Transcend Wireless

10 Industrial Ave,
Suite 3
Mahwah NJ 07430

Phone: 201.684.0055
Fax: 201.684.0066

September 25, 2019

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

Sprint Spectrum – CT03XC067
Tower Share Application
250 Olcott St. Manchester, CT 06040
Latitude- 41.769939
Longitude- -72.559083

Dear Ms. Bachman,

This letter and attachments are submitted on behalf of Sprint Spectrum, L.P. ("Sprint"). Sprint plans to install antennas and related equipment at the tower site located at 250 Olcott St. Manchester, Connecticut.

Sprint will install six (6) 800/1900/2500 MHz antennas and nine (9) RRHs at the 135' level of the proposed and CSC approved replacement 180' self-support lattice tower. Four (4) hybrid cables will also be installed. Sprint's equipment cabinets will be placed on a 10' X 12' concrete pad within the existing ground facility. Included are plans by Centek Engineering, dated January 29, 2019 depicting the planned changes and attached as **Exhibit A**. Also included is a structural analysis prepared by Centek Engineering, dated January 3, 2019, confirming that the proposed tower is structurally capable of supporting the proposed equipment. This is attached and detailed in **Exhibit B**.

Please accept this letter as notification pursuant to Regulations of Connecticut State Agencies 16-50aa, of Sprint's intent to share a telecommunications facility pursuant to R.C.S.A. 16-50j-88. In accordance with R.C.S.A., a copy of this letter is being sent to The Honorable Jay Moran, Mayor the Town of Manchester, James Davis, Zoning Enforcement Officer for the Town of Manchester, as well as the tower and property owner, Connecticut Light and Power Company d/b/a Eversource Energy. Please see the attached letter from Connecticut Light and Power Company d/b/a Eversource Energy authorizing the proposed shared use of this facility attached as **Exhibit C**.

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

1. The proposed modification will not result in an increase in the height of the proposed structure. The top of the self-support lattice tower is 180'; Sprint's proposed antennas will be located at a center line height of 135'.

2. The proposed modifications will not result in the increase of the site boundary as depicted on the attached site plan.

3. The proposed modifications will not increase noise levels at the facility by six decibels or more, or to levels that exceed local and state criteria.

4. The operation of the proposed antennas will not increase radio frequency emissions at the facility to a level at or above the Federal Communications Commission safety standard. As indicated in the attached power density calculations, the combined site operations will result in a total power density of 3.38%, as evidenced by **Exhibit D**.

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

A. Technical Feasibility. The proposed self-support lattice tower has been deemed structurally capable of supporting Sprint's proposed loading, as detailed in the structural analysis. The structural analysis is included as **Exhibit B**.
B. Legal Feasibility. As referenced above, C.G.S. 16-50aa has been authorized to issue orders approving the shared use of an existing tower such as this self-support lattice tower in Manchester. Under the authority granted to the Council, an order of the Council approving the requested shared use would permit Sprint to obtain a building permit for the proposed installation. Further, a Letter of Authorization is included as **Exhibit C**, authorizing Sprint to file this application for shared use.
C. Environmental Feasibility. The proposed shared use of this facility would have minimal environmental impact. The installation of Sprint equipment at the 135' level of the proposed and CSC approved 180' tower would have an insignificant visual impact on the area around the tower. Sprint's ground equipment would be installed within the existing facility compound. Sprint's shared use would therefore not cause any significant alteration in the physical or environmental characteristics of the existing site. Additionally, as evidenced by **Exhibit D**, the proposed antennas would not increase radio frequency emissions to a level at or above the Federal Communications Commission safety standard.
D. Economic Feasibility. Sprint will be entering into an agreement with the owner of this facility to mutually agreeable terms. As previously mentioned, the Letter of Authorization has been provided by the owner to assist Sprint with this tower sharing application.
E. Public Safety Concerns. As discussed above, the self-support lattice tower is structurally capable of supporting Sprint's proposed loading. Sprint is not aware of any public safety concerns relative to the proposed sharing of the proposed self-support lattice tower. Sprint's intentions of providing new and improved wireless service through the shared use of this facility is expected to enhance the safety and welfare of local residents and individuals traveling through Manchester and nearby the facility.

Sincerely,

Jake Shappy

Jake Shappy
Transcend Wireless
10 Industrial Ave., Suite 3
Mahwah, New Jersey
jshappy@transcendwireless.com
845-553-3330

CC: The Hon. Jay Moran, Mayor of Manchester
James Davis, Zoning Enforcement Officer
Connecticut Light and Power Company d/b/a Eversource Energy

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

July 20, 2018

Kathleen M. Shanley
Manager-Transmission Siting
Eversource Energy
P.O. Box 270
Hartford, CT 06141-0270

RE: **PETITION NO. 1346** - The Connecticut Light and Power Company d/b/a Eversource Energy petition for a declaratory ruling, pursuant to Connecticut General Statutes §4-176 and §16-50k, for the proposed replacement and relocation of an existing telecommunications facility and an existing relay and control enclosure located at Manchester Substation, 250 Olcott Street, Manchester, Connecticut, and related substation improvements.

Dear Ms. Shanley:

At a public meeting held on July 19, 2018, the Connecticut Siting Council (Council) considered and ruled that the above-referenced proposal would not have a substantial adverse environmental effect, and pursuant to Connecticut General Statutes § 16-50k, would not require a Certificate of Environmental Compatibility and Public Need, with the following conditions:

1. Approval of any minor project changes be delegated to Council staff;

2. Unless otherwise approved by the Council, if the facility authorized herein is not fully constructed within three years from the date of the mailing of the Council's decision, this decision shall be void, and the facility owner/operator shall dismantle the facility and remove all associated equipment or reapply for any continued or new use to the Council before any such use is made. The time between the filing and resolution of any appeals of the Council's decision shall not be counted in calculating this deadline. Authority to monitor and modify this schedule, as necessary, is delegated to the Executive Director. The facility owner/operator shall provide written notice to the Executive Director of any schedule changes as soon as is practicable;

3. Any request for extension of the time period to fully construct the facility shall be filed with the Council not later than 60 days prior to the expiration date of this decision and shall be served on all parties and intervenors, if applicable, and the Town of Manchester;

4. Unless otherwise approved by the Council, the existing tower shall be removed within 180 days of the installation of the new self-supporting lattice tower;

5. The Council shall be notified in writing within 45 days of when the existing tower is removed and the new self-supporting lattice tower is operational unless a written request for an extension is submitted to the Council within that timeframe;

6. Within 45 days after completion of construction of the control enclosure, the Council shall be notified in writing that construction has been completed;

7. The facility owner/operator shall remit timely payments associated with annual assessments and invoices submitted by the Council for expenses attributable to the facility under Conn. Gen. Stat. §16-50v;

8. This Declaratory Ruling may be transferred, provided the facility owner/operator/transferor is current with payments to the Council for annual assessments and invoices under Conn. Gen. Stat. §16-50v and the transferee provides written confirmation that the transferee agrees to comply with the terms, limitations and conditions contained in the Declaratory Ruling, including timely payments to the Council for annual assessments and invoices under Conn. Gen. Stat. §16-50v; and

9. If the facility owner/operator is a wholly owned subsidiary of a corporation or other entity and is sold/transferred to another corporation or other entity, the Council shall be notified of such sale and/or transfer and of any change in contact information for the individual or representative responsible for management and operations of the facility within 30 days of the sale and/or transfer.

This decision is under the exclusive jurisdiction of the Council and is not applicable to any other modification or construction. All work is to be implemented as specified in the petition dated June 1, 2018 and additional information received on June 7, 2018, July 9, 2018 and July 10, 2018.

Enclosed for your information is a copy of the staff report on this project.

Sincerely,

Robert Stein

Robert Stein
Chairman

RS/MP/lm

Enclosure: Staff Report dated July 19, 2018

c: The Honorable Jay Moran, Mayor, Town of Manchester
Scott A. Shanley, General Manager, Town of Manchester
James Davis, Zoning Enforcement Officer, Town of Manchester

STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL
Ten Franklin Square, New Britain, CT 06051
Phone: (860) 827-2935 Fax: (860) 827-2950
E-Mail: siting.council@ct.gov
www.ct.gov/csc

Petition No. 1346
Eversource
Manchester Substation, Manchester, Connecticut
Staff Report
July 19, 2018

Introduction

On June 1, 2018, The Connecticut Light and Power Company d/b/a Eversource Energy (Eversource) submitted a petition to the Connecticut Siting Council (Council) for a declaratory ruling pursuant to Connecticut General Statutes (CGS) §4-176 and §16-50k for the proposed replacement and relocation of an existing telecommunications facility and an existing relay and control enclosure and related substation improvements at Manchester Substation, 250 Olcott Street, Manchester, Connecticut.

Council member Daniel P. Lynch, Jr. and Council staff member Michael Perrone conducted a field review of the proposed project on June 19, 2018. Paul Melzen, Substation Engineer, Eversource; Steven Florio, Construction Manager, Eversource; Ryan Ericson, Telecom Engineer, Eversource; Matthew LeClair, Substation Engineer, Eversource; Shodan Patel, Project Manager, Eversource; Susan Bellion, Project Siting Specialist, Eversource; Ian Cole, Environmental, Eversource; and Kyle Shiel, Senior Planner, Town of Manchester Planning Department also attended the field review.

Eversource met with the Town of Manchester officials in February 2018. Notice of the Petition was provided to the Town of Manchester and abutting property owners on or about May 30, 2018. To date, the Council has not received any comments regarding the Petition filing.

The Council issued interrogatories to Eversource on June 22, 2018 and July 2, 2018. Eversource submitted responses to Council interrogatories on July 9, 2018 and July 10, 2018, respectively.

On June 21, 2018, pursuant to CGS §4-176(e) of the Uniform Administrative Procedure Act (UAPA), which requires an administrative agency to take action on a petition within 60 days of receipt, the Council voted to set the date by which to render a decision on the above-referenced petition by November 28, 2018. November 28, 2018, is the statutorily-mandated 180-day decision deadline for this petition under CGS §4-176(i).

Proposed Project

Manchester Substation is located on a 30.4-acre parcel surrounded by a mix of municipal, commercial and industrial facilities including the Town of Manchester Landfill, Transfer Station, and Sewage Treatment Plant located north of the subject property and residential areas located to the east and southwest. The nearest residence is located off of Olcott Street West, approximately 540 feet southwest of the proposed replacement tower compound.

Eversource would remove an existing communications tower and existing 345-kV relay and control enclosure from the center of the substation and replace them with a new communications tower and new 115-kV/345-kV relay and control enclosure to the west of the current positions. The proposed replacement tower would be located outside of the substation fence line, and the replacement enclosure would be located within an expanded area of the substation.

The replacement tower and replacement control enclosure project is being proposed to allow for future upgrades and newer telecommunications technologies to be installed at the site. It would provide future capacity for Eversource, municipal and emergency communications and commercial wireless service providers. The control enclosure portion of the project is identified in Eversource's 2018 Forecast of Loads and Resources dated March 1, 2018 and in the June 2018 ISO-New England Regional System Plan Asset Condition Update as the proposed "Manchester Control House Expansion" with an estimated in-service date of 2019.

Tower Replacement

The existing tower is an approximately 200-foot self-supporting lattice tower located inside the fenced substation. It is 30 feet wide at the base, and it tapers to 8-feet 6-inches wide at the top. The existing tower contains antennas of multiple entities including, but not limited to, Eversource, Hartford Ops/Meter & Service, Talcott Microwave, DSCADA, EDACS/Voice Radio, Bolton Microwave, Sprint[1], Yankee Gas, and Hartford Underground.

The proposed replacement tower would be a 180-foot self-supporting lattice tower. It would be 23 feet wide at the base and tapering to 5-feet wide at the top. It would be located approximately 435 feet to the west of the existing tower location (and outside of the fenced substation). The proposed (and future) antenna inventory is listed below.

Antenna Type[1]	Antenna Make/Model or Capacity[2]	Antenna Center Line Elevation (ft. AGL)	Comments	Frequency (MHz)
14-ft. Omni	(1) Kreco CO-41-AN	±187.0	Hartford Ops / Meter & Service	RX: 49.02
19.2-ft. Dual Omni w/TTA	(1) dbSpectra DS9A09F36D-N (1) Bird 430-94C-09168-M-110_48	±189.4	DSCADA	TX: 936.95 & 938.95 RX: 897.95 & 899.95
23.3-ft. Dual Omni	(1) Sinclair SC351D-HF2LDF(D00-G6)	±187.3	EDACS / Voice Radio	TX: 451.675 RX: 456.675
8' Dish w/ Radome	(1) RFS PADX8-W59AC	±175.0	Bolton Microwave	TX: 6093.45 RX: 6345.49
8' Dish w/ Radome	(1) RFS PADX8-W59AC	±175.0	Talcott Microwave	TX: 6004.50 RX: 6256.54
8' Dish w/ Radome	(1) RFS PADX8-W59AC	±175.0	Future Eversource	NA - Future Dish
8' Dish w/ Radome	(1) RFS PADX8-W59AC	±164.0	Future Eversource	NA - Future Dish
23.3-ft. Dual Omni	(1) Sinclair SC351D-HF2LDF(D00-G6)	±156.4	Future Eversource	NA - Future Antenna
10-ft Dipole	(1) Sinclair SD212-SF2P2SNF(D00)	±163.0	Yankee Gas	TX & RX: 173.39625
15.75-ft Dipole	(1) Comprod 531-70HD*8	±158.1	Hartford Underground	TX & RX: 47.90
Wireless Carrier	(12) Panel Antennas (8'x1'), (12) RRHs, (3) MDB	±135.0	Future Carrier	TBD
Wireless Carrier	(12) Panel Antennas (8'x1'), (12) RRHs, (3) MDB	±125.0	Future Carrier	TBD
Wireless Carrier	(12) Panel Antennas (8'x1'), (12) RRHs, (3) MDB	±115.0	Future Carrier	TBD
Wireless Carrier	(12) Panel Antennas (8'x1'), (12) RRHs, (3) MDB	±105.0	Future Carrier	TBD

[1] Sprint PCS is the only commercial wireless telecommunications carrier on the existing tower. The relocation of Sprint onto the replacement tower would require a separate filing with the Council for review and approval. Thus, it is not yet known which height Sprint would co-locate at on the replacement tower in the future.

The total height with appurtenances would be approximately 199 feet, i.e. the tops of the 19.2-foot and 23.3-foot omni antennas would reach a maximum height of approximately 199 feet.

A Professional Engineer duly licensed in the State of Connecticut has certified that the proposed replacement tower is structurally adequate to support the proposed (and future) loading as identified above. Specifically, the proposed replacement tower is designed support all existing entities and a total of four future wireless carriers (i.e. Sprint plus three other carriers).

Once the replacement tower is constructed and operational, the existing tower would be removed.

The proposed replacement tower radius would remain within the boundaries of the subject property.

An existing fenced laydown area located to the west of the substation (but still on the subject property) would be removed to accommodate the proposed approximately 69-foot 9-inch by 94-foot 4-inch tower compound. The proposed compound fence would be eight feet tall anti-climb mesh fence with three strands of barbed wire on top that would add approximately one foot of additional height. Eversource would install a 10-foot by 20-foot equipment shelter inside the proposed tower compound.

A new electrical power supply for the proposed replacement tower would be trenched underground from an existing Eversource utility pole (#3343), located approximately 217 feet to the west on Olcott Road to a new electrical service panel located just outside of the proposed compound. For backup power, Eversource's proposed 20-kW propane-fueled generator would be located on a 4-foot by 6-foot concrete pad within the proposed tower compound. Eversource's generator is sized for its needs only. Eversource's proposed 1,000-gallon propane tank would be located within the tower compound and would provide approximately five days of run time at 100-percent load.

Substation Modifications/Expansion

The proposed substation modifications would require the removal of the existing 11-foot by 16-foot control enclosure from the interior of the substation and the removal of approximately 400 feet of existing substation security fencing from the western side of the substation. These modifications would allow for an approximately 21,470 square foot expansion of the substation to the west to accommodate the new 150-foot by 32-foot replacement control enclosure.

New water and sewer lines would be run to the new control enclosure. The existing water and sewer lines that currently supply the 345-kV control enclosure would be removed from the substation and capped at a location just inside the substation fence line.

Additional substation modifications would include the replacement of three existing 115-kV oil-filled circuit breakers with new gas-insulated circuit breakers and the installation of two new station service transformers to feed the replacement enclosure.

The base of the substation expansion area would match the existing ground surface with gravel, and the final fence design of the proposed substation expansion area would match the fence design of the existing substation.

Environmental Effects and Mitigation Measures

The substation expansion area for the new control enclosure and new tower compound would require minimal grading. However, the proposed project would require soil removal for the new tower foundation excavation and fill to remediate below grade facilities and foundations. Approximately 460 cubic yards of material would be removed for the construction of the tower and compound. Approximately 5,200 cubic yards of material would be removed for the construction of the new control enclosure, below-grade facilities and the new security fence. The removal of the obsolete 345-kV control enclosure and existing below-grade facilities would require approximately 3,500 cubic yards of fill.

If the quality of the excavated material is acceptable, it would be reused on site. If soil cannot be reused on-site, it would be field sampled for characterization and disposed of at a pre-approved soil disposal facility in accordance with Eversource polices and state and federal regulations.

Approximately 12 conifers greater than six inches diameter and several small deciduous saplings would be removed for the expansion of the substation and replacement control enclosure. No additional tree removal is anticipated for construction, but if needed, areas to the north and south of the proposed substation modifications would be cleared and re-graded to allow for additional work/laydown areas. Specifically, a small scrub/shrub habitat block exists in the southwest corner of the site. This habitat block totals approximately 4.1 acres. If needed, a portion of this habitat block would be cleared and converted to additional work zone and gravel laydown areas to provide additional space for work zones. Due to the relatively small size of this area and the minor clearing proposed, the removal of portions of scrub/shrub habitat block would not be expected to result in a significant negative impact on any dependent wildlife populations.

The foundation design for the proposed station service transformers do not include measures for insulating oil containment because the oil volumes are not significant and do not trigger such requirement under 40 Code of Federal Regulations (CFR) 112. However, in accordance with Federal Spill Prevention Containment & Countermeasure (SPCC) rules under 40 CFR 112, there would be above-ground oil volume triggers that require spill plans and either engineered secondary containment or a strong response plan. Eversource notes that all of its substations are covered under a SPCC Multi Plan, which includes a strong contingency in the event of oil release.

The proposed replacement 115-kV circuit breakers would be gas-insulated using sulfur hexafluoride (SF_6); therefore, oil containment measures are not required.

The project would be located in an upland area and would not be expected to have a significant adverse impact on wetland resources or watercourses because such project area would be limited to areas within or immediately west of the substation footprint. Such wetland/watercourse resources are located east of the substation. An inspection to field delineate wetlands was conducted on February 14, 2018. One wetland area, consisting of a contributing unnamed intermittent watercourse and backwater wetlands/floodplains to the South Fork Hockanum River is located approximately 160 feet north of the existing control enclosure and approximately 356 feet east of the proposed substation fence expansion.

