November 10, 2016

VIA EMAIL AND HAND DELIVERY

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

RE: T-Mobile Northeast LLC –CTNH584
Tower Share Application
33 Keegan Road, Plymouth, CT 06782
LAT: 41-39-42.334 N
LNG: -73-02-44.321 W

Dear Ms. Bachman:

This letter and attachments are submitted on behalf of T-Mobile Northeast LLC ("T-Mobile"). T-Mobile plans to install antennas and related equipment at the tower located at 33 Keegan Road, Plymouth, CT.

T-Mobile will install nine (9) 700/1900/2100 MHz antennas at the 130' level of the existing 140' monopole tower. Six (6) 1 5/8 " Coax cables and one (2) hybrid cable will also be installed on the face of the tower. T-Mobile's equipment and utility cabinets will be placed on a 10' x 20' concrete pad inside the existing fenced compound. Included are plans prepared by Centek Engineering dated September 28th 2016, depicting the planned changes and attached as **Exhibit A**. Also included is a structural analysis prepared by Centek Engineering dated September 28th 2016, confirming that the existing tower is structurally capable of supporting T-Mobile's equipment. The structural analysis is attached as **Exhibit B**.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies 16-50aa, of T-Mobile's intent to share a telecommunications facility pursuant to R.C.S.A. 16-50j-88. In accordance with R.C.S.A., a copy of this letter is being sent to Mayor David V. Merchant, Town of Plymouth. Also, please see the attached letter from t Verizon Wireless authorizing the proposed shared use of the facility attached as **Exhibit C.**

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. 16-50j-89.

1. The proposed equipment will not result in an increase in the height of the existing structure. The top of the lattice tower is approximately 140' AGL; T-Mobile's proposed antennas will be located at a centerline height of 130' AGL.

2. The proposed modifications will not require the extension of the site boundary as depicted on the attached site plan. T-Mobile's equipment pad will be located within the existing fenced compound.

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 proposed 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 3.09%; the combined site operations will result in a total power density of 3.09% as evidenced by the power density calculations attached as **Exhibit D**.

5. The proposed equipment will not cause a change or alteration in the physical or environmental characteristics of the site.

Connecticut General Statutes 16-50aa indicates that the Council must approve the shared use of a telecommunications facility provided it finds the shared use is technically, legally, environmentally and economically feasible and meets the public safety concerns. As demonstrated in this letter, T-Mobile respectfully submits that the shared use of this facility satisfies these criteria:

A. Technical Feasibility. The existing lattice tower has been deemed to be structural capable of supporting T-Mobile's proposed loading. The structural analysis is included as **Exhibit B**.
B. Legal Feasibility. As referenced above, C.G.S. 16-50aa has been authorized to issue orders approving the shared use of an existing tower such as this lattice tower in Enfield. Under the authority granted to the Council, an order of the Council approving the requested shared use would permit T-Mobile to obtain a building permit for the proposed installation. Further, a letter of authorization from Verizon Wireless is included as **Exhibit C** authorizing T-Mobile to file this application for shared use.
C. Environmental Feasibility. The proposed shared use of this facility would have a minimal environmental effect. The installation of T-Mobile's equipment at 130' AGL on the existing 140' lattice tower would have an insignificant visual impact on the area around the tower. T-Mobile's ground equipment will be installed within the existing fenced compound. Therefore, T-Mobile's shared use would not cause any significant alteration in the physical or environmental characteristics of the existing site. Additionally, as evidenced by **Exhibit D**, the proposed antennas will not increase radio frequency emissions to a level at or above the Federal Communications Commission safety standard.
D. Economic Feasibility. T-Mobile will be entering into an agreement with the Town of Enfield under mutually agreeable terms.
E. Public Safety Concerns. As discussed above, the lattice tower is structurally

capable of supporting T-Mobile's proposed loading. T-Mobile is not aware of any public safety concerns relative to the proposed sharing of the existing monopole tower. T-Mobile's intent to provide new and improved wireless service through the shared use of this facility is expected to enhance the safety and welfare of residents and individuals traveling through the Town of Plymouth.

Respectfully submitted,

By: *Matthew Bandle*

Matthew Bandle, Agent for T-Mobile
Site Acquisition Project Manager
508-642-8801
MBandle@VerticalDevelopmentllc.com

Attachments

cc: Mayor David V. Merchant, Town of Plymouth and Verizon Wireless.

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

140-ft Existing Valmont Monopole

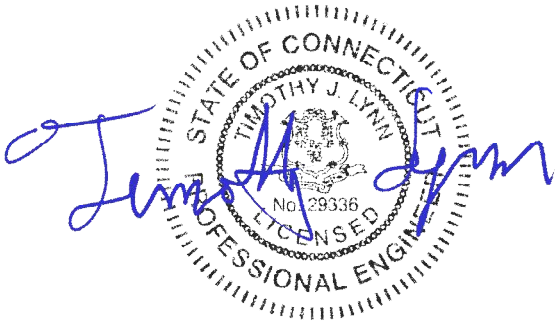
Proposed T-Mobile
Antenna Installation

T-Mobile Site Ref: CTNH584A

33 Keegan Road
Plymouth, CT

Centek Project No. 16141.00

Date: September 28, 2016



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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Introduction

The purpose of this report is to summarize the results of the non-linear, P-Δ structural analysis of the antenna installation proposed by T-Mobile on the existing monopole (tower) located in in Plymouth, CT.

The host tower is a 140-ft, three-section, eighteen sided, tapered monopole, originally designed and manufactured by Valmont job no: 301371, dated September 10, 2015. The tower geometry, structure member sizes and foundation system information were obtained from the aforementioned design documents.

Antenna and appurtenance information were obtained from a T-Mobile RF data sheet.

The tower is made up of three (3) tapered vertical sections consisting of A572-65 pole sections. The vertical tower sections are slip joint connected. The diameter of the pole (flat-flat) is 23.49-in at the top and 60.00-in at the base.

T-Mobile proposes the installation of nine (9) panel antennas mounted to a low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

The existing, proposed and future loads considered in this analysis consist of the following:

- VERIZON (Existing):
  Antennas: Six (6) Andrew HBXX-6517DS panel antennas, six (6) Andrew LNX-6514DS panel antennas, three (3) Alcatel-Lucent RRH2x60-AWS remote radio heads, three (3) Alcatel-Lucent RRH2x60-LTE remote radio heads, three (3) Alcatel-Lucent RRH2x60-PCS remote radio heads and two (2) RFS DB-T1-6Z-8AB-0Z main distribution boxes mounted to one (1) low profile platform with a RAD center elevation of 140-ft above grade level.
  Coax Cables: Two (2) 1-5/8" ∅ fiber cables running on the interior of monopole.
- **T-MOBILE (Proposed):**
  Antennas: Three (3) Andrew LNX-6515DS panel antennas, three (3) Ericsson AIR21 B2A/B4P panel antennas and three (3) Ericsson AIR32 panel antennas mounted to one (1) low profile platform with a RAD center elevation of 130-ft above grade level.
  Coax Cables: Six (6) 1-5/8" ∅ coax cables and two (2) 1-5/8" ∅ fiber cables running on the interior of monopole.

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.
- All coax cables are routed as specified in this report.

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 1.0" radial ice on the tower structure and its components.

Basic Wind Speed:	Litchfield; v = 90-100 mph (3-second gust)	*[Annex B of TIA-222-G-2005]*
	Plymouth; v = 93 mph (3 second gust)	*[Appendix N of the 2016 CT Building Code]*
Load Cases:	Load Case 1; 93 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; 40 mph wind speed w/ 1.0" 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

Tower stresses were calculated utilizing the structural analysis software tnxTower. Design flexural strength was determined based on section 4.7 and Table 4-8 of the TIA-222-G.

- Calculated stresses were found to be within allowable limits. In Load Case 1, per tnxTower "Section Capacity Table", this tower was found to be at **29.9%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Pole Shaft (L3)	1.00'-46.42'	29.9%	**PASS**

Foundation and Anchors

The existing foundation consists of a 7.5-ft square x 4.0-ft long reinforced concrete pier on a 26.5-ft square x 2.5-ft thick reinforce concrete pad. The sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned tower design documents. The base of the tower is connected to the foundation by means of (20) 2.25"∅, ASTM A615-75 anchor bolts embedded approximately 6-ft into the concrete foundation structure.

- The tower base reactions developed from the governing Load Case 1 were used in the verification of the foundation and its anchors:

Location	Vector	Proposed Reactions
Base	Shear	21 kips
	Compression	42 kips
	Moment	1999 kip-ft

- The foundation was found to be within allowable limits.

Foundation	Design Limit	TIA-222-G Section 9.4 FS[(1)]	Proposed Loading (FS)[(1)]	Result
Reinforced Concrete Pad and Pier	OTM[(2)]	1.0	3.28	**PASS**

Note 1: FS denotes Factor of Safety.
Note 2: OTM denotes Overturning Moment.

- The anchor bolts and base plate were found to be within allowable limits.

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Combined Axial and Shear	29.0%	**PASS**
Base Plate	Bending	15.6%	**PASS**

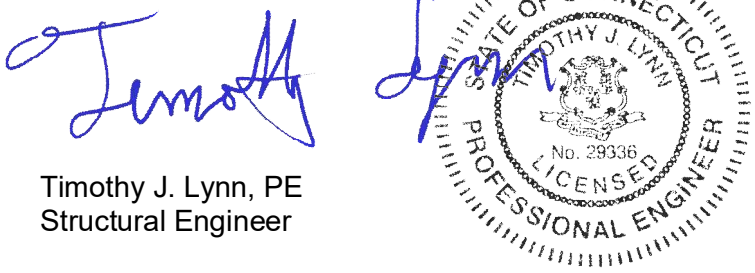
Conclusion

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:



Timothy J. Lynn, PE
Structural Engineer

Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

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

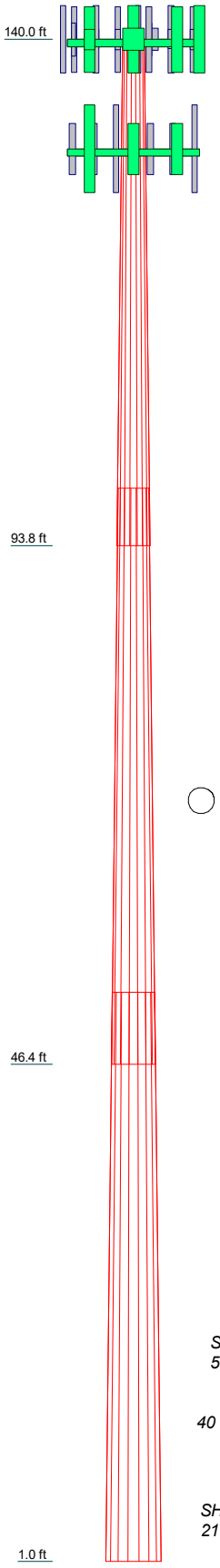
GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	46.250	18	0.375	5.250	23.490	36.180		5.5
2	52.583	18	0.438	6.583	33.990	48.410	A572-65	10.1
3	52.000	18	0.438		45.730	60.000		12.9
								28.5



ALL REACTIONS ARE FACTORED

AXIAL 70 K

SHEAR 5 K

MOMENT 416 kip-ft

TORQUE 0 kip-ft

40 mph WIND - 1.000 in ICE

AXIAL 42 K

SHEAR 21 K

MOMENT 1999 kip-ft

TORQUE 0 kip-ft

REACTIONS - 93 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
HBXX-6517DS (Verizon - Existing)	140	RRH2x60-PCS (Verizon - Existing)	140
LNX-6514DS (Verizon - Existing)	140	RRH2x60-PCS (Verizon - Existing)	140
HBXX-6517DS (Verizon - Existing)	140	RRH2x60-PCS (Verizon - Existing)	140
LNX-6514DS (Verizon - Existing)	140	DB-T1-6Z-8AB-0Z (Verizon - Existing)	140
HBXX-6517DS (Verizon - Existing)	140	DB-T1-6Z-8AB-0Z (Verizon - Existing)	140
LNX-6514DS (Verizon - Existing)	140	Andrew 12'-6" Low Profile Platform (Verizon - Existing)	140
HBXX-6517DS (Verizon - Existing)	140	LNX-6515DS (T-Mobile - Proposed)	130
LNX-6514DS (Verizon - Existing)	140	AIR21 B2A/B4P (T-Mobile - Proposed)	130
HBXX-6517DS (Verizon - Existing)	140	AIR32 (T-Mobile - Proposed)	130
LNX-6514DS (Verizon - Existing)	140	LNX-6515DS (T-Mobile - Proposed)	130
HBXX-6517DS (Verizon - Existing)	140	AIR21 B2A/B4P (T-Mobile - Proposed)	130
LNX-6514DS (Verizon - Existing)	140	AIR32 (T-Mobile - Proposed)	130
RRH2x60-07-U (Verizon - Existing)	140	LNX-6515DS (T-Mobile - Proposed)	130
RRH2x60-07-U (Verizon - Existing)	140	AIR21 B2A/B4P (T-Mobile - Proposed)	130
RRH2x60-07-U (Verizon - Existing)	140	AIR32 (T-Mobile - Proposed)	130
RRH2x60-AWS (Verizon - Existing)	140	Andrew 12'-6" Low Profile Platform (T-Mobile - Proposed)	130
RRH2x60-AWS (Verizon - Existing)	140		
RRH2x60-AWS (Verizon - Existing)	140		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 93 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 40 mph basic wind with 1.00 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 0.000 ft
7. Weld together tower sections have flange connections.
8. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
9. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
10. Welds are fabricated with ER-70S-6 electrodes.
11. TOWER RATING: 29.9%

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

Job: ***16141.00 - CTNH584A***			
Project: ***160' Valmont Monopole - 33 Keegan Road, Plymouth, CT***			
Client: T-Mobile	Drawn by: TJL	App'd:	
Code: TIA-222-G	Date: 09/28/16	Scale: NTS	
Path: J:\Jobs\1614100.WI\04_Structural\Backup Documentation\ER\139' Monopole_Plymouth.eri		Dwg No. E-1	

Tower Input Data

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

Basic wind speed of 93 mph.
Structure Class II.
Exposure Category C.
Topographic Category 1.
Crest Height 0.000 ft.
Nominal ice thickness of 1.000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 40 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in pole design is 1.
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	140.000-93.750	46.250	5.250	18	23.490	36.180	0.375	1.500	A572-65 (65 ksi)
L2	93.750-46.417	52.583	6.583	18	33.990	48.410	0.438	1.750	A572-65 (65 ksi)
L3	46.417-1.000	52.000		18	45.730	60.000	0.438	1.750	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	23.852	27.513	1857.194	8.206	11.933	155.636	3716.832	13.759	3.474	9.265
	36.738	42.617	6902.504	12.711	18.379	375.556	13814.091	21.313	5.708	15.22
L2	35.976	46.591	6626.409	11.911	17.267	383.769	13261.536	23.300	5.212	11.913
	49.157	66.616	19368.656	17.030	24.592	787.591	38762.798	33.314	7.750	17.715
L3	48.270	62.894	16300.151	16.079	23.231	701.665	32621.749	31.453	7.278	16.636
	60.926	82.710	37071.587	21.145	30.480	1216.259	74191.955	41.363	9.790	22.377

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 140.000-93.750				1	1	1			
L2 93.750-46.417				1	1	1			
L3 46.417-1.000				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 klf
HYBRIFLEX 1-5/8" (Verizon - Existing)	C	No	Inside Pole	140.000 - 1.000	2	No Ice	0.000	0.002
						1/2" Ice	0.000	0.002
						1" Ice	0.000	0.002
1 5/8 (T-Mobile - Proposed)	C	No	Inside Pole	140.000 - 1.000	6	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
HYBRIFLEX 1-5/8" (T-Mobile - Proposed)	C	No	Inside Pole	140.000 - 1.000	2	No Ice	0.000	0.002
						1/2" Ice	0.000	0.002
						1" Ice	0.000	0.002

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	140.000-93.750	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.640
L2	93.750-46.417	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.655
L3	46.417-1.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	0.000	0.000	0.629

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	140.000-93.750	A	2.267	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.640
L2	93.750-46.417	A	2.154	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.655
L3	46.417-1.000	A	1.936	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	0.000	0.000	0.629

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice

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
HBXX-6517DS	A	From Face	3.000	0.000	140.000	No Ice	8.528	5.243	0.050
(Verizon - Existing)			-6.000			1/2" Ice	9.000	5.709	0.100
			0.000			1" Ice	9.480	6.183	0.157
LNX-6514DS	A	From Face	3.000	0.000	140.000	No Ice	8.173	5.405	0.038
(Verizon - Existing)			-4.000			1/2" Ice	8.633	5.863	0.089
			0.000			1" Ice	9.100	6.327	0.145
HBXX-6517DS	A	From Face	3.000	0.000	140.000	No Ice	8.528	5.243	0.050
(Verizon - Existing)			0.000			1/2" Ice	9.000	5.709	0.100
			0.000			1" Ice	9.480	6.183	0.157
LNX-6514DS	A	From Face	3.000	0.000	140.000	No Ice	8.173	5.405	0.038
(Verizon - Existing)			4.000			1/2" Ice	8.633	5.863	0.089
			0.000			1" Ice	9.100	6.327	0.145

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
HBXX-6517DS	B	From Face	3.000	0.000	140.000	No Ice	8.528	5.243	0.050
(Verizon - Existing)			-6.000			1/2" Ice	9.000	5.709	0.100
			0.000			1" Ice	9.480	6.183	0.157
LNX-6514DS	B	From Face	3.000	0.000	140.000	No Ice	8.173	5.405	0.038
(Verizon - Existing)			-4.000			1/2" Ice	8.633	5.863	0.089
			0.000			1" Ice	9.100	6.327	0.145
HBXX-6517DS	B	From Face	3.000	0.000	140.000	No Ice	8.528	5.243	0.050
(Verizon - Existing)			0.000			1/2" Ice	9.000	5.709	0.100
			0.000			1" Ice	9.480	6.183	0.157
LNX-6514DS	B	From Face	3.000	0.000	140.000	No Ice	8.173	5.405	0.038
(Verizon - Existing)			4.000			1/2" Ice	8.633	5.863	0.089
			0.000			1" Ice	9.100	6.327	0.145
HBXX-6517DS	C	From Face	3.000	0.000	140.000	No Ice	8.528	5.243	0.050
(Verizon - Existing)			-6.000			1/2" Ice	9.000	5.709	0.100
			0.000			1" Ice	9.480	6.183	0.157
LNX-6514DS	C	From Face	3.000	0.000	140.000	No Ice	8.173	5.405	0.038
(Verizon - Existing)			-4.000			1/2" Ice	8.633	5.863	0.089
			0.000			1" Ice	9.100	6.327	0.145
HBXX-6517DS	C	From Face	3.000	0.000	140.000	No Ice	8.528	5.243	0.050
(Verizon - Existing)			0.000			1/2" Ice	9.000	5.709	0.100
			0.000			1" Ice	9.480	6.183	0.157
LNX-6514DS	C	From Face	3.000	0.000	140.000	No Ice	8.173	5.405	0.038
(Verizon - Existing)			4.000			1/2" Ice	8.633	5.863	0.089
			0.000			1" Ice	9.100	6.327	0.145
RRH2x60-07-U	A	From Face	3.000	0.000	140.000	No Ice	2.100	1.406	0.050
(Verizon - Existing)			0.000			1/2" Ice	2.287	1.565	0.068
			0.000			1" Ice	2.481	1.737	0.089
RRH2x60-07-U	B	From Face	3.000	0.000	140.000	No Ice	2.100	1.406	0.050
(Verizon - Existing)			0.000			1/2" Ice	2.287	1.565	0.068
			0.000			1" Ice	2.481	1.737	0.089
RRH2x60-07-U	C	From Face	3.000	0.000	140.000	No Ice	2.100	1.406	0.050
(Verizon - Existing)			0.000			1/2" Ice	2.287	1.565	0.068
			0.000			1" Ice	2.481	1.737	0.089
RRH2x60-AWS	A	From Face	3.000	0.000	140.000	No Ice	3.357	2.025	0.055
(Verizon - Existing)			-4.000			1/2" Ice	3.614	2.258	0.078
			0.000			1" Ice	3.878	2.498	0.105
RRH2x60-AWS	B	From Face	3.000	0.000	140.000	No Ice	3.357	2.025	0.055
(Verizon - Existing)			-4.000			1/2" Ice	3.614	2.258	0.078
			0.000			1" Ice	3.878	2.498	0.105
RRH2x60-AWS	C	From Face	3.000	0.000	140.000	No Ice	3.357	2.025	0.055
(Verizon - Existing)			-4.000			1/2" Ice	3.614	2.258	0.078
			0.000			1" Ice	3.878	2.498	0.105
RRH2x60-PCS	A	From Face	3.000	0.000	140.000	No Ice	2.150	1.346	0.055
(Verizon - Existing)			4.000			1/2" Ice	2.340	1.504	0.073
			0.000			1" Ice	2.537	1.669	0.093
RRH2x60-PCS	B	From Face	3.000	0.000	140.000	No Ice	2.150	1.346	0.055
(Verizon - Existing)			4.000			1/2" Ice	2.340	1.504	0.073
			0.000			1" Ice	2.537	1.669	0.093
RRH2x60-PCS	C	From Face	3.000	0.000	140.000	No Ice	2.150	1.346	0.055
(Verizon - Existing)			4.000			1/2" Ice	2.340	1.504	0.073
			0.000			1" Ice	2.537	1.669	0.093
DB-T1-6Z-8AB-0Z	B	From Face	1.000	0.000	140.000	No Ice	4.800	2.000	0.044
(Verizon - Existing)			0.000			1/2" Ice	5.070	2.193	0.080
			0.000			1" Ice	5.348	2.393	0.120
DB-T1-6Z-8AB-0Z	C	From Face	1.000	0.000	140.000	No Ice	4.800	2.000	0.044
(Verizon - Existing)			0.000			1/2" Ice	5.070	2.193	0.080
			0.000			1" Ice	5.348	2.393	0.120

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
Andrew 12'-6" Low Profile Platform (Verizon - Existing)	C	None		0.000	140.000	No Ice 1/2" Ice 1" Ice	14.450 19.000 23.550	14.450 19.000 23.550	1.300 1.690 2.080
LNX-6515DS (T-Mobile - Proposed)	A	From Face	3.000 4.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	11.445 12.064 12.689	7.696 8.289 8.889	0.055 0.121 0.194
AIR21 B2A/B4P (T-Mobile - Proposed)	A	From Face	3.000 0.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	6.049 6.419 6.795	4.356 4.705 5.061	0.083 0.125 0.172
AIR32 (T-Mobile - Proposed)	A	From Face	3.000 -4.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	6.510 6.887 7.271	4.712 5.068 5.431	0.133 0.179 0.230
LNX-6515DS (T-Mobile - Proposed)	B	From Face	3.000 4.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	11.445 12.064 12.689	7.696 8.289 8.889	0.055 0.121 0.194
AIR21 B2A/B4P (T-Mobile - Proposed)	B	From Face	3.000 0.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	6.049 6.419 6.795	4.356 4.705 5.061	0.083 0.125 0.172
AIR32 (T-Mobile - Proposed)	B	From Face	3.000 -4.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	6.510 6.887 7.271	4.712 5.068 5.431	0.133 0.179 0.230
LNX-6515DS (T-Mobile - Proposed)	C	From Face	3.000 4.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	11.445 12.064 12.689	7.696 8.289 8.889	0.055 0.121 0.194
AIR21 B2A/B4P (T-Mobile - Proposed)	C	From Face	3.000 0.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	6.049 6.419 6.795	4.356 4.705 5.061	0.083 0.125 0.172
AIR32 (T-Mobile - Proposed)	C	From Face	3.000 -4.000 0.000	0.000	130.000	No Ice 1/2" Ice 1" Ice	6.510 6.887 7.271	4.712 5.068 5.431	0.133 0.179 0.230
Andrew 12'-6" Low Profile Platform (T-Mobile - Proposed)	C	None		0.000	130.000	No Ice 1/2" Ice 1" Ice	14.450 19.000 23.550	14.450 19.000 23.550	1.300 1.690 2.080

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z ksf	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
L1 140.000-93.75 0	115.474	1.305	0.027	116.763	A B C	0.000 0.000 0.000	116.763 116.763 116.763	116.763	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L2 93.750-46.417	69.285	1.172	0.025	167.899	A B C	0.000 0.000 0.000	167.899 167.899 167.899	167.899	100.00 100.00 100.00	0.000 0.000 0.000	0.000 0.000 0.000
L3 46.417-1.000	23.829	0.936	0.020	206.638	A B	0.000 0.000	206.638 206.638	206.638	100.00 100.00	0.000 0.000	0.000 0.000

Section Elevation ft	z ft	K_Z	q_z ksf	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	0.000	206.638		100.00	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z ksf	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
L1	115.474	1.305	0.005	2.267	134.237	A	0.000	134.237	134.237	100.00	0.000	0.000
140.000-93.750						B	0.000	134.237		100.00	0.000	0.000
						C	0.000	134.237		100.00	0.000	0.000
L2	69.285	1.172	0.005	2.154	185.782	A	0.000	185.782	185.782	100.00	0.000	0.000
93.750-46.417						B	0.000	185.782		100.00	0.000	0.000
						C	0.000	185.782		100.00	0.000	0.000
L3 46.417-1.000	23.829	0.936	0.004	1.936	222.943	A	0.000	222.943	222.943	100.00	0.000	0.000
						B	0.000	222.943		100.00	0.000	0.000
						C	0.000	222.943		100.00	0.000	0.000

