New Cingular Wireless PCS, LLC ("AT&T")
500 Enterprise Drive
Rocky Hill, Connecticut 06067

Alex Murshteyn
Real Estate Consultant
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Raynham, MA 02767
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January 29, 2016

Honorable Robert Stein, Chairman
and Members of the Connecticut Siting Council
Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051

Re: **Request for Tower Share**
New Cingular Wireless PCS, LLC ("AT&T") Request for Approval of the Shared Use of an Existing Tower at 303 Boxwood Lane, Danbury, CT 06811.
AT&T site number: CT968

Dear Chairman Stein and Members of the Council:

AT&T proposes to share an existing telecommunications tower (the tower) located at 303 Boxwood Lane, Danbury, CT (the facility). The subject parcel is identified by the City of Danbury as Map E-12 Lot 40. The property is owned by the State of Connecticut c/o Western Connecticut State University, specifically comprising it's Westside Campus Lake Ave Ext parcel, which is roughly 273± acres and accommodates the University, Sprint and T-Mobile within the bounds of the existing a 75' x 75' fenced tower compound. The existing tower is and will be owned and operated by the University of 181 White Street, Danbury, CT.

Pursuant to Connecticut General Statues Section 16-50aa (the Statute), AT&T requests a finding from the Connecticut Siting Council that the shared use of this facility is technically, legally, environmentally and economically feasible, will meet safety concerns, will avoid the unnecessary proliferation of towers and is in the public interest. AT&T further requests an order approving the shared use of this facility.

The purpose of this request is to use an existing tower to develop AT&T's wireless broadband network to provide high speed wireless data and to develop wireless service within the State of Connecticut and in this part of Danbury, CT: thus avoiding the need for an additional tower in Danbury.

AT&T is licensed by the Federal Communications Commission ("FCC") to provide multiple technologies, including Global Systems for Mobile Communications ("GSM" or "2G"), Universal Mobile Telecommunications Service ("UMTS" or "3G") and long-term evolution ("4G" or "LTE") services in Fairfield County. AT&T is building and enhancing its network to take advantage of its licensed spectrum, and improve its broadband high speed wireless voice and data services.

Existing Facility & Proposed Modification

The existing facility is and will continue to be a 100' lattice tower located at 303 Boxwood Lane. Site coordinates (NAD83) are N41° 23' 41.9" and W73° 29' 12.27". Currently there are two other commercial wireless carriers located on this tower; and a third has decommissioned, which is where AT&T intends to install. The site plan of the facility is included in the Drawings, prepared by Centek Engineering, Inc. attached hereto.

AT&T intends to install six (6) OPA-65R-LCUU-H4 CCI panel antennas, twelve (12) Ericsson RRUs with three (3) A2 modules and three (3) Surge arrestors mounted on the existing antenna frame abandoned by Nextel on the existing lattice tower. AT&T will install three (3) 1/2" RET cables, eight (8) DC cables and two (2) fiber lines on the tower.

AT&T has reached agreement, subject to final approval by the State, to license the portion of space abandoned by Nextel within a 10'x30' building it shared as an equipment shelter with the University's radio station, and to install an emergency backup generator. The equipment will be installed within the existing fenced compound. An existing ice bridge will be reused to connect the equipment with the tower. A GPS antenna will be located on the ice bridge.

Consistent with the requirements of the Statute, it is feasible for AT&T to collocate at this facility. AT&T is proposing to collocate on the existing lattice tower that will continue to remain the ownership of the University. Included with this application is a Structural Analysis Report from Centek Engineering, Inc. dated December 1, 2014 that shows that the existing tower can support AT&T's proposed equipment.

The Proposal is Legally Feasible.

The Council has authority, pursuant to statute, to issue an order approving of the shared use of this tower. By issuing an order approving AT&T's shared use of this tower, AT&T will be able to proceed with obtaining a building permit for the proposed installation. Western Connecticut State University has executed a Letter of Authorization that approved AT&T's Request for Tower Share filing on January 19, 2016, which approval is included with this application. AT&T's proposal is legally feasible.

AT&T is a telecommunication provider licensed by the FCC to provide service in the State of Connecticut, including but not limited to Fairfield County. AT&T will enter into an agreement with the owner of this facility, Western Connecticut State University, for the location of this proposed equipment on the existing tower so that it may provide telecommunications services to the surrounding community. Consequently, the proposal is legally feasible.

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The Proposal is Environmentally Feasible.

Pursuant to the Statute, the proposal will be environmentally feasible for the following reasons:

- The overall impact on the City of Danbury will be decreased with the sharing of a single tower versus the proliferation of multiple towers.
- There will be no material increase in the visibility of the tower with the addition of the antennas and associated equipment on the new tower.
- There will be no increased impact on air quality because no air pollutants will be generated during normal operation of the facility.
- There will only be a brief, slight increase in noise pollution while the site is under construction.
- During construction, the proposed project will generate a small amount of traffic as construction takes place. Upon completion, traffic will be limited to an average of one trip per month for maintenance and inspections.
- There will be no adverse impact to the health and safety of the surrounding community or workers at the facility due to the addition of AT&T's antennas to the new tower. AT&T has performed an analysis of the radio frequency field emanating from the transmitting antennas on the tower to ensure compliance with the National Council on Radiation Protection and measurements (NCRP) standard for maximum permissible exposure (MPE) adopted by the FCC. The analysis dated May 22, 2016 indicates that AT&T and other antennas on the tower will cumulatively emit 44.91% of the NCRP standard for maximum permissible exposure. The report indicates that maximum level of exposure will be well below the FCC's mandated radio frequency exposure limits. The report is attached hereto and the calculations are below.

Transmission Mode	Antenna Centerline AGL (ft)	Frequency (MHz)	Number of Channels	Effective Radiated Power per Channel (Watts)	Power Density (mW/cm^2)	Standard Limits (mW/cm^2)	% MPE (Uncontrolled/ General Public)
AT&T UMTS	98	850	2	500.00	0.0374	0.5667	6.61%
AT&T UMTS	98	1900	2	500.00	0.0374	1	3.74%
AT&T LTE 700 BC/DE	98	700	2	500.00	0.0374	0.4667	8.02%
AT&T LTE 1900	98	1900	1	500.00	0.0187	1	1.87%
AT&T LTE WCS	98	WCS	1	500.00	0.0187	1	1.87%
Sprint CDMA/LTE	89.2	1900	5	778.00	0.1758	1	17.58%
Sprint CDMA/LTE	89.2	850	1	438.00	0.0198	0.5667	3.49%
T-Mobile GSM/UMTS	83	1945	4	9.00	0.0019	1	0.19%
T-Mobile UMTS/LTE	83	2100	4	12.00	0.0025	1	0.25%
WCXI (WCSU)	65	91.7	1	3,000.00	0.0026	0.2000	1.28%
Total							44.91%

- AT&T expects to enhance safety in this portion of Danbury by improving wireless telecommunications for local residents and travelers. AT&T is currently developing its network to provide its customers with quality and reliable coverage to comply with their FCC license, the site is a necessary part of AT&T's network development.

- Specifically, this proposal is designed to provide reliable wireless coverage for this section of Danbury, CT.

Conclusions:

For the reasons stated above, the attachment of AT&T's antennas and associated equipment to the tower would meet all the requirements set forth in the Statute. The proposal is legally, technically, economically and environmentally feasible and meets all public safety concerns. Therefore, AT&T respectfully requests that the Council approve this request for the shared use of this tower located at 303 Boxwood Lane, Danbury, CT.

Respectfully yours,

Alex Murshteyn
Real Estate Consultant – Site Acquisition
c/o New Cingular Wireless, PCS LLC (AT&T)
Centerline Communications, LLC
95 Ryan Drive, Suite 1
Raynham, MA 02767
Mobile: (508) 821-0159
AMurshteyn@centerlincommunications.com

Enclosures (5)

cc: Mayor Mark D. Boughton, City of Danbury
Mark Case, Director of Administrative Services, Western Connecticut State University
Michele Briggs, New Cingular Wireless PCS, LLC (via e-mail)

at&t

LETTER OF AUTHORIZATION

SITE No.: CT968

SITE NAME: Danbury, CT

ADDRESS: 303 Boxwood Lane (Westside Campus cell tower), Danbury, Connecticut

Western Connecticut State University, owner of the above-described property, authorizes New Cingular Wireless PCS, LLC ("AT&T") and/or their agent, to act as our nonexclusive agent for the sole purpose of filing and consummating any land use or building permit application(s) necessary to obtain approval of the applicable jurisdiction for AT&T's installation of the antennas and related telecommunications equipment on the above-described property.

We understand that this application may be denied, modified or approved with conditions, and that any such conditions of approval or modifications will be the sole responsibility of the carrier and will be complied with prior to issuance of a building permit.

Signature: Sean Loughran

Print Name: SEAN LOUGHRAN

Title: VP of FINANCE + ADMINISTRATION

Photographic Simulations

DANBURY NORTH CT
BOXWOOD LANE
DANBURY, CT 06811

Prepared in January 2016 by:
All-Points Technology Corporation, P.C.
3 Saddlebrook Drive
Killingworth, CT 06141

Prepared for AT&T

ALL-POINTS
TECHNOLOGY CORPORATION

PHOTO LOG

Legend

- Site
- Year-Round Visibility
- Seasonal Visibility
- Not Visible

1,000 500 0 1,000 Feet

1 inch = 1,000 feet

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EXISTING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	**WESTERN CONNECTICUT STATE UNIVERSITY WESTSIDE CAMPUS**	**EAST**	**+/- 0.23 MILE**	**YEAR ROUND**

PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
1	**WESTERN CONNECTICUT STATE UNIVERSITY WESTSIDE CAMPUS**	**EAST**	**+/- 0.23 MILE**	**YEAR ROUND**

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EXISTING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	**WESTERN CONNECTICUT STATE UNIVERSITY WESTSIDE CAMPUS**	**SOUTHEAST**	**+/- 0.40 MILE**	**YEAR ROUND**

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PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
2	WESTERN CONNECTICUT STATE UNIVERSITY WESTSIDE CAMPUS	SOUTHEAST	+/- 0.40 MILE	YEAR ROUND

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EXISTING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
3	WEST PINE DRIVE	SOUTHEAST	+/- 0.77 MILE	NOT VISIBLE

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EXISTING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
4	**LOGANS WAY**	**SOUTHWEST**	**+/- 0.20 MILE**	**NOT VISIBLE**

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EXISTING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
5	**SCUPPO ROAD**	**NORTHWEST**	**+/- 0.43 MILE**	**NOT VISIBLE**

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EXISTING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
6	BAYBERRY LANE	NORTHWEST	+/- 0.33 MILE	SEASONAL

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PROPOSED

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
6	**BAYBERRY LANE**	**NORTHWEST**	**+/- 0.33 MILE**	**SEASONAL**

ALL-POINTS TECHNOLOGY CORPORATION

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EXISTING

PHOTO	LOCATION	ORIENTATION	DISTANCE TO SITE	VISIBILITY
7	**BOXWOOD LANE**	**NORTHEAST**	**+/- 432 FEET**	**SEASONAL**

ALL-POINTS TECHNOLOGY CORPORATION

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Michael Lawton
SAI Communications
260 Cedar Hill St.
Marlborough, MA 01752
Mike.Lawton@sai-comm.com

May 22, 2015

Connecticut Siting Council

Subject: AT&T Wireless, CT968 – Danbury - Boxwood Lane

Dear Connecticut Siting Council:

At the request of AT&T Wireless, SAI Communications has performed a cumulative assessment of the RF Power Density at the proposed site located at 303 Boxwood Lane, Danbury, CT.
Calculations were done in compliance with FCC OET Bulletin 65. This report provides an FCC compliance assessment based on a “worst-case” analysis that all transmitters are simultaneously operating at full power and pointing directly at the ground.

FCC OET Bulletin 65 formula:

$$S = \frac{2.56 * 1.64 * ERP}{4 * \pi * R^2}$$

Transmission Mode	Antenna Centerline AGL (ft)	Frequency (MHz)	Number of Channels	Effective Radiated Power per Channel (Watts)	Power Density (mW/cm^2)	Standard Limits (mW/cm^2)	% MPE (Uncontrolled/ General Public)
AT&T UMTS	98	850	2	500.00	0.0374	0.5667	6.61%
AT&T UMTS	98	1900	2	500.00	0.0374	1	3.74%
AT&T LTE 700 BC/DE	98	700	2	500.00	0.0374	0.4667	8.02%
AT&T LTE 1900	98	1900	1	500.00	0.0187	1	1.87%
AT&T LTE WCS	98	WCS	1	500.00	0.0187	1	1.87%
Sprint CDMA/LTE	89.2	1900	5	778.00	0.1758	1	17.58%
Sprint CDMA/LTE	89.2	850	1	438.00	0.0198	0.5667	3.49%
T-Mobile GSM/UMTS	83	1945	4	9.00	0.0019	1	0.19%
T-Mobile UMTS/LTE	83	2100	4	12.00	0.0025	1	0.25%
WCXI (WCSU)	65	91.7	1	3,000.00	0.0026	0.2000	1.28%
Total							44.91%

Conclusion: AT&T’s proposed antenna installation is calculated to be within 44.91% of FCC Standard for General Public/Uncontrolled Maximum Permissible Exposure (MPE).

Sincerely,

Michael Lawton
SAI Communications

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

100' Existing NUDD Lattice Tower

Proposed AT&T Antenna Installation

AT&T Site Ref: CT968

303 Boxwood Lane,
Danbury, CT

CENTEK Project No. 14301.000

~~Date: November 21, 2014~~

Rev 1: December 1, 2014

Prepared for:

AT&T Mobility
500 Enterprise Drive, Suite 3A
Rocky Hill, CT 06067

Table of Contents

SECTION 1 - REPORT

- INTRODUCTION
- ANTENNA AND APPURTENANCE SUMMARY
- PRIMARY ASSUMPTIONS USED IN THE ANALYSIS
- ANALYSIS
- TOWER LOADING
- TOWER CAPACITY
- FOUNDATION AND ANCHORS
- CONCLUSION

SECTION 2 – CONDITIONS & SOFTWARE

- STANDARD ENGINEERING CONDITIONS
- GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

SECTION 3 – CALCULATIONS

- tnxTower INPUT/OUTPUT SUMMARY
- tnxTower FEDLINE PLAN
- tnxTower FEDLINE DISTRIBUTION
- tnxTower DETAILED OUTPUT
- FOUNDATION ANALYSIS

SECTION 4 – REFERENCE MATERIAL

- RF DATA SHEET
- ANTENNA CUT SHEETS

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 AT&T on the existing self supporting lattice tower located in Danbury, Connecticut.

The host tower is a 100-ft, three-legged self-support lattice tower originally designed and manufactured by Fred A. Nudd Corporation; file no: 96-4992 dated January 21, 1997. Subsequent reinforcements were made to the tower per Centek job no. 361A dated November 28, 2001 and Centek job no. 10106 dated August 16, 2010. The tower geometry, structure member sizes and the foundation system information were taken from the aforementioned design documents.

Antenna and appurtenance information were obtained from a previous structural report prepared by Infinigy job no. 333-315 dated September 24, 2014 and visual verification from grade conducted by Centek personnel on November 19, 2014.

The tower is made up of five (5) steel sections consisting of A500-42, A500-50, and A500-61ksi pipe legs. Diagonal lateral support bracing consists of A36 single angle and steel rod construction. The vertical tower sections are connected by bolted flange plates while the pipe legs and bracing are connected by welded connections (40'-100'), bolted and welded gusset connections (0'-40'). The tower face width is 7.5-ft at the bottom tapering to 3.5-ft at the top.

AT&T proposes the installation of six (6) panel antennas, fifteen (15) remote radio heads and four (4) surge arrestors mounted to the existing vacant mounts. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna configuration

Antenna and Appurtenance Summary

The existing tower was designed to support several communication antennas. The existing, proposed and future loads considered in this analysis consist of the following:

- Unknown (Existing):
  Antennas: One (1) 3' parabolic grid antenna with a RAD center elevation of 96-ft above the existing tower base.
  Coax Cables: One (1) 1/2" ∅ coax cable.
- Sprint (Existing/Reserved):
  Antennas: Three (3) RFS APXVSPP18-C-A20 panel antennas, three (3) RFS APXVTM14 panel antennas, six (6) Alcatel-Lucent 1900 MHz RRH's, three (3) Alcatel-Lucent 800 MHz RRH's and three (3) Alcatel-Lucent TD-RRH8x20 remote radio heads mounted on three (3) sector frames with a RAD center elevation of 89-ft above the existing tower base.
  Coax Cables: Four (4) 1-1/4" ∅ fiber cables and one (1) RET cable.
- T-Mobile: (Existing):
  Antennas: Three (3) Ericsson AIR21 panel antennas and three (3) RFS TMA's pipe mounted to the tower legs with a RAD center elevation of 83-ft above the existing tower base.
  Coax Cables: Twelve (12) 1 5/8" ∅ and one (1) 7/8" ∅ coax cables.

- WCSU FM (Existing):
  Antennas: One (1) 4-Bay Shively Labs 6810 FM Antenna w/ Radomes with a RAD center elevation of 65-ft above the existing tower base.
  Coax Cables: One (1) 1 5/8” ∅ coax cable.
- Sprint (Existing):
  Antennas: (1) GPS antenna mounted to a 2’ standoff mount with a RAD center elevation of 30-ft above the existing tower base.
  Coax Cables: One (1) 1/2” ∅ coax cable.
- **AT&T Mobility (Proposed):**
  Antennas: Six (6) CCI OPA-65R-LUCC-H4 panel antennas, six (6) Ericsson RRUS-11 remote radio heads, three (3) Ericsson RRUS-12 remote radio heads, three (3) Ericsson RRUS-32 remote radio heads, three (3) Ericsson A2 units and four (4) Raycap DC6-48-60-18-8F surge arrestors mounted on three (3) existing sector frames with a RAD center elevation of 98-ft above the existing tower base.
  Coax Cables: Two (2) fiber cable, eight (8) dc control cables and three (3) RET cables running on a face of the existing tower

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 shall be routed as specified on in Section 3 of 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 shaft, and the model assumes that the shaft members are subjected to bending, axial, and shear forces.

The existing tower was analyzed for the controlling basic wind speed (fastest mile) with no ice and a 75% reduction of wind force with ½ inch accumulative ice to determine stresses in members as per guidelines of TIA/EIA-222-F-96 entitled "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", the American Institute of Steel Construction (AISC) and the Manual of Steel Construction; Allowable Stress Design (ASD).

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC[1] and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation on the tower analysis.

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA/EIA-222-F, gravity loads of the tower structure and its components, and the application of ½" radial ice on the tower structure and its components.

Basic Wind Speed:	Fairfield; v = 85 mph (fastest mile)	*[Section 16 of TIA/EIA-222-F-96]*
	Danbury; v = 95 mph (3 second gust) equivalent to v = 77.5 mph (fastest mile)	*[Appendix K of the 2005 CT Building Code Supplement]*
	TIA/EIA wind speed controls.	
Load Cases:	<u>Load Case 1</u>; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	<u>Load Case 2</u>; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	*[Section 2.3.16 of TIA/EIA-222-F-96]*
	<u>Load Case 3</u>; Seismic – not checked	*[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type*

1 The 2005 Connecticut State Building Code as amended by the 2009 CT State Supplement. (CSBC)

Tower Capacity

Tower stresses were calculated utilizing the structural analysis software tnxtower. Allowable stresses were determined based on Table 5 of the TIA/EIA code with a 1/3 increase per Section 3.1.1.1 of the same code.

- Calculated stresses were found to be within allowable limits. In Load Case 2, per tnxtower "Section Capacity Table", this tower was found to be at **99.8%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Diagonal (T2)	60'-0"-80'-0"	99.4%	**PASS**
Leg (T4)	40'-0"-53'-4"	99.8%	**PASS**

Foundation and Anchors

The existing foundation consists of three (3) 2.0-ft ∅ x 4.25-ft long reinforced concrete piers on a 14.5-ft square x 3-ft thick reinforced concrete pad bearing directly on existing sub grade. The existing foundation dimensions and sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned manufacturers original design documents; Fred A. Nudd Corporation; file no: 96-4992. Tower legs are connected to the foundation by means of (4) 1.5" ∅, ASTM A36 anchor bolts per leg, embedded into the concrete foundation structure.

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

Reactions	Vector	Proposed Base Reactions
Base	Shear	**13 kips**
	Compression	**25 kips**
	Moment	**908 kip-ft**
Leg	Shear	**10 kips**
	Compression	**148 kips**
	Uplift	**133 kips**

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	73.4%	**PASS**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2 (FS)(1)	Proposed Loading (FS)(1)	Result
Reinforced Concrete Mat	OTM(2)	2.0	2.08	**PASS**

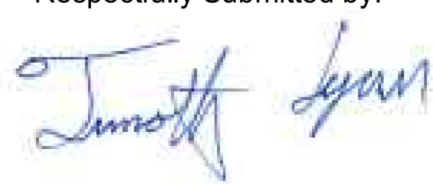
C o n c l u s i o n

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

General Description of Structural Analysis Program

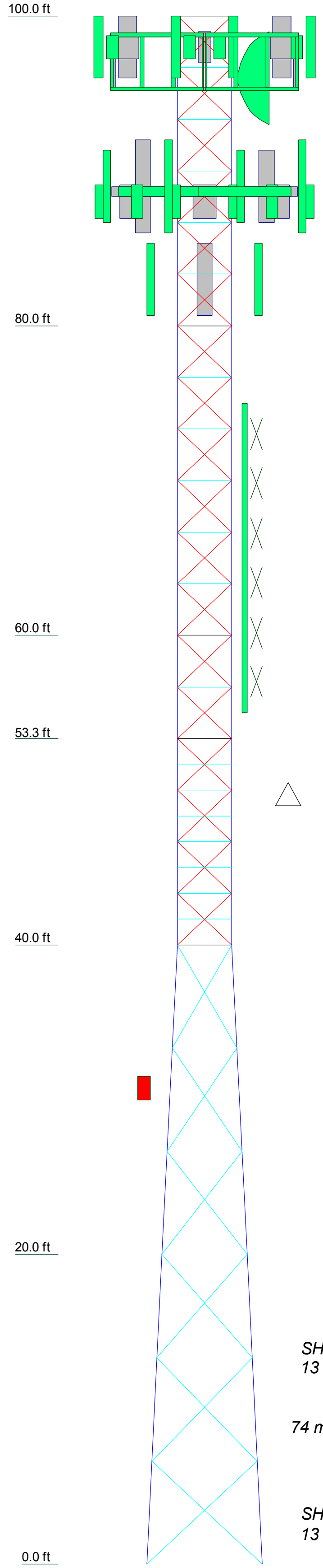
tnxTower, is an integrated structural analysis and design software package for Designed specifically for the telecommunications industry, tnxTower, formerly ERITower, automates much of the tower analysis and design required by the TIA/EIA 222 Standard.

tnxTower Features:

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

Section	T1	T2	T3	T4	T5	T6
Legs	P2.5x.276	P2.5x.276 (GR)	P3x.3 (GR)		P5x.375 (GR)	
Leg Grade	A500-50		A500M-61		A500-42	
Diagonals	SR 5/8		SR 3/4		L2x2x3/16	L2 1/2x2 1/2x3/16
Diagonal Grade	A36					
Top Girts	L1 1/2x1 1/2x3/16	2L1 1/2x1 1/2x3/16			N.A.	
Bottom Girts	N.A.			2L1 1/2x1 1/2x3/16	N.A.	
Horizontals	L1 1/2x1 1/2x3/16	2L1 1/2x1 1/2x3/16			N.A.	
Sec. Horizontals	N.A.			L2 1/2x2 1/2x5/16	N.A.	
Face Width (ft)	3.5				5.5	7.5
# Panels @ (ft)	12 @ 3.33333		2 @ 3.335	4 @ 3.3325	6 @ 6.66667	
Weight (K)	0.8	1.1	0.5	1.3	2.7	2.9

Total weight (K): 9.3



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) OPA-65R-LCUU-H4 (ATT - Proposed)	98	13-ft T-Frame (Sprint - Existing)	89
(2) OPA-65R-LCUU-H4 (ATT - Proposed)	98	APXVSPP18-C-A20 (Sprint - Existing)	89
(2) OPA-65R-LCUU-H4 (ATT - Proposed)	98	APXVSPP18-C-A20 (Sprint - Existing)	89
(2) RRUS-11 (ATT - Proposed)	98	APXVSPP18-C-A20 (Sprint - Existing)	89
RRUS-12 (ATT - Proposed)	98	APXVTM14 (Sprint - Existing)	89
RRUS-32 (ATT - Proposed)	98	APXVTM14 (Sprint - Existing)	89
A2 (ATT - Proposed)	98	APXVTM14 (Sprint - Existing)	89
(2) RRUS-11 (ATT - Proposed)	98	(2) FD-RRH 4x45 1900 (Sprint - Existing)	88
RRUS-12 (ATT - Proposed)	98	(2) FD-RRH 4x45 1900 (Sprint - Existing)	88
RRUS-32 (ATT - Proposed)	98	(2) FD-RRH 4x45 1900 (Sprint - Existing)	88
A2 (ATT - Proposed)	98	FD-RRH 2x50 800 (Sprint - Existing)	88
(2) RRUS-11 (ATT - Proposed)	98	FD-RRH 2x50 800 (Sprint - Existing)	88
RRUS-12 (ATT - Proposed)	98	FD-RRH 2x50 800 (Sprint - Existing)	88
RRUS-32 (ATT - Proposed)	98	TD-RRH8x20-25 (Sprint - Existing)	88
A2 (ATT - Proposed)	98	TD-RRH8x20-25 (Sprint - Existing)	88
DC6-48-60-18-8F Surge Arrestor (ATT - Proposed)	98	TD-RRH8x20-25 (Sprint - Existing)	88
DC6-48-60-18-8F Surge Arrestor (ATT - Proposed)	98	AIR21 (T-Mobile - Existing)	83
DC6-48-60-18-8F Surge Arrestor (ATT - Proposed)	98	AIR21 (T-Mobile - Existing)	83
DC6-48-60-18-8F Surge Arrestor (ATT - Proposed)	98	AIR21 (T-Mobile - Existing)	83
12' Boom Starmount	97	ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	80
12' Boom Starmount	97	ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	80
12' Boom Starmount	97	ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	80
Parabolic Grid	96	6810 4 Bay	65
13-ft T-Frame (Sprint - Existing)	89	GPS (Sprint)	30
13-ft T-Frame (Sprint - Existing)	89	2.5" Tube x 2' Standoff (Sprint)	30

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A500M-61	61 ksi	75 ksi
A36	36 ksi	58 ksi	A500-42	42 ksi	58 ksi

TOWER DESIGN NOTES

1. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
2. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
3. Deflections are based upon a 50 mph wind.
4. Grouted pipe f'c is 5 ksi
5. 3/4" dia SR used for sections T3 _T4 to account for 5/8" SR with 1/4" bar
6. TOWER RATING: 99.8%

MAX. CORNER REACTIONS AT BASE:
DOWN: 148 K
UPLIFT: -133 K
SHEAR: 10 K

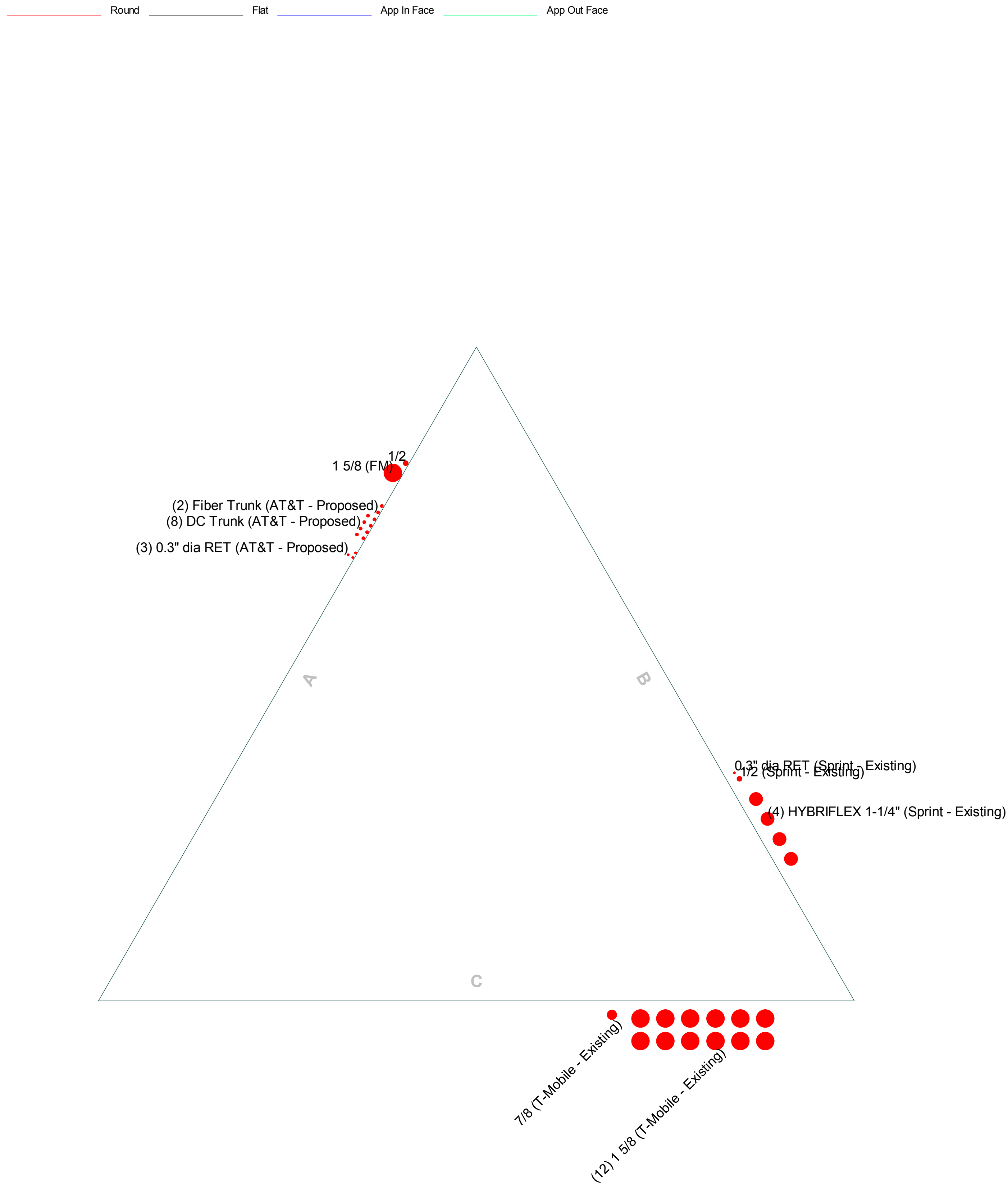
AXIAL 25 K
SHEAR 13 K
MOMENT 908 kip-ft
TORQUE 4 kip-ft
74 mph WIND - 0.5000 in ICE

AXIAL 17 K
SHEAR 13 K
MOMENT 906 kip-ft
TORQUE 4 kip-ft
REACTIONS - 85 mph WIND

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

Job: **14301.000 - CT968**			
Project: **100' Nudd Lattice - 303 Boxwood Lane, Danbury, CT**			
Client: AT&T Mobility	Drawn by: TJL	App'd:	
Code: TIA/EIA-222-F	Date: 12/01/14	Scale: NTS	
Path: J:\Jobs\1430100.WI\04_Structural\Backup Documentation\Calcs\Rev (1)\ERI Files\100-ft NUDD Lattice Tower Danbury, CT.eri		Dwg No. E-1	

Feedline Plan



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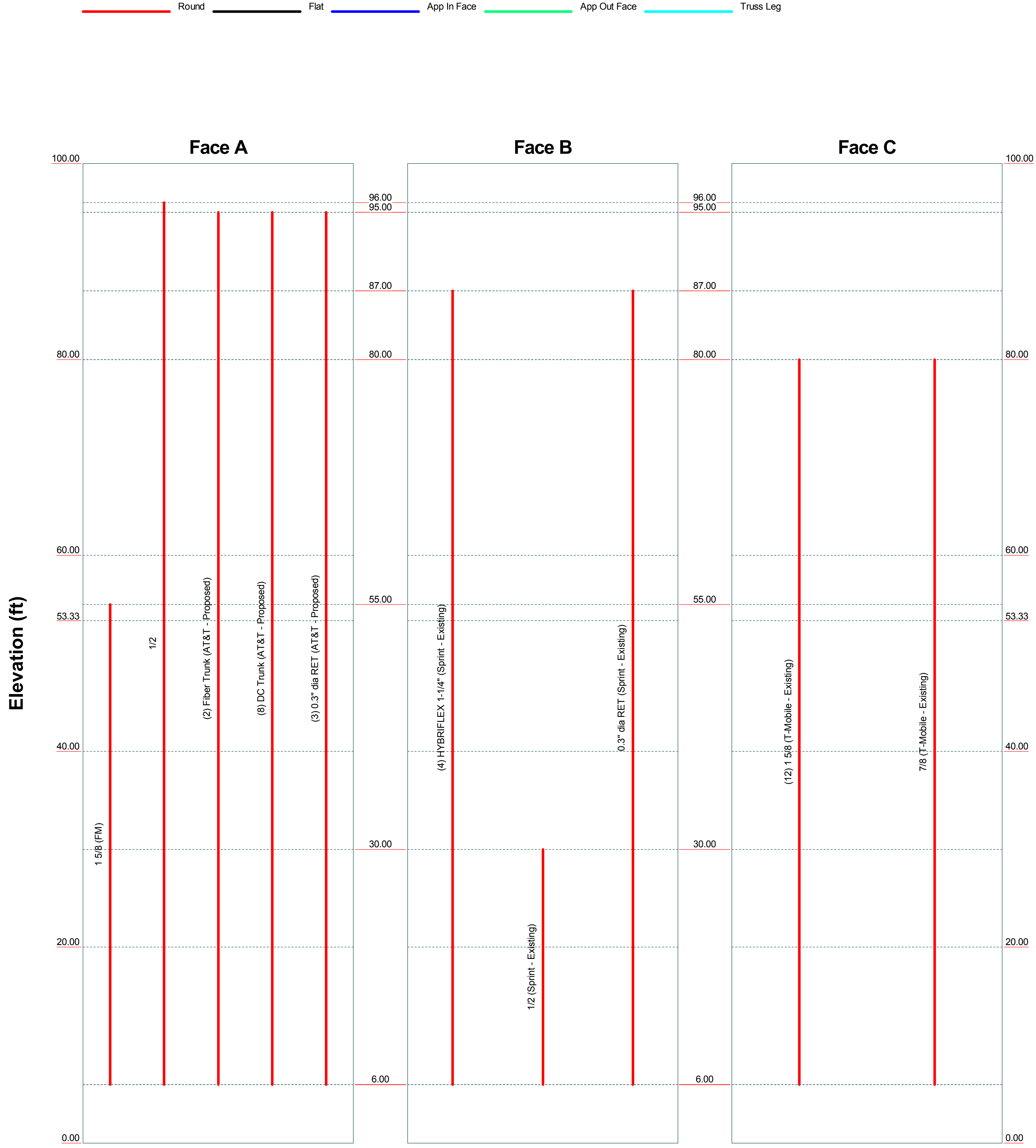
Path: J:\Jobs\1430100.WI\04_Structural\Backup Documentation\Calcs\Rev (1)\ERI Files\100-ft NUDD Lattice Tower Danbury, CT.eri		Dwg No. E-7

Feedline Distribution Chart
0' - 100'



Centek Engineering Inc. 63-2 North Branford Rd. Branford, CT 06405 Phone: (203) 488-0580 FAX: (203) 488-8587	Job: ***14301.000 - CT968***		
	Project: ***100' Nudd Lattice - 303 Boxwood Lane, Danbury, CT***		
	Client: AT&T Mobility	Drawn by: TJL	App'd:
	Code: TIA/EIA-222-F	Date: 12/01/14	Scale: NTS
	Path: J:\Jobs\1430100.WI\04_Structural\Backup Documentation\Calcs\Rev (1)\ERI Files\100-ft NUDD Lattice Tower Danbury, CT.eri		Dwg No. E-7

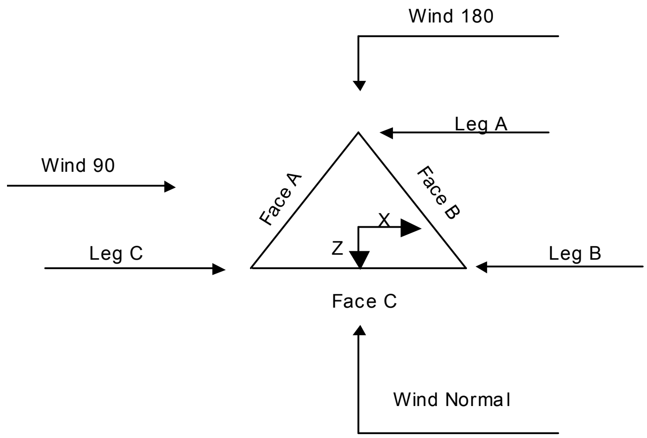
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 100.00 ft above the ground line.
The base of the tower is set at an elevation of 0.00 ft above the ground line.
The face width of the tower is 3.50 ft at the top and 7.50 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

- Basic wind speed of 85 mph.
- Nominal ice thickness of 0.5000 in.
- Ice density of 56 pcf.
- A wind speed of 74 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 50 mph.
- 3/4" dia SR used for sections T3 & T4 to account for 5/8" SR with 1/4" bar.
- Tension only take-up is 0.0313 in.
- A non-linear (P-delta) analysis was used.
- Grouted pipe f'_c is 5 ksi.
- Pressures are calculated at each section.
- Stress ratio used in tower member design is 1.333.
- Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	*Tower Elevation* *ft*	*Assembly Database*	*Description*	*Section Width* *ft*	*Number of Sections*	*Section Length* *ft*
T1	100.00-80.00			3.50	1	20.00
T2	80.00-60.00			3.50	1	20.00
T3	60.00-53.33			3.50	1	6.67
T4	53.33-40.00			3.50	1	13.33
T5	40.00-20.00			3.50	1	20.00
T6	20.00-0.00			5.50	1	20.00

Tower Section Geometry *(cont'd)*

Tower Section	*Tower Elevation* *ft*	*Diagonal Spacing* *ft*	*Bracing Type*	*Has K Brace End Panels*	*Has Horizontals*	*Top Girt Offset* *in*	*Bottom Girt Offset* *in*
T1	100.00-80.00	3.33	TX Brace	No	Yes	0.0000	0.0000
T2	80.00-60.00	3.33	TX Brace	No	Yes	0.0000	0.0000
T3	60.00-53.33	3.34	TX Brace	No	Yes	0.0000	0.0000
T4	53.33-40.00	3.33	TX Brace	No	Yes	0.0000	0.0000
T5	40.00-20.00	6.67	X Brace	No	No	0.0000	0.0000
T6	20.00-0.00	6.67	X Brace	No	No	0.0000	0.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Leg Type*	*Leg Size*	*Leg Grade*	*Diagonal Type*	*Diagonal Size*	*Diagonal Grade*
T1 100.00-80.00	Pipe	P2.5x.276	A500-50 (50 ksi)	Solid Round	5/8	A36 (36 ksi)
T2 80.00-60.00	Grouted Pipe	P2.5x.276	A500-50 (50 ksi)	Solid Round	5/8	A36 (36 ksi)
T3 60.00-53.33	Grouted Pipe	P3x.3	A500M-61 (61 ksi)	Solid Round	3/4	A36 (36 ksi)
T4 53.33-40.00	Grouted Pipe	P3x.3	A500M-61 (61 ksi)	Solid Round	3/4	A36 (36 ksi)
T5 40.00-20.00	Grouted Pipe	P5x.375	A500-42 (42 ksi)	Equal Angle	L2x2x3/16	A36 (36 ksi)
T6 20.00-0.00	Grouted Pipe	P5x.375	A500-42 (42 ksi)	Equal Angle	L2 1/2x2 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*Top Girt Type*	*Top Girt Size*	*Top Girt Grade*	*Bottom Girt Type*	*Bottom Girt Size*	*Bottom Girt Grade*
T1 100.00-80.00	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T2 80.00-60.00	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)
T3 60.00-53.33	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)
T4 53.33-40.00	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	*No. of Mid Girts*	*Mid Girt Type*	*Mid Girt Size*	*Mid Girt Grade*	*Horizontal Type*	*Horizontal Size*	*Horizontal Grade*
T1 100.00-80.00	None	Solid Round		A572-50 (50 ksi)	Equal Angle	L1 1/2x1 1/2x3/16	A36 (36 ksi)
T2 80.00-60.00	None	Single Angle		A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)
T3 60.00-53.33	None	Single Angle		A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)
T4 53.33-40.00	None	Single Angle		A36 (36 ksi)	Double Equal Angle	2L1 1/2x1 1/2x3/16	A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Secondary Horizontal Type*	*Secondary Horizontal Size*	*Secondary Horizontal Grade*	*Inner Bracing Type*	*Inner Bracing Size*	*Inner Bracing Grade*
T4 53.33-40.00	Equal Angle	L2 1/2x2 1/2x5/16	A36 (36 ksi)	Equal Angle		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation *ft*	*Gusset Area (per face)* ft^2	*Gusset Thickness* *in*	*Gusset Grade*	*Adjust. Factor* A_f	*Adjust. Factor* A_r	*Weight Mult.*	*Double Angle Stitch Bolt Spacing Diagonals* *in*	*Double Angle Stitch Bolt Spacing Horizontals* *in*
T1 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T2 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T3 60.00-53.33	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T4 53.33-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T5 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000
T6 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry *(cont'd)*

