L1	100 - 76 (1)	TP25.08x21x0.1875	4.28	0.289	26.000	0.022	0.00	0.000	26.000	0.000
L2	76 - 50 (2)	TP29.5x25.08x0.1875	5.57	0.328	26.000	0.025	0.00	0.000	26.000	0.000
L3	50 - 1 (3)	TP37.46x28.4025x0.25	8.74	0.296	26.000	0.023	0.00	0.000	26.000	0.000

Pole Interaction Design Data

Section No.	Elevation	Ratio $\frac{P}{P_a}$	Ratio $\frac{f_{bx}}{F_{bx}}$	Ratio $\frac{f_{by}}{F_{by}}$	Ratio $\frac{f_v}{F_v}$	Ratio $\frac{f_{vt}}{F_{vt}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft								
L1	100 - 76 (1)	0.005	0.255	0.000	0.022	0.000	0.260	1.333	H1-3+VT
L2	76 - 50 (2)	0.006	0.470	0.000	0.025	0.000	0.476	1.333	H1-3+VT
L3	50 - 1 (3)	0.009	0.638	0.000	0.023	0.000	0.647	1.333	H1-3+VT

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	$SF*P_{allow}$ K	% Capacity	Pass Fail
L1	100 - 76	Pole	TP25.08x21x0.1875	1	-2.72	770.14	19.5	Pass
L2	76 - 50	Pole	TP29.5x25.08x0.1875	2	-4.15	878.43	35.7	Pass
L3	50 - 1	Pole	TP37.46x28.4025x0.25	3	-9.84	1534.98	48.5	Pass
							Summary	
						Pole (L3)	48.5	Pass
						RATING =	**48.5**	**Pass**

Stiffened or Unstiffened, Exterior Flange Plate - Any Bolt Material TIA Rev F

Site Data

BU#:
Site Name:
App #:

Pole Manufacturer:	Other

Reactions		
Moment:	75.41	ft-kips
Axial:	2.72	kips
Shear:	4.28	kips
Elevation:	75	feet

If No stiffeners, Criteria: AISC ASD <-Only Applcable to Unstiffened Cases

Bolt Data			
Qty:	10		
Diameter (in.):	0.75	Bolt Fu:	120
Bolt Material:	A325	Bolt Fy:	92
N/A:	75	<-- Disregard	Bolt Fty: 44.00
N/A:	55	<-- Disregard	
Circle (in.):	27.625		

Plate Data		
Diam:	29.875	in
Thick, t:	0.75	in
Grade (Fy):	50	ksi
Strength, Fu:	65	ksi
Single-Rod B-eff:	5.84	in

Stiffener Data (Welding at Both Sides)		
Config:	0	*
Weld Type:	Fillet	
Groove Depth:	0.25	<-- Disregard
Groove Angle:	45	<-- Disregard
Fillet H. Weld:	0.25	in
Fillet V. Weld:	0.25	in
Width:	3	in
Height:	8	in
Thick:	0.5	in
Notch:	0.375	in
Grade:	36	ksi
Weld str.:	70	ksi

Pole Data		
Diam:	25.08	in
Thick:	0.1875	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Stress Increase Factor		
ASIF:	1.333	

Flange Bolt Results

		Rigid
Bolt Tension Capacity, B:	25.91 kips	Service, ASD
Max Bolt directly applied T:	12.83 Kips	Fty*ASIF
Min. PL "tc" for B cap. w/o Pry:	0.691 in	
Min PL "treq" for actual T w/ Pry:	0.357 in	
Min PL "t1" for actual T w/o Pry:	0.487 in	
T allowable w/o Prying:	25.91 kips	α'<0 case
Prying Force, Q:	0.00 kips	
Total Bolt Tension=T+Q:	12.83 kips	
Non-Prying Bolt Stress Ratio, T/B:	49.5% Pass	

Exterior Flange Plate Results Flexural Check

		Rigid
Compression Side Plate Stress:	24.2 ksi	Service ASD
Allowable Plate Stress:	50.0 ksi	0.75*Fy*ASIF
Compression Plate Stress Ratio:	48.4% Pass	Comp. Y.L. Length:
No Prying		7.50
Tension Side Stress Ratio, (treq/t)^2:	22.6% Pass	

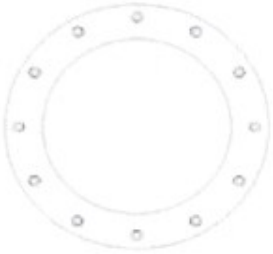
n/a

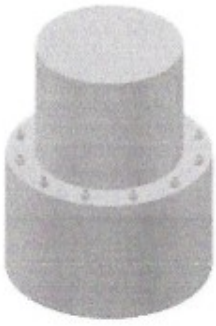
Stiffener Results

Horizontal Weld :	n/a
Vertical Weld:	n/a
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	n/a
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	n/a
Plate Comp. (AISC Bracket):	n/a

Pole Results

Pole Punching Shear Check: n/a





* 0 = none, 1 = every bolt, 2 = every 2 bolts, 3 = 2 per bolt

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Square, Stiffened / Unstiffened Base Plate, Any Rod Material - Rev. F /G

Assumptions: 1) Rod groups at corners. Total # rods divisible by 4. Maximum total # of rods = 48 (12 per Corner).
2) Rod Spacing = Straight Center-to-Center distance between any (2) adjacent rods (same corner)
3) Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