Tower Pressure - Service

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z ksf	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
L1	115.474	1.305	0.010	116.763	A	0.000	116.763	116.763	100.00	0.000	0.000
140.000-93.75					B	0.000	116.763		100.00	0.000	0.000
0					C	0.000	116.763		100.00	0.000	0.000
L2	69.285	1.172	0.009	167.899	A	0.000	167.899	167.899	100.00	0.000	0.000
93.750-46.417					B	0.000	167.899		100.00	0.000	0.000
					C	0.000	167.899		100.00	0.000	0.000
L3	23.829	0.936	0.007	206.638	A	0.000	206.638	206.638	100.00	0.000	0.000
46.417-1.000					B	0.000	206.638		100.00	0.000	0.000
					C	0.000	206.638		100.00	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 ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.640	5.518	A	1	0.65	0.027	1	1	116.763	2.288	0.049	C
140.000-93.75			B	1	0.65		1	1	116.763			
0			C	1	0.65		1	1	116.763			
L2	0.655	10.128	A	1	0.65	0.025	1	1	167.899	2.947	0.062	C
93.750-46.417			B	1	0.65		1	1	167.899			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
			C	1	0.65		1	1	167.899			
L3	0.629	12.882	A	1	0.65	0.020	1	1	206.638	2.881	0.063	C
46.417-1.000			B	1	0.65		1	1	206.638			
			C	1	0.65		1	1	206.638			
Sum Weight:	1.924	28.528						OTM	528.946 kip-ft	8.116		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.640	5.518	A	1	0.65	0.027	1	1	116.763	2.288	0.049	C
140.000-93.75			B	1	0.65		1	1	116.763			
0			C	1	0.65		1	1	116.763			
L2	0.655	10.128	A	1	0.65	0.025	1	1	167.899	2.947	0.062	C
93.750-46.417			B	1	0.65		1	1	167.899			
			C	1	0.65		1	1	167.899			
L3	0.629	12.882	A	1	0.65	0.020	1	1	206.638	2.881	0.063	C
46.417-1.000			B	1	0.65		1	1	206.638			
			C	1	0.65		1	1	206.638			
Sum Weight:	1.924	28.528						OTM	528.946 kip-ft	8.116		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.640	5.518	A	1	0.65	0.027	1	1	116.763	2.288	0.049	C
140.000-93.75			B	1	0.65		1	1	116.763			
0			C	1	0.65		1	1	116.763			
L2	0.655	10.128	A	1	0.65	0.025	1	1	167.899	2.947	0.062	C
93.750-46.417			B	1	0.65		1	1	167.899			
			C	1	0.65		1	1	167.899			
L3	0.629	12.882	A	1	0.65	0.020	1	1	206.638	2.881	0.063	C
46.417-1.000			B	1	0.65		1	1	206.638			
			C	1	0.65		1	1	206.638			
Sum Weight:	1.924	28.528						OTM	528.946 kip-ft	8.116		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.640	5.518	A	1	0.65	0.027	1	1	116.763	2.288	0.049	C
140.000-93.75			B	1	0.65		1	1	116.763			
0			C	1	0.65		1	1	116.763			
L2	0.655	10.128	A	1	0.65	0.025	1	1	167.899	2.947	0.062	C
93.750-46.417			B	1	0.65		1	1	167.899			
			C	1	0.65		1	1	167.899			
L3	0.629	12.882	A	1	0.65	0.020	1	1	206.638	2.881	0.063	C
46.417-1.000			B	1	0.65		1	1	206.638			
			C	1	0.65		1	1	206.638			
Sum Weight:	1.924	28.528						OTM	528.946 kip-ft	8.116		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.640	9.673	A	1	1.2	0.005	1	1	134.237	0.898	0.019	C
140.000-93.75			B	1	1.2		1	1	134.237			
0			C	1	1.2		1	1	134.237			
L2	0.655	15.674	A	1	1.2	0.005	1	1	185.782	1.114	0.024	C
93.750-46.417			B	1	1.2		1	1	185.782			
			C	1	1.2		1	1	185.782			
L3	0.629	18.927	A	1	1.2	0.004	1	1	222.943	1.062	0.023	C
46.417-1.000			B	1	1.2		1	1	222.943			
			C	1	1.2		1	1	222.943			
Sum Weight:	1.924	44.275						OTM	203.128 kip-ft	3.074		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.640	9.673	A	1	1.2	0.005	1	1	134.237	0.898	0.019	C
140.000-93.75			B	1	1.2		1	1	134.237			
0			C	1	1.2		1	1	134.237			
L2	0.655	15.674	A	1	1.2	0.005	1	1	185.782	1.114	0.024	C
93.750-46.417			B	1	1.2		1	1	185.782			
			C	1	1.2		1	1	185.782			
L3	0.629	18.927	A	1	1.2	0.004	1	1	222.943	1.062	0.023	C
46.417-1.000			B	1	1.2		1	1	222.943			
			C	1	1.2		1	1	222.943			
Sum Weight:	1.924	44.275						OTM	203.128 kip-ft	3.074		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.640	9.673	A	1	1.2	0.005	1	1	134.237	0.898	0.019	C
140.000-93.75			B	1	1.2		1	1	134.237			
0			C	1	1.2		1	1	134.237			
L2	0.655	15.674	A	1	1.2	0.005	1	1	185.782	1.114	0.024	C
93.750-46.417			B	1	1.2		1	1	185.782			
			C	1	1.2		1	1	185.782			
L3	0.629	18.927	A	1	1.2	0.004	1	1	222.943	1.062	0.023	C
46.417-1.000			B	1	1.2		1	1	222.943			
			C	1	1.2		1	1	222.943			
Sum Weight:	1.924	44.275						OTM	203.128 kip-ft	3.074		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.640	9.673	A	1	1.2	0.005	1	1	134.237	0.898	0.019	C
140.000-93.75			B	1	1.2		1	1	134.237			
0			C	1	1.2		1	1	134.237			
L2	0.655	15.674	A	1	1.2	0.005	1	1	185.782	1.114	0.024	C
93.750-46.417			B	1	1.2		1	1	185.782			
			C	1	1.2		1	1	185.782			
L3	0.629	18.927	A	1	1.2	0.004	1	1	222.943	1.062	0.023	C
46.417-1.000			B	1	1.2		1	1	222.943			
			C	1	1.2		1	1	222.943			
Sum Weight:	1.924	44.275						OTM	203.128 kip-ft	3.074		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.640	5.518	A	1	0.65	0.010	1	1	116.763	0.852	0.018	C
140.000-93.75			B	1	0.65		1	1	116.763			
0			C	1	0.65		1	1	116.763			
L2	0.655	10.128	A	1	0.65	0.009	1	1	167.899	1.098	0.023	C
93.750-46.417			B	1	0.65		1	1	167.899			
			C	1	0.65		1	1	167.899			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L3	0.629	12.882	A	1	0.65	0.007	1	1	206.638	1.073	0.024	C
46.417-1.000			B	1	0.65		1	1	206.638			
			C	1	0.65		1	1	206.638			
Sum Weight:	1.924	28.528						OTM	196.989 kip-ft	3.023		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.640	5.518	A	1	0.65	0.010	1	1	116.763	0.852	0.018	C
140.000-93.75			B	1	0.65		1	1	116.763			
0			C	1	0.65		1	1	116.763			
L2	0.655	10.128	A	1	0.65	0.009	1	1	167.899	1.098	0.023	C
93.750-46.417			B	1	0.65		1	1	167.899			
			C	1	0.65		1	1	167.899			
L3	0.629	12.882	A	1	0.65	0.007	1	1	206.638	1.073	0.024	C
46.417-1.000			B	1	0.65		1	1	206.638			
			C	1	0.65		1	1	206.638			
Sum Weight:	1.924	28.528						OTM	196.989 kip-ft	3.023		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft²	F K	w klf	Ctrl. Face
L1	0.640	5.518	A	1	0.65	0.010	1	1	116.763	0.852	0.018	C
140.000-93.75			B	1	0.65		1	1	116.763			
0			C	1	0.65		1	1	116.763			
L2	0.655	10.128	A	1	0.65	0.009	1	1	167.899	1.098	0.023	C
93.750-46.417			B	1	0.65		1	1	167.899			
			C	1	0.65		1	1	167.899			
L3	0.629	12.882	A	1	0.65	0.007	1	1	206.638	1.073	0.024	C
46.417-1.000			B	1	0.65		1	1	206.638			
			C	1	0.65		1	1	206.638			
Sum Weight:	1.924	28.528						OTM	196.989 kip-ft	3.023		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z ksf	D_F	D_R	A_E ft^2	F K	w klf	Ctrl. Face
L1	0.640	5.518	A	1	0.65	0.010	1	1	116.763	0.852	0.018	C
140.000-93.75			B	1	0.65		1	1	116.763			
0			C	1	0.65		1	1	116.763			
L2	0.655	10.128	A	1	0.65	0.009	1	1	167.899	1.098	0.023	C
93.750-46.417			B	1	0.65		1	1	167.899			
			C	1	0.65		1	1	167.899			
L3	0.629	12.882	A	1	0.65	0.007	1	1	206.638	1.073	0.024	C
46.417-1.000			B	1	0.65		1	1	206.638			
			C	1	0.65		1	1	206.638			
Sum Weight:	1.924	28.528						OTM	196.989 kip-ft	3.023		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Leg Weight	28.528					
Bracing Weight	0.000					
Total Member Self-Weight	28.528			0.044	-0.075	
Total Weight	34.961			0.044	-0.075	
Wind 0 deg - No Ice		0.030	-13.251	-1222.968	-4.313	0.086
Wind 30 deg - No Ice		6.634	-11.491	-1061.234	-612.804	0.100
Wind 45 deg - No Ice		9.366	-9.391	-867.753	-864.411	0.096
Wind 60 deg - No Ice		11.460	-6.652	-615.132	-1057.115	0.086
Wind 90 deg - No Ice		13.216	-0.030	-4.194	-1218.193	0.050
Wind 120 deg - No Ice		11.430	6.599	607.879	-1052.877	0.000
Wind 135 deg - No Ice		9.323	9.348	861.846	-858.418	-0.026
Wind 150 deg - No Ice		6.581	11.460	1057.083	-605.464	-0.050
Wind 180 deg - No Ice		-0.030	13.251	1223.055	4.163	-0.086
Wind 210 deg - No Ice		-6.634	11.491	1061.321	612.654	-0.100
Wind 225 deg - No Ice		-9.366	9.391	867.840	864.260	-0.096
Wind 240 deg - No Ice		-11.460	6.652	615.219	1056.964	-0.086
Wind 270 deg - No Ice		-13.216	0.030	4.281	1218.042	-0.050
Wind 300 deg - No Ice		-11.430	-6.599	-607.792	1052.726	0.000
Wind 315 deg - No Ice		-9.323	-9.348	-861.759	858.267	0.026
Wind 330 deg - No Ice		-6.581	-11.460	-1056.996	605.313	0.050
Member Ice	15.746					
Total Weight Ice	61.980			0.248	-0.429	
Wind 0 deg - Ice		0.006	-4.527	-399.241	-1.314	0.024
Wind 30 deg - Ice		2.265	-3.924	-346.162	-200.429	0.027
Wind 45 deg - Ice		3.201	-3.206	-282.859	-282.814	0.026
Wind 60 deg - Ice		3.918	-2.269	-200.262	-345.954	0.024
Wind 90 deg - Ice		4.520	-0.006	-0.637	-398.897	0.014
Wind 120 deg - Ice		3.911	2.258	199.226	-345.070	0.000
Wind 135 deg - Ice		3.192	3.197	282.104	-281.563	-0.007
Wind 150 deg - Ice		2.254	3.918	345.773	-198.897	-0.014
Wind 180 deg - Ice		-0.006	4.527	399.737	0.455	-0.024
Wind 210 deg - Ice		-2.265	3.924	346.658	199.570	-0.027
Wind 225 deg - Ice		-3.201	3.206	283.355	281.955	-0.026
Wind 240 deg - Ice		-3.918	2.269	200.758	345.096	-0.024
Wind 270 deg - Ice		-4.520	0.006	1.133	398.038	-0.014
Wind 300 deg - Ice		-3.911	-2.258	-198.730	344.211	0.000

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 315 deg - Ice		-3.192	-3.197	-281.608	280.704	0.007
Wind 330 deg - Ice		-2.254	-3.918	-345.277	198.038	0.014
Total Weight	34.961			0.044	-0.075	
Wind 0 deg - Service		0.011	-4.935	-455.429	-1.654	0.032
Wind 30 deg - Service		2.471	-4.279	-395.197	-228.267	0.037
Wind 45 deg - Service		3.488	-3.497	-323.140	-321.971	0.036
Wind 60 deg - Service		4.268	-2.477	-229.060	-393.737	0.032
Wind 90 deg - Service		4.922	-0.011	-1.535	-453.726	0.019
Wind 120 deg - Service		4.257	2.458	226.413	-392.159	0.000
Wind 135 deg - Service		3.472	3.481	320.995	-319.739	-0.010
Wind 150 deg - Service		2.451	4.268	393.705	-225.534	-0.019
Wind 180 deg - Service		-0.011	4.935	455.516	1.503	-0.032
Wind 210 deg - Service		-2.471	4.279	395.284	228.117	-0.037
Wind 225 deg - Service		-3.488	3.497	323.227	321.820	-0.036
Wind 240 deg - Service		-4.268	2.477	229.147	393.586	-0.032
Wind 270 deg - Service		-4.922	0.011	1.622	453.575	-0.019
Wind 300 deg - Service		-4.257	-2.458	-226.326	392.008	0.000
Wind 315 deg - Service		-3.472	-3.481	-320.908	319.588	0.010
Wind 330 deg - Service		-2.451	-4.268	-393.618	225.383	0.019

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 45 deg - No Ice
7	0.9 Dead+1.6 Wind 45 deg - No Ice
8	1.2 Dead+1.6 Wind 60 deg - No Ice
9	0.9 Dead+1.6 Wind 60 deg - No Ice
10	1.2 Dead+1.6 Wind 90 deg - No Ice
11	0.9 Dead+1.6 Wind 90 deg - No Ice
12	1.2 Dead+1.6 Wind 120 deg - No Ice
13	0.9 Dead+1.6 Wind 120 deg - No Ice
14	1.2 Dead+1.6 Wind 135 deg - No Ice
15	0.9 Dead+1.6 Wind 135 deg - No Ice
16	1.2 Dead+1.6 Wind 150 deg - No Ice
17	0.9 Dead+1.6 Wind 150 deg - No Ice
18	1.2 Dead+1.6 Wind 180 deg - No Ice
19	0.9 Dead+1.6 Wind 180 deg - No Ice
20	1.2 Dead+1.6 Wind 210 deg - No Ice
21	0.9 Dead+1.6 Wind 210 deg - No Ice
22	1.2 Dead+1.6 Wind 225 deg - No Ice
23	0.9 Dead+1.6 Wind 225 deg - No Ice
24	1.2 Dead+1.6 Wind 240 deg - No Ice
25	0.9 Dead+1.6 Wind 240 deg - No Ice
26	1.2 Dead+1.6 Wind 270 deg - No Ice
27	0.9 Dead+1.6 Wind 270 deg - No Ice
28	1.2 Dead+1.6 Wind 300 deg - No Ice
29	0.9 Dead+1.6 Wind 300 deg - No Ice
30	1.2 Dead+1.6 Wind 315 deg - No Ice
31	0.9 Dead+1.6 Wind 315 deg - No Ice
32	1.2 Dead+1.6 Wind 330 deg - No Ice

Comb. No.	Description
33	0.9 Dead+1.6 Wind 330 deg - No Ice
34	1.2 Dead+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
39	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
40	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
41	1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp
42	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
43	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
44	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
45	1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp
46	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
47	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
48	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
49	1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp
50	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
51	Dead+Wind 0 deg - Service
52	Dead+Wind 30 deg - Service
53	Dead+Wind 45 deg - Service
54	Dead+Wind 60 deg - Service
55	Dead+Wind 90 deg - Service
56	Dead+Wind 120 deg - Service
57	Dead+Wind 135 deg - Service
58	Dead+Wind 150 deg - Service
59	Dead+Wind 180 deg - Service
60	Dead+Wind 210 deg - Service
61	Dead+Wind 225 deg - Service
62	Dead+Wind 240 deg - Service
63	Dead+Wind 270 deg - Service
64	Dead+Wind 300 deg - Service
65	Dead+Wind 315 deg - Service
66	Dead+Wind 330 deg - Service

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
L1	140 - 93.75	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-26.774	-0.445	-0.257
			Max. Mx	10	-11.507	-374.532	1.992
			Max. My	18	-11.504	1.954	-376.851
			Max. Vy	10	11.653	-374.532	1.992
			Max. Vx	18	11.711	1.954	-376.851
			Max. Torque	4			-0.163
L2	93.75 - 46.417	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-44.692	-0.445	-0.257
			Max. Mx	10	-23.646	-1012.491	4.301
			Max. My	18	-23.644	4.262	-1017.477
			Max. Vy	10	16.161	-1012.491	4.301
			Max. Vx	18	16.219	4.262	-1017.477
			Max. Torque	4			-0.163
L3	46.417 - 1	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	34	-70.464	-0.445	-0.257
			Max. Mx	10	-41.947	-1986.640	6.880
			Max. My	18	-41.947	6.840	-1994.604
			Max. Vy	10	21.158	-1986.640	6.880

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vx	18	21.215	6.840	-1994.604
			Max. Torque	4			-0.163

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	34	70.464	0.000	0.000
	Max. H_x	26	41.953	21.145	-0.049
	Max. H_z	2	41.953	-0.049	21.201
	Max. M_x	2	1994.495	-0.049	21.201
	Max. M_z	10	1986.640	-21.145	0.049
	Max. Torsion	20	0.163	10.615	-18.385
	Min. Vert	31	31.465	14.917	14.957
	Min. H_x	10	41.953	-21.145	0.049
	Min. H_z	18	41.953	0.049	-21.201
	Min. M_x	18	-1994.604	0.049	-21.201
	Min. M_z	26	-1986.452	21.145	-0.049
	Min. Torsion	4	-0.163	-10.615	18.385

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	34.961	0.000	0.000	0.044	-0.075	0.000
1.2 Dead+1.6 Wind 0 deg - No Ice	41.953	0.049	-21.201	-1994.495	-7.028	0.141
0.9 Dead+1.6 Wind 0 deg - No Ice	31.465	0.049	-21.201	-1984.821	-6.964	0.140
1.2 Dead+1.6 Wind 30 deg - No Ice	41.953	10.615	-18.385	-1730.742	-999.369	0.163
0.9 Dead+1.6 Wind 30 deg - No Ice	31.465	10.615	-18.385	-1722.346	-994.490	0.162
1.2 Dead+1.6 Wind 45 deg - No Ice	41.953	14.986	-15.026	-1415.207	-1409.694	0.157
0.9 Dead+1.6 Wind 45 deg - No Ice	31.465	14.986	-15.026	-1408.343	-1402.823	0.156
1.2 Dead+1.6 Wind 60 deg - No Ice	41.953	18.336	-10.643	-1003.226	-1723.957	0.141
0.9 Dead+1.6 Wind 60 deg - No Ice	31.465	18.336	-10.643	-998.361	-1715.563	0.140
1.2 Dead+1.6 Wind 90 deg - No Ice	41.953	21.145	-0.049	-6.880	-1986.640	0.081
0.9 Dead+1.6 Wind 90 deg - No Ice	31.465	21.145	-0.049	-6.854	-1976.973	0.081
1.2 Dead+1.6 Wind 120 deg - No Ice	41.953	18.288	10.558	991.326	-1717.028	0.000
0.9 Dead+1.6 Wind 120 deg - No Ice	31.465	18.288	10.558	986.503	-1708.673	0.000
1.2 Dead+1.6 Wind 135 deg - No Ice	41.953	14.917	14.957	1405.514	-1399.892	-0.042

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
0.9 Dead+1.6 Wind 135 deg - No Ice	31.465	14.917	14.957	1398.677	-1393.077	-0.042
1.2 Dead+1.6 Wind 150 deg - No Ice	41.953	10.530	18.336	1723.921	-987.362	-0.081
0.9 Dead+1.6 Wind 150 deg - No Ice	31.465	10.530	18.336	1715.536	-982.550	-0.081
1.2 Dead+1.6 Wind 180 deg - No Ice	41.953	-0.049	21.201	1994.604	6.840	-0.141
0.9 Dead+1.6 Wind 180 deg - No Ice	31.465	-0.049	21.201	1984.901	6.825	-0.140
1.2 Dead+1.6 Wind 210 deg - No Ice	41.953	-10.615	18.385	1730.850	999.182	-0.163
0.9 Dead+1.6 Wind 210 deg - No Ice	31.465	-10.615	18.385	1722.426	994.350	-0.162
1.2 Dead+1.6 Wind 225 deg - No Ice	41.953	-14.986	15.026	1415.316	1409.506	-0.157
0.9 Dead+1.6 Wind 225 deg - No Ice	31.465	-14.986	15.026	1408.423	1402.684	-0.156
1.2 Dead+1.6 Wind 240 deg - No Ice	41.953	-18.336	10.643	1003.334	1723.770	-0.141
0.9 Dead+1.6 Wind 240 deg - No Ice	31.465	-18.336	10.643	998.442	1715.423	-0.140
1.2 Dead+1.6 Wind 270 deg - No Ice	41.953	-21.145	0.049	6.988	1986.452	-0.081
0.9 Dead+1.6 Wind 270 deg - No Ice	31.465	-21.145	0.049	6.935	1976.834	-0.081
1.2 Dead+1.6 Wind 300 deg - No Ice	41.953	-18.288	-10.558	-991.218	1716.840	0.000
0.9 Dead+1.6 Wind 300 deg - No Ice	31.465	-18.288	-10.558	-986.422	1708.533	0.000
1.2 Dead+1.6 Wind 315 deg - No Ice	41.953	-14.917	-14.957	-1405.406	1399.704	0.042
0.9 Dead+1.6 Wind 315 deg - No Ice	31.465	-14.917	-14.957	-1398.597	1392.938	0.042
1.2 Dead+1.6 Wind 330 deg - No Ice	41.953	-10.530	-18.336	-1723.812	987.174	0.081
0.9 Dead+1.6 Wind 330 deg - No Ice	31.465	-10.530	-18.336	-1715.456	982.411	0.081
1.2 Dead+1.0 Ice+1.0 Temp	70.464	0.000	0.000	0.257	-0.445	0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	70.464	0.006	-4.527	-415.512	-1.412	0.027
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	70.464	2.266	-3.924	-360.271	-208.647	0.031
1.2 Dead+1.0 Wind 45 deg+1.0 Ice+1.0 Temp	70.464	3.201	-3.206	-294.386	-294.391	0.030
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	70.464	3.918	-2.269	-208.421	-360.105	0.027
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	70.464	4.520	-0.006	-0.650	-415.203	0.015
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	70.464	3.911	2.258	207.371	-359.176	0.000
1.2 Dead+1.0 Wind 135 deg+1.0 Ice+1.0 Temp	70.464	3.192	3.197	293.631	-293.077	-0.008
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	70.464	2.254	3.918	359.901	-207.039	-0.015
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	70.464	-0.006	4.527	416.071	0.445	-0.027
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	70.464	-2.266	3.924	360.829	207.680	-0.031
1.2 Dead+1.0 Wind 225 deg+1.0 Ice+1.0 Temp	70.464	-3.201	3.206	294.945	293.424	-0.030

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	70.464	-3.918	2.269	208.979	359.138	-0.027
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	70.464	-4.520	0.006	1.208	414.235	-0.015
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	70.464	-3.911	-2.258	-206.812	358.209	0.000
1.2 Dead+1.0 Wind 315 deg+1.0 Ice+1.0 Temp	70.464	-3.192	-3.197	-293.073	292.110	0.008
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	70.464	-2.254	-3.918	-359.342	206.072	0.015
Dead+Wind 0 deg - Service	34.961	0.011	-4.935	-462.776	-1.686	0.033
Dead+Wind 30 deg - Service	34.961	2.471	-4.279	-401.574	-231.953	0.038
Dead+Wind 45 deg - Service	34.961	3.488	-3.497	-328.356	-327.166	0.036
Dead+Wind 60 deg - Service	34.961	4.268	-2.477	-232.758	-400.089	0.033
Dead+Wind 90 deg - Service	34.961	4.922	-0.011	-1.563	-461.042	0.019
Dead+Wind 120 deg - Service	34.961	4.257	2.458	230.063	-398.480	0.000
Dead+Wind 135 deg - Service	34.961	3.472	3.481	326.172	-324.892	-0.010
Dead+Wind 150 deg - Service	34.961	2.451	4.268	400.056	-229.167	-0.019
Dead+Wind 180 deg - Service	34.961	-0.011	4.935	462.866	1.530	-0.033
Dead+Wind 210 deg - Service	34.961	-2.471	4.279	401.664	231.797	-0.038
Dead+Wind 225 deg - Service	34.961	-3.488	3.497	328.446	327.010	-0.036
Dead+Wind 240 deg - Service	34.961	-4.268	2.477	232.848	399.933	-0.033
Dead+Wind 270 deg - Service	34.961	-4.922	0.011	1.653	460.886	-0.019
Dead+Wind 300 deg - Service	34.961	-4.257	-2.458	-229.973	398.325	0.000
Dead+Wind 315 deg - Service	34.961	-3.472	-3.481	-326.082	324.736	0.010
Dead+Wind 330 deg - Service	34.961	-2.451	-4.268	-399.966	229.012	0.019

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	0.000	-34.961	0.000	0.000	34.961	0.000	0.000%
2	0.049	-41.953	-21.201	-0.049	41.953	21.201	0.000%
3	0.049	-31.465	-21.201	-0.049	31.465	21.201	0.000%
4	10.615	-41.953	-18.385	-10.615	41.953	18.385	0.000%
5	10.615	-31.465	-18.385	-10.615	31.465	18.385	0.000%
6	14.986	-41.953	-15.026	-14.986	41.953	15.026	0.000%
7	14.986	-31.465	-15.026	-14.986	31.465	15.026	0.000%
8	18.336	-41.953	-10.643	-18.336	41.953	10.643	0.000%
9	18.336	-31.465	-10.643	-18.336	31.465	10.643	0.000%
10	21.145	-41.953	-0.049	-21.145	41.953	0.049	0.000%
11	21.145	-31.465	-0.049	-21.145	31.465	0.049	0.000%
12	18.288	-41.953	10.558	-18.288	41.953	-10.558	0.000%
13	18.288	-31.465	10.558	-18.288	31.465	-10.558	0.000%
14	14.917	-41.953	14.957	-14.917	41.953	-14.957	0.000%
15	14.917	-31.465	14.957	-14.917	31.465	-14.957	0.000%
16	10.530	-41.953	18.336	-10.530	41.953	-18.336	0.000%
17	10.530	-31.465	18.336	-10.530	31.465	-18.336	0.000%
18	-0.049	-41.953	21.201	0.049	41.953	-21.201	0.000%
19	-0.049	-31.465	21.201	0.049	31.465	-21.201	0.000%
20	-10.615	-41.953	18.385	10.615	41.953	-18.385	0.000%
21	-10.615	-31.465	18.385	10.615	31.465	-18.385	0.000%
22	-14.986	-41.953	15.026	14.986	41.953	-15.026	0.000%
23	-14.986	-31.465	15.026	14.986	31.465	-15.026	0.000%
24	-18.336	-41.953	10.643	18.336	41.953	-10.643	0.000%
25	-18.336	-31.465	10.643	18.336	31.465	-10.643	0.000%
26	-21.145	-41.953	0.049	21.145	41.953	-0.049	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
27	-21.145	-31.465	0.049	21.145	31.465	-0.049	0.000%
28	-18.288	-41.953	-10.558	18.288	41.953	10.558	0.000%
29	-18.288	-31.465	-10.558	18.288	31.465	10.558	0.000%
30	-14.917	-41.953	-14.957	14.917	41.953	14.957	0.000%
31	-14.917	-31.465	-14.957	14.917	31.465	14.957	0.000%
32	-10.530	-41.953	-18.336	10.530	41.953	18.336	0.000%
33	-10.530	-31.465	-18.336	10.530	31.465	18.336	0.000%
34	0.000	-70.464	0.000	0.000	70.464	0.000	0.000%
35	0.006	-70.464	-4.527	-0.006	70.464	4.527	0.000%
36	2.265	-70.464	-3.924	-2.266	70.464	3.924	0.000%
37	3.201	-70.464	-3.206	-3.201	70.464	3.206	0.000%
38	3.918	-70.464	-2.269	-3.918	70.464	2.269	0.000%
39	4.520	-70.464	-0.006	-4.520	70.464	0.006	0.000%
40	3.911	-70.464	2.258	-3.911	70.464	-2.258	0.000%
41	3.192	-70.464	3.197	-3.192	70.464	-3.197	0.000%
42	2.254	-70.464	3.918	-2.254	70.464	-3.918	0.000%
43	-0.006	-70.464	4.527	0.006	70.464	-4.527	0.000%
44	-2.265	-70.464	3.924	2.266	70.464	-3.924	0.000%
45	-3.201	-70.464	3.206	3.201	70.464	-3.206	0.000%
46	-3.918	-70.464	2.269	3.918	70.464	-2.269	0.000%
47	-4.520	-70.464	0.006	4.520	70.464	-0.006	0.000%
48	-3.911	-70.464	-2.258	3.911	70.464	2.258	0.000%
49	-3.192	-70.464	-3.197	3.192	70.464	3.197	0.000%
50	-2.254	-70.464	-3.918	2.254	70.464	3.918	0.000%
51	0.011	-34.961	-4.935	-0.011	34.961	4.935	0.000%
52	2.471	-34.961	-4.279	-2.471	34.961	4.279	0.000%
53	3.488	-34.961	-3.497	-3.488	34.961	3.497	0.000%
54	4.268	-34.961	-2.477	-4.268	34.961	2.477	0.000%
55	4.922	-34.961	-0.011	-4.922	34.961	0.011	0.000%
56	4.257	-34.961	2.458	-4.257	34.961	-2.458	0.000%
57	3.472	-34.961	3.481	-3.472	34.961	-3.481	0.000%
58	2.451	-34.961	4.268	-2.451	34.961	-4.268	0.000%
59	-0.011	-34.961	4.935	0.011	34.961	-4.935	0.000%
60	-2.471	-34.961	4.279	2.471	34.961	-4.279	0.000%
61	-3.488	-34.961	3.497	3.488	34.961	-3.497	0.000%
62	-4.268	-34.961	2.477	4.268	34.961	-2.477	0.000%
63	-4.922	-34.961	0.011	4.922	34.961	-0.011	0.000%
64	-4.257	-34.961	-2.458	4.257	34.961	2.458	0.000%
65	-3.472	-34.961	-3.481	3.472	34.961	3.481	0.000%
66	-2.451	-34.961	-4.268	2.451	34.961	4.268	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	0.00001748
3	Yes	4	0.00000001	0.00001029
4	Yes	4	0.00000001	0.00038906
5	Yes	4	0.00000001	0.00025768
6	Yes	4	0.00000001	0.00044121
7	Yes	4	0.00000001	0.00029164
8	Yes	4	0.00000001	0.00038019
9	Yes	4	0.00000001	0.00025172
10	Yes	4	0.00000001	0.00001342
11	Yes	4	0.00000001	0.00000705