The proposed project is located within the Federal Emergency Management Agency (FEMA) unshaded Zone X, an area outside of the 100-year and 500-year flood zones.

The proposed project is not located with a Connecticut Department of Energy and Environmental Protection (DEEP) Aquifer Protection Area.

Eversource developed and submitted a Stormwater Pollution Control Plan (SWPCP) to DEEP to register under a *General Permit for the Discharge of Stormwater and Remediation Wastewaters from Construction Activities.*

Eversource would conform to its Best Management Practices Manual for Massachusetts and Connecticut, *2002 Connecticut Guidelines for Soil Erosion and Sediment Control,* and the *2004 Connecticut Stormwater Manual,* as applicable. No soil remediation would be required for this proposed project.

The proposed project is located about 0.4 mile outside of the shaded area of the DEEP Natural Diversity Database (NDDB) Map. Because such distance is greater than 0.25 mile, no consultation with DEEP regarding the NDDB is required.

Connecticut is within the range of the northern long-eared bat (NLEB), a federally-listed Threatened species and state-listed Endangered species. There are no known NLEB hibernacula within 0.25 mile of the project or known maternity roost trees within 150 feet of the proposed project area. The existing white pines slated for removal, originally planted as landscape evergreens, do not provide optimal NLEB roosting habitat. Thus, the proposed project is not likely to adversely affect the NLEB.

The proposed replacement tower would not be located near an Important Bird Area (IBA), as designated by the National Audubon Society. The nearest IBA to the proposed replacement tower site is Meshomasic State Forest Block in Manchester, located approximately 2.6 miles to the southeast. The proposed replacement tower would not be expected to adversely impact this IBA because of the distance.

The proposed replacement tower would comply with the United States Fish and Wildlife Service guidelines for minimizing the potential for telecommunications towers to impact bird species.

By letter dated March 26, 2018, the State Historic Preservation Office (SHPO) notes that the area possesses a low potential to contain intact archaeological resources[2]. SHPO also indicated that no historic properties would be affected by the proposed project.

The final fence design of the proposed substation expansion area would be visually consistent with the existing fence design of the substation. While the proposed replacement tower would be located closer to the nearest residence versus the existing tower, it would be 20 feet shorter than the existing tower, and it would be narrower in width.

Construction-related noise is exempt per DEEP noise regulations. Post-construction noise levels would not increase beyond the property boundaries. Therefore, noise emissions would be consistent with present day levels.

Aviation Safety

According to Eversource's TOWAIR analysis, notification to the Federal Aviation Administration is not required.

Magnetic Fields and Radio Frequency Power Density

Magnetic field levels at the property boundaries would not be materially affected by the proposed substation expansion.

The proposed replacement telecommunications facility would have a cumulative worst-case power density of 3.29 percent of the applicable limit using a -10 dB off-beam adjustment.

[2] SHPO incorrectly refers to the replacement tower height as 280 feet.

Construction Schedule

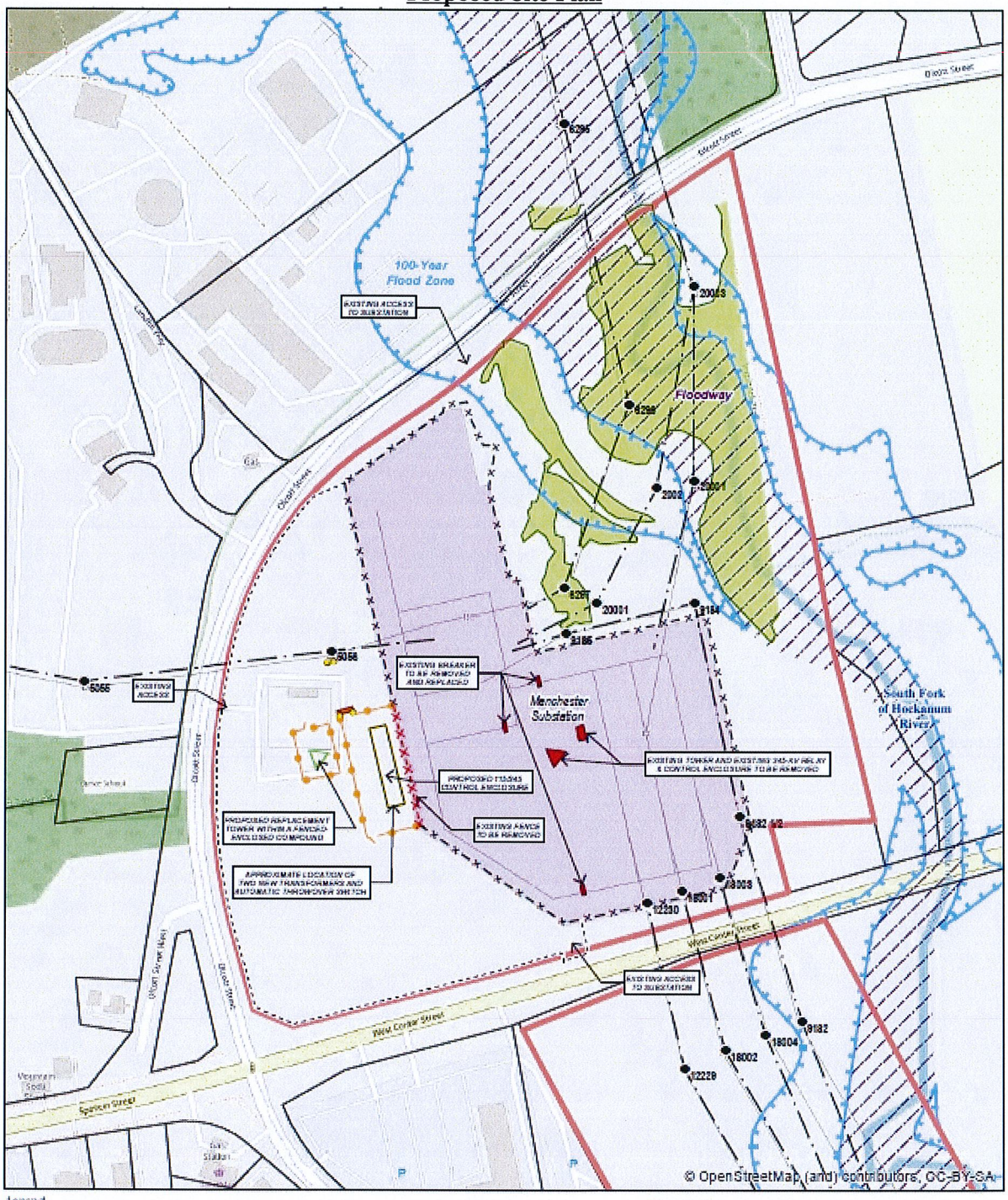
Eversource intends to begin construction in August 2018 and complete construction and restoration by the end of 2020. Removal of the existing tower and existing enclosure would be completed following the installation of the replacement facilities. In general, work hours would be from 7 AM to 7 PM Monday through Saturday. Eversource would submit a request to the Council in advance of the need for any non-standard work hours.

Staff Recommendations

Staff recommends the following:

1. Approval of any minor project changes be delegated to Council staff.

Proposed Site Plan



Legend

- Proposed Control Enclosure
- Replacement Tower
- Existing Fence
- Existing Fence to be Removed
- Proposed Fence
- Proposed Pedestrian Gate
- Strongarm Gate
- Limit of Work/Laydown Area
- Structures to be removed
- Bollard
- Transmission Tower
- Transmission Line
- Eversource Owned Property
- Approximate Parcel Boundary
- Watercourse (CTDEEP)
- Wetland Boundary
- Wetland Area
- FEMA 100-Year Flood Zone
- FEMA Floodway

Map Notes:
Base Map Source: ESRI Open Street Map
Map Scale: 1 inch = 250 feet
Map Date: May 2018

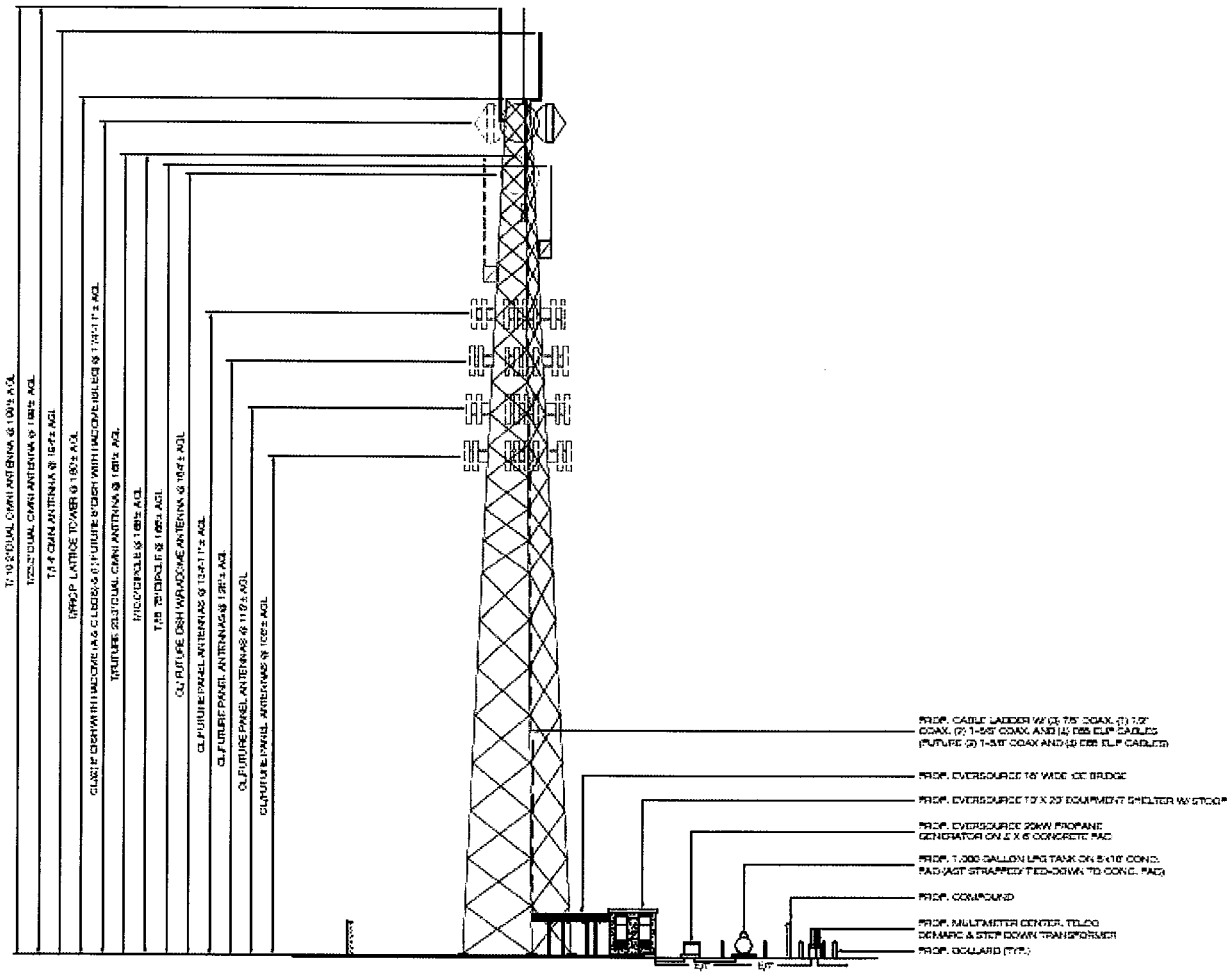
250 125 0 250 Feet

Figure 2
Site Schematic Map
Manchester 3A Substation Expansion and Replacement Communications Facility Project
250 Olcott Street
Manchester, Connecticut

EVERSOURCE ENERGY

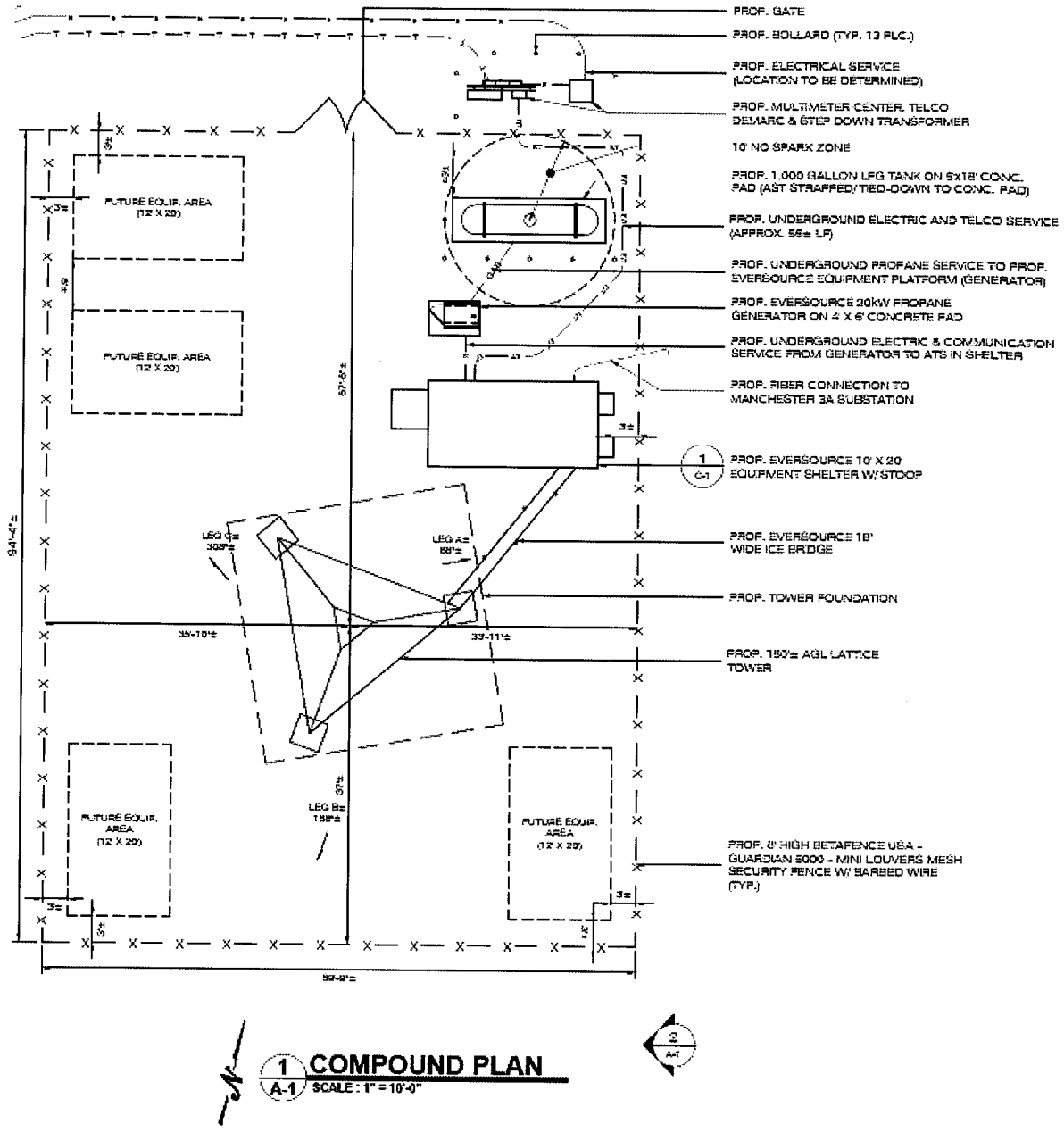
ALL POINTS TECHNOLOGY CORPORATION

Proposed Replacement Tower



2 EAST ELEVATION
A-1 SCALE: 1" = 16'-0"

Proposed Tower Compound



1 A-1 **COMPOUND PLAN**
SCALE : 1" = 10'-0"

EVERSOURCE ENERGY

107 Selden Street
Berlin, CT 06037

September 09, 2019

Mr. Jake Shappy
Transcend Wireless, LLC.
10 Industrial Ave. Suite 3
Mahwah, New Jersey. 07430

RE: Letter of Authorization

Project: Sprint Site # CT03XC067
250 Olcott Street
Manchester, CT. 06040

Owner: Eversource Energy

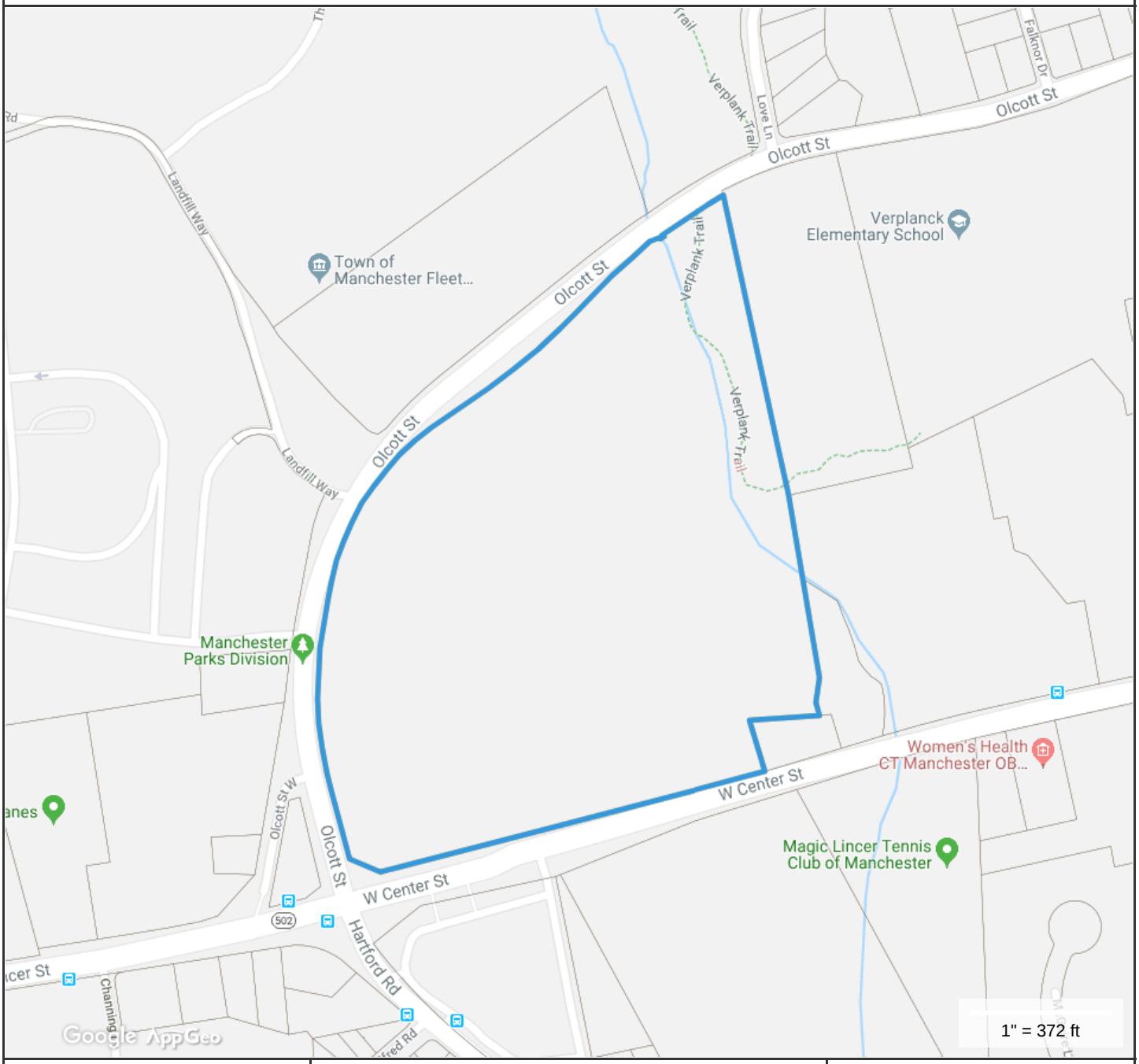
Dear Mr. Shappy,

Eversource Energy, owner of the tower facility located at the address identified above, do hereby authorize Sprint PCS, and/ or it's agent, to use this authorization letter for the sole purpose of filing and consummating any land-use or building permit application(s) as may be required by the applicable permitting authorities for the Licensee's telecommunication's installation.