			K Factors[1]							
Tower Elevation *ft*	*Calc K Single Angles*	*Calc K Solid Rounds*	*Legs*	*X Brace Diags* *X* *Y*	*K Brace Diags* *X* *Y*	*Single Diags* *X* *Y*	*Girts* *X* *Y*	*Horiz.* *X* *Y*	*Sec. Horiz.* *X* *Y*	*Inner Brace* *X* *Y*
T1 100.00-80.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 80.00-60.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 60.00-53.33	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 53.33-40.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 40.00-20.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 20.00-0.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1

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

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U	Net Width Deduct in	U
T1 100.00-80.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T2 80.00-60.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T3 60.00-53.33	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T4 53.33-40.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T5 40.00-20.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1
T6 20.00-0.00	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1	0.0000	1

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Leg Connection Type	Leg		Diagonal		Top Girt		Bottom Girt		Mid Girt		Long Horizontal		Short Horizontal	
		Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.	Bolt Size in	No.
T1 100.00-80.00	Flange	0.7500 A325N	4	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T2 80.00-60.00	Flange	0.7500 A325N	4	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T3 60.00-53.33	Flange	0.7500 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T4 53.33-40.00	Flange	1.0000 A325N	4	0.5000 A325N	0	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.7500 A325N	1
T5 40.00-20.00	Flange	1.0000 A325N	6	0.6250 A325N	1	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0
T6 20.00-0.00	Flange	1.5000 A36	4	0.6250 A325N	1	0.5000 A325N	0	0.5000 A325N	0	0.6250 A325N	0	0.5000 A325N	0	0.6250 A325N	0

Grouted Pipe Properties

Size	F_y ksi	A_s in^2	A_c in^2	Wt plf	E_c ksi	E_m ksi	F_{ym} ksi
P2.5x.276 (GR)	50	2.2535	4.2383	16.498	4031	35064	58
P3x.3 (GR)	55	3.0159	6.6052	24.023	4031	36062	64
P5x.375 (GR)	42	6.1120	18.1937	58.701	4031	38598	55

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
1 5/8 (FM)	A	Yes	Ar (CfAe)	55.00 - 6.00	0.0000	0.3	1	1	1.9800	1.9800		1.04
1/2	A	Yes	Ar (CfAe)	96.00 - 6.00	0.0000	0.32	1	1	0.5800	0.5800		0.25

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Face Offset in	Lateral Offset (Frac FW)	#	# Per Row	Clear Spacing in	Width or Diameter in	Perimeter in	Weight plf
HYBRIFLEX 1-1/4" (Sprint - Existing)	B	Yes	Ar (CfAe)	87.00 - 6.00	1.0000	0.25	4	4	1.0000	1.5400		1.30
1/2 (Sprint - Existing)	B	Yes	Ar (CfAe)	30.00 - 6.00	1.0000	0.17	1	1	0.5800	0.5800		0.25
0.3" dia RET (Sprint - Existing)	B	Yes	Ar (CfAe)	87.00 - 6.00	1.0000	0.16	1	1	0.3000	0.3000		0.00
1 5/8 (T-Mobile - Existing)	C	Yes	Ar (CfAe)	80.00 - 6.00	1.0000	-0.3	12	6	0.7500 0.5000	1.9800		1.04
7/8 (T-Mobile - Existing)	C	Yes	Ar (CfAe)	80.00 - 6.00	1.0000	-0.18	1	1	1.1100	1.1100		0.54
Fiber Trunk (AT&T - Proposed)	A	Yes	Ar (CfAe)	95.00 - 6.00	0.0000	0.25	2	2	0.4000	0.4000		1.00
DC Trunk (AT&T - Proposed)	A	Yes	Ar (CfAe)	95.00 - 6.00	0.0000	0.22	8	4	0.4000	0.4000		0.11
0.3" dia RET (AT&T - Proposed)	A	Yes	Ar (CfAe)	95.00 - 6.00	0.0000	0.18	3	2	0.3000	0.3000		0.00

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
T1	100.00-80.00	A	4.523	0.000	0.000	0.000	0.05
		B	3.768	0.000	0.000	0.000	0.04
		C	0.000	0.000	0.000	0.000	0.00
T2	80.00-60.00	A	5.967	0.000	0.000	0.000	0.06
		B	10.767	0.000	0.000	0.000	0.10
		C	21.650	0.000	0.000	0.000	0.26
T3	60.00-53.33	A	2.265	0.000	0.000	0.000	0.02
		B	3.591	0.000	0.000	0.000	0.03
		C	7.220	0.000	0.000	0.000	0.09
T4	53.33-40.00	A	6.176	0.000	0.000	0.000	0.06
		B	7.176	0.000	0.000	0.000	0.07
		C	14.430	0.000	0.000	0.000	0.17
T5	40.00-20.00	A	9.267	0.000	0.000	0.000	0.08
		B	11.250	0.000	0.000	0.000	0.11
		C	21.650	0.000	0.000	0.000	0.26
T6	20.00-0.00	A	6.487	0.000	0.000	0.000	0.06
		B	8.213	0.000	0.000	0.000	0.08
		C	15.155	0.000	0.000	0.000	0.18

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	*Tower Elevation ft*	*Face or Leg*	*Ice Thickness in*	A_R ft^2	A_F ft^2	C_AA_A *In Face* ft^2	C_AA_A *Out Face* ft^2	*Weight K*
T1	100.00-80.00	A	0.500	7.232	4.750	0.000	0.000	0.13
		B		2.240	4.445	0.000	0.000	0.09
		C		0.000	0.000	0.000	0.000	0.00
T2	80.00-60.00	A	0.500	9.467	6.333	0.000	0.000	0.17
		B		6.400	12.700	0.000	0.000	0.25
		C		8.483	22.750	0.000	0.000	0.68
T3	60.00-53.33	A	0.500	3.572	2.112	0.000	0.000	0.06
		B		2.134	4.235	0.000	0.000	0.08
		C		2.829	7.587	0.000	0.000	0.23
T4	53.33-40.00	A	0.500	9.620	4.221	0.000	0.000	0.15
		B		4.266	8.465	0.000	0.000	0.16
		C		5.654	15.163	0.000	0.000	0.46
T5	40.00-20.00	A	0.500	14.433	6.333	0.000	0.000	0.22
		B		7.717	12.700	0.000	0.000	0.25
		C		8.483	22.750	0.000	0.000	0.68
T6	20.00-0.00	A	0.500	10.103	4.433	0.000	0.000	0.15
		B		6.323	8.890	0.000	0.000	0.18
		C		5.938	15.925	0.000	0.000	0.48

Feed Line Shielding

Section	*Elevation ft*	*Face*	A_R ft^2	A_R *Ice* ft^2	A_F ft^2	A_F *Ice* ft^2
T1	100.00-80.00	A	0.195	1.644	0.170	0.449
		B	0.163	0.917	0.141	0.251
		C	0.000	0.000	0.000	0.000
T2	80.00-60.00	A	0.257	2.168	0.224	0.593
		B	0.465	2.621	0.404	0.716
		C	0.934	4.285	0.812	1.171
T3	60.00-53.33	A	0.117	0.829	0.085	0.213
		B	0.186	0.929	0.135	0.239
		C	0.374	1.519	0.271	0.390
T4	53.33-40.00	A	0.320	2.451	0.676	1.514
		B	0.372	2.255	0.785	1.393
		C	0.747	3.687	1.579	2.277
T5	40.00-20.00	A	0.000	0.938	0.837	1.877
		B	0.000	0.923	1.017	1.845
		C	0.000	1.411	1.957	2.823
T6	20.00-0.00	A	0.000	0.523	0.583	1.307
		B	0.000	0.547	0.738	1.368
		C	0.000	0.786	1.363	1.966

Feed Line Center of Pressure

Section	*Elevation ft*	CP_X *in*	CP_Z *in*	CP_X *Ice in*	CP_Z *Ice in*
T1	100.00-80.00	0.6704	-1.0549	0.4769	-0.7656
T2	80.00-60.00	4.7574	3.0203	3.2022	1.8623
T3	60.00-53.33	4.2318	2.5647	2.9370	1.6042
T4	53.33-40.00	3.2918	1.6990	2.1374	0.9607

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T5	40.00-20.00	4.0544	1.9400	3.4046	1.2863
T6	20.00-0.00	3.9691	1.7668	3.5283	1.2011

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft²	C_AA_A Side ft²	Weight K
12' Boom Starmount	A	From Leg	1.50 0.00 0.00	0.0000	97.00	No Ice 1/2" Ice	15.00 20.00	8.00 11.00	0.47 0.68
12' Boom Starmount	B	From Leg	1.50 0.00 0.00	0.0000	97.00	No Ice 1/2" Ice	15.00 20.00	8.00 11.00	0.47 0.68
12' Boom Starmount	C	From Leg	1.50 0.00 0.00	0.0000	97.00	No Ice 1/2" Ice	15.00 20.00	8.00 11.00	0.47 0.68
Parabolic Grid	B	From Leg	0.50 0.00 0.00	0.0000	96.00	No Ice 1/2" Ice	1.20 2.00	1.20 2.00	0.02 0.04
APXVSPP18-C-A20 (Sprint - Existing)	A	From Leg	3.00 -4.00 0.00	0.0000	89.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
APXVSPP18-C-A20 (Sprint - Existing)	B	From Leg	3.00 -4.00 0.00	0.0000	89.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
APXVSPP18-C-A20 (Sprint - Existing)	C	From Leg	3.00 -4.00 0.00	0.0000	89.00	No Ice 1/2" Ice	8.26 8.81	5.28 5.74	0.06 0.11
APXVTM14 (Sprint - Existing)	A	From Leg	3.00 4.00 0.00	0.0000	89.00	No Ice 1/2" Ice	6.90 7.35	3.61 3.97	0.06 0.10
APXVTM14 (Sprint - Existing)	B	From Leg	3.00 4.00 0.00	0.0000	89.00	No Ice 1/2" Ice	6.90 7.35	3.61 3.97	0.06 0.10
APXVTM14 (Sprint - Existing)	C	From Leg	3.00 4.00 0.00	0.0000	89.00	No Ice 1/2" Ice	6.90 7.35	3.61 3.97	0.06 0.10
(2) FD-RRH 4x45 1900 (Sprint - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	2.71 2.94	2.78 3.02	0.06 0.08
(2) FD-RRH 4x45 1900 (Sprint - Existing)	B	From Leg	3.00 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	2.71 2.94	2.78 3.02	0.06 0.08
(2) FD-RRH 4x45 1900 (Sprint - Existing)	C	From Leg	3.00 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	2.71 2.94	2.78 3.02	0.06 0.08
FD-RRH 2x50 800 (Sprint - Existing)	A	From Leg	3.00 0.00 0.00	0.0000	88.00	No Ice 1/2" Ice	0.00 0.00	2.25 2.46	0.06 0.09
FD-RRH 2x50 800 (Sprint - Existing)	B	From Leg	3.00 0.00	0.0000	88.00	No Ice 1/2" Ice	0.00 0.00	2.25 2.46	0.06 0.09

Description	*Face or Leg*	*Offset Type*	*Offsets: Horz Lateral Vert* *ft ft ft*	*Azimuth Adjustment* °	*Placement* *ft*		C_AA_A *Front* ft^2	C_AA_A *Side* ft^2	*Weight* *K*
FD-RRH 2x50 800 (Sprint - Existing)	C	From Leg	0.00 3.00 0.00	0.0000	88.00	No Ice 1/2" Ice	0.00 0.00	2.25 2.46	0.06 0.09
TD-RRH8x20-25 (Sprint - Existing)	A	From Leg	0.00 3.00 0.00	0.0000	88.00	No Ice 1/2" Ice	4.72 5.01	1.70 1.92	0.07 0.10
TD-RRH8x20-25 (Sprint - Existing)	B	From Leg	0.00 3.00 0.00	0.0000	88.00	No Ice 1/2" Ice	4.72 5.01	1.70 1.92	0.07 0.10
TD-RRH8x20-25 (Sprint - Existing)	C	From Leg	0.00 3.00 0.00	0.0000	88.00	No Ice 1/2" Ice	4.72 5.01	1.70 1.92	0.07 0.10
13-ft T-Frame (Sprint - Existing)	A	From Leg	0.00 1.00 0.00	0.0000	89.00	No Ice 1/2" Ice	11.70 16.40	11.70 16.40	0.53 0.74
13-ft T-Frame (Sprint - Existing)	B	From Leg	0.00 1.00 0.00	0.0000	89.00	No Ice 1/2" Ice	11.70 16.40	11.70 16.40	0.53 0.74
13-ft T-Frame (Sprint - Existing)	C	From Leg	0.00 1.00 0.00	0.0000	89.00	No Ice 1/2" Ice	11.70 16.40	11.70 16.40	0.53 0.74
AIR21 (T-Mobile - Existing)	A	From Leg	0.00 2.00 0.00	0.0000	83.00	No Ice 1/2" Ice	6.53 6.98	4.36 4.77	0.08 0.12
AIR21 (T-Mobile - Existing)	B	From Leg	0.00 2.00 0.00	0.0000	83.00	No Ice 1/2" Ice	6.53 6.98	4.36 4.77	0.08 0.12
AIR21 (T-Mobile - Existing)	C	From Leg	0.00 2.00 0.00	0.0000	83.00	No Ice 1/2" Ice	6.53 6.98	4.36 4.77	0.08 0.12
ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	B	From Leg	0.00 1.00 0.00	0.0000	80.00	No Ice 1/2" Ice	0.00 0.00	0.39 0.48	0.01 0.02
ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	B	From Leg	0.00 1.00 0.00	0.0000	80.00	No Ice 1/2" Ice	0.00 0.00	0.39 0.48	0.01 0.02
ATMAA1412D-1A20 Twin TMA (T-Mobile - Existing)	B	From Leg	0.00 1.00 0.00	0.0000	80.00	No Ice 1/2" Ice	0.00 0.00	0.39 0.48	0.01 0.02
6810 4 Bay	B	From Leg	0.00 1.00 0.00	0.0000	65.00	No Ice 1/2" Ice	28.90 34.00	28.90 34.00	0.43 1.01
2.5" Tube x 2' Standoff (Sprint)	C	From Leg	0.00 1.00 0.00	0.0000	30.00	No Ice 1/2" Ice	1.11 1.44	0.63 0.84	0.12 0.13
GPS (Sprint)	C	From Leg	0.00 2.00 0.00	0.0000	30.00	No Ice 1/2" Ice	1.00 1.50	1.00 1.50	0.01 0.01
(2) OPA-65R-LCUU-H4 (AT&T - Proposed)	A	From Leg	0.00 3.00 0.00	0.0000	98.00	No Ice 1/2" Ice	6.72 7.13	3.41 3.77	0.06 0.10
(2) OPA-65R-LCUU-H4 (AT&T - Proposed)	B	From Leg	0.00 3.00 0.00	0.0000	98.00	No Ice 1/2" Ice	6.72 7.13	3.41 3.77	0.06 0.10
(2) OPA-65R-LCUU-H4 (AT&T - Proposed)	C	From Leg	0.00 3.00 0.00	0.0000	98.00	No Ice 1/2" Ice	6.72 7.13	3.41 3.77	0.06 0.10

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00						
(2) RRUS-11 (AT&T - Proposed)	A	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07
RRUS-12 (AT&T - Proposed)	A	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	1.49 1.67	0.06 0.08
RRUS-32 (AT&T - Proposed)	A	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	2.76 3.02	0.08 0.10
A2 (AT&T - Proposed)	A	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	0.54 0.67	0.02 0.03
(2) RRUS-11 (AT&T - Proposed)	B	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07
RRUS-12 (AT&T - Proposed)	B	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	1.49 1.67	0.06 0.08
RRUS-32 (AT&T - Proposed)	B	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	2.76 3.02	0.08 0.10
A2 (AT&T - Proposed)	B	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	0.54 0.67	0.02 0.03
(2) RRUS-11 (AT&T - Proposed)	C	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	2.99 3.23	1.25 1.41	0.05 0.07
RRUS-12 (AT&T - Proposed)	C	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	1.49 1.67	0.06 0.08
RRUS-32 (AT&T - Proposed)	C	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	2.76 3.02	0.08 0.10
A2 (AT&T - Proposed)	C	From Leg	2.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	0.54 0.67	0.02 0.03
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	A	From Leg	0.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	2.23 2.45	2.23 2.45	0.02 0.04
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	B	From Leg	0.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	2.23 2.45	0.02 0.04
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	C	From Leg	0.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	2.23 2.45	0.02 0.04
DC6-48-60-18-8F Surge Arrestor (AT&T - Proposed)	C	From Leg	0.00 0.00 0.00	0.0000	98.00	No Ice 1/2" Ice	0.00 0.00	2.23 2.45	0.02 0.04

Tower Pressures - No Ice

$G_H = 1.162$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 100.00-80.00	90.00	1.332	25	74.792	A	2.276	16.726	9.583	50.44	0.000	0.000
					B	2.304	16.003		52.35	0.000	0.000
					C	2.445	12.397		64.57	0.000	0.000
T2 80.00-60.00	70.00	1.24	23	74.792	A	2.222	18.107	9.583	47.14	0.000	0.000
					B	2.042	22.699		38.73	0.000	0.000
					C	1.633	33.113		27.58	0.000	0.000
T3 60.00-53.33	56.67	1.167	22	25.290	A	0.724	7.151	3.891	49.41	0.000	0.000
					B	0.674	8.408		42.84	0.000	0.000
					C	0.538	11.850		31.41	0.000	0.000
T4 53.33-40.00	46.67	1.104	20	50.543	A	4.003	15.847	7.776	39.17	0.000	0.000
					B	3.894	16.795		37.58	0.000	0.000
					C	3.100	23.673		29.04	0.000	0.000
T5 40.00-20.00	30.00	1	18	99.283	A	6.440	27.841	18.574	54.18	0.000	0.000
					B	6.261	29.824		51.47	0.000	0.000
					C	5.321	40.224		40.78	0.000	0.000
T6 20.00-0.00	10.00	1	18	139.283	A	10.235	25.061	18.574	52.62	0.000	0.000
					B	10.079	26.788		50.38	0.000	0.000
					C	9.455	33.729		43.01	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.162$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 100.00-80.00	90.00	1.332	18	0.5000	76.458	A	6.746	27.451	12.917	37.77	0.000	0.000
						B	6.640	23.186		43.31	0.000	0.000
						C	2.445	21.863		53.14	0.000	0.000
T2 80.00-60.00	70.00	1.24	17	0.5000	76.458	A	8.186	29.162	12.917	34.58	0.000	0.000
						B	14.429	25.643		32.23	0.000	0.000
						C	24.024	26.061		25.79	0.000	0.000
T3 60.00-53.33	56.67	1.167	16	0.5000	25.846	A	2.708	10.880	5.003	36.82	0.000	0.000
						B	4.805	9.343		35.36	0.000	0.000
						C	8.005	9.448		28.66	0.000	0.000
T4 53.33-40.00	46.67	1.104	15	0.5000	51.654	A	7.386	24.741	9.998	31.12	0.000	0.000
						B	11.751	19.583		31.91	0.000	0.000
						C	17.564	19.539		26.94	0.000	0.000
T5 40.00-20.00	30.00	1	14	0.5000	100.952	A	11.734	39.047	21.913	43.15	0.000	0.000
						B	18.133	32.346		43.41	0.000	0.000
						C	27.205	32.624		36.63	0.000	0.000
T6 20.00-0.00	10.00	1	14	0.5000	140.952	A	13.944	35.821	21.913	44.03	0.000	0.000
						B	18.340	32.016		43.52	0.000	0.000
						C	24.777	31.392		39.01	0.000	0.000

Tower Pressure - Service

$G_H = 1.162$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1 100.00-80.00	90.00	1.332	9	74.792	A	2.276	16.726	9.583	50.44	0.000	0.000
					B	2.304	16.003		52.35	0.000	0.000
					C	2.445	12.397		64.57	0.000	0.000
T2 80.00-60.00	70.00	1.24	8	74.792	A	2.222	18.107	9.583	47.14	0.000	0.000
					B	2.042	22.699		38.73	0.000	0.000
					C	1.633	33.113		27.58	0.000	0.000
T3 60.00-53.33	56.67	1.167	7	25.290	A	0.724	7.151	3.891	49.41	0.000	0.000
					B	0.674	8.408		42.84	0.000	0.000
					C	0.538	11.850		31.41	0.000	0.000
T4 53.33-40.00	46.67	1.104	7	50.543	A	4.003	15.847	7.776	39.17	0.000	0.000
					B	3.894	16.795		37.58	0.000	0.000
					C	3.100	23.673		29.04	0.000	0.000
T5 40.00-20.00	30.00	1	6	99.283	A	6.440	27.841	18.574	54.18	0.000	0.000
					B	6.261	29.824		51.47	0.000	0.000
					C	5.321	40.224		40.78	0.000	0.000
T6 20.00-0.00	10.00	1	6	139.283	A	10.235	25.061	18.574	52.62	0.000	0.000
					B	10.079	26.788		50.38	0.000	0.000
					C	9.455	33.729		43.01	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	R_R	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1 100.00-80.00	0.08	0.75	A	0.254	2.425	0.603	1	1	12.360	0.86	42.91	A
			B	0.245	2.453	0.601	1	1	11.915			
			C	0.198	2.601	0.59	1	1	9.761			
T2 80.00-60.00	0.43	1.13	A	0.272	2.374	0.608	1	1	13.224	1.26	62.76	C
			B	0.331	2.217	0.626	1	1	16.247			
			C	0.465	1.95	0.68	1	1	24.153			
T3 60.00-53.33	0.14	0.51	A	0.311	2.266	0.619	1	1	5.154	0.42	62.92	C
			B	0.359	2.151	0.636	1	1	6.020			
			C	0.49	1.914	0.692	1	1	8.742			
T4 53.33-40.00	0.30	1.26	A	0.393	2.079	0.649	1	1	14.283	0.88	66.32	C
			B	0.409	2.046	0.655	1	1	14.902			
			C	0.53	1.864	0.713	1	1	19.982			
T5 40.00-20.00	0.45	2.74	A	0.345	2.183	0.631	1	1	24.002	1.37	68.58	C
			B	0.363	2.141	0.637	1	1	25.270			
			C	0.459	1.959	0.677	1	1	32.566			
T6 20.00-0.00	0.32	2.90	A	0.253	2.427	0.603	1	1	25.340	1.48	73.99	C
			B	0.265	2.394	0.606	1	1	26.305			
			C	0.31	2.27	0.619	1	1	30.334			
Sum Weight:	1.72	9.30						OTM	286.09 kip-ft	6.27		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 100.00-80.00	0.08	0.75	A	0.254	2.425	0.603	0.8	1	11.905	0.83	41.33	A
			B	0.245	2.453	0.601	0.8	1	11.454			
			C	0.198	2.601	0.59	0.8	1	9.272			
T2 80.00-60.00	0.43	1.13	A	0.272	2.374	0.608	0.8	1	12.780	1.24	61.91	C
			B	0.331	2.217	0.626	0.8	1	15.839			
			C	0.465	1.95	0.68	0.8	1	23.826			
T3 60.00-53.33	0.14	0.51	A	0.311	2.266	0.619	0.8	1	5.009	0.41	62.14	C
			B	0.359	2.151	0.636	0.8	1	5.885			
			C	0.49	1.914	0.692	0.8	1	8.635			
T4 53.33-40.00	0.30	1.26	A	0.393	2.079	0.649	0.8	1	13.482	0.86	64.26	C
			B	0.409	2.046	0.655	0.8	1	14.123			
			C	0.53	1.864	0.713	0.8	1	19.362			
T5 40.00-20.00	0.45	2.74	A	0.345	2.183	0.631	0.8	1	22.714	1.33	66.34	C
			B	0.363	2.141	0.637	0.8	1	24.018			
			C	0.459	1.959	0.677	0.8	1	31.502			
T6 20.00-0.00	0.32	2.90	A	0.253	2.427	0.603	0.8	1	23.293	1.39	69.38	C
			B	0.265	2.394	0.606	0.8	1	24.289			
			C	0.31	2.27	0.619	0.8	1	28.443			
Sum Weight:	1.72	9.30						OTM	278.21 kip-ft	6.05		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 100.00-80.00	0.08	0.75	A	0.254	2.425	0.603	0.85	1	12.018	0.83	41.73	A
			B	0.245	2.453	0.601	0.85	1	11.569			
			C	0.198	2.601	0.59	0.85	1	9.394			
T2 80.00-60.00	0.43	1.13	A	0.272	2.374	0.608	0.85	1	12.891	1.24	62.12	C
			B	0.331	2.217	0.626	0.85	1	15.941			
			C	0.465	1.95	0.68	0.85	1	23.908			
T3 60.00-53.33	0.14	0.51	A	0.311	2.266	0.619	0.85	1	5.045	0.42	62.33	C
			B	0.359	2.151	0.636	0.85	1	5.918			
			C	0.49	1.914	0.692	0.85	1	8.662			
T4 53.33-40.00	0.30	1.26	A	0.393	2.079	0.649	0.85	1	13.682	0.86	64.78	C
			B	0.409	2.046	0.655	0.85	1	14.318			
			C	0.53	1.864	0.713	0.85	1	19.517			
T5 40.00-20.00	0.45	2.74	A	0.345	2.183	0.631	0.85	1	23.036	1.34	66.90	C
			B	0.363	2.141	0.637	0.85	1	24.331			
			C	0.459	1.959	0.677	0.85	1	31.768			
T6 20.00-0.00	0.32	2.90	A	0.253	2.427	0.603	0.85	1	23.805	1.41	70.53	C
			B	0.265	2.394	0.606	0.85	1	24.793			
			C	0.31	2.27	0.619	0.85	1	28.916			
Sum Weight:	1.72	9.30						OTM	280.18 kip-ft	6.10		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 100.00-80.00	0.21	1.10	A	0.447	1.978	0.672	1	1	25.194	1.07	53.50	A
			B	0.39	2.084	0.648	1	1	21.655			
			C	0.318	2.249	0.622	1	1	16.035			
T2 80.00-60.00	1.10	1.52	A	0.488	1.915	0.692	1	1	28.357	1.59	79.30	C
			B	0.524	1.871	0.71	1	1	32.638			
			C	0.655	1.78	0.789	1	1	44.583			
T3 60.00-53.33	0.37	0.65	A	0.526	1.869	0.711	1	1	10.443	0.52	78.11	C
			B	0.547	1.846	0.723	1	1	11.559			
			C	0.675	1.777	0.803	1	1	15.588			
T4 53.33-40.00	0.77	1.66	A	0.622	1.792	0.767	1	1	26.369	1.07	80.36	C
			B	0.607	1.8	0.758	1	1	26.588			
			C	0.718	1.778	0.833	1	1	33.843			
T5 40.00-20.00	1.16	3.25	A	0.503	1.896	0.699	1	1	39.030	1.51	75.29	C
			B	0.5	1.9	0.698	1	1	40.695			
			C	0.593	1.809	0.749	1	1	51.645			
T6 20.00-0.00	0.82	3.52	A	0.353	2.164	0.634	1	1	36.639	1.51	75.33	C
			B	0.357	2.155	0.635	1	1	38.673			
			C	0.398	2.067	0.651	1	1	45.213			
Sum Weight:	4.43	11.68						OTM	347.08 kip-ft	7.26		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 100.00-80.00	0.21	1.10	A	0.447	1.978	0.672	0.8	1	23.845	1.01	50.64	A
			B	0.39	2.084	0.648	0.8	1	20.327			
			C	0.318	2.249	0.622	0.8	1	15.545			
T2 80.00-60.00	1.10	1.52	A	0.488	1.915	0.692	0.8	1	26.720	1.42	70.76	C
			B	0.524	1.871	0.71	0.8	1	29.752			
			C	0.655	1.78	0.789	0.8	1	39.778			
T3 60.00-53.33	0.37	0.65	A	0.526	1.869	0.711	0.8	1	9.902	0.47	70.09	C
			B	0.547	1.846	0.723	0.8	1	10.597			
			C	0.675	1.777	0.803	0.8	1	13.987			
T4 53.33-40.00	0.77	1.66	A	0.622	1.792	0.767	0.8	1	24.892	0.96	72.01	C
			B	0.607	1.8	0.758	0.8	1	24.238			
			C	0.718	1.778	0.833	0.8	1	30.330			
T5 40.00-20.00	1.16	3.25	A	0.503	1.896	0.699	0.8	1	36.683	1.35	67.36	C
			B	0.5	1.9	0.698	0.8	1	37.068			
			C	0.593	1.809	0.749	0.8	1	46.204			
T6 20.00-0.00	0.82	3.52	A	0.353	2.164	0.634	0.8	1	33.850	1.34	67.07	C
			B	0.357	2.155	0.635	0.8	1	35.005			
			C	0.398	2.067	0.651	0.8	1	40.258			
Sum Weight:	4.43	11.68						OTM	315.33 kip-ft	6.54		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 100.00-80.00	0.21	1.10	A	0.447	1.978	0.672	0.85	1	24.182	1.03	51.35	A
			B	0.39	2.084	0.648	0.85	1	20.659			
			C	0.318	2.249	0.622	0.85	1	15.668			
T2 80.00-60.00	1.10	1.52	A	0.488	1.915	0.692	0.85	1	27.130	1.46	72.89	C
			B	0.524	1.871	0.71	0.85	1	30.473			
			C	0.655	1.78	0.789	0.85	1	40.979			
T3 60.00-53.33	0.37	0.65	A	0.526	1.869	0.711	0.85	1	10.037	0.48	72.09	C
			B	0.547	1.846	0.723	0.85	1	10.838			
			C	0.675	1.777	0.803	0.85	1	14.387			
T4 53.33-40.00	0.77	1.66	A	0.622	1.792	0.767	0.85	1	25.261	0.99	74.10	C
			B	0.607	1.8	0.758	0.85	1	24.826			
			C	0.718	1.778	0.833	0.85	1	31.209			
T5 40.00-20.00	1.16	3.25	A	0.503	1.896	0.699	0.85	1	37.270	1.39	69.34	C
			B	0.5	1.9	0.698	0.85	1	37.975			
			C	0.593	1.809	0.749	0.85	1	47.564			
T6 20.00-0.00	0.82	3.52	A	0.353	2.164	0.634	0.85	1	34.548	1.38	69.14	C
			B	0.357	2.155	0.635	0.85	1	35.922			
			C	0.398	2.067	0.651	0.85	1	41.496			
Sum Weight:	4.43	11.68						OTM	323.26 kip-ft	6.72		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	R_R	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1 100.00-80.00	0.08	0.75	A	0.254	2.425	0.603	1	1	12.360	0.30	14.85	A
			B	0.245	2.453	0.601	1	1	11.915			
			C	0.198	2.601	0.59	1	1	9.761			
T2 80.00-60.00	0.43	1.13	A	0.272	2.374	0.608	1	1	13.224	0.43	21.72	C
			B	0.331	2.217	0.626	1	1	16.247			
			C	0.465	1.95	0.68	1	1	24.153			
T3 60.00-53.33	0.14	0.51	A	0.311	2.266	0.619	1	1	5.154	0.15	21.77	C
			B	0.359	2.151	0.636	1	1	6.020			
			C	0.49	1.914	0.692	1	1	8.742			
T4 53.33-40.00	0.30	1.26	A	0.393	2.079	0.649	1	1	14.283	0.31	22.95	C
			B	0.409	2.046	0.655	1	1	14.902			
			C	0.53	1.864	0.713	1	1	19.982			
T5 40.00-20.00	0.45	2.74	A	0.345	2.183	0.631	1	1	24.002	0.47	23.73	C
			B	0.363	2.141	0.637	1	1	25.270			
			C	0.459	1.959	0.677	1	1	32.566			
T6 20.00-0.00	0.32	2.90	A	0.253	2.427	0.603	1	1	25.340	0.51	25.60	C
			B	0.265	2.394	0.606	1	1	26.305			
			C	0.31	2.27	0.619	1	1	30.334			
Sum Weight:	1.72	9.30						OTM	98.99 kip-ft	2.17		

Tower Forces - Service - Wind 60 To Face

Section Elevation *ft*	*Add Weight* *K*	*Self Weight* *K*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *K*	*w* *plf*	*Ctrl. Face*
T1 100.00-80.00	0.08	0.75	A	0.254	2.425	0.603	0.8	1	11.905	0.29	14.30	A
			B	0.245	2.453	0.601	0.8	1	11.454			
			C	0.198	2.601	0.59	0.8	1	9.272			
T2 80.00-60.00	0.43	1.13	A	0.272	2.374	0.608	0.8	1	12.780	0.43	21.42	C
			B	0.331	2.217	0.626	0.8	1	15.839			
			C	0.465	1.95	0.68	0.8	1	23.826			
T3 60.00-53.33	0.14	0.51	A	0.311	2.266	0.619	0.8	1	5.009	0.14	21.50	C
			B	0.359	2.151	0.636	0.8	1	5.885			
			C	0.49	1.914	0.692	0.8	1	8.635			
T4 53.33-40.00	0.30	1.26	A	0.393	2.079	0.649	0.8	1	13.482	0.30	22.24	C
			B	0.409	2.046	0.655	0.8	1	14.123			
			C	0.53	1.864	0.713	0.8	1	19.362			
T5 40.00-20.00	0.45	2.74	A	0.345	2.183	0.631	0.8	1	22.714	0.46	22.95	C
			B	0.363	2.141	0.637	0.8	1	24.018			
			C	0.459	1.959	0.677	0.8	1	31.502			
T6 20.00-0.00	0.32	2.90	A	0.253	2.427	0.603	0.8	1	23.293	0.48	24.01	C
			B	0.265	2.394	0.606	0.8	1	24.289			
			C	0.31	2.27	0.619	0.8	1	28.443			
Sum Weight:	1.72	9.30						OTM	96.27 kip-ft	2.09		

Tower Forces - Service - Wind 90 To Face

Section Elevation *ft*	*Add Weight* *K*	*Self Weight* *K*	*Face*	*e*	C_F	R_R	D_F	D_R	A_E ft^2	*F* *K*	*w* *plf*	*Ctrl. Face*
T1 100.00-80.00	0.08	0.75	A	0.254	2.425	0.603	0.85	1	12.018	0.29	14.44	A
			B	0.245	2.453	0.601	0.85	1	11.569			
			C	0.198	2.601	0.59	0.85	1	9.394			
T2 80.00-60.00	0.43	1.13	A	0.272	2.374	0.608	0.85	1	12.891	0.43	21.50	C
			B	0.331	2.217	0.626	0.85	1	15.941			
			C	0.465	1.95	0.68	0.85	1	23.908			
T3 60.00-53.33	0.14	0.51	A	0.311	2.266	0.619	0.85	1	5.045	0.14	21.57	C
			B	0.359	2.151	0.636	0.85	1	5.918			
			C	0.49	1.914	0.692	0.85	1	8.662			
T4 53.33-40.00	0.30	1.26	A	0.393	2.079	0.649	0.85	1	13.682	0.30	22.41	C
			B	0.409	2.046	0.655	0.85	1	14.318			
			C	0.53	1.864	0.713	0.85	1	19.517			
T5 40.00-20.00	0.45	2.74	A	0.345	2.183	0.631	0.85	1	23.036	0.46	23.15	C
			B	0.363	2.141	0.637	0.85	1	24.331			
			C	0.459	1.959	0.677	0.85	1	31.768			
T6 20.00-0.00	0.32	2.90	A	0.253	2.427	0.603	0.85	1	23.805	0.49	24.41	C
			B	0.265	2.394	0.606	0.85	1	24.793			
			C	0.31	2.27	0.619	0.85	1	28.916			
Sum Weight:	1.72	9.30						OTM	96.95 kip-ft	2.11		

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	6.99					
Bracing Weight	2.30					
Total Member Self-Weight	9.30			2.00	-2.59	
Total Weight	17.21			2.00	-2.59	
Wind 0 deg - No Ice		-0.01	-13.14	-895.25	-1.07	3.78
Wind 30 deg - No Ice		6.43	-11.23	-769.17	-441.57	4.36
Wind 60 deg - No Ice		11.09	-6.45	-441.37	-762.74	3.80
Wind 90 deg - No Ice		12.87	0.01	3.52	-883.19	2.25
Wind 120 deg - No Ice		11.29	6.58	451.94	-771.08	0.07
Wind 150 deg - No Ice		6.44	11.24	774.68	-444.20	-2.11
Wind 180 deg - No Ice		0.01	12.92	891.37	-4.11	-3.72
Wind 210 deg - No Ice		-6.43	11.23	773.16	436.39	-4.36
Wind 240 deg - No Ice		-11.28	6.56	449.31	764.39	-3.85
Wind 270 deg - No Ice		-12.87	-0.01	0.48	878.01	-2.25
Wind 300 deg - No Ice		-11.10	-6.47	-444.00	759.09	-0.08
Wind 330 deg - No Ice		-6.44	-11.24	-770.69	439.03	2.11
Member Ice	2.38					
Total Weight Ice	25.49			4.65	-6.80	
Wind 0 deg - Ice		-0.01	-13.37	-885.20	-5.69	3.34
Wind 30 deg - Ice		6.36	-11.11	-744.80	-434.37	3.69
Wind 60 deg - Ice		10.87	-6.32	-423.43	-741.61	3.15
Wind 90 deg - Ice		12.74	0.01	5.76	-863.86	1.83
Wind 120 deg - Ice		11.50	6.69	450.54	-770.22	-0.04
Wind 150 deg - Ice		6.37	11.11	755.21	-436.30	-1.86
Wind 180 deg - Ice		0.01	12.65	862.74	-7.92	-3.16
Wind 210 deg - Ice		-6.36	11.11	754.10	420.76	-3.69
Wind 240 deg - Ice		-11.49	6.68	448.61	755.50	-3.30
Wind 270 deg - Ice		-12.74	-0.01	3.53	850.26	-1.83
Wind 300 deg - Ice		-10.88	-6.33	-425.36	729.11	0.01
Wind 330 deg - Ice		-6.37	-11.11	-745.92	422.69	1.86
Total Weight	17.21			2.00	-2.59	
Wind 0 deg - Service		-0.00	-4.55	-309.49	-0.29	1.31
Wind 30 deg - Service		2.22	-3.89	-265.86	-152.72	1.51
Wind 60 deg - Service		3.84	-2.23	-152.44	-263.85	1.31
Wind 90 deg - Service		4.45	0.00	1.50	-305.53	0.78
Wind 120 deg - Service		3.91	2.28	156.66	-266.74	0.03
Wind 150 deg - Service		2.23	3.89	268.34	-153.63	-0.73
Wind 180 deg - Service		0.00	4.47	308.72	-1.35	-1.29
Wind 210 deg - Service		-2.22	3.89	267.81	151.08	-1.51
Wind 240 deg - Service		-3.90	2.27	155.75	264.57	-1.33
Wind 270 deg - Service		-4.45	-0.00	0.45	303.89	-0.78
Wind 300 deg - Service		-3.84	-2.24	-153.35	262.74	-0.03
Wind 330 deg - Service		-2.23	-3.89	-266.39	151.99	0.73

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 30 deg - No Ice
4	Dead+Wind 60 deg - No Ice
5	Dead+Wind 90 deg - No Ice
6	Dead+Wind 120 deg - No Ice
7	Dead+Wind 150 deg - No Ice
8	Dead+Wind 180 deg - No Ice

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

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	100 - 80	Leg	Max Tension	8	17.22	-0.00	-0.01
			Max. Compression	2	-30.43	0.00	0.08
			Max. Mx	5	-5.32	0.40	-0.01
			Max. My	2	-5.42	0.01	-0.43
			Max. Vy	11	-0.72	0.23	-0.01
			Max. Vx	8	0.75	0.02	-0.22
		Diagonal	Max Tension	7	6.46	0.00	0.00
		Horizontal	Max Tension	2	0.53	0.00	0.00
			Max. Compression	2	-5.21	0.00	0.00
			Max. Mx	14	0.13	-0.01	0.00
			Max. My	15	0.52	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
		Top Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-2.53	0.00	0.00
			Max. Mx	14	-2.45	-0.01	0.00
			Max. My	15	-2.49	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	15	0.00	0.00	0.00
T2	80 - 60	Leg	Max Tension	8	66.48	-0.07	-0.25
			Max. Compression	6	-82.69	-0.37	-0.21
			Max. Mx	5	-71.78	-0.41	0.04
			Max. My	2	27.66	-0.01	0.44