12	Yes	4	0.00000001	0.00037468
13	Yes	4	0.00000001	0.00024835
14	Yes	4	0.00000001	0.00043123
15	Yes	4	0.00000001	0.00028532
16	Yes	4	0.00000001	0.00037770
17	Yes	4	0.00000001	0.00025034
18	Yes	4	0.00000001	0.00001407
19	Yes	4	0.00000001	0.00000759
20	Yes	4	0.00000001	0.00038031
21	Yes	4	0.00000001	0.00025175
22	Yes	4	0.00000001	0.00044103
23	Yes	4	0.00000001	0.00029153
24	Yes	4	0.00000001	0.00038748
25	Yes	4	0.00000001	0.00025670
26	Yes	4	0.00000001	0.00001553
27	Yes	4	0.00000001	0.00000878
28	Yes	4	0.00000001	0.00037438
29	Yes	4	0.00000001	0.00024821
30	Yes	4	0.00000001	0.00043088
31	Yes	4	0.00000001	0.00028514
32	Yes	4	0.00000001	0.00037302
33	Yes	4	0.00000001	0.00024721
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00033302
36	Yes	4	0.00000001	0.00034153
37	Yes	4	0.00000001	0.00034403
38	Yes	4	0.00000001	0.00034145
39	Yes	4	0.00000001	0.00033341
40	Yes	4	0.00000001	0.00034031
41	Yes	4	0.00000001	0.00034283
42	Yes	4	0.00000001	0.00034072
43	Yes	4	0.00000001	0.00033410
44	Yes	4	0.00000001	0.00034139
45	Yes	4	0.00000001	0.00034342
46	Yes	4	0.00000001	0.00034042
47	Yes	4	0.00000001	0.00033154
48	Yes	4	0.00000001	0.00033800
49	Yes	4	0.00000001	0.00034055
50	Yes	4	0.00000001	0.00033865
51	Yes	4	0.00000001	0.00000001
52	Yes	4	0.00000001	0.00000672
53	Yes	4	0.00000001	0.00000740
54	Yes	4	0.00000001	0.00000639
55	Yes	4	0.00000001	0.00000001
56	Yes	4	0.00000001	0.00000639
57	Yes	4	0.00000001	0.00000724
58	Yes	4	0.00000001	0.00000649
59	Yes	4	0.00000001	0.00000001
60	Yes	4	0.00000001	0.00000638
61	Yes	4	0.00000001	0.00000739
62	Yes	4	0.00000001	0.00000668
63	Yes	4	0.00000001	0.00000001
64	Yes	4	0.00000001	0.00000638
65	Yes	4	0.00000001	0.00000722
66	Yes	4	0.00000001	0.00000631

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	140 - 93.75	7.369	60	0.463	0.000
L2	99 - 46.417	3.721	60	0.358	0.000
L3	53 - 1	1.054	60	0.186	0.000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
140.000	HBXX-6517DS	60	7.369	0.463	0.000	120943
130.000	LNX-6515DS	60	6.427	0.440	0.000	60471

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	140 - 93.75	31.774	20	1.997	0.001
L2	99 - 46.417	16.046	20	1.545	0.000
L3	53 - 1	4.545	20	0.804	0.000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
140.000	HBXX-6517DS	20	31.774	1.997	0.001	28103
130.000	LNX-6515DS	20	27.713	1.899	0.001	14051

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	140 - 93.75 (1)	TP36.18x23.49x0.375	46.250	0.000	0.0	40.902	-11.503	3038.840	0.004
L2	93.75 - 46.417 (2)	TP48.41x33.99x0.438	52.583	0.000	0.0	64.109	-23.644	4697.720	0.005
L3	46.417 - 1 (3)	TP60x45.73x0.438	52.000	0.000	0.0	82.710	-41.947	5588.970	0.008

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	140 - 93.75 (1)	TP36.18x23.49x0.375	377.978	2140.900	0.177	0.000	2140.900	0.000
L2	93.75 - 46.417 (2)	TP48.41x33.99x0.438	1019.933	4452.633	0.229	0.000	4452.633	0.000
L3	46.417 - 1 (3)	TP60x45.73x0.438	1998.550	6848.867	0.292	0.000	6848.867	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	140 - 93.75 (1)	TP36.18x23.49x0.375	11.740	1519.420	0.008	0.163	4287.042	0.000
L2	93.75 - 46.417 (2)	TP48.41x33.99x0.438	16.248	2348.860	0.007	0.163	8916.167	0.000
L3	46.417 - 1 (3)	TP60x45.73x0.438	21.243	2794.480	0.008	0.163	13714.500	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	140 - 93.75 (1)	0.004	0.177	0.000	0.008	0.000	0.180 ✔	1.000	4.8.2 ✔
L2	93.75 - 46.417 (2)	0.005	0.229	0.000	0.007	0.000	0.234 ✔	1.000	4.8.2 ✔
L3	46.417 - 1 (3)	0.008	0.292	0.000	0.008	0.000	0.299 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	140 - 93.75	Pole	TP36.18x23.49x0.375	1	-11.503	3038.840	18.0	Pass
L2	93.75 - 46.417	Pole	TP48.41x33.99x0.438	2	-23.644	4697.720	23.4	Pass
L3	46.417 - 1	Pole	TP60x45.73x0.438	3	-41.947	5588.970	29.9	Pass
							Summary	
						Pole (L3)	29.9	Pass
						RATING =	**29.9**	**Pass**

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Subject:		Anchor Bolt and Baseplate Analysis
Location:		160-FT Valmont Monopole Plymouth, CT
Rev. 0: 9/28/16		Prepared by: T.J.L. Checked by: C.F.C. Job No. 16141.00

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturning Moment =	OM := 1999·ft·kips	(Input From tnxTower)
Shear Force =	Shear := 21·kips	(Input From tnxTower)
Axial Force =	Axial := 42·kips	(Input From tnxTower)

Anchor Bolt Data:

ASTM A615 Grade 75

Number of Anchor Bolts =	N := 20	(User Input)
Diameter of Bolt Circle =	D_{bc} := 67.43·in	(User Input)
Bolt "Column" Distance =	l := 3.0·in	(User Input)
Bolt Ultimate Strength =	F_u := 100·ksi	(User Input)
Bolt Yield Strength =	F_y := 75·ksi	(User Input)
Bolt Modulus =	E := 29000·ksi	(User Input)
Diameter of Anchor Bolts =	D := 2.25·in	(User Input)
Threads per Inch =	n := 4.5	(User Input)

Base Plate Data:

Use ASTM A572 Grade 50

Plate Yield Strength =	Fy_{bp} := 50·ksi	(User Input)
Base Plate Thickness =	t_{bp} := 3.0·in	(User Input)
Base Plate Diameter =	D_{bp} := 74.56·in	(User Input)
Outer Pole Diameter =	D_{pole} := 60·in	(User Input)
	η := 0.5	For Ungrouted Base Plate per TIA-222-G Section 4.9.9

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 33.715 \cdot in$

Distance to Bolts = $i := 1 .. N$

$d_i := \left\| \theta \leftarrow 2 \cdot \pi \cdot \left(\frac{i}{N} \right) \right.$
$\left. d \leftarrow R_{bc} \cdot \sin(\theta) \right.$

$d_1 = 10.42 \cdot in$

$d_2 = 19.82 \cdot in$

$d_3 = 27.28 \cdot in$

$d_4 = 32.06 \cdot in$

$d_5 = 33.72 \cdot in$

$d_6 = 32.06 \cdot in$

$d_7 = 27.28 \cdot in$

$d_8 = 19.82 \cdot in$

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 30 \cdot in$

Moment Arms of Bolts about Neutral Axis = $MA_i := if\left(d_i \geq R_{pole}, d_i - R_{pole}, 0in\right)$

$MA_1 = 0.00 \cdot in$

$MA_2 = 0.00 \cdot in$

$MA_3 = 0.00 \cdot in$

$MA_4 = 2.06 \cdot in$

$MA_5 = 3.72 \cdot in$

$MA_6 = 2.06 \cdot in$

$MA_7 = 0.00 \cdot in$

$MA_8 = 0.00 \cdot in$

Effective Width of Baseplate for Bending = $B_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 35.4 \cdot in$

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \sum_i \left(d_i\right)^2 = 1.137 \times 10^4 \cdot in^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 3.976 \cdot in^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot in}{n}\right)^2 = 3.248 \cdot in^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 2.033 \cdot in$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.508 \cdot in$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.826 \cdot in^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{Max} := OM \cdot \frac{R_{bc}}{I_p} - \frac{Axial}{N} = 69 \cdot kips$

Maximum Compressive Force = $C_{Max} := OM \cdot \frac{R_{bc}}{I_p} + \frac{Axial}{N} = 73.2 \cdot kips$

Maximum Shear Force = $V_{Max} := \frac{Shear}{N} = 1.1 \cdot kips$

Design Tensile Strength = $\Phi R_{nt} := 0.8 \cdot F_u \cdot A_n = 259.815 \cdot k$

Bolt % of Capacity = $\frac{\left(C_{Max} + \frac{V_{Max}}{\eta}\right)}{\Phi R_{nt}} \cdot 100 = 29$

Condition1 = $Condition1 := if\left[\frac{\left(C_{Max} + \frac{V_{Max}}{\eta}\right)}{\Phi R_{nt}} \le 1.00, "OK", "Overstressed"\right]$

Condition1 = "OK"

Base Plate Analysis:

Force from Bolts = $C_i := \frac{OM \cdot d_i}{I_p} + \frac{Axial}{N}$

$C_1 = 24.1 \cdot kips$

$C_2 = 43.9 \cdot kips$

$C_3 = 59.7 \cdot kips$

$C_4 = 69.8 \cdot kips$

$C_5 = 73.2 \cdot kips$

$C_6 = 69.8 \cdot kips$

$C_7 = 59.7 \cdot kips$

$C_8 = 43.9 \cdot kips$

Maximum Bending Stress in Plate = $f_{bp} := \sum_i \frac{4 \cdot C_i \cdot MA_i}{\left(B_{eff} \, t_{bp}^{\,2}\right)} = 7 \cdot ksi$

Allowable Bending Stress in Plate = $F_{bp} := 0.9 \cdot Fy_{bp} = 45 \cdot ksi$

Plate Bending Stress % of Capacity = $\frac{f_{bp}}{F_{bp}} = 15.6 \cdot \%$

Condition2 = $Condition2 := if\left(\frac{f_{bp}}{F_{bp}} < 1.00, "Ok", "Overstressed"\right)$

Condition2 = "Ok"

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Subject:	FOUNDATION ANALYSIS
Location:	160-ft Valmont Monopole Plymouth, CT
Rev. 0: 9/28/16	Prepared by: T.J.L Checked by: C.F.C. Job no. 16141.00

Standard Monopole Foundation:

Input Data:

Tower Data

Overturning Moment =	$OM := 1999 \cdot ft \cdot kips$	(User Input)	
Shear Force =	$Shear := 21 \cdot kip$	(User Input)	
Axial Force =	$Axial := 42 \cdot kip$	(User Input)	
Tower Height =	$H_t := 140 \cdot ft$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 6 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 4.0 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 7.5 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 2.5 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 26.5 \cdot ft$	(User Input)	

Anchor Bolt Data:

Length of Anchor Bolts =	$L_{st} := 72 \cdot in$	(User Input)	
Projection of Anchor Bolts Above Pier =	$A_{BP} := 12.0 \cdot in$	(User Input)	
Anchor Bolt Diameter =	$d_{anchor} := 2.25 \cdot in$	(User Input)	
Base Plate Bolt Circle =	$MP := 67.43 \cdot in$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 4000 \cdot psi$	(User Input)	
Steel Reinforcment Yield Strength =	$f_y := 60000 \cdot psi$	(User Input)	
Anchor Bolt Yield Strength =	$f_{ya} := 75000 \cdot psi$	(User Input)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Ultimate Soil Bearing Capacity =	$q_u := 48000 \cdot psf$	(User Input)	
Allowable Soil Bearing Capacity =	$q_a := \frac{q_u}{2} = 24000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 100 \cdot pcf$	(User Input)	
Unit Weight of Concrete =	$\gamma_{conc} := 150 \cdot pcf$	(User Input)	
Foundation Bouyancy =	$Bouyancy := 0$	(User Input)	(Yes=1 / No=0)
Depth to Neglect =	$n := 0 \cdot ft$	(User Input)	
Cohesion of Clay Type Soil =	$c := 0 \cdot ksf$	(User Input)	(Use 0 for Sandy Soil)
Seismic Zone Factor =	$Z := 2$	(User Input)	(UBC-1997 Fig 23-2)
Coefficient of Friction Between Concrete =	$\mu := 0.45$	(User Input)	

Pier Reinforcement:

Bar Size =	$BS_{pier} := 11$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.41 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 46$	(User Input)	
Clear Cover of Reinforcement =	$Cvr_{pier} := 3 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pier} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Diameter of Tie =	$d_{Tie} := 3 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 7$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 0.875 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 32$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 9$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.128 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 31$	(User Input)	(Bottom of Pad)
Clear Cover of Reinforcement =	$Cvr_{pad} := 3.0 \cdot in$	(User Input)	
Reinforcement Location Factor =	$\alpha_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Coating Factor =	$\beta_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Concrete Strength Factor =	$\lambda_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)
Reinforcement Size Factor =	$\gamma_{pad} := 1.0$	(User Input)	(ACI-2008 12.2.4)

Calculated Factors:

Pier Reinforcement Bar Area = $A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 1.561 \cdot in^2$

Pad Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.601 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.999 \cdot in^2$

Coefficient of Lateral Soil Pressure = $K_p := \frac{1 + \sin(\Phi_s)}{1 - \sin(\Phi_s)} = 3$

Stability of Footing:

Adjusted Concrete Unit Weight = $\gamma_c := if(Bouyancy = 1, \gamma_{conc} - 62.4pcf, \gamma_{conc}) = 150 \cdot pcf$

Adjusted Soil Unit Weight = $\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 100 \cdot pcf$

Passive Pressure = $P_{pn} := K_p \cdot \gamma_s \cdot n + c \cdot 2 \cdot \sqrt{K_p} = 0 \cdot ksf$

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 1.05 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}] = 1.05 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 1.8 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.425 \cdot ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)] = 2.5$

$A_p := W_f \cdot T_p = 66.25$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 94.406 \cdot kip$

Weight of Concrete Pad = $WT_c := \left[\left(W_f^2 \cdot T_f\right) + d_p^2 L_p\right] \cdot \gamma_c = 297.094 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left[\left(W_f^2 - d_p^2\right) \cdot \left(\left|L_p - L_{pag} - n\right|\right)\right] \cdot \gamma_s = 226.1 \cdot kip$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left(\frac{D_f^2 \cdot \tan(\Phi_s)}{2} \cdot W_f\right) \cdot \gamma_s = 27.54 \cdot kip$

Weight of Soil Wedge at back face Corners = $WT_{s3} := 2 \cdot \left[(D_f)^3 \cdot \frac{\tan(\Phi_s)}{3}\right] \cdot \gamma_s = 8.314 \cdot kips$

Total Weight = $WT_{tot} := WT_c + WT_{s1} + Axial = 565.194 \cdot kip$

Resisting Weight = $WT_R := 0.9 \cdot WT_c + 0.75 \cdot WT_{s1} + 0.75 \cdot Axial = 468.459 \cdot kip$

Resisting Moment = $M_r := (WT_R) \cdot \frac{W_f}{2} + 0.75 \cdot S_u \cdot \frac{T_f}{3} + 0.75 \cdot \left[\left(WT_{s2} + WT_{s3}\right) \cdot \left(W_f + \frac{D_f \cdot \tan(\Phi_s)}{3}\right)\right] = 7010 \cdot kip \cdot ft$

Overturning Moment = $M_{ot} := OM + Shear \cdot (L_p + T_f) = 2136 \cdot kip \cdot ft$

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 3.28$

Factor of Safety Required = $FS_{req} := 1$

$OverTurning\_Moment\_Check := if(FS \geq FS_{req}, "Okay", "No Good")$

$OverTurning\_Moment\_Check = "Okay"$

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 348.743 \cdot kips$

$Shear\_Check := if(S_p > Shear, "Okay", "No Good")$

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Area of the Mat = $A_{mat} := W_f^2 = 702.25$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 3101.6 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{WT_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 1.493 \cdot ksf$

$Max\_Pressure\_Check := if(P_{max} < .75 \cdot q_u, "Okay", "No Good")$

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{WT_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = 0.116 \cdot ksf$

$Min\_Pressure\_Check := if\left[(P_{min} \geq 0) \cdot (P_{min} < .75 \cdot q_u), "Okay", "No Good"\right]$

Min_Pressure_Check = "Okay"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 9.579$

Distance to Kern = $X_k := \frac{W_f}{6} = 4.417$

Since Resultant Force is Not in Kern, Area to which Pressure is Applied Must be Reduced.

Eccentricity = $e := \frac{M_{ot}}{WT_{tot}} = 3.778$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot WT_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 1.501 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 1.493 \cdot ksf$

$Pressure\_Check := if(q_{adj} < .75 \cdot q_u, "Okay", "No Good")$

Pressure_Check = "Okay"

Concrete Bearing Capacity:

Strength Reduction Factor = $\Phi_c := 0.65$ (ACI-2008 9.3.2.2)

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 1.406 \times 10^4 \cdot kips$ (ACI-2008 10.14)

$Bearing\_Check := if(P_b > Axial, "Okay", "No Good")$

Bearing_Check = "Okay"

Shear Strength of Concrete:

Beam Shear: (Critical section located at a distance d from the face of Pier) (ACI 11.3.1.1)

$\phi_c := 0.85$ (ACI 9.3.2.5)

$d := T_f - Cvr_{pad} - d_{bbot} = 2.156$

$d_1 := \frac{W_f}{2} - \frac{d_p}{2}$

$d_2 := d_1 - d$

$L := \left(\frac{W_f}{2} - e\right) \cdot 3$

$Slope := if\left(L > W_f, \frac{P_{max} - P_{min}}{W_f}, \frac{q_{adj}}{L}\right)$

$V_{req} := \left[\left(q_{adj} - Slope \cdot d_1\right) + \left(\frac{Slope \cdot d_1}{2}\right)\right] \cdot W_f \cdot d_1$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d$ (ACI-2008 11.2.1.1)

$Beam\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

Beam_Shear_Check = "Okay"

Punching Shear: (Critical Section Located at a distance of d/2 from the face of pier) (ACI 11.11.1.2)

Critical Perimeter of Punching Shear = $b_o := (d_p + d) \cdot \pi = 30.3$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 73.2$

Area Outside of Perimeter = $A_{out} := A_{mat} - A_{bo} = 629$

Guess Value = $v_u := 1ksf$ (From "Foundation Analysis and design", By Joseph Bowles, Eq. 8-9)

Given $d^2 + d_p \cdot d = \frac{WT_{tot}}{\pi \cdot v_u}$

$v_u := Find(v_u) = 8.6 \cdot ksf$

$V_u := v_u \cdot d \cdot W_f = 493.7 \cdot kips$

Required Shear Strength = $V_{req} := V_u = 493.7 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 2025.2 \cdot kip$ (ACI-2008 11.11.2.1)

$Punching\_Shear\_Check := if(V_{req} < V_{Avail}, "Okay", "No Good")$

$Punching\_Shear\_Check = "Okay"$

Steel Reinforcement in Pad:

Required Reinforcement for Bending:

Strength Reduction Factor = $\phi_m := .90$ (ACI-2008 9.3.2.1)

$q_b := q_{adj} - d_1 \cdot Slope = 1 \cdot ksf$

Maximum Bending at Face of Pier = $M_n := \frac{1}{\phi_m} \cdot \left[(q_{adj} - q_b) \cdot \frac{d_1^2}{3} + q_b \cdot \frac{d_1^2}{2} \right] \cdot W_f = 1765.5 \cdot kip \cdot ft$

$$\beta := \begin{cases} 0.85 & \text{if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 & \text{if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000 \right)}{1000} \right] \cdot 0.5 \right] & \text{otherwise} \end{cases} = 0.85$$ (ACI-200810.2.7.3)

$R_n := \frac{M_n}{W_f \cdot d^2} = 99.5 \cdot psi$

$\rho := \frac{0.85 \cdot f_c}{f_y} \left(1 - \sqrt{1 - \frac{2 \cdot R_n}{0.85 \cdot f_c}} \right) = 0.0017$

$\rho_{min} := \rho = 0.00168$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases}$$ (ACI -2008 7.12.2.1)

Check Bottom Bars:

$$As := \begin{cases} \rho_{min} \cdot W_f \cdot d & \text{if } \rho_{min} > \frac{\rho_{sh}}{2} \\ \rho_{sh} \cdot W_f \cdot \frac{d}{2} & \text{otherwise} \end{cases} = 13.854 \cdot in^2$$

$As_{prov} := A_{bbot} \cdot NB_{bot} = 31 \cdot in^2$

$Pad\_Reinforcement\_Bot := if(As_{prov} > As, "Okay", "No Good")$

$Pad\_Reinforcement\_Bot = "Okay"$

Check top Bars:

$As := \rho_{sh} \cdot \left(W_f \cdot \frac{d}{2}\right) = 7.4 \cdot in^2$

$As_{prov} := A_{btop} \cdot NB_{top} = 19.2 \cdot in^2$

$Pad\_Reinforcement\_Top := if(As_{prov} > As, "Okay", "No Good")$

$Pad\_Reinforcement\_Top = "Okay"$

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 9.23 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 3 \cdot in$$

Transverse Reinforcement Index =

$k_{tr} := 0$ (ACI-2008 12.2.3)

$$L_{dbt} := \frac{3 \cdot f_y \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 30.2 \cdot in$$

Minimum Development Length =

$L_{dbmin} := 12 \cdot in$ (ACI-2008 12.2.1)

$L_{dbtCheck} := if(L_{dbt} \geq L_{dbmin}, "Use L.dbt", "Use L.dbmin")$

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{d_p}{2} - Cvr_{pad} = 111 \cdot in$$

$Lpad\_Check := if(L_{Pad} > L_{dbt}, "Okay", "No Good")$

$Lpad\_Check = "Okay"$

Steel Reinforcement in Pier:

Area of Pier =

$A_p := d_p^2 = 8100 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p = 40.5 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 71.83 \cdot in^2$

$Steel\_Area\_Check := if(A_{sprov} > A_{smin}, "Okay", "No Good")$

Steel_Area_Check = "Okay"

NOTE: Anchor Bolts are not accounted for in reinforcement calculation and will provide additional reinforcement to satisfy minimum requirement of steel.