Sincerely,

Steven J. Florio
Eversource Energy

REF: CENTEK Engineering, LLC
Project # 18116.00
Structural Analysis Rev. Date 01/03/2019
CD's Rev. Date 01/29/2019



CRCOG CAPITOL REGION COUNCIL OF GOVERNMENTS
Working together for a better region.

MAP FOR REFERENCE ONLY
NOT A LEGAL DOCUMENT

250 OLCOTT STREET

Location	250 OLCOTT STREET	**Mblu**	33/ 4300/ 250/ /
Acct#	430000250	**Owner**	CONNECTICUT LIGHT & POWER CO
Assessment	$330,300	**Appraisal**	$471,900
PID	12560	**Building Count**	1
DISTRICT	T	**CONCRETE**	

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2016	$51,200	$420,700	$471,900
Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2016	$35,800	$294,500	$330,300

Owner of Record

Owner	CONNECTICUT LIGHT & POWER CO	**Sale Price**	$0
Address	PO BOX 270 HARTFORD, CT 06141-0270	**Certificate**	C
		Book & Page	422/ 507

Sale Date

Ownership History

Ownership History				
Owner	**Sale Price**	**Certificate**	**Book & Page**	**Sale Date**
CONNECTICUT LIGHT & POWER CO	$0	C	422/ 507	

Building Information

Building 1 : Section 1

Year Built: 1950
Living Area: 900
Replacement Cost: $52,272
Replacement Cost Less Depreciation: $28,700

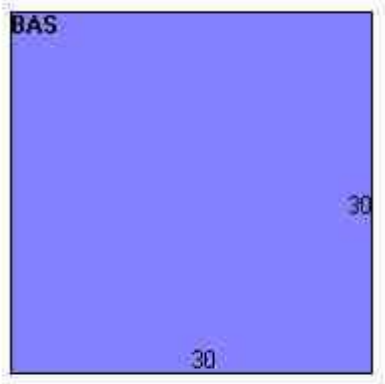
Building Attributes	
Field	**Description**
STYLE	Light Indust
MODEL	Ind/Comm
Grade	Average
Stories:	1
Occupancy	1
Exterior Wall 1	Brick/Masonry
Exterior Wall 2	
Roof Structure	Flat

Building Photo

(http://images.vgsi.com/photos2/ManchesterCTPhotos//\00\03\8

Roof Cover	Tar + Gravel
Interior Wall 1	Minim/Masonry
Interior Wall 2	
Interior Floor 1	Concr-Finished
Interior Floor 2	
Heating Fuel	Electric
Heating Type	Electr Basebrd
AC Type	None
Bldg Use	Pub Util. 96
Total Rooms	
Total Bedrms	00
Total Baths	0
1st Floor Use:	400
Heat/AC	None
Frame Type	Steel
Baths/Plumbing	Average
Ceiling/Wall	Ceil & Min Wl
Rooms/Prtns	Average
Wall Height	12
% Comn Wall	0

Building Layout



(http://images.vgsi.com/photos2/ManchesterCTPhotos//Sketches

Building Sub-Areas (sq ft)			Legend
Code	**Description**	**Gross Area**	**Living Area**
BAS	First Floor	900	900
		900	900

Extra Features

Extra Features	Legend

No Data for Extra Features

Land

Land Use

Use Code	400
Description	Pub Util. 96
Zone	IND
Neighborhood	3000
Alt Land Appr	No
Category	

Land Line Valuation

Size (Acres)	30.4
Frontage	0
Depth	0
Assessed Value	$294,500
Appraised Value	$420,700

Outbuildings

Outbuildings						Legend
Code	**Description**	**Sub Code**	**Sub Description**	**Size**	**Value**	**Bldg #**
SHD2	Shed W/Imp			900 S.F.	$9,900	1
FN3	Fence 6' Chain			600 L.F.	$6,900	1
PAV1	Paving Asphalt			1000 S.F.	$1,300	1
SHD2	Shed W/Imp			160 S.F.	$1,800	1
SHD2	Shed W/Imp			240 S.F.	$2,600	1

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2015	$52,700	$420,700	$473,400

2010	$56,000	$426,300	$482,300
2005	$35,700	$331,000	$366,700

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2015	$36,900	$294,500	$331,400
2010	$39,100	$298,400	$337,500
2005	$25,000	$231,700	$256,700

UPS Internet Shipping: View/Print Label

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

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

3. **GETTING YOUR SHIPMENT TO UPS**
   Customers with a Daily Pickup
   Your driver will pickup your shipment(s) as usual.

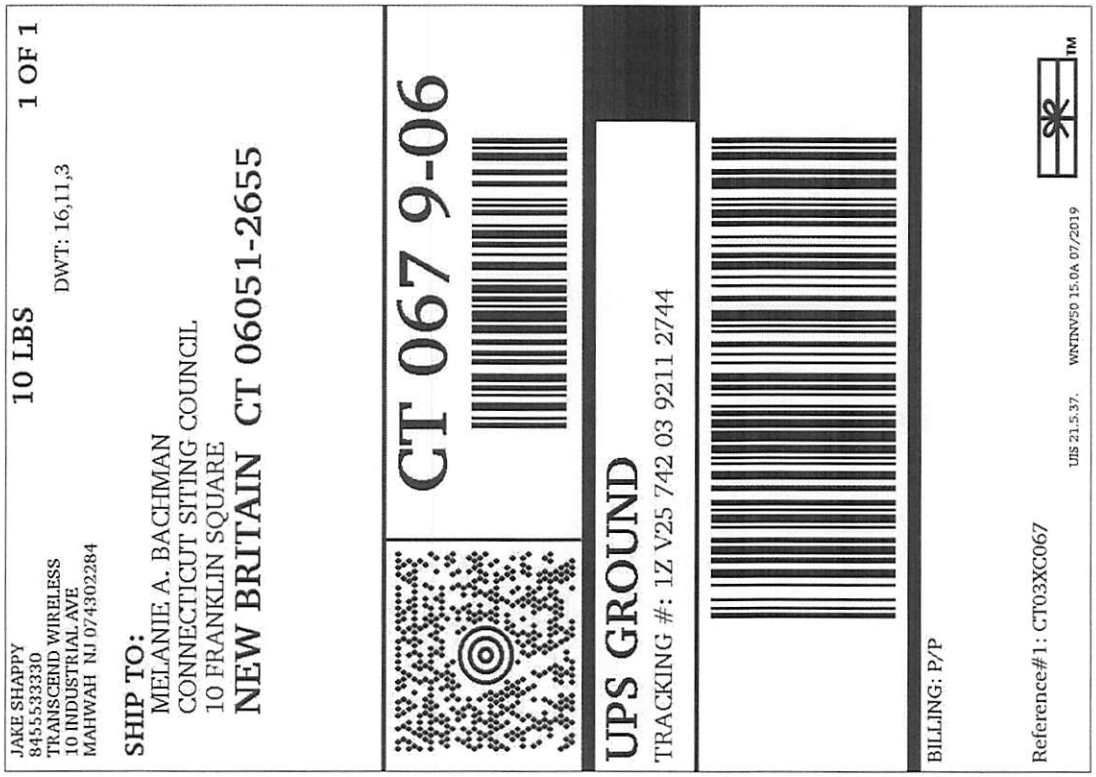
   Customers without a Daily Pickup
   Take your package to any location of The UPS Store®, UPS Access Point(TM) location, UPS Drop Box, UPS Customer Center, Staples® or Authorized Shipping Outlet near you. Items sent via UPS Return Services(SM) (including via Ground) are also accepted at Drop Boxes. To find the location nearest you, please visit the 'Find Locations' Quick link at ups.com.
   Schedule a same day or future day Pickup to have a UPS driver pickup all of your Internet Shipping packages. Hand the package to any UPS driver in your area.

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

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

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

FOLD HERE



UPS Internet Shipping: View/Print Label

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

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

3. **GETTING YOUR SHIPMENT TO UPS**
   Customers with a Daily Pickup
   Your driver will pickup your shipment(s) as usual.

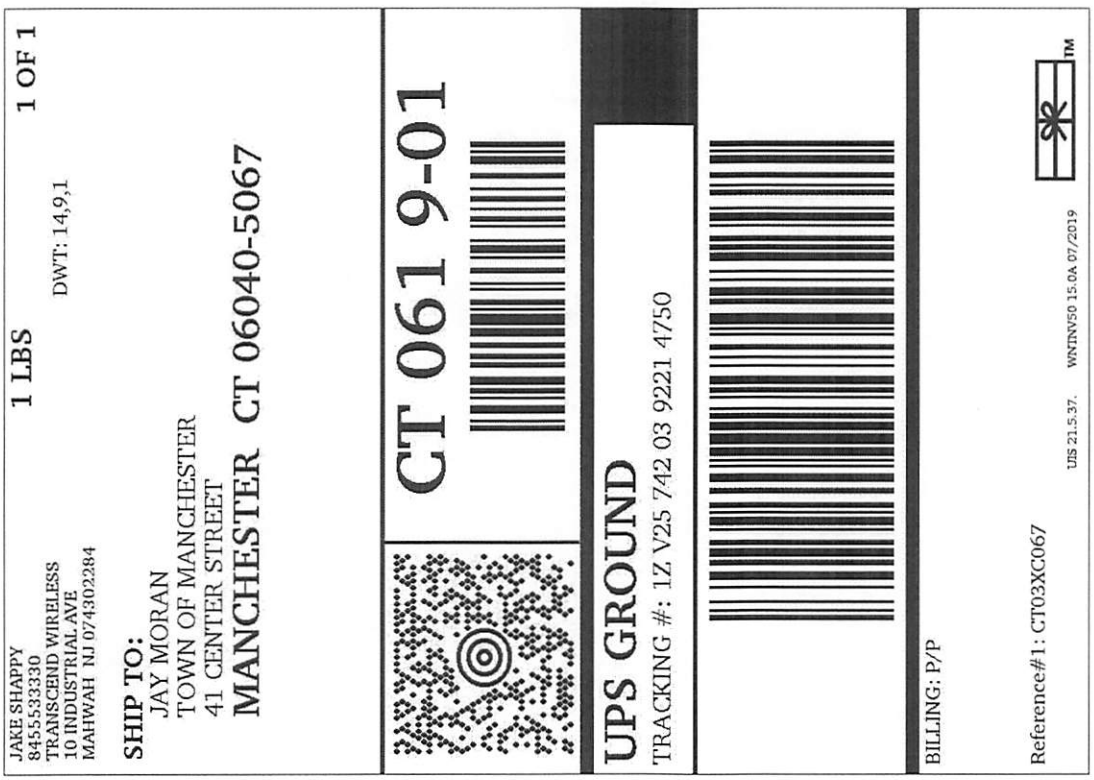
   Customers without a Daily Pickup
   Take your package to any location of The UPS Store®, UPS Access Point(TM) location, UPS Drop Box, UPS Customer Center, Staples® or Authorized Shipping Outlet near you. Items sent via UPS Return Services(SM) (including via Ground) are also accepted at Drop Boxes. To find the location nearest you, please visit the 'Find Locations' Quick link at ups.com.
   Schedule a same day or future day Pickup to have a UPS driver pickup all of your Internet Shipping packages. Hand the package to any UPS driver in your area.

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

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

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

FOLD HERE



UPS Internet Shipping: View/Print Label

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

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

3. **GETTING YOUR SHIPMENT TO UPS**
   Customers with a Daily Pickup
   Your driver will pickup your shipment(s) as usual.

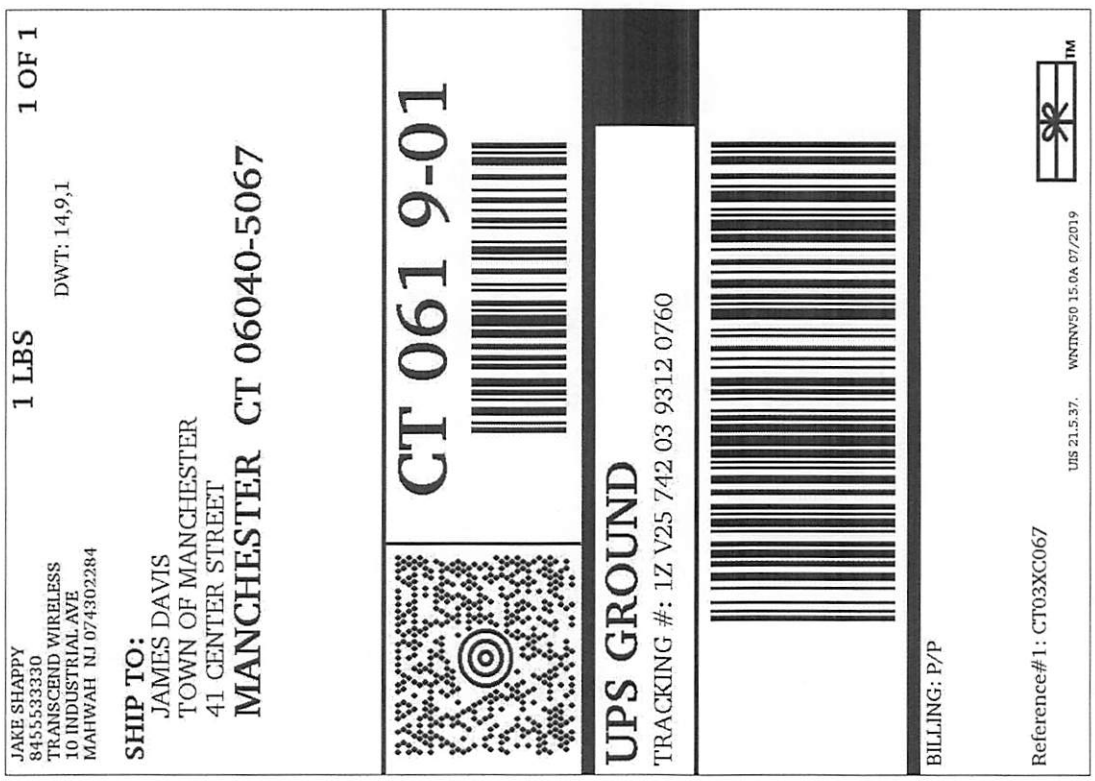
   Customers without a Daily Pickup
   Take your package to any location of The UPS Store®, UPS Access Point(TM) location, UPS Drop Box, UPS Customer Center, Staples® or Authorized Shipping Outlet near you. Items sent via UPS Return Services(SM) (including via Ground) are also accepted at Drop Boxes. To find the location nearest you, please visit the 'Find Locations' Quick link at ups.com.
   Schedule a same day or future day Pickup to have a UPS driver pickup all of your Internet Shipping packages. Hand the package to any UPS driver in your area.

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

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

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

FOLD HERE



UPS Internet Shipping: View/Print Label

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

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

3. **GETTING YOUR SHIPMENT TO UPS**
   Customers with a Daily Pickup
   Your driver will pickup your shipment(s) as usual.

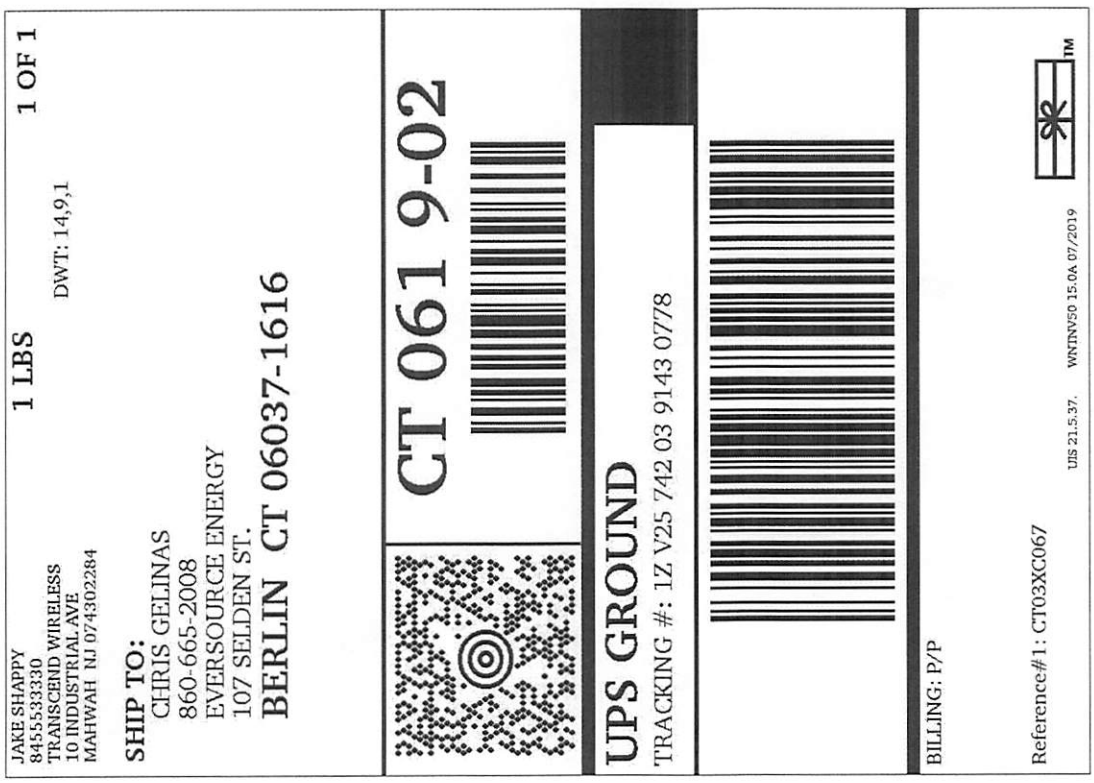
   Customers without a Daily Pickup
   Take your package to any location of The UPS Store®, UPS Access Point(TM) location, UPS Drop Box, UPS Customer Center, Staples® or Authorized Shipping Outlet near you. Items sent via UPS Return Services(SM) (including via Ground) are also accepted at Drop Boxes. To find the location nearest you, please visit the 'Find Locations' Quick link at ups.com.
   Schedule a same day or future day Pickup to have a UPS driver pickup all of your Internet Shipping packages.
   Hand the package to any UPS driver in your area.