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Vy	10	0.22	0.22	-0.17
			Max. Vx	3	0.31	-0.16	0.28
		Diagonal	Max Tension	7	8.78	0.00	0.00
		Horizontal	Max Tension	6	1.43	0.00	0.00
			Max. Compression	6	-7.42	0.00	0.00
			Max. Mx	14	0.15	0.01	0.00
			Max. My	16	1.20	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	16	-0.00	0.00	0.00
		Top Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	2	-5.93	0.00	0.00
			Max. Mx	14	-4.93	0.01	0.00
			Max. My	16	-4.94	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	16	-0.00	0.00	0.00
T3	60 - 53.33	Leg	Max Tension	8	84.27	-0.00	-0.48
			Max. Compression	2	-103.61	0.02	0.61
			Max. Mx	5	-90.18	-0.60	-0.03
			Max. My	8	-57.48	-0.12	-0.62
			Max. Vy	2	0.12	-0.32	0.34
			Max. Vx	8	-0.13	-0.00	-0.48
		Diagonal	Max Tension	8	10.23	0.00	0.00
		Horizontal	Max Tension	2	1.79	0.00	0.00
			Max. Compression	6	-10.10	0.00	0.00
			Max. Mx	14	0.18	0.01	0.00
			Max. My	16	1.51	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	16	-0.00	0.00	0.00
		Top Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	6	-8.62	0.00	0.00
			Max. Mx	14	-5.99	0.01	0.00
			Max. My	16	-6.08	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	16	-0.00	0.00	0.00
T4	53.33 - 40	Leg	Max Tension	8	124.96	-0.00	0.56
			Max. Compression	2	-146.68	0.18	2.19
			Max. Mx	10	-144.86	1.96	-0.94
			Max. My	2	-146.68	0.18	2.19
			Max. Vy	13	1.14	1.19	0.77
			Max. Vx	8	-1.26	0.01	-1.53
		Diagonal	Max Tension	8	11.31	0.00	0.00
		Horizontal	Max Tension	2	2.54	0.00	0.00
			Max. Compression	2	-10.46	0.00	0.00
			Max. Mx	14	0.20	0.01	0.00
			Max. My	16	2.16	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	16	-0.00	0.00	0.00
		Secondary Horizontal	Max Tension	2	2.54	0.00	0.00
			Max. Compression	2	-2.54	0.00	0.00
			Max. Mx	14	0.20	-0.01	0.00
			Max. My	16	2.16	0.00	0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	16	-0.00	0.00	0.00
		Top Girt	Max Tension	1	0.00	0.00	0.00
			Max. Compression	6	-9.75	0.00	0.00
			Max. Mx	14	-6.61	0.01	0.00
			Max. My	16	-6.68	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	16	-0.00	0.00	0.00
		Bottom Girt	Max Tension	1	0.00	0.00	0.00

Section No.	*Elevation ft*	*Component Type*	*Condition*	*Gov. Load Comb.*	*Force K*	*Major Axis Moment kip-ft*	*Minor Axis Moment kip-ft*
			Max. Compression	6	-4.97	0.00	0.00
			Max. Mx	14	-3.31	0.01	0.00
			Max. My	22	-3.54	0.00	-0.00
			Max. Vy	14	0.01	0.00	0.00
			Max. Vx	22	-0.00	0.00	0.00
T5	40 - 20	Leg	Max Tension	8	136.53	-1.41	0.06
			Max. Compression	19	-144.67	1.31	-0.00
			Max. Mx	2	-142.19	2.19	-0.18
			Max. My	9	-5.43	-0.21	2.52
			Max. Vy	2	0.25	2.19	-0.18
			Max. Vx	9	0.32	-0.21	2.52
		Diagonal	Max Tension	2	2.96	0.00	0.00
			Max. Compression	2	-3.62	0.04	0.00
			Max. Mx	8	-1.19	0.05	-0.00
			Max. My	8	0.90	-0.02	0.02
			Max. Vy	19	-0.02	0.05	0.01
			Max. Vx	8	-0.01	0.00	0.00
T6	20 - 0	Leg	Max Tension	8	132.98	-1.02	0.01
			Max. Compression	19	-147.63	0.00	-0.00
			Max. Mx	21	127.35	-1.55	0.01
			Max. My	9	-6.89	-0.05	1.66
			Max. Vy	25	-0.25	-1.53	-0.00
			Max. Vx	9	0.29	-0.05	1.66
		Diagonal	Max Tension	16	2.18	0.00	0.00
			Max. Compression	9	-1.77	0.00	0.00
			Max. Mx	19	-0.13	0.07	0.00
			Max. My	9	0.01	0.04	0.01
			Max. Vy	19	-0.02	0.07	0.00
			Max. Vx	22	-0.00	0.00	0.00

Maximum Reactions

Location	*Condition*	*Gov. Load Comb.*	*Vertical K*	*Horizontal, X K*	*Horizontal, Z K*
Leg C	Max. Vert	23	146.14	7.96	-4.27
	Max. H_x	10	143.87	8.51	-4.56
	Max. H_z	17	-125.31	-8.16	4.43
	Min. Vert	4	-131.56	-7.69	4.10
	Min. H_x	17	-125.31	-8.16	4.43
	Min. H_z	10	143.87	8.51	-4.56
Leg B	Max. Vert	19	148.30	-7.86	-4.53
	Max. H_x	25	-123.77	8.02	4.63
	Max. H_z	25	-123.77	8.02	4.63
	Min. Vert	12	-131.27	7.55	4.34
	Min. H_x	6	144.98	-8.39	-4.83
	Min. H_z	6	144.98	-8.39	-4.83
Leg A	Max. Vert	15	147.18	0.28	9.08
	Max. H_x	4	74.50	0.76	4.97
	Max. H_z	2	145.22	0.29	9.72
	Min. Vert	8	-133.14	-0.28	-8.78
	Min. H_x	10	-64.27	-0.77	-4.27
	Min. H_z	21	-126.69	-0.23	-9.35

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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	17.21	0.00	0.00	2.04	-2.65	0.01
Dead+Wind 0 deg - No Ice	17.21	-0.01	-13.14	-905.95	-1.12	3.82
Dead+Wind 30 deg - No Ice	17.21	6.43	-11.23	-778.34	-446.87	4.41
Dead+Wind 60 deg - No Ice	17.21	11.09	-6.45	-446.61	-771.87	3.84
Dead+Wind 90 deg - No Ice	17.21	12.87	0.01	3.58	-893.72	2.27
Dead+Wind 120 deg - No Ice	17.21	11.29	6.58	457.35	-780.28	0.07
Dead+Wind 150 deg - No Ice	17.21	6.44	11.24	783.94	-449.52	-2.13
Dead+Wind 180 deg - No Ice	17.21	0.01	12.92	902.03	-4.21	-3.76
Dead+Wind 210 deg - No Ice	17.21	-6.43	11.23	782.43	441.55	-4.41
Dead+Wind 240 deg - No Ice	17.21	-11.28	6.56	454.70	773.47	-3.90
Dead+Wind 270 deg - No Ice	17.21	-12.87	-0.01	0.50	888.46	-2.27
Dead+Wind 300 deg - No Ice	17.21	-11.10	-6.47	-449.31	768.13	-0.08
Dead+Wind 330 deg - No Ice	17.21	-6.44	-11.24	-779.90	444.24	2.13
Dead+Ice+Temp	25.49	0.00	0.00	4.75	-6.97	-0.00
Dead+Wind 0 deg+Ice+Temp	25.49	-0.01	-13.37	-900.80	-5.85	3.44
Dead+Wind 30 deg+Ice+Temp	25.49	6.36	-11.11	-757.99	-442.12	3.82
Dead+Wind 60 deg+Ice+Temp	25.49	10.87	-6.32	-430.93	-754.78	3.26
Dead+Wind 90 deg+Ice+Temp	25.49	12.74	0.01	5.89	-879.18	1.89
Dead+Wind 120 deg+Ice+Temp	25.49	11.50	6.69	458.49	-783.80	-0.03
Dead+Wind 150 deg+Ice+Temp	25.49	6.37	11.11	768.63	-444.06	-1.91
Dead+Wind 180 deg+Ice+Temp	25.49	0.01	12.65	878.08	-8.11	-3.26
Dead+Wind 210 deg+Ice+Temp	25.49	-6.36	11.11	767.52	428.14	-3.82
Dead+Wind 240 deg+Ice+Temp	25.49	-11.49	6.68	456.56	768.73	-3.41
Dead+Wind 270 deg+Ice+Temp	25.49	-12.74	-0.01	3.62	865.25	-1.89
Dead+Wind 300 deg+Ice+Temp	25.49	-10.88	-6.33	-432.92	742.02	0.01
Dead+Wind 330 deg+Ice+Temp	25.49	-6.37	-11.11	-759.14	430.12	1.91
Dead+Wind 0 deg - Service	17.21	-0.00	-4.55	-312.18	-2.11	1.32
Dead+Wind 30 deg - Service	17.21	2.22	-3.89	-268.02	-156.36	1.53
Dead+Wind 60 deg - Service	17.21	3.84	-2.23	-153.23	-268.83	1.33
Dead+Wind 90 deg - Service	17.21	4.45	0.00	2.56	-311.00	0.79
Dead+Wind 120 deg - Service	17.21	3.91	2.28	159.57	-271.75	0.02
Dead+Wind 150 deg - Service	17.21	2.23	3.89	272.61	-157.28	-0.74
Dead+Wind 180 deg - Service	17.21	0.00	4.47	313.48	-3.17	-1.30
Dead+Wind 210 deg - Service	17.21	-2.22	3.89	272.08	151.08	-1.53
Dead+Wind 240 deg - Service	17.21	-3.90	2.27	158.68	265.94	-1.35
Dead+Wind 270 deg - Service	17.21	-4.45	-0.00	1.50	305.73	-0.79
Dead+Wind 300 deg - Service	17.21	-3.84	-2.24	-154.15	264.10	-0.02
Dead+Wind 330 deg - Service	17.21	-2.23	-3.89	-268.56	152.01	0.74

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
1	0.00	-17.21	0.00	0.00	17.21	0.00	0.000%
2	-0.01	-17.21	-13.14	0.01	17.21	13.14	0.000%
3	6.43	-17.21	-11.23	-6.43	17.21	11.23	0.000%
4	11.09	-17.21	-6.45	-11.09	17.21	6.45	0.000%
5	12.87	-17.21	0.01	-12.87	17.21	-0.01	0.000%
6	11.29	-17.21	6.58	-11.29	17.21	-6.58	0.000%
7	6.44	-17.21	11.24	-6.44	17.21	-11.24	0.000%
8	0.01	-17.21	12.92	-0.01	17.21	-12.92	0.000%
9	-6.43	-17.21	11.23	6.43	17.21	-11.23	0.000%
10	-11.28	-17.21	6.56	11.28	17.21	-6.56	0.000%
11	-12.87	-17.21	-0.01	12.87	17.21	0.01	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	*PX K*	*PY K*	*PZ K*	*PX K*	*PY K*	*PZ K*	*% Error*
12	-11.10	-17.21	-6.47	11.10	17.21	6.47	0.000%
13	-6.44	-17.21	-11.24	6.44	17.21	11.24	0.000%
14	0.00	-25.49	0.00	0.00	25.49	0.00	0.000%
15	-0.01	-25.49	-13.37	0.01	25.49	13.37	0.000%
16	6.36	-25.49	-11.11	-6.36	25.49	11.11	0.000%
17	10.87	-25.49	-6.32	-10.87	25.49	6.32	0.000%
18	12.74	-25.49	0.01	-12.74	25.49	-0.01	0.000%
19	11.50	-25.49	6.69	-11.50	25.49	-6.69	0.000%
20	6.37	-25.49	11.11	-6.37	25.49	-11.11	0.000%
21	0.01	-25.49	12.65	-0.01	25.49	-12.65	0.000%
22	-6.36	-25.49	11.11	6.36	25.49	-11.11	0.000%
23	-11.49	-25.49	6.68	11.49	25.49	-6.68	0.000%
24	-12.74	-25.49	-0.01	12.74	25.49	0.01	0.000%
25	-10.88	-25.49	-6.33	10.88	25.49	6.33	0.000%
26	-6.37	-25.49	-11.11	6.37	25.49	11.11	0.000%
27	-0.00	-17.21	-4.55	0.00	17.21	4.55	0.000%
28	2.22	-17.21	-3.89	-2.22	17.21	3.89	0.000%
29	3.84	-17.21	-2.23	-3.84	17.21	2.23	0.000%
30	4.45	-17.21	0.00	-4.45	17.21	-0.00	0.000%
31	3.91	-17.21	2.28	-3.91	17.21	-2.28	0.000%
32	2.23	-17.21	3.89	-2.23	17.21	-3.89	0.000%
33	0.00	-17.21	4.47	-0.00	17.21	-4.47	0.000%
34	-2.22	-17.21	3.89	2.22	17.21	-3.89	0.000%
35	-3.90	-17.21	2.27	3.90	17.21	-2.27	0.000%
36	-4.45	-17.21	-0.00	4.45	17.21	0.00	0.000%
37	-3.84	-17.21	-2.24	3.84	17.21	2.24	0.000%
38	-2.23	-17.21	-3.89	2.23	17.21	3.89	0.000%

Non-Linear Convergence Results

Load Combination	*Converged?*	*Number of Cycles*	*Displacement Tolerance*	*Force Tolerance*
1	Yes	4	0.00000001	0.00028477
2	Yes	4	0.00000001	0.00048487
3	Yes	4	0.00000001	0.00027023
4	Yes	4	0.00000001	0.00000619
5	Yes	4	0.00000001	0.00014113
6	Yes	4	0.00000001	0.00008872
7	Yes	4	0.00000001	0.00011574
8	Yes	4	0.00000001	0.00000606
9	Yes	4	0.00000001	0.00025805
10	Yes	4	0.00000001	0.00047065
11	Yes	4	0.00000001	0.00012389
12	Yes	4	0.00000001	0.00000591
13	Yes	4	0.00000001	0.00012296
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00047192
16	Yes	4	0.00000001	0.00028180
17	Yes	4	0.00000001	0.00002488
18	Yes	4	0.00000001	0.00010688
19	Yes	4	0.00000001	0.00014141
20	Yes	4	0.00000001	0.00011030
21	Yes	4	0.00000001	0.00002472
22	Yes	4	0.00000001	0.00023462
23	Yes	4	0.00000001	0.00046149
24	Yes	4	0.00000001	0.00010757

25	Yes	4	0.00000001	0.00002431
26	Yes	4	0.00000001	0.00011779
27	Yes	4	0.00000001	0.00000704
28	Yes	4	0.00000001	0.00000730
29	Yes	4	0.00000001	0.00000746
30	Yes	4	0.00000001	0.00000721
31	Yes	4	0.00000001	0.00001010
32	Yes	4	0.00000001	0.00000722
33	Yes	4	0.00000001	0.00000747
34	Yes	4	0.00000001	0.00000731
35	Yes	4	0.00000001	0.00000704
36	Yes	4	0.00000001	0.00000721
37	Yes	4	0.00000001	0.00001646
38	Yes	4	0.00000001	0.00000721

Maximum Tower Deflections - Service Wind

Section No.	*Elevation ft*	*Horz. Deflection in*	*Gov. Load Comb.*	*Tilt °*	*Twist °*
T1	100 - 80	6.445	32	0.5728	0.1047
T2	80 - 60	4.042	32	0.5432	0.1044
T3	60 - 53.33	1.950	32	0.4004	0.0841
T4	53.33 - 40	1.413	32	0.3403	0.0695
T5	40 - 20	0.638	32	0.1788	0.0384
T6	20 - 0	0.139	31	0.0716	0.0088

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	*Appurtenance*	*Gov. Load Comb.*	*Deflection in*	*Tilt °*	*Twist °*	*Radius of Curvature ft*
98.00	(2) OPA-65R-LCUU-H4	32	6.200	0.5727	0.1049	77991
97.00	12' Boom Starmount	32	6.078	0.5726	0.1051	77991
96.00	Parabolic Grid	32	5.956	0.5724	0.1052	77991
89.00	APXVSPP18-C-A20	32	5.108	0.5676	0.1057	35450
88.00	(2) FD-RRH 4x45 1900	32	4.988	0.5662	0.1057	32496
83.00	AIR21	32	4.393	0.5545	0.1052	22830
80.00	ATMAA1412D-1A20 Twin TMA	32	4.042	0.5432	0.1044	18344
65.00	6810 4 Bay	32	2.415	0.4420	0.0924	6642
30.00	2.5" Tube x 2' Standoff	31	0.312	0.1073	0.0205	7778

Maximum Tower Deflections - Design Wind

Section No.	*Elevation ft*	*Horz. Deflection in*	*Gov. Load Comb.*	*Tilt °*	*Twist °*
T1	100 - 80	18.496	2	1.6411	0.3772
T2	80 - 60	11.620	2	1.5558	0.3748
T3	60 - 53.33	5.614	2	1.1462	0.2850
T4	53.33 - 40	4.073	2	0.9746	0.2329

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T5	40 - 20	1.833	2	0.5124	0.1114
T6	20 - 0	0.403	19	0.2053	0.0255

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
98.00	(2) OPA-65R-LCUU-H4	2	17.797	1.6409	0.3788	27193
97.00	12' Boom Starmount	2	17.448	1.6406	0.3795	27193
96.00	Parabolic Grid	2	17.099	1.6401	0.3802	27193
89.00	APXVSPP18-C-A20	2	14.671	1.6262	0.3828	12360
88.00	(2) FD-RRH 4x45 1900	2	14.327	1.6220	0.3826	11330
83.00	AIR21	2	12.625	1.5883	0.3794	7958
80.00	ATMAA1412D-1A20 Twin TMA	2	11.620	1.5558	0.3748	6382
65.00	6810 4 Bay	2	6.950	1.2650	0.3169	2283
30.00	2.5" Tube x 2' Standoff	19	0.895	0.3079	0.0534	2678

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt K	Allowable Load K	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	100	Leg	A325N	0.7500	4	4.30	19.44	0.221 ✔	1.333	Bolt Tension
T2	80	Leg	A325N	0.7500	4	16.62	19.44	0.855 ✔	1.333	Bolt Tension
T4	53.33	Leg	A325N	1.0000	4	31.23	34.56	0.904 ✔	1.333	Bolt Tension
		Secondary Horizontal	A325N	0.7500	1	2.54	9.28	0.274 ✔	1.333	Bolt Shear
T5	40	Leg	A325N	1.0000	6	22.26	34.56	0.644 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	3.62	6.44	0.562 ✔	1.333	Bolt Shear
T6	20	Leg	A36	1.5000	4	33.11	33.82	0.979 ✔	1.333	Bolt Tension
		Diagonal	A325N	0.6250	1	2.18	6.12	0.357 ✔	1.333	Member Bearing

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$

Section No.	*Elevation* ft	*Size*	*L* ft	L_u ft	*Kl/r*	F_a ksi	*A* in^2	*Actual P* K	*Allow.* P_a K	*Ratio* $\frac{P}{P_a}$
T1	100 - 80	P2.5x.276	20.00	3.33	43.3 K=1.00	25.362	2.2535	-30.43	57.15	0.532 ✔
T2	80 - 60	P2.5x.276 (GR)	20.00	3.33	43.3 K=1.00	29.235	2.2535	-82.69	65.88	1.255 ✔
T3	60 - 53.33	P3x.3 (GR)	6.67	3.34	35.2 K=1.00	33.632	3.0159	-103.61	101.43	1.021 ✔
T4	53.33 - 40	P3x.3 (GR)	13.33	1.67	17.6 K=1.00	36.553	3.0159	-146.68	110.24	1.331 ✔
T5	40 - 20	P5x.375 (GR)	20.03	6.68	43.6 K=1.00	27.894	6.1120	-144.67	170.49	0.849 ✔
T6	20 - 0	P5x.375 (GR)	20.03	6.68	43.6 K=1.00	27.894	6.1120	-147.63	170.49	0.866 ✔

Diagonal Design Data (Compression)

Section No.	*Elevation* ft	*Size*	*L* ft	L_u ft	*Kl/r*	F_a ksi	*A* in^2	*Actual P* K	*Allow.* P_a K	*Ratio* $\frac{P}{P_a}$
T5	40 - 20	L2x2x3/16	7.69	3.67	113.8 K=1.02	11.159	0.7150	-3.62	7.98	0.453 ✔
T6	20 - 0	L2 1/2x2 1/2x3/16	9.79	4.67	114.9 K=1.01	10.999	0.9020	-1.77	9.92	0.178 ✔

Horizontal Design Data (Compression)

Section No.	*Elevation* ft	*Size*	*L* ft	L_u ft	*Kl/r*	F_a ksi	*A* in^2	*Actual P* K	*Allow.* P_a K	*Ratio* $\frac{P}{P_a}$
T1	100 - 80	L1 1/2x1 1/2x3/16	3.50	3.26	128.2 K=0.96	9.083	0.5273	-4.67	4.79	0.974* ✔
T2	80 - 60	2L1 1/2x1 1/2x3/16	3.50	3.26	102.8 K=1.20	12.616	1.0547	-7.42	13.31	0.557 ✔
T3	60 - 53.33	2L1 1/2x1 1/2x3/16	3.50	3.21	102.2 K=1.21	12.704	1.0547	-10.10	13.40	0.754 ✔
T4	53.33 - 40	2L1 1/2x1 1/2x3/16	3.50	3.21	102.2 K=1.21	12.704	1.0547	-10.46	13.40	0.780 ✔

* DL controls

Secondary Horizontal Design Data (Compression)

Section No.	*Elevation* ft	*Size*	*L* ft	L_u ft	*Kl/r*	F_a ksi	*A* in^2	*Actual P* K	*Allow.* P_a K	*Ratio* $\frac{P}{P_a}$

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T4	53.33 - 40	L2 1/2x2 1/2x5/16	3.50	2.92	95.8 K=1.34	13.504	1.4600	-2.54	19.72	0.129

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	100 - 80	L1 1/2x1 1/2x3/16	3.50	3.26	128.2 K=0.96	9.083	0.5273	-2.46	4.79	0.513*
T2	80 - 60	2L1 1/2x1 1/2x3/16	3.50	3.26	102.8 K=1.20	12.616	1.0547	-5.00	13.31	0.376*
T3	60 - 53.33	2L1 1/2x1 1/2x3/16	3.50	3.26	102.8 K=1.20	12.616	1.0547	-8.62	13.31	0.648
T4	53.33 - 40	2L1 1/2x1 1/2x3/16	3.50	3.21	102.2 K=1.21	12.704	1.0547	-9.75	13.40	0.727

* DL controls

Bottom Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T4	53.33 - 40	2L1 1/2x1 1/2x3/16	3.50	3.21	102.2 K=1.21	12.704	1.0547	-4.97	13.40	0.371

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	100 - 80	P2.5x.276	20.00	3.33	43.3	30.000	2.2535	17.22	67.61	0.255
T2	80 - 60	P2.5x.276 (GR)	20.00	3.33	43.3	30.000	2.2535	66.48	67.61	0.983
T3	60 - 53.33	P3x.3 (GR)	6.67	3.34	35.2	36.600	3.0159	84.27	110.38	0.763
T4	53.33 - 40	P3x.3 (GR)	13.33	1.67	17.6	36.600	3.0159	124.96	110.38	1.132
T5	40 - 20	P5x.375 (GR)	20.03	6.68	43.6	25.200	6.1120	136.53	154.02	0.886

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T6	20 - 0	P5x.375 (GR)	20.03	6.68	43.6	25.200	6.1120	132.98	154.02	0.863 ✔

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	100 - 80	5/8	4.83	4.50	345.8	21.600	0.3068	6.46	6.63	0.975 ✔
T2	80 - 60	5/8	4.83	4.50	345.8	21.600	0.3068	8.78	6.63	1.325 ✔
T3	60 - 53.33	3/4	4.83	4.43	283.6	21.600	0.4418	10.23	9.54	1.072 ✔
T4	53.33 - 40	3/4	4.83	4.43	283.5	21.600	0.4418	11.31	9.54	1.185 ✔
T5	40 - 20	L2x2x3/16	7.69	3.67	74.0	21.600	0.7150	2.96	15.44	0.192 ✔
T6	20 - 0	L2 1/2x2 1/2x3/16	9.79	4.67	74.1	21.600	0.9020	2.18	19.48	0.112 ✔

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T1	100 - 80	L1 1/2x1 1/2x3/16	3.50	3.26	85.7	21.600	0.5273	0.53	11.39	0.046 ✔
T2	80 - 60	2L1 1/2x1 1/2x3/16	3.50	3.26	85.7	21.600	1.0547	1.43	22.78	0.063 ✔
T3	60 - 53.33	2L1 1/2x1 1/2x3/16	3.50	3.21	84.3	21.600	1.0547	1.79	22.78	0.079 ✔
T4	53.33 - 40	2L1 1/2x1 1/2x3/16	3.50	3.21	84.3	21.600	1.0547	2.54	22.78	0.112 ✔

Secondary Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P K	Allow. P_a K	Ratio $\frac{P}{P_a}$
T4	53.33 - 40	L2 1/2x2 1/2x5/16	3.50	2.92	50.6	21.600	1.4600	2.54	31.54	0.081 ✔

Section Capacity Table

Section No.	*Elevation ft*	*Component Type*	*Size*	*Critical Element*	*P K*	*SF*P_{allow} K*	*% Capacity*	*Pass Fail*
T1	100 - 80	Leg	P2.5x.276	3	-30.43	76.19	39.9	Pass
T2	80 - 60	Leg	P2.5x.276 (GR)	59	-82.69	87.82	94.2	Pass
T3	60 - 53.33	Leg	P3x.3 (GR)	120	-103.61	135.21	76.6	Pass
T4	53.33 - 40	Leg	P3x.3 (GR)	138	-146.68	146.95	99.8	Pass
T5	40 - 20	Leg	P5x.375 (GR)	192	136.53	205.31	66.5	Pass
T6	20 - 0	Leg	P5x.375 (GR)	212	-147.63	227.26	65.0 73.4 (b)	Pass
T1	100 - 80	Diagonal	5/8	10	6.46	8.83	73.1	Pass
T2	80 - 60	Diagonal	5/8	70	8.78	8.83	99.4	Pass
T3	60 - 53.33	Diagonal	3/4	124	10.23	12.72	80.4	Pass
T4	53.33 - 40	Diagonal	3/4	148	11.31	12.72	88.9	Pass
T5	40 - 20	Diagonal	L2x2x3/16	210	-3.62	10.64	34.0 42.1 (b)	Pass
T6	20 - 0	Diagonal	L2 1/2x2 1/2x3/16	214	-1.77	13.22	13.4 26.7 (b)	Pass
T1	100 - 80	Horizontal	L1 1/2x1 1/2x3/16	51	-4.67	4.79	97.4	Pass
T2	80 - 60	Horizontal	2L1 1/2x1 1/2x3/16	75	-7.42	17.74	41.8	Pass
T3	60 - 53.33	Horizontal	2L1 1/2x1 1/2x3/16	129	-10.10	17.86	56.6	Pass
T4	53.33 - 40	Horizontal	2L1 1/2x1 1/2x3/16	151	-10.46	17.86	58.5	Pass
T4	53.33 - 40	Secondary Horizontal	L2 1/2x2 1/2x5/16	155	-2.54	26.28	9.7 20.5 (b)	Pass
T1	100 - 80	Top Girt	L1 1/2x1 1/2x3/16	4	-2.46	4.79	51.3	Pass
T2	80 - 60	Top Girt	2L1 1/2x1 1/2x3/16	63	-5.00	13.31	37.6	Pass
T3	60 - 53.33	Top Girt	2L1 1/2x1 1/2x3/16	66	-8.62	17.74	48.6	Pass
T4	53.33 - 40	Top Girt	2L1 1/2x1 1/2x3/16	141	-9.75	17.86	54.6	Pass
T4	53.33 - 40	Bottom Girt	2L1 1/2x1 1/2x3/16	144	-4.97	17.86	27.9	Pass
							Summary	
						Leg (T4)	99.8	Pass
						Diagonal (T2)	99.4	Pass
						Horizontal (T1)	97.4	Pass
						Secondary Horizontal (T4)	20.5	Pass
						Top Girt (T4)	54.6	Pass
						Bottom Girt (T4)	27.9	Pass
						Bolt Checks	73.4	Pass
						RATING =	**99.8**	**Pass**

Pier and Mat Foundation Analysis:

Input Data:

Tower Data

Overturning Moment =	$OM := 908 \cdot ft \cdot kips$	(User Input from tnxTower)	
Shear Force =	$S_t := 13 \cdot kip$	(User Input from tnxTower)	
Axial Force =	$WT_t := 25 \cdot kip$	(User Input from tnxTower)	
Max Compression Force =	$C_t := 148 \cdot kip$	(User Input from tnxTower)	
Max Uplift Force =	$U_t := 133 \cdot kip$	(User Input from tnxTower)	
Tower Height =	$H_t := 100 \cdot ft$	(User Input)	
Tower Width =	$W_t := 7.5 \cdot ft$	(User Input)	
Tower Position on Foundation (1=offset, 2=centered) =	$Pos_t := 2$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 7.0 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 4.25 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.25 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 2.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 3.0 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 14.5 \cdot ft$	(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)	
Internal Friction Angle of Soil =	$\Phi_s := 30 \cdot deg$	(User Input)	
Allowable Soil Bearing Capacity =	$q_s := 10000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 120 \cdot pcf$	(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 =	$BS_{pier} := 8$	(User Input)	
Bar Diameter =	$d_{bpier} := 1.0 \cdot in$	(User Input)	
Number of Bars =	$NB_{pier} := 8$	(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 =	$d_{Tie} := 4 \cdot in$	(User Input)	

Pad Reinforcement:

Bar Size =	$BS_{top} := 6$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 0.750 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 15$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 8$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.000 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 15$	(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 = $A_{bpier} := \frac{\pi \cdot d_{bpier}^2}{4} = 0.785 \cdot in^2$

Pad Top Reinforcement Bar Area = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 0.442 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 0.785 \cdot in^2$

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

Load Factor =

$$LF := \begin{cases} 1.333 & \text{if } H_t \le 700 \cdot ft \\ 1.7 & \text{if } H_t \ge 1200 \cdot ft \\ 1.333 + \left(\frac{H_t - 700ft}{1200ft - 700ft}\right) \cdot 0.4 & \text{otherwise} \end{cases} = 1.333$$

Stability of Footing:

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

Adjusted Soil Unit Weight = $\gamma_s := \text{if}(\text{Bouyancy} = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 120 \cdot pcf$

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 1.44 \cdot ksf$

$P_{top} := \text{if}[n < (D_f - T_f), P_{pt}, P_{pn}] = 1.44 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 2.52 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.98 \cdot ksf$

$T_p := \text{if}[n < (D_f - T_f), T_f, (D_f - n)] = 3 \cdot ft$

$A_p := W_f \cdot T_p = 43.5 \cdot ft^2$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 86.13 \cdot kip$

Weight of Concrete = $WT_c := \left[(W_f^2 \cdot T_f) + (3) \cdot \left(\frac{d_p^2 \cdot \pi}{4} \cdot L_p\right)\right] \cdot \gamma_c = 100.621 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left[\left[W_f^2 - (3) \cdot \left(\frac{d_p^2 \cdot \pi}{4}\right)\right] \cdot (|L_p - L_{pag} - n|)\right] \cdot \gamma_s = 96.4 \cdot kip$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\Phi_s)}{2} \cdot W_f\right] \cdot \gamma_s = 24.612 \cdot kip$

Foundation has undercut toe per Fred A. Nudd dwg 96-4992-1

Tower Offset = $X_{t1} := \left[\frac{W_f}{2} - \frac{(W_t \cdot \cos(30 \cdot deg))}{2}\right]$ $\quad X_{t2} := \frac{W_f}{2} - \frac{(W_t \cdot \cos(30 \cdot deg))}{3}$

$X_t := \text{if}(Pos_t = 1, X_{t1}, X_{t2}) = 5.085$

$X_{off1} := \frac{W_f}{2} - \left[\frac{(W_t \cdot \cos(30 \cdot deg))}{3} + X_t\right] = 0$ $\quad X_{off2} := 0$

$X_{off} := \text{if}(Pos_t = 1, X_{off1}, X_{off2})$ $\quad X_{off} = 0 \cdot ft$

Total Weight = $WT_{tot} := WT_c + WT_{s1} = 197 \cdot kip$

Resisting Moment = $M_r := (WT_{tot}) \cdot \frac{W_f}{2} + WT_t \cdot \left(\frac{W_f}{2} - X_{off}\right) + \left(S_u \cdot \frac{T_p}{3}\right) + WT_{s2} \cdot \left[W_f + \frac{(D_f - n) \cdot \tan(\Phi_s)}{3}\right] = 2086 \cdot kip \cdot ft$

Overturning Moment = $M_{ot} := OM + S_t \cdot (L_p + T_f) = 1002.3 \cdot kip \cdot ft$

Foundation has undercut toe per Fred A. Nudd dwg 96-4992-1

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 2.08$

Factor of Safety Required = $FS_{req} := 2$ $\quad$ OverTurning_Moment_Check := if($FS \geq FS_{req}$, "Okay", "No Good")

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 87.394 \cdot kips$

Shear_Check := if($S_p > S_t$, "Okay", "No Good")

Shear_Check = "Okay"

Bearing Pressure Caused by Footing:

Total Load = $Load_{tot} := WT_c + WT_{s1} + WT_t = 222 \cdot kip$

Area of the Mat = $A_{mat} := W_f^{\,2} = 210.25$

Section Modulus of Mat = $S := \frac{W_f^{\,3}}{6} = 508.1 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{Load_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 3.028 \cdot ksf$

Max_Pressure_Check := if($P_{max} < q_s$, "Okay", "No Good")

Max_Pressure_Check = "Okay"

Minimum Pressure in Mat = $P_{min} := \frac{Load_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -0.917 \cdot ksf$

Min_Pressure_Check := if[$(P_{min} \geq 0) \cdot (P_{min} < q_s)$, "Okay", "No Good"]

Min_Pressure_Check = "No Good"

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 3.71$

Distance to Kern = $X_k := \frac{W_f}{6} = 2.417$

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

Eccentricity = $e := \frac{M_{ot}}{Load_{tot}} = 4.514$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot Load_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 3.731 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 3.731 \cdot ksf$

Pressure_Check := if($q_{adj} < q_s$, "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 = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 999.78 \cdot kips$ (ACI-2008 10.14)

Bearing_Check := if($P_b > LF \cdot C_t$, "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)

$d := T_f - Cvr_{pad} - d_{bbot} = 32 \cdot in$

$FL := LF \cdot \frac{C_t}{W_f^2} = 0.938 \cdot ksf$

$V_{req} := FL \cdot (X_t - .5 \cdot d_p - d) \cdot W_f = 19.297 \cdot kips$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d = 599 \cdot kip$ (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 = $b_o := (d_p + d) \cdot \pi = 14.7$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 17.1$

Required Shear Strength = $V_{req} := FL \cdot (W_f^2 - A_{bo}) = 181 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 1210.6 \cdot kip$ (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)

Maximum Moment in Pad = $M_{max} := 352 \cdot kip \cdot ft$ (User Input)

Design Moment = $M_n := \dfrac{LF \cdot M_{max}}{\phi_m} = 521.351 \cdot kips \cdot ft$

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

(ACI-200810.2.7.3)

$$b_{eff} := W_t \cdot \cos(30 \cdot deg) + d_p = 101.942 \cdot in$$

$$A_s := \frac{M_n}{(f_y \cdot d)} = 3.258 \cdot in^2$$

$$a := \frac{A_s \cdot f_y}{\beta \cdot f_c \cdot b_{eff}} = 0.564 \cdot in$$

$$A_s := \frac{M_n}{f_y \cdot \left(d - \dfrac{a}{2}\right)} = 3.287 \cdot in^2$$

$$\rho := \frac{A_s}{b_{eff} \cdot d} = 0.01209 \cdot in$$

Required Reinforcement for Temperature and Shrinkage:

$\rho_{sh} :=$ | .0018 if $f_y \geq 60000 \cdot psi$ = 0.0018 ; .0020 otherwise (ACI -2008 7.12.2.1)

Check Bottom Bars:

$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 2.9 \cdot in^2$

$As_{prov} := A_{bbot} \cdot NB_{bot} = 11.8 \cdot in^2$

Pad_Reinforcement_Bot := if(As_{prov} > As, "Okay" , "No Good")

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 2.9 \cdot in^2$

$As_{prov} := A_{btop} \cdot NB_{top} = 6.6 \cdot in^2$

Pad_Reinforcement_Top := if(As_{prov} > As, "Okay" , "No Good")

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing = $B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 10.93 \cdot in$

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)

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 23.7 \cdot in$$

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

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

Available Length in Pad = $L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr_{pad} = 39 \cdot in$

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

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier = $A_p := \frac{\pi \cdot d_p^2}{4} = 452.39 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p = 2.26 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 6.28 \cdot in^2$

Steel_Area_Check := if$(A_{sprov} > A_{smin}$, "Okay" , "No Good")

Steel_Area_Check = "Okay"

Bar Spacing In Pier = $B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 8.425 \cdot in$

Diameter of Reinforcement Cage = $Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 18 \cdot in$

Maximum Moment in Pier = $M_p := S_t \cdot (L_p) \cdot LF = 883.8 \cdot in \cdot kips$

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

$$\begin{pmatrix} D & N & n & P_u & M_{xu} \end{pmatrix} := \begin{pmatrix} d_p \cdot 12 & NB_{pier} & BS_{pier} & \frac{C_t \cdot 1.333}{kips} & \frac{M_p}{in \cdot kips} \end{pmatrix}$$

$$\begin{pmatrix} D & N & n & P_u & M_{xu} \end{pmatrix} = (24 \quad 8 \quad 8 \quad 197.284 \quad 883.779)$$

$$\begin{pmatrix} \phi P_n & \phi M_{xn} & f_{sp} & \rho \end{pmatrix} := (0 \quad 0 \quad 0 \quad 0)$$

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

$$\begin{pmatrix} \phi P_n & \phi M_{xn} & f_{sp} & \rho \end{pmatrix} = \begin{pmatrix} 605.792 & 2.714 \times 10^3 & -27.286 & 0.014 \end{pmatrix}$$

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:

$L_{pier} := L_p - Cvr_{pier} = 48 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 33 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension = $c := \text{if}\left(Cvr_{pier} < \frac{B_{sPier}}{2}, Cvr_{pier}, \frac{B_{sPier}}{2}\right) = 3 \cdot in$

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

$$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 23.72 \cdot in$$

Minimum Development Length = $L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 13.282 \cdot in$ (ACI 12.2.1)

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

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right) = 23.717 \cdot in$

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

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

Compression: (ACI-2008 12.3.2)

$$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 18.974 \cdot in$$

$L_{dbmin} := 0.0003 \cdot \frac{in^2}{lb} \cdot \left(d_{bpier} \cdot f_y\right) = 18 \cdot in$

$L_{dbc} := \text{if}\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 18.974 \cdot in$

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

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

Tie Size and Spacing in Column:

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

Used #4 Ties

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

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

$s_{lim2} := \frac{48 \cdot d_{Tie}}{8} \cdot z = 24 \cdot in$

$s_{lim3} := D_f \cdot z = 84 \cdot in$

$s_{lim4} := 18in$

Maximum Spacing = $s_{tie} := min\left(\begin{pmatrix} s_{lim1} \\ s_{lim2} \\ s_{lim3} \\ s_{lim4} \end{pmatrix}\right) = 16 \cdot in$

Number of Ties Required = $n_{tie} := \frac{L_{pier} - 3 \cdot in}{s_{tie}} + 1 = 3.813$

Section 1 - RFDS GENERAL INFORMATION

RFDS NAME:	s968	DATE:	11/25/2014	RF DESIGN ENG:	Radu Alecsandru	RF PERF ENG:	
ISSUE:	Pre-construction	Approved? (Y/N)	Y	RF DESIGN PHONE:	ra9161@att.com	RF PERF PHONE:	
REVISION:	V01	RF MANAGER:	Cameron Syme	RF DESIGN EMAIL:	860-513-7598	RF PERF EMAIL:	
INITIATIVE / PROJECT:	Pre-construction RFDS for leasing and zoning purposes, general design. It is not the finalized location, CL and azimuths. RRU positioning may be different based on the structural analysis.					TRIDENT:	
						GSM FREQUENCY:	
						UMTS FREQUENCY:	
						LTE FREQUENCY:	
						I-PLAN JOB NUMBER:	