Site ID: CTNL801A
Site Name: Amtrak_OldLyme2

Base Reactions		
TIA Revision:	F	
Unfactored Moment, M:	562.89	ft-kips
Unfactored Axial, P:	9.84	kips
Unfactored Shear, V:	8.74	kips

Anchor Rod Data		
Qty:	8	
Diam:	2.25	in
Rod Material:	A615-J	
Yield, Fy:	75	ksi
Strength, Fu:	100	ksi
Bolt Circle:	43.25	in
Anchor Spacing:	6	in

Anchor Rod Results

TIA F --> Maximum Rod Tension	76.9 Kips
Allowable Tension:	195.0 Kips
Anchor Rod Stress Ratio:	39.4% Pass

Plate Data		
W=Side:	41	in
Thick:	2.25	in
Grade:	50	ksi
Clip Distance:	5	in

Base Plate Results Flexural Check

Base Plate Stress:	24.4 ksi
Allowable PL Bending Stress:	50.0 ksi
Base Plate Stress Ratio:	48.8% Pass

PL Ref. Data
Yield Line (in): 20.52
Max PL Length: 20.52

Stiffener Data (Welding at both sides)		
Configuration:	Unstiffened	
Weld Type:		**
Groove Depth:		in **
Groove Angle:		degrees
Fillet H. Weld:		<-- Disregard
Fillet V. Weld:		in
Width:		in
Height:		in
Thick:		in
Notch:		in
Grade:		ksi
Weld str.:		ksi

N/A - Unstiffened

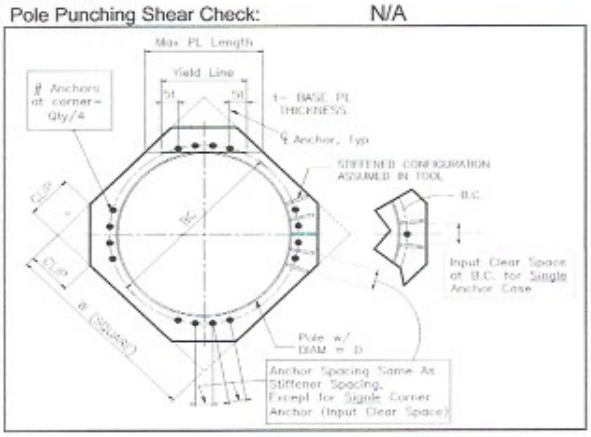
Stiffener Results

Horizontal Weld :	N/A
Vertical Weld:	N/A
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	N/A
Plate Tension+Shear, ft/Ft+(fv/Fv)^2:	N/A
Plate Comp. (AISC Bracket):	N/A

Pole Results

Pole Punching Shear Check: N/A

Pole Data		
Diam:	37.46	in
Thick:	0.25	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round



Stress Increase Factor		
ASD ASIF:	1.333	

** Note: for complete joint penetration groove welds the groove depth must be exactly 1/2 the stiffener thickness for calculation purposes

Monopole Pier and Pad Foundation

Site ID: CTNL801A
Site Name: Amtrak_OldLyme2

TIA-222 Revision: F

Design Reactions		
Shear, **S**:	8.74	kips
Moment, **M**:	562.89	ft-kips
Tower Height, **H**:	100	ft
Tower Weight, **Wt**:	9.84	kips
Base Diameter, **BD**:	3.12	ft

Foundation Dimensions		
Depth, **D**:	6	ft
Pad Width, **W**:	17	ft
Neglected Depth, **N**:	3.33	ft
Thickness, **T**:	1.50	ft
Pier Diameter, **Pd**:	5.50	ft
Ext. Above Grade, **E**:	0.50	ft
BP Dist. Above Pier:	0	in.
Clear Cover, **Cc**:	3.0	in

Soil Properties		
Soil Unit Weight, **γ**:	0.100	kcf
Ult. Bearing Capacity, Bc:	8.0	ksf
Angle of Friction, **Φ**:	0	deg
Cohesion, **Co**:	0.000	ksf
Passive Pressure, **Pp**:	0.000	ksf
Base Friction, **μ**:	0.30	

Material Properties		
Rebar Yield Strength, **Fy**:	60000	psi
Concrete Strength, **F'c**:	4000	psi
Concrete Unit Weight, **δc**:	0.150	kcf
Seismic Zone, **z**:	1	

Rebar Properties		
Pier Rebar Size, **Sp**:	7	
Pier Rebar Quanity, **mp**:	30	29
Pad Rebar Size, **Spad**:	8	
Pad Rebar Quanity, **mpad**:	18	4
Pier Tie Size, **St**:	5	3
Tie Quanity, **mt**:	7	7

Design Checks	Capacity/ Availability	Demand/ Limits	Check
Req'd Pier Diam.(ft)	5.5	4.62	**OK**
Overturning (ft-kips)	1017.84	562.89	**55.3%**
Shear Capacity (kips)	31.81	8.74	**27.5%**
Bearing (ksf)	6.00	1.66	**27.6%**
Pad Shear - 1-way (kips)	280.62	129.33	**46.1%**
Pad Shear - 2-way (kips)	695.77	42.91	**6.2%**
Pad Moment Capacity (k-ft)	888.50	226.67	**25.5%**
Pier Moment Capacity (k-ft)	9815.92	606.59	**6.2%**