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

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

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

FOLD HERE



WIRELESS COMMUNICATIONS FACILITY

MANCHESTER
SITE ID: CT03XC067
250 SOUTH OLCOTT ST
MANCHESTER, CT 06040

PROJECT SUMMARY

1. THE PROPOSED GENERAL SCOPE OF WORK CONSISTS OF THE FOLLOWING:

   A. INSTALL NEW SPRINT RADIO EQUIPMENT ON NEW CONCRETE PAD AT GRADE (PAD INSTALLATION BY OTHERS) WITHIN THE COMMUNICATIONS FACILITY FENCED COMPOUND.

   B. INSTALL A TOTAL OF (6) PANEL ANTENNAS, (9) RRH UNITS WITH ASSOCIATED CABLES ONTO THREE (3) PROPOSED SECTOR MOUNTING FRAMES AT A CENTERLINE ELEVATION OF 135' AGL. THE PROPOSED SPRINT ANTENNAS AND APPURTENANCES TO BE INSTALLED ON A 180' TALL SELF-SUPPORTING LATTICE TOWER (TOWER INSTALLATION BY OTHERS).

GENERAL NOTES

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE 2015 INTERNATIONAL BUILDING CODE AS MODIFIED BY THE 2018 CONNECTICUT STATE BUILDING CODE, INCLUDING THE TIA-222 REVISION "G" STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND SUPPORTING STRUCTURES, 2016 CONNECTICUT FIRE SAFETY CODE AND, 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 SPRINT 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.

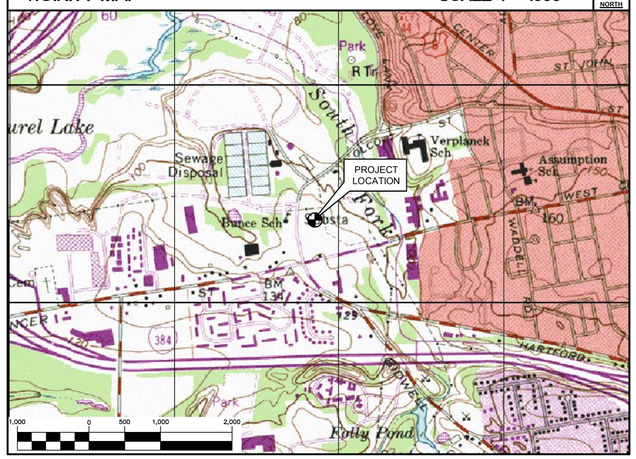
SITE DIRECTIONS

FROM: 5 WAYSIDE ROAD, BURLINGTON, MA 01803 **TO:** 250 SOUTH OLCOTT ST, MANCHESTER, CT 06040

1.	START OUT BY GOING TO WAYSIDE ROAD.	0.10 MI.
2.	TURN LEFT ONTO CAMBRIDGE ST/US-3 N/MA.	0.30 MI.
3.	MERGE ONTO I-95 S/US-3 N TOWARD WALTHAM/LOWELL.	12.10 MI.
4.	TAKE EXIT 25 TOWARD I-90/MASS PIKE.	0.40 MI.
5.	KEEP RIGHT AT THE FORK, FOLLOW SIGNS FOR I-90 W/WORCESTER AND MERGE ONTO I-90 W.	44.50 MI.
6.	USE THE RIGHT 2 LANE TO TAKE EXIT 9 FOR I-84 TOWARD US-20/HARTFORD/NYC.	0.70 MI.
7.	CONTINUE ONTO I-84.	35.40 MI.
8.	TAKE EXIT 60-62 FOR US-44/MIDDLE TURNPIKE W.	1.40 MI.
9.	KEEP LEFT AT THE FORK, FOLLOW SIGNS FOR I-84 W/HARTFORD.	0.40 MI.
10.	KEEP RIGHT TO CONTINUE ON EXIT 60, FOLLOW SIGNS FOR US-44/BURNSIDE AVE/MIDDLE TNPK W.	0.50 MI.
11.	TURN LEFT ONTO US-44 E/MIDDLE TURNPIKE W.	0.60 MI.
12.	TURN RIGHT ONTO US-44 E/US-6 E.	0.20 MI.
13.	TURN RIGHT ONTO LOVE LN.	0.50 MI.
14.	TURN RIGHT ONTO OLCOTT ST.	0.20 MI.

VICINITY MAP

SCALE: 1" = 1000'



PROJECT INFORMATION

SITE NAME:	MANCHESTER
SITE ID:	CT03XC067
SITE ADDRESS:	250 SOUTH OLCOTT ST MANCHESTER, CT 06040
APPLICANT:	SPRINT 5 WAYSIDE ROAD BURLINGTON, MA 01803
CONTACT PERSON:	DOUG TALMADGE (PROJECT MANAGER) (475) 434-4292
ENGINEER:	CENTEK ENGINEERING, INC. 63-2 NORTH BRANFORD RD. BRANFORD, CT 06405
PROJECT COORDINATES:	LATITUDE: 41° 46' 11.78"N LONGITUDE: 72° 33' 32.70"W GROUND ELEVATION: ±113' AMSL SITE COORDINATES REFERENCED AND GROUND ELEVATION REFERENCED FROM GOOGLE EARTH.

SHEET INDEX

SHT. NO.	DESCRIPTION	REV.
T-1	TITLE SHEET	0
N-1	DESIGN BASIS, NOTES AND SPECIFICATIONS	0
C-1	COMPOUND PLANS AND ELEVATION	0
C-2	MISCELLANEOUS DETAILS	0
C-3	EQUIPMENT AND ANTENNA DETAILS	0
E-1	COMPOUND PLAN AND NOTES	0
E-2	ELECTRICAL RISER DIAGRAM AND NOTES	0
E-3	SCHEMATIC RISER DIAGRAM AND NOTES	0
E-4	COMPOUND GROUNDING PLAN	0
E-5	ELECTRICAL DETAILS	0
E-6	ELECTRICAL DETAILS	0
E-7	ELECTRICAL SPECIFICATIONS	0

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	DMD	TJL	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

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

SPRINT
WIRELESS COMMUNICATIONS FACILITY
MANCHESTER
SITE ID: CT03XC067
250 OLCOTT ST
MANCHESTER, CT 06040

DATE: 10/25/18
SCALE: AS NOTED
JOB NO. 18116.00

TITLE SHEET

T-1

Sheet No. 1 of 12

DESIGN BASIS:

GOVERNING CODE: 2015 INTERNATIONAL BUILDING (IBC) AS MODIFIED BY THE 2018 CT STATE BUILDING CODE AND AMENDMENTS.

1. DESIGN CRITERIA:

- WIND LOAD: PER TIA 222 G: 90–105 MPH (3 SECOND GUST)
- RISK CATEGORY: III (BASED ON IBC TABLE 1604.5)
- NOMINAL DESIGN SPEED (OTHER STRUCTURE): 97 MPH (Vasd) (EXPOSURE C/IMPORTANCE FACTOR 1.0 BASED ON ASCE 7–10) PER 2015 INTERNATIONAL BUILDING CODE (IBC) AS MODIFIED BY THE 2018 CONNECTICUT STATE BUILDING CODE.
- SEISMIC LOAD (DOES NOT CONTROL): PER ASCE 7–10 MINIMUM DESIGN LOADS FOR BUILDING 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 EVERSOURCE OWNED EQUIPMENT.
14. REFER TO DRAWING T1 FOR ADDITIONAL NOTES AND REQUIREMENTS.

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.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	DMD	TJL	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

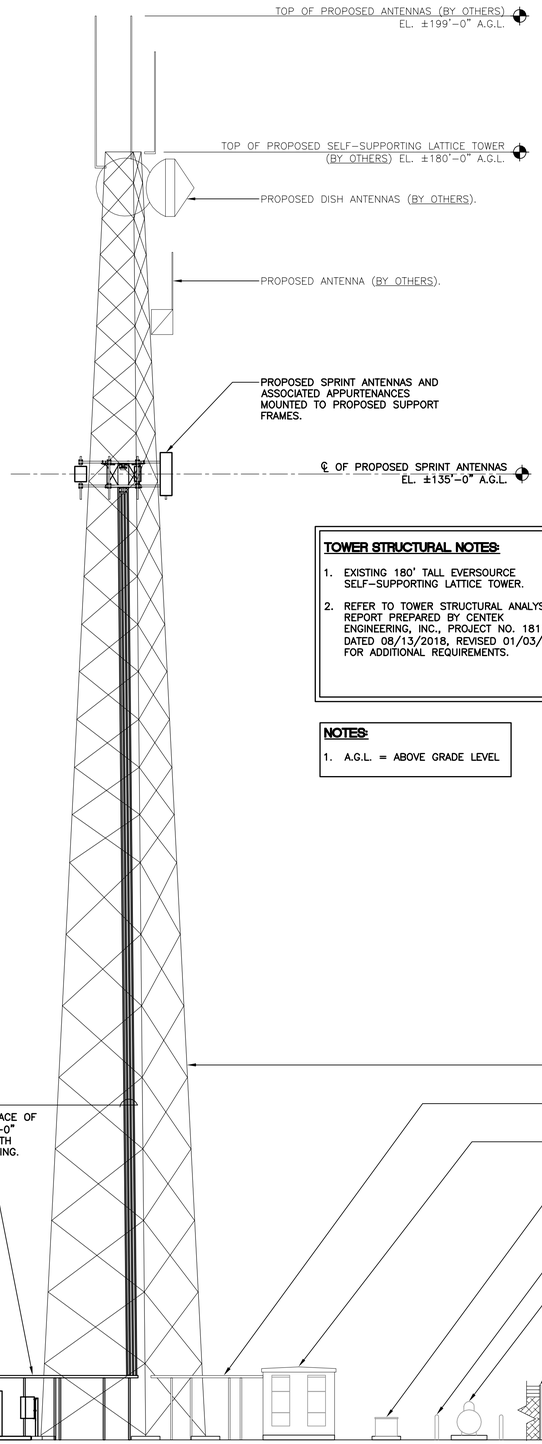
CENTEK engineering
Centered on Solutions℠
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

SPRINT
WIRELESS COMMUNICATIONS FACILITY
MANCHESTER
SITE ID: CT03XC067
250 OLCOTT ST
MANCHESTER, CT 06040

DATE: 10/25/18
SCALE: AS NOTED
JOB NO. 18116.00

DESIGN BASIS, NOTES AND SPECIFICATIONS

N–1

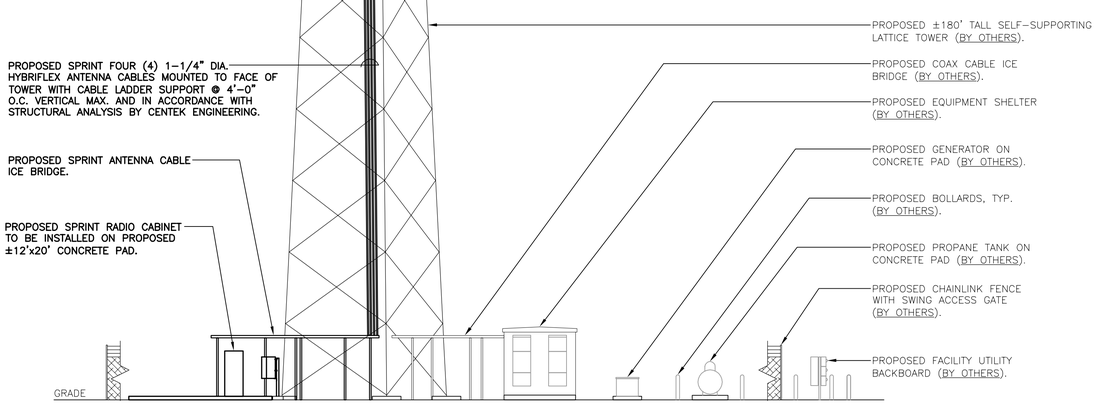


TOWER STRUCTURAL NOTES:

1. EXISTING 180' TALL EVERSOURCE SELF-SUPPORTING LATTICE TOWER.
2. REFER TO TOWER STRUCTURAL ANALYSIS REPORT PREPARED BY CENTEK ENGINEERING, INC., PROJECT NO. 18116.00 DATED 08/13/2018, REVISED 01/03/2019 FOR ADDITIONAL REQUIREMENTS.

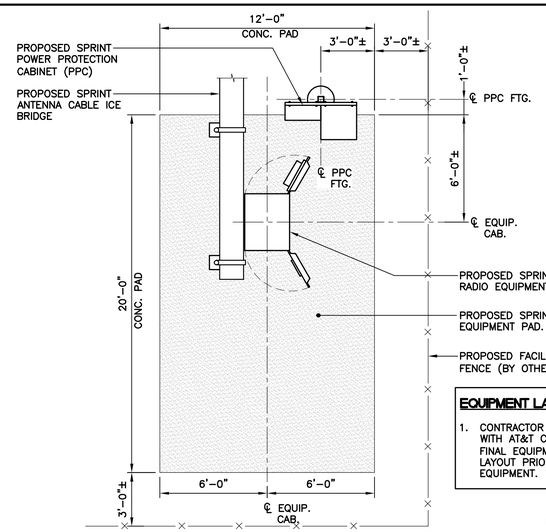
NOTES:

1. A.G.L. = ABOVE GRADE LEVEL



1 C-1 **COMPOUND/TOWER ELEVATION**
SCALE: 1" = 10'-0"

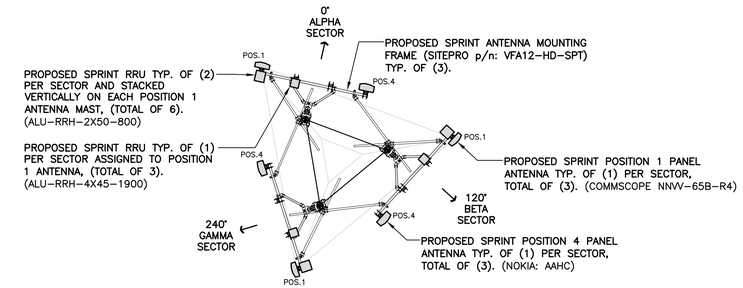
GRAPHIC SCALE
10 0 5 10 20 40
(IN FEET)
1 inch = 10 ft.



3 C-1 **EQUIPMENT LAYOUT PLAN**
SCALE: 1/4" = 1'-0"

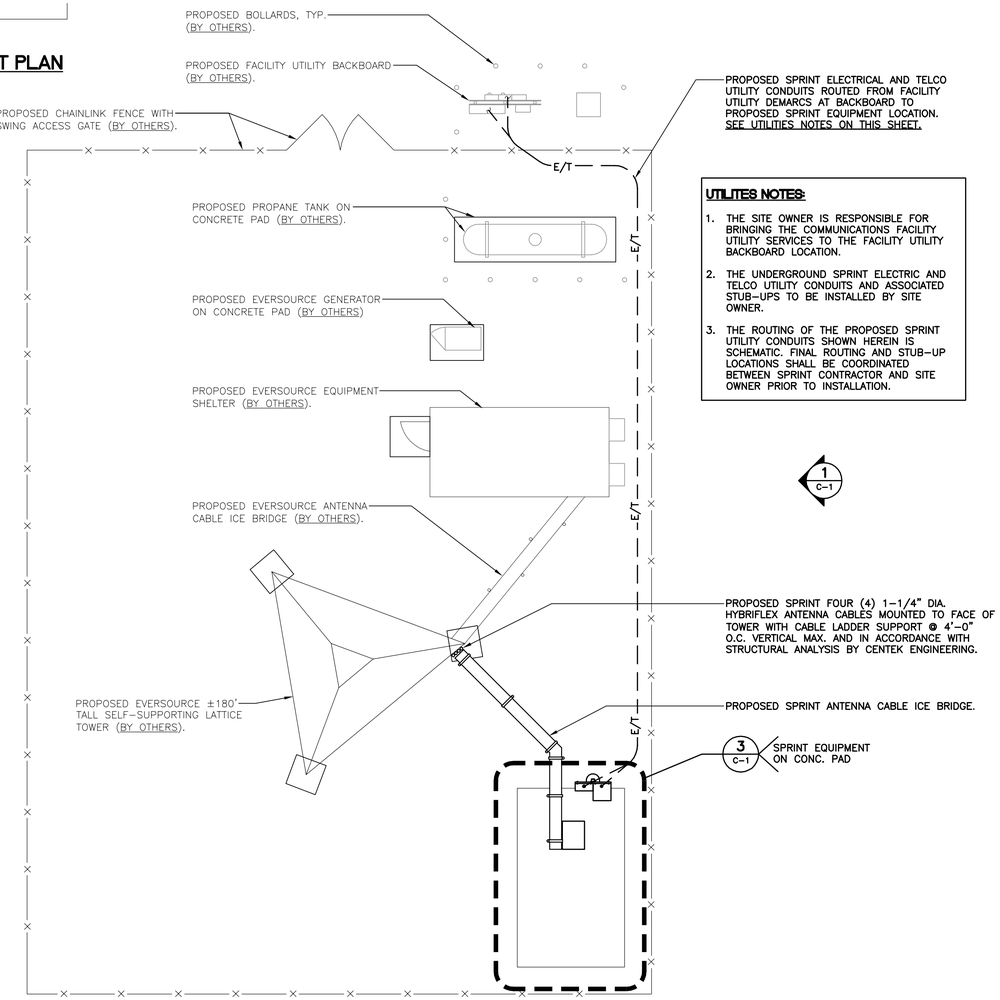
EQUIPMENT LAYOUT NOTE:

1. CONTRACTOR TO VERIFY AND COORDINATE WITH AT&T CONSTRUCTION MANAGER FOR FINAL EQUIPMENT MAKE/MODEL AND LAYOUT PRIOR TO ORDERING OR INSTALLING EQUIPMENT.



4 C-1 **ANTENNA MOUNTING CONFIGURATION PLAN**
SCALE: 1/8" = 1'-0"

TRUE NORTH



UTILITES NOTES:

1. THE SITE OWNER IS RESPONSIBLE FOR BRINGING THE COMMUNICATIONS FACILITY UTILITY SERVICES TO THE FACILITY UTILITY BACKBOARD LOCATION.
2. THE UNDERGROUND SPRINT ELECTRIC AND TELCO UTILITY CONDUITS AND ASSOCIATED STUB-UPS TO BE INSTALLED BY SITE OWNER.
3. THE ROUTING OF THE PROPOSED SPRINT UTILITY CONDUITS SHOWN HEREIN IS SCHEMATIC. FINAL ROUTING AND STUB-UP LOCATIONS SHALL BE COORDINATED BETWEEN SPRINT CONTRACTOR AND SITE OWNER PRIOR TO INSTALLATION.