Section 2 - LOCATION INFORMATION

USID:		FA LOCATION CODE:		LOCATION NAME:	Danbury-Boxwood Ln	ORACLE PROJECT #:	
REGION:	NE	MARKET CLUSTER:	CT	MARKET:	NER	SEARCH RING NAME:	Danbury-Boxwood Ln
ADDRESS:.	Boxwood Ln	CITY:	Danbury	STATE:	CT	SEARCH RING ID:	s968
ZIP CODE:		COUNTY:		MSA/RSA:		BTA:	
LATITUDE (D-M-S):	41°23'41.93"N	LONGITUDE (D-M-S):	73°29'12.27"W	LAT (DEC. DEG.):		LONG (DEC. DEG.):	
DIRECTIONS, ACCESS AND EQUIPMENT LOCATION:						BORDER CELL WITH CONTOUR COORD:	
						AM STUDY REQ'D (Y/N):	
						FREQ COORD:	

Section 3 - LICENSE COVERAGE/FILING INFORMATION

CGSA - NO FILING TRIGGERED:		CGSA LOSS:		PCS REDUCED - UPS ZIP:	
CGSA - MINOR FILING NEEDED:		CGSA EXT AGMT NEEDED:		PCS POPS REDUCED:	
CGSA - MAJOR FILING NEEDED:		CGSA SCORECARD UPDATED:			

Section 4 - TOWER/REGULATORY INFORMATION

STRUCTURE AT&T OWNED?:		GROUND ELEVATION:		STRUCTURE TYPE:		MARKET LOCATION 850 MHZ CALL SIGN(S):	
ADDTIONAL REGULATORY?:		HEIGHT OVERALL:		FCC ASR NUMBER:		MARKET LOCATION 1900 MHZ CALL SIGN(S):	
SUB-LEASE RIGHTS?:		STRUCTURE HEIGHT:				MARKET LOCATION 700 MHZ CALL SIGN(S):	
LIGHTING TYPE:						MARKET LOCATION AWS MHZ CALL SIGN(S):	

Section 5 - E-911 INFORMATION

	PSAP NAME:	PSAP ID:	E911 PHASE:	MPC SVC PROVIDER:	LMU REQUIRED:	ESRN:	DATE LIVE PH1:	DATE LIVE PH2:
ALPHA								
BETA								
GAMMA								
DELTA								
EPSILON								
PSI								

Section 6 - RBS GENERAL INFORMATION

4-DIGIT SITE ID:	s968	COW OR TOY?:	No	CELLULAR NETWORK:		DISASTER PRIORITY:	
CELL SITE TYPE:	Sectorized	SITE TYPE:		OPS DISTRICT:		OPS ZONE:	
BTS LOCATION ID:		ORIGINATING CO:		RF DISTRICT:		RF ZONE:	

Section 7 - RBS SPECIFIC INFORMATION

	GSM RBSs	UMTS 1ST CARRIER RBSs	UMTS 2ND CARRIER RBSs	UMTS 3RD CARRIER RBSs	UMTS 4TH CARRIER RBSs	LTE RBSs
MSC						
BSC/RNC						
LAC						
RAC						
EQUIPMENT VENDOR						
EQUIPMENT TYPE						
LOCATION						
CABINET LOCATION						

Section 8 - RBS INDIVIDUAL INFORMATION

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
CELL ID/BCF												
CTS COMMON ID												

Section 9 - SOFT SECTOR ID

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 10 - CID/SAC

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 11 - CURRENT RADIO COUNTS (Existing)

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 12 - CURRENT T1 COUNTS (Existing)

	GSM 1st Cabinet	GSM 2nd Cabinet	UMTS 1st Cabinet	UMTS 2nd Cabinet	LTE 1st Cabinet	LTE 2nd Cabinet
# T1s						
LINK PROFILE						
FIBER or ETHERNET?						
Tx Board Model						
Tx Board QTY						
RAX/ECU Board Model						
RAX/ECU Board QTY						
BBU Board Model						
BBU Board QTY						
RRU - location						

Section 13 - NEW/PROPOSED RADIO COUNTS

	GSM 850 RBS	GSM 1900 RBS	UMTS 850 RBS	UMTS 1900 RBS	UMTS 2ND 850 RBS	UMTS 2ND 1900 RBS	UMTS 3RD 850 RBS	UMTS 3RD 1900 RBS	UMTS 4TH 850 RBS	UMTS 4TH 1900 RBS	LTE 700 RBS	LTE AWS RBS
ALPHA (OR OMNI)												
BETA												
GAMMA												
DELTA												
EPSILON												
PSI												

Section 14 - NEW/PROPOSED T1 COUNTS

	GSM 1st Cabinet	GSM 2nd Cabinet	UMTS 1st Cabinet	UMTS 2nd Cabinet	LTE 1st Cabinet	LTE 2nd Cabinet
# T1s						
LINK PROFILE						
FIBER or ETHERNET?						
Tx Board Model						
Tx Board QTY						
RAX/ECU Board Model						
RAX/ECU Board QTY						
BBU Board Model						
BBU Board QTY						
RRU - location						

Section 15A - CURRENT SECTOR/CELL INFORMATION - ALPHA (OR OMNI)

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15B - CURRENT SECTOR/CELL INFORMATION - BETA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15C - CURRENT SECTOR/CELL INFORMATION - GAMMA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15D - CURRENT SECTOR/CELL INFORMATION - DELTA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15E - CURRENT SECTOR/CELL INFORMATION - EPSILON

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 15F - CURRENT SECTOR/CELL INFORMATION - ZETA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?					
TECHNOLOGY					
FEEDERS (# /TYPE/LENGTH)					
ANTENNA MAKE - MODEL					
ANTENNA VENDOR					
ANTENNA SIZE H"xW"xD"					
ANTENNA WEIGHT					
ANTENNA GAIN					
AZIMUTH					
RADIATION CENTER					
ANTENNA TIP HEIGHT					
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)					
MECHANICAL DOWNTILT					
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
TMA/LNA (TYPE/MODEL)					
CURRENT INJECTORS FOR TMA					
CURRENT INJCTR POWER CABLE					
ANTENNA SHARING KIT?					
BAS Filter					
DIPLEXER (QTY/MODEL)					
DUPLEXER (QTY/MODEL)					
SURGE ARRESTOR (QTY/MODEL)					
DC BLOCK (QTY/MODEL)					
RET EQUIPMENT (QTY/MODEL)					
1900 PDU FOR TMAS					

Section 16A - NEW/PROPOSED SECTOR/CELL INFORMATION - ALPHA (OR OMNI)

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?	TBD TBD	TBD TBD			
TECHNOLOGY	LTE WCS	UMTS 850 /LTE-DB			
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site			
ANTENNA MAKE - MODEL	OPA-65R-LCUU-H4	OPA-65R-LCUU-H4			
ANTENNA VENDOR	CCI	CCI			
ANTENNA SIZE H"xW"xD"	48 x 15 x 7	48 x 15 x 7			
ANTENNA WEIGHT	57	57			
ANTENNA GAIN	17.0 dBi (high band)	17.0 dBi (high band)			
AZIMUTH	60 °	60 °			
RADIATION CENTER	98	98 '			
ANTENNA TIP HEIGHT	100 '	100 '			
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	0 °	0 °			
MECHANICAL DOWNTILT	0 °	0 °			
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
RRH	WCS RRUS32	850 RRUS11/700 RRUS11/1900 RRUS12/1900 RRUS-A2			
CURRENT INJECTORS FOR TMA	n/a	n/a			
CURRENT INJCTR POWER CABLE	n/a	n/a			
ANTENNA SHARING KIT?	n/a	n/a			
BAS Filter	n/a	n/a			
DIPLEXER (QTY/MODEL)	n/a	n/a			
DUPLEXER (QTY/MODEL)	n/a	n/a			
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site	SQUID x 4 per site			
DC BLOCK (QTY/MODEL)	n/a	n/a			
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable	n/a			
1900 PDU FOR TMAS	CCU - Kathrein 860 10006	n/a			

Section 16B - NEW/PROPOSED SECTOR/CELL INFORMATION - BETA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?	TBD TBD	TBD TBD			
TECHNOLOGY	LTE WCS	UMTS 850 /LTE-DB			
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site			
ANTENNA MAKE - MODEL	OPA-65R-LCUU-H4	OPA-65R-LCUU-H4			
ANTENNA VENDOR	CCI	CCI			
ANTENNA SIZE H"xW"xD"	48 x 15 x 7	48 x 15 x 7			
ANTENNA WEIGHT	57	57			
ANTENNA GAIN	17.0 dBi (high band)	17.0 dBi (high band)			
AZIMUTH	170 °	170 °			
RADIATION CENTER	98 '	98 '			
ANTENNA TIP HEIGHT	100 '	100 '			
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	0 °	0 °			
MECHANICAL DOWNTILT	0 °	0 °			
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
RRH	WCS RRUS32	850 RRUS11/700 RRUS11/1900 RRUS12/1900 RRUS-A2			
CURRENT INJECTORS FOR TMA	n/a	n/a			
CURRENT INJCTR POWER CABLE	n/a	n/a			
ANTENNA SHARING KIT?	n/a	n/a			
BAS Filter	n/a	n/a			
DIPLEXER (QTY/MODEL)	n/a	n/a			
DUPLEXER (QTY/MODEL)	n/a	n/a			
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site	SQUID x 4 per site			
DC BLOCK (QTY/MODEL)	n/a	n/a			
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable	n/a			
1900 PDU FOR TMAS	CCU - Kathrein 860 10006	n/a			

Section 16C - NEW/PROPOSED SECTOR/CELL INFORMATION - GAMMA

ANTENNA CONFIG (FROM BACK):	ANTENNA 1 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 2 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 3 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 4 GSM, UMTS (850 / 1900) or LTE (700 / AWS)	ANTENNA 5 GSM, UMTS (850 / 1900) or LTE (700 / AWS)
TX/RX?	TBD TBD	TBD TBD			
TECHNOLOGY	LTE WCS	UMTS 850 /LTE-DB			
FEEDERS (# /TYPE/LENGTH)	2 Optic Fiber w 8 DC lines per site	2 Optic Fiber w 8 DC lines per site			
ANTENNA MAKE - MODEL	OPA-65R-LCUU-H4	OPA-65R-LCUU-H4			
ANTENNA VENDOR	CCI	CCI			
ANTENNA SIZE H"xW"xD"	48 x 15 x 7	48 x 15 x 7			
ANTENNA WEIGHT	57	57			
ANTENNA GAIN	17.0 dBi (high band)	17.0 dBi (high band)			
AZIMUTH	300 °	300 °			
RADIATION CENTER	98 '	98 '			
ANTENNA TIP HEIGHT	100 '	100 '			
MAGNETIC DECLINATION					
ELECTRICAL TILT (700/850/1900/AWS)	0 °	0 °			
MECHANICAL DOWNTILT	0 °	0 °			
SCPA/MCPA?					
MCPA MODULES					
HATCHPLATE POWER (Watts)					
ERP (Watts)					
NARROW BAND LLC (QTY/MODEL)					
HYBRID COMBINER (QTY/MODEL)					
RRH	WCS RRUS32	850 RRUS11/700 RRUS11/1900 RRUS12/1900 RRUS-A2			
CURRENT INJECTORS FOR TMA	n/a	n/a			
CURRENT INJCTR POWER CABLE	n/a	n/a			
ANTENNA SHARING KIT?	n/a	n/a			
BAS Filter	n/a	n/a			
DIPLEXER (QTY/MODEL)	n/a	n/a			
DUPLEXER (QTY/MODEL)	n/a	n/a			
SURGE ARRESTOR (QTY/MODEL)	SQUID x 4 per site	SQUID x 4 per site			
DC BLOCK (QTY/MODEL)	n/a	n/a			
RET EQUIPMENT (QTY/MODEL)	Home Run RET cable	n/a			
1900 PDU FOR TMAS	CCU - Kathrein 860 10006	n/a			

65° OctoPort Multi-Band Antenna

Model OPA-65R-LCUU-H4

Octoport Multi-Band Antenna Array

The CCI Octoport Multi-Band Antenna Array is an industry first 8-port antenna with full WCS Band Coverage. With four high band ports covering PCS, AWS and WCS bands, two 700 MHZ ports, and two 850 MHz ports our octoport antenna is ready for 4X4 high band MIMO.

Modern networks demand high performance, consequently CCI has incorporated several new and innovative design techniques to provide an antenna with excellent side-lobe performance, sharp elevation beams, and high front to back ratio.

Multiple networks can now be connected to a single antenna, reducing tower loading and leasing expense, while decreasing deployment time and installation cost.

Full band capability for 700 MHz , Cellular 850 MHz, PCS 1900 MHz, AWS 1710/2155 MHz and WCS 2300 MHz coverage in a single enclosure.

Benefits

- **RET System allows Independent Tilt of each band specific paired port**
- **Reduces tower loading**
- **Frees up space for tower mounted Remote Radio Heads**
- **Single radome with eight ports**
- **All Band design simplifies radio assignments**
- **Sharp elevation beam eases network planning**

Features

- High Band Ports include WCS Band
- Four High Band ports with four Low Band ports in one antenna
- Sharp elevation beam
- Excellent elevation side-lobe performance
- Excellent MIMO performance due to array spacing
- Excellent PIM Performance
- A multi-network solution in one radome

Applications

- 4x4 MIMO on High Band and Dual 2x2 MIMO on 700 & 850 Low Bands
- Adding additional capacity without adding additional antennas
- Adding WCS Band without increasing antenna count

65° OctoPort Multi-Band Antenna

Model OPA-65R-LCUU-H4

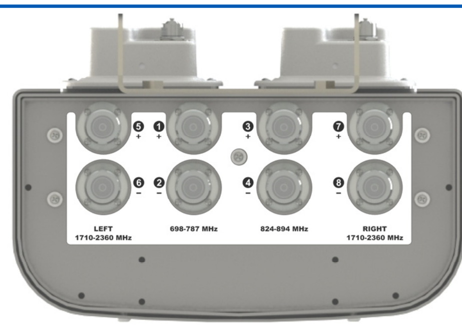
OPA-65R Multi-Band Antenna

Electrical Specifications

Frequency Range	2 X Low Band Ports (L) which cover the range from 698-787	2 X Low Band Ports (C) which cover the range from 824-894	4 X High Band Ports (H1 & H2) which cover the full range from 1710-2360 MHz			
			1850-1990 MHz	1710-1755/2110-2170 MHz		2305-2360 MHz
Gain	12.7 dBi	13.3 dBi	15.7 dBi	14.9 dBi	16.4 dBi	16.8 dBi
Azimuth Beamwidth (-3dB)	65°	63°	63°	68°	62°	58°
Elevation Beamwidth (-3dB)	18.9°	16.5°	8.9°	9.8°	7.7°	6.9°
Electrical Downtilt	0° to 10°	0° to 10°	0° to 8°	0° to 8°	0° to 8°	0° to 8°
Elevation Sidelobes (1st Upper)	< -20 dB	< -18 dB	< -20 dB	< -20 dB	< -18 dB	< -18 dB
Front-to-Back Ratio @180°	> 28 dB	> 28 dB	> 30 dB	> 30 dB	> 30 dB	> 30 dB
Front-to-Back Ratio over ± 20°	> 28 dB	> 27 dB	> 28 dB	> 28 dB	> 26 dB	> 26 dB
Cross-Polar Discrimination (at Peak)	> 20 dB	> 20 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB
Cross-Polar Discrimination (at ± 60°)	> 15 dB	> 13 dB	> 17 dB	> 17 dB	> 17 dB	> 17 dB
Cross-Polar Port-to-Port Isolation	> 25 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB	> 25 dB
VSWR	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1	< 1.5:1
Passive Intermodulation (2x20W)	≤ -150dBc	≤ -150dBc	≤ -150dBc	≤ -150dBc	≤ -150dBc	≤ -150dBc
Input Power	500 Watts CW	500 Watts CW	300 Watts CW	300 Watts CW	300 Watts CW	300 Watts CW
Polarization	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°	Dual Pol 45°
Input Impedance	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms	50 Ohms
Lightning Protection	DC Ground	DC Ground	DC Ground	DC Ground	DC Ground	DC Ground

Mechanical Specifications

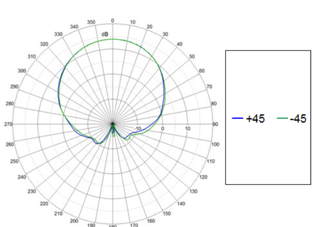
Dimensions (LxWxD)	48.0 x 14.4 x 7.3 inches (1218 x 366 x 185 mm)
Survival Wind Speed	> 150 mph
Front Wind Load	152 lbs (676 N) @ 100 mph (161 kph)
Side Wind Load	86 lbs (381 N) @ 100 mph (161 kph)
Equivalent Flat Plate Area	5.9 ft^2 (0.60 m^2)
Weight (w/o RET/Mounting)	57 lbs (26 kg)
RET System Weight	7.0 lbs (3.0 kg)
Connector	8; 7-16 DIN female long neck
Mounting Pole	2-5 inches (5-12 cm)



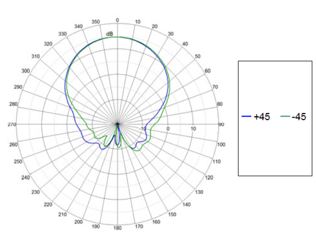
Bottom View

Rear View

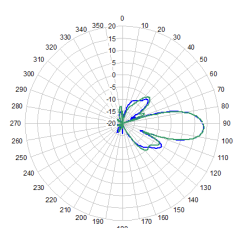
Antenna Patterns*



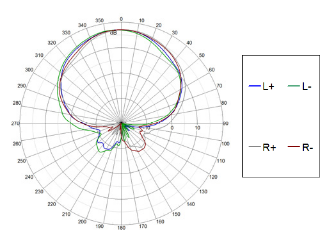
737 MHz Azimuth



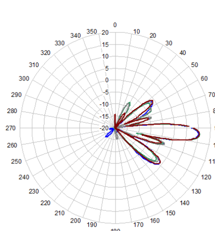
887 MHz Azimuth



Elevation 5°



1920 MHz Azimuth



Elevation 4°

*Typical antenna patterns. For detail information on antenna pattern, please contact us at info@cciproducts.com. All specifications are subject to change without notice.

USA HQ: 89 Leuning Street, South Hackensack, NJ 07606 Telephone: 201-342-3338,
Canada: 411 Legget Drive, Suite 104, Ottawa, ON, Canada K2K 3C9 Telephone: 613-591-6696

RRUS 11

Frequency (AT&T)
- ✓ Band 12 (Lower 700 MHz)
- ✓ Band 4 (AWS, 17/2100 MHz) — 2Q2011

RF Characteristics
- ✓ Output power: 2x30 Watts
- ✓ 2x2 MIMO Capable
- ✓ IBW of 20 MHz
- ✓ Rx Sens.: Better than -105 dBm (5 MHz)

RET/TMA Support
- ✓ AISG 2.0 Compatible
- ✓ Via RET Port and Centre Conductor
- ✓ Cascading
- ✓ 30 VDC Bias

Environmental
- ✓ Self Convection
- ✓ Temperature -40 to 131 F

Power
- ✓ Input voltage: -48 VDC or AC (exemption)
- ✓ Fuse size: 13 – 32 A
  - Recommended: 25 A
- ✓ Power Consumption:
  - Typical 200 Watts
  - Max 310 Watts
  - Excl. RET and TMA load

RRUS 11 Mechanics

Wall and pole mounting brackets
- Reused from RRUW and RRU22
- Vertical Mount Only

Clearing distances:
- Above >= 16 in.
- Below >= 12 in.
- Side >= 0 mm

DC connector
- Bayonet
- Screw terminals in connector plug
- Supported outer cable diameter: 6-18 mm

CPRI connector
- LCD with proprietary cover
- Separate cover available from 1Q2011

Size & Weight
- Band 4: 44 lbs
- Band 12: 50 lbs
- 17.8” x 17.3” x 7.2” incl. sun shield

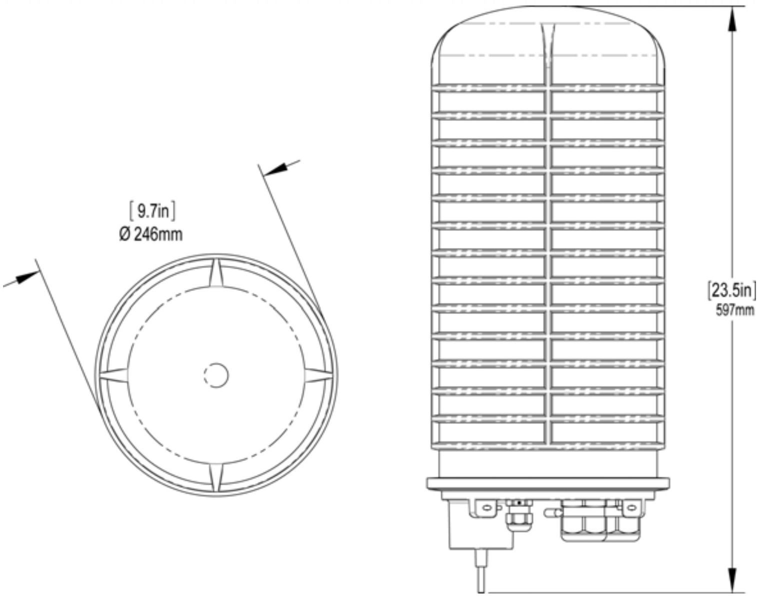
DC6-48-60-18-8F

DC Surge Suppression Solution

The DC6-48-60-18 is a dual chambered, DC surge suppression system for use in multi-circuit, Distributed Antenna Systems. The system will protect up to 6 Remote Radio Heads from voltage surges and lightning, and connect up to 18 fiber pairs. The system is enclosed in a NEMA 4 rated, waterproof enclosure.

FEATURES

- Protects up to 6 Remote Radio Heads, each with its own protection circuit.
- Flexible design allows for installation at the top of a tower for Remote Radio Head protection.
- Includes fiber connections for up to 18 pairs of fiber.
- LED indicators on individual circuits provide visual indication of suppressor status.
- Form 'C' relays allow for remote monitoring of the suppressor status.
- Patented Strikesorb technology provides over 60 kA of surge current capacity per circuit.
- Strikesorb suppression modules are fully recognized to UL 1449-3rd Edition Safety Standard, meeting all intermediate and high current fault requirements to facilitate use in OEM applications.
- Raycap recommends that DC protection system be installed within 2 meters or 6 feet of the radio.
- Dome design is lightweight and aerodynamic providing maximum flexibility for installation on top of towers.



DC6-48-60-18-8F

DC Power Surge Protection

Electrical Specifications	
Model Number	DC6-48-60-18-8F
Nominal Operating Voltage	48 VDC
Nominal Discharge Current (I_n)	20 kA 8/20 µs
Maximum Discharge Current (I_{max}) per NEMA LS-1	60 kA 8/20 µs
Maximum Continuous Operating Voltage (U_c)	75 VDC
Voltage Protection Rating	400 V

Mechanical Specifications	
Suppression Connection Method	Compression lug, #2-#14 AWG Copper, #2-#12 Aluminum
Fiber Connection Method	LC-LC Single mode duplex
Environmental Rating	IP 68, 7m 72hrs
Operating Temperature	-40° C to + 80° C
Storage Temperature	-70° C to + 80° C
Cold Temperature Cycling	IEC 61300-2-22e -30° C to + 60° C 200 hrs @ 5 psi
Resistance to Aggressive Materials	CEI IEC 61073-2 including acids and bases
UV Protection	ISO 4892-2 Method A Xenon-Arc 2160 hrs
Weight	20 lbs without Mounting Bracket

STANDARDS

Strikesorb modules are compliant to the following Surge Protection Device (SPD) Standards:

– ANSI/UL 1449 – 3rd Edition
– IEEE C62.41
– NEMA LS-1, IEC 61643-1:2005 2nd Edition:2005
– IEC 61643-12
– EN 61643-11:2002 (including A11:2007)

GS-07F-0435V

Certified to ISO 9001:2000

TUV Rheinland of North America

Raycap

G02-00-068 REV 050610

Raycap, Inc. 806 W. Clearwater Loop • Post Falls • Idaho • 83854 • USA
Phone 208.777.1166 • Toll Free 800.890.2569 • Fax 208.777.4466 • www.raycapsurgeprotection.com

Rosenberger
Rosenberger Site Solutions, LLC

AT&T LTE FIBER INSTALLATION MATERIALS

12 PAIR FIBER TRUNK

FTTA fiber trunks are fiber optical cable assemblies connecting base stations and remote radio heads in telecommunication applications. They can be used indoor and outdoor, are UV protected and riser rated. Connectors and fan-out are IP67 protected. This ensures easy handling in an outdoor environment. A pulling sock eases cable hoisting.

Part #	Diameter	Description	QTY
FB-L98B-002-15000 CEQ.32135	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 15 meter length.	Each
FB-L98B-002-30000 CEQ.32194	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 30 meter length.	Each
FB-L98B-002-50000 CEQ.32193	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 50 meter length.	Each
FB-L98B-002-75000 CEQ.32192	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 75 meter length.	Each
FB-L98B-002-100000 CEQ.32191	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 100 meter length.	Each
FB-L98B-002-125000 CEQ.32190	10mm	Preconnect Trunk with UL certified cable 12 channels, 24 fibers, single mode LC Duplex to LC Duplex, OD 10.0mm: 125 meter length.	Each

6 CONDUCTOR (3 PAIR) POWER CABLE

600 Volts Power Cable. UL Approved for direct burial or sunlight applications.

Part #	Diameter	Description	QTY
WR-VG86T CEQ.32182	19.2 mm	RSS 8-AWG 6 - Conductor Unshielded 600 Volts Power Cable -# 8 Tinned Copper (three traced red/black pairs) w/ #10 Bare Ground Wire.	Per FT
WR-VG86ST-BRD CEQ.32181	19.7 mm	RSS 8-AWG 6 - Conductor Shielded (Tinned Copper Braid and Aluminum Tape w/ Drain Wire) 600 Volts Power Cable -# 8 Tinned Copper (three traced red/black pairs) w/ #10 Bare Ground Wire.	Per FT

2 CONDUCTOR (SINGLE PAIR) SHIELDED POWER CABLE

600 Volts Power Cable. UL Approved for direct burial or sunlight applications.

Part #	Diameter	Description	QTY
WR-VG122ST-BRDA CEQ.10224	9.8mm	RSS 12-AWG 2 – Flexible Conductor Shielded (Tinned Copper Braid and Aluminum Tape w/ Drain Wire) 600 Volts Power Cable -# 12 AWG 65 Strands Tinned Copper (red and black) w/ #12 Bare Ground Wire.	Per FT
WR-VG102ST-BRDA CEQ.10225	11.6mm	RSS 10-AWG 2 – Flexible Conductor Shielded (Tinned Copper Braid and Aluminum Tape w/ Drain Wire) 600 Volts Power Cable -# 10 AWG 105 Strands Tinned Copper (red and black) w/ #10 Bare Ground Wire.	Per FT
WR-VG82ST-BRDA CEQ.10226	15.4mm	RSS 8-AWG 2 – Flexible Conductor Shielded (Tinned Copper Braid and Aluminum Tape w/ Drain Wire) 600 Volts Power Cable -# 8 AWG 168 Strands Tinned Copper (red and black) w/ #10 Bare Ground Wire.	Per FT

▪P.O. Box 8817 ▪ Lake Charles, LA 70606 ▪ Ph. 337.598.5250 ▪ Fax: 337.598.5290 ▪rlss@rlss.us ▪ www.RLSS.us

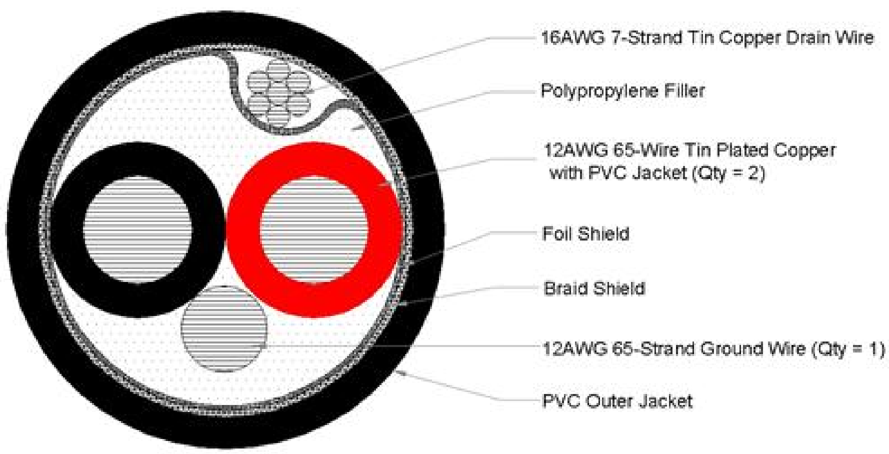
Rev. Date: 9/10/2010

Product Specifications

PWRT-212-S

Remote Radio Head Power Cable, 2 conductor with shield, 12 AWG (3.31 mm2)

Cross Section Drawing



Construction Materials

Construction Type	Non-armored
Conductor Material	Tinned copper
Dielectric Material	PVC
Drain Wire Material	Tinned copper
Filler Material	Polypropylene
Ground Wire Material	Tinned copper
Insulation Material, singles	PVC
Jacket Material	PVC
Outer Shield (Braid) Coverage	65 %
Outer Shield (Braid) Gauge	36 AWG
Outer Shield (Braid) Material	Tinned copper
Outer Shield (Tape) Material	Aluminum/Poly, non-bonded

Dimensions

Cable Weight	0.16 kg/m | 0.11 lb/ft
Diameter Over Conductor, singles	2.5654 mm per 65 strand 0.1010 in per 65 strand
Diameter Over Dielectric	3.5814 mm | 0.1410 in
Diameter Over Drain Wire	1.5200 mm per 7 strand 0.0598 in per 7 strand
Diameter Over Ground Wire	2.565 mm | 0.101 in
Diameter Over Jacket	10.109 mm | 0.398 in

Product Specifications

PWRT-212-S

Diameter Over Shield (Braid)	7.823 mm | 0.308 in
Jacket Thickness	1.143 mm | 0.045 in

Electrical Specifications

Conductor dc Resistance	1.68 ohms/kft | 5.51 ohms/km
Conductor dc Resistance Note	Maximum value based on a standard condition of 20 °C (68 °F)
Safety Voltage Rating	600 V

Environmental Specifications

Environmental Space	UV resistant for outdoor and/or direct burial installations
Operating Temperature	-40 °C to +90 °C (-40 °F to +194 °F)
Safety Standard	NEC Article 336 (Type TC)

General Specifications

Application	Industrial
Cable Type	Power
Jacket Color	Black
Conductor Gauge, singles	12 AWG
Conductor Type, singles	Stranded
Conductors, quantity	2
Drain Wire Gauge	16 AWG
Ground Wire Gauge	12 AWG
Ground Wire Type	Stranded
Jacket Color, singles	Black | Red

Regulatory Compliance/Certifications

Agency	Classification
ISO 9001:2008	Designed, manufactured and/or distributed under this quality management system

WIRELESS COMMUNICATIONS FACILITY
CT0968
DANBURY
303 BOXWOOD LANE
DANBURY. CT 06811

APPROVED
By Radu Alecsandru at 9:01 am, Feb 01, 2016

PROJECT SUMMARY

1. THE PROPOSED SCOPE OF WORK CONSISTS OF COLOCATION INSTALLATION ON AN EXISTING UNMANNED TELECOMMUNICATIONS FACILITY INCLUDING THE FOLLOWING:
   - A. INSTALL (6) AT&T PANEL ANTENNAS.
   - B. INSTALL (6) ERICSSON RRUS-11s, (2) PER SECTOR.
   - C. INSTALL (3) ERICSSON RRUS-12 + A2s, (1) PER SECTOR.
   - D. INSTALL (3) ERICSSON RRUS-32, (1) PER SECTOR.
   - E. INSTALL (3) RAYCAP DC6-48-60-18-8F.
   - F. INSTALL (1) 50kW DIESEL FUELED BACKUP POWER GENERATOR ON CONCRETE SLAB-ON-GRADE.

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2003 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2005 CONNECTICUT SUPPLEMENT AND 2009 AMENDMENTS, INCLUDING THE TIA/EIA-222 REVISION "F" "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES." 2005 CONNECTICUT FIRE SAFETY CODE AND 2009 AMENDMENTS, 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 AT&T 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 EQUIPMENT AND PRODUCTS PURCHASED ARE TO BE REVIEWED BY CONTRACTOR AND ALL APPLICABLE SUB-CONTRACTORS FOR ANY CONDITION PER THE MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUPPLY THESE ITEMS AT NO COST TO OWNER OR CONSTRUCTION MANAGER.

19. 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.

20. 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.

21. 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: 500 ENTERPRISE DRIVE, ROCKY HILL, CONNECTICUT

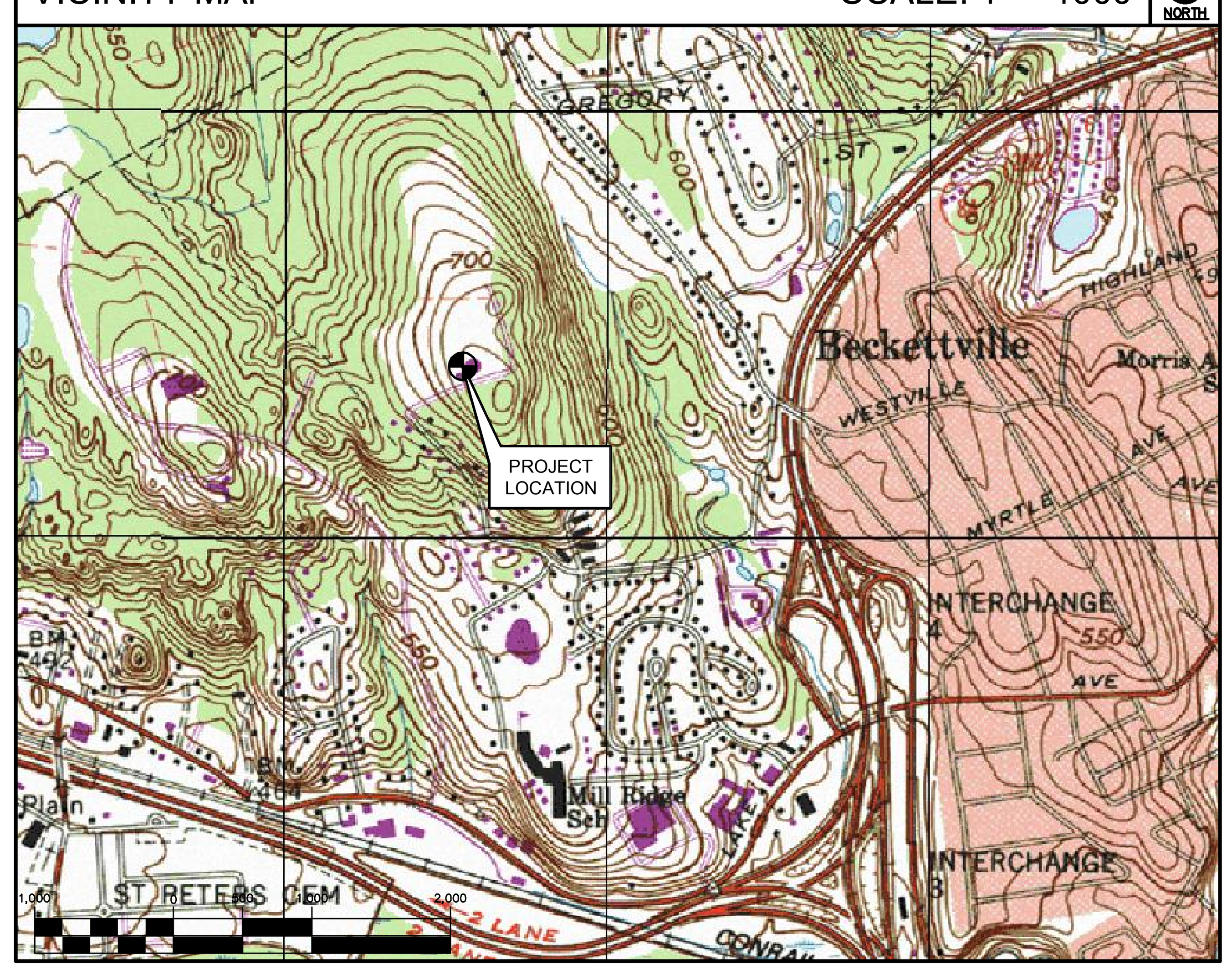
TO: 303 BOXWOOD LANE, DANBURY, CT 06811

1.	TURN LEFT ONTO CAPITOL BLVD	0.4 mi
2.	TURN LEFT ONTO WEST STREET	0.2 mi
3.	TAKE RAMP LEFT FOR I-91 S	0.3 mi
4.	AT EXIT 18, TAKE RAMP RIGHT FOR I-691 WEST TOWARD MERIDEN/WATERBURY	8.8 mi
5.	CONTINUE ONTO I-691 WEST.	7.7 mi
6.	AT EXIT 1, TAKE RAMP LEFT FOR I-84 WEST TOWARD WATERBURY/DANBURY, MERGE ONTO I-84 WEST.	35.9 mi
7.	TAKE EXIST 4 FOR US-6 WEST/US-202 WEST TOWARD LAKE AVE.	0.3 mi
8.	TURN RIGHT ONTO US-202 WEST/US-6 WEST/LAKE AVE. EXT.	404 ft
9.	TURN RIGHT ONTO MILL RIDGE ROAD	0.3 mi
10.	TURN RIGHT ONTO HIGH RIDGE ROAD	0.2 mi
11.	TURN LEFT AT THE 1ST CROSS STREET ONTO SCUPPO ROAD	89 ft
12.	SLIGHT RIGHT ONTO BOXWOOD LANE	0.1 mi
		0.1 mi

VICINITY MAP

SCALE: 1" = 1000'

NORTH



PROJECT INFORMATION

AT&T SITE NUMBER:	CT0968
AT&T SITE NAME:	DANBURY
SITE ADDRESS:	303 BOXWOOD LANE DANBURY, CT 06811
LESSEE/APPLICANT:	AT&T MOBILITY 500 ENTERPRISE DRIVE, SUITE 3A ROCKY HILL, CT 06067
CONTACT PERSON:	ANA SEMASHKA SAI COMMUNICATIONS (617) 851-6234
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT. 06405
PROJECT COORDINATES:	LATITUDE: 41°-23'-41.93"N LONGITUDE: 73°-29'-12.27"W GROUND ELEVATION: ±721' AMSL

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	1
N-1	GENERAL NOTES AND SPECIFICATIONS	1
C-1	SITE LOCATION PLAN	0
C-2	PLANS AND ELEVATION	1
C-3	PLANS, ELEVATIONS AND DETAILS	1
C-4	RF EQUIPMENT TABLE AND PLUMBING DIAGRAM	0
E-1	SITE UTILITY PLAN	0
E-2	SCHEMATIC RISER AND NOTES	0
E-3	SCHEMATIC GROUNDING PLAN AND NOTES	0
E-4	GROUNDING PLAN	0
E-5	DETAILS	0
E-6	DETAILS	0
E-7	DETAILS	0
E-8	SPECIFICATIONS	0

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
1	1/29/16	CAG	HMR	CONSTRUCTION DRAWINGS - ISSUED FINAL
0	1/26/16	CAG	HMR	CONSTRUCTION DRAWINGS - ISSUED FOR CLIENT REVIEW

PROFESSIONAL ENGINEER SEAL

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AT&T MOBILITY
WIRELESS COMMUNICATIONS FACILITY
DANBURY
SITE NUMBER: CT0968
303 BOXWOOD LANE
DANBURY, CT 06811

DATE: 1/25/16
SCALE: AS NOTED
JOB NO. 16010.000

TITLE SHEET

T-1

Sheet No. 1 of 14

NOTES AND SPECIFICATIONS

DESIGN BASIS

GOVERNING CODE: 2003 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2005 CONNECTICUT STATE BUILDING CODE AND 2009 AMENDMENTS.

1. DESIGN CRITERIA:
   - WIND LOAD (ANTENNA MOUNTS):
     TIA/EIA-222-F-1996
     BASIC WIND SPEED (V) = 85 MPH (FASTEST MILE)

     2009 CT BUILDING CODE AMENDMENT APPENDIX K
     BASIC WIND SPEED (V) = 95 MPH (3-SECOND GUST)
     EQUIVALENT TO (V) = 77.5 MPH (FASTEST MILE)
     TIA-EIA-222-F-1996 WIND SPEED GOVERNS
   - SEISMIC LOAD (DOES NOT CONTROL):
     PER ASCE 7-02 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES.