Bar Spacing In Pier =

$B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 4.737 \cdot in$

Diameter of Reinforcement Cage =

$Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 84 \cdot in$

Maximum Moment in Pier =

$M_p := \left[OM + Shear \cdot \left(L_p + \frac{A_{BP}}{2} \right) \right] = 25122 \cdot in \cdot kips$

Pier Check evaluated from outside program and results are listed below;

$(D \ N \ n \ P_u \ M_{xu}) := \left(d_p \cdot 12 \ \ NB_{pier} \ \ BS_{pier} \ \ \frac{Axial \cdot 1.333}{kips} \ \ \frac{M_p}{in \cdot kips} \right)$

$(D \ N \ n \ P_u \ M_{xu}) = (90 \ \ 46 \ \ 11 \ \ 56 \ \ 25122)$

$(\phi P_n \ \ \phi M_{xn} \ \ f_{sp} \ \ \rho) := (0 \ \ 0 \ \ 0 \ \ 0)$

$(\phi P_n \ \ \phi M_{xn} \ \ f_{sp} \ \ \rho) := \phi P'_n(D, N, n, P_u, M_{xu})^T$

$(\phi P_n \ \ \phi M_{xn} \ \ f_{sp} \ \ \rho) = (315.3 \ \ 1.4 \times 10^5 \ \ -60 \ \ 0)$

$Axial\_Load\_Check := if(\phi P_n \geq P_u, "Okay", "No Good")$

Axial_Load_Check = "Okay"

$Bending\_Check := if(\phi M_{xn} \geq M_{xu}, "Okay", "No Good")$

Bending_Check = "Okay"

Development Length Pier Reinforcement:

Available Length in Foundation:

$L_{pier} := L_p - Cvr_{pier} = 45 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 27 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

$c := if\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 2.368 \cdot in$

Transverse Reinforcement = $k_{tr} := 0$ (ACI-2008 12.2.3)

$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 59.73 \cdot in$

Minimum Development Length = $L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 18.727 \cdot in$ (ACI 12.2.1)

Pier reinforcement bars are standard 90 degree hooks and therefore developement in the pad is computed as follows:

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right)$

$L_{tension\_Check} := if\left(L_{pier} + L_{pad} > L_{dbt}, "Okay", "No Good"\right)$

$L_{tension\_Check} = "Okay"$

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 26.753 \cdot in$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot f_y\right) = 25.38 \cdot in$

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 26.753 \cdot in$

$L_{compression\_Check} := if\left(L_{pier} + L_{pad} > L_{dbc}, "Okay", "No Good"\right)$

$L_{compression\_Check} = "Okay"$

Tie Size and Spacing in Column:

Minimum Tie Size = $Tie_{min} := if(BS_{pier} \le 10, 3, 4) = 4$

Used #3 Ties

Seismic Factor = $z := if(Z \le 2, 1, 0.5) = 1$ (ACI-2008 21.10.5)

$s_{lim1} := 16 \cdot d_{bpier} \cdot z = 22.56 \cdot in$

$s_{lim2} := \frac{48 \cdot d_{Tie}}{8} \cdot z = 18 \cdot in$

$s_{lim3} := D_f \cdot z = 72 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing = $s_{tie} := \min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) = 18 \cdot in$

Number of Ties Required = $n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 3.333$

Check Anchor Steel Embedment:

Depth Available = $D_{ab} := L_{st} - A_{BP} = 5 \cdot ft$

Length of Anchor Bolt = $L_{anchor} := \frac{(0.11 \cdot f_{ya}) \cdot in}{\sqrt{f_c \cdot psi}} = 10.87 \cdot ft$

$Depth\_Check := if(D_{ab} \ge L_{anchor}, "Okay", "No Good")$

Depth_Check = "No Good"

Note: Anchor plate is provided

RAN Template:	A&L Template:
795ADB V2	795ADB V2_2xAIR+1DP

CTNH584A_0.1_Capacity-L1900

Section 1 - Site Information

Site ID: CTNH584A
Status: Draft
Version: 0.1
Project Type: Capacity-L1900
Approved: Not Approved
Approved By: Not Approved
Last Modified: 8/23/2016 8:16:06 AM
Last Modified By: GSM1900\MLucey

Site Name: CTNH584A
Site Class: Monopole
Site Type: Structure Non Building
Solution Type:
Plan Year:
Market: CONNECTICUT
Vendor: Ericsson
Landlord: Not Specified

Latitude: 41.66190500
Longitude: -73.04573400
Address: 33 Keegan Rd
City, State: Plymouth, CT
Region: NORTHEAST

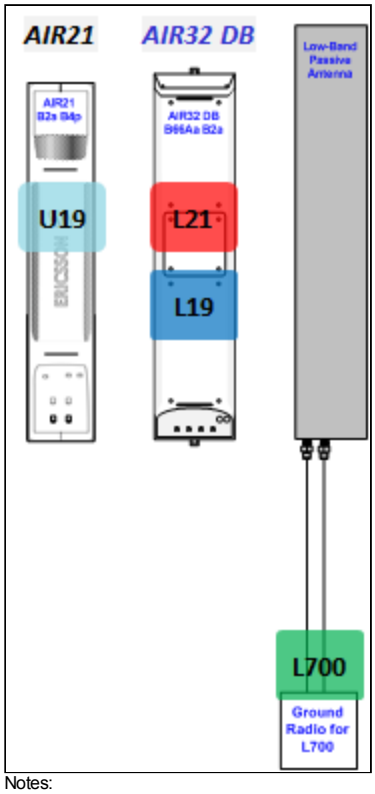
RAN Template: 795ADB V2			**AL Template:** 795ADB V2_2xAIR+1DP	
Sector Count: 3	**Antenna Count:** 9	**Coax Line Count:** 6	**TMA Count:** 0	**RRU Count:** 0

Section 2 - Existing Template Images

----- This section is intentionally blank. -----

Section 3 - Proposed Template Images

795ADB V2_2xAIR+1DP.png



Notes:

Section 4 - Siteplan Images

----- This section is intentionally blank. -----

RAN Template:	A&L Template:
795ADB V2	795ADB V2_2xAIR+1DP

CTNH584A_0.1_Capacity-L1900

Section 5 - RAN Equipment

Existing RAN Equipment
----- This section is intentionally blank. -----

Proposed RAN Equipment

Template: 795ADB V2

Enclosure	1	2
Enclosure Type	RBS 6201 ODE	Ancillary Equipment
Baseband	DUS41 L2100; DUS41 L1900; DUW30 U1900	
Hybrid Cable System		Ericsson 9x18 HCS *Select Length*; Ericsson 6x12 HCS *Select Length & AWG*
Multiplexer	XMU L700	
Radio	RUS01 B12 **(x6)** L700	

RAN Scope of Work:

RAN Template:	A&L Template:
795ADB V2	795ADB V2_2xAIR+1DP

CTNH584A_0.1_Capacity-L1900

Section 6 - A&L Equipment

Existing Template: Custom
Proposed Template: 795ADB V2_2xAIR+1DP

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro						
Antenna	1		2				3
Antenna Model	AIR21 B2A/B4P (Quad)		KRD901146/1AIR32 B66Aa/B2a (Octa)				LNX-6515DS-A1M (Dual)
Azimuth	60		60				60
M. Tilt	0		0				0
Height	130		130				130
Ports	P1	P2	P3	P4	P5	P6	P7
Active Tech.	U1900		L2100		L1900		L700
Dark Tech.							
Restricted Tech.							
Decomm. Tech.							
E. Tilt	2		2		2		2
Cables							1-5/8" Coax - 150 ft. 1-5/8" Coax - 150 ft.
TMAs							
Diplexers / Combiners							
Radio							
Sector Equipment							Andrew Smart Bias T

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:
795ADB V2	795ADB V2_2xAIR+1DP

CTNH584A_0.1_Capacity-L1900

Sector 2 (Proposed) view from behind							
Coverage Type	A - Outdoor Macro						
Antenna	1		2				3
Antenna Model	AIR21 B2A/B4P (Quad)		KRD901146/1AIR32 B66Aa/B2a (Octa)				LNX-6515DS-A1M (Dual)
Azimuth	180		180				180
M. Tilt	0		0				0
Height	130		130				130
Ports	P1	P2	P3	P4	P5	P6	P7
Active Tech.	U1900		L2100		L1900		L700
Dark Tech.							
Restricted Tech.							
Decomm. Tech.							
E. Tilt	2		2		2		2
Cables							1-5/8" Coax - 150 ft. 1-5/8" Coax - 150 ft.
TMAs							
Diplexers / Combiners							
Radio							
Sector Equipment							Andrew Smart Bias T

Unconnected Equipment:

Scope of Work:

RAN Template:	A&L Template:
795ADB V2	795ADB V2_2xAIR+1DP

CTNH584A_0.1_Capacity-L1900

Sector 3 (Proposed) view from behind							
Coverage Type	A - Outdoor Macro						
Antenna	1		2				3
Antenna Model	AIR21 B2A/B4P (Quad)		KRD901146/1AIR32 B66Aa/B2a (Octa)				LNX-6515DS-A1M (Dual)
Azimuth	300		300				300
M. Tilt	0		0				0
Height	130		130				130
Ports	P1	P2	P3	P4	P5	P6	P7
Active Tech.	U1900		L2100		L1900		L700
Dark Tech.							
Restricted Tech.							
Decomm. Tech.							
E. Tilt	2		2		2		2
Cables							1-5/8" Coax - 150 ft. 1-5/8" Coax - 150 ft.
TMAs							
Diplexers / Combiners							
Radio							
Sector Equipment							Andrew Smart Bias T

Unconnected Equipment:

Scope of Work:

Product Specifications

LNX-6515DS-VTM | LNX-6515DS-A1M

Single Band Antenna, 698–896 MHz, 65° horizontal beamwidth, RET compatible

- Excellent choice to maximize both coverage and capacity in suburban and rural applications
- Fully compatible with Andrew remote electrical tilt system for greater OpEx savings
- Exceptional horizontal pattern roll-off and strong front-to-back ratio
- Extended bandwidth allows one antenna to serve multiple frequency allocations
- Great solution to maximize network coverage and capacity
- The RF connectors are designed for IP67 rating and the radome for IP56 rating

Electrical Specifications

Frequency Band, MHz	**698–806**	**806–896**
Gain, dBi	16.7	17.6
Beamwidth, Horizontal, degrees	65	64
Beamwidth, Vertical, degrees	9.7	8.6
Beam Tilt, degrees	0–8	0–8
USLS (First Lobe), dB	17	17
Front-to-Back Ratio at 180°, dB	32	27
CPR at Boresight, dB	24	27
CPR at Sector, dB	15	13
Isolation, dB	30	30
VSWR | Return Loss, dB	1.4 | 15.6	1.4 | 15.6
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153
Input Power per Port, maximum, watts	400	400
Polarization	±45°	±45°
Impedance	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	**698–806**	**806–896**
Gain by all Beam Tilts, average, dBi	16.6	16.9
Gain by all Beam Tilts Tolerance, dB	±0.4	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 16.6 4 ° | 16.6 8 ° | 16.4	0 ° | 17.0 4 ° | 17.0 8 ° | 16.8
Beamwidth, Horizontal Tolerance, degrees	±1	±0.9
Beamwidth, Vertical Tolerance, degrees	±0.6	±0.4
USLS, beampeak to 20° above beampeak, dB	18	18
Front-to-Back Total Power at 180° ± 30°, dB	25	23
CPR at Boresight, dB	24	27
CPR at Sector, dB	15	13

* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

General Specifications

Antenna Type	Sector
Band	Single band
Brand	DualPol®
Operating Frequency Band	698 – 896 MHz

Performance Note	Outdoor usage

Mechanical Specifications

Color	Light gray
Lightning Protection	dc Ground
Radiator Material	Aluminum
Radome Material	Fiberglass, UV resistant
RF Connector Interface	7-16 DIN Female
RF Connector Location	Bottom
RF Connector Quantity, total	2
Wind Loading, frontal	878.0 N @ 150 km/h 197.4 lbf @ 150 km/h
Wind Loading, lateral	273.0 N @ 150 km/h 61.4 lbf @ 150 km/h
Wind Loading, rear	1033.0 N @ 150 km/h 232.2 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Depth	180.5 mm | 7.1 in
Length	2453.0 mm | 96.6 in
Width	301.0 mm | 11.9 in
Net Weight, without mounting kit	19.8 kg | 43.7 lb

Remote Electrical Tilt (RET) Information

Model with Factory Installed AISG 2.0 Actuator	LNX-6515DS-A1M

Packed Dimensions

Depth	295.0 mm | 11.6 in
Length	2718.0 mm | 107.0 in
Width	392.0 mm | 15.4 in
Shipping Weight	36.9 kg | 81.4 lb

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant by Exemption
China RoHS SJ/T 11364-2006	Above Maximum Concentration Value (MCV)
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

Included Products

DB380-3 — Pipe Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Used for wide panel antennas. Includes

ERICSSON

AIR 21, 1.3 M
B2A B4P

The Antenna-Integrated Radio (AIR) is a single tower-mounted unit that can replace the antenna/s and radio for one sector. There is no need for additional electronics such as ASC and a RET actuator and control. A passive antenna function for an extra band is optional. (The option has to be specified when ordering, retrofit is not possible).

The height and width are the same as for a passive antenna with similar characteristics. The depth is increased to house the radios' electronics. Digital Units (DUs) from Ericsson's RBS 6000 family provide the baseband function and support GSM, WCDMA and LTE.

One or two DUs, depending on capacity and the standards to be supported, are needed for a three-sector site with AIR units.

TECHNICAL SPECIFICATIONS AIR 21, 1.3M, B2A B4P

RADIO	
Active frequency band:	Band 2 (1850-1910 / 1930-1990 MHz)
Passive frequency band (optional):	Band 4 (1710-1755 / 2110-2155 MHz)
Downlink EIRP in bore-sight direction for the active band:	2 x 62,5 dBm
Uplink sensitivity:	TBD*
Remote electrical tilt:	-2° to -12°, independently controlled per frequency band
MIMO:	2 x 2 for DL 4 RX branches to be used for diversity/ beam-steering /MIMO
Instantaneous bandwidth:	20 MHz
Capacity (single standard per sector):	Up to 8 carriers GSM Up to 4 carriers WCDMA with 2 x 2 DL MIMO Up to 20 MHz LTE with 2 x 2 DL MIMO
Multi-RAT capability:	Single standard or two simultaneous standards (Capacity above is reduced for multi-RAT)
Bore-sight antenna gain for passive antenna option:	17.5 dBi
Nominal beam-width, azimuth:	65°
Nominal beam-width, elevation:	7°
Additional antenna parameters:	See Antenna characteristics, page 3
MECHANICAL SPECIFICATION	
Weight (excl. mounting brackets):	37,5 kg for active only 41,5 kg for active and passive
Size (H x W x D)	1422 mm x 307 mm x 200 mm
Wind load:	580 N / 300 N / 720 N (frontal/lateral/rear-side) @ 42 m/s wind speed
INTERFACES	
AIR – DU:	DATA 1, Data 2: CPRI links (SFP modules with LC socket + flanges that match protective cover TYCO C20611458)
Power:	- 48 V DC (TYCO/Ericsson RPT 447 04)
Passive antenna (option).	TX/RX 1, TX/RX 2: RF connectors (7-16 female)
LMU RX sharing	RX1, RX2:, RF connectors (N female)
SUPPORTING BASE-BAND	
RBS 6601:	One or two units depending on configuration.

* 1 dB better than best-in-class RRU connected to same size best-in-class antenna

** Other base-band configurations are available

Telefonaktiebolaget LM Ericsson
SE-126 25 Stockholm, Sweden
Telephone +46 8 719 0000
Fax +46 8 18 40 85
www.ericsson.com

12/287 01-FGB 101 558 RevB1

AIR-32 B4A/B2P & B2A/B66AA

ERICSSON ANTENNA INTEGRATED RADIO AIR-32

Radio		
	Single Band (B4a/B2p)	**Dual Band (B2a/B66Aa)**
Band 2 (1850-1910 / 1930-1990 MHz)	Passive frequency band	Active frequency band
Band 4 (1710-1755 / 2110-2155 MHz)	Active frequency band	Subset of Band 66A (AWS 1+3)
Band 66A (1710-1780 / 2110-2180 MHz)	N/A	Active frequency band
PA Output Power	4 x 30W	2 x (4 x 30) W
Downlink EIRP in bore-sight direction for each active band	4 x 62.5 dBmi	4 x 62.5 dBmi
Instantaneous bandwidth	45 MHz (W, L)	B2: 40 MHz (W, L) B2: 20 MHz (G) B66A: 70 MHz (W, L)
Capacity (single standard per unit)	6 GSM 6 WCDMA 2 x 20 MHz LTE	6 GSM (B2 only) 6 WCDMA per Active frequency band 2 x 20 MHz LTE per band
Multi-RAT capability	WCDMA and LTE on both PAs	WCDMA and GSM on both PAs (B2 only) WCDMA and LTE on both PAs (B2 and B4) GSM and LTE (B2 only)

Interfaces		
Optical CPRI	2 x 10 Gbps	2 x 10 Gbps per Active frequency band
DC Power	-48 VDC 3-wire or 2-wire	-48 VDC 3-wire or 2-wire (separate input for both radios)
AC power (Optional)	PSU-AC 08	PSU-AC 08
Passive antenna	4 RF connectors (7/16 female)	N/A
Environmental		
Operating Temperature Range	-40 to +55 °C	-40 to +55 °C
Solar Radiation	≤ 1,120 W/m²	≤ 1,120 W/m²
Relative Humidity	5 to 100%	5 to 100%
Absolute Humidity	0.26 to 40 g/m^3	0.26 to 40 g/m^3
Maximum temperature change	1.0°C/min	1.0°C/min
Antenna		
Electrical Tilt	2º – 12º (B4) 2º – 12º (B2)	2º – 12º (B66A) 2º – 12º (B2)
Bore-sight antenna gain	18 dBi (B4) 17.5 dBi (B2)	18 dBi (B66A) 17.5 dBi (B2)
Nominal beam-width, azimuth	65º (B4) 63º (B2)	65º (B66A) 63º (B2)
Nominal beam-width, elevation	6º (B4) 6º (B2)	6º (B66A) 6º (B2)
Mechanical		
Weight	48 Kg (105.8 lbs)	60 Kg (132.2 lbs)
Dimensions (H x W x D)	1439 x 327 x 220 mm (56.6” x 12.9” x 8.7”)	1439 x 327 x 220 mm (56.6” x 12.9” x 8.7”)
Wind load at 42 m/s (150 km/h) Front / Lateral / Rear	640N / 300N / 660N	640N / 300N / 660N

T-Mobile

WIRELESS COMMUNICATIONS FACILITY

PLYMOUTH
SITE ID: CTNH584A
33 KEEGAN ROAD
PLYMOUTH, CT 06782

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2012 INTERNATIONAL BUILDING CODE AS AMENDED BY THE 2016 CONNECTICUT SUPPLEMENT, INCLUDING THE TIA-222-G-2005 "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES", NATIONAL ELECTRICAL CODE AND LOCAL CODES.
2. THE COMPOUND, TOWER, PRIMARY GROUND RING, ELECTRICAL SERVICE TO THE METER BANK AND TELEPHONE SERVICE TO THE DEMARCATION POINT ARE PROVIDED BY SITE OWNER. AS BUILT FIELD CONDITIONS REGARDING THESE ITEMS SHALL BE CONFIRMED BY THE CONTRACTOR. SHOULD ANY FIELD CONDITIONS PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL NOT PROCEED WITH ANY AFFECTED WORK.
3. CONTRACTOR SHALL REVIEW ALL DRAWINGS AND SPECIFICATIONS IN THE CONTRACT DOCUMENT SET. CONTRACTOR SHALL COORDINATE ALL WORK SHOWN IN THE SET OF DRAWINGS. THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF DRAWINGS TO ALL SUBCONTRACTORS AND ALL RELATED PARTIES. THE SUBCONTRACTORS SHALL EXAMINE ALL THE DRAWINGS AND SPECIFICATIONS FOR THE INFORMATION THAT AFFECTS THEIR WORK.
4. CONTRACTOR SHALL PROVIDE A COMPLETE BUILD-OUT WITH ALL FINISHES, STRUCTURAL, MECHANICAL, AND ELECTRICAL COMPONENTS AND PROVIDE ALL ITEMS AS SHOWN OR INDICATED ON THE DRAWINGS OR IN THE WRITTEN SPECIFICATIONS.
5. CONTRACTOR SHALL FURNISH ALL MATERIAL, LABOR AND EQUIPMENT TO COMPLETE THE WORK AND FURNISH A COMPLETED JOB ALL IN ACCORDANCE WITH LOCAL AND STATE GOVERNING AUTHORITIES AND OTHER AUTHORITIES HAVING LAWFUL JURISDICTION OVER THE WORK.
6. CONTRACTOR SHALL SECURE AND PAY FOR ALL PERMITS AND ALL INSPECTIONS REQUIRED AND SHALL ALSO PAY FEES REQUIRED FOR THE GENERAL CONSTRUCTION, PLUMBING, ELECTRICAL AND HVAC. PERMITS SHALL BE PAID FOR BY THE RESPECTIVE SUBCONTRACTORS.
7. CONTRACTOR SHALL MAINTAIN A CURRENT SET OF DRAWINGS AND SPECIFICATIONS ON SITE AT ALL TIMES AND INSURE DISTRIBUTION OF NEW DRAWINGS TO SUBCONTRACTORS AND OTHER RELEVANT PARTIES AS SOON AS THEY ARE MADE AVAILABLE. ALL OLD DRAWINGS SHALL BE MARKED VOID AND REMOVED FROM THE CONTRACT AREA. THE CONTRACTOR SHALL FURNISH AN 'AS-BUILT' SET OF DRAWINGS TO OWNER UPON COMPLETION OF PROJECT.
8. LOCATION OF EQUIPMENT, AND WORK SUPPLIED BY OTHERS THAT IS DIAGRAMMATICALLY INDICATED ON THE DRAWINGS SHALL BE DETERMINED BY THE CONTRACTOR. THE CONTRACTOR SHALL DETERMINE LOCATIONS AND DIMENSIONS SUBJECT TO STRUCTURAL CONDITIONS AND WORK OF THE SUBCONTRACTORS.
9. THE CONTRACTOR IS SOLELY RESPONSIBLE TO DETERMINE CONSTRUCTION PROCEDURE AND SEQUENCE, AND TO ENSURE THE SAFETY OF THE EXISTING STRUCTURES AND ITS COMPONENT PARTS DURING CONSTRUCTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, BRACING, UNDERPINNING, ETC. THAT MAY BE NECESSARY. MAINTAIN EXISTING BUILDING'S/PROPERTY'S OPERATIONS, COORDINATE WORK WITH BUILDING/PROPERTY OWNER.
10. DRAWINGS INDICATE THE MINIMUM STANDARDS, BUT IF ANY WORK SHOULD BE INDICATED TO BE SUBSTANDARD TO ANY ORDINANCES, LAWS, CODES, RULES, OR REGULATIONS BEARING ON THE WORK, THE CONTRACTOR SHALL INCLUDE IN HIS WORK AND SHALL EXECUTE THE WORK CORRECTLY IN ACCORDANCE WITH SUCH ORDINANCES, LAWS, CODES, RULES OR REGULATIONS WITH NO INCREASE IN COSTS.
11. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
12. ALL EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUBCONTRACTORS FOR ANY CONDITION PER MFR.'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.
13. ANY AND ALL ERRORS, DISCREPANCIES, AND 'MISSED" ITEMS ARE TO BE BROUGHT TO THE ATTENTION OF THE T-MOBILE CONSTRUCTION MANAGER DURING THE BIDDING PROCESS BY THE CONTRACTOR. ALL THESE ITEMS ARE TO BE INCLUDED IN THE BID. NO 'EXTRA' WILL BE ALLOWED FOR MISSED ITEMS.
14. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL ON-SITE SAFETY FROM THE TIME THE JOB IS AWARDED UNTIL ALL WORK IS COMPLETE AND ACCEPTED BY THE OWNER.
15. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE CONSTRUCTION MANAGER FOR REVIEW.
16. THE CONTRACTOR SHALL FIELD VERIFY ALL DIMENSIONS, ELEVATIONS, ANGLES, AND EXISTING CONDITIONS AT THE SITE, PRIOR TO FABRICATION AND/OR INSTALLATION OF ANY WORK IN THE CONTRACT AREA.
17. COORDINATION, LAYOUT, FURNISHING AND INSTALLATION OF CONDUIT AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL AND TELECOMMUNICATION SERVICE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
18. ALL DAMAGE CAUSED TO ANY EXISTING STRUCTURE SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR. THE CONTRACTOR WILL BE HELD LIABLE FOR ALL REPAIRS REQUIRED FOR EXISTING STRUCTURES IF DAMAGED DURING CONSTRUCTION ACTIVITIES.
19. THE CONTRACTOR SHALL CONTACT "CALL BEFORE YOU DIG" AT LEAST 48 HOURS PRIOR TO ANY EXCAVATIONS AT 1-800-922-4455. ALL UTILITIES SHALL BE IDENTIFIED AND CLEARLY MARKED PRIOR TO ANY EXCAVATION WORK. CONTRACTOR SHALL MAINTAIN AND PROTECT MARKED UTILITIES THROUGHOUT PROJECT COMPLETION.
20. CONTRACTOR SHALL COMPLY WITH OWNERS ENVIRONMENTAL ENGINEER ON ALL METHODS AND PROVISIONS FOR ALL EXCAVATION ACTIVITIES INCLUDING SOIL DISPOSAL. ALL BACKFILL MATERIALS TO BE PROVIDED BY THE CONTRACTOR.

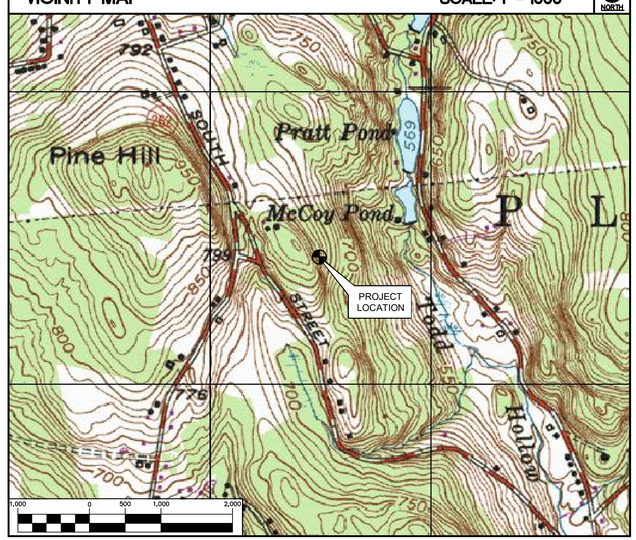
SITE DIRECTIONS

FROM: 35 GRIFFIN ROAD SOUTH, BLOOMFIELD, CONNECTICUT **TO:** 33 KEEGAN ROAD, PLYMOUTH, CONNECTICUT

1.	HEAD NORTHEAST ON GRIFFIN RD S TOWARD W NEWBERRY RD	0.6 MI
2.	TURN RIGHT ONTO DAY HILL RD	3.6 MI
3.	USE THE RIGHT LANE TO MERGE ONTO I-91 S VIA THE RAMP TO HARTFORD	0.4 MI
4.	MERGE ONTO I-91 S	6.9 MI
5.	TAKE EXIT 32A-32B FOR I-84 W TOWARD WATERBURY	0.5 MI
6.	MERGE ONTO I-84	1.1 MI
7.	KEEP LEFT TO STAY ON I-84	11.7 MI
8.	TAKE EXIT 33 FOR CT-72 W TOWARD BRISTOL	0.3 MI
9.	KEEP LEFT TO CONTINUE ON CT-72 W	4.1 MI
10.	TURN RIGHT ONTO CT-72	0.4 MI
11.	SLIGHT RIGHT ONTO RIVERSIDE AVE	0.9 MI
12.	TURN LEFT ONTO MAIN ST	259 FT
13.	TURN RIGHT ONTO SCHOOL ST	0.4 MI
14.	CONTINUE ONTO DIVINITY ST	217 FT
15.	TURN RIGHT ONTO PARK ST	1.0 MI
16.	CONTINUE ONTO TERRYVILLE RD	1.2 MI
17.	CONTINUE ONTO S RIVERSIDE AVE	0.9 MI
18.	TURN LEFT ONTO US-6 W/MAIN ST	2.9 MI
19.	TURN LEFT ONTO CT-262	0.6 MI
20.	SLIGHT LEFT ONTO KEEGAN RD	0.2 MI

VICINITY MAP

SCALE: 1" = 1000'



PROJECT SUMMARY

THE GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

1. A TOTAL OF NINE (9) DIRECTIONAL PANEL ANTENNAS ARE TO BE MOUNTED AT A CENTERLINE ELEVATION OF ±130' AGL ON A ±140' TALL MONOPOLE.
2. GROUND WORK INCLUDES THE INSTALLATION OF ONE (1) EQUIPMENT CABINET ATOP A 10'x20' CONCRETE PAD.