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

TRUE NORTH

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	DMD	TJL	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

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

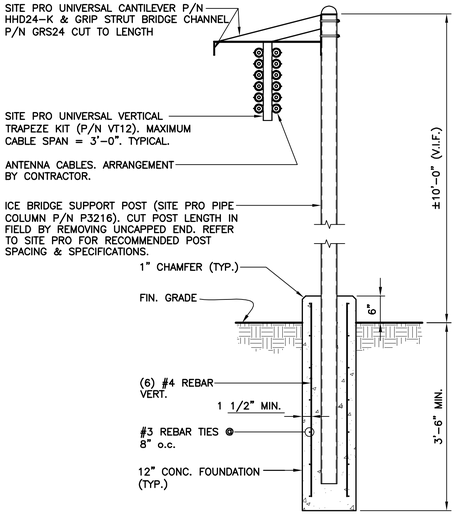
SPRINT
WIRELESS COMMUNICATIONS FACILITY
MANCHESTER
SITE ID: CT03XC067
250 OLCOTT ST
MANCHESTER, CT 06040

DATE:	10/25/18
SCALE:	AS NOTED
JOB NO.	18116.00

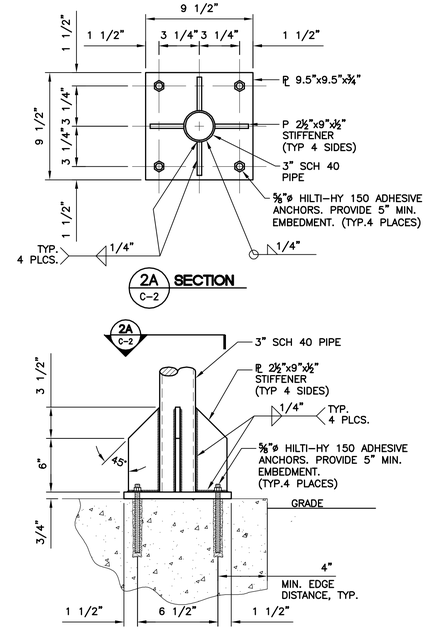
COMPOUND PLAN AND ELEVATION

C-1

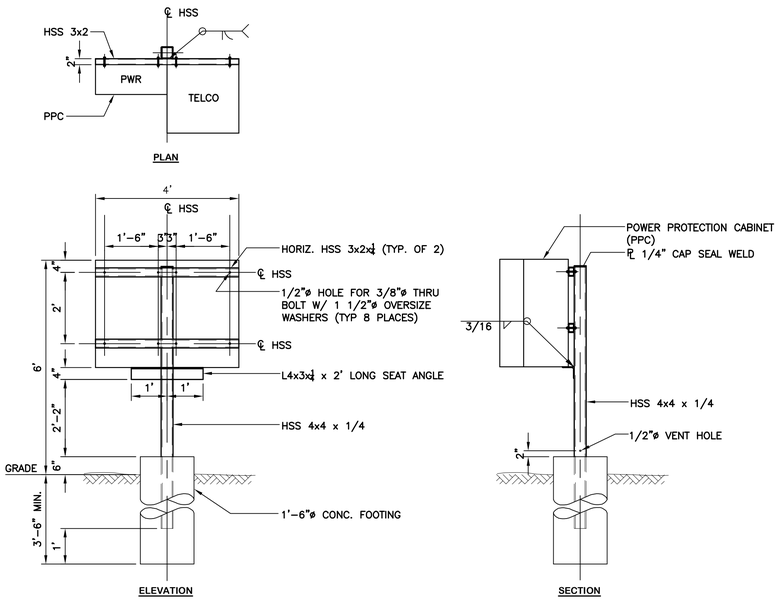
Sheet No. 3 of 12



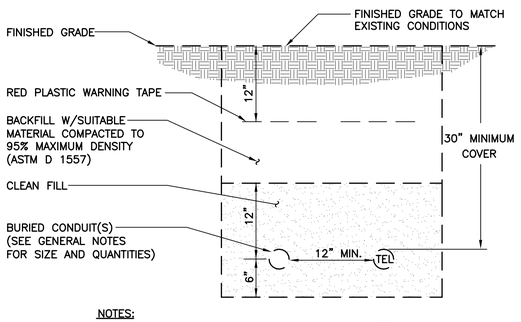
1 C-2 **ICE BRIDGE CANOPY DETAIL**
NOT TO SCALE



2 C-2 **POST TO CONCRETE CONNECTION DETAIL**
NOT TO SCALE

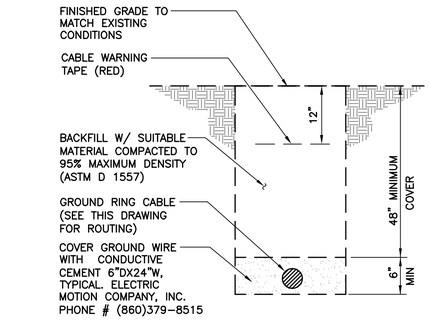


3 C-2 **PPC SUPPORT FRAME DETAIL**
NOT TO SCALE



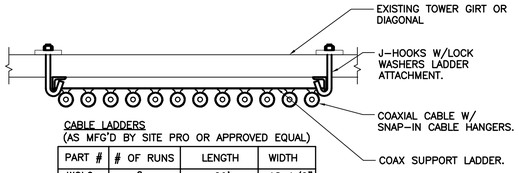
NOTES:
1. THE CLEAN FILL SHALL PASS THROUGH A 3/8" MESH SCREEN AND SHALL NOT CONTAIN SHARP STONES. OTHER BACKFILL SHALL NOT CONTAIN ASHES, CINDERS, SHELLS, FROZEN MATERIAL, LOOSE DEBRIS OR STONES LARGER THAN 2" IN MAXIMUM DIMENSION.
2. WHERE EXISTING UTILITIES ARE LIKELY TO BE ENCOUNTERED, CONTRACTOR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

4 C-2 **TYPICAL ELECTRICAL TRENCH DETAIL**
NOT TO SCALE



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

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



CABLE LADDERS
(AS MFG'D BY SITE PRO OR APPROVED EQUAL)

PART #	# OF RUNS	LENGTH	WIDTH
WCL6	6	20'	18 1/2"
WCL8	8	20'	26"
WCL9	9	20'	29 1/2"
WCL12	12	20'	38"

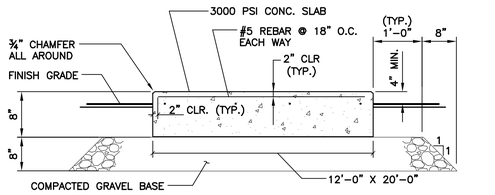
NOTES:
1. EACH 20' SECTION INCLUDES 6 WAVEGUIDE BRACKETS THAT ARE PRE-PUNCHED FOR SNAP-IN HANGERS AND BUTTERFLY HANGERS.
2. EACH KIT INCLUDES SPLICES TO ATTACH ADDITIONAL SECTIONS.
3. ALL PARTS ARE HOT-DIP GALVANIZED.

CABLE LADDERS ATTACHMENT KIT
(AS MFG'D BY SITE PRO OR APPROVED EQUAL)

PART #	APPLICATION
CLK-U	UNIVERSAL (ANGLES 2" TO 5" & ROUND MEMBERS 1" TO 4 1/2"ø)

NOTES:
1. USE A MINIMUM OF TWO KITS PER 20' SECTION OF LADDER.
2. ALL PARTS ARE HOT-DIPPED GALVANIZED.

6 C-2 **COAX SUPPORT LADDER DETAIL**
NOT TO SCALE



NOTES:
1. TOP OF SLAB TOLERANCE IS 1/4"±.
2. PROVIDE PVC SLEEVES FOR UTILITY CONDUIT PASSAGE THROUGH PAD OR CAST CONDUITS IN PLACE AS APPLICABLE. COORDINATE SLEEVE/CONDUIT LOCATIONS WITH CONSTRUCTION MANAGER.
3. REFER TO NOTES ON SHEET N-1 FOR ADDITIONAL REQUIREMENTS.
4. COORDINATE EQUIPMENT CABINET HOLD-DOWN HARDWARE WITH MANUFACTURER.

7 C-2 **EQUIPMENT PAD DETAIL**
NOT TO SCALE

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	DMD	TJL	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

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

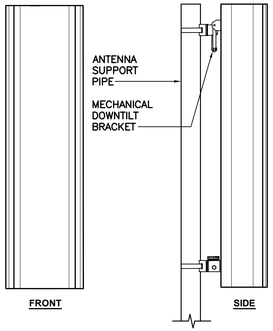
Sprint

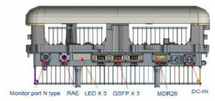
SPRINT
WIRELESS COMMUNICATIONS FACILITY
MANCHESTER
SITE ID: CT03XC067
250 OLCOTT ST
MANCHESTER, CT 06040

DATE: 10/25/18
SCALE: AS NOTED
JOB NO. 18116.00

MISCELLANEOUS DETAILS

C-2
Sheet No. 4 of 12





BOTTOM - AAHC

BOTTOM - NNVV-65B-R4 ANTENNA

ALPHA/BETA/GAMMA ANTENNA		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: COMMSCOPE MODEL: NNVV-65B-R4	72.0"L x 19.6"W x 7.8"D	78 LBS.
MAKE: NOKIA MODEL: AAHC	25.6"L x 19.7"W x 9.6"D	104 LBS.

1 C-2 **PROPOSED ANTENNA DETAILS**
NOT TO SCALE

RADIO EQUIPMENT CABINET		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: ELTEK MODEL: ESOA220-SCA02	30.0"W x 38.0"D x 73.5"H	505 LBS. (WITHOUT EQUIP. OR BATTERIES)
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT CABINET MODEL SELECTION WITH SPRINT CONSTRUCTION MANAGER PRIOR TO ORDERING.		

2 C-2 **EQUIPMENT CABINET DETAIL**
NOT TO SCALE

POWER PROTECTION CABINET (PPC)		
EQUIPMENT	DIMENSIONS	WEIGHT
MAKE: ELTEK PART NO.: 5811122212 (POWER SECTION/TELCO SECTION COMBO)	POWER SECTION: 24.0"W x 10.0"D x 36.0"H TELCO SECTION: 24.0"W x 23.0"D x 36.0"H	POWER SECTION: 80 LBS TELCO SECTION: 50 LBS
NOTES: 1. CONTRACTOR TO COORDINATE FINAL PPC CABINET MODEL SELECTION WITH SPRINT CONSTRUCTION MANAGER PRIOR TO ORDERING.		

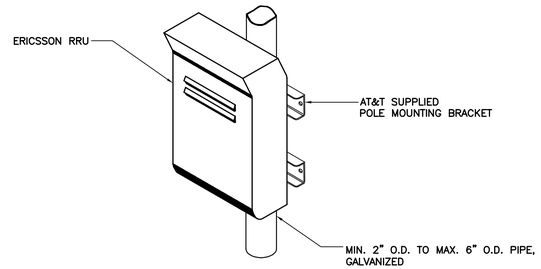
3 C-2 **POWER PROTECTION CABINET DETAIL**
NOT TO SCALE

RRH-4x45-1900

RRH-2x50-800

RRU (REMOTE RADIO UNIT)			
EQUIPMENT	DIMENSIONS	WEIGHT	CLEARANCES
MAKE: ALCATEL-LUCENT MODEL: RRH-4x45-1900	25"L x 12"W x 12"D	60 LBS.	ABOVE: 16" MIN. BELOW: 12" MIN. FRONT: 36" MIN.
MAKE: ALCATEL-LUCENT MODEL: RRH-2x50-800	15.7"L x 13.0"W x 9.8"D	53 LBS.	ABOVE: 16" MIN. BELOW: 12" MIN. FRONT: 36" MIN.
NOTES: 1. CONTRACTOR TO COORDINATE FINAL EQUIPMENT MODEL SELECTION WITH SPRINT CONSTRUCTION MANAGER PRIOR TO ORDERING.			

4 C-2 **REMOTE RADIO HEAD DETAILS**
NOT TO SCALE



ISOMETRIC VIEW

NOTES:

1. AT&T SHALL SUPPLY RRU, AND RRU POLE-MOUNTING BRACKET. CONTRACTOR SHALL SUPPLY POLE/PIPE AND INSTALL ALL MOUNTING HARDWARE INCLUDING ERICSSON RRU POLE-MOUNTING BRACKET. CONTRACTOR SHALL INSTALLS RRU AND MAKES CABLE TERMINATIONS.
2. NO PAINTING OF THE RRU OR SOLAR SHIELD IS ALLOWED.

5 C-4 **TYPICAL RRU MOUNTING DETAIL**
SCALE: NTS

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	DMD	TJL	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

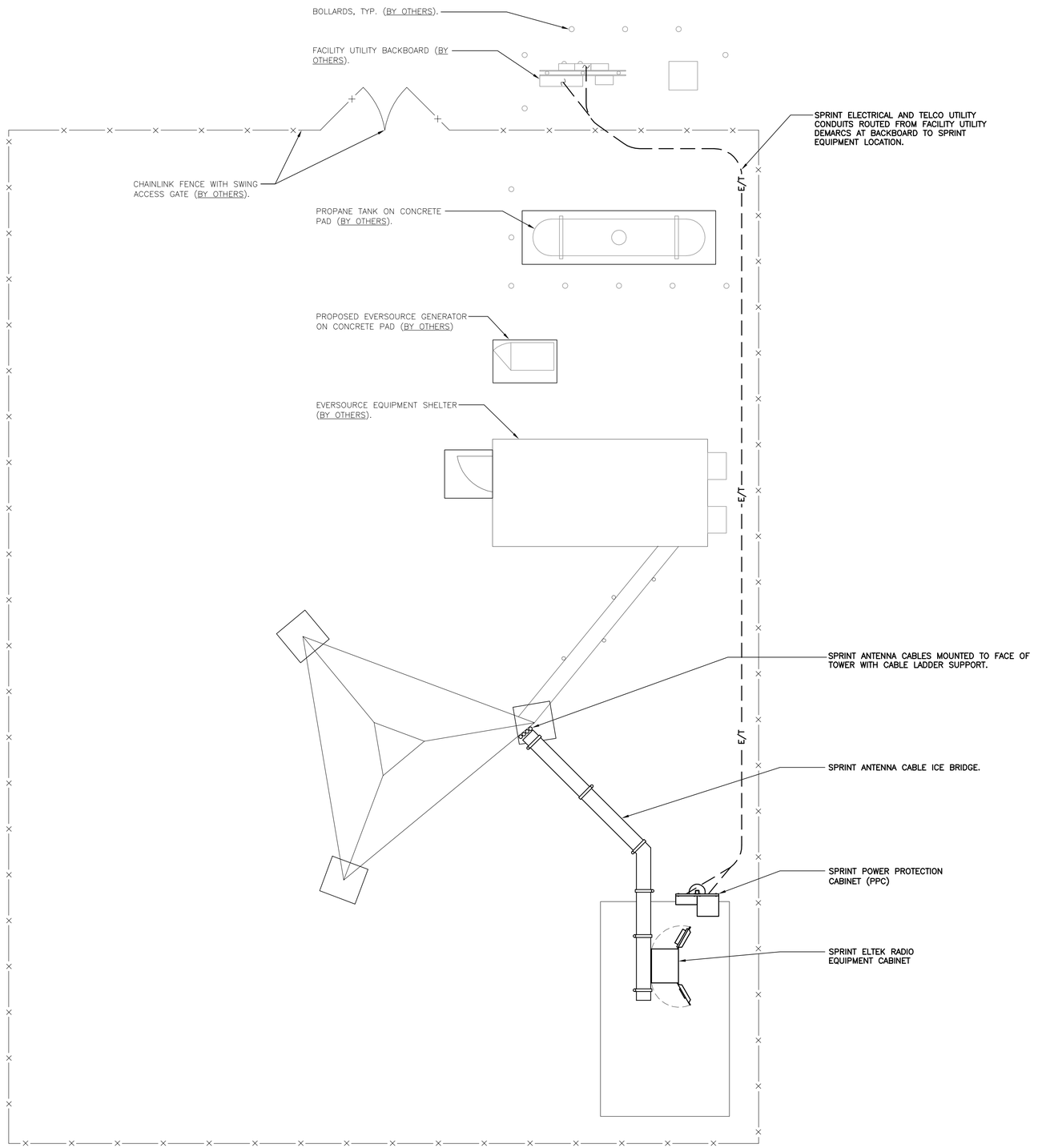
CENTEK engineering
Centered on Solutions℠
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

SPRINT
WIRELESS COMMUNICATIONS FACILITY
MANCHESTER
SITE ID: CT03XC067
250 OLCOTT ST
MANCHESTER, CT 06040

DATE: 10/25/18
SCALE: AS NOTED
JOB NO. 18116.00

EQUIPMENT AND ANTENNA DETAILS

C-3
Sheet No. 5 of 12



1 / E-1 **COMPOUND PLAN**
SCALE: 3/16" = 1'-0"

TRUE NORTH

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. THE EXACT BUILDING FOUNDATION SIZE AND BUILDING WALL PENETRATIONS FOR UTILITIES SHALL BE CONFIRMED WITH THE BUILDING SPECIFICATIONS AND PLANS PRIOR TO LAYOUT.
4. ALL UTILITY WORK SHALL BE IN ACCORDANCE WITH LOCAL UTILITY COMPANY REQUIREMENTS AND SPECIFICATIONS.
5. PROVIDE CADWELD CONNECTION STYLES: THROUGH (CABLE TO CABLE) TYPE "TA"
   (CABLE TO SURFACE) TYPE "LA" OR "VS" (PIPE)
   (CABLE TO ROD) TYPE "GT" OR "NC"
   (CABLE TO CABLE) TYPE "SS"

ELECTRICAL LEGEND

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	TJB	TGK	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

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

SPRINT
WIRELESS COMMUNICATIONS FACILITY
SITE ID: CT03XC067
MANCHESTER
250 OLCOTT ST
MANCHESTER, CT 06040

DATE: 01/09/19
SCALE: AS NOTED
JOB NO. 18116.00

COMPOUND PLAN AND NOTES

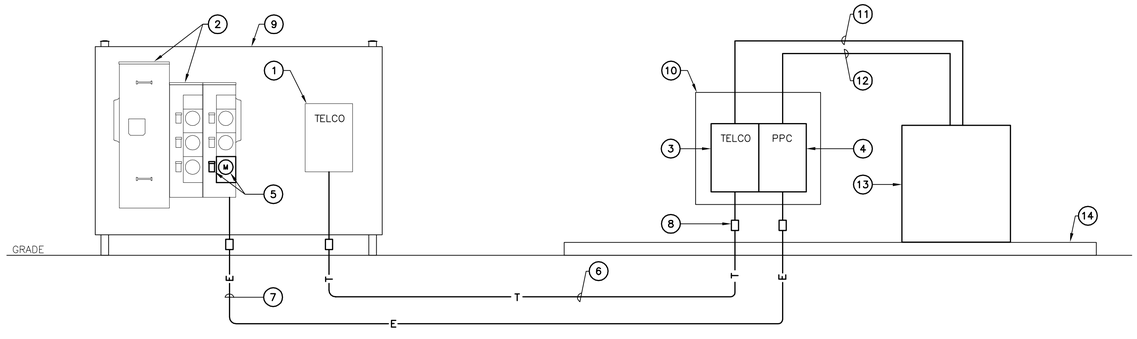
E-1
Sheet No. 6 of 12

RISER DIAGRAM NOTES

1. EXISTING TELCO BOARD TO REMAIN.
2. EXISTING MULTIMETER CENTER TO REMAIN.
3. ELTEK TELCO CABINET.
4. ELTEK PPC CABINET.
5. 200A, SINGLE PHASE, 240 UTILITY METER AND ASSOCIATED 200A, 240V, 2P CIRCUIT BREAKER IN AVAILABLE POSITION IN METER CENTER.
6. 4" CONDUIT WITH PULL ROPE FOR TELEPHONE COMPANY CONDUCTORS. COORDINATE REQUIREMENTS WITH TELEPHONE SERVICE PROVIDER. PROVIDE ALL COUPLINGS, ADAPTERS, SWEEPS, AND ASSOCIATED HARDWARE. MATERIAL SHALL BE PER TELEPHONE COMPANY SPECIFICATIONS.
7. (3) #3/0 AWG, (1) #6 AWG GROUND, 2-1/2" CONDUIT.
8. EXPANSION COUPLING (TYP).
9. EXISTING UTILITY BACKBOARD. REFER TO CIVIL DRAWINGS.
10. UTILITY FRAME AT EQUIPMENT. REFER TO CIVIL DRAWINGS FOR DETAILS.
11. CONDUITS AND CONDUCTORS FOR TELCO CONNECTION TO EQUIPMENT CABINETS AS REQUIRED BY MANUFACTURER AND CONSTRUCTION MANAGER FOR PROPER OPERATION OF EQUIPMENT.
12. POWER CONDUITS AND CONDUCTORS FOR EQUIPMENT CABINETS AS REQUIRED BY MANUFACTURER FOR PROPER OPERATION.
13. SPRINT EQUIPMENT CABINET. INSTALL PER MANUFACTURER SPECIFICATIONS.
14. SPRINT CONCRETE EQUIPMENT PAD.