GENERAL NOTES:

1. ALL CONSTRUCTION SHALL BE IN COMPLIANCE WITH THE GOVERNING BUILDING CODE.
2. 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.
3. BEFORE BEGINNING THE WORK, THE CONTRACTOR IS RESPONSIBLE FOR MAKING SUCH INVESTIGATIONS CONCERNING PHYSICAL CONDITIONS (SURFACE AND SUBSURFACE) AT OR CONTIGUOUS TO THE SITE WHICH MAY AFFECT PERFORMANCE AND COST OF THE WORK.
4. DIMENSIONS AND DETAILS SHALL BE CHECKED AGAINST EXISTING FIELD CONDITIONS.
5. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.
6. ALL DIMENSIONS, ELEVATIONS, AND OTHER REFERENCES TO EXISTING STRUCTURES, SURFACE, AND SUBSURFACE CONDITIONS ARE APPROXIMATE. NO GUARANTEE IS MADE FOR THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. THE CONTRACTOR SHALL VERIFY AND COORDINATE ALL DIMENSIONS, ELEVATIONS, ANGLES WITH EXISTING CONDITIONS AND WITH ARCHITECTURAL AND SITE DRAWINGS BEFORE PROCEEDING WITH ANY WORK.
7. AS THE WORK PROGRESSES, THE CONTRACTOR SHALL NOTIFY THE OWNER OF ANY CONDITIONS WHICH ARE IN CONFLICT OR OTHERWISE NOT CONSISTENT WITH THE CONSTRUCTION DOCUMENTS AND SHALL NOT PROCEED WITH SUCH WORK UNTIL THE CONFLICT IS SATISFACTORILY RESOLVED.
8. THE CONTRACTOR SHALL COMPLY WITH ALL APPLICABLE SAFETY CODES AND REGULATIONS DURING ALL PHASES OF CONSTRUCTION. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR PROVIDING AND MAINTAINING ADEQUATE SHORING, BRACING, AND BARRICADES AS MAY BE REQUIRED FOR THE PROTECTION OF EXISTING PROPERTY, CONSTRUCTION WORKERS, AND FOR PUBLIC SAFETY.
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 SITE OPERATIONS, COORDINATE WORK WITH NORTHEAST UTILITIES
10. THE STRUCTURE IS DESIGNED TO BE SELF-SUPPORTING AND STABLE AFTER FOUNDATION REMEDIATION WORK IS COMPLETE. IT IS THE CONTRACTOR'S SOLE RESPONSIBILITY TO DETERMINE ERECTION PROCEDURE AND SEQUENCE AND TO ENSURE THE SAFETY OF THE STRUCTURE AND ITS COMPONENT PARTS DURING ERECTION. THIS INCLUDES THE ADDITION OF WHATEVER SHORING, TEMPORARY BRACING, GUYS OR TIEDOWNS, WHICH MIGHT BE NECESSARY.
11. 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.
12. SHOP DRAWINGS, CONCRETE MIX DESIGNS, TEST REPORTS, AND OTHER SUBMITTALS PERTAINING TO STRUCTURAL WORK SHALL BE FORWARDED TO THE OWNER FOR REVIEW BEFORE FABRICATION AND/OR INSTALLATION IS MADE. SHOP DRAWINGS SHALL INCLUDE ERECTION DRAWINGS AND COMPLETE DETAILS OF CONNECTIONS AS WELL AS MANUFACTURER'S SPECIFICATION DATA WHERE APPROPRIATE. SHOP DRAWINGS SHALL BE CHECKED BY THE CONTRACTOR AND BEAR THE CHECKER'S INITIALS BEFORE BEING SUBMITTED FOR REVIEW.
13. NO DRILLING WELDING OR TAPING ON CL&P OWNED EQUIPMENT.
14. REFER TO DRAWING T1 FOR ADDITIONAL NOTES AND REQUIREMENTS.

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.
7. SLAB/ TOP OF WALL TOLERANCE IS 1/4"±
8. TOP 8" OF FOUNDATION SIDES MUST BE FORMED FLAT TO ACCEPT TIE-DOWN PLATES.
9. PER NEC REQUIREMENTS, THE REBAR IN FOUNDATION AND FOOTING SHALL BE BONDED TO GROUND RING WITH A #2 AWG SOLID CONDUCTOR USING LISTED AND APPROVED METHODS.
10. PROVIDE PVC SLEEVES FOR UTILITY CONDUIT PASSAGE THROUGH FOUNDATION OR CAST CONDUITS IN PLACE. REFER TO ELECTRICAL DRAWINGS FOR CONDUIT SIZES AND QUANTITIES.

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.

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.
11. THE CONTRACTOR SHALL VERIFY AND COORDINATE THE SIZE AND LOCATION OF ALL OPENINGS, SLEEVES AND ANCHOR BOLTS AS REQUIRED BY ALL TRADES.

STRUCTURAL STEEL

1. ALL STRUCTURAL STEEL IS DESIGNED BY ALLOWABLE STRESS DESIGN (ASD)

   A. STRUCTURAL STEEL (W SHAPES)---ASTM A992 (FY = 50 KSI)
   B. STRUCTURAL STEEL (OTHER SHAPES)---ASTM A36 (FY = 36 KSI)
   C. STRUCTURAL HSS (RECTANGULAR SHAPES)---ASTM A500 GRADE B, (FY = 46 KSI)
   D. STRUCTURAL HSS (ROUND SHAPES)---ASTM A500 GRADE B, (FY = 42 KSI)
   E. PIPE---ASTM A53 (FY = 35 KSI)
   F. CONNECTION BOLTS---ASTM A325-N
   G. U-BOLTS---ASTM A36
   H. ANCHOR RODS---ASTM F 1554
   I. WELDING ELECTRODE---ASTM E 70XX
2. CONTRACTOR TO REVIEW ALL SHOP DRAWINGS AND SUBMIT COPY TO ENGINEER FOR APPROVAL. DRAWINGS MUST BEAR THE CHECKER'S INITIALS BEFORE SUBMITTING TO THE ENGINEER FOR REVIEW. SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING: SECTION PROFILES, SIZES, CONNECTION ATTACHMENTS, REINFORCING, ANCHORAGE, SIZE AND TYPE OF FASTENERS AND ACCESSORIES. INCLUDE ERECTION DRAWINGS, ELEVATIONS AND DETAILS.
3. STRUCTURAL STEEL SHALL BE DETAILED, FABRICATED AND ERECTED IN ACCORDANCE WITH THE LATEST PROVISIONS OF AISC MANUAL OF STEEL CONSTRUCTION.
4. PROVIDE ALL PLATES, CLIP ANGLES, CLOSURE PIECES, STRAP ANCHORS, MISCELLANEOUS PIECES AND HOLES REQUIRED TO COMPLETE THE STRUCTURE.
5. FIT AND SHOP ASSEMBLE FABRICATIONS IN THE LARGEST PRACTICAL SECTIONS FOR DELIVERY TO SITE.
6. INSTALL FABRICATIONS PLUMB AND LEVEL, ACCURATELY FITTED, AND FREE FROM DISTORTIONS OR DEFECTS.
7. AFTER ERECTION OF STRUCTURES, TOUCHUP ALL WELDS, ABRASIONS AND NON-GALVANIZED SURFACES WITH A 95% ORGANIC ZINC RICH PAINT IN ACCORDANCE WITH ASTM 780.
8. ALL STEEL MATERIAL (EXPOSED TO WEATHER) SHALL BE GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ASTM A123 "ZINC (HOT DIPPED GALVANIZED) COATINGS" ON IRONS AND STEEL PRODUCTS.
9. ALL BOLTS, ANCHORS AND MISCELLANEOUS HARDWARE SHALL BE GALVANIZED IN ACCORDANCE WITH ASTM A153 "ZINC COATING (HOT-DIP) ON IRON AND STEEL HARDWARE".
10. THE ENGINEER SHALL BE NOTIFIED OF ANY INCORRECTLY FABRICATED, DAMAGED OR OTHERWISE MISFITTING OR NON CONFORMING MATERIALS OR CONDITIONS TO REMEDIAL OR CORRECTIVE ACTION. ANY SUCH ACTION SHALL REQUIRE ENGINEER REVIEW.
11. CONNECTION ANGLES SHALL HAVE A MINIMUM THICKNESS OF 1/4 INCHES.
12. STRUCTURAL CONNECTION BOLTS SHALL CONFORM TO ASTM A325. ALL BOLTS SHALL BE 3/4" DIAMETER MINIMUM AND SHALL HAVE A MINIMUM OF TWO BOLTS, UNLESS OTHERWISE ON THE DRAWINGS.
13. LOCK WASHER ARE NOT PERMITTED FOR A325 STEEL ASSEMBLIES.
14. SHOP CONNECTIONS SHALL BE WELDED OR HIGH STRENGTH BOLTED.
15. MILL BEARING ENDS OF COLUMNS, STIFFENERS, AND OTHER BEARING SURFACES TO TRANSFER LOAD OVER ENTIRE CROSS SECTION.
16. FABRICATE BEAMS WITH MILL CAMBER UP.
17. LEVEL AND PLUMB INDIVIDUAL MEMBERS OF THE STRUCTURE TO AN ACCURACY OF 1:500, BUT NOT TO EXCEED 1/4" IN THE FULL HEIGHT OF THE COLUMN.
18. COMMENCEMENT OF STRUCTURAL STEEL WORK WITHOUT NOTIFYING THE ENGINEER OF ANY DISCREPANCIES WILL BE CONSIDERED ACCEPTANCE OF PRECEDING WORK.
19. INSPECTION AND TESTING OF ALL WELDING AND HIGH STRENGTH BOLTING SHALL BE PERFORMED BY AN INDEPENDENT TESTING LABORATORY.
20. FOUR COPIES OF ALL INSPECTION TEST REPORTS SHALL BE SUBMITTED TO THE ENGINEER WITHIN TEN (10) WORKING DAYS OF THE DATE OF INSPECTION.

PAINT NOTES

PAINTING SCHEDULE:

1. ANTENNA PANELS:

   A. SHERWIN WILLIAMS POLANE-B
   B. COLOR TO BE MATCHED WITH EXISTING TOWER STRUCTURE.
2. COAXIAL CABLES:

   A. ONE COAT OF DTM BONDING PRIMER (2-5 MILS. DRY FINISH)
   B. TWO COATS OF DTM ACRYLIC PRIMER/FINISH (2.5-5 MILS. DRY FINISH)
   C. COLOR TO BE FIELD MATCHED WITH EXISTING STRUCTURE.

EXAMINATION AND PREPARATION:

1. DO NOT APPLY PAINT IN SNOW, RAIN, FOG OR MIST OR WHEN RELATIVE HUMIDITY EXCEEDS 85%. DO NOT APPLY PAINT TO DAMP OR WET SURFACES.
2. VERIFY THAT SUBSTRATE CONDITIONS ARE READY TO RECEIVE WORK. EXAMINE SURFACE SCHEDULED TO BE FINISHED PRIOR TO COMMENCEMENT OF WORK. REPORT ANY CONDITION THAT MAY POTENTIALLY AFFECT PROPER APPLICATION.
3. TEST SHOP APPLIED PRIMER FOR COMPATIBILITY WITH SUBSEQUENT COVER MATERIALS.
4. PERFORM PREPARATION AND CLEANING PROCEDURE IN STRICT ACCORDANCE WITH COATING MANUFACTURER'S INSTRUCTIONS FOR EACH SUBSTRATE CONDITION.
5. CORRECT DEFECTS AND CLEAN SURFACES WHICH AFFECT WORK OF THIS SECTION. REMOVE EXISTING COATINGS THAT EXHIBIT LOOSE SURFACE DEFECTS.
6. IMPERVIOUS SURFACE: REMOVE MILDEW BY SCRUBBING WITH SOLUTION OF TRI-SODIUM PHOSPHATE AND BLEACH. RINSE WITH CLEAN WATER AND ALLOW SURFACE TO DRY.
7. ALUMINUM SURFACE SCHEDULED FOR PAINT FINISH: REMOVE SURFACE CONTAMINATION BY STEAM OR HIGH-PRESSURE WATER. REMOVE OXIDATION WITH ACID ETCH AND SOLVENT WASHING. APPLY ETCHING PRIMER IMMEDIATELY FOLLOWING CLEANING.
8. FERROUS METALS: CLEAN UNGALVANIZED FERROUS METAL SURFACES THAT HAVE NOT BEEN SHOP COATED; REMOVE OIL, GREASE, DIRT, LOOSE MILL SCALE, AND OTHER FOREIGN SUBSTANCES. USE SOLVENT OR MECHANICAL CLEANING METHODS THAT COMPLY WITH THE STEEL STRUCTURES PAINTING COUNCIL'S (SSPC) RECOMMENDATIONS. TOUCH UP BARE AREAS AND SHOP APPLIED PRIME COATS THAT HAVE BEEN DAMAGED. WIRE BRUSH, CLEAN WITH SOLVENTS RECOMMENDED BY PAINT MANUFACTURER, AND TOUCH UP WITH THE SAME PRIMER AS THE SHOP COAT.
9. GALVANIZED SURFACES: CLEAN GALVANIZED SURFACES WITH NON-PETROLEUM-BASED SOLVENTS SO SURFACE IS FREE OF OIL AND SURFACE CONTAMINANTS. REMOVE PRETREATMENT FROM GALVANIZED SHEET METAL FABRICATED FROM COIL STOCK BY MECHANICAL METHODS.
10. ANTENNA PANELS: REMOVE ALL OIL, DUST, GREASE, DIRT, AND OTHER FOREIGN MATERIAL TO ENSURE ADEQUATE ADHESION. PANELS MUST BE WIPED WITH METHYL ETHYL KETONE (MEK).
11. COAXIAL CABLES: REMOVE ALL OIL, DUST, GREASE. DIRT, AND OTHER FOREIGN MATERIAL TO ENSURE ADEQUATE ADHESION.

CLEANING:

1. COLLECT WASTE MATERIAL, WHICH MAY CONSTITUTE A FIRE HAZARD, PLACE IN CLOSED METAL CONTAINERS AND REMOVE DAILY FROM SITE.

APPLICATION:

1. APPLY PRODUCTS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
2. DO NOT APPLY FINISHES TO SURFACES THAT ARE NOT DRY.
3. APPLY EACH COAT TO UNIFORM FINISH.
4. APPLY EACH COAT OF PAINT SLIGHTLY DARKER THAN PRECEDING COAT UNLESS OTHERWISE APPROVED.
5. SAND METAL LIGHTLY BETWEEN COATS TO ACHIEVE REQUIRED FINISH.
6. VACUUM CLEAN SURFACES FREE OF LOOSE PARTICLES. USE TACK CLOTH JUST PRIOR TO APPLYING NEXT COAT.
7. ALLOW APPLIED COAT TO DRY BEFORE NEXT COAT IS APPLIED.

COMPLETED WORK:

1. SAMPLES: PREPARE 24" X 24" SAMPLE AREA FOR REVIEW.
2. MATCH APPROVED SAMPLES FOR COLOR, TEXTURE AND COVERAGE. REMOVE REFINISH OR REPAIR WORK NOT IN COMPLIANCE WITH SPECIFIED REQUIREMENTS.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	1/26/16	CAG	HMR	CONSTRUCTION DRAWINGS – ISSUED FOR CLIENT REVIEW
1	1/29/16	CAG	HMR	CONSTRUCTION DRAWINGS – ISSUED FINAL

PROFESSIONAL ENGINEER SEAL

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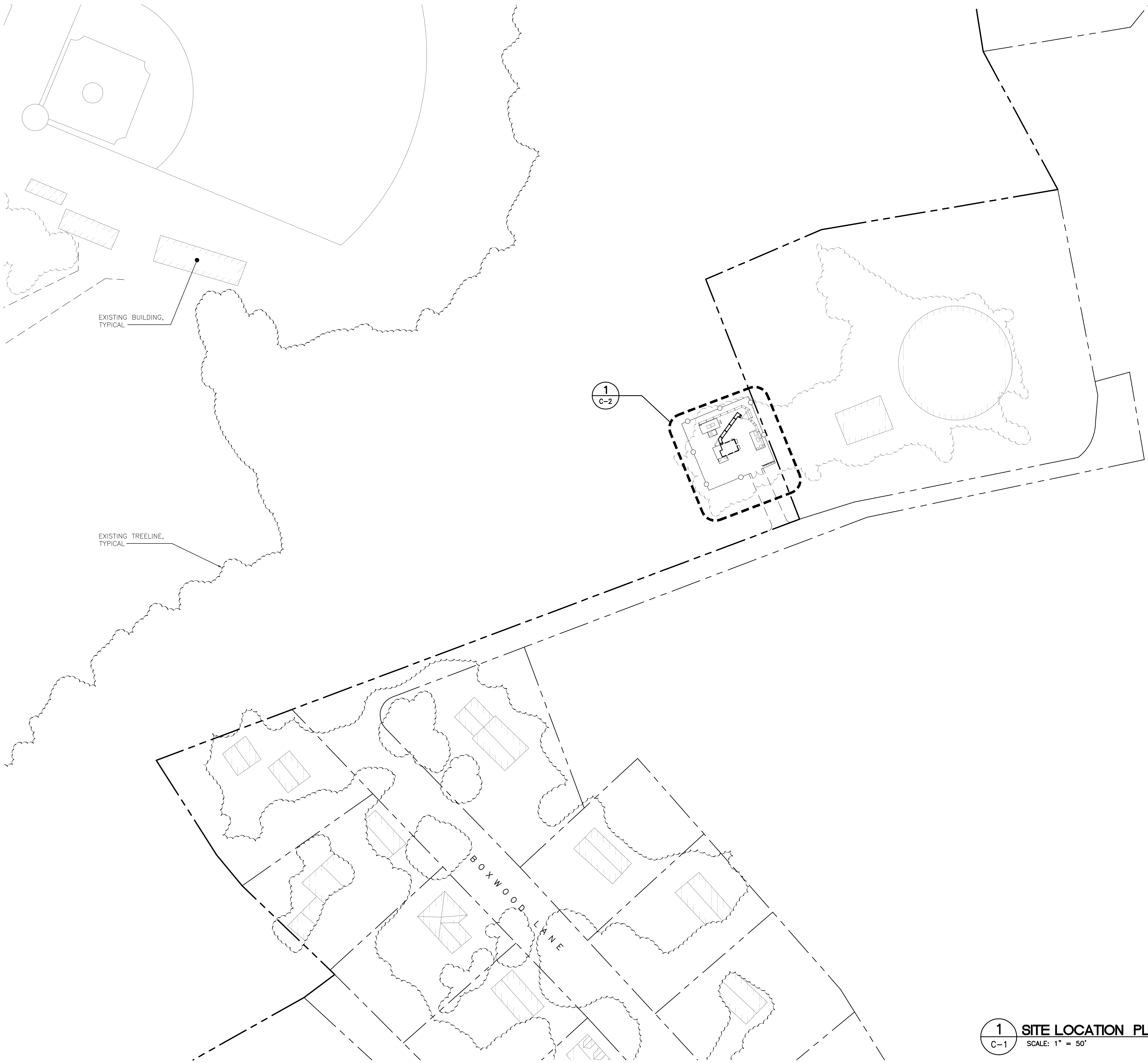
WIRELESS COMMUNICATIONS FACILITY
DANBURY
SITE NUMBER: CT0968
303 BOXWOOD LANE
DANBURY, CT 06811

DATE: 1/25/16
SCALE: AS NOTED
JOB NO. 16010.000

GENERAL NOTES AND SPECIFICATIONS

N-1

Sheet No. 2 of 14



1 / C-1 **SITE LOCATION PLAN**

SCALE: 1" = 50'

APPROX. NORTH

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
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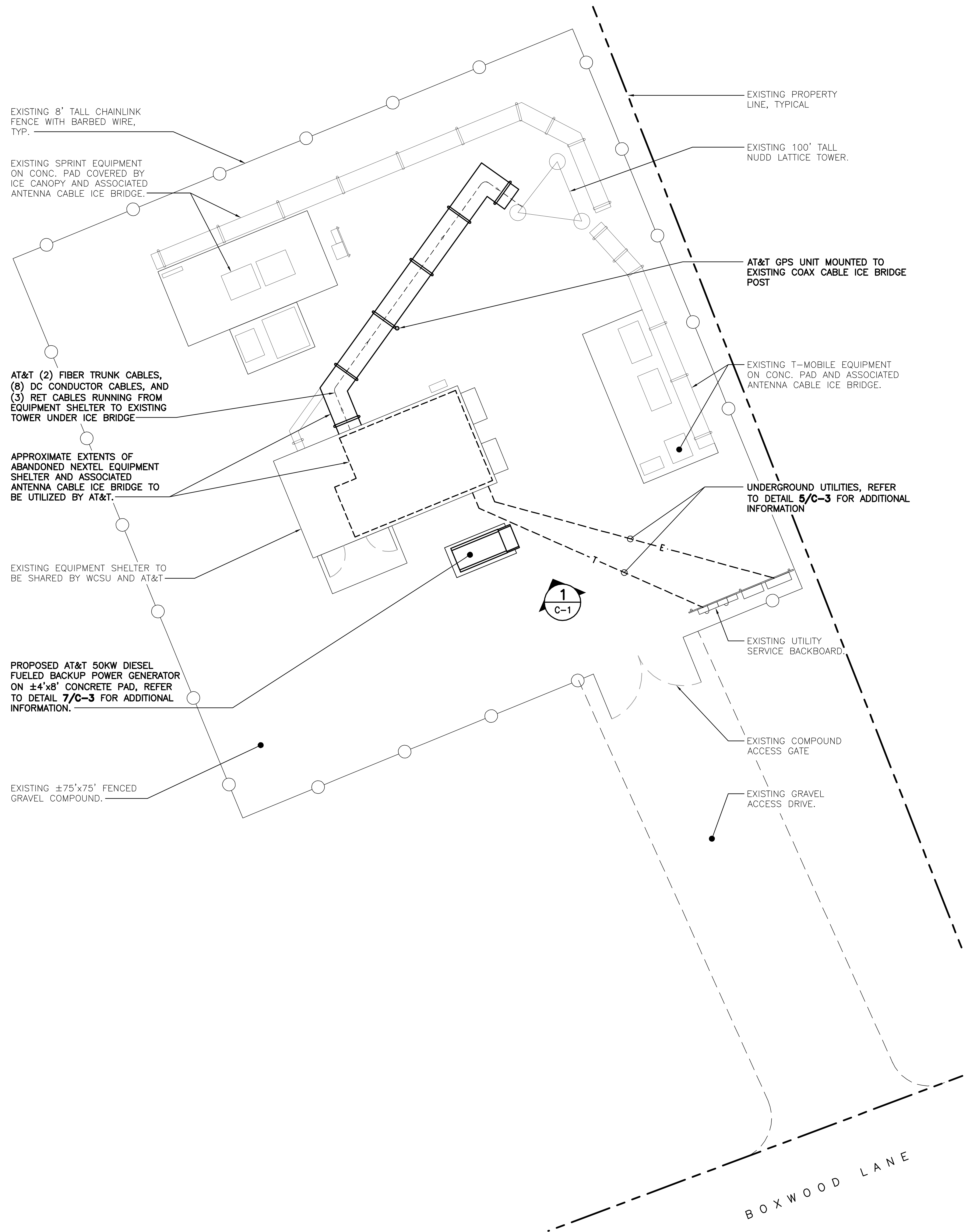
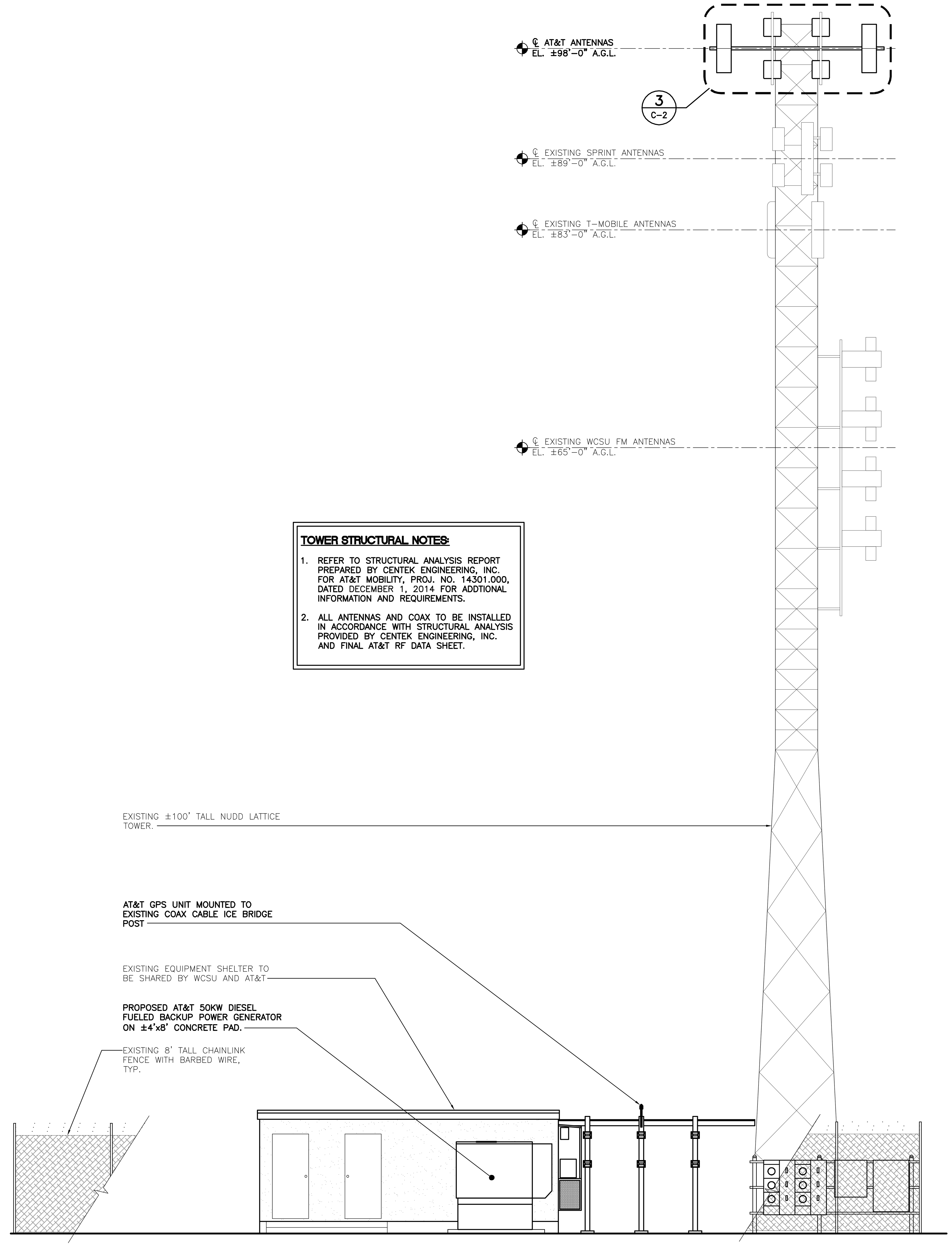
SITE LOCATION PLAN

C-1

Sheet No. 3 of 14



2 C-1 **COMPOUND PLAN**
SCALE: 1/8" = 1'-0"
APPROX. NORTH



TOWER STRUCTURAL NOTES:

1. REFER TO STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING, INC. FOR AT&T MOBILITY, PROJ. NO. 14301.000, DATED DECEMBER 1, 2014 FOR ADDTIONAL INFORMATION AND REQUIREMENTS.
2. ALL ANTENNAS AND COAX TO BE INSTALLED IN ACCORDANCE WITH STRUCTURAL ANALYSIS PROVIDED BY CENTEK ENGINEERING, INC. AND FINAL AT&T RF DATA SHEET.

1 C-1 **EAST ELEVATION**
SCALE: 1" = 10'-0"

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.

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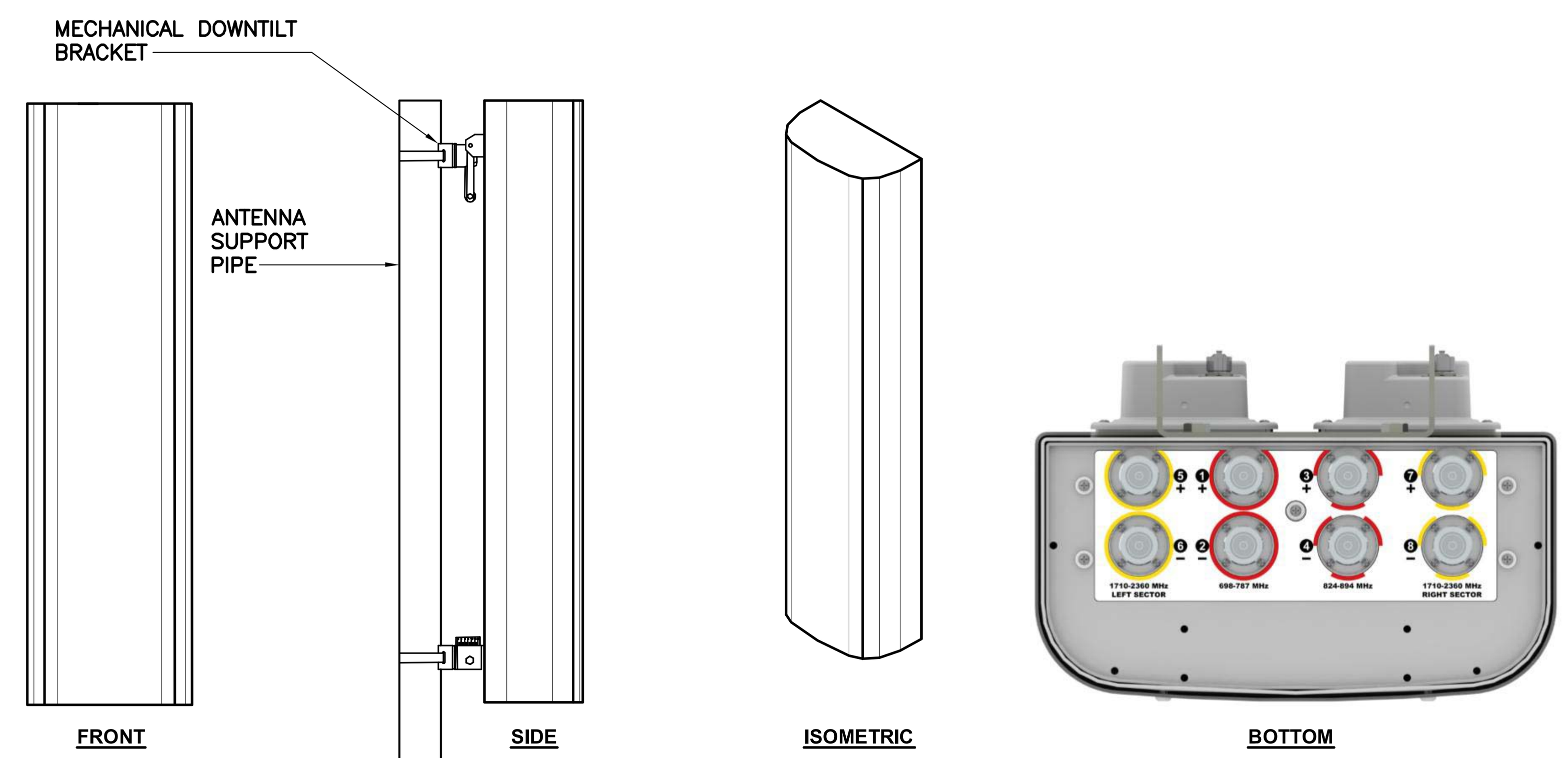
PLANS AND ELEVATION

C-2

Sheet No. 4 of 14

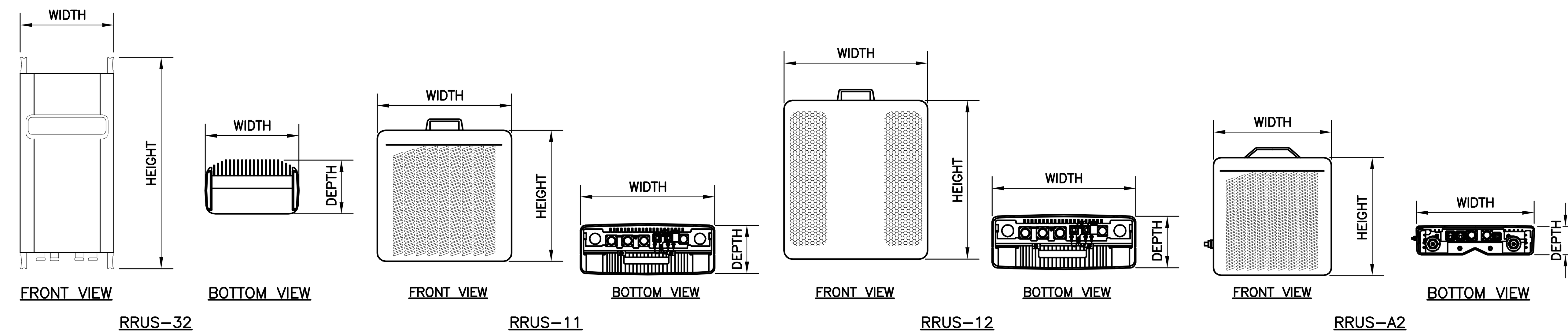


ALPHA/BETA/GAMMA ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: CCI MODEL: OPA-65R-LCUU-H4	48.3"H x 14.4"W x 7.3"D	45.3-LBS

2 (C-3) PROPOSED ANTENNA DETAIL

SCALE: NTS

NOTES:
1. INSTALL ANTENNA TO EXISTING PIPE MAST USING MANUFACTURERS SUPPLIED BRACKETS AND MOUNTING HARDWARE
2. SET MECHANICAL DOWNTILT TO VALUE SPECIFIED IN LATEST RFDS

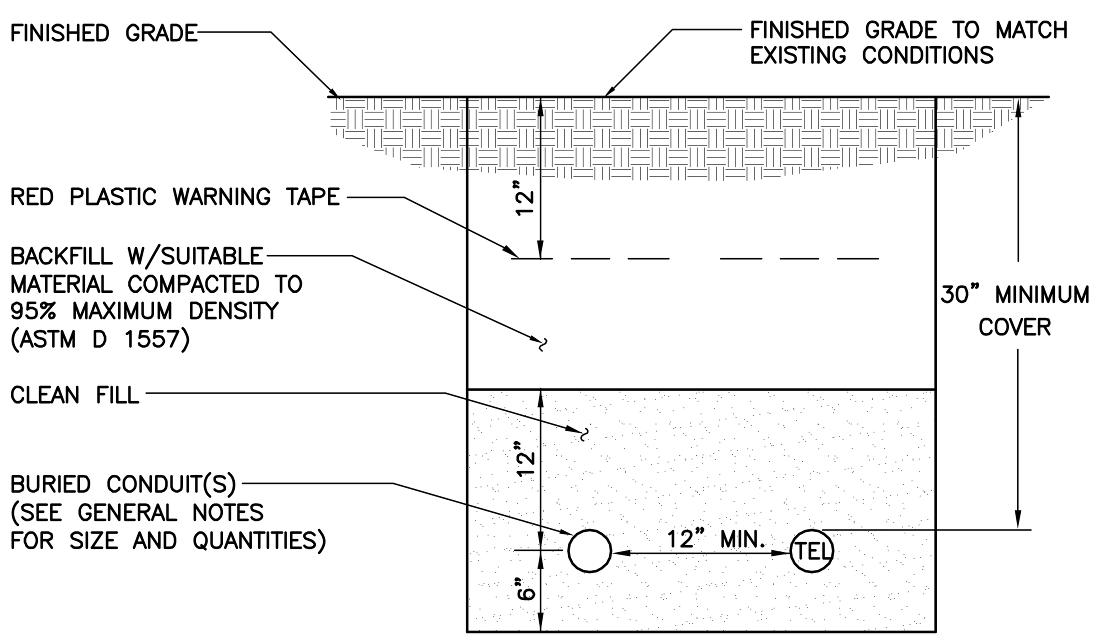


RRU (REMOTE RADIO UNIT)			
EQUIPMENT	DIMENSIONS	WEIGHT	CLEARANCES
MAKE: ERICSSON MODEL: RRUS 32	27.17"H x 12.05"W x 7.01"D	52.91 LBS.	ABOVE: 16" MIN. BELOW: 12" MIN. FRONT: 36" MIN.
MAKE: ERICSSON MODEL: RRUS 11	17.8"H x 17.3"W x 7.2"D	50.0 LBS.	ABOVE: 16" MIN. BELOW: 12" MIN. FRONT: 36" MIN.
MAKE: ERICSSON MODEL: RRUS 12	20.4"H x 18.5"W x 7.5"D	50.0 LBS.	ABOVE: 16" MIN. BELOW: 12" MIN. FRONT: 36" MIN.
MAKE: ERICSSON MODEL: RRUS A2	16.42"H x 15.19"W x 3.35"D	22.05 LBS.	ABOVE: 16" MIN. BELOW: 12" MIN. FRONT: 36" MIN.

NOTES:
1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH AT&T CONSTRUCTION MANAGER PRIOR TO ORDERING.

1 (C-3) ERICSSON REMOTE RADIO UNIT (RRU) DETAIL

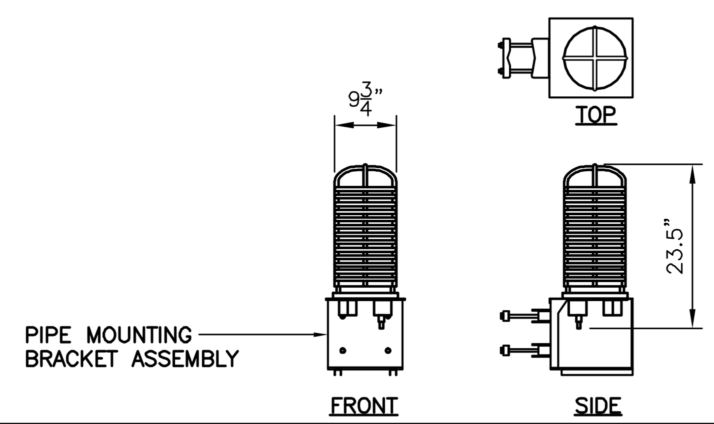
SCALE: NTS



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.

5 (C-3) TYPICAL ELECTRICAL/TEL TRENCH DETAIL

NOT TO SCALE

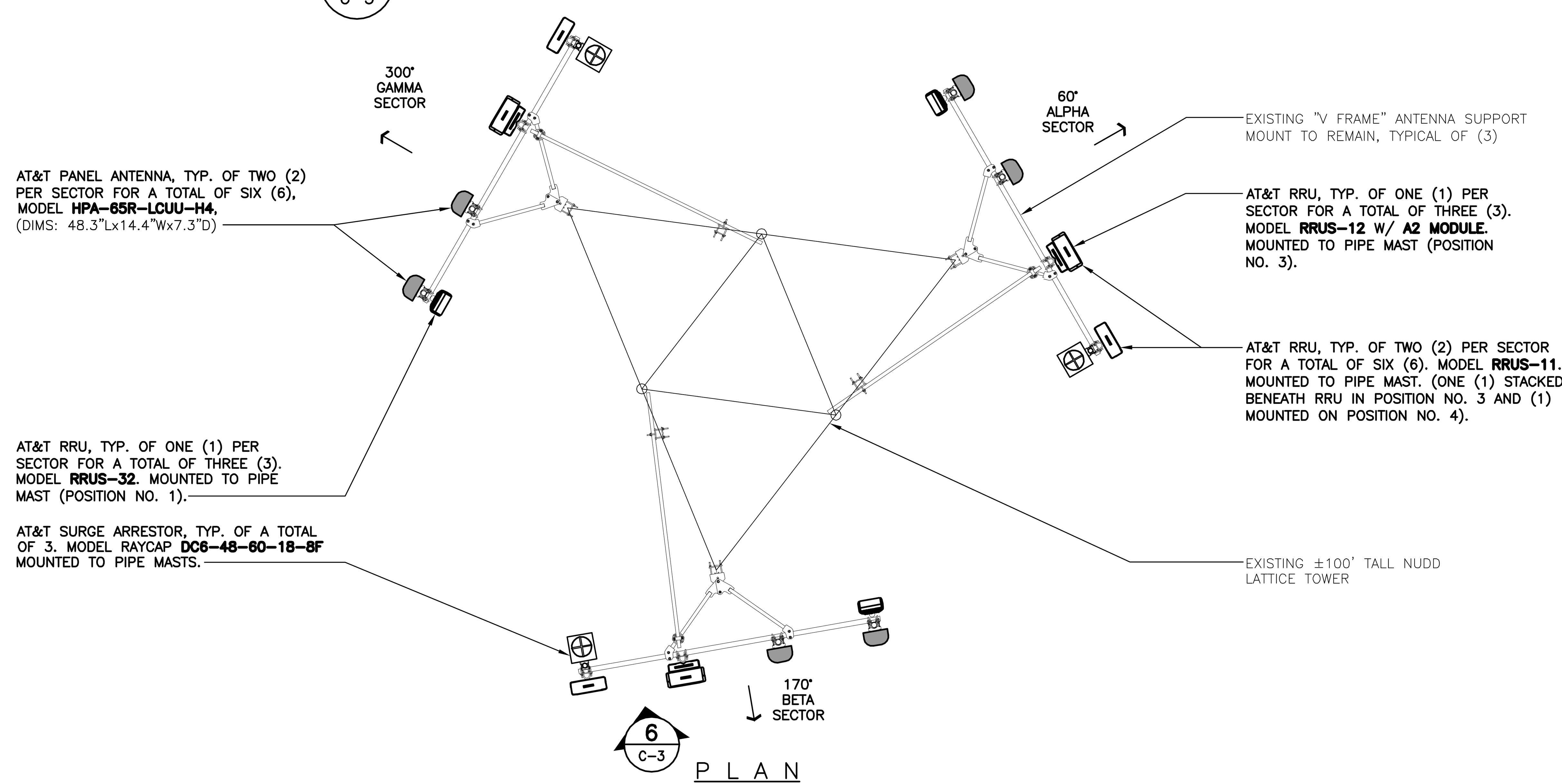


SURGE ARRESTOR			
ARRESTOR MAKE/MODEL	QTY REQUIRED	ARRESTOR LOCATION	WEIGHT
MAKE: RAYCAP (SQUID) MODEL: DC6-48-60-18-8F	(1) PER SECTOR, TOTAL OF (3)	TOWER, ADJACENT TO AT&T ANTENNAS AND RRUs.	20 LBS. (WITHOUT MOUNT)

NOTES:
1. CONTRACTOR TO COORDINATE FINAL SURGE ARRESTOR MODEL SELECTION(S) WITH AT&T CONSTRUCTION MANAGER PRIOR TO ORDERING.
2. CONTRACTOR TO INSTALL ARRESTOR IN CONFORMANCE WITH MANUFACTURERS RECOMMENDATIONS.