PROJECT INFORMATION

SITE NAME:	PLYMOUTH
SITE ID:	CTNH584A
SITE ADDRESS:	33 KEEGAN ROAD PLYMOUTH, CT 06782
LESSEE/TENANT:	T-MOBILE NORTHEAST, LLC 35 GRIFFIN ROAD SOUTH BLOOMFIELD, CT 06002
CONTACT PERSON:	MATT BANDLE (PROJECT MANAGER) VERTICAL DEVELOPMENT, LLC (508) 642-8801
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT. 06405 (203) 488-0580
PROJECT COORDINATES:	LATITUDE: 41°-39'-42.33" N LONGITUDE: 73°-02'-44.32" W GROUND ELEVATION: ±826' A.M.S.L. SITE COORDINATES AND GROUND ELEVATION REFERENCED FROM CSC WEB LOG.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	DESIGN BASIS AND STRUCTURAL SPECIFICATIONS	0
C-1	SITE LOCATION PLAN AND ABBUTERS MAP	0
C-2	COMPOUND PLAN, ELEVATION & ANTENNA MOUNTING CONFIG.	0
C-3	SITE DETAILS	0
E-1	COMPOUND PLAN AND NOTES	0
E-2	ELECTRICAL RISER DIAGRAM AND NOTES	0
E-3	ELECTRICAL SCHEMATIC DIAGRAM	0
E-4	ELECTRICAL GROUNDING PLAN AND NOTES	0
E-5	ELECTRICAL DETAILS	0
E-6	ELECTRICAL DETAILS	0
E-7	ELECTRICAL SPECIFICATIONS	0

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	09/28/16	DRA	HMR	ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

T-Mobile

CENTEK engineering
Centered on Solutions℠
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

T-MOBILE
WIRELESS COMMUNICATIONS FACILITY
PLYMOUTH
SITE ID: CTNH584A
33 KEEGAN ROAD
PLYMOUTH, CT 06782

DATE:	09/20/16
SCALE:	AS NOTED
JOB NO.	16141.00

TITLE SHEET

T-1

Sheet No. 1 of 12

SITE AND FOUNDATION SPECIFICATIONS

DESIGN BASIS

GOVERNING CODE: 2012 INTERNATIONAL BUILDING CODE (IBC) AS AMENDED BY THE 2016 CONNECTICUT STATE BUILDING CODE.

1. DESIGN CRITERIA:

   - WIND LOAD (ANTENNA MOUNTS):
     TIA-222-G-2005
     BASIC WIND SPEED (V) = 90-100 MPH (3-SECOND GUST)

     2016 CT BUILDING CODE AMENDMENT APPENDIX N
     BASIC WIND SPEED (V) = 93 MPH (3-SECOND GUST)

SPECIAL INSPECTIONS

1. SPECIAL INSPECTIONS ARE TO BE PROVIDED BY AN APPROVED AGENCY HIRED BY VERIZON WIRELESS. REFER TO THE STATEMENT OF SPECIAL INSPECTIONS PREPARED BY CENTEK ENGINEERING, INC. DATED 09.28.16.

GENERAL NOTES

1. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
2. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST THE PRE MANUFACTURED EQUIPMENT BUILDING SHOP DRAWINGS.
3. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.
4. REFER TO DRAWING T1 FOR ADDITIONAL NOTES AND REQUIREMENTS.

SITE NOTES

1. THE CONTRACTOR SHALL CALL UTILITIES PRIOR TO THE START OF CONSTRUCTION.
2. ACTIVE EXISTING UTILITIES, WHERE ENCOUNTERED IN THE WORK, SHALL BE PROTECTED AT ALL TIMES. THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY, PRIOR TO PROCEEDING, SHOULD ANY UNCOVERED EXISTING UTILITY PRECLUDE COMPLETION OF THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.
3. ALL RUBBISH, STUMPS, DEBRIS, STICKS, STONES AND OTHER REFUSE SHALL BE REMOVED OFF SITE AND BE LEGALLY DISPOSED, AT NO ADDITIONAL COST.
4. THE SITE SHALL BE GRADED TO CAUSE SURFACE WATER TO FLOW AWAY FROM THE EQUIPMENT AND TOWER AREAS.
5. NO FILL OR EMBANKMENT MATERIAL SHALL BE PLACED ON FROZEN GROUND. FROZEN MATERIALS, SNOW OR ICE SHALL NOT BE PLACED IN ANY FILL OR EMBANKMENT.
6. THE SUBGRADE SHALL BE COMPACTED AND BROUGHT TO A SMOOTH UNIFORM GRADE PRIOR TO FINISHED SURFACE APPLICATION.
7. THE AREAS OF THE COMPOUND DISTURBED BY THE WORK SHALL BE RETURNED TO THEIR ORIGINAL CONDITION.
8. CONTRACTOR SHALL MINIMIZE DISTURBANCE TO EXISTING SITE DURING CONSTRUCTION. EROSION CONTROL MEASURES, SHALL BE IN CONFORMANCE WITH THE LOCAL GUIDELINES FOR EROSION AND SEDIMENT CONTROL.
9. IF ANY FIELD CONDITIONS EXIST WHICH PRECLUDE COMPLIANCE WITH THE DRAWINGS, THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER AND SHALL PROCEED WITH AFFECTED WORK AFTER CONFLICT IS SATISFACTORILY RESOLVED.
10. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST THE PRE MANUFACTURED EQUIPMENT BUILDING SHOP DRAWINGS.

EARTHWORK NOTES

1. COMPACTED GRAVEL FILL SHALL BE FURNISHED AND PLACED AS A FOUNDATION FOR STRUCTURES, WHERE SHOWN ON THE CONTRACT DRAWINGS OR DIRECTED BY THE ENGINEER.
2. CRUSHED STONE FILL SHALL BE PLACED IN 12" MAX. LIFTS AND CONSOLIDATED USING A HAND OPERATED VIBRATORY PLATE COMPACTOR WITH A MINIMUM OF 2 PAQSSES OF COMPACTOR PER LIFT.
3. COMPACTED GRAVEL FILL TO BE WELL GRADED BANK RUN GRAVEL MEETING THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE DESIGNATION	% PASSING
1 ½"	100
No. 4	40-70
No. 100	5-20
No. 200	4-8

4. CRUSHED STONE TO BE UNIFORMLY GRADED, CLEAN, HARD PROCESS AGGREGATE MEETING THE FOLLOWING GRADATION REQUIREMENTS:

SIEVE DESIGNATION	% PASSING
1"	100
¾"	90-100
½"	0-15
⅜"	0-5

5. SELECT BACKFILL FOR FOUNDATION WALLS SHALL BE FREE OF ORGANIC MATERIAL, TOPSOIL, DEBRIS AND BOULDERS LARGER THAN 6".
6. GRAVEL AND GRANULAR FILL SHALL BE INSTALLED IN 8" MAX. LIFTS. COMPACTED TO 95% MIN. AT MAX. DRY DENSITY.
7. NON WOVEN GEOTEXTILE FOR SEPARATION PURPOSES SHALL BE MIRAFI 140N, OR ENGINEER APPROVED EQUAL.

FOUNDATION CONSTRUCTION NOTES

1. ALL FOOTINGS SHALL BE PLACED ON SUITABLE, COMPACTED SOIL HAVING ADEQUATE BEARING CAPACITY AND FREE OF ORGANIC CONTENT, CLAY, OR OTHER UNSUITABLE MATERIAL. ADDITIONAL EXCAVATION MAY BE REQUIRED BELOW FOOTING ELEVATIONS INDICATED IF UNSUITABLE MATERIAL IS ENCOUNTERED.
2. SUBGRADE PREPARATION: IF UNSUITABLE SOIL IS ENCOUNTERED, REMOVE ALL UNSUITABLE MATERIALS FROM BELOW PROPOSED STRUCTURE FOUNDATIONS AND COMPACT EXPOSED SOIL SURFACES. PLACE AND COMPACT APPROVED GRAVEL FILL. PLACEMENT OF ALL COMPACTED FILL MUST BE UNDER SUPERVISION OF AN APPROVED TESTING LABORATORY. FILL SHALL BE COMPACTED IN LAYERS NOT TO EXCEED 10" BEFORE COMPACTION. DETERMINE MAXIMUM DRY DENSITY IN ACCORDANCE WITH ASTM D1557-70 AND MAKE ONE (1) FIELD DENSITY TEST IN ACCORDANCE WITH ASTM D2167-66 FOR EACH 50 CUBIC YARDS OF COMPACTED FILL. BUT NOT LESS THAN ONE (1) PER LAYER, TO INSURE COMPACTION TO 95% OF MAX. DRY DENSITY.
3. ALL SOIL SURROUNDING AND UNDER ALL FOOTINGS SHALL BE KEPT REASONABLY DRY AND PROTECTED FROM FREEZING AND FROST ACTION DURING THE COURSE OF CONSTRUCTION.
4. WHERE GROUNDWATER IS ENCOUNTERED, DEWATERING SHALL BE ACCOMPLISHED CONTINUOUSLY AND COMPLETELY DURING FOUNDATION CONSTRUCTION. PROVIDE CRUSHED STONE AS REQUIRED TO STABILIZE FOOTING SUBGRADE.
5. ALL FOOTINGS ARE TO REST ON FIRM SOIL, REGARDLESS OF ELEVATIONS SHOWN ON THE DRAWINGS, BUT IN NO CASE MAY FOOTING ELEVATIONS BE HIGHER THAN INDICATED ON THE FOUNDATION PLAN, UNLESS SPECIFICALLY DIRECTED BY THE ENGINEER.
6. FOUNDATION WATERPROOFING AND DAMPPROOFING SHALL COMPLY WITH BUILDING CODE REQUIREMENTS UNLESS A MORE SUBSTANTIAL SYSTEM IS INDICATED OR SPECIFIED.

CONCRETE CONSTRUCTION NOTES

1. CONCRETE CONSTRUCTION SHALL CONFORM TO THE FOLLOWING STANDARDS:

   ACI 211 – STANDARD PRACTICE FOR SELECTING PROPORTIONS FOR NORMAL AND HEAVYWEIGHT CONCRETE.

   ACI 301 – SPECIFICATIONS FOR STRUCTURAL CONCRETE FOR BUILDINGS.

   ACI 302 – GUIDE FOR CONCRETE FLOOR AND SLAB CONSTRUCTION

   ACI 304 – RECOMMENDED PRACTICE FOR MEASURING, MIXING, TRANSPORTING, AND PLACING CONCRETE.

   ACI 306.1 STANDARD SPECIFICATION FOR COLD WEATHER CONCRETING

   ACI 318 – BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE.

2. CONCRETE SHALL DEVELOP COMPRESSIVE STRENGTH IN 28 DAYS AS FOLLOWS:

   SLABS ON GRADE 4,000 PSI
   ALL OTHER CONCRETE 3,000 PSI

   - PORTLAND CEMENT: ASTM C150, TYPE II, (540 LBS/CUBIC YARD)
   - AGGREGATE: ASTM C33, No. 67, TYPICAL
   - WATER: POTABLE WITH MAXIMUM WATER CEMENT RATIO OF .55
   - SLUMP: 3" TO 4"
   - ADMIXTURES: USE AIR ENTRAINING ADGENT CONFORMING TO ASTM C260 WITH 4 TO 6% TOTAL AIR. USE WATER REDUCING AGENT CONFORMING TO ASTM C494, TYPE A, IN ALL CONCRETE. CALCIUM CHLORIDE MAY NOT BE USED TO ACCELERATE THE CONCRETE SETTING TIME.

3. REINFORCING STEEL SHALL BE 60,000 PSI YIELD STRENGTH.
4. WELDED WIRE FABRIC SHALL CONFORM TO ASTM- A-185.
5. ALL DETAILING, FABRICATION, AND ERECTION OF REINFORCING BARS, UNLESS OTHERWISE NOTED, MUST FOLLOW THE LATEST ACI CODE AND LATEST ACI "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED CONCRETE STRUCTURES".
6. CONCRETE COVER OVER REINFORCING SHALL CONFORM TO THE FOLLOWING, UNLESS OTHERWISE SHOWN:

   BOTTOM OF FOOTINGS 3 INCHES

   SURFACES NOT EXPOSED TO EARTH OR WEATHER 1-1/2 INCHES

7. NO STEEL WIRE, METAL FORM TIES, OR ANY OTHER METAL SHALL REMAIN WITHIN THE REQUIRED COVER OF ANY CONCRETE SURFACE.
8. ALL REINFORCEMENT SHALL BE CONTINUOUS UNLESS OTHERWISE NOTED. SPLICES SHALL BE WELL STAGGERED. ADDITIONAL BARS AND SPECIAL BENDING DETAILS ARE REQUIRED AT INTERSECTING WALLS AND AT JOINTS. SUCH DETAILS SHALL COMPLY WITH ACI 315 RECOMMENDATIONS UNLESS OTHERWISE SHOWN.
9. NO TACK WELDING OF REINFORCING WILL BE PERMITTED.
10. NO CALCIUM CHLORIDE OR ADMIXTURES CONTAINING MORE THAN 1% CHLORIDE BY WEIGHT OF ADMIXTURE SHALL BE USED IN THE CONCRETE.
11. UNLESS OTHERWISE NOTED, ALL LAP SPLICES SHALL BE 48 BAR DIAMETERS.
12. SLAB ON GRADE FINISHES:

    EXTERIOR SLAB: NON-SLIP BROOM FINISH
    INTERIOR SLAB: STEEL TROWEL FINISH

13. INSPECTION AND TESTING OF CONCRETE WORK SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY, PAID BY THE OWNER, AND APPROVED BY THE ENGINEER. THE INSPECTOR SHALL OBSERVE CONDITION OF SOILS AND FORMWORK BEFORE FOOTINGS ARE PLACED, SIZE, SPACING AND LOCATION OF REINFORCEMENT, AND PLACEMENT OF CONCRETE.
14. THE TESTING COMPANY SHALL ALSO OBTAIN A MINIMUM OF THREE (3) COMPRESSIVE STRENGTH TEST SPECIMENS FOR EACH CONCRETE MIX DESIGN. ONE SPECIMEN TESTED AT 7 DAYS, ONE AT 28 DAYS, AND ONE HELD IN RESERVE FOR FUTURE TESTING, IF NEEDED.
15. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

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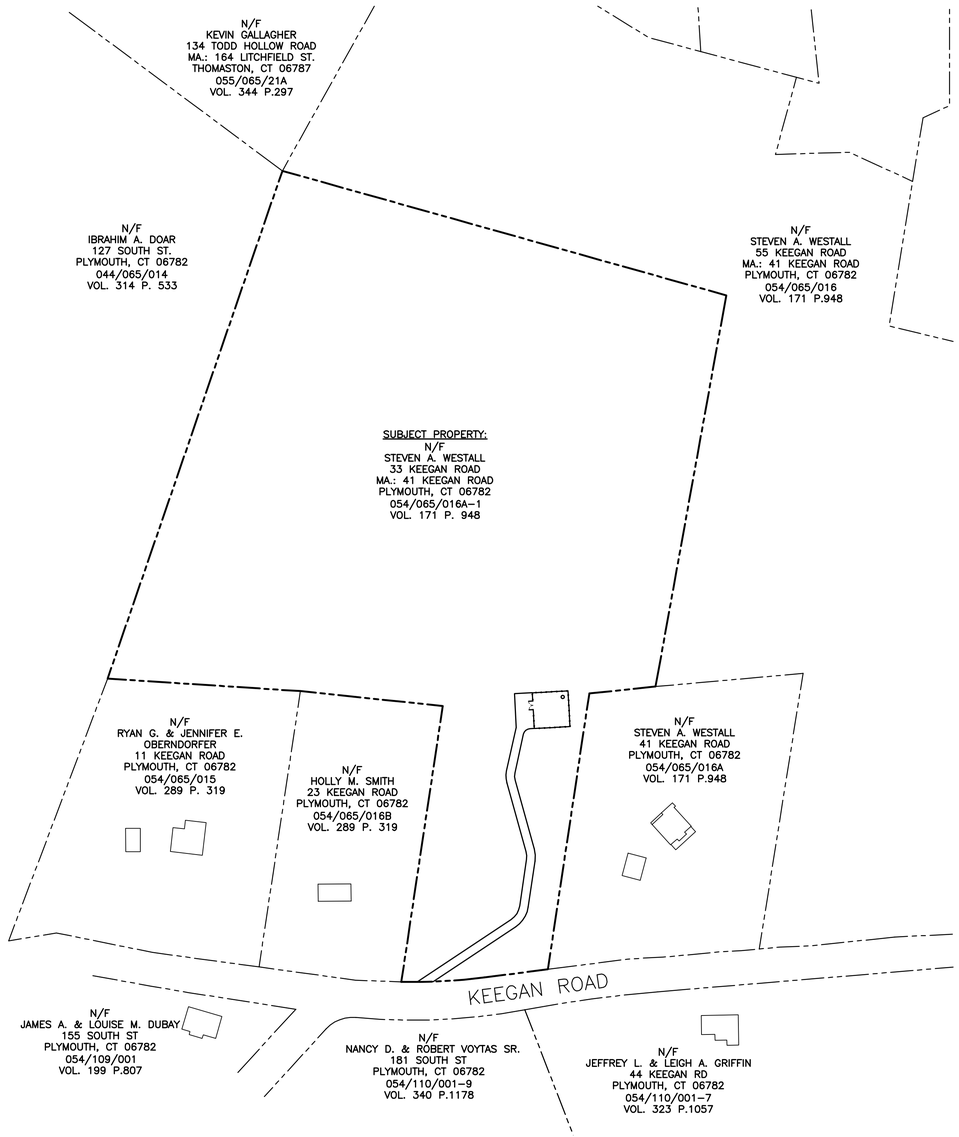
DESIGN BASIS AND STRUCTURAL SPECIFICATIONS

N-1

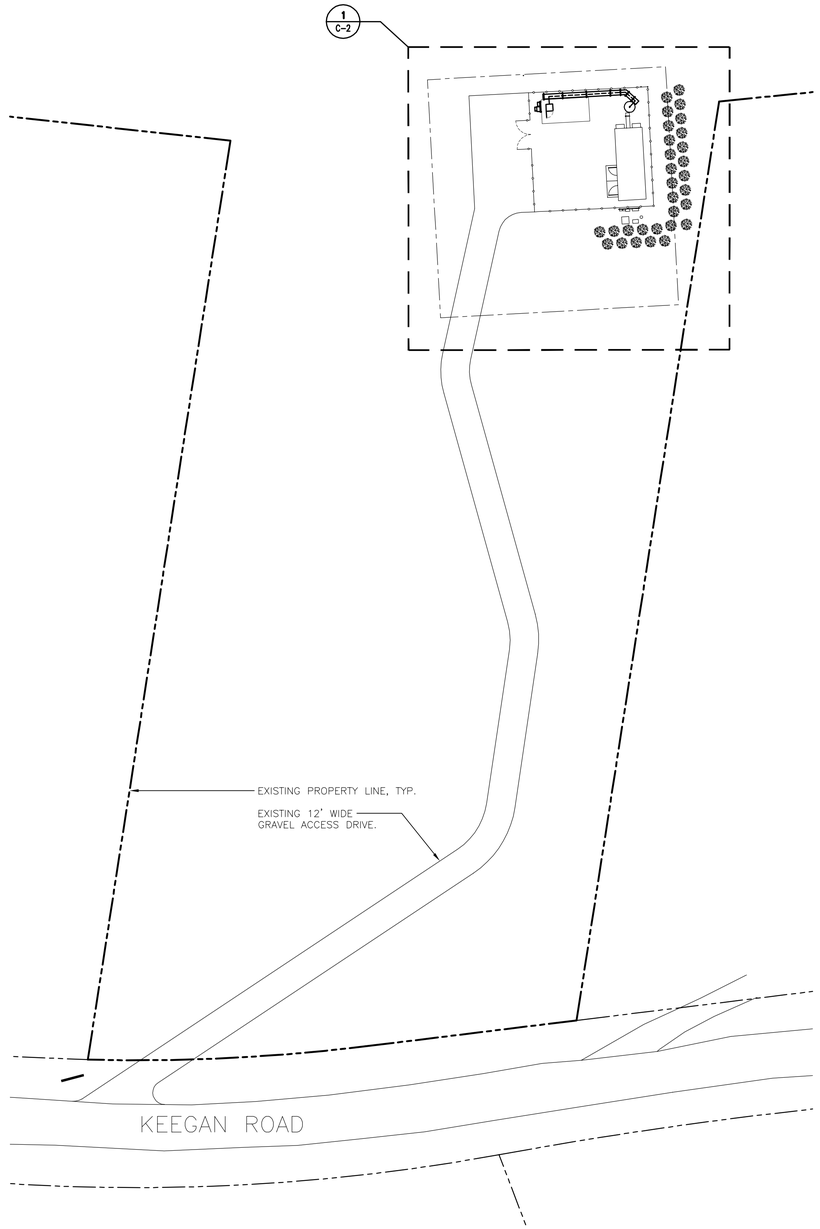
Sheet No. 2 of 12



1 / C-1 **ABUTTERS MAP**
SCALE: 1" = 100'

TRUE NORTH

GRAPHIC SCALE
100 0 50 100 200 400
(IN FEET)
1 inch = 100 ft.



2 / C-1 **SITE LOCATION PLAN**
SCALE: 1" = 30'

TRUE NORTH

GRAPHIC SCALE
30 0 15 30 60 120
(IN FEET)
1 inch = 30 ft.

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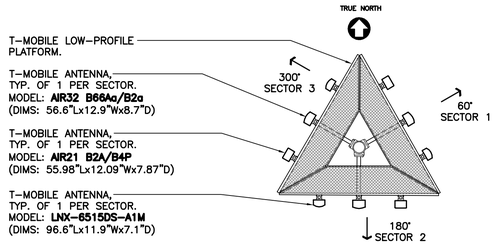
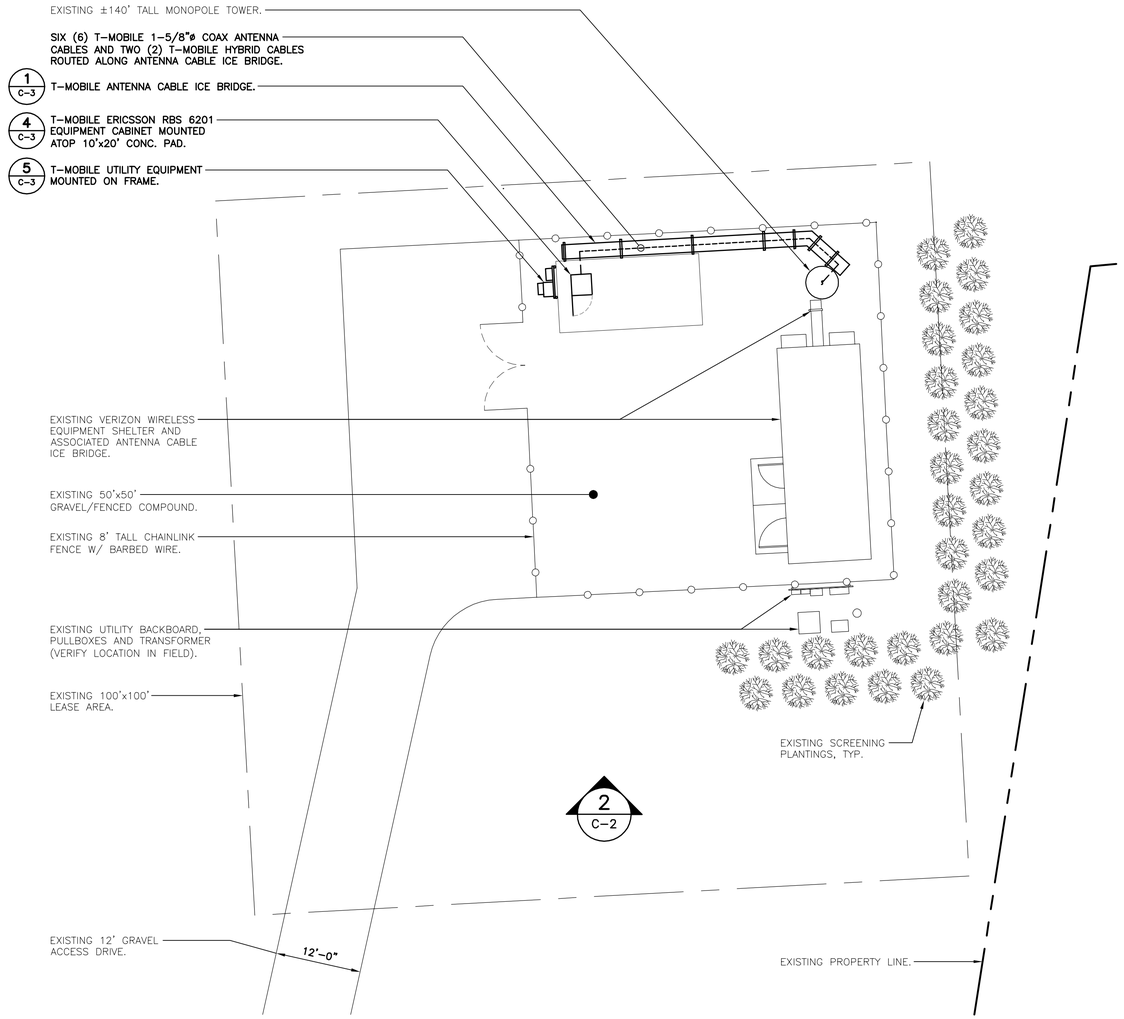
SITE LOCATION PLAN AND ABUTTERS MAP

C-1

Sheet No. 3 of 12



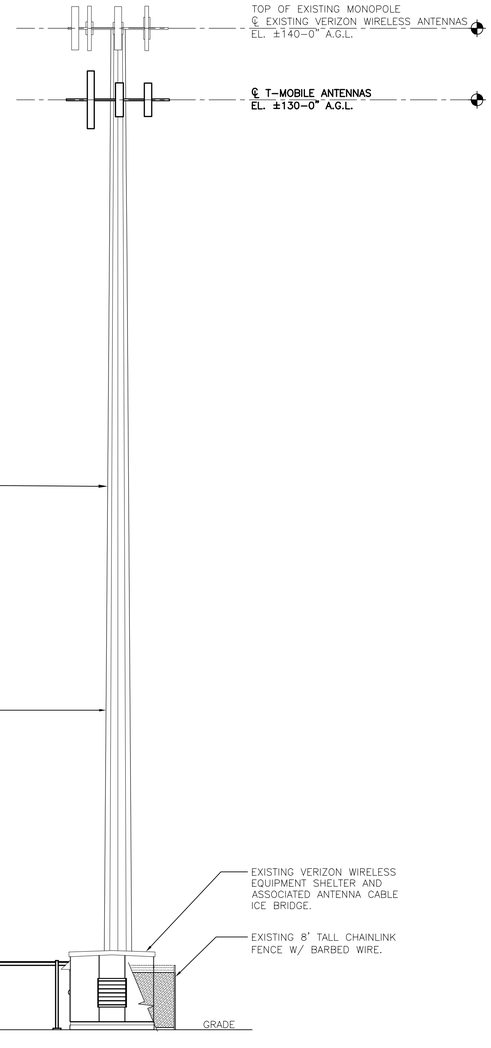
3 / C-2 **ANTEANNA LAYOUT PLAN**
NOT TO SCALE



1 / C-2 **COMPOUND PLAN**
SCALE: 1" = 10'

TRUE NORTH

GRAPHIC SCALE
40 0 20 40 80 160
(IN FEET)
1 inch = 40 ft.