GENERAL NOTES:

1. CONDUCTOR SIZES SHALL NOT BE REDUCED OR SUBSTITUTED WITHOUT ENGINEERS APPROVAL.
2. UNLESS OTHERWISE NOTED, ALL CONDUCTORS AND CONDUCTOR TERMINATIONS SHALL BE RATED FOR MINIMUM 75 DEGREE C CONTINUOUS OPERATION.
3. COORDINATE ALL SHUTDOWNS WITH OWNER AND ALL AFFECTED PARTIES. PROVIDE TEMPORARY POWER AS REQUIRED.
4. CONTRACTOR TO COORDINATE ALL CONDUIT ROUTING AND INSTALLATION REQUIREMENTS IN THE FIELD WITH LOCAL UTILITIES, SITE OWNER, AND WIRELESS CARRIER'S CONSTRUCTION MANAGER PRIOR TO INSTALLATION.
5. RESTORE ALL DISTURBED AREAS TO PRE-CONSTRUCTION CONDITION.
6. ALL WORK SHALL BE IN ACCORDANCE WITH NEC REQUIREMENTS. COORDINATE WITH CONSTRUCTION MANAGER FOR ANY ADDITIONAL REQUIREMENTS.
7. COORDINATE WITH CONSTRUCTION MANAGER FOR LOCATION, LAYOUT, AND MOUNTING REQUIREMENTS FOR ALL ELECTRICAL EQUIPMENT.
8. ALL CONDUITS SHALL HAVE EXPANSION COUPLINGS WHERE EXTENDING ABOVE GRADE.
9. REFER TO SITE UTILITY PLAN FOR ADDITIONAL INFORMATION.
10. ALL TELEPHONE UTILITY WORK MUST BE COORDINATED WITH TELEPHONE UTILITY COMPANY, AND ALL EQUIPMENT MUST BE UTILITY COMPANY APPROVED. CONTRACTOR SHALL PROVIDE ALL ELEMENTS NOT PROVIDED BY UTILITY COMPANY.



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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	TJB	TGK	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

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

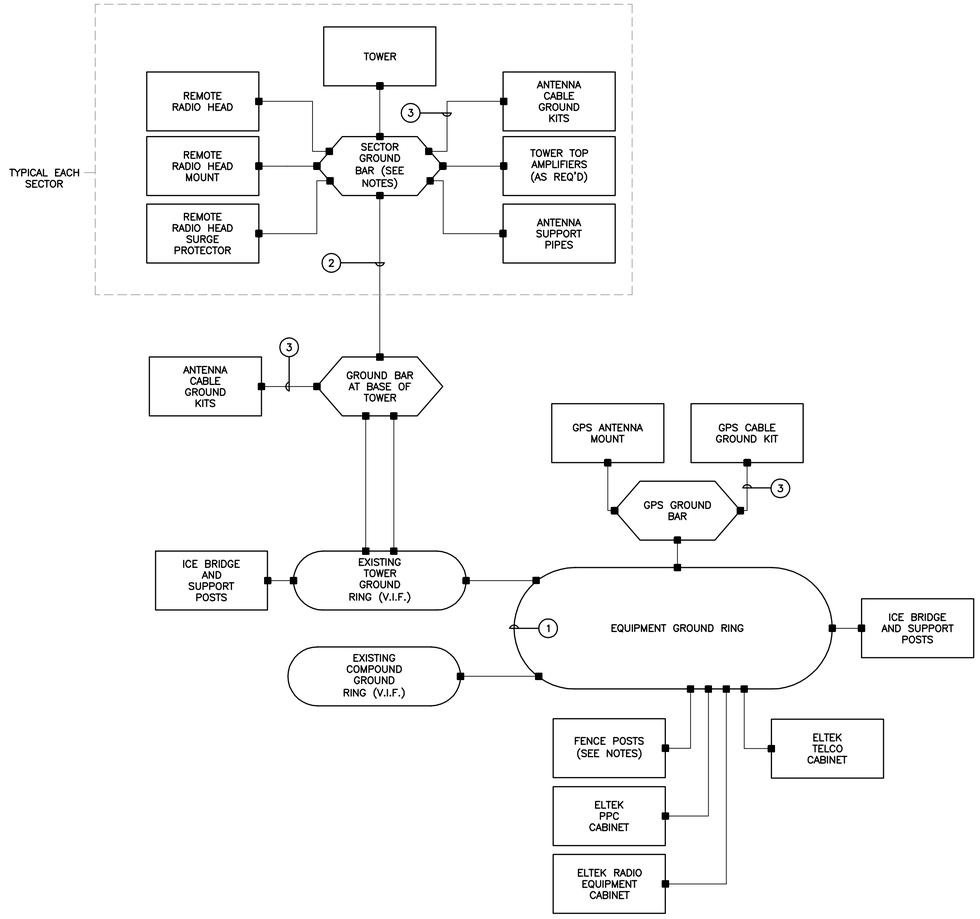
SPRINT
WIRELESS COMMUNICATIONS FACILITY
MANCHESTER
SITE ID: CT03XC067
250 OLCOTT ST
MANCHESTER, CT 06040

DATE: 01/09/19
SCALE: AS NOTED
JOB NO. 18116.00

ELECTRICAL RISER DIAGRAM AND NOTES

E-2

Sheet No. 7 of 12



GROUNDING SCHEMATIC NOTES

(1) GROUND RING, #2 AWG BCW

(2) #2/0 GREEN INSULATED

(3) #6 AWG

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 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 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 SHALL BE BONDED TO GROUND RING.
12. ALL GROUNDING SHALL BE IN ACCORDANCE WITH NEC AND OWNER'S REQUIREMENTS.
13. COORDINATE WITH TOWER OWNER BEFORE INSTALLING ANY GROUNDING ELEMENTS ON TOWER OR BONDING TO EXISTING TOWER GROUND RING.

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	TJB	TGK	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

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

SPRINT

WIRELESS COMMUNICATIONS FACILITY

SITE ID: CT03XC067

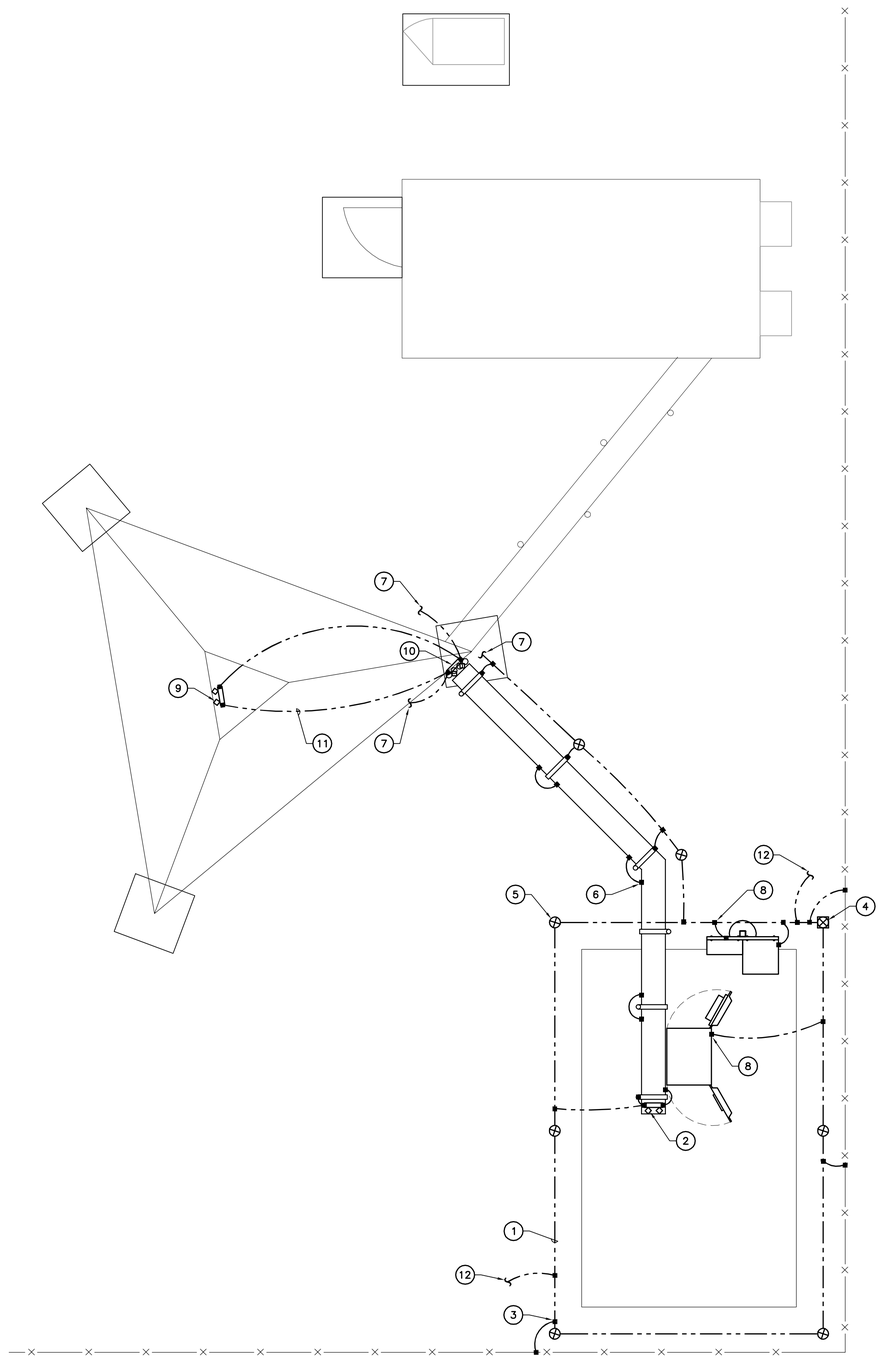
MANCHESTER

250 OLCOTT ST
MANCHESTER, CT 06040

DATE: 01/09/19
SCALE: AS NOTED
JOB NO. 18116.00

SCHEMATIC RISER DIAGRAM AND NOTES

E-3



GROUNDING PLAN NOTES

1. #2 SOLID TINNED BCW GROUND RING (2'-0" FROM OUTSIDE EDGE OF EQUIPMENT PAD) (TYP.)
2. GROUND BAR PER DETAILS.
3. BOND FENCE TO GROUNDING RING (TYP. 3 PLACES).
4. GROUNDING ROD WITH ACCESS (TYP.) PER DETAILS.
5. GROUNDING ROD (TYP.) PER DETAILS.
6. ICE BRIDGE SECTIONS. BOND EACH SECTION TOGETHER. BOND TO GROUND RING AT EACH END.
7. BOND TO EXISTING TOWER GROUND RING. CONTRACTOR TO VERIFY LOCATION IN FIELD.
8. BOND SPRINT EQUIPMENT CABINET TO GROUND PER MANUFACTURERS SPECIFICATIONS.
9. UPPER TOWER MOUNTED GROUND BAR PER DETAILS.
10. LOWER TOWER MOUNTED GROUND BAR PER DETAILS.
11. BOND UPPER TOWER MOUNTED GROUND BAR TO LOWER TOWER MOUNTED GROUND BAR (2 GROUND LEADS) PER DETAILS.
12. BOND EQUIPMENT GROUND RING TO EXISTING COMPOUND GROUND RING. (MINIMUM TWO PLACES.)

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

TRUE NORTH

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	TJB	TGK	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

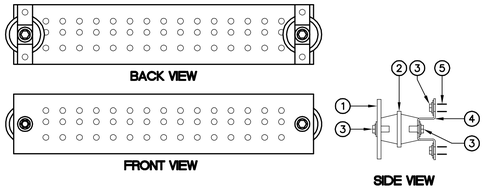
CENTEK engineering
Centered on Solutions℠
(203) 488-0580
(203) 488-8587 Fax
63-2 North Branford Road
Branford, CT 06405
www.CentekEng.com

SPRINT
WIRELESS COMMUNICATIONS FACILITY
MANCHESTER
SITE ID: CT03XC067
250 OLCOTT ST
MANCHESTER, CT 06040

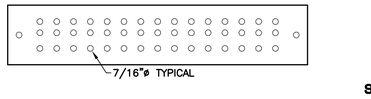
DATE: 01/09/19
SCALE: AS NOTED
JOB NO. 18116.00

COMPOUND GROUNDING PLAN

E-4
Sheet No. 9 of 12



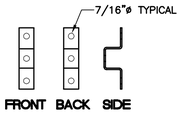
TYPICAL GROUND BAR ASSEMBLY
N.T.S.



TYPICAL GROUND BAR - DIMENSIONS
N.T.S.

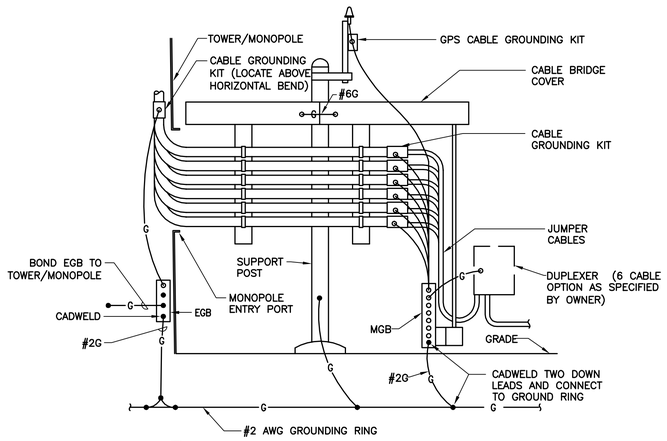
NOTES

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.

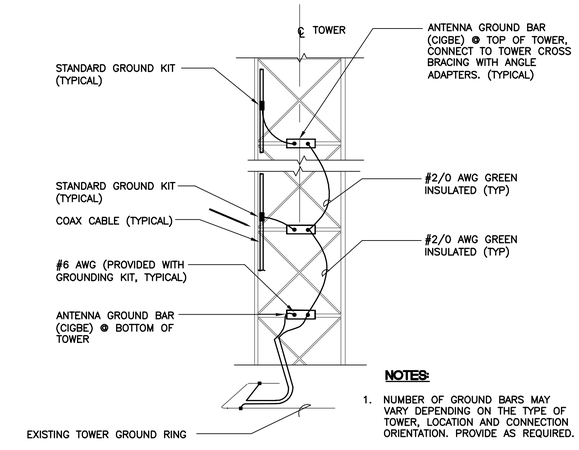


BRACKET FOR GROUND BAR-DIMENSIONS
N.T.S.

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



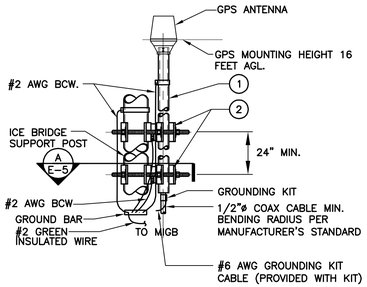
2 E-5 CABLE BRIDGE GROUNDING DIAGRAM
NOT TO SCALE



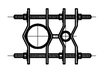
NOTES:

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

3 E-5 ANTENNA CABLE GROUNDING - LATTICE TOWER
NOT TO SCALE



GPS ANTENNA MOUNTING BRACKET



A E-5 SECTION
NOT TO SCALE

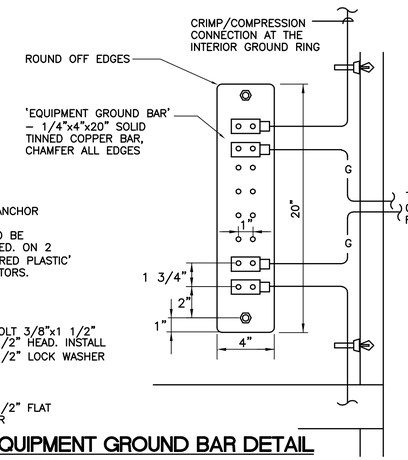
BILL OF MATERIALS

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

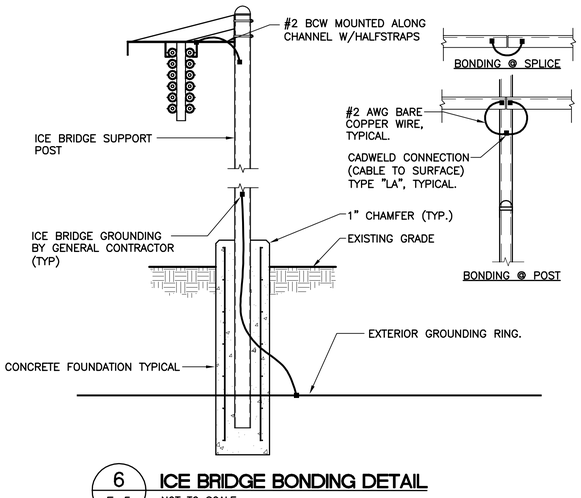
NOTES

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.