4 (C-3) SURGE ARRESTOR DETAIL

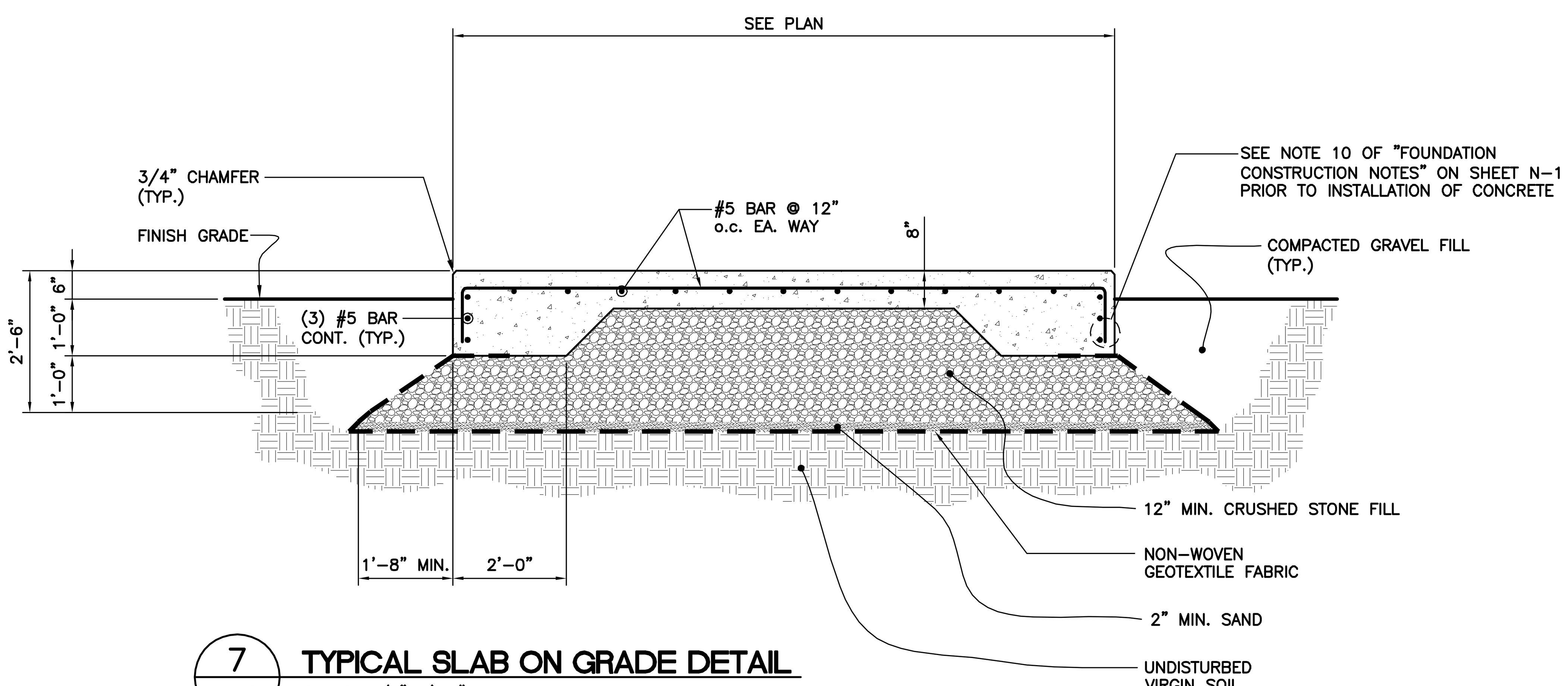
SCALE: NTS



3 (C-3) EXISTING ANTENNA PLAN

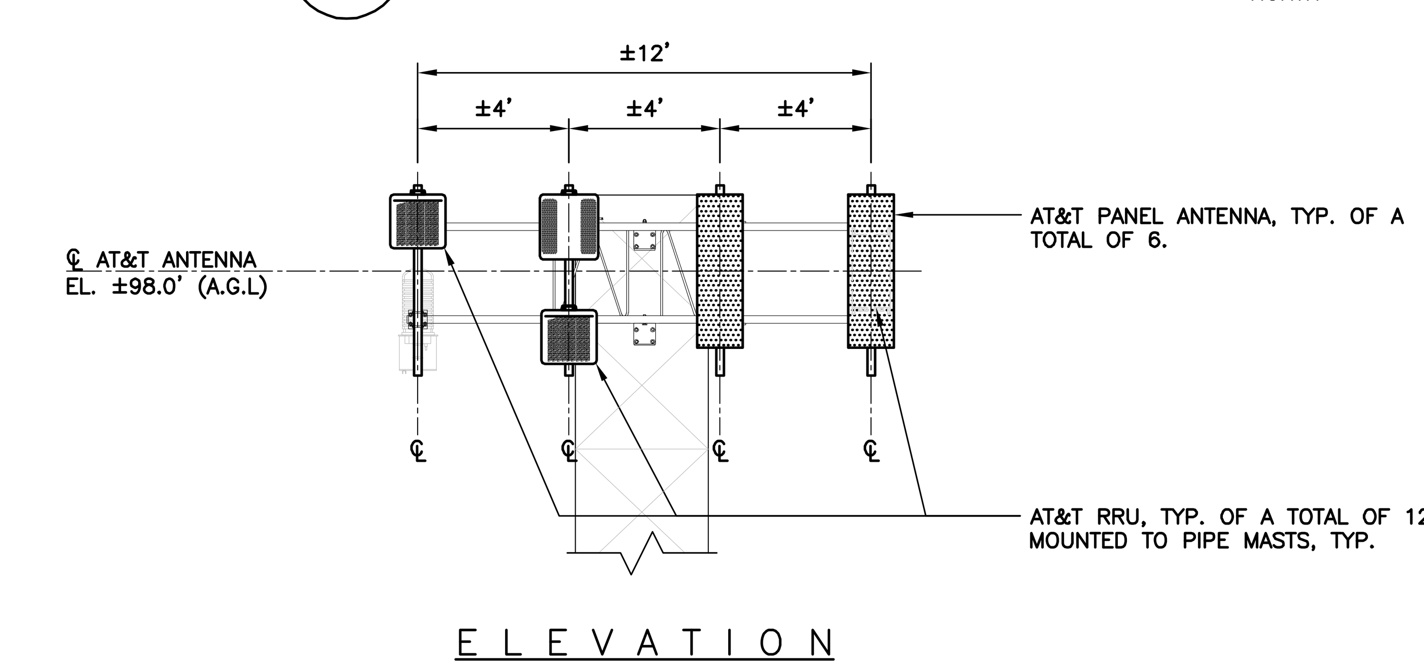
SCALE: 1/4" = 1'-0"

NORTH



7 (C-3) TYPICAL SLAB ON GRADE DETAIL

SCALE: 1/2"=1'-0"



NOTES:
1. PROVIDE MOUNTING PIPES, CROSSOVERS & ASSOCIATED HARDWARE TO COMPLETE THE PROPOSED UPGRADE.
2. REFER TO CENTEK ENGINEERING, INC. AND FINAL AT&T RF DATA SHEET PRIOR TO INSTALLATION OF TOWER MOUNTED ANTENNAS, CABLES AND RELATED EQUIPMENT.

6 (C-3) EXISTING ANTENNA PLAN

SCALE: 1/4" = 1'-0"

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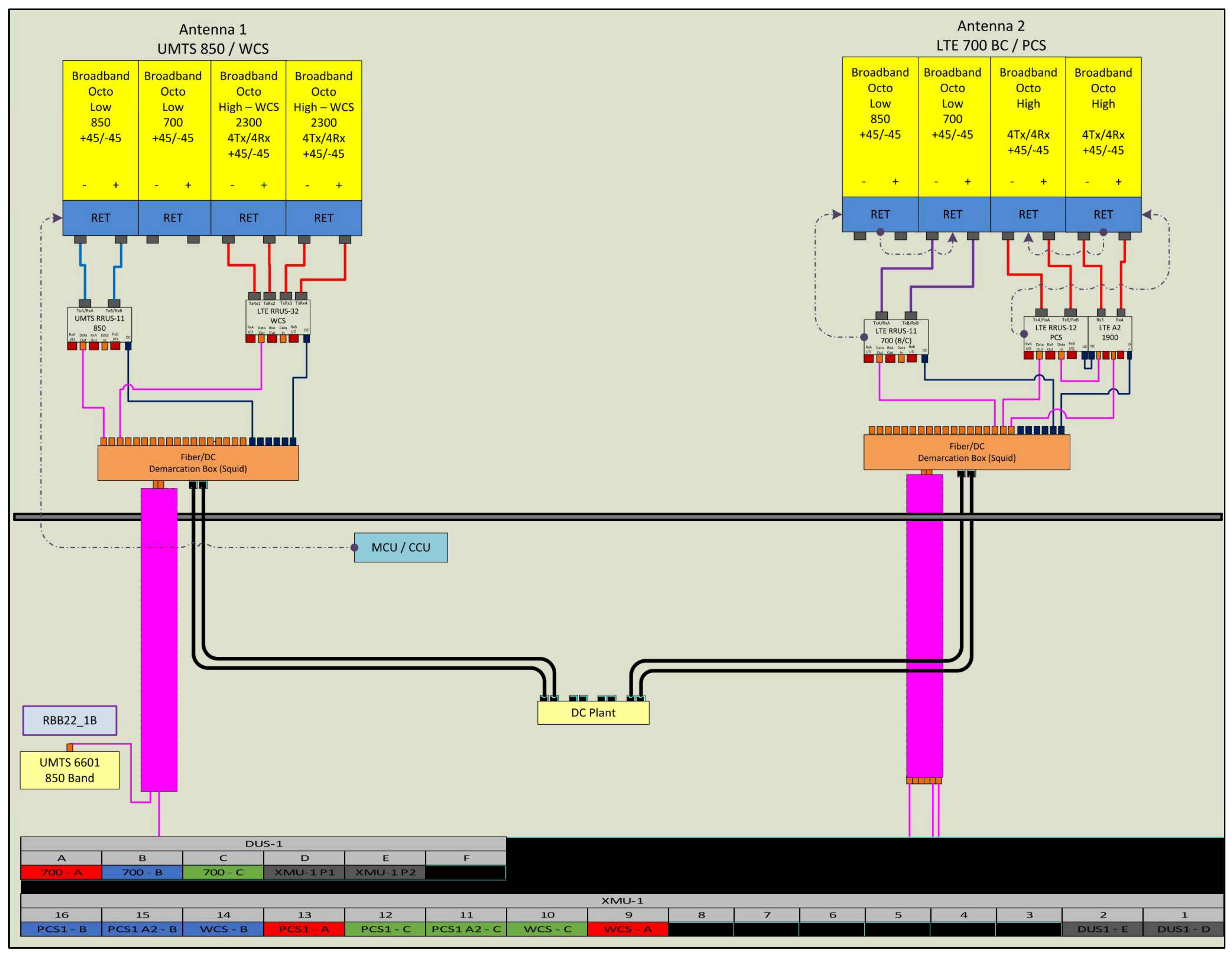
PLANS, ELEVATIONS AND DETAILS

C-3

RF EQUIPMENT TABLE

SECTOR	PANEL ANTENNAS					FILTER	FROM REMOTE RADIO UNIT				REMOTE RADIO UNIT		FROM SURGE SUPPRESSOR				SURGE SUPPRESSOR	FROM SHELTER		
	AZIMUTH	QTY.	MAKE & MODEL	RAD CENTER (AGL)	DOWNTILT	QTY.	COAX QTY.	COAX SIZE	COAX LENGTH	RET QTY.	QTY.	MAKE & MODEL	DC QTY.	DC SIZE	FIBER QTY.	DC & FIBER LENGTH	QUANTITY	DC BUNDLE QTY.	FIBER TRUNK QTY.	FIBER & DC LENGTH
ALPHA	60°	2	CCI OPA-65R-LCUU-H4	98.0'	0°M 0°E	0	12	1/2" Ø	15' ±	1	2 1 1 1	ERICSSON RRUS-11 ERICSSON RRUS-12 ERICSSON RRUS-A2 ERICSSON RRUS-32	5	6MM² PAIR	5	15' ±	3	8	2	195'±
BETA	170°	2	CCI OPA-65R-LCUU-H4	98.0'	0°M 0°E	0	12	1/2" Ø	15' ±	1	2 1 1 1	ERICSSON RRUS-11 ERICSSON RRUS-12 ERICSSON RRUS-A2 ERICSSON RRUS-32	5	6MM² PAIR	5	15' ±				195'±
GAMMA	300°	2	CCI OPA-65R-LCUU-H4	98.0'	0°M 0°E	0	12	1/2" Ø	15' ±	1	2 1 1 1	ERICSSON RRUS-11 ERICSSON RRUS-12 ERICSSON RRUS-A2 ERICSSON RRUS-32	5	6MM² PAIR	5	15' ±				195'±

1 C-4 **RF EQUIPMENT TABLE**
SCALE: NTS



2 C-4 **RF PLUMBING DIAGRAM (TYPICAL)**
SCALE: NTS

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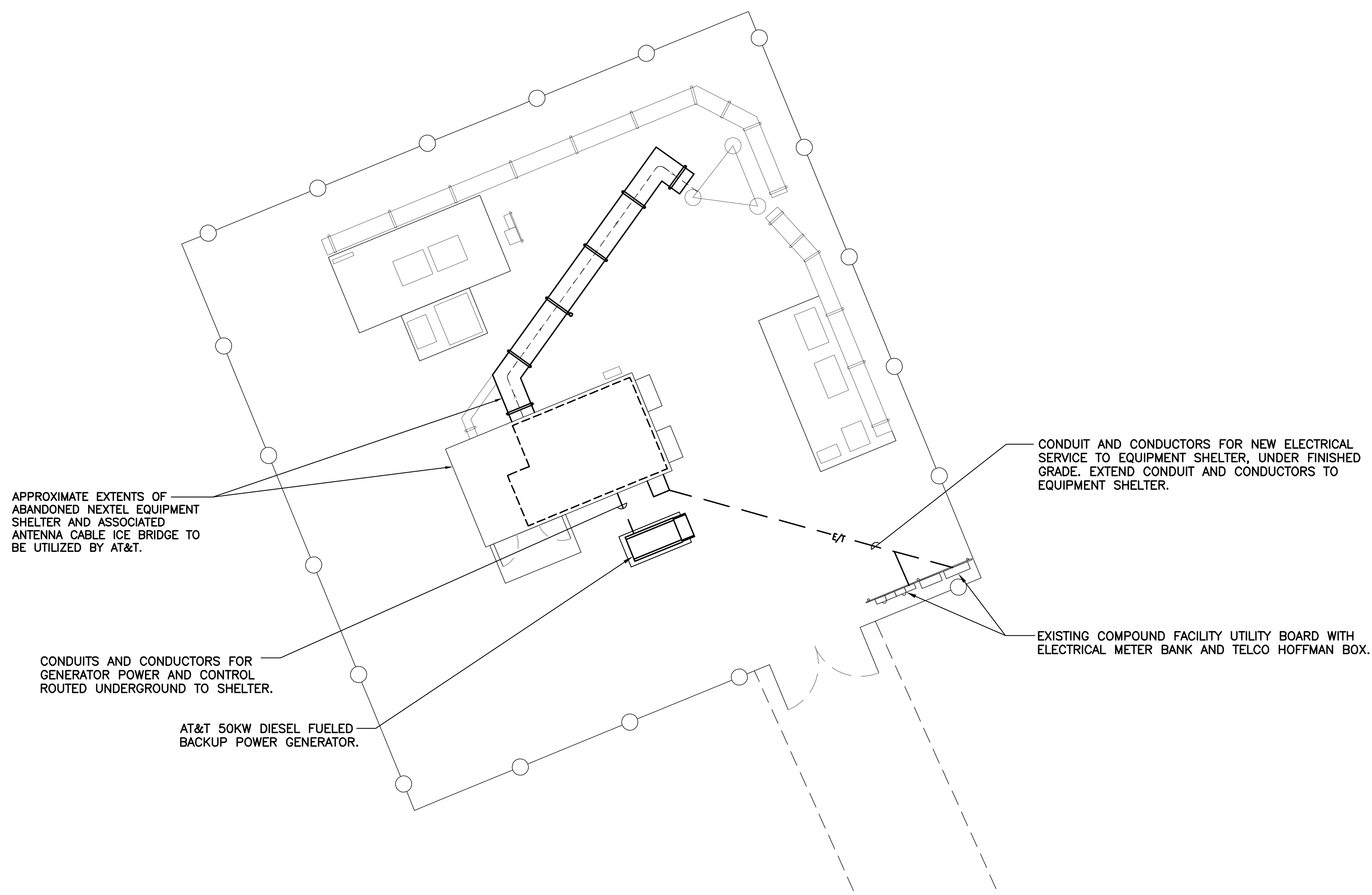
RF EQUIPMENT TABLE AND PLUMBING DIAGRAM

C-4

Sheet No. 6 of 14



1 / E-1 **SITE UTILITY PLAN**
SCALE: 1" = 10'

APPROXIMATE NORTH

GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.

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. REFER TO GROUNDING PLAN FOR INFORMATION ON GROUNDING REQUIREMENTS.
5. CONTRACTOR SHALL COORDINATE WITH CONDUIT ROUTING AND REMOVE AND REINSTALL DEVICES AS REQUIRED TO ACCOMMODATE INSTALLATION. DEVICES SHALL INCLUDE, BUT ARE NOT LIMITED TO: LIGHT FIXTURES, FIRE ALARM DEVICES, CONTROLS, A/V DEVICES, ELECTRICAL DEVICES, ETC.
6. ALL EXISTING PIPING WITHIN THE EXTENT OF WORK AREA SHALL REMAIN UNLESS NOTED OTHERWISE. THE ELECTRICAL CONTRACTOR SHALL RELOCATE/OFFSET EXISTING ELECTRICAL SYSTEMS AS REQUIRED TO ACCOMMODATE THE PROPOSED ARCHITECTURAL/HVAC/PLUMBING/FIRE PROTECTION RENOVATIONS AND ANY PROPOSED NEW CEILING HEIGHTS.
7. CONDUIT PENETRATIONS IN SHELTER SHOWN APPROXIMATE. COORDINATE WITH EXISTING CONDUIT PENETRATIONS AND INSTALL NEW AS REQUIRED. COORDINATE NEW PENETRATION WITH SHELTER MANUFACTURER.

ELECTRICAL LEGEND

SYMBOL	DESCRIPTION
— — — —	GROUND RING
–T———T–	COMMUNICATION CONDUIT
–E———E–	ELECTRICAL CONDUIT AS INDICATED
–F———F–	FIRE ALARM CONDUIT AS INDICATED
(ground bar symbol)	GROUND BAR
⊗	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"
●	MECHANICAL CONNECTION

VERIFY ALL SHELTER DIMENSIONS, EQUIPMENT DIMENSIONS, EQUIPMENT LOCATIONS AND UTILITY OPENINGS WITH BUILDING SHOP DRAWINGS PRIOR TO COMMENCEMENT OF WORK.

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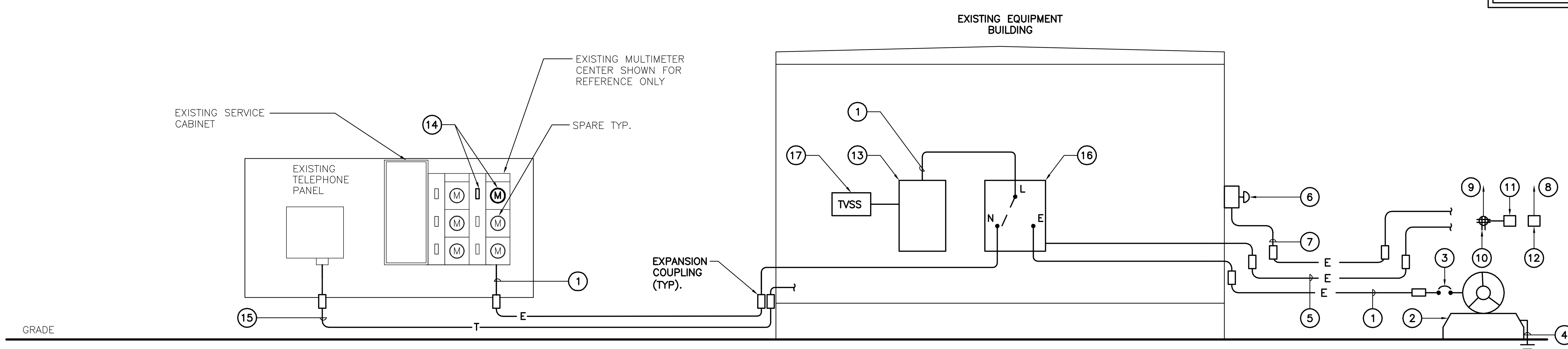
SITE UTILITY PLAN

E-1

Sheet No. 7 of 14



1 E-1 ELECTRICAL POWER RISER DIAGRAM

NOT TO SCALE

ELECTRICAL LEGEND

1. (3) # 3/0 AWG, (1) # 6 AWG GND, MIN 2-1/2" CONDUIT.
2. 50KW DIESEL FUELED GENERATOR.
3. 200A, 240V, MAIN CIRCUIT BREAKER AT GENERATOR OUTPUT.
4. GROUND GENERATOR PER NEC AND MANUFACTURER'S SPECIFICATIONS.
5. 1" CONDUIT WITH CONTROL AND ALARM CONDUCTORS FROM GENERATOR TO TRANSFER SWITCH AND ALARM PANEL IN SHELTER. INSTALL CONDUCTORS AS REQUIRED BY MANUFACTURER.
6. REMOTE GENERATOR SHUT OFF SWITCH IN BREAK GLASS ENCLOSURE MOUNTED TO THE EXTERIOR OF THE SHELTER IN LOCATION APPROVED BY LOCAL FIRE MARSHAL. INSTALL ALL REQUIRED SIGNAGE.
7. 3/4" CONDUIT AND CONDUCTORS REQUIRED FOR PROPER OPERATION OF EMERGENCY GENERATOR SHUT OFF SWITCH.
8. DEDICATED 20A, 120V, CIRCUIT IN 3/4" CONDUIT FROM OWNER'S ELECTRIC PANEL TO GENERATOR BLOCK HEATER.
9. DEDICATED 20A, 120V, CIRCUIT IN 3/4" CONDUIT FROM OWNER'S ELECTRIC PANEL TO GENERATOR BATTERY CHARGER AND DUPLEX RECEPTACLE.
10. WEATHER RESISTANT DUPLEX GFCI RECEPTACLE IN WEATHERPROOF ENCLOSURE MOUNT IN CONVENIENT LOCATION AT GENERATOR.
11. GENERATOR BATTERY CHARGER.
12. GENERATOR BLOCK HEATER.
13. 200A, 240V, ELECTRIC PANEL, WITH 42 POSITIONS, SURFACE MOUNT, 200A MCB, BOLT ON BREAKERS, AIC RATING TO EXCEED AVAILABLE FAULT CURRENT FROM UTILITY COMPANY.
14. PROVIDE 120/240AC, 200 AMP., 1ϕ, 3 WIRE REVENUE METER WITH 200 AMP, 2P BREAKER IN SPARE METER AND BREAKER LOCATION. (ALL SERVICE EQUIPMENT MUST BE UTILITY CO. APPROVED. COORDINATE WITH UTILITY COMPANY TO REASSIGN EXISTING NEXTEL METER IF POSSIBLE).
15. (2) 4"C, WITH CONDUCTORS REQUIRED FOR TELEPHONE SERVICE. COORDINATE REQUIREMENTS WITH OWNER AND TELEPHONE UTILITY COMPANY.
16. AUTOMATIC TRANSFER SWITCH: 200A, 240V, SINGLE PHASE, SOLID NEUTRAL, OPEN TRANSITION, NEMA-1 (ASCO 300 SERIES).
17. INSTALL AT&T APPROVED TRANSIENT VOLTAGE SURGE SUPPRESSOR ALONG WITH CONDUIT CONDUCTORS AND CIRCUIT BREAKER AS SPECIFIED BY MANUFACTURER FOR PROPER OPERATION. FOR BID PURPOSES ASSUME RAYCAP MODEL AM2080-V-07 WITH 100A, 3P CIRCUIT BREAKER AND 1/0 CONDUCTORS.

EXISTING CONDUITS, CONDUCTORS, AND OTHER EQUIPMENT MAY BE REUSED WITH AT+T APPROVAL AND ONLY IF THEY ARE THOROUGHLY TESTED AND MEET AT+T STANDARDS AND SATISFY THE SPECIFICATIONS WITHIN THESE PLANS AND CURRENT CODE REQUIREMENTS.

NOTES:

1. EXISTING SITE UTILITIES SHOWN APPROXIMATE. VERIFY ARRANGEMENT IN FIELD.
2. PROVIDE LABEL AT AT&T METER STATING "AT&T".
3. PROVIDE LABEL AT AT&T SERVICE EQUIPMENT STATING TYPE AND LOCATION OF AT&T ONSITE GENERATOR.
4. COORDINATE WITH AT&T CONSTRUCTION MANAGER FOR ANY REQUIRED UPGRADES TO INTERIOR FITOUT OF EXISTING SHELTER BEING USED. THE SCOPE OF THIS PROJECT SHALL INCLUDE ALL UPGRADES TO EXISTING EQUIPMENT SHELTER.

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SCHEMATIC RISER AND NOTES

E-2

GROUNDING REUSE NOTE

EXISTING ONSITE GROUNDING ELEMENTS MAY BE USED WITH WIRELESS CARRIERS APPROVAL AND ONLY IF THEY ARE THOROUGHLY TESTED AND MEET WIRELESS CARRIERS STANDARDS AND SATISFY THE SPECIFICATIONS WITHIN THESE PLANS AND CURRENT CODE REQUIREMENTS.

GROUNDING SCHEMATIC NOTES

1. #2 AWG GREEN INSULATED
2. GROUND RING, #2 AWG BCW
3. #2/0 GREEN INSULATED
4. #6 AWG
5. REFER TO RISER DIAGRAM FOR SPECIFICATIONS
6. BOND ALL HALO GROUND RING TAILS TO GROUND RING. COORDINATE LOCATION AND QUANTITY WITH EQUIPMENT ROOM/SHELTER DRAWINGS

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.
13. ALL EXPOSED METAL OBJECTS IN SHELTER SHALL BE BONDED TO THE HALO GROUND WITHIN THAT ROOM.
14. BOND GENERATOR TO GROUND PER NEC AND MANUFACTURERS SPECIFICATIONS
15. COORDINATE WITH TOWER OWNER BEFORE INSTALLING ANY GROUNDING ELEMENTS ON TOWER OR BONDING TO EXISTING TOWER GROUND RING.

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.

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 203-289-0285) 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

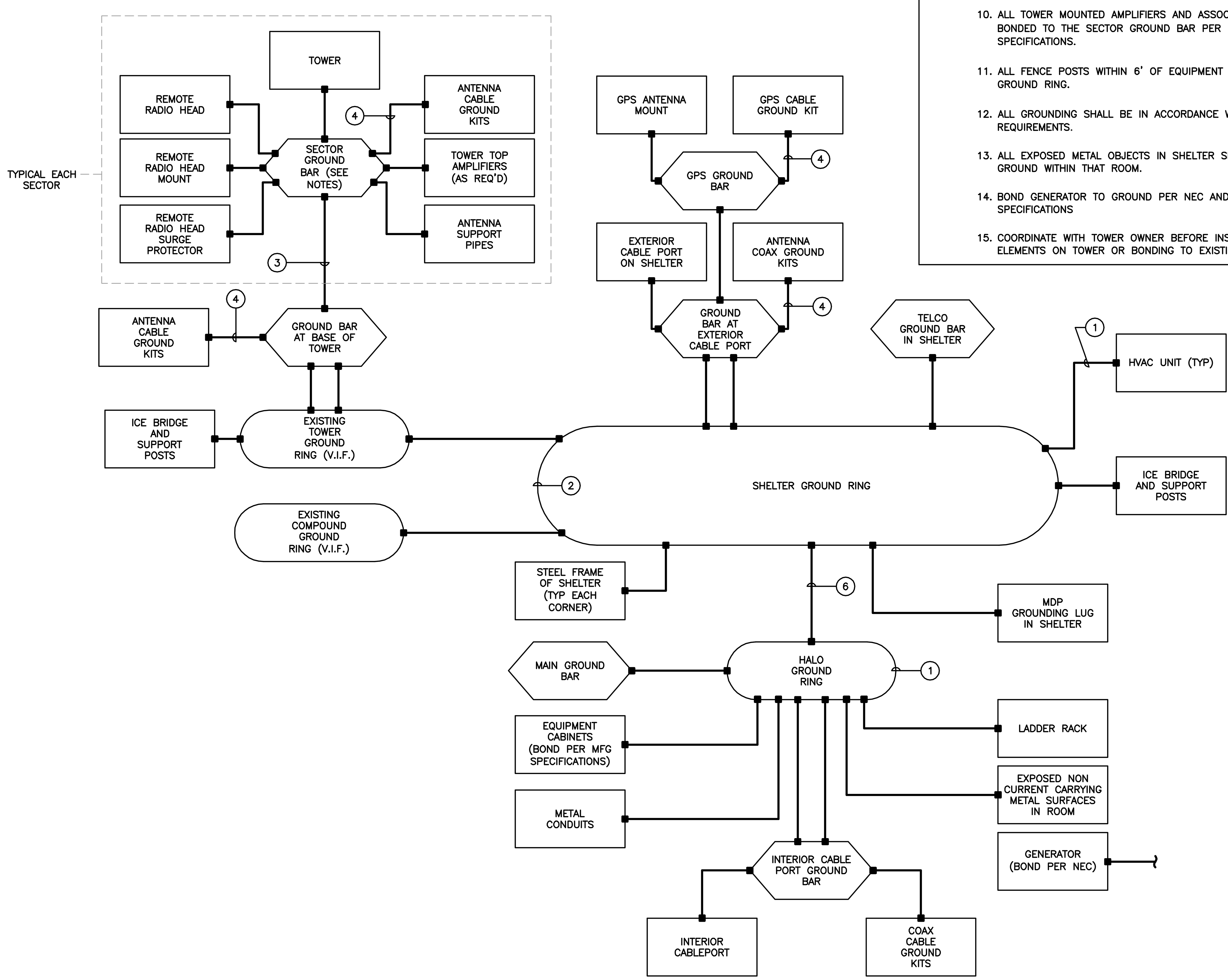
BOND THE EGR DOWN CONDUCTORS, AND/OR BURIED GROUND RING TO ANY METALLIC OBJECT OR EXISTING GROUNDING SYSTEM WITHIN 6'.

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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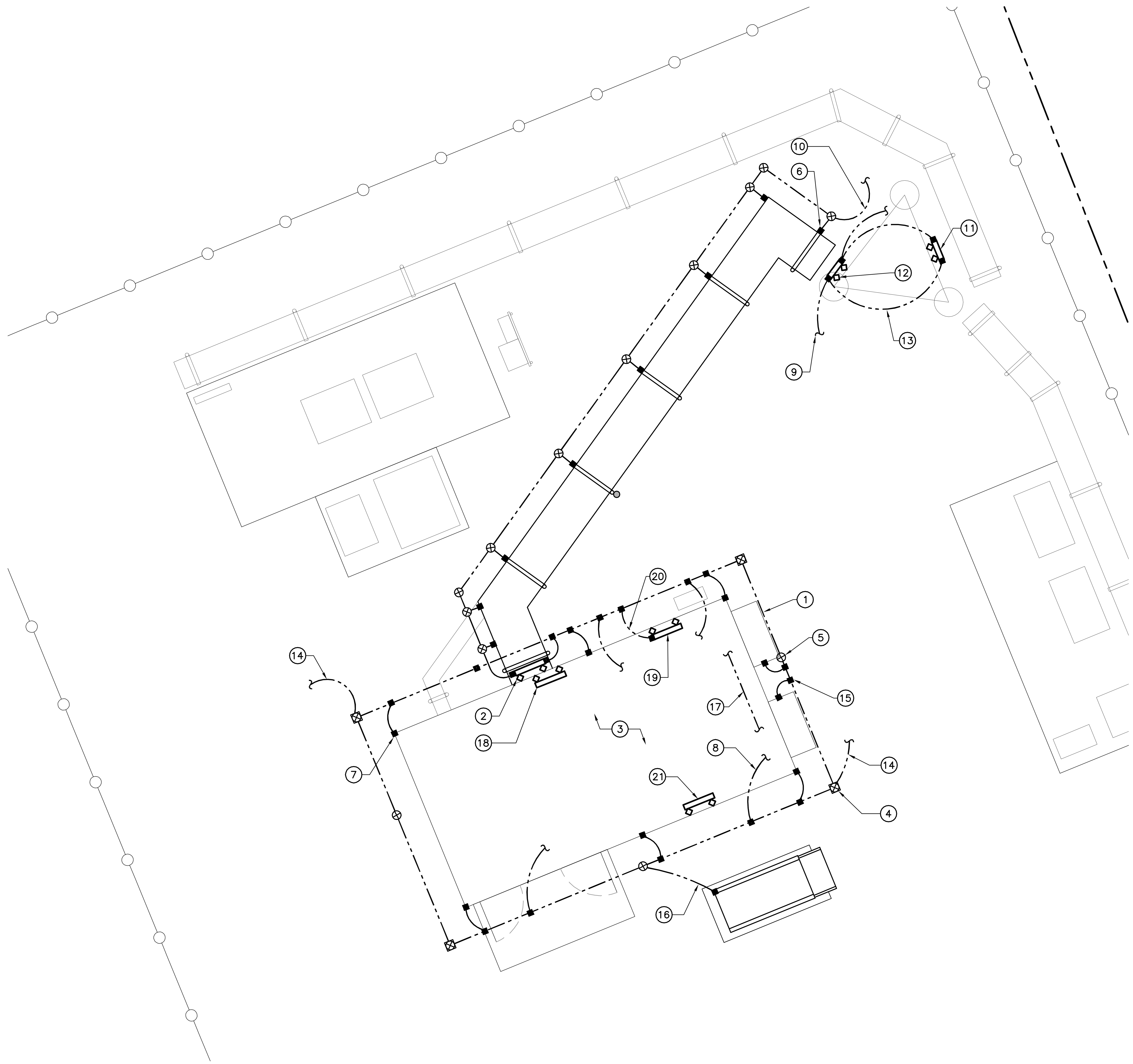
SCHEMATIC GROUNDING PLAN AND NOTES

E-3

Sheet No. 9 of 14



1 / E-4 **COMPOUND GROUNDING PLAN**
SCALE: 1/4" = 1'-0"

APPROXIMATE NORTH

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

GROUNDING PLAN NOTES

1. #2 SOLID TINNED BCW GROUND RING (2'-0" FROM OUTSIDE EDGE OF EQUIPMENT SHELTER FOUNDATION) (TYP.).
2. WAVEPORT GROUND BAR PER DETAILS.
3. BOND ALL EQUIPMENT CABINETS TO GROUND PER MFG SPECIFICATIONS.
4. GROUNDING ROD WITH ACCESS (TYP.) PER DETAILS.
5. GROUNDING ROD (TYP.) PER DETAILS.
6. ICE BRIDGE POST AND COVER. BOND EACH SECTION AND SUPPORT TO GROUND RING PER DETAILS.
7. CADWELD EQUIPMENT BUILDING TO GROUND RING (TYP. EACH CORNER).
8. EXTEND GROUND RING PIGTAIL THROUGH SHELTER AND BOND TO HALO GROUND DOWNLEAD. (TYP. 4 PLACES)
9. BOND GROUND BAR TO EXISTING TOWER GROUND RING (TYP OF 2). CONTRACTOR TO VERIFY LOCATION IN FIELD.
10. BOND SHELTER GND RING TO EXISTING TOWER GROUND RING WITH #2 AWG BCW.
11. UPPER TOWER MOUNTED GROUND BAR PER DETAILS.
12. LOWER TOWER MOUNTED GROUND BAR PER DETAILS.
13. BOND UPPER TOWER MOUNTED GROUND BAR TO LOWER TOWER MOUNTED GROUND BAR (2 GROUND LEADS) PER DETAILS.
14. BOND SHELTER GROUND RING TO EXISTING COMPOUND GROUND RING. (MINIMUM TWO PLACES.)
15. BOND HVAC UNIT TO GROUND RING (TYPICAL).
16. BOND GENERATOR TO GROUND PER NEC AND MANUFACTURER SPECIFICATIONS.
17. INSTALL #2 AWG GREEN INSULATED HALO GROUND NEAR CEILING ALONG PERIMETER OF EQUIPMENT ROOM. BOND TO ALL INTERIOR GROUND BARS WITH TWO #2 AWG GREEN INSULATED. BOND TO GROUND RING LEADS WITH NON-DIRECTIONAL SPLICES AS SHOWN IN DETAILS.
18. INTERIOR CABLE PORT GROUND BAR.
19. TELCO GROUND BAR (LOCATION SHOWN FOR REFERENCE ONLY. COORDINATE LOCATION WITH OWNER.)
20. BOND TO GROUND RING WITH #2 AWG.
21. MAIN GROUND BAR (LOCATION SHOWN FOR REFERENCE ONLY. COORDINATE LOCATION WITH OWNER.)

GROUNDING REUSE NOTE

EXISTING ONSITE GROUNDING ELEMENTS MAY BE USED WITH WIRELESS CARRIERS APPROVAL AND ONLY IF THEY ARE THOROUGHLY TESTED AND MEET WIRELESS CARRIERS STANDARDS AND SATISFY THE SPECIFICATIONS WITHIN THESE PLANS AND CURRENT CODE REQUIREMENTS.