2 / C-2 **SOUTHWEST ELEVATION**
SCALE: 1" = 20'

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

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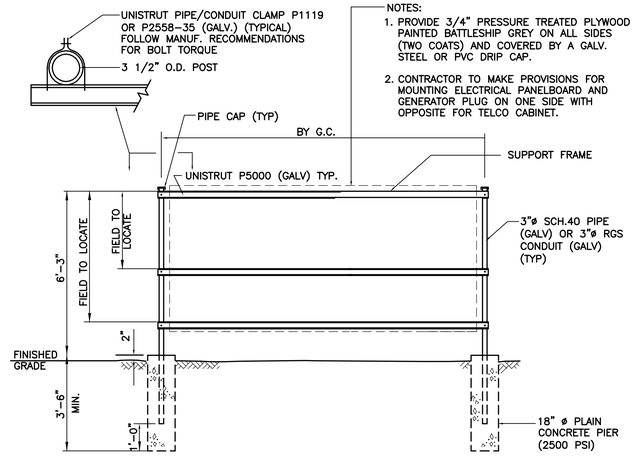
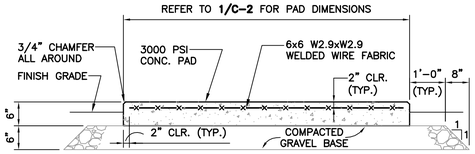
COMPOUND PLAN, ELEVATION AND ANTENNA MOUNTING CONFIG.

C-2

Sheet No. 4 of 12

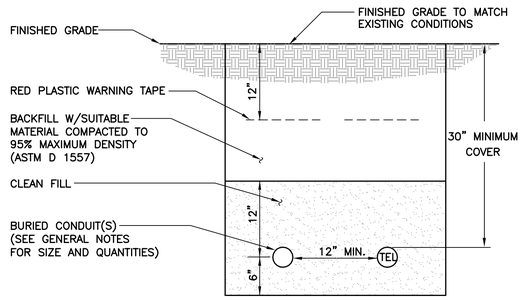


5 C-3 **UTILITY SUPPORT FRAME (TYP)**
NOT TO SCALE



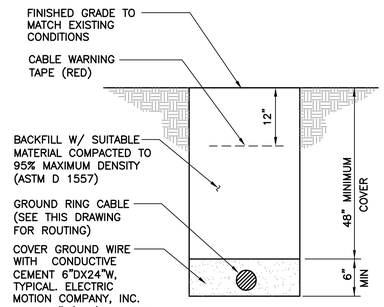
NOTE:
REFER TO EQUIPMENT MANUFACTURER FOR RECOMMENDED HOLD-DOWN HARDWARE.

4 C-3 **TYPICAL CONC. PAD DETAIL**
NOT TO SCALE



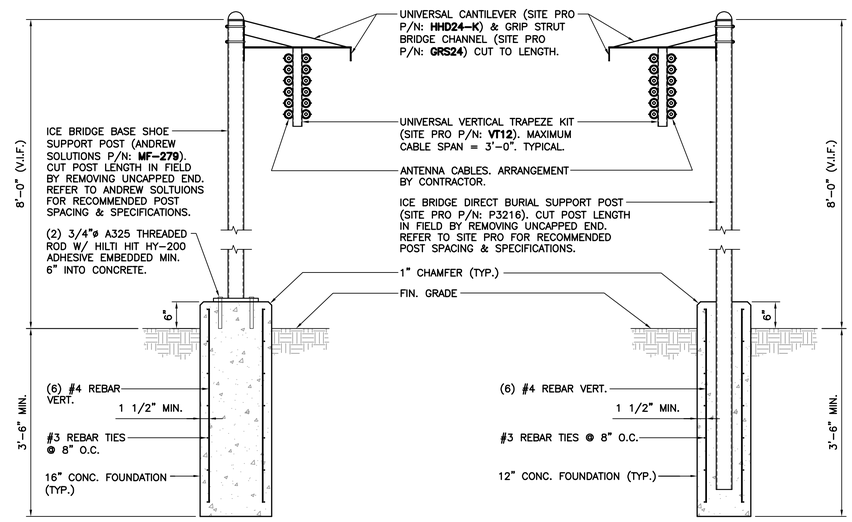
NOTES:
1. THE CLEAN FILL SHALL PASS THROUGH A 3/8" MESH SCREEN AND SHALL NOT CONTAIN SHARP STONES. OTHER BACKFILL SHALL NOT CONTAIN ASHES, CINDERS, SHELLS, FROZEN MATERIAL, LOOSE DEBRIS OR STONES LARGER THAN 2" IN MAXIMUM DIMENSION.
2. WHERE EXISTING UTILITIES ARE LIKELY TO BE ENCOUNTERED, CONTRACTOR SHALL HAND DIG AND PROTECT EXISTING UTILITIES.

3 C-3 **TYPICAL ELECTRICAL/TEL TRENCH DETAIL**
NOT TO SCALE



NOTES:
1. BACK FILL SHALL NOT CONTAIN ASHES, CINDERS, SHELLS, FROZEN MATERIAL, LOOSE DEBRIS OR STONES LARGER THAN 2" IN MAXIMUM DIMENSION.
2. WHERE EXISTING UTILITIES ARE LIKELY TO BE ENCOUNTERED, CONTRACTOR SHALL HAND DIG AND PROTECT EXISTING UTILITIES.

2 C-3 **TYPICAL BURIAL GROUND CABLE DETAIL**
NOT TO SCALE



BASE SHOE OPTION **DIRECT BURIAL OPTION**

1 C-3 **ICE BRIDGE DETAIL**
NOT TO SCALE

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SITE DETAILS

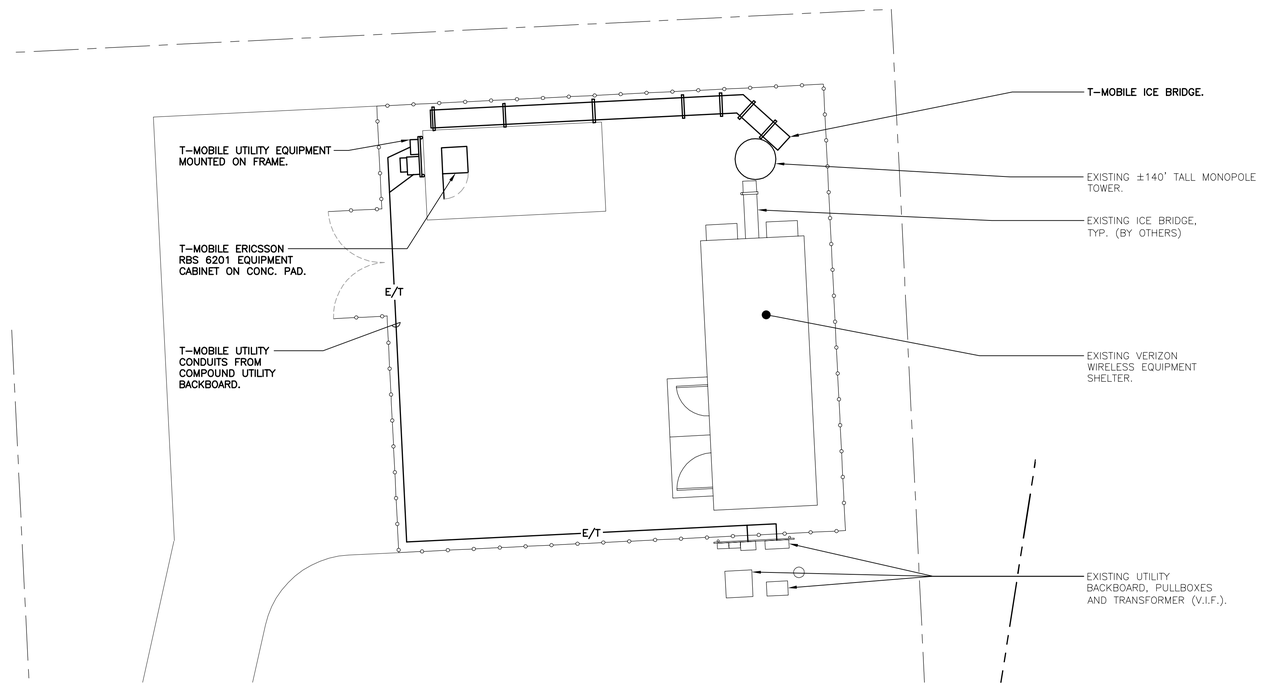
C-3
Sheet No. 5 of 12

GENERAL NOTES

1. REFER TO CIVIL DRAWINGS FOR ACTUAL LOCATIONS OF STRUCTURES ON SITE.
2. COORDINATION, LAYOUT AND FURNISHING OF CONDUIT, CABLE AND ALL APPURTENANCES REQUIRED FOR PROPER INSTALLATION OF ELECTRICAL / TELECOMMUNICATIONS SERVICES SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
3. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
4. PROVIDE CADWELD CONNECTION STYLES: THROUGH (CABLE TO CABLE) TYPE "TA"
   (CABLE TO SURFACE) TYPE "LA" OR "VS" (PIPE)
   (CABLE TO ROD) TYPE "GT" OR "NC"
   (CABLE TO CABLE) TYPE "SS"

ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
——— – – ———	GROUND RING
– T ——— T —	UNDERGROUND COMMUNICATION CONDUIT
– E ——— E —	UNDERGROUND ELECTRICAL CONDUIT
	GROUND BAR
—○———○—	PERIMETER CHAIN LINK FENCE
⊗	5/8" DIAMETER x 10'–0" COPPER GROUND ROD **OR** 24"x24" GROUND PLATE ABOVE MATT FOUNDATION.
⊠	5/8" DIAMETER x 10'–0" COPPER GROUND ROD WITH ACCESS.
■	EXOTHERMIC WELD TYPE "TA"



1 / E–1 **SITE PLAN**
SCALE: 1/8" = 1'

APPROXIMATE NORTH

GRAPHIC SCALE
8 0 4 8 16 32
(IN FEET)
1 inch = 8 ft.

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COMPOUND PLAN AND NOTES

E–1

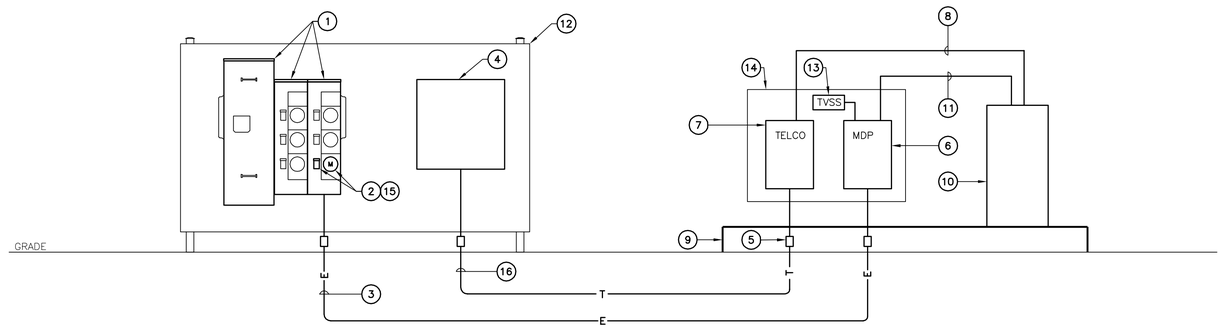
Sheet No. 6 of 12

RISER DIAGRAM NOTES

1. EXISTING METER CENTER AND MAIN SERVICE DISCONNECT TO REMAIN. (SHOWN FOR REFERENCE ONLY).
2. 200A, SINGLE PHASE, 240 UTILITY METER AND ASSOCIATED 200A, 240V, 2P CIRCUIT BREAKER IN AVAILABLE POSITION IN METER CENTER. AIC RATING TO EXCEED AVAILABLE FAULT CURRENT FROM UTILITY.
3. (3) #3/0 AWG, (1) #6 AWG GROUND, 2-1/2" CONDUIT.
4. EXISTING TELCO DEMARC LOCATION.
5. EXPANSION COUPLING (TYP).
6. MAIN DISTRIBUTION PANEL "MDP": 200A, 120/240V, SINGLE PHASE, 3W, NEMA-3R, DOOR HINGED TO CABINET, BOLT-ON BREAKERS, SURFACE MOUNT, 65 KAIC, 200A MCB, 42 POSITION.
7. 3' X 3' X 1' NEMA-3R HOFFMAN BOX AT EQUIPMENT FOR TELCO CONNECTIONS.
8. CONDUITS AND CONDUCTORS FOR TELCO CONNECTION TO EQUIPMENT CABINET AS REQUIRED BY MANUFACTURER AND CONSTRUCTION MANAGER FOR PROPER OPERATION OF EQUIPMENT.
9. CONCRETE EQUIPMENT SLAB.
10. OWNER'S EQUIPMENT CABINET (TYPICAL). INSTALL PER MANUFACTURER SPECIFICATIONS.
11. POWER CONDUITS AND CONDUCTORS FOR EQUIPMENT CABINETS AS REQUIRED BY MANUFACTURER FOR PROPER OPERATION.
12. EXISTING UTILITY BACKBOARD TO REMAIN.
13. RAYCAP AM2080-V-07 SURGE PROTECTOR. INSTALL WIRING AND CIRCUIT BREAKER AS SPECIFIED BY MANUFACTURER. MOUNT IN WEATHERPROOF ENCLOSURE NEAR MDP.
14. UTILITY FRAME AT EQUIPMENT. REFER TO CIVIL DRAWINGS FOR DETAILS.
15. PROVIDE SIGN STATING "T-MOBILE".
16. 2" CONDUIT WITH PULL ROPES FOR TELEPHONE COMPANY CONDUCTORS. PROVIDE ALL COUPLINGS, ADAPTERS, SWEEPS, AND ASSOCIATED HARDWARE. MATERIAL SHALL BE PER TELEPHONE COMPANY SPECIFICATIONS.

GENERAL NOTES:

1. CONDUCTOR SIZES SHALL NOT BE REDUCED OR SUBSTITUTED WITHOUT ENGINEERS APPROVAL.
2. UNLESS OTHERWISE NOTED, ALL CONDUCTORS AND CONDUCTOR TERMINATIONS SHALL BE RATED FOR MINIMUM 75 DEGREE C CONTINUOUS OPERATION.
3. CONTRACTOR TO COORDINATE ALL CONDUIT ROUTING AND INSTALLATION REQUIREMENTS IN THE FIELD WITH LOCAL UTILITIES, LANDLORD, AND WIRELESS CARRIER'S CONSTRUCTION MANAGER PRIOR TO INSTALLATION.
6. RESTORE ALL DISTURBED AREAS TO PRE-CONSTRUCTION CONDITION.
7. ALL WORK SHALL BE IN ACCORDANCE WITH NEC REQUIREMENTS. COORDINATE WITH BUILDING OFFICIAL, BUILDING OWNER, AND CONSTRUCTION MANAGER FOR ANY ADDITIONAL REQUIREMENTS.
8. COORDINATE WITH CONSTRUCTION MANAGER FOR LOCATION, LAYOUT, AND MOUNTING REQUIREMENTS FOR ALL ELECTRICAL EQUIPMENT.
9. ALL CONDUITS SHALL HAVE EXPANSION COUPLINGS WHERE EXTENDING ABOVE GRADE.
10. COORDINATE ELECTRICAL SERVICE AND DISTRIBUTION EQUIPMENT INTERRUPTING RATING WITH AVAILABLE FAULT CURRENT FROM UTILITY COMPANY. EQUIPMENT SHALL NOT BE RATED LESS THAN 65 KAIC.
12. ALL TELEPHONE UTILITY WORK MUST BE COORDINATED WITH TELEPHONE UTILITY COMPANY, AND ALL EQUIPMENT MUST BE UTILITY COMPANY APPROVED. CONTRACTOR SHALL PROVIDE ALL ELEMENTS NOT PROVIDED BY UTILITY COMPANY.
13. PROVIDE ALL NEC REQUIRED SIGNAGE AT SERVICE AND DISTRIBUTION EQUIPMENT.



1 / E-2 **ELECTRICAL POWER RISER DIAGRAM**
NOT TO SCALE

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ELECTRICAL RISER DIAGRAM AND NOTES

E-2

GROUNDING SCHEMATIC NOTES

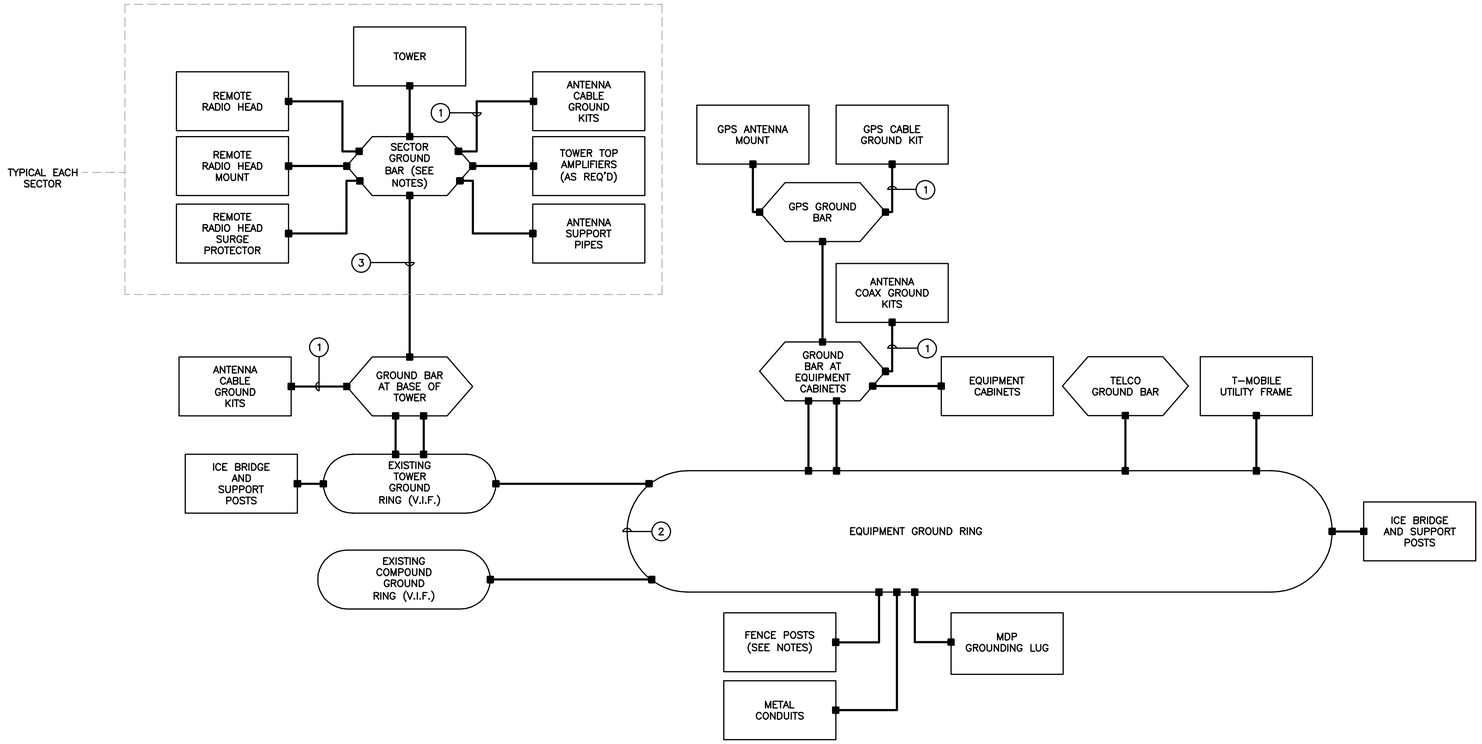
(1) #6 AWG.

(2) GROUND RING, #2 AWG BCW.

(3) #2/0 GREEN INSULATED.

GENERAL NOTES:

1. ALL SURGE SUPPRESSION EQUIPMENT SHALL BE BONDED TO GROUND PER MANUFACTURER'S SPECIFICATIONS
2. UNLESS OTHERWISE NOTED OR REQUIRED BY CODE, GROUND CONDUCTORS SHOWN SHALL BE #2 AWG (SOLID TINNED BCW – EXTERIOR; STRANDED GREEN INSULATED – INTERIOR).
3. BOND CABLE TRAY AND ICE BRIDGE SECTIONS TOGETHER WITH #6 AWG STRANDED GREEN INSULATED JUMPERS.
4. ALL SECTOR GROUND BARS SHALL BE BONDED TOGETHER WITH #2 AWG SOLID TINNED BCW.
5. BOND ALL EQUIPMENT CABINETS AND BATTERY CABINETS TO GROUND PER MANUFACTURER'S SPECIFICATIONS.
6. ALL BONDS TO TOWER SHALL BE MADE IN STRICT ACCORDANCE WITH SPECIFICATIONS OF TOWER MANUFACTURER OR STRUCTURAL ENGINEER.
7. REFER TO GROUNDING PLAN FOR LOCATION OF GROUNDING DEVICES.
8. REFER TO ALL ELECTRICAL AND GROUNDING DETAILS.
9. COORDINATE ALL TOWER MOUNTED EQUIPMENT WITH OWNER.
10. ALL TOWER MOUNTED AMPLIFIERS AND ASSOCIATED EQUIPMENT SHALL BE BONDED TO THE SECTOR GROUND BAR PER MANUFACTURER'S SPECIFICATIONS.
11. ALL FENCE POSTS WITHIN 6' OF EQUIPMENT SHELTER SHALL BE BONDED TO GROUND RING.
12. ALL GROUNDING SHALL BE IN ACCORDANCE WITH NEC AND OWNER'S REQUIREMENTS.



CELLULAR GROUNDING NOTES

OBJECTIVE

PROVIDE A CELLULAR GROUNDING SYSTEM WITH MAXIMUM ALTERNATING CURRENT RESISTANCE OF 5 OHMS BETWEEN ANY POINT ON THE GROUNDING SYSTEM AND REFERENCE GROUND. PROVIDE EXTERIOR GROUNDING SCHEME WITH OWNER'S ENGINEER APPROVAL AS REQUIRED TO ACHIEVE DESIRED MAXIMUM AC RESISTANCE TO GROUND.

TESTING

CONTRACTOR TO PROVIDE AN INDEPENDENT TESTING CONTRACTOR TO DETERMINE THE GROUNDING SYSTEM RESISTANCE BY USE OF THE THREE POINT TEST AND AN AEMC MODEL 4500, OR APPROVED EQUAL. TEST TO BE PERFORMED PRIOR TO CONNECTION OF POWER SUPPLY TO THE CELL SITE AND CONNECTION OF THE GROUNDING SYSTEM TO THE WATER MAIN OR AC SUPPLY AS APPLICABLE. IF 5 OHM LIMIT IS EXCEEDED, CONTACT ENGINEER FOR ADDITIONAL INSTRUCTIONS TO ACHIEVE 5 OHMS OR LESS.

CONDUCTOR USED FOR CELLULAR GROUNDING SYSTEM

EGR – #2 AWG ANNEALED SOLID TINNED BARE COPPER
IGR – #2 AWG ANNEALED STRANDED (7 STRAND) 'THW' GREEN COLORED INSULATION
INTER–BUS EXTENSION (FROM IGR TO EGR) – SEE DETAILS
EXTERNAL BOND CONNECTIONS TO EGR – #2 ANNEALED SOLID TINNED BARE COPPER
INTERIOR BOND CONNECTIONS TO IGR – #6 ANNEALED STRANDED (7 STRAND) 'THW' GREEN COLORED INSULATION

MINIMUM BENDING RADIUS

IGR #2 : 1'–0" NOMINAL AND 8" MINIMUM
EGR #2 : 2'–0" NOMINAL AND 8" MINIMUM
CELLULAR GROUNDING CONDUCTOR SHALL BE AS STRAIGHT AS POSSIBLE WITH MINIMUM 6" BENDING RADIUS.

FASTENER FOR CELLULAR GROUNDING CONDUCTOR

USE NON–METALLIC FASTENER AND STANDOFF 'CLIC' (AVAIL. FROM NEFCO 800–969–0285) TO SURFACE SUPPORT CONDUCTOR 3" AWAY FROM SURFACES.

SPACING OF FASTENERS: 2'–0" O.C. OUTSIDE BUILDING
3'–0" O.C. INSIDE BUILDING

GROUNDING ELECTRODE

GROUNDING ELECTRODE SHALL BE 5/8" DIA. x 10'–0" l. COPPER CLAD STEEL ROD. ADJUST LOCATION OF GROUNDING ELECTRODE IF SOIL CONDITION IS NOT CONDUCTIVE (GRAVEL, SANDY SOIL, ROCKS). SPACE GROUNDING ELECTRODES 20'–0" APART (SPACING MAY BE REDUCED WHERE REQUIRED TO ACCOMMODATE FIELD CONDITIONS BUT SHALL NOT BE LESS THAN 10'–0"). ELECTRODES SHALL BE DRIVEN ONLY WITH PROPER DRIVER SLEEVE TO PREVENT MUSHROOMING TOP OF ROD. WHEN ROCK BOTTOM IS ENCOUNTERED, THE ELECTRODE SHALL BE DRIVEN AT AN OBLIQUE ANGLE NOT TO EXCEED 45° FROM THE VERTICAL AWAY FROM STRUCTURES. TOP OF GROUNDING ELECTRODE SHALL BE MIN. 3'–6" BELOW FINISH GRADE.

CONNECTIONS ABOVE GRADE (MECHANICAL)

COMPRESSION LUG CONNECTOR – 15 TON COMPRESSION, 2 HOLE, LONG BARREL, ELECTRO TINNED PLATED, HIGH CONDUCTIVITY, COPPER 600V RATED. USE 1/4" ø BOLT, 3/4" SPACING LUGS TO BOND OBJECTS FROM THE IGR. (CONNECTOR SHALL BE BURNDY HYLUG SERIES OR EQUAL.)

EXOTHERMIC WELD LUG CONNECTOR – 2 HOLE, OFFSET, ELECTRO TINNED PLATED, HIGH CONDUCTIVITY, COPPER 600V. USE 1/2"ø BOLT, 1–3/4" SPACING LUGS. CONNECTOR SHALL BE CADWELD CONNECTION STYLE (CABLE TO SURFACE) TYPE LA, LUG SIZE 1/8 x 1. EXOTHERMIC WELD TO LUG AS REQUIRED.

C–TAP COMPRESSION CONNECTOR – HIGH CONDUCTIVITY COPPER FOR MAIN TO BRANCH LINE TAPPING. (CONNECTOR SHALL BE BURNDY HYTAP SERIES OR EQUAL.)

MECHANICAL CONNECTIONS

USE MATCHING MANUFACTURER TOOL AND DIE FOR COMPRESSION CONNECTION.