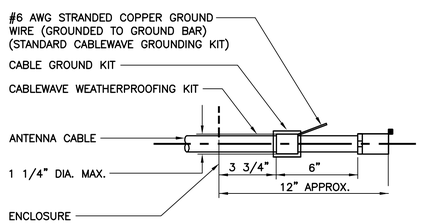
4 E-5 GPS GROUNDING/MOUNTING BRACKET DETAIL
NOT TO SCALE



5 E-5 EQUIPMENT GROUND BAR DETAIL
NOT TO SCALE



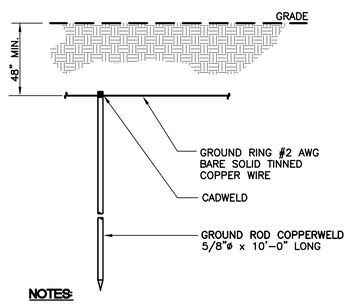
6 E-5 ICE BRIDGE BONDING DETAIL
NOT TO SCALE



NOTES:

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

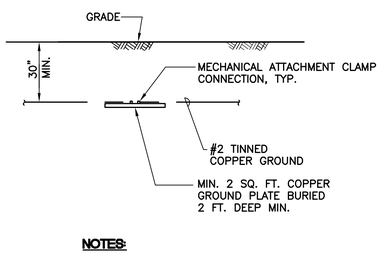
7 E-5 ANTENNA CABLE GROUNDING DETAIL
NOT TO SCALE



NOTES:

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

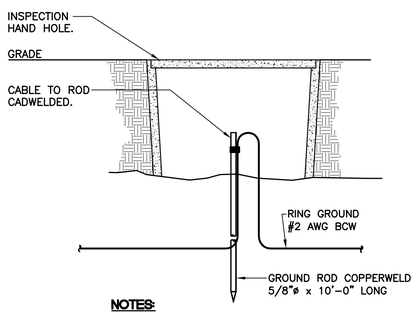
8 E-5 GROUND ROD DETAIL
NOT TO SCALE



NOTES:

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

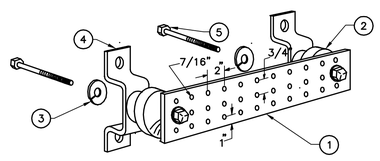
8A E-5 GROUND PLATE DETAIL
NOT TO SCALE



NOTES:

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

9 E-5 GROUND ROD WITH ACCESS DETAIL
NOT TO SCALE



NOTES

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

10 E-5 GROUND BAR DETAIL
NOT TO SCALE

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	TJB	TCK	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

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

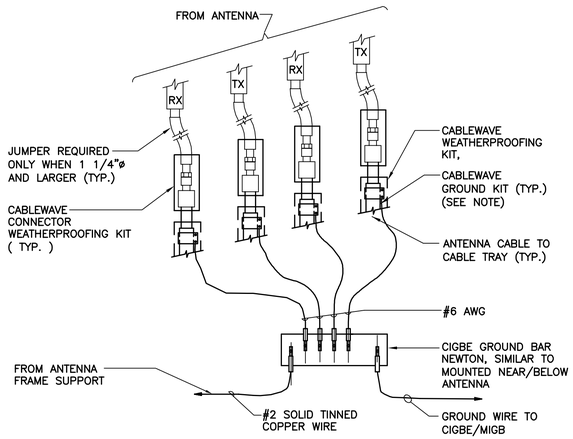
SPRINT
WIRELESS COMMUNICATIONS FACILITY
MANCHESTER
SITE ID: CT03XC067
250 OLCOTT ST
MANCHESTER, CT 06040

DATE:	01/09/19
SCALE:	AS NOTED
JOB NO.	18116.00

ELECTRICAL DETAILS

E-5

Sheet No. 10 of 12

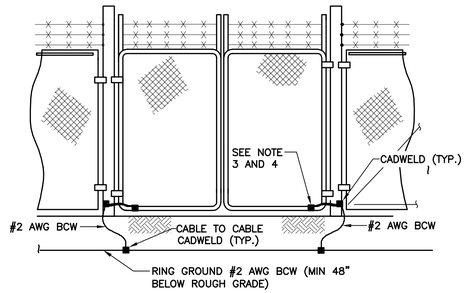


NOTES:

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

1 E-6 CONNECTION OF GROUND WIRES TO GROUND BAR

NOT TO SCALE

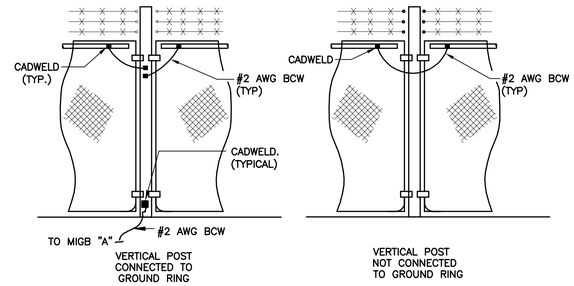


NOTES:

1. THE #2 AWG, BCW, FROM THE RING GROUND SHALL BE CADWELDED TO THE POST, ABOVE GRADE.
2. BOND EACH HORIZONTAL POLE/BRACE TO EACH OTHER AND TO EACH VERTICAL POLE BONDED TO THE EXTERIOR GROUND RING.
3. GATE JUMPER SHALL BE #4/0 AWG WELDING CABLE OR FLEXIBLE COPPER BRAID BURNDY TYPE B WITH SLEEVES ON EACH END DESIGNED FOR EXOTHERMIC WELDING.
4. GATE JUMPER SHALL BE INSTALLED SO THAT IT WILL NOT BE SUBJECTED TO DAMAGING STRAIN WHEN GATE IS FULLY OPEN IN EITHER DIRECTION.

2 E-6 FENCE GATE GROUNDING

NOT TO SCALE

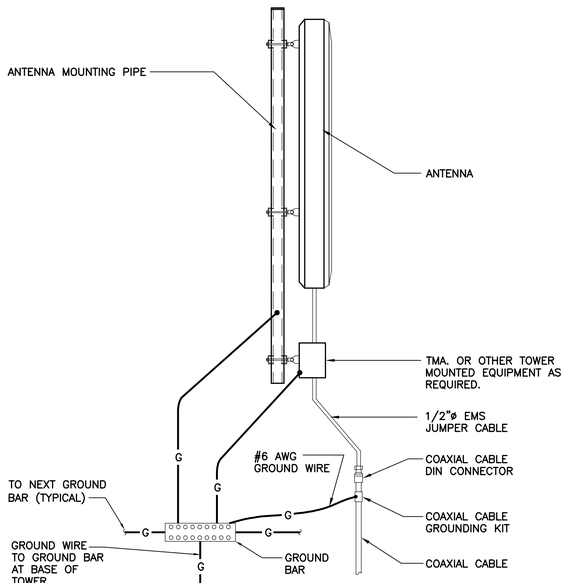


NOTES:

1. VERTICAL POSTS SHALL BE BONDED TO THE RING AT EACH CORNER AND AT EACH GATE POST. AS A MINIMUM ONE VERTICAL POST SHALL BE BONDED TO THE GROUND RING IN EVERY 100 FOOT STRAIGHT RUN OF FENCE.
2. HORIZONTAL POLES SHALL BE BONDED TO EACH OTHER.
3. BOND EACH HORIZONTAL POLE / BRACE TO EACH OTHER AND TO EACH VERTICAL POST THAT IS BONDED TO THE EXTERIOR GROUND RING.

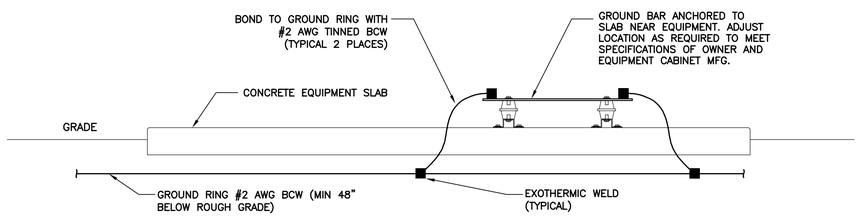
3 E-6 GROUND-STD. DETAIL FENCE GROUNDING

NOT TO SCALE



4 E-6 TYPICAL ANTENNA GROUNDING DETAIL

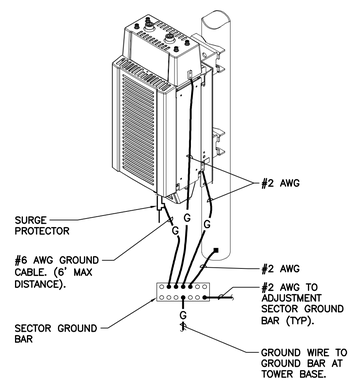
NOT TO SCALE



5 E-6 GROUNDING AND BONDING AT CONCRETE SLAB

NOT TO SCALE

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



6 E-6 RRH POLE MOUNT GROUNDING

NOT TO SCALE

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	TJB	TCK	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

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

SPRINT

WIRELESS COMMUNICATIONS FACILITY

MANCHESTER

SITE ID: CT03XC067

250 OLCOTT ST

MANCHESTER, CT 06040

DATE:	01/09/19
SCALE:	AS NOTED
JOB NO.	18116.00

ELECTRICAL DETAILS

E-6

Sheet No. 11 of 12

ELECTRICAL SPECIFICATIONS

SECTION 16010

1.01. SCOPE OF WORK

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

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

B. LOCAL UTILITY COMPANIES SHALL PROVIDE THE FOLLOWING:

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

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

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

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

1.02. GENERAL REQUIREMENTS

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

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

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

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

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

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

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

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

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

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

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

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

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

N. SHOP DRAWINGS:

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

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

SECTION 16111

1.01. CONDUIT

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

CONDUIT MATERIAL SHALL BE AS FOLLOWS:

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

SECTION 16114

1.01. CABLE TRAY

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

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

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

SECTION 16123

1.01. CONDUCTORS

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

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

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

SECTION 16130

1.01. BOXES

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

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

SECTION 16170

1.01. DISCONNECT SWITCHES

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

SECTION 16190

1.01. SEISMIC RESTRAINT

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

SECTION 16195

1.01. LABELING AND IDENTIFICATION NOMENCLATURE FOR ELECTRICAL EQUIPMENT

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

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

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

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

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

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

SECTION 16450

1.01. GROUNDING

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

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

C. GROUNDING OF PANELBOARDS:

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

D. EQUIPMENT GROUNDING CONDUCTOR:

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

E. CELLULAR GROUNDING SYSTEM:

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

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

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

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

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

SECTION 16470

1.01. DISTRIBUTION EQUIPMENT

A. REFER TO CONTRACT DRAWINGS FOR DETAILS AND SCHEDULES.

SECTION 16477

1.01. FUSES

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

SECTION 16960

1.01. TESTS BY INDEPENDENT ELECTRICAL TESTING FIRM

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

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

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

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

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

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

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

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

SECTION 16961

1.01. TESTS BY CONTRACTOR

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

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

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

REV.	DATE	DRAWN BY	CHK'D BY	DESCRIPTION
0	01/29/19	TJB	TGK	CONSTRUCTION DRAWINGS

PROFESSIONAL ENGINEER SEAL

Sprint

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

SPRINT

WIRELESS COMMUNICATIONS FACILITY

MANCHESTER

SITE ID: CT03XC067

250 OLCOTT ST

MANCHESTER, CT 06040

DATE: 01/09/19

SCALE: AS NOTED

JOB NO. 18116.00

ELECTRICAL SPECIFICATIONS

E-7

Sheet No. 12 of 12

CENTEK engineering

Centered on Solutions℠

Structural Analysis Report

180-ft Self-Supporting Lattice Tower

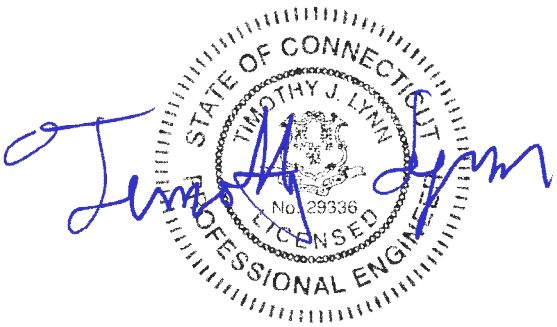
Proposed Sprint Antenna Installation

Sprint Site Ref: CT03XC067

250 Olcott Street
Manchester, CT

CENTEK Project No. 18116.00

~~Date: August 13, 2018~~
Rev 1: January 3, 2019



Prepared for:
Transcend Wireless
10 Industrial Ave, Suite 3
Mahwah, NJ 07430

Table of Contents

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 Sprint on the self-supporting lattice tower located in Manchester, Connecticut.

The host tower is a 180-ft, nine-section, three legged, self-supporting tapered lattice tower originally designed and manufactured by Sabre Industries report no. 408277, dated May 9, 2018. The tower geometry, structure member sizes and the foundation system information were obtained from the aforementioned design documents.

Antenna and appurtenance information were obtained from the tower design documents and a Sprint RF sheet.

The existing tower consists of nine (9) tapered steel pipe leg sections conforming to ASTM A500-50. Diagonal lateral support bracing consists of steel angle sections conforming to ASTM A572-50. The vertical tower sections are connected by bolted flange plates while the pipe legs and bracing are connected by bolted and welded gusset connections. The width of the tower face is 7-ft at the top and 23-ft at the base.

Antenna and Appurtenance Summary

- Eversource:
  Appurtenance: One (1) dBSpectra DS9A09F36D-N antenna, one (1) 24' x 6" Omni antenna, one (1) Kreco CO-41A antenna and one (1) TTA leg mounted to the top of the tower.
  Conduit: Four (4) 1-5/8"∅, one (1) 1/2" ∅ and one (1) 7/8" ∅ coax cable.
- Eversource :
  Appurtenance: Three (3) 8-ft ∅ microwave dishes pipe mounted with a RAD center elevation of 175-ft above existing grade.
  Conduit: Six (6) E65 cables.
- Eversource :
  Appurtenance: One (1) 8-ft ∅ microwave dish pipe mounted with a RAD center elevation of 164-ft above existing grade.
  Conduit: Two (2) E65 cables.
- Eversource:
  Appurtenance: One (1) Comprod 531-70HD antenna and one (1) Sinclair SD212 antenna mounted one a 6-ft sidearm with an elevation of 158-ft above existing grade.
  Conduit: Two (2) 7/8" ∅ coax cables.
- Eversource:
  Appurtenance: One (1) 24' x 6" Omni antenna mounted one a 6-ft sidearm with an elevation of 156-ft above existing grade.
  Conduit: Two (2) 7/8" ∅ coax cables

- FUTURE CARRIER (Reserved):
  Antennas: Twelve (12) 8' panel antennas, twelve (12) RRHs and three (3) distribution boxes mounted on three (3) 14-ft V-Frames with a RAD center elevation of 125-ft above existing grade.
  Coax Cables: Twenty-One (21) 1-5/8"∅ cables running on a face of the existing tower as specified in Section 3 of this report**.**
- FUTURE CARRIER (Reserved):
  Antennas: Twelve (12) 8' panel antennas, twelve (12) RRHs and three (3) distribution boxes mounted on three (3) 14-ft V-Frames with a RAD center elevation of 115-ft above existing grade.
  Coax Cables: Twenty-One (21) 1-5/8"∅ cables running on a face of the existing tower as specified in Section 3 of this report**.**
- FUTURE CARRIER (Reserved):
  Antennas: Twelve (12) 8' panel antennas, twelve (12) RRHs and three (3) distribution boxes mounted on three (3) 14-ft V-Frames with a RAD center elevation of 105-ft above existing grade.
  Coax Cables: Twenty-One (21) 1-5/8"∅ cables running on a face of the existing tower as specified in Section 3 of this report**.**
- **SPRINT (Proposed):**
  Antennas: Three (3) Commscope NNVV-65B-R4 panel antennas, three (3) Nokia AAHC panel antennas, three (3) 1900MHz 4X45W RRHs and six (6) 800MHz 2X50W RRHs mounted on three (3) 14-ft V-Frames with a RAD center elevation of 135-ft above existing grade.
  Coax Cables: Four (4) 1-1/4"∅ Hybriflex cable running on a face of the existing tower as specified in Section 3 of this report.

Primary Assumptions Used in the Analysis

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

Analysis

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

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

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

Tower Loading

Tower loading was determined by the basic wind speed as applied to projected surface areas with modification factors per TIA-222-G-2005, gravity loads of the tower structure and its components, and the application of 1.00" radial ice on the tower structure and its components.

Basic Wind Speed:	Hartford County; v = 90-105 mph (3-second gust)	*[Annex B of TIA-222-G-2005]*
	Manchester; v = 105 mph (Nominal – Structure Class III)	*[Appendix N of the 2016 CT Building Code]*
Load Cases:	Load Case 1; 105 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	*[Appendix N of the 2016 CT Building Code]*
	Load Case 2; 50 mph wind speed w/ 1.00" radial ice plus gravity load – used in calculation of tower stresses.	*[Annex B of TIA-222-G-2005]*
	Load Case 3; 105 mph wind speed used in calculation of tower deflection.	

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

Tower Capacity

- Calculated stresses were found to be within allowable limits. This tower was found to be at **99.8%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg (T8)	20'-0"-40'-0"	81.6%	**PASS**
Diagonal (9)	0'-0"-20'-0"	99.8%	**PASS**

- The tower combined deflection is **0.4408 degrees**.

Deflection Criteria	Proposed (degrees)
Sway (Tilt)	0.4303
Twist	0.0957
Combined	0.4408

Note 1: Tower deflection calculated utilizing the service wind load combination and max wind speed.

Foundation and Anchors

The existing foundation consists of three (3) 4'-0" diameter x 4'-9" long piers on one (1) 34'-0" square x 1'-9" thick concrete mat. The foundation properties and sub-grade conditions used in the analysis of the existing foundation were obtained from the aforementioned original design documents. Tower legs are connected to the foundation by means of (6) 1-1/2"∅, ASTM F1554-105 anchor bolts per leg, embedded into the concrete foundation structure.

- The tower base maximum corner reactions developed from the governing Load Case 2 were used in the verification of the foundation and its anchors:

Vector	Proposed Reactions
Compression	**491 kips**
Uplift	**443 kips**
Shear	**59 kips**
Total Shear	**99 kips**
Overturning Moment	**9429 kip-ft**

- The foundation was found to be within allowable limits.

Foundation	Design Limit	TIA-222-G Section 9.4 FS[1]	Proposed Loading (FS)[1]	Result
Reinf. Conc. Pad and Piers	Uplift	1.0	1.44	**PASS**

Note 1: FS denotes Factor of Safety

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

Tower Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts	Tension	57.6%	**PASS**

Conclusion

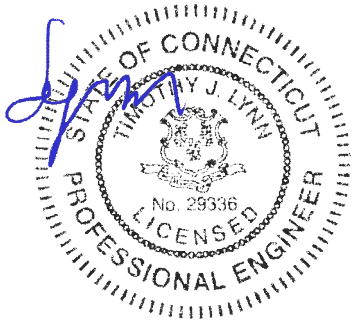
This analysis shows that the subject tower **is adequate** to support the proposed modified antenna configuration.