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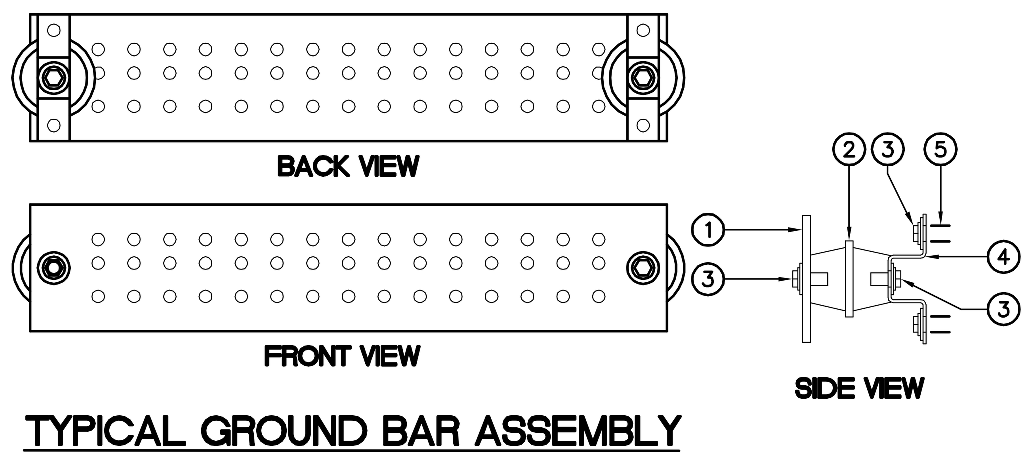
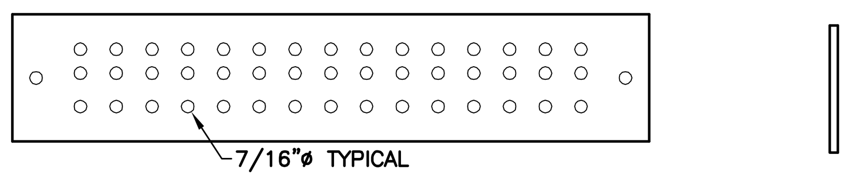
GROUNDING PLAN

E-4



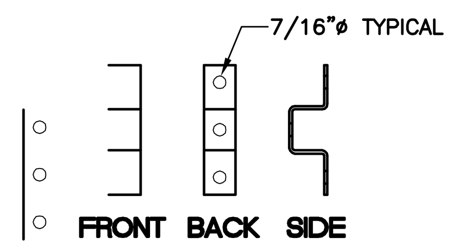
TYPICAL GROUND BAR ASSEMBLY
N.T.S.



TYPICAL GROUND BAR - DIMENSIONS
N.T.S.

NOTES

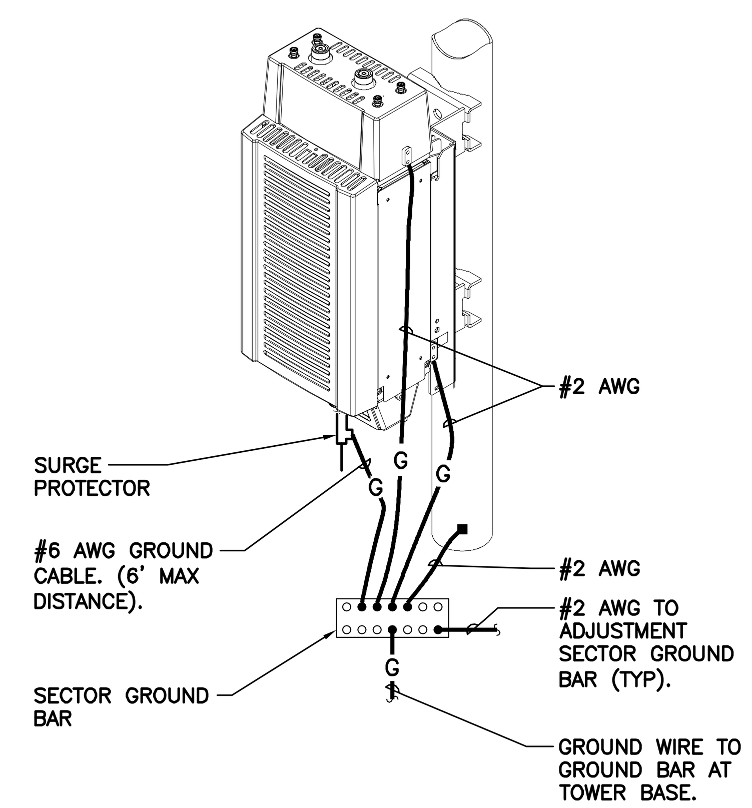
1. HIGH CONDUCTIVITY TINNED COPPER BAR 1'-8"Lx4"Wx1/4"D.
2. RED COLORED STANDOFF INSULATOR PLASTIC #1872-1A.
3. STAINLESS STEEL TRUSS SPANNER MACHINE SCREWS, SPLIT LOCKWASHER AND FLAT WASHER.
4. 1"Wx1/8"T STAINLESS STEEL TYPE 304 BRACKET.
5. STAINLESS STEEL TYPE 304 HARDWARE - 3/8"ø EXPANSION BOLT FOR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



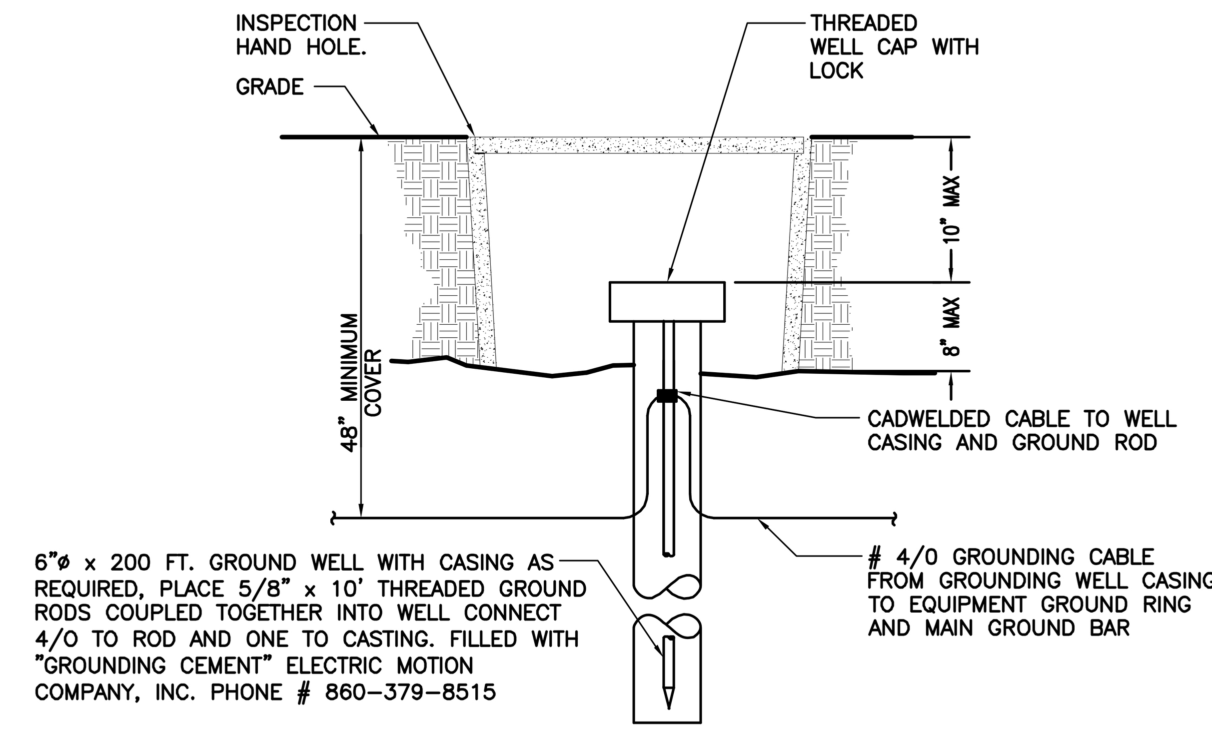
BRACKET FOR GROUND BAR-DIMENSIONS
N.T.S.

1 (E-5) MASTER/EQUIPMENT GROUND BAR DETAILS
N.T.S.

EACH RRH CABINET SHALL BE GROUNDED IN THE FOLLOWING MANNER:
1. AT TOP OF THE CABINET
2. AT RIGHT SIDE OF THE CABINET.



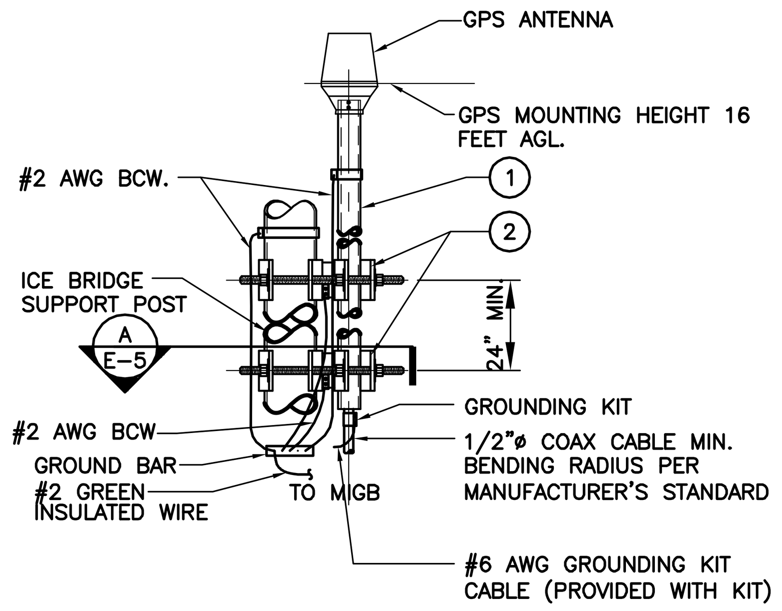
2 (E-5) RRH POLE MOUNT GROUNDING
NOT TO SCALE



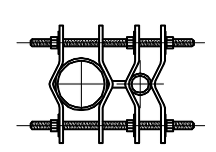
NOTES:

1. INSPECTION HAND HOLE MAY BE CONCRETE OR PVC AND SHALL BE A MINIMUM OF 12" DIA X 18" DEEP.
2. TO BE INCORPORATED INTO PROJECT IF 5 OHMS CAN NOT BE ACHIEVED AT THE PROJECT SITE

3 (E-5) GROUNDING WELL DETAIL
NOT TO SCALE



GPS ANTENNA MOUNTING BRACKET



A (E-5) SECTION
NOT TO SCALE

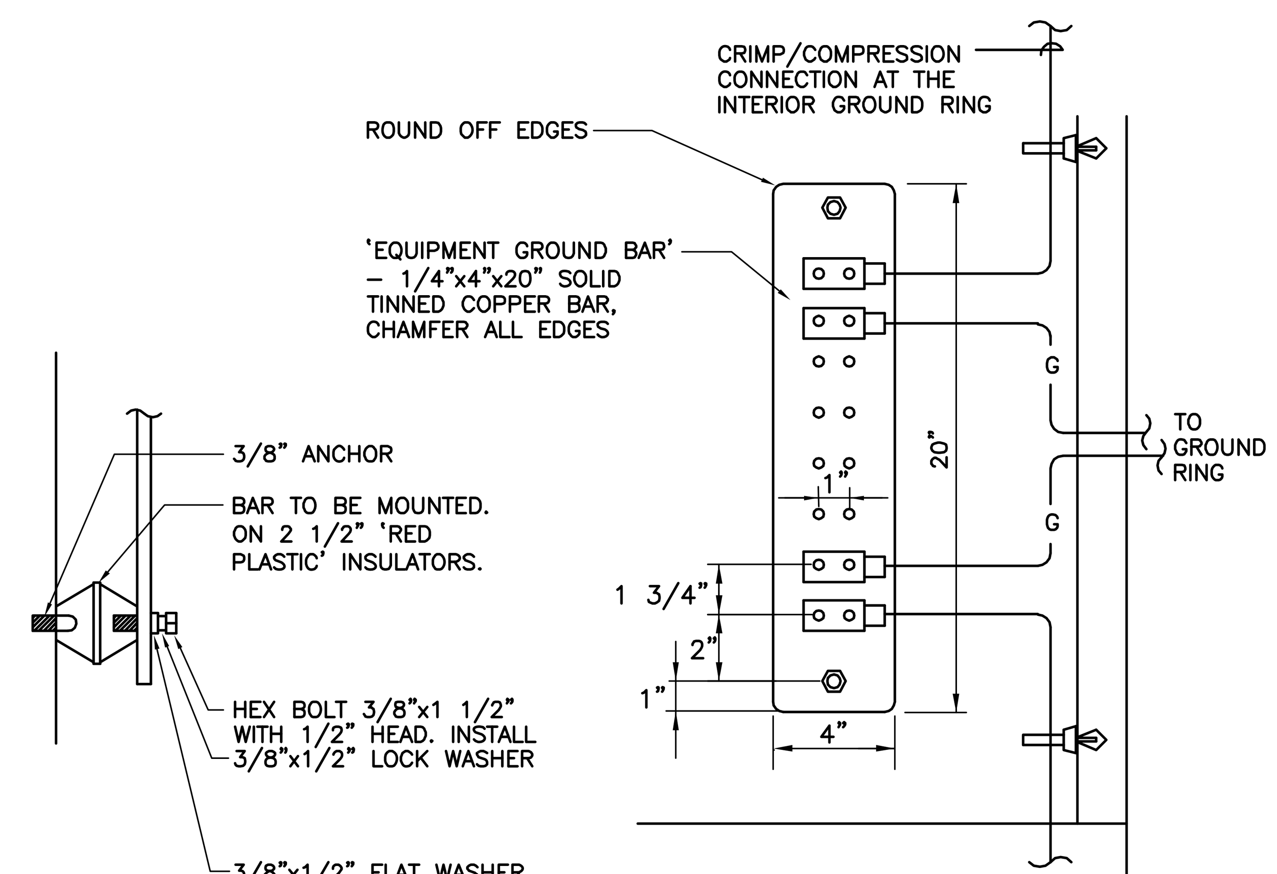
BILL OF MATERIALS

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

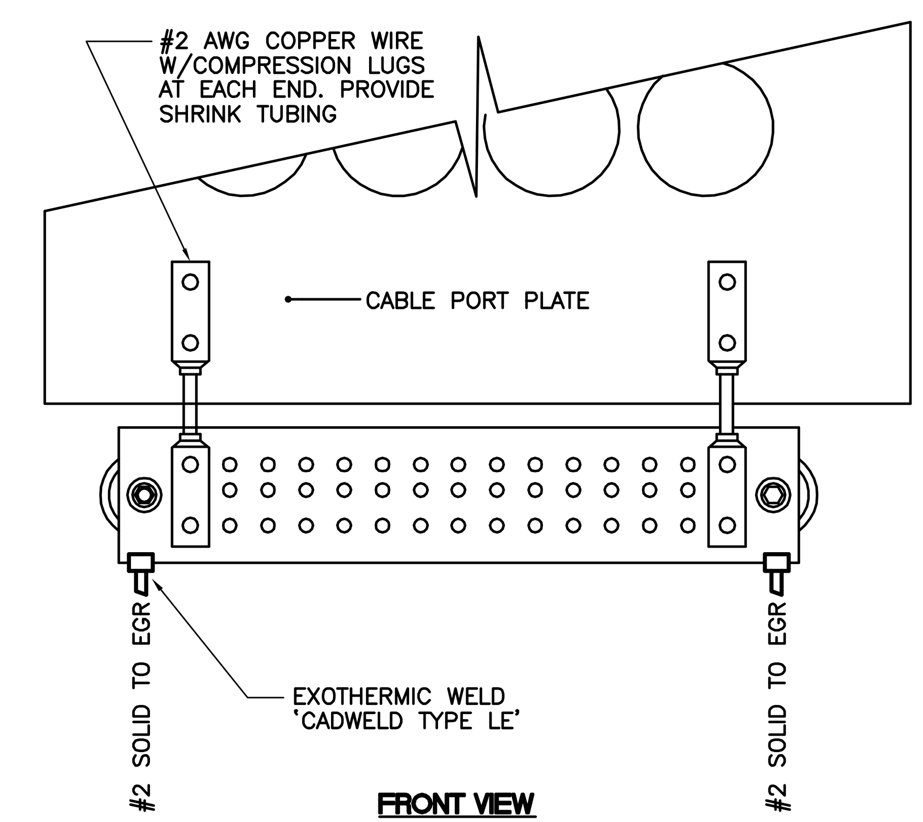
NOTES

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.

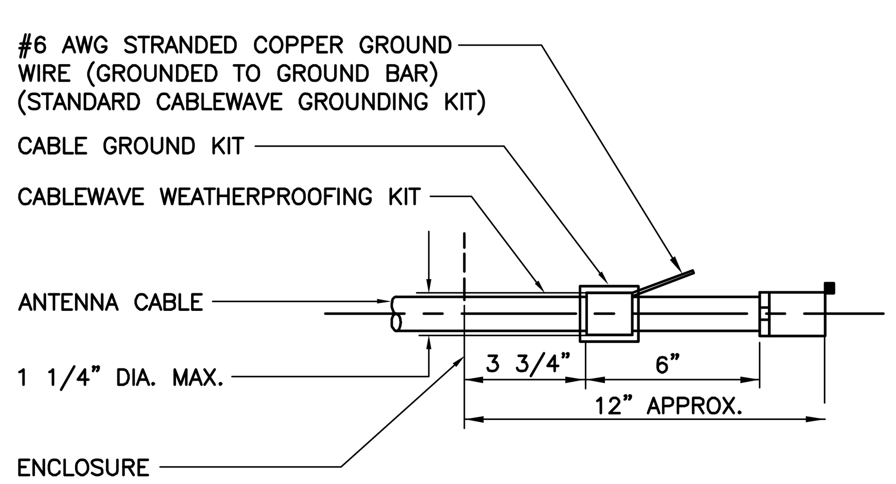
4 (E-5) GPS GROUNDING/MOUNTING BRACKET DETAIL
NOT TO SCALE



5 (E-5) EQUIPMENT GROUND BAR DETAIL
NOT TO SCALE



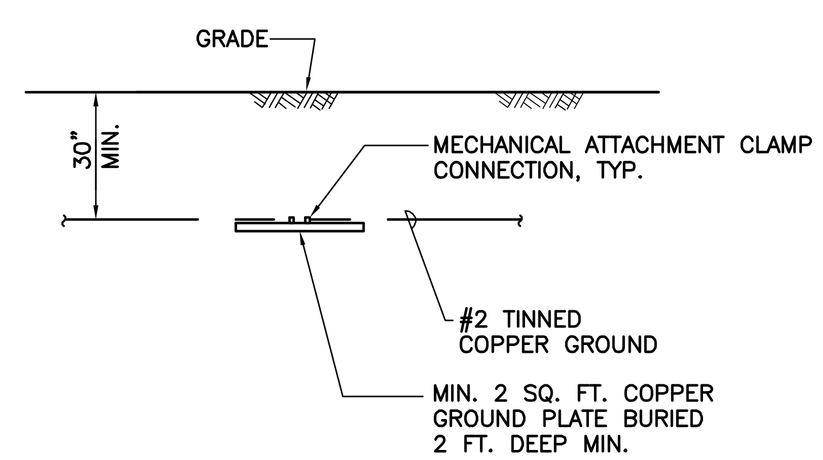
6 (E-5) CABLEPORT GROUND BAR LUG CONNECTION
NOT TO SCALE



NOTE:

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

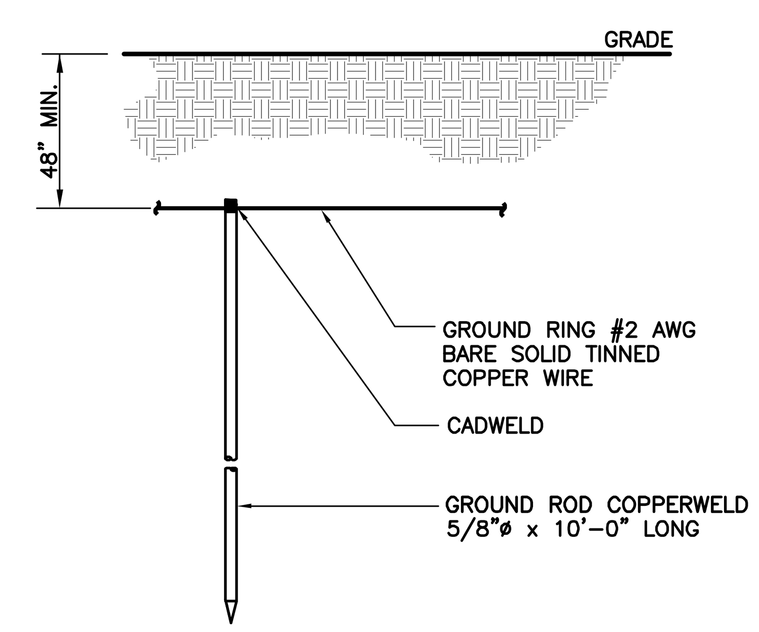
7 (E-5) ANTENNA CABLE GROUNDING DETAIL
NOT TO SCALE



NOTE:

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.

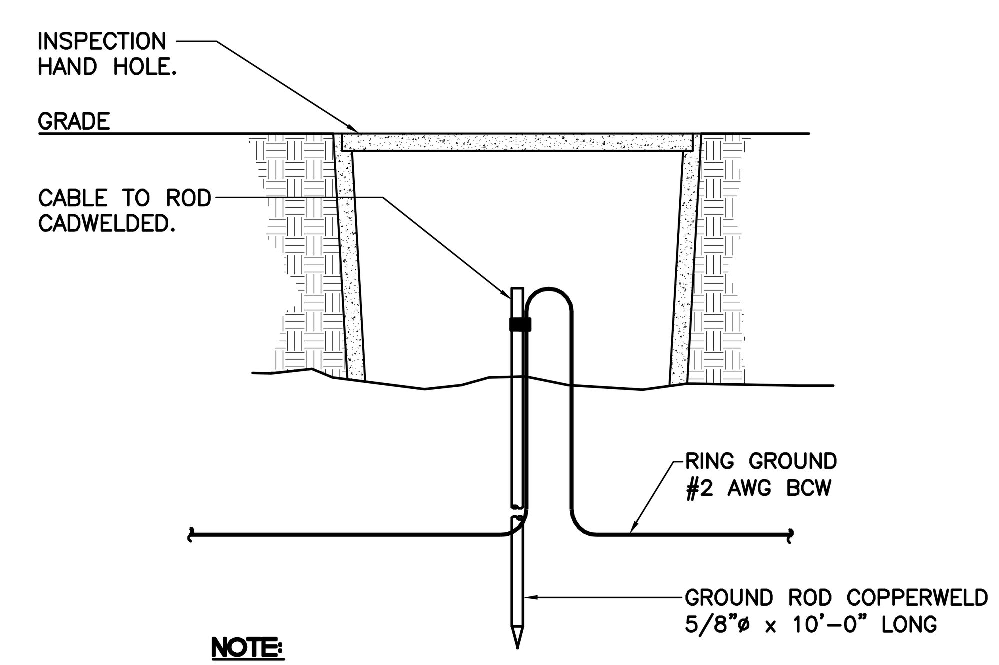
7A (E-5) GROUND PLATE DETAIL
NOT TO SCALE



NOTE:

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



NOTE:

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

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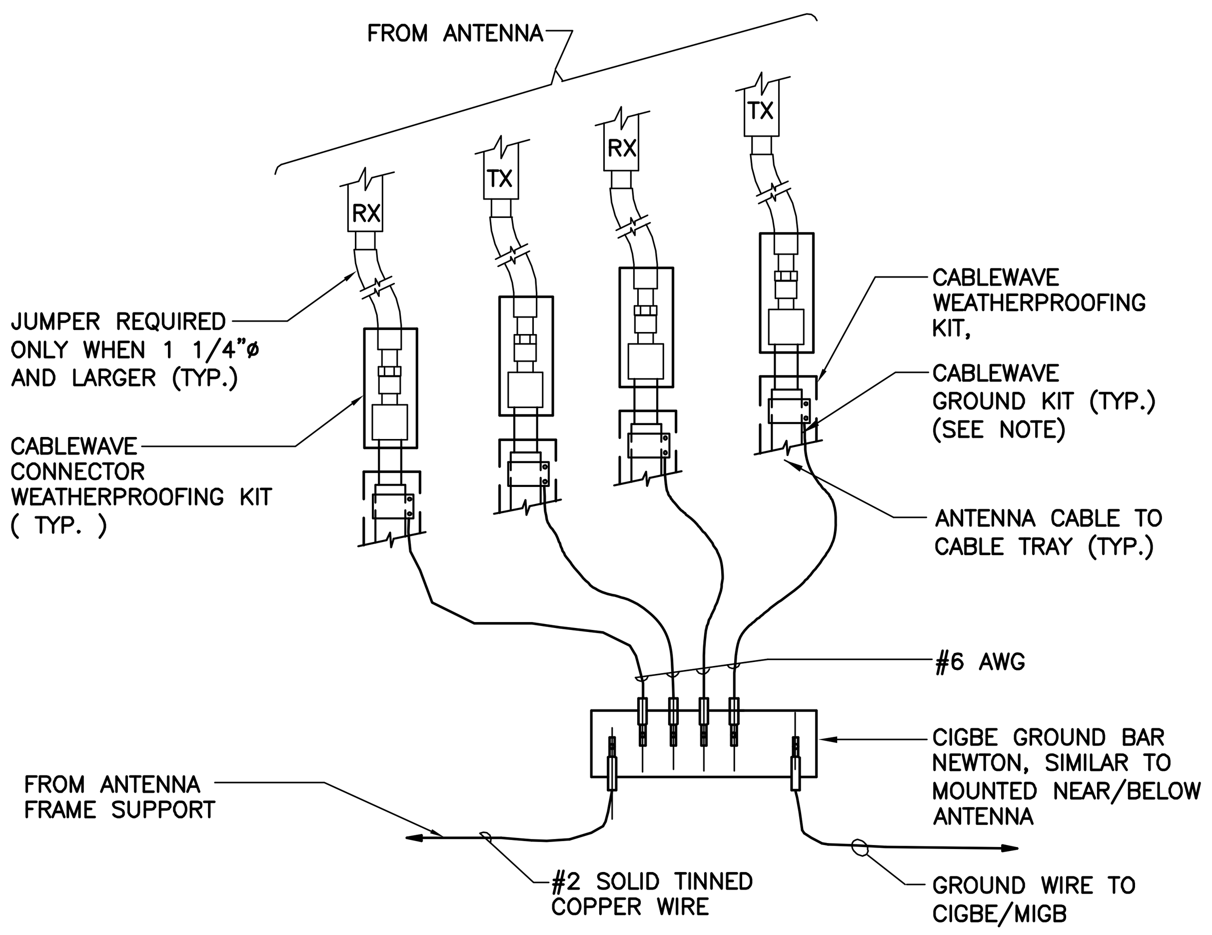
DETAILS

E-5

Sheet No. 11 of 14

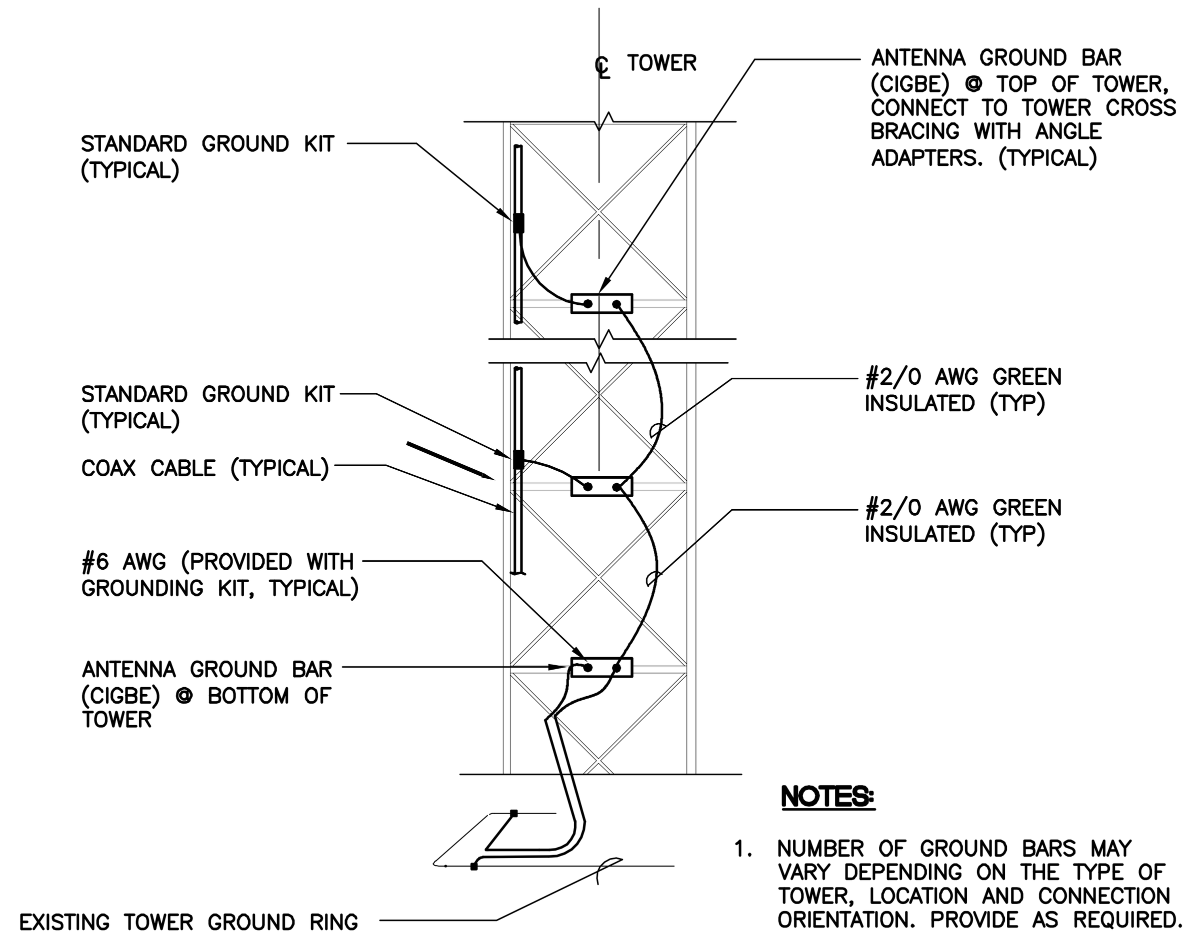


NOTE:

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

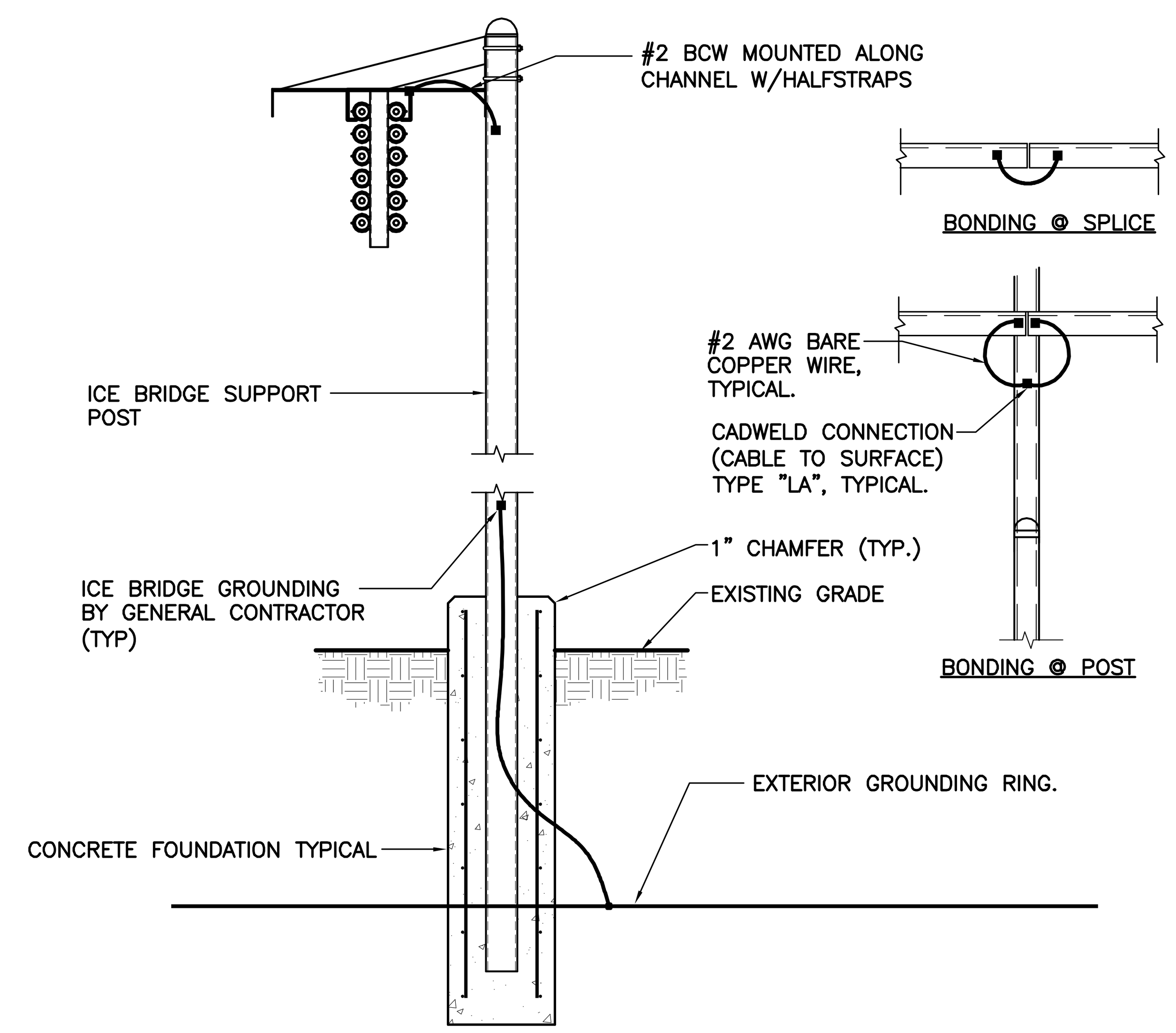


NOTES:

1. NUMBER OF GROUND BARS MAY VARY DEPENDING ON THE TYPE OF TOWER, LOCATION AND CONNECTION ORIENTATION. PROVIDE AS REQUIRED.

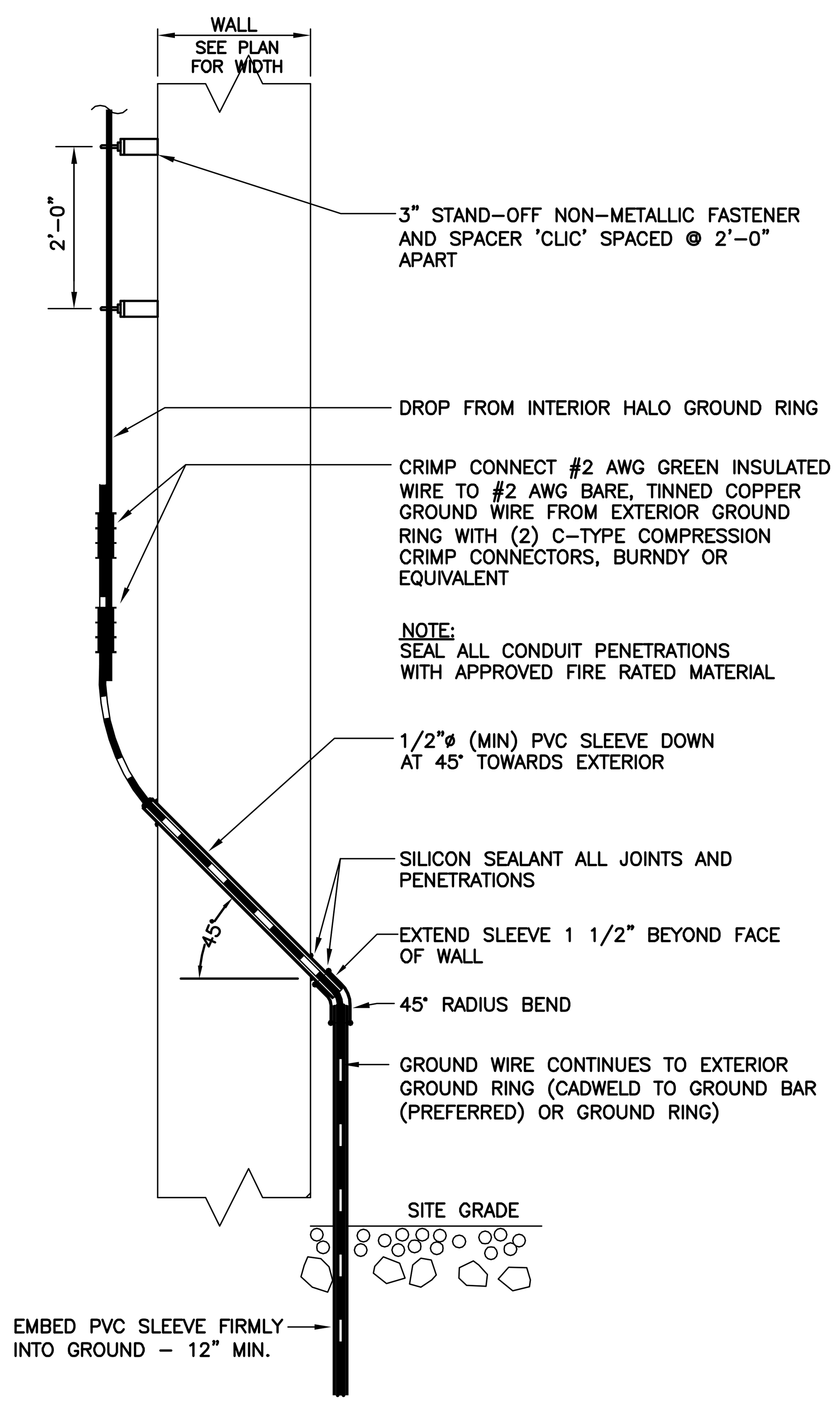
2/E-6 ANTENNA CABLE GROUNDING - LATTICE TOWER

NOT TO SCALE



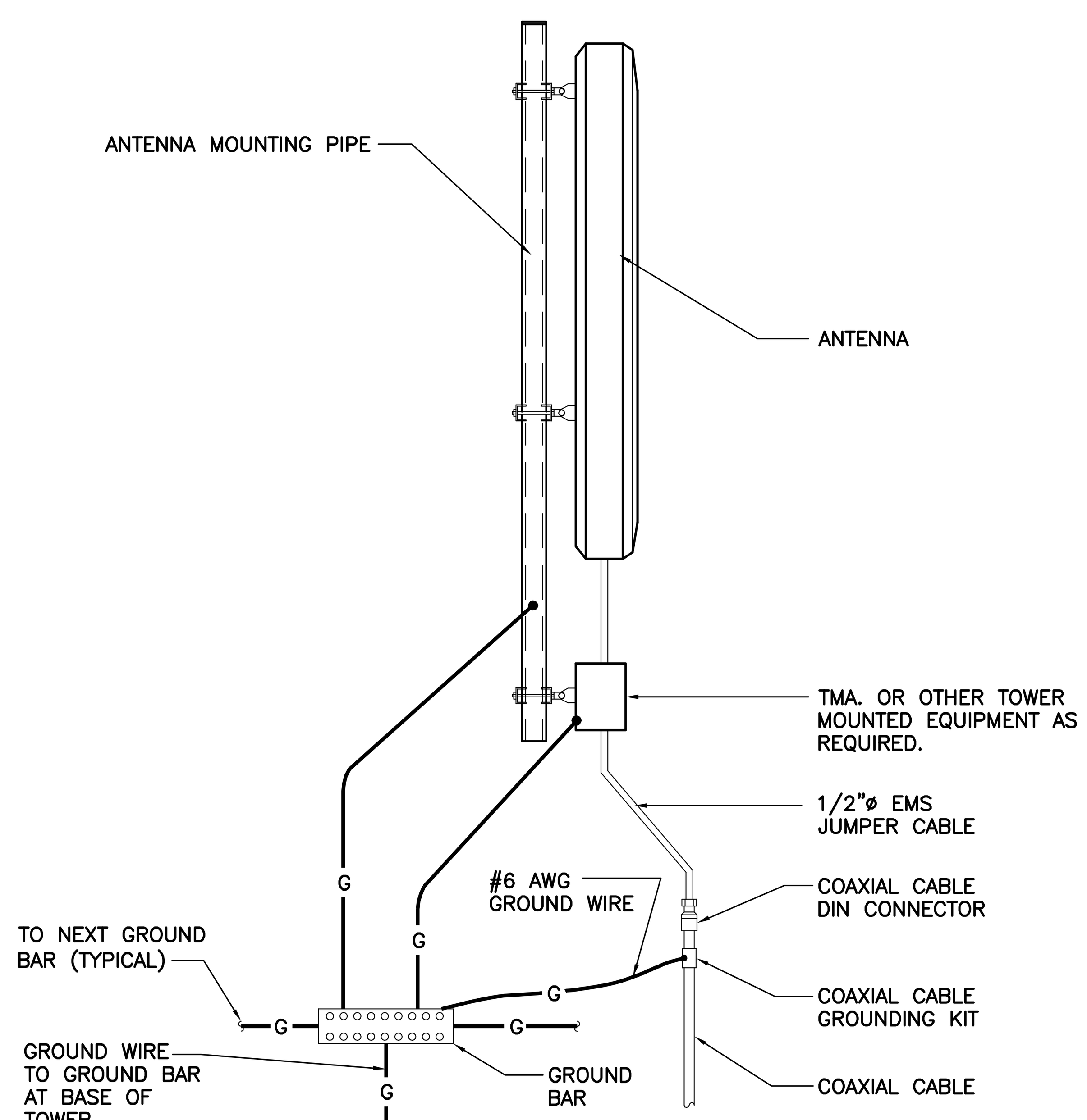
3/E-6 ICE BRIDGE BONDING DETAIL

NOT TO SCALE



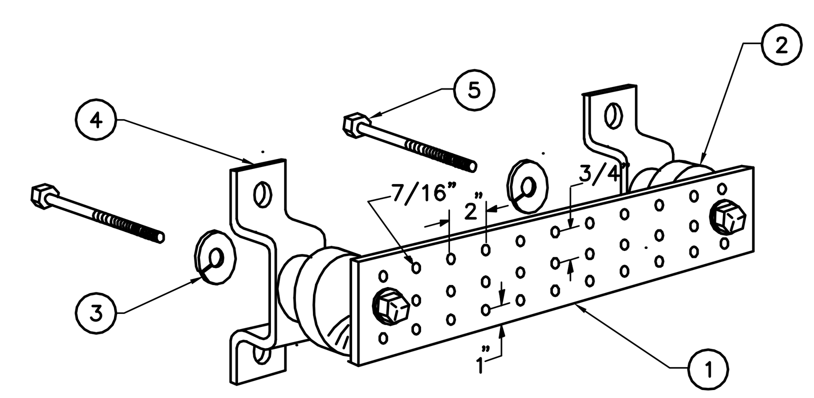
4/E-6 CELLULAR GROUNDING CONDUCTOR SECURED ON WALL

N.T.S.