APPLY ANTI–OXIDANT CONDUCTIVITY ENHANCER COMPOUND ON SURFACES THAT ARE COMPRESSED.

SURFACES INTENDED TO BE CONNECTED WITH MECHANICAL CONNECTORS SHALL BE BARE METAL TO BARE METAL. PRIME AND PAINT OVER BONDED AREA TO PREVENT CORROSION.

WHEN BONDING #2 TO #2

EXTERIOR OF BUILDING – USE EXOTHERMIC WELD CONNECTION
INTERIOR OF BUILDING – USE COMPRESSION CONNECTION ON STRANDED CONDUCTORS ONLY.
– USE EXOTHERMIC WELD CONNECTION ON SOLID CONDUCTOR.

WHEN BONDING #2 TO FENCE POST

USE EXOTHERMIC WELD (CADWELD TYPE 'VS') CONNECTION TO FENCE POST STEEL SURFACE. TEST WELD FOR POSSIBLE BURN THRU. PATCH WELDED AREA WITH GALVANIZED COATING AS REQUIRED FOR PROPER WELDED PERMANENT BOND. REFER TO MANUFACTURER'S REQUIREMENTS FOR DETAILS

GROUNDING SYSTEM INTERCONNECTION

BOND THE EGR DOWN CONDUCTORS, AND/OR BURIED GROUND RING TO ANY METALLIC OBJECT OR EXISTING GROUNDING SYSTEM WITHIN 6'.

WHEN BONDING #2 TO TOWER GROUND PLATE

TOWER GROUND PLATE SHALL BE 6" x 8" x 1/4" COPPER AND BE MADE AVAILABLE TO TOWER CONTRACTOR TO BE INSTALLED DURING TOWER CONSTRUCTION. USE EXOTHERMIC WELD (CADWELD TYPE 'HS') TO TOWER GROUND PLATE TEST WELD FOR POSSIBLE BURN THRU. COORDINATE THE SIZE OF THE MOUNTING HOLE WITH TOWER CONTRACTOR.

METALLIC CONDUITS

BOND ALL STEEL CONDUITS TO PANELS AT POINT OF CONTACT WITH APPROVED GROUNDING BUSHING.

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JOB NO. 16141.00

ELECTRICAL SCHEMATIC DIAGRAM

E-3

Sheet No. 8 of 12

GROUNDING PLAN NOTES

1. #2 SOLID TINNED BCW GROUND RING. (TYP)
2. GROUNDING ROD (TYP.) PER DETAILS.
3. ICE BRIDGE POST AND COVER. BOND EACH SECTION AND SUPPORT TO GROUND RING PER DETAILS. (TYP.)
4. UPPER TOWER MOUNTED GROUND BAR PER DETAILS.
5. LOWER TOWER MOUNTED GROUND BAR PER DETAILS.
6. BOND UPPER TOWER MOUNTED GROUND BAR TO LOWER TOWER MOUNTED GROUND BAR (2 GROUND LEADS) PER DETAILS.
7. BOND TO EXISTING TOWER GROUND RING.
8. GROUNDING ROD WITH ACCESS (TYP.) PER DETAILS.
9. MAIN EQUIPMENT GROUND BAR, PER DETAILS.
10. BOND MDP TO GROUND RING.
11. BOND TELCO GROUND BAR TO GROUND RING.
12. BOND TO GROUND RING (TYPICAL OF 2).
13. BOND TO EXISTING COMPOUND GROUND RING.
14. CONNECT FENCE POSTS TO GROUNDING RING (TYP). (REFER TO GROUNDING SCHEMATIC NOTES).
15. BOND EQUIPMENT CABINET TO GROUND BAR PER MFG SPECIFICATIONS.

GENERAL NOTES

1. REFER TO GROUNDING SCHEMATIC AND ALL DETAILS FOR ADDITIONAL INFORMATION.

1 / E-4 **COMPOUND GROUNDING PLAN**
SCALE: 1/4" = 1'

APPROXIMATE NORTH

GRAPHIC SCALE
4 0 2 4 8 16
(IN FEET)
1 inch = 4 ft.

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ELECTRICAL GROUNDING PLAN AND NOTES

E-4

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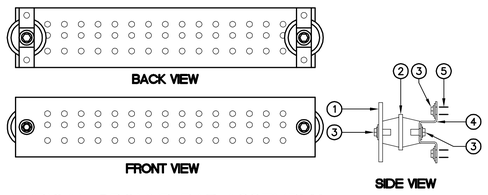
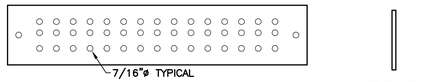


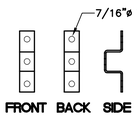
TYPICAL GROUND BAR ASSEMBLY



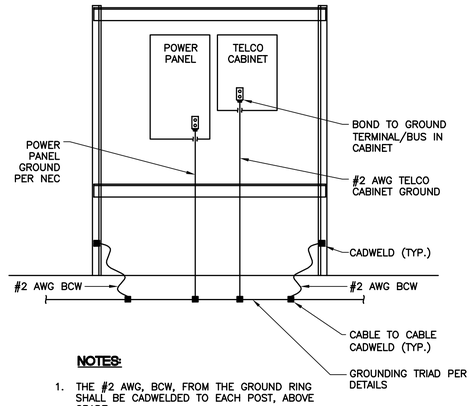
TYPICAL GROUND BAR - DIMENSIONS

NOTES

1. HIGH CONDUCTIVITY TINNED COPPER BAR 1'-8"Lx4"Wx1/4"D.
2. RED COLORED STANDOFF INSULATOR PLASTIC #1872-1A.
3. STAINLESS STEEL TRUSS SPANNER MACHINE SCREWS, SPLIT LOCKWASHER AND FLAT WASHER.
4. 1"Wx1/8"T STAINLESS STEEL TYPE 304 BRACKET.
5. STAINLESS STEEL TYPE 304 HARDWARE – 3/8"ø EXPANSION BOLT FOR CONCRETE.



BRACKET FOR GROUND BAR-DIMENSIONS

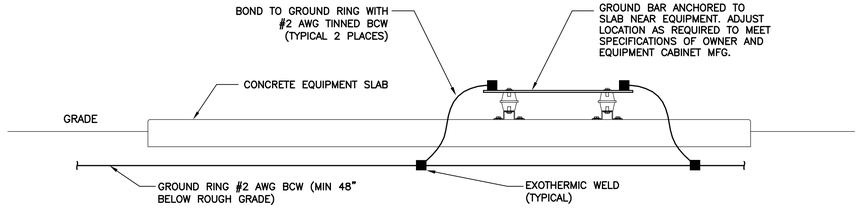


NOTES:

1. THE #2 AWG, BCW, FROM THE GROUND RING SHALL BE CADWELDED TO EACH POST, ABOVE GRADE.

2 E-5 UTILITY FRAME GROUNDING DETAIL

NOT TO SCALE

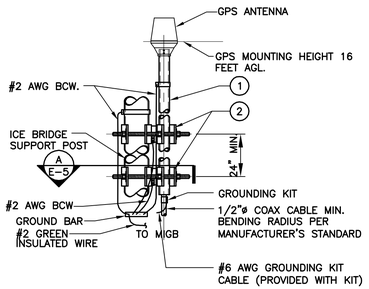


3 E-5 GROUNDING AND BONDING AT CONCRETE SLAB

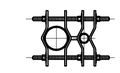
NOT TO SCALE

1 E-5 MASTER/EQUIPMENT GROUND BAR DETAILS

NOT TO SCALE



GPS ANTENNA MOUNTING BRACKET



A E-5 SECTION

NOT TO SCALE

NOTES

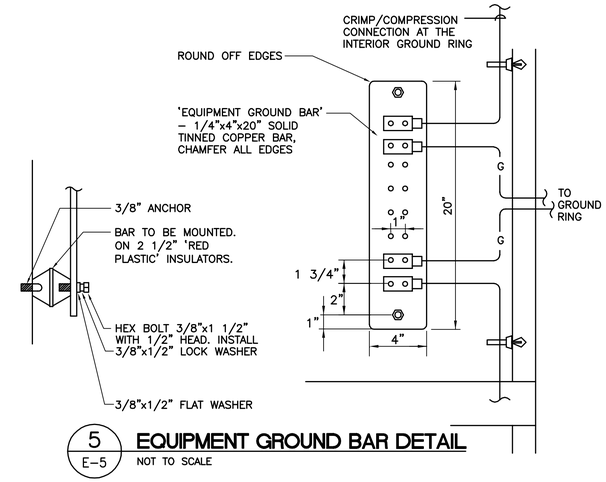
1. THE ELEVATION AND LOCATION OF THE GPS ANTENNA SHALL BE IN ACCORDANCE WITH THE FINAL RF REPORT.
2. THE GPS ANTENNA MOUNT IS DESIGNED TO FASTEN TO A STANDARD 2-1/2" DIAMETER, SCHEDULE 40, GALVANIZED STEEL OR STAINLESS STEEL PIPE. THE PIPE MUST NOT BE THREADED AT THE ANTENNA MOUNT END. THE PIPE SHALL BE CUT TO THE REQUIRED LENGTH (MINIMUM OF 24 INCHES) USING A HAND OR ROTARY PIPE CUTTER TO ASSURE A SMOOTH AND PERPENDICULAR CUT. A HACK SAW SHALL NOT BE USED. THE CUT PIPE END SHALL BE DEBURRED AND SMOOTH IN ORDER TO SEAL AGAINST THE NEOPRENE GASKET ATTACHED TO THE ANTENNA MOUNT.

BILL OF MATERIALS

ITEM	DESCRIPTION	QUANTITY
1	2-1/2"ø SCH. 40 x 8'-0" LG. MAX SS OR GALV. PIPE	1
2	UNIVERSAL CLAMP SET.	2

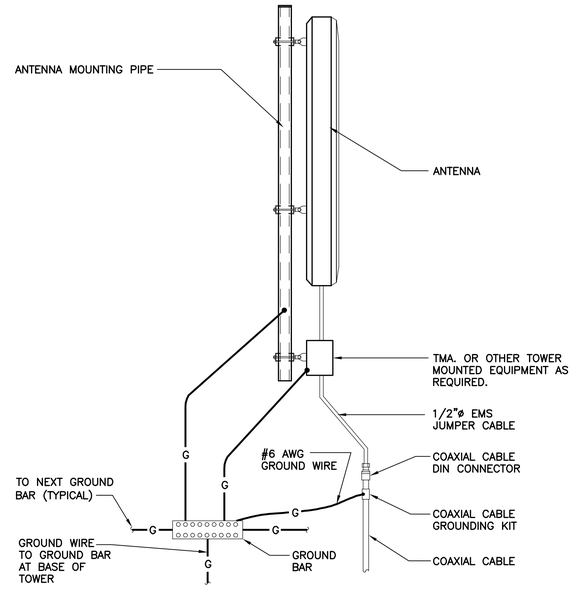
4 E-5 GPS GROUNDING/MOUNTING BRACKET DETAIL

NOT TO SCALE



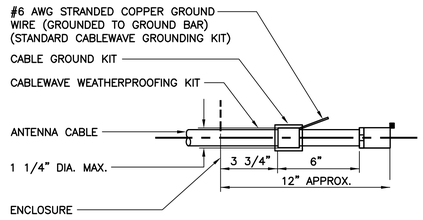
5 E-5 EQUIPMENT GROUND BAR DETAIL

NOT TO SCALE



6 E-5 TYPICAL ANTENNA GROUNDING DETAIL

NOT TO SCALE

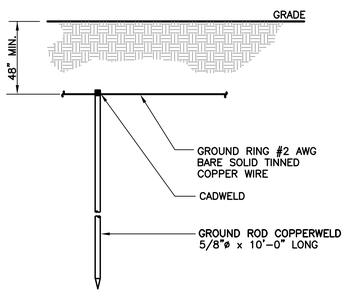


NOTES:

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO GROUND BAR.

7 E-5 ANTENNA CABLE GROUNDING DETAIL

NOT TO SCALE

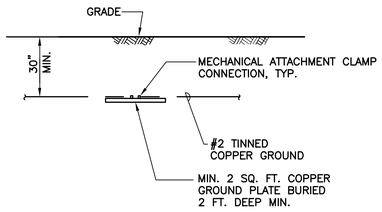


NOTES:

1. USE GROUND PLATE DETAIL IF 10 FT. GROUND ROD DEPTH CANNOT BE ACHIEVED DUE TO LEDGE CONDITION OR IF EXISTING TOWER FOUNDATION IS ENCOUNTERED.

8 E-5 GROUND ROD DETAIL

NOT TO SCALE

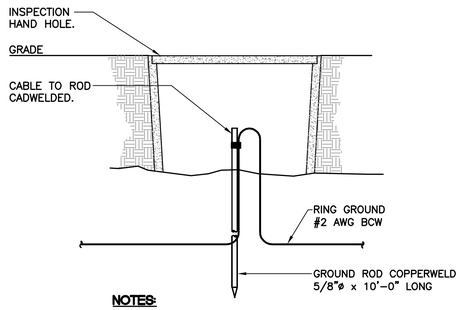


NOTES:

1. GROUND PLATE DETAIL TO BE USED ONLY IF 10 FT. GROUND ROD DEPTH CANNOT BE ACHIEVED DUE TO LEDGE CONDITION OR IF EXISTING TOWER FOUNDATION IS ENCOUNTERED.

8A E-5 GROUND PLATE DETAIL

NOT TO SCALE

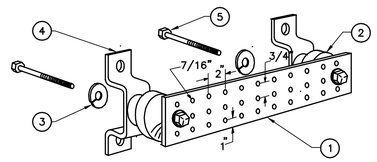


NOTES:

1. INSPECTION HAND HOLE MAY BE CONCRETE OR PVC AND SHALL BE A MINIMUM OF 12" DIA x 18" DEEP.

9 E-5 GROUND ROD WITH ACCESS DETAIL

NOT TO SCALE



NOTES

1. TINNED COPPER GROUND BAR, 1/4" x 4" x 20", NEWTON INSTRUMENT CO. HOLE CENTERS TO MATCH NEMA DOUBLE LUG CONFIGURATION.
2. INSULATORS, NEWTON INSTRUMENT CAT. NO. 3061-4.
3. 5/8" LOCK WASHERS, NEWTON INSTRUMENT CO. CAT. NO. 3015-8.
4. WALL MOUNTING BRACKET, NEWTON INSTRUMENT CO. CAT NO. A-6056.
5. 5/8-11 x 1" STAINLESS STEEL TRUSS SPANNER MACHINE SCREWS.

10 E-5 GROUND BAR DETAIL

NOT TO SCALE

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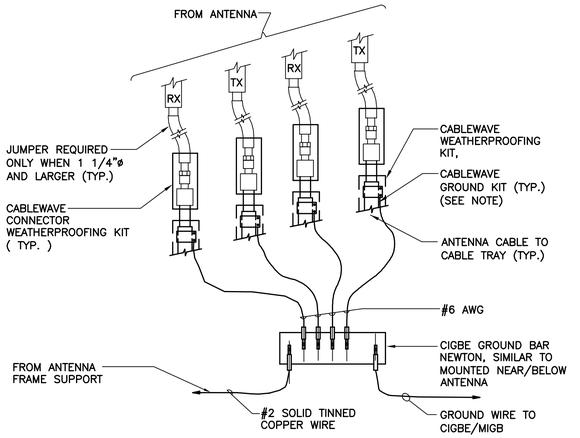
ELECTRICAL DETAILS

E-5

Sheet No. 10 of 12

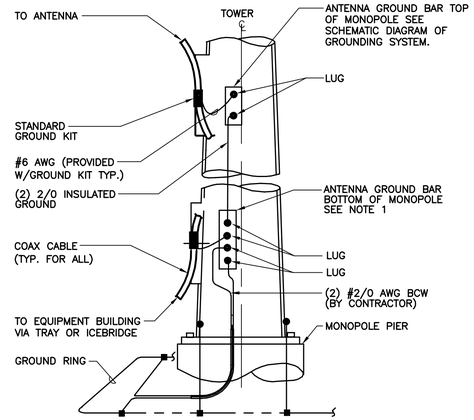


NOTES:

1. DO NOT INSTALL CABLE GROUND KIT AT A BEND AND ALWAYS DIRECT GROUND WIRE DOWN TO CIGBE

1 E-6 CONNECTION OF GROUND WIRES TO GROUND BAR

NOT TO SCALE

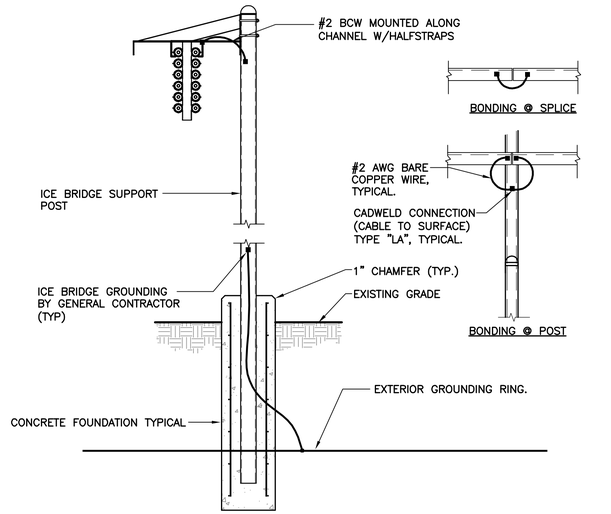


NOTES:

1. NUMBER OF GROUND BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, LOCATION AND CONNECTION ORIENTATION. PROVIDE AS REQUIRED.
2. A SEPARATE GROUND BAR TO BE USED FOR GPS ANTENNA IF REQUIRED.

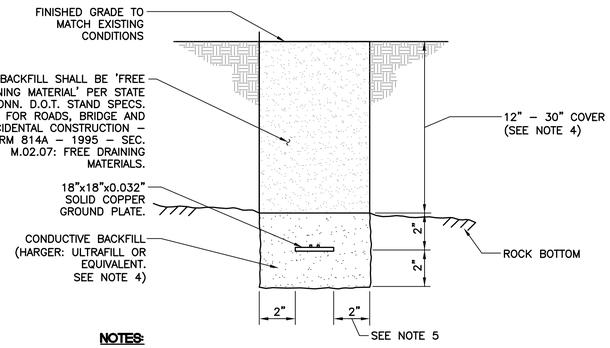
2 E-6 ANTENNA CABLE GROUNDING

NOT TO SCALE



3 E-6 ICE BRIDGE BONDING DETAIL

NOT TO SCALE

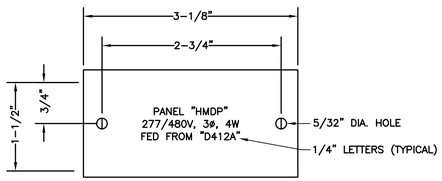


NOTES:

1. ENGINEER SHALL INSPECT PLACEMENT OF EGR CONDUCTOR PRIOR TO BACKFILLING.
2. MAINTAIN MIN. 2'–0" LINEAR CLEARANCE BETWEEN BACKFILL AND THE FOLLOWING: FOUNDATION, UNDERGROUND PIPING/CONDUIT, UNDERGROUND SERVICES. IN THE CLEARANCE AREAS, USE EARTH BACKFILL INSTEAD.
3. EXERCISE HANDLING AND USE PRECAUTION OF BACKFILL MATERIAL PER MFR'S REQUIREMENTS.
4. FOR LOCATIONS WHERE ROCK BOTTOM DEPTH IS LESS THAN 12" CONDUCTIVE CONCRETE SHALL BE USED INSTEAD OF CONDUCTIVE BACKFILL.
5. PROVIDE MIN 2" CLEARANCE ON ALL SIDES OF GROUND PLATE.

4 E-6 GROUND PLATE TRENCH/BACKFILL DETAIL (SHALLOW TOPSOIL)

NOT TO SCALE

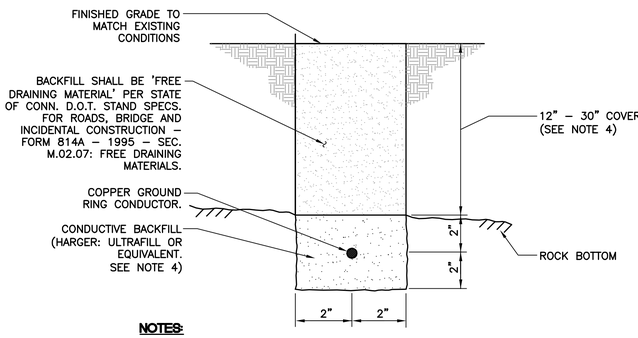


NOTES:

1. REFER TO SPECIFICATIONS FOR ADDITIONAL NAMEPLATE REQUIREMENTS.
2. NAMEPLATE TO BE 1/16" WHITE PLASTIC WITH BLACK CENTER LAMINATION. FACE TO BE WHITE, ENGRAVED LETTERS TO BE BLACK.
3. SECURE NAMEPLATE TO SURFACES WITH (2) FLAT HEAD BRASS SCREWS.

7 E-6 DETAIL OF TYPICAL NAMEPLATE

NOT TO SCALE



NOTES:

1. ENGINEER SHALL INSPECT PLACEMENT OF EGR CONDUCTOR PRIOR TO BACKFILLING.
2. MAINTAIN MIN. 2'–0" LINEAR CLEARANCE BETWEEN BACKFILL AND THE FOLLOWING: FOUNDATION, UNDERGROUND PIPING/CONDUIT, UNDERGROUND SERVICES. IN THE CLEARANCE AREAS, USE EARTH BACKFILL INSTEAD.
3. EXERCISE HANDLING AND USE PRECAUTION OF BACKFILL MATERIAL PER MFR'S REQUIREMENTS.
4. FOR LOCATIONS WHERE ROCK BOTTOM DEPTH IS LESS THAN 12" CONDUCTIVE CONCRETE SHALL BE USED INSTEAD OF CONDUCTIVE BACKFILL.

5 E-6 EGR TRENCH/BACKFILL DETAIL (SHALLOW TOPSOIL)

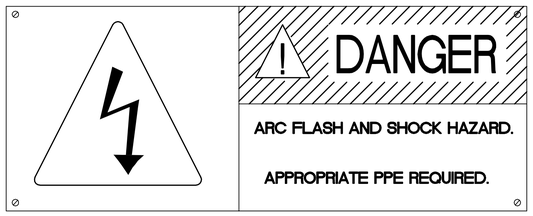
NOT TO SCALE

NOTES:

1. REFER TO SPECIFICATIONS FOR FOR ADDITIONAL NAMEPLATE REQUIREMENTS.
2. PROVIDE WARNING LABEL ON ALL SERVICE EQUIPMENT IN ACCORDANCE WITH 2011 NEC 110.24.
3. PROVIDE FAULT SHORT CIRCUIT AND COORDINATION STUDY TO ENSURE COMPLIANCE WITH NEC 110.9 & 110.10

8 E-6 DETAIL OF TYPICAL FAULT CURRENT SIGN

NOT TO SCALE



NOTES:

1. REFER TO SPECIFICATIONS FOR FOR ADDITIONAL NAMEPLATE REQUIREMENTS.
2. PROVIDE WARNING LABEL ON ALL SWITCHBOARDS, DISTRIBUTION PANELS, PANELBOARDS IN ACCORDANCE WITH 2005 NEC 110.16.

9 E-6 DETAIL OF TYPICAL FLASH PROTECTION WARNING SIGN

NOT TO SCALE

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ELECTRICAL DETAILS

E-6

Sheet No. 11 of 12

ELECTRICAL SPECIFICATIONS

SECTION 16010

1.01. SCOPE OF WORK

A. WORK SHALL INCLUDE ALL LABOR, EQUIPMENT AND SERVICES REQUIRED TO COMPLETE (MAKE READY FOR OPERATION) ALL THE ELECTRICAL WORK INCLUDING, BUT NOT LIMITED TO, THE FOLLOWING:

1. 200A, 240/120V, 1P, 3 WIRE ELECTRIC SERVICE WITH REVENUE METER AND 200A MAIN CIRCUIT BREAKER FOR OWNER AND ASSOCIATED DISTRIBUTION EQUIPMENT. (AS REQUIRED BY UTILITY CO.)
2. NEW SITE TELEPHONE SERVICE AS SPECIFIED BY TELEPHONE COMPANY.
3. FEEDERS AND BRANCH CIRCUIT WIRING TO PANELS, RECEPTACLES, EQUIPMENT, LIGHTING FIXTURES, ETC. AS INDICATED OR NOTED ON PLANS.
4. CELLULAR SITE ALARMS, ASSOCIATED WIRING AND DEVICES.
5. CELLULAR GROUNDING SYSTEMS, CONSISTING OF ANTENNA GROUNDING, INTERIOR GROUNDING RING, GROUND BARS, ETC.
6. FIELD MEASURE EXISTING ELECTRICAL SERVICES TO CONFIRM AVAILABLE EXISTING POWER.
7. COORDINATE ALL WORK SHOWN, ON THESE PLANS WITH LOCAL UTILITY COMPANIES.

B. LOCAL UTILITY COMPANIES SHALL PROVIDE THE FOLLOWING:

1. TELEPHONE CABLES.
2. SHUTDOWN OF SERVICE (COORDINATE WITH OWNER).

C. CONTRACTOR SHALL CONFER WITH LOCAL UTILITY COMPANIES TO ASCERTAIN THE LIMITS OF THEIR WORK AND SHALL INCLUDE IN BID ANY CHARGES OR FEES MADE BY THE UTILITY COMPANIES FOR THEIR PORTION OF THE WORK AND SHALL PROVIDE AND INSTALL ALL ITEMS REQUIRED, BUT NOT PROVIDED BY UTILITY COMPANY.

D. ELECTRICAL CONTRACTOR SHALL COORDINATE ELECTRICAL INSTALLATION WITH ELECTRIC UTILITY CO. PRIOR TO INSTALLATION.

E. CONTRACTOR SHALL COORDINATE WITH TELEPHONE UTILITY COMPANY FOR LOCATION OF TELEPHONE SERVICE AND TO DETERMINE ANY REQUIRED EQUIPMENT TO BE INSTALLED BY CONTRACTOR.

1.02. GENERAL REQUIREMENTS

A. THE ENTIRE ELECTRICAL INSTALLATION SHALL BE MADE IN STRICT ACCORDANCE WITH ALL LOCAL, STATE AND NATIONAL CODES AND REGULATIONS WHICH MAY APPLY AND NOTHING IN THE DRAWINGS OR SPECIFICATIONS SHALL BE INTERPRETED AS AN INFRINGEMENT OF SUCH CODES OR REGULATIONS.

B. THE ELECTRICAL CONTRACTOR IS TO BE RESPONSIBLE FOR THE COMPLETE INSTALLATION AND COORDINATION OF THE ENTIRE ELECTRICAL SERVICE. ALL ACTIVITIES TO BE COORDINATED THROUGH OWNERS REPRESENTATIVE, DESIGN ENGINEER AND OTHER AUTHORITIES HAVING JURISDICTION OF TRADES.

C. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL PERMITS AND PAY ALL FEES THAT MAY BE REQUIRED FOR THE ELECTRICAL WORK AND FOR SCHEDULING OF ALL INSPECTIONS THAT MAY BE REQUIRED BY THE LOCAL AUTHORITY.

D. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH THE BUILDING OWNER FOR NEW AND/OR DEMOLITION WORK INVOLVED.

E. THE CONTRACTOR SHALL BE RESPONSIBLE FOR COORDINATION WITH LOCAL TELEPHONE COMPANY THAT MAY BE REQUIRED FOR THE INSTALLATION OF TELEPHONE SERVICE TO THE PROPOSED CELLULAR SITE.

F. NO MATERIAL OTHER THAN THAT CONTAINED IN THE "LATEST LIST OF ELECTRICAL FITTINGS" APPROVED BY THE UNDERWRITERS' LABORATORIES, SHALL BE USED IN ANY PART OF THE WORK. ALL MATERIAL FOR WHICH LABEL SERVICE HAS BEEN ESTABLISHED SHALL BEAR THE U.L. LABEL.

G. THE CONTRACTOR SHALL GUARANTEE ALL NEW WORK FOR A PERIOD OF ONE YEAR FROM THE ACCEPTANCE DATE BY THE OWNER. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING WARRANTIES FROM ALL EQUIPMENT MANUFACTURERS FOR SUBMISSION TO THE OWNER.

H. DRAWINGS INDICATE GENERAL ARRANGEMENT OF WORK INCLUDED IN CONTRACT. CONTRACTOR SHALL, WITHOUT EXTRA CHARGE, MAKE MODIFICATIONS TO THE LAYOUT OF THE WORK TO PREVENT CONFLICT WITH WORK OF OTHER TRADES AND FOR THE PROPER INSTALLATION OF WORK. CHECK ALL DRAWINGS AND VISIT JOB SITE TO VERIFY SPACE AND TYPE OF EXISTING CONDITIONS IN WHICH WORK WILL BE DONE, PRIOR TO SUBMITTAL OF BID.

I. THE ELECTRICAL CONTRACTOR SHALL SUPPLY THREE (3) COMPLETE SETS OF APPROVED DRAWINGS, ENGINEERING DATA SHEETS, MAINTENANCE AND OPERATING INSTRUCTION MANUALS FOR ALL SYSTEMS AND THEIR RESPECTIVE EQUIPMENT. THESE MANUALS SHALL BE INSERTED IN VINYL COVERED 3-RING BINDERS AND TURNED OVER TO OWNER'S REPRESENTATIVE ONE (1) WEEK PRIOR TO FINAL PUNCH LIST.

J. ALL WORK SHALL BE INSTALLED IN A NEAT AND WORKMAN LIKE MANNER AND WILL BE SUBJECT TO THE APPROVAL OF THE OWNER'S REPRESENTATIVE.

K. ALL EQUIPMENT AND MATERIALS TO BE INSTALLED SHALL BE NEW, UNLESS OTHERWISE NOTED.

L. BEFORE FINAL PAYMENT, THE CONTRACTOR SHALL PROVIDE A COMPLETE SET OF PRINTS (AS-BUILTS), LEGIBLY MARKED IN RED PENCIL TO SHOW ALL CHANGES FROM THE ORIGINAL PLANS.

M. PROVIDE TEMPORARY POWER AND LIGHTING IN WORK AREAS AS REQUIRED.

N. SHOP DRAWINGS:

1. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF SHOP DRAWINGS ON ALL EQUIPMENT AND MATERIALS PROPOSED FOR USE ON THIS PROJECT, GIVING ALL DETAILS, WHICH INCLUDE DIMENSIONS, CAPACITIES, ETC.
2. CONTRACTOR SHALL SUBMIT SIX (6) COPIES OF ALL TEST REPORTS CALLED FOR IN THE SPECIFICATIONS AND DRAWINGS.

O. ENTIRE ELECTRICAL INSTALLATION SHALL BE IN ACCORDANCE WITH OWNER'S SPECIFICATIONS, AND REQUIREMENTS OF ALL LOCAL AUTHORITIES HAVING JURISDICTION. IT IS THE CONTRACTOR'S RESPONSIBILITY TO COORDINATE WITH APPROPRIATE INDIVIDUALS TO OBTAIN ALL SUCH SPECIFICATIONS AND REQUIREMENTS. NOTHING CONTAINED IN, OR OMITTED FROM, THESE DOCUMENTS SHALL RELIEVE CONTRACTOR FROM THIS OBLIGATION.

SECTION 16111

1.01. CONDUIT

A. MINIMUM CONDUIT SIZE FOR BRANCH CIRCUITS, LOW VOLTAGE CONTROL AND ALARM CIRCUITS SHALL BE 3/4". ALL CONDUIT RUNS LOCATED WITHIN THE OWNER'S EQUIPMENT ROOM SHALL ORIGINATE FROM THE WIREWAY AND RUN VERTICALLY TO ITS DESTINATION. NO BENDS WILL BE ACCEPTED. CONDUITS SHALL BE PROPERLY FASTENED TO THE WALLS AND CEILINGS AS REQUIRED BY THE N.E.C.

CONDUIT MATERIAL SHALL BE AS FOLLOWS:

1. ELECTRIC METALLIC TUBING (EMT) – BRANCH CIRCUITS INSIDE WIRELESS ROOM
2. GALVANIZED RIGID CONDUIT (GRC) – FEEDERS AND CIRCUITS EXPOSED TO EXTERIOR & UNDERGROUND.
3. LIQUID TIGHT FLEXIBLE METAL CONDUIT – FOR SHORT LENGTHS (MAX. 3'-0") WIRING TO VIBRATING EQUIPMENT (HVAC UNITS, MOTORS, ETC.) IN WET LOCATIONS.
4. FLEXIBLE METAL CONDUIT – FOR SHORT LENGTHS (MAX. 3'-0") WIRING TO VIBRATING EQUIPMENT IN DRY LOCATIONS.
5. PVC CONDUIT – WHERE SHOWN ON GROUNDING DETAILS.

SECTION 16114

1.01. CABLE TRAY

A. CABLE TRAY SHALL BE SOLID SIDE BAR, 18" WIDE (NEWTON INSTRUMENT COMPANY, INC.). TRAY SHALL BE INSTALLED AS SHOWN ON CONTRACT DOCUMENTS.

B. CROSSWISE RUNS SHALL BE COORDINATED WITH THE SPECIFIC EQUIPMENT THE TRAY SHALL SERVE.

C. ALL PROTRUDING CABLE TRAY SUPPORT RODS SHALL BE FILED SMOOTH WITH NO SHARP EDGES. ALL SUPPORT RODS SHALL BE CAD-PLATED FOR RUST RESISTANCE AND A MINIMUM 1/2" DIAMETER.

SECTION 16123

1.01. CONDUCTORS

A. ALL CONDUCTORS SHALL BE TYPE THWN (INT. APPLICATION) AND XHHW (EXT. APPLICATION), 75 DEGREE C, 600 VOLT INSULATION, SOFT ANNEALED STRANDED COPPER. #10 AWG AND SMALLER SHALL BE SPLICED USING ACCEPTABLE SOLDERLESS PRESSURE CONNECTORS. #8 AWG AND LARGER SHALL BE SPLICED USING COMPRESSION SPLIT-BOLT TYPE CONNECTORS. #12 AWG SHALL BE THE MINIMUM SIZE CONDUCTOR FOR LINE VOLTAGE BRANCH CIRCUITS. REFER TO PANEL SCHEDULE FOR BRANCH CIRCUIT CONDUCTOR SIZE(S). CONDUCTORS SHALL BE COLOR CODED FOR CONSISTENT PHASE IDENTIFICATION:

	120/208/240V	277/480V
LINE	COLOR	COLOR
A	BLACK	BROWN
B	RED	ORANGE
C	BLUE	YELLOW
N	CONTINUOUS WHITE	GREY
G	CONTINUOUS GREEN	GREEN WITH YELLOW STRIPE

B. MINIMUM BENDING RADIUS FOR CONDUCTORS SHALL BE 12 TIMES THE LARGEST DIAMETER OF BRANCH CIRCUIT CONDUCTOR.

SECTION 16130

1.01. BOXES

A. FURNISH AND INSTALL OUTLET BOXES FOR ALL DEVICES, SWITCHES, RECEPTACLES, ETC.. BOXES TO BE ZINC COATED STEEL.

B. FURNISH AND INSTALL PULL BOXES IN MAIN FEEDERS RUNS WHERE REQUIRED. PULL BOXES SHALL BE GALVANIZED STEEL WITH SCREW REMOVABLE COVERS, SIZE AND QUANTITY AS REQUIRED. PROVIDE WEATHERPROOF CONSTRUCTION IN WET LOCATIONS.

SECTION 16140

1.01. WIRING DEVICES

A. THE FOLLOWING LIST IS PROVIDED TO CONVEY THE QUALITY AND RATING OF WIRING DEVICES WHICH ARE TO BE INSTALLED. A COMPLETE LIST OF ALL DEVICES MUST BE SUBMITTED BEFORE INSTALLATION FOR APPROVAL.

1. 15 MINUTE TIMER SWITCH – INTERMATIC #FF15M (INTERIOR LIGHTS)
2. DUPLEX RECEPTACLE – P&S #2095 (GFCI) SPECIFICATION GRADE
3. SINGLE POLE SWITCH – P&S #CSB20AC2 (20A-120V HARD USE) SPECIFICATION GRADE
4. DUPLEX RECEPTACLE – P&S #5362 (20A-120V HARD USE) SPECIFICATION GRADE

B. PLATES – ALL PLATES USED SHALL BE CORROSION RESISTANT TYPE 304 STAINLESS STEEL. PLATES SHALL BE FROM SAME MANUFACTURER AS SWITCHES AND RECEPTACLES. PROVIDE WEATHERPROOF HOUSING FOR DEVICES LOCATED IN WET LOCATIONS.

C. OTHER MANUFACTURERS OF THE SWITCHES, RECEPTACLES AND PLATES MAY BE SUBMITTED FOR APPROVAL BY THE ENGINEER.

SECTION 16170

1.01. DISCONNECT SWITCHES

A. FUSIBLE AND NON-FUSIBLE, 600V, HEAVY DUTY DISCONNECT SWITCHES SHALL BE AS MANUFACTURED BY SQUARE "D". PROVIDE FUSES AS CALLED FOR ON THE CONTRACT DRAWINGS. AMPERE RATING SHALL BE CONSISTENT WITH LOAD BEING SERVED. DISCONNECT SWITCH COVER SHALL BE MECHANICALLY INTERLOCKED TO PREVENT COVER FROM OPENING WHEN THE SWITCH IS IN THE "ON" POSITION. EXTERIOR APPLICATIONS SHALL BE NEMA 3R CONSTRUCTION WITH PADLOCK FEATURE.

SECTION 16190

1.01. SEISMIC RESTRAINT

A. ALL DEVICES SHALL BE INSTALLED IN ACCORDANCE WITH ZONE 2 SEISMIC REQUIREMENTS.

SECTION 16195

1.01. LABELING AND IDENTIFICATION NOMENCLATURE FOR ELECTRICAL EQUIPMENT

A. CONTRACTOR SHALL FURNISH AND INSTALL NON-METALLIC ENGRAVED BACK-LIT NAMEPLATES ON ALL PANELS AND MAJOR ITEMS OF ELECTRICAL EQUIPMENT.

B. LETTERS TO BE WHITE ON BLACK BACKGROUND WITH LETTERS 1-1/2 INCH HIGH WITH 1/4 INCH MARGIN.

C. IDENTIFICATION NOMENCLATURE SHALL BE IN ACCORDANCE WITH OWNER'S STANDARDS.

D. PROVIDE NAMEPLATE FOR PORTABLE ENGINE/GENERATOR CONNECTION SHOWING VOLTAGE KVA/KW RATING, # PHASE, AND # OF WIRES. PLATE TO BE PLASTIC ENGRAVED, RED WITH WHITE LETTERS.

E. ALL RECEPTACLES, SWITCHES, DISCONNECT SWITCHES, ETC. SHALL BE LABELED WITH THE CORRECT BRANCH CIRCUIT NUMBER SERVED BY MEANS OF PERMANENT PRESSED TYPE BLACK 1/4" TRANSFER LETTERING. (FOR EXAMPLE: "MDP-5", ETC.).

F. PROVIDE A NAMEPLATE AT THE SERVICE EQUIPMENT INDICATING THE TYPE AND LOCATION OF THE ON SITE GENERATOR.

SECTION 16450

1.01. GROUNDING

A. ALL NON-CURRENT CARRYING PARTS OF THE ELECTRICAL AND TELEPHONE CONDUIT SYSTEMS SHALL BE MECHANICALLY AND ELECTRICALLY CONNECTED TO PROVIDE AN INDEPENDENT RETURN PATH TO THE EQUIPMENT GROUNDING SOURCES.

B. GROUNDING SYSTEM WILL BE IN ACCORDANCE WITH THE LATEST ACCEPTABLE EDITION OF THE NATIONAL ELECTRICAL CODE AND REQUIREMENTS PER LOCAL INSPECTOR HAVING JURISDICTION.

C. GROUNDING OF PANELBOARDS:

1. PANELBOARD SHALL BE GROUNDED BY TERMINATING THE PANELBOARD FEEDER'S EQUIPMENT GROUND CONDUCTOR TO THE EQUIPMENT GROUND BAR KIT(S) LUGGED TO THE CABINET. ENSURE THAT THE SURFACE BETWEEN THE KIT AND CABINET ARE BARE METAL TO BARE METAL. PRIME AND PAINT OVER TO PREVENT CORROSION.
2. CONDUIT(S) TERMINATING INTO THE PANELBOARD SHALL HAVE GROUNDING TYPE BUSHINGS. THE BUSHINGS SHALL BE BONDED TOGETHER WITH BARE #10 AWG COPPER CONDUCTOR WHICH IN TURN IS TERMINATED INTO THE PANELBOARD'S EQUIPMENT GROUND BAR KIT(S).

D. EQUIPMENT GROUNDING CONDUCTOR:

1. EACH EQUIPMENT GROUND CONDUCTOR SHALL BE SIZED IN ACCORDANCE WITH THE N.E.C. ARTICLE 250-122.
2. THE MINIMUM SIZE OF EQUIPMENT GROUND CONDUCTOR SHALL BE #12 AWG COPPER.
3. REFER TO PANEL SCHEDULE "BRANCH CIRCUIT" DATA FOR EQUIPMENT GROUND CONDUCTOR SIZE FOR EACH BRANCH CIRCUIT.
4. EACH FEEDER OR BRANCH CIRCUIT SHALL HAVE EQUIPMENT GROUND CONDUCTOR(S) INSTALLED IN THE SAME RACEWAY(S).

E. CELLULAR GROUNDING SYSTEM:

CONTRACTOR SHALL PROVIDE A CELLULAR GROUNDING SYSTEM WITH THE MAXIMUM AC RESISTANCE TO GROUND OF 5 OHM BETWEEN ANY POINT ON THE GROUNDING SYSTEM AS MEASURED BY 3-POINT GROUNDING TEST. (REFER TO SECTION 16960).

PROVIDE THE CELLULAR GROUNDING SYSTEM AS SPECIFIED ON DRAWINGS, INCLUDING, BUT NOT LIMITED TO:

1. GROUND BARS
2. INTERIOR GROUND RING
3. EXTERIOR GROUNDING (WHERE REQUIRED DUE TO MEASURED AC RESISTANCE GREATER THAN SPECIFIED).
4. ANTENNA GROUND CONNECTIONS AND PLATES.

F. CONTRACTOR, AFTER COMPLETION OF THE COMPLETE GROUNDING SYSTEM BUT PRIOR TO CONCEALMENT/BURIAL OF SAME, SHALL NOTIFY OWNER'S WIRELESS PROJECT ENGINEER WHO WILL HAVE A DESIGN ENGINEER VISIT SITE AND MAKE A VISUAL INSPECTION OF THE GROUNDING GRID AND CONNECTIONS OF THE SYSTEM.

G. ALL EQUIPMENT SHALL BE BONDED TO GROUND AS REQUIRED BY N.E.C., MFG. SPECIFICATIONS, AND OWNER'S SPECIFICATIONS.

SECTION 16470

1.01. DISTRIBUTION EQUIPMENT

A. REFER TO CONTRACT DRAWINGS FOR DETAILS AND SCHEDULES.

SECTION 16477

1.01. FUSES

A. FUSES SHALL BE NONRENEWABLE TYPE AS MANUFACTURED BY "BUSSMAN" OR APPROVED EQUAL. FUSES RATED TO 1/10 AMPERE UP TO 600 AMPERES SHALL BE EQUIVALENT TO BUSSMAN TYPE LPN-RK (250V) UL CLASS RK1, LOW PEAK, DUAL ELEMENT, TIME-DELAY FUSES. FUSES SHALL HAVE SEPARATE SHORT CIRCUIT AND OVERLOAD ELEMENTS AND HAVE AN INTERRUPTING RATING OF 200 KAIC. UPON COMPLETION OF WORK, PROVIDE ONE SPARE SET OF FUSES FOR EACH TYPE INSTALLED.

SECTION 16960

1.01. TESTS BY INDEPENDENT ELECTRICAL TESTING FIRM

A. CONTRACTOR SHALL RETAIN THE SERVICES OF A LOCAL INDEPENDENT ELECTRICAL TESTING FIRM (WITH MINIMUM 5 YEARS COMMERCIAL EXPERIENCE IN THE ELECTRICAL TESTING INDUSTRY) AS SPECIFIED BY OWNER TO PERFORM:

TEST 1: THERMAL OVERLOAD AND MAGNETIC TRIP TEST, AND CABLE INSULATION TEST FOR ALL CIRCUIT BREAKERS RATED 100 AMPS OR GREATER.

TEST 2: RESISTANCE TO GROUND TEST ON THE CELLULAR GROUNDING SYSTEM.

THE TESTING FIRM SHALL INCLUDE THE FOLLOWING INFORMATION WITH THE REPORT:

1. TESTING PROCEDURE INCLUDING THE MAKE AND MODEL OF TEST EQUIPMENT.
2. CERTIFICATION OF TESTING EQUIPMENT CALIBRATION WITHIN SIX (6) MONTHS OF DATE OF TESTING. INCLUDE CERTIFICATION LAB ADDRESS AND TELEPHONE NUMBER.
3. GRAPHICAL DESCRIPTION OF TESTING METHOD ACTUALLY IMPLEMENTED.

B. THESE TESTS SHALL BE PERFORMED IN THE PRESENCE AND TO THE SATISFACTION OF OWNER'S CONSTRUCTION REPRESENTATIVE. TESTING DATA SHALL BE INITIALED AND DATED BY THE CONSTRUCTION REPRESENTATIVE AND INCLUDED WITH THE WRITTEN REPORT/ANALYSIS.

C. THE CONTRACTOR SHALL FORWARD SIX (6) COPIES OF THE INDEPENDENT ELECTRICAL TESTING FIRM'S REPORT/ANALYSIS TO ENGINEER A MINIMUM OF TEN (10) WORKING DAYS PRIOR TO THE JOB TURNOVER.

D. CONTRACTOR TO PROVIDE A MINIMUM OF ONE (1) WEEK NOTICE TO OWNER AND ENGINEER FOR ALL TESTS REQUIRING WITNESSING.

SECTION 16961

1.01. TESTS BY CONTRACTOR

A. ALL TESTS AS REQUIRED UPON COMPLETION OF WORK, SHALL BE MADE BY THIS CONTRACTOR. THESE SHALL BE CONTINUITY AND INSULATION TESTS; TEST TO DETERMINE THE QUALITY OF MATERIALS, ETC. AND SHALL BE MADE IN ACCORDANCE WITH N.E.C. RECOMMENDATIONS. ALL FEEDERS AND BRANCH CIRCUIT WIRING (EXCEPT CLASS 2 SIGNAL CIRCUITS) MUST BE TESTED FREE FROM SHORT CIRCUIT AND GROUND FAULT CONDITIONS AT 500V IN A REASONABLY DRY AMBIENT OF APPROXIMATELY 70 DEGREES F.

B. CONTRACTOR SHALL PERFORM LOAD PHASE BALANCING TESTS. CIRCUITS SHALL BE SO CONNECTED TO THE PANELBOARDS SUCH THAT THE NEW LOAD IS DISTRIBUTED AS EQUALLY AS POSSIBLE BETWEEN EACH LOAD AND NEUTRAL. 10% SHALL BE CONSIDERED AS A REASONABLE AND ACCEPTABLE ALLOWANCE. BRANCH CIRCUITS SHALL BE BALANCED ON THEIR OWN PANELBOARDS; FEEDER LOADS SHALL, IN TURN, BE BALANCED ON THE SERVICE EQUIPMENT. REASONABLE LOAD TEST SHALL BE ARRANGED TO VERIFY LOAD BALANCE IF REQUESTED BY THE ENGINEER.

C. ALL TESTS, UPON REQUEST, SHALL BE REPEATED IN THE PRESENCE OF OWNER'S REPRESENTATIVE. ALL TESTS SHALL BE DOCUMENTED AND TURNED OVER TO OWNER. OWNER SHALL HAVE THE AUTHORITY TO STOP ANY OF THE WORK NOT BEING PROPERLY INSTALLED. ALL SUCH DETECTED WORK SHALL BE REPAIRED OR REPLACED AT NO ADDITIONAL EXPENSE TO THE OWNER AND THE TESTS SHALL BE REPEATED.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	09/28/16	TJB	CKD	ISSUED FOR CONSTRUCTION

PROFESSIONAL ENGINEER SEAL

CENTEK engineering
Centered on Solutions℠
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

T-MOBILE

WIRELESS COMMUNICATIONS FACILITY

PLYMOUTH

SITE ID: CTNH584A

33 KEEGAN ROAD

PLYMOUTH, CT 06782

DATE: 09/20/16

SCALE: AS NOTED

JOB NO. 16141.00

ELECTRICAL SPECIFICATIONS

E-7

Sheet No. 12 of 12

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: CTNH584A

Plymouth
33 Keegan Road
Plymouth, CT 06782

October 1, 2016

EBI Project Number: 6216004447

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general public allowable limit:	3.09 %

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

EBI Consulting
environmental | engineering | due diligence

October 1, 2016

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

Emissions Analysis for Site: **CTNH584A – Plymouth**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **33 Keegan Road, Plymouth, 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 **33 Keegan Road, Plymouth, 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 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.

2) 2 LTE channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 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) Since the 700 MHz radios are ground mounted there are additional cabling losses accounted for. For each ground mounted 700 MHz RF path an additional 0.84 dB of cable loss was factored into the calculations. This is based on manufacturers Specifications for 150 feet of 1-5/8” coax cable on each path.

6) 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.

7) 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.

8) The antennas used in this modeling are the **Ericsson AIR32 B66Aa/B2P** & **Ericsson AIR21 B2A/B4P** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **Commscope LNX-6515DS-VTM** for 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **Ericsson AIR32 B66Aa/B2P** has a maximum gain of **15.9 dBd** at its main lobe at 1900 MHz and 2100 MHz. The **Ericsson AIR21 B2A/B4P** has a maximum gain of **15.9 dBd** at its main lobe at 1900 MHz and 2100 MHz. The **Commscope LNX-6515DS-VTM** has 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.

9) The antenna mounting height centerline of the proposed antennas is **130 feet** above ground level (AGL).

10) 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.

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

T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	**1**	Antenna #:	**1**	Antenna #:	**1**
Make / Model:	Ericsson AIR32 B66Aa/B2P	Make / Model:	Ericsson AIR32 B66Aa/B2P	Make / Model:	Ericsson AIR32 B66Aa/B2P
Gain:	15.9 dBd	Gain:	15.9 dBd	Gain:	15.9 dBd
Height (AGL):	130	Height (AGL):	130	Height (AGL):	130
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):	240	Total TX Power(W):	240	Total TX Power(W):	240
ERP (W):	9,337.08	ERP (W):	9,337.08	ERP (W):	9,337.08
Antenna A1 MPE%	2.18	Antenna B1 MPE%	2.18	Antenna C1 MPE%	2.18
Antenna #:	**2**	Antenna #:	**2**	Antenna #:	**2**
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):	130	Height (AGL):	130	Height (AGL):	130
Frequency Bands	1900 MHz (PCS)	Frequency Bands	1900 MHz (PCS)	Frequency Bands	1900 MHz (PCS)
Channel Count	2	Channel Count	2	Channel Count	2
Total TX Power(W):	60	Total TX Power(W):	60	Total TX Power(W):	60
ERP (W):	2,334.27	ERP (W):	2,334.27	ERP (W):	2,334.27
Antenna A2 MPE%	0.55	Antenna B2 MPE%	0.55	Antenna C2 MPE%	0.55
Antenna #:	**3**	Antenna #:	**3**	Antenna #:	**3**
Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM	Make / Model:	Commscope LNX-6515DS-VTM
Gain:	14.6 dBd	Gain:	14.6 dBd	Gain:	14.6 dBd
Height (AGL):	130	Height (AGL):	130	Height (AGL):	130
Frequency Bands	700 MHz	Frequency Bands	700 MHz	Frequency Bands	700 MHz
Channel Count	1	Channel Count	1	Channel Count	1
Total TX Power(W):	30	Total TX Power(W):	30	Total TX Power(W):	30
ERP (W):	713.05	ERP (W):	713.05	ERP (W):	713.05
Antenna A3 MPE%	0.36	Antenna B3 MPE%	0.36	Antenna C3 MPE%	0.36

Site Composite MPE%	
Carrier	**MPE%**
T-Mobile (Per Sector Max)	**3.09 %**
No Additional Carriers Listed in CSC Active Database	NA
Site Total MPE %:	**3.09 %**

T-Mobile Sector A Total:	3.09 %
T-Mobile Sector B Total:	3.09 %
T-Mobile Sector C Total:	3.09 %
Site Total:	3.09 %

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 AWS - 2100 MHz LTE	2	2,334.27	130	10.92	AWS - 2100 MHz	1000	1.09%
T-Mobile PCS - 1900 MHz LTE	2	2,334.27	130	10.92	PCS - 1900 MHz	1000	1.09%
T-Mobile PCS - 1950 MHz UMTS	2	1,167.14	130	5.46	PCS - 1950 MHz	1000	0.55%
T-Mobile 700 MHz LTE	1	713.05	130	1.67	700 MHz	467	0.36%
						Total:	**3.09%**

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:	3.09 %
Sector B:	3.09 %
Sector C:	3.09 %
T-Mobile Per Sector Maximum:	3.09 %
Site Total:	3.09 %
Site Compliance Status:	**COMPLIANT**

The anticipated composite MPE value for this site assuming all carriers present is **3.09%** 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.

verizon

November 14, 2016

RE: Verizon telecommunication facility at 33 Keegan Rd, Plymouth, CT

To whom it may concern:

Cellco Partnership d/b/a Verizon Wireless as the owner of the telecommunication facility located at 33 Keegan Rd, Plymouth, CT hereby authorizes MetroPCS Massachusetts, LLC and/or its agent to apply for and obtain all necessary permits and approvals from all applicable Town of Plymouth and/or State of Connecticut agencies and commissions for the proposed colocation at the approved telecommunication facility referenced above.

Please contact us at 860-803-8239 should you have any questions.

Sincerely

By: _____

Print Name: TIMOTHY BANKS

Its: NETWORK REAL ESTATE SPECIALIST