5/E-6 TYPICAL ANTENNA GROUNDING DETAIL

NOT TO SCALE

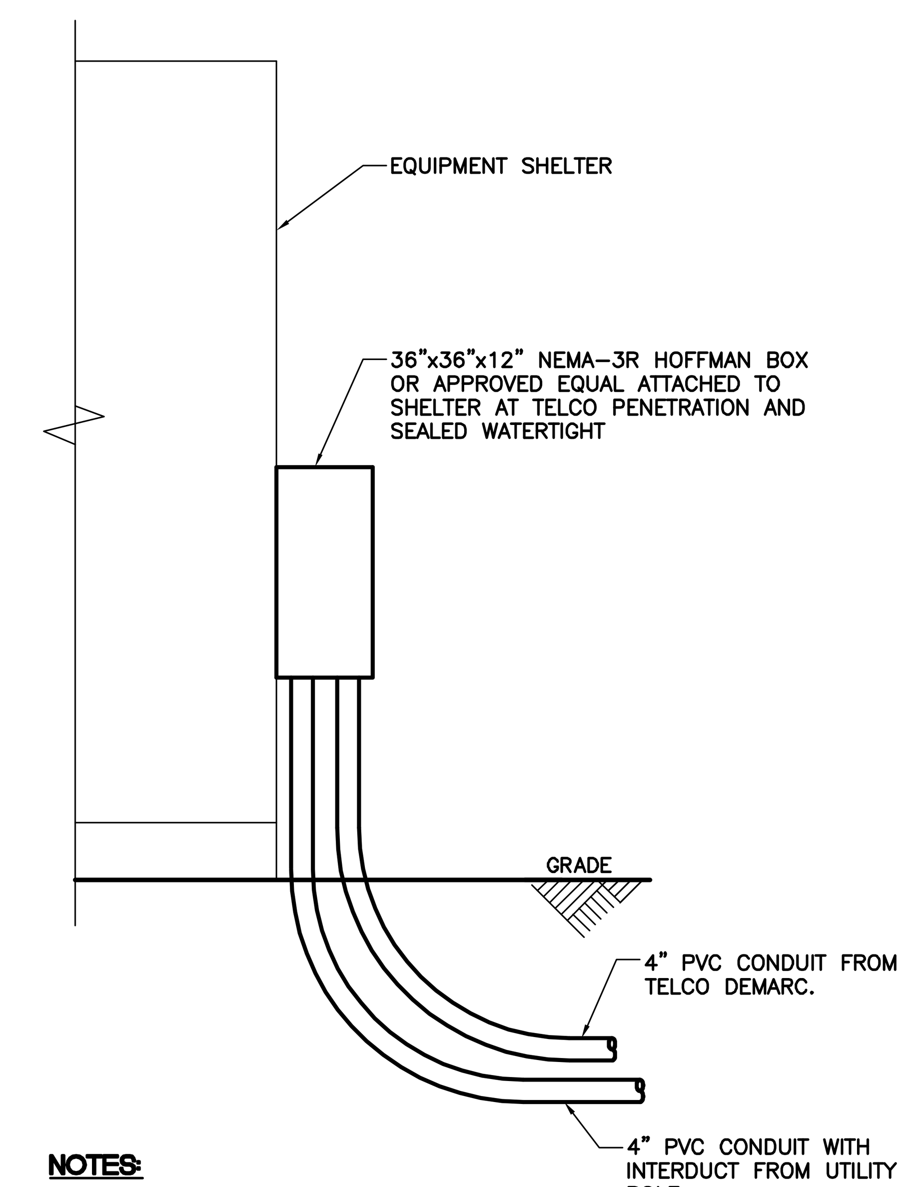


NOTES

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.

6/E-6 GROUND BAR DETAIL

NOT TO SCALE



NOTES:

1. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF CONDUITS, PULL ROPES, AND SUPPORT ASSEMBLY.
2. COORDINATE EXACT LOCATION AND CONDUIT SIZE WITH TELEPHONE COMPANY.

7/E-6 HOFFMAN BOX DETAIL

NOT TO SCALE

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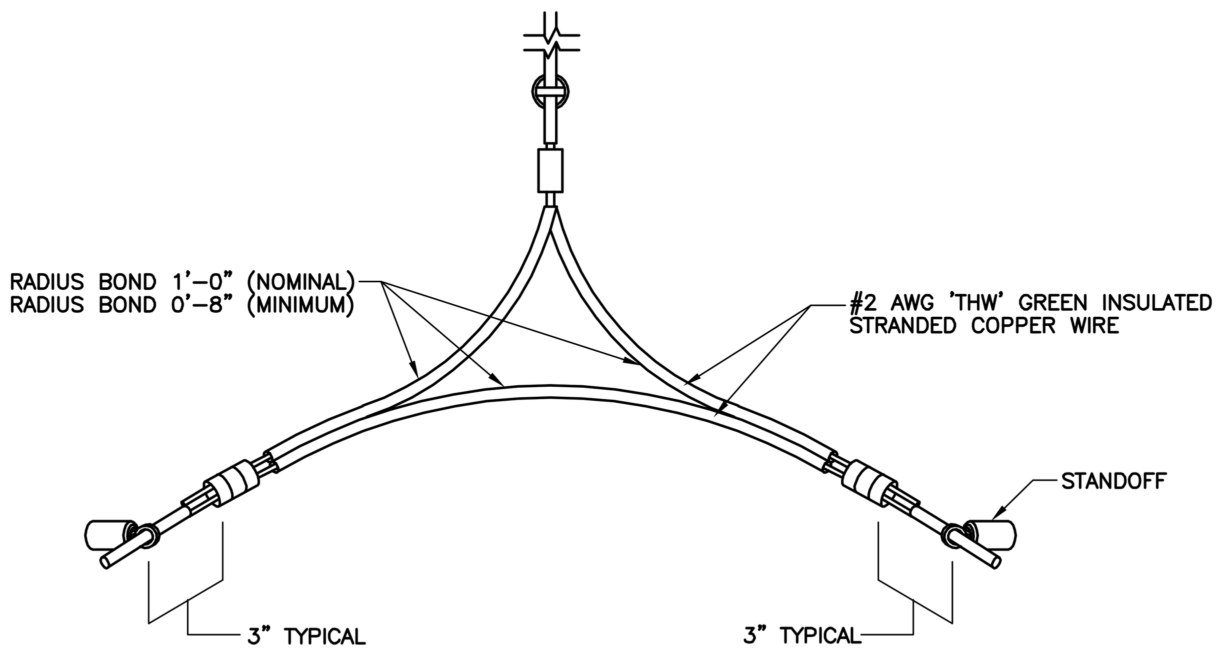
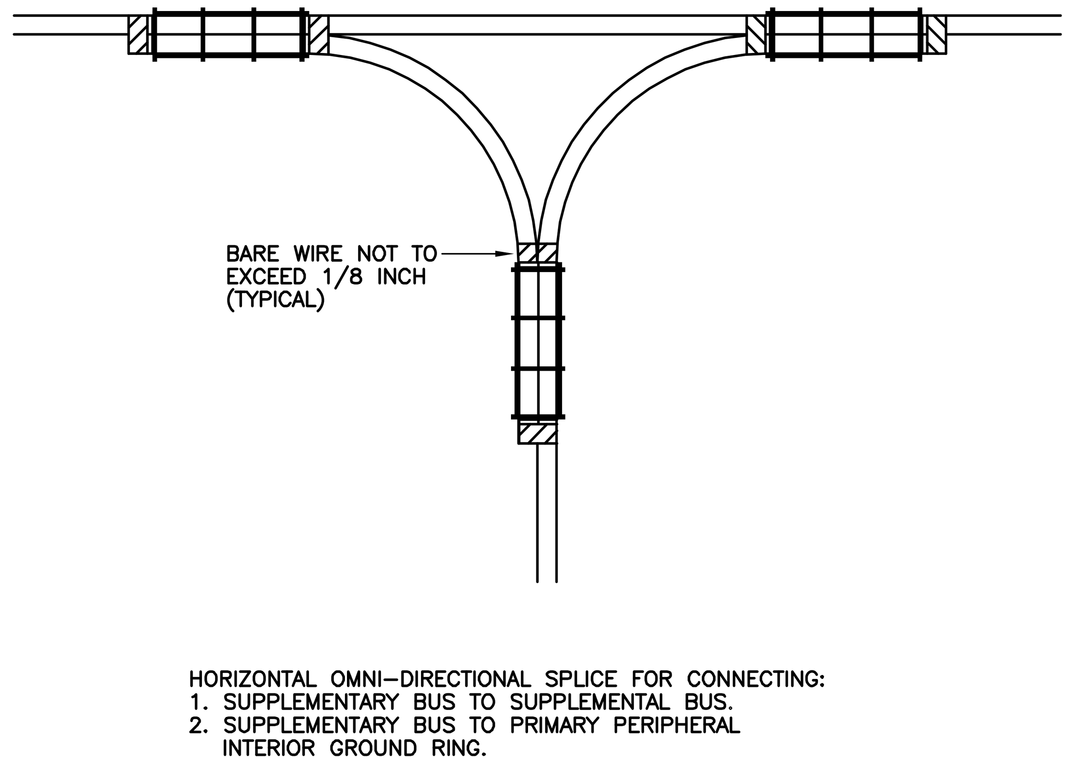
DETAILS

E-6

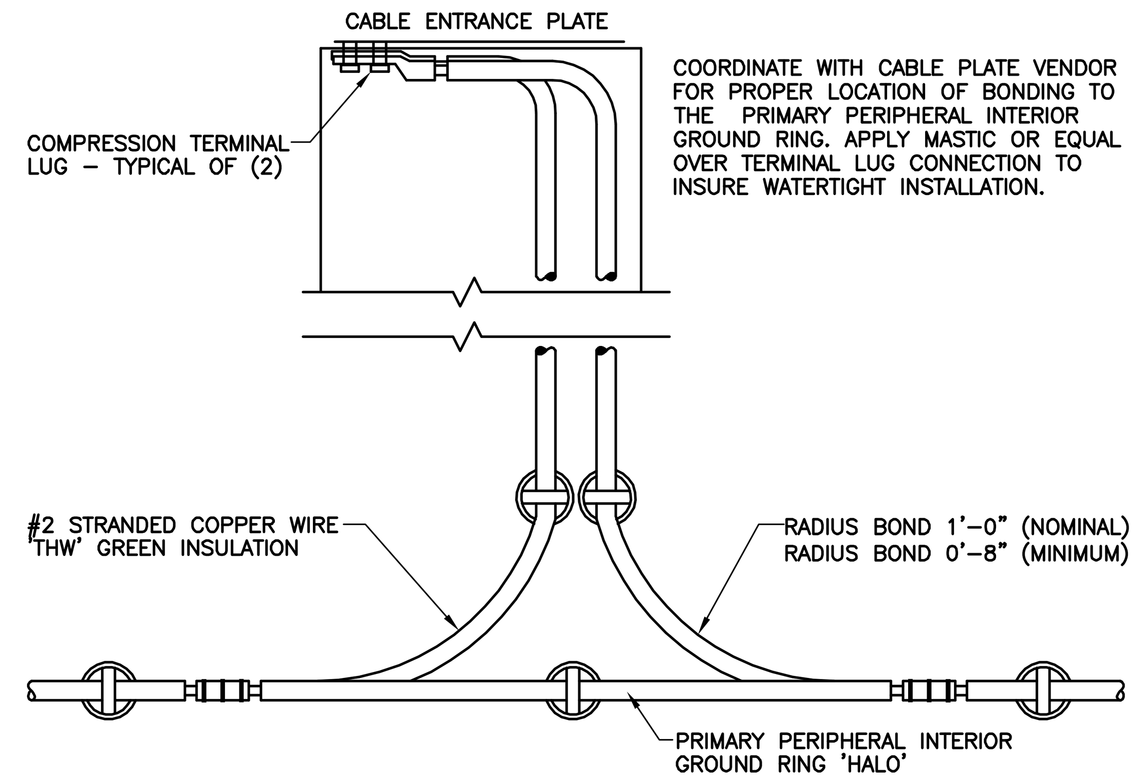
Sheet No. 12 of 14



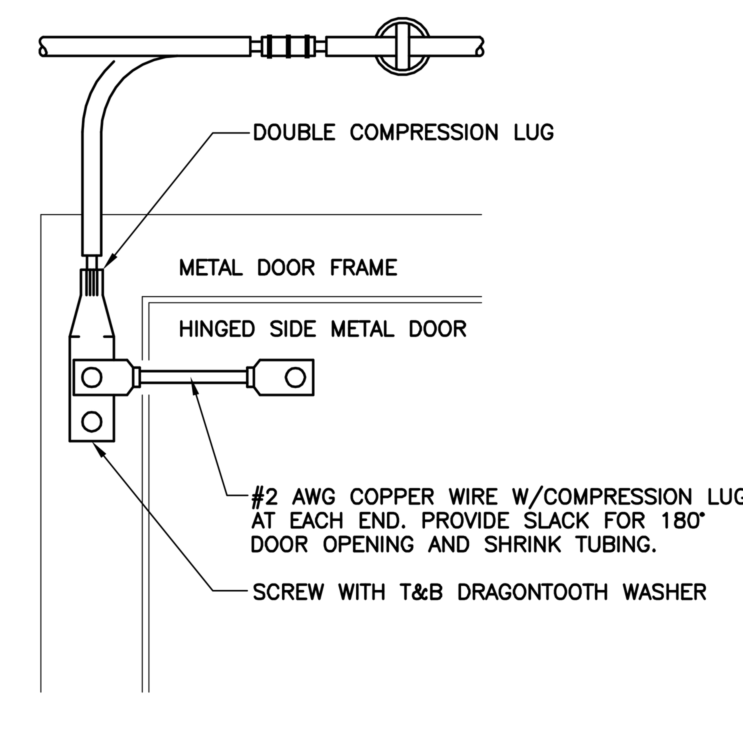
1 E-7 ISOMETRIC VIEW OF VERTICAL NONDIRECTIONAL SPLICE FOR CORNER INSTALLATION
N.T.S.



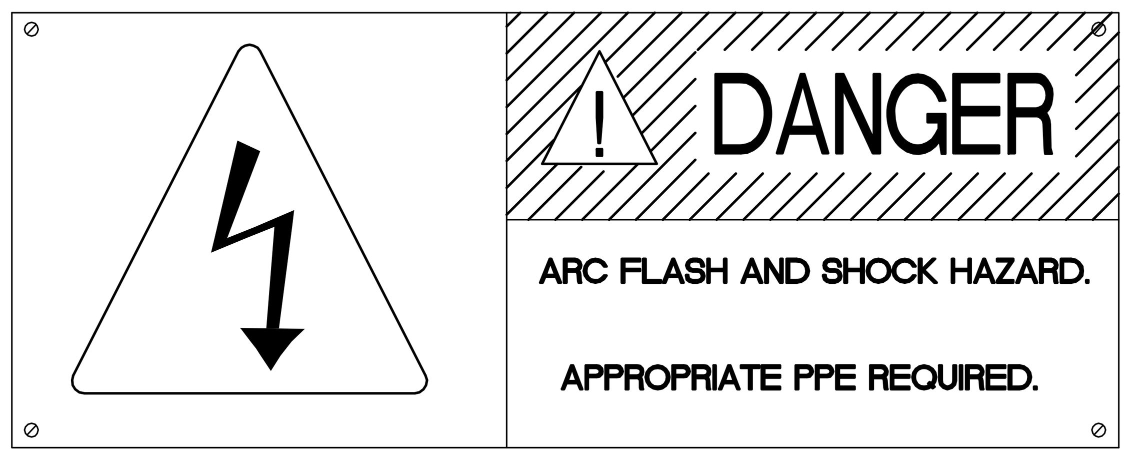
2 E-7 HORIZONTAL NONDIRECTIONAL SPLICE
N.T.S.



3 E-7 BONDING CABLE ENTRANCE PLATE TO PRIMARY PERIPHERAL INTERIOR GROUND RING
N.T.S.



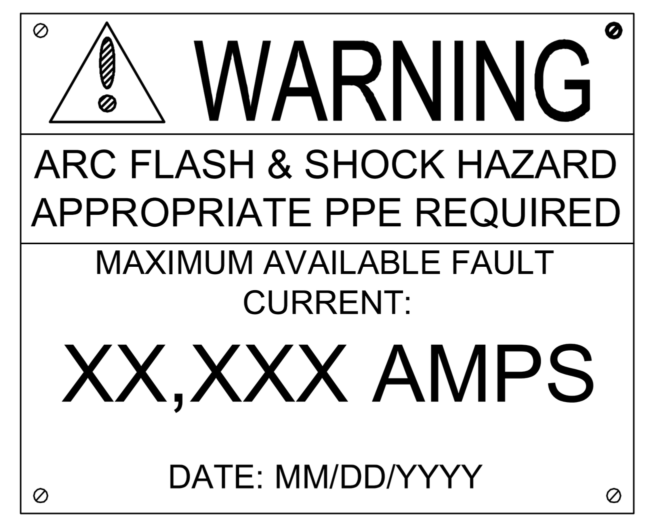
4 E-7 BONDING METAL DOOR FRAME AND DOOR TO INTERIOR GROUNDING RING
N.T.S.



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.

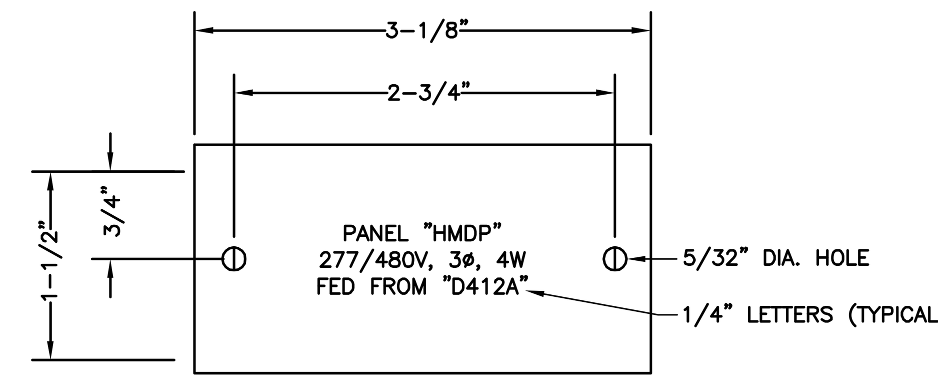
5 E-7 DETAIL OF TYPICAL FLASH PROTECTION WARNING SIGN
NOT TO SCALE



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

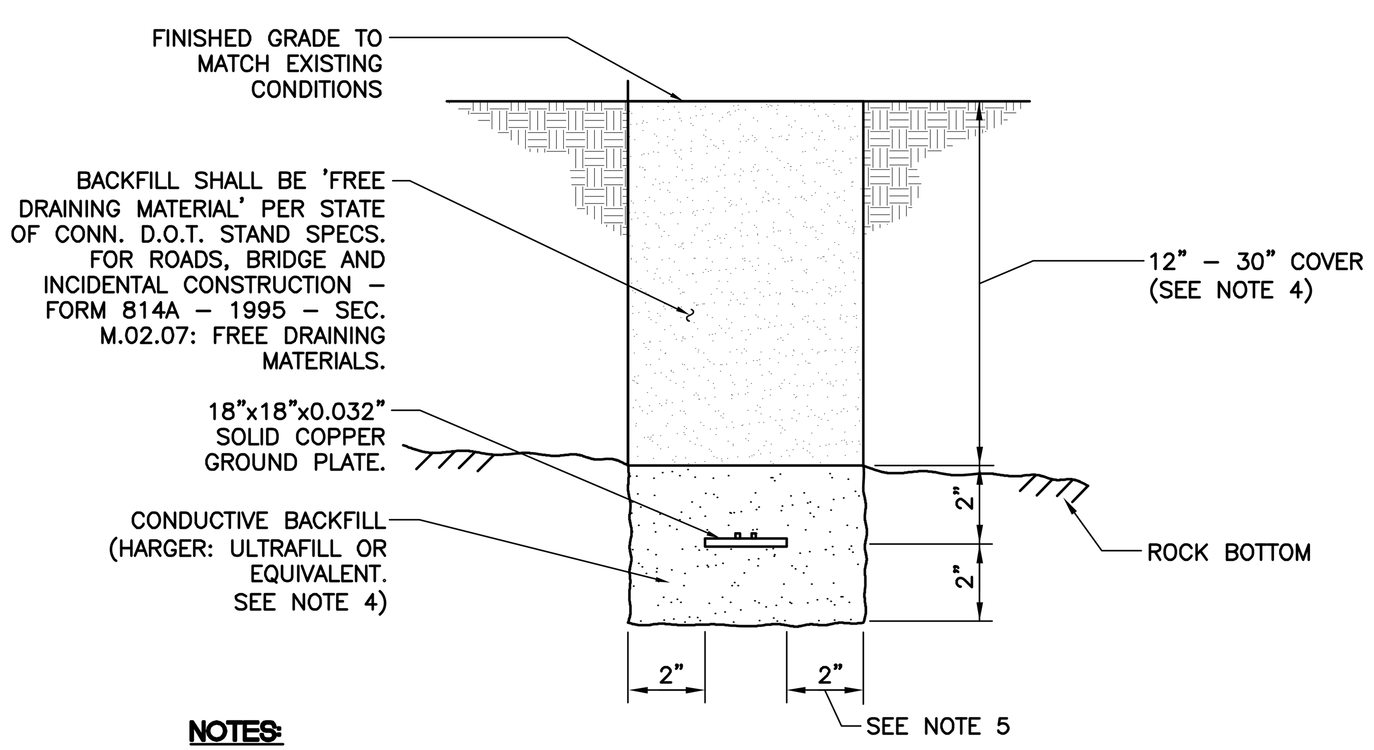
6 E-7 DETAIL OF TYPICAL FAULT CURRENT SIGN
NOT TO SCALE



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.

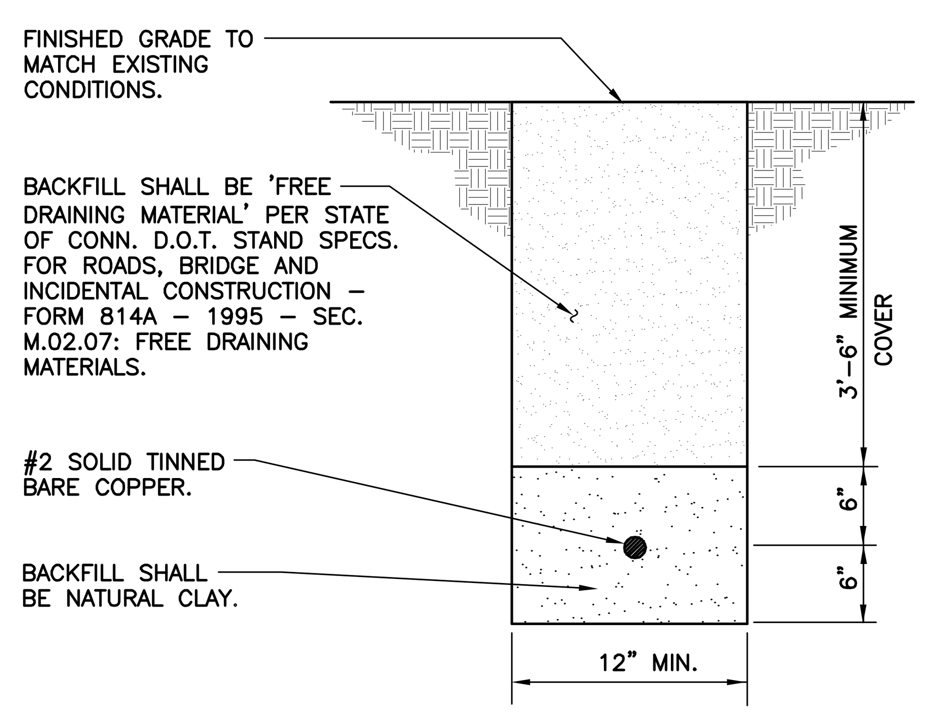
4 E-7 DETAIL OF TYPICAL NAMEPLATE
NOT TO SCALE



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. PROVIDE MIN 2" CLEARANCE ON ALL SIDES OF GROUND PLATE.

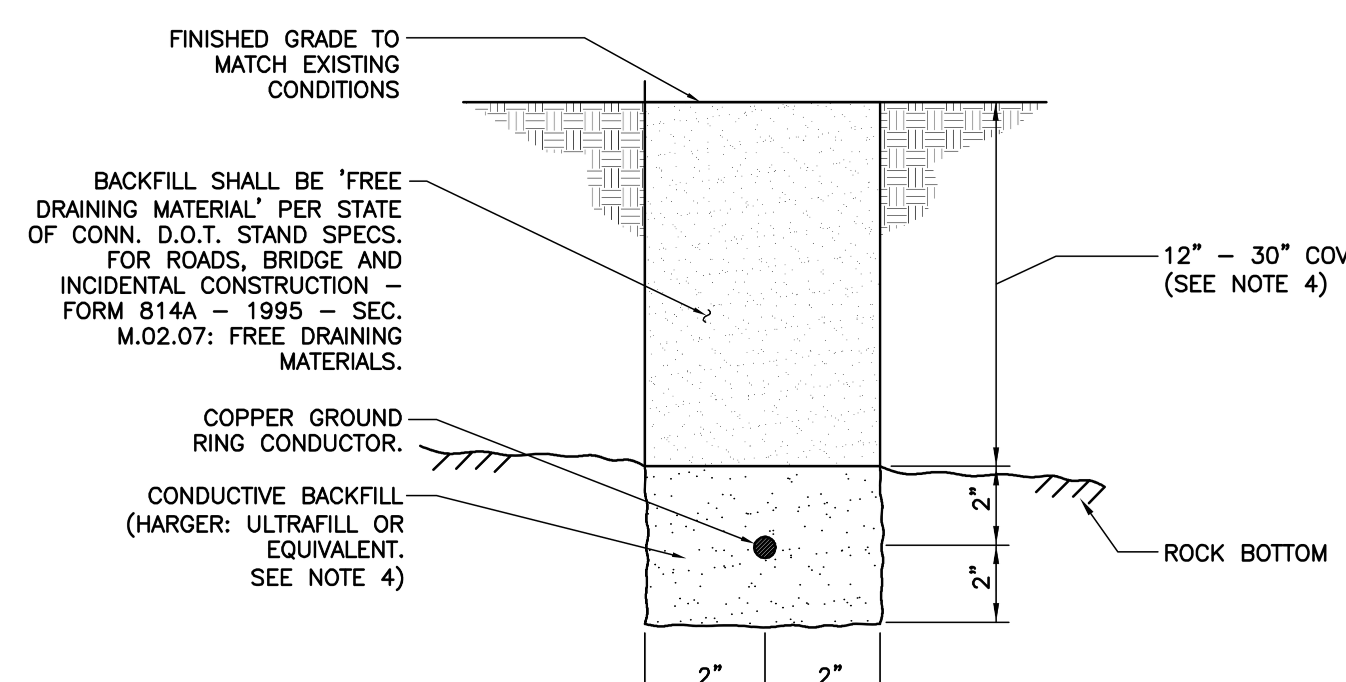
8 E-7 GROUND PLATE TRENCH/BACKFILL DETAIL (SHALLOW TOPSOIL)
NOT TO SCALE



NOTES:

1. ENGINEER SHALL INSPECT PLACEMENT OF EGR CONDUCTOR PRIOR TO BACKFILLING.
2. MAINTAIN MIN. 2'-0" LINEAR CLEARANCE BETWEEN NATURAL CLAY 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.

9 E-7 EGR TRENCH/BACKFILL 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.

10 E-7 EGR TRENCH/BACKFILL DETAIL (SHALLOW TOPSOIL)
NOT TO SCALE

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	1/26/16	TJB	CKO	CONSTRUCTION DRAWINGS - ISSUED FOR CLIENT REVIEW

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DATE: 1/25/16
SCALE: AS NOTED
JOB NO. 16010.000

DETAILS

E-7

Sheet No. 13 of 14

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. INSTALL NEW 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. GENERATOR/TRANSFER SWITCH.
4. FEEDERS AND BRANCH CIRCUIT WIRING TO PANELS, RECEPTACLES, EQUIPMENT, LIGHTING FIXTURES, ETC. AS INDICATED OR NOTED ON PLANS.
5. POWER AND TEMPERATURE CONTROL WIRING FOR HVAC EQUIPMENT.
   a. FURNISH AND INSTALL ALL POWER WIRING FOR ALL HEATING, VENTILATING, AIR CONDITIONING, MOTORS AND DEVICES, AND FIRE PROTECTION EQUIPMENT INDICATED ON THE PLANS OR CALLED FOR IN THIS SPECIFICATION, EITHER ELECTRICAL OR MECHANICAL INCLUDING ALL CONTROL WIRING. ALL MAGNETIC STARTERS SHALL BE FURNISHED UNDER DIVISION 15 AND HAVE INSTALLED THEREIN A PROPER OVERLOAD HEATER FOR EACH MOTOR.
   b. ALL WIRING, BOTH POWER AND CONTROL, FOR SUCH ITEMS AS UNIT HEATERS, EXHAUST FANS, ETC., NOT SPECIFICALLY CALLED FOR IN THE TEMPERATURE CONTROL SPECIFICATIONS, SHALL BE WIRED UNDER DIVISION 16.
   c. ALL CONTROLS WHICH ARE TO BE WIRED BY THIS CONTRACTOR SHALL BE DELIVERED TO HIM BY THE CONTRACTOR/VENDOR FURNISHING THEM.
6. CELLULAR SITE ALARMS, ASSOCIATED WIRING AND DEVICES.
7. CELLULAR GROUNDING SYSTEMS, CONSISTING OF ANTENNA GROUNDING, INTERIOR GROUNDING RING, GROUND BARS, ETC.
8. FURNISH AND INSTALL 3/4" PLYWOOD BACKBOARD OF SIZE INDICATED ON DRAWINGS FOR MOUNTING OF POWER/SERVICE EQUIPMENT AND TELEPHONE/ALARM EQUIPMENT. BACKBOARDS SHALL BE PAINTED WITH TWO (2) COATS OF SEMI-GLOSS GRAY FIRE RETARDANT PAINT.
9. FIELD MEASURE EXISTING ELECTRICAL SERVICES TO CONFIRM AVAILABLE EXISTING POWER.
10. 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 16113

1.01. WIREWAYS

A. THE 4" X 4" WIREWAY LOCATED IN THE OWNER'S EQUIPMENT ROOM SHALL BE INSTALLED ALONG THE TOP OF THE INTERIOR WALL AND SHALL HAVE ONE VERTICAL DROP CONNECTED TO PANELBOARD. MANUFACTURER SHALL BE HOFFMAN ENGINEERING COMPANY OR APPROVED EQUAL.

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 16490

1.01. AUTOMATIC TRANSFER SWITCH

A. THE AUTOMATIC TRANSFER SWITCHES, ASCO # 300 SERIES SHALL CONSIST OF A POWER TRANSFER MODULE AND A CONTROL MODULE, INTERCONNECTED TO PROVIDE COMPLETE AUTOMATIC OPERATION. THE AUTOMATIC TRANSFER SWITCH SHALL BE MECHANICALLY HELD AND ELECTRICALLY OPERATED BY A SINGLE-SOLENOID MECHANISM ENERGIZED FROM THE SOURCE TO WHICH THE LOAD IS TO BE TRANSFERRED. THE SWITCH SHALL BE RATED FOR CONTINUOUS DUTY AND BE INHERENTLY DOUBLE-THROW. THE SWITCH SHALL BE MECHANICALLY INTERLOCKED TO ENSURE ONLY ONE OF TWO POSSIBLE POSITIONS – NORMAL OR EMERGENCY. THE AUTOMATIC TRANSFER SWITCH SHALL BE SUITABLE FOR USE WITH EMERGENCY SOURCES, IE., AND ENGINE OR TURBINE GENERATOR SOURCE.

B. ALL MAIN CONTACTS SHALL BE OF SILVER COMPOSITION. THE OPERATING TRANSFER TIME IN EITHER DIRECTION SHALL NOT EXCEED ONE-SIXTH (1/6) OF A SECOND.

C. ALL CONTACTS, COILS, SPRINGS, AND CONTROL ELEMENTS SHALL BE CONVENIENTLY REMOVABLE FROM THE FRONT OF THE TRANSFER SWITCH WITHOUT MAJOR DISASSEMBLY OR DISCONNECTION OF POWER CONDUCTORS.

D. THE CONTROL MODULE SHALL BE SUPPLIED WITH A PROTECTIVE COVER AND BE MOUNTED SEPARATELY FROM THE TRANSFER SWITCH FOR EASE OF MAINTENANCE. SENSING AND CONTROL LOGIC SHALL BE SOLID-STATE AND MOUNTED ON PLUG-IN PRINTED CIRCUIT BOARDS. PRINTED CIRCUIT BOARDS SHALL BE KEYED TO PREVENT INCORRECT INSTALLATION. INTERFACING RELAYS SHALL BE INDUSTRIAL-CONTROL-GRADE, PLUG-IN TYPE WITH DUST COVERS AND LOCKING CLIPS.

E. THE AUTOMATIC TRANSFER SWITCH SHALL BE MOUNTED IN A NEMA 1 ENCLOSURE. SWITCH AND ACCESSORY DEVICES SHALL BE SUPPLIED BY ONE MANUFACTURER, WITH NUMBER OF POLES AND RATINGS AS SHOWN ON PLANS.

F. ALL PRODUCTION UNITS SHOULD BE SUBJECTED TO THE FOLLOWING FACTORY TESTS:

1. THE COMPLETE AUTOMATIC TRANSFER SWITCH SHALL BE TESTED TO ENSURE PROPER OPERATION OF THE INDIVIDUAL COMPONENTS AND CORRECT OVERALL SEQUENCE OF OPERATION, AND TO ENSURE THAT THE OPERATING TRANSFER TIME, VOLTAGE, FREQUENCY, AND TIME DELAY SETTINGS ARE IN COMPLIANCE WITH THE SPECIFICATION REQUIREMENTS.
2. THE COMPLETE AUTOMATIC TRANSFER SWITCH SHALL BE SUBJECTED TO A DIELECTRIC STRENGTH TEST PER NEMA STANDARD ICS 1.109.05.

G. ACCESSORIES:

1. SWITCHES SHALL INCLUDE A TIME DELAY TO IGNORE MOMENTARY OUTAGES. IT SHALL DELAY CLOSING OF THE ENGINE START CONTACTS FOR A FIXED TIME OF 3 SECONDS.
2. SWITCHES SHALL INCLUDE A TIME DELAY ON TRANSFER FROM NORMAL TO EMERGENCY, FIELD ADJUSTABLE FROM 0.6 TO 60 SECONDS.
3. SWITCHES SHALL INCLUDE A TIME DELAY ON RE-TRANSFER FROM EMERGENCY TO NORMAL, FIELD ADJUSTABLE FROM 1 TO 30 MINUTES. THE TIME DELAY SHALL BE AUTOMATICALLY BYPASSED IF THE EMERGENCY SOURCE FAILS AND THE NORMAL SOURCE IS AVAILABLE.
4. THE SWITCHES SHALL INCLUDE VOLTAGE AND FREQUENCY SENSING OF THE EMERGENCY SOURCE AND SHALL BE FACTORY SET TO ALLOW TRANSFER TO EMERGENCY WHEN THE SOURCE IS APPROXIMATELY AT 90% OF RATED VOLTAGE AND FREQUENCY.
5. GOLD PLATED CONTACTS RATED 10 AMPS, 32 VOLTS DC WHICH CLOSE WHEN THE NORMAL SOURCE FAILS, SHALL BE PROVIDED TO INITIATE ENGINE STARTING.
6. AUXILIARY CONTACTS FOR REMOTE INDICATION OF NORMAL POWER AVAILABILITY

   GREEN LIGHT – POWER AVAILABLE
   RED LIGHT – GENERATOR REQUIRED
7. SOLID STATE PLANT EXERCISER WITH 2 POSITION SELECTOR SWITCH AND OVERRIDE CIRCUIT.

SECTION 16500

1.01. LIGHTING FIXTURES

A. REFER TO LIGHT FIXTURE SCHEDULE FOR REQUIREMENTS.

SECTION 16620
(SUPPLIED BY OWNER, INSTALLED BY CONTRACTOR)

1.01. GENERATOR SET

A. REFER TO CONTRACT DRAWINGS FOR DETAILS AND SCHEDULES.

SECTION 16700

1.01. BUILDING ALARMS (SIGNAL COMMUNICATIONS)

A. ALARM BOX SHALL BE 12" W x 12" H x 6" D NEMA 1 ENCLOSURE, MCKINSTRY #30-1216LP WITH ACCESSORIES:

- "T" HANDLE LATCH KIT
- 14 GAUGE STEEL PANEL, PAINTED WHITE ENAMEL
- (6) 1/2"-3/4" K.OS ON EACH SIDE/TOP/BOTTOM WALLS
- (2) 3/4" RUBBER GROMMETS AS SLEEVES
- PROVIDE WIRING SCHEMATIC IN REMOVABLE PLASTIC COVER, TAPED TO BACK SIDE OF HINGED DOOR.

B. ALARM SENSORS' RELAY SHALL BE NORMALLY CLOSED. UPON ALARM CONDITION, THE RELAY SHALL REVERSE STATE TO OPEN. CONFIRM INSTALLATION AND LOCATION REQUIREMENTS FOR BUILDING'S ALARM SENSORS.

ALARM SENSORS SHALL BE:

1. FIRE ALARM CONTROL PANEL: FROM C CONTACT RELAY.
2. DOOR CONTACT SENSOR (SENTROL #1085T): SPDT MAGNETIC FORM C CONTACT – OPEN/CLOSE LOOP, MAX 1" GAP.
3. LOW TEMPERATURE SENSOR (HONEYWELL #T631C1103); SPDT AIR SWITCH CONTROLLER – COILED COPPER TUBE IN NEMA 1 ENCLOSURE. SET AT 50 DEGREES F., MOUNT LAMINATED, BACK-LIT NAMEPLATE WITH LEGIBLE DESCRIPTION "LOW TEMP 50 DEGREE F" BELOW SENSOR.
4. HIGH TEMPERATURE SENSOR (HONEYWELL #T631C1103): SPDT AIR SWITCH CONTROLLER – COILED COPPER TUBE IN NEMA 1 ENCLOSURE. SET AT 80 DEGREES F., MOUNT LAMINATED, BACK-LIT NAMEPLATE WITH LEGIBLE DESCRIPTION "HI TEMP 80 DEGREES F" BELOW SENSOR.

C. CONFIRM REQUIREMENTS FOR ALL BUILDING ALARM SENSORS INSTALLATION, AND LOCATION OF EACH SENSOR. ALARM WIRING SHALL BE ROUTED TO ALARM BOX AND SPADE CONNECTED TO RESPECTIVE TERMINAL BLOCK. EACH PAIR OF ALARM WIRING SHALL BE PERMANENTLY AND UNIQUELY TAGGED AT EACH TERMINAL STRIP LOCATION AND AT SPLICE/JUNCTION/BOXES/WIRING TROUGH.

D. REFER TO "WIRING SCHEMATIC FOR ALARM SENSORS" ON DRAWINGS.

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	1/26/16	TJB	CKD	CONSTRUCTION DRAWINGS – ISSUED FOR CLIENT REVIEW

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DATE:	1/25/16
SCALE:	AS NOTED
JOB NO.	16010.000

SPECIFICATIONS

E-8