The analysis is based, in part, on the information provided to this office by Sprint. If the existing conditions are different than the information in this report, Centek Engineering, Inc. must be contacted for resolution of any potential issues.

Please feel free to call with any questions or comments.

Respectfully Submitted by:

Timothy J. Lynn, PE
Structural Engineer



Standard Conditions for Furnishing of Professional Engineering Services on Existing Structures

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

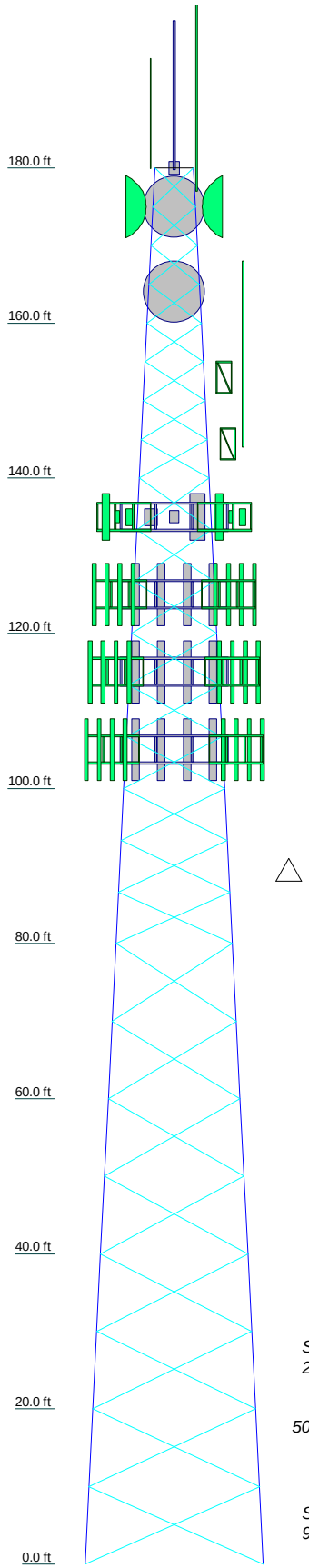
- Information supplied by the client regarding the structure itself, its foundations, the soil conditions, the antenna and feed line loading on the structure and its components, or other relevant information.
- Information from the field and/or drawings in the possession of Centek Engineering, Inc. or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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM

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

tnxTower Features:

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



Section	Legs	Leg Grade	Diagonals	Diagonal Grade	Top Girts	Face Width (ft)	# Panels @ (ft)	Weight (K)
T1	P2.5x.276	A500-50	L2x2x1/8	A572-50	L2x2x1/8	5	8 @ 5	0.8
T2	P3x.3		L2x2x3/16			7		1.2
T3	P5x0.5		L2 1/2x2 1/2x1/4			9	9 @ 6.66667	2.5
T4			L3 1/2x3x1/4			11		2.9
T5					N.A.	13		3.1
T6	P8x.5		L4x3 1/2x5/16			15	8 @ 10	4.3
T7			L4x3 1/2x3/8			17		4.9
T8			L4x4x3/8			19		5.2
T9	P10x.5		L5x5x5/16			21		6.3
						23		31.2

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
DS9A09F36D-N (Eversource)	189.4	AAHC (Sprint - Proposed)	135
24' x 6" Omni (Eversource)	189	(4) RRUS-11 (Future Carrier)	125
CO-41A (Eversource)	187	(4) RRUS-11 (Future Carrier)	125
Tower Top Amplifier (Eversource)	180	(3) RC2DC-3315-PF-48 (Future Carrier)	125
8' Dish (Eversource)	175	14' V-Boom (Future Carrier)	125
8' Dish (Eversource)	175	14' V-Boom (Future Carrier)	125
8' Dish (Eversource)	175	14' V-Boom (Future Carrier)	125
8' Dish (Eversource)	164	(4) 8' x1' Panel (Future Carrier)	125
531-70HD (Eversource)	158	(4) 8' x1' Panel (Future Carrier)	125
SD212 (Eversource)	158	(4) 8' x1' Panel (Future Carrier)	125
ROHN 6-ft Side Arm (Eversource)	158	(4) RRUS-11 (Future Carrier)	125
24' x 6" Omni (Eversource)	156	(4) RRUS-11 (Future Carrier)	115
ROHN 6-ft Side Arm (Eversource)	153	(4) RRUS-11 (Future Carrier)	115
ROHN 3-ft Side Arm (Eversource)	144.4	(3) RC2DC-3315-PF-48 (Future Carrier)	115
NNVV-65B-R4 (Sprint - Proposed)	135	14' V-Boom (Future Carrier)	115
AAHC (Sprint - Proposed)	135	14' V-Boom (Future Carrier)	115
FD-RRH 2x50 800 (Sprint - Proposed)	135	14' V-Boom (Future Carrier)	115
FD-RRH 2x50 800 (Sprint - Proposed)	135	(4) 8' x1' Panel (Future Carrier)	115
FD-RRH 2x50 800 (Sprint - Proposed)	135	(4) 8' x1' Panel (Future Carrier)	115
FD-RRH 4x45 1900 (Sprint - Proposed)	135	(4) 8' x1' Panel (Future Carrier)	115
FD-RRH 4x45 1900 (Sprint - Proposed)	135	(4) RRUS-11 (Future Carrier)	115
FD-RRH 4x45 1900 (Sprint - Proposed)	135	(4) RRUS-11 (Future Carrier)	105
FD-RRH 2x50 800 (Sprint - Proposed)	135	(4) RRUS-11 (Future Carrier)	105
FD-RRH 2x50 800 (Sprint - Proposed)	135	(3) RC2DC-3315-PF-48 (Future Carrier)	105
FD-RRH 2x50 800 (Sprint - Proposed)	135	14' V-Boom (Future Carrier)	105
14' V-Boom (Sprint - Proposed)	135	14' V-Boom (Future Carrier)	105
14' V-Boom (Sprint - Proposed)	135	14' V-Boom (Future Carrier)	105
14' V-Boom (Sprint - Proposed)	135	(4) 8' x1' Panel (Future Carrier)	105
NNVV-65B-R4 (Sprint - Proposed)	135	(4) 8' x1' Panel (Future Carrier)	105
AAHC (Sprint - Proposed)	135	(4) 8' x1' Panel (Future Carrier)	105
NNVV-65B-R4 (Sprint - Proposed)	135	(4) RRUS-11 (Future Carrier)	105

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A500-50	50 ksi	62 ksi	A572-50	50 ksi	65 ksi

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 97 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 97 mph wind.
5. Tower Structure Class III.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 99.8%

ALL REACTIONS ARE FACTORED

MAX. CORNER REACTIONS AT BASE:
DOWN: 491 K
SHEAR: 59 K

UPLIFT: -443 K
SHEAR: 55 K

AXIAL 245 K
SHEAR 26 K *MOMENT 2673 kip-ft*

TORQUE 10 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 55 K
SHEAR 99 K *MOMENT 9429 kip-ft*

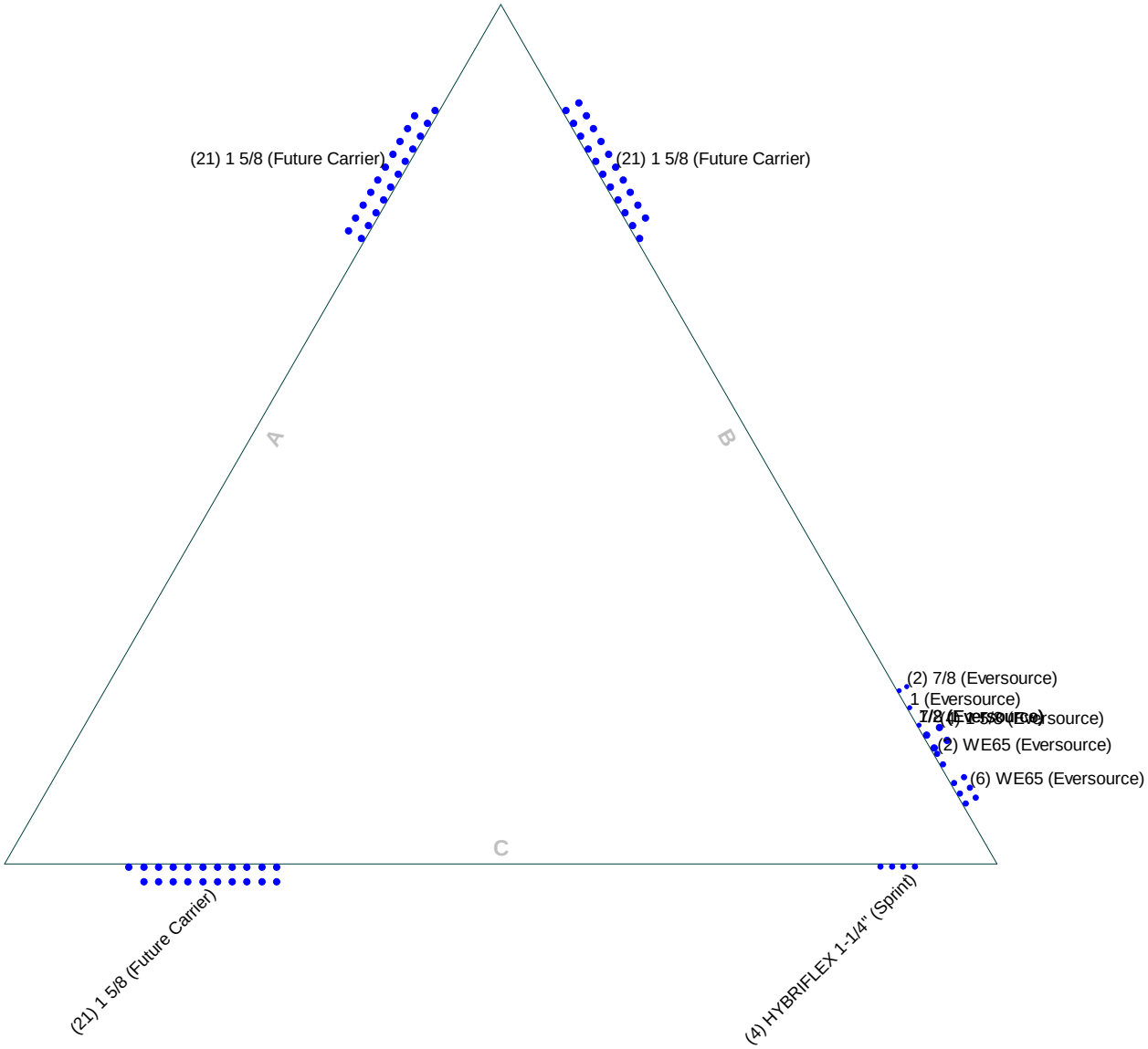
TORQUE 38 kip-ft
REACTIONS - 97 mph WIND

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

Job:	***18116.00 - CT03XC067***		
Project:	***180-ft Sabre Lattice Tower - 250 Olcott St., Manchester, CT***		
Client: Sprint	Drawn by: TJL	App'd:	
Code: TIA-222-G	Date: 01/03/19	Scale: NTS	
Path: J:\Jobs\1811600.WI\04_Structural\Backup Documentation\Rev (1)\ER Files\180' Self-supporting Lattice.eri		Dwg No. E-1	

Feed Line Plan

Round Flat App In Face App Out Face

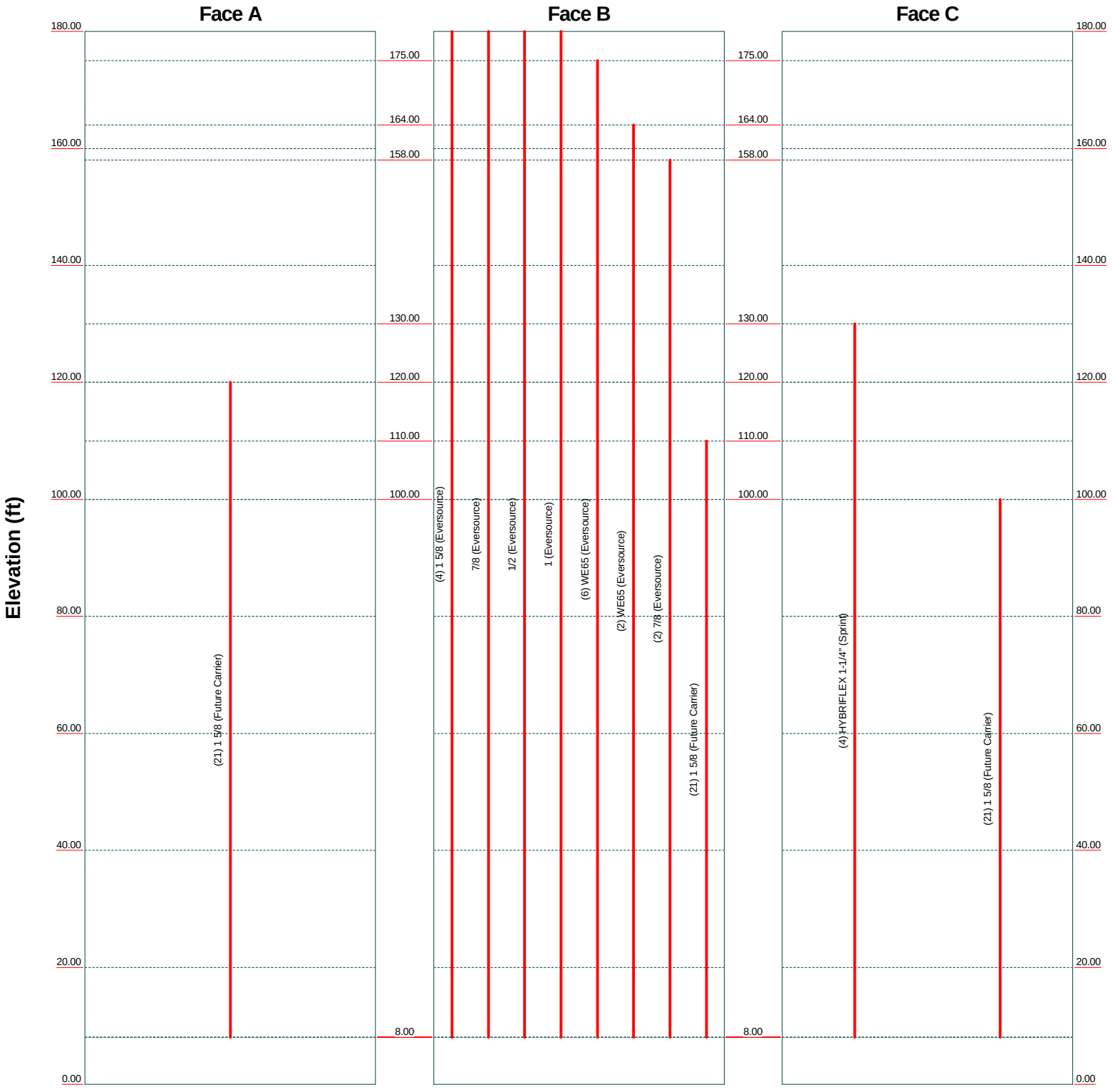


Centek Engineering Inc.
63-2 North Branford Rd.
Branford, CT 06405
Phone: (203) 488-0580
FAX: (203) 488-8587

Job: ***18116.00 - CT03XC067***		
Project: ***180-ft Sabre Lattice Tower - 250 Olcott St., Manchester, CT***		
Client: Sprint	Drawn by: TJL	App'd:
Code: TIA-222-G	Date: 01/03/19	Scale: NTS
Path: J:\Jobs\1811600.WI\04_Structural\Backup Documentation\Rev (1)\ER Files\180' Self-supporting Lattice.er		Dwg No. E-7

Feed Line Distribution Chart
0' - 180'

Round | Flat | App In Face | App Out Face | Truss Leg



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

Job: ***18116.00 - CT03XC067***		
Project: ***180-ft Sabre Lattice Tower - 250 Olcott St., Manchester, CT***		
Client: Sprint	Drawn by: TJL	App'd:
Code: TIA-222-G	Date: 01/03/19	Scale: NTS
Path: J:\Jobs\1811600.WF04_Structural\Backup Documentation\Rev (1)\ER Files\180' Self-supporting Lattice.er		Dwg No. E-7

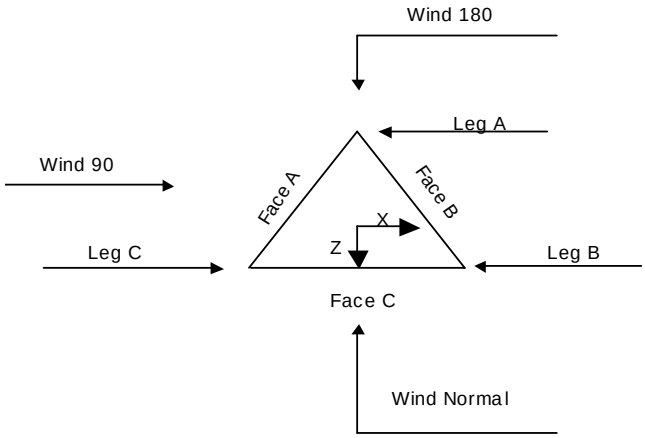
Tower Input Data

The main tower is a 3x free standing tower with an overall height of 180.00 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 5.00 ft at the top and 23.00 ft at the base.
This tower is designed using the TIA-222-G standard.
The following design criteria apply:

Basic wind speed of 97 mph.
Structure Class III.
Exposure Category C.
Topographic Category 1.
Crest Height 0.00 ft.
Nominal ice thickness of 1.0000 in.
Ice thickness is considered to increase with height.
Ice density of 56 pcf.
A wind speed of 50 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 97 mph.
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.
Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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



Triangular Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	180.00-160.00			5.00	1	20.00
T2	160.00-140.00			7.00	1	20.00
T3	140.00-120.00			9.00	1	20.00
T4	120.00-100.00			11.00	1	20.00
T5	100.00-80.00			13.00	1	20.00
T6	80.00-60.00			15.00	1	20.00
T7	60.00-40.00			17.00	1	20.00
T8	40.00-20.00			19.00	1	20.00
T9	20.00-0.00			21.00	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	180.00-160.00	5.00	X Brace	No	Yes	0.0000	0.0000
T2	160.00-140.00	5.00	X Brace	No	No	0.0000	0.0000
T3	140.00-120.00	6.67	X Brace	No	No	0.0000	0.0000
T4	120.00-100.00	6.67	X Brace	No	No	0.0000	0.0000
T5	100.00-80.00	6.67	X Brace	No	No	0.0000	0.0000
T6	80.00-60.00	10.00	X Brace	No	No	0.0000	0.0000

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
T7	60.00-40.00	10.00	X Brace	No	No	0.0000	0.0000
T8	40.00-20.00	10.00	X Brace	No	No	0.0000	0.0000
T9	20.00-0.00	10.00	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 180.00-160.00	Pipe	P2.5x.276	A500-50 (50 ksi)	Single Angle	L2x2x1/8	A572-50 (50 ksi)
T2 160.00-140.00	Pipe	P3x.3	A500-50 (50 ksi)	Single Angle	L2x2x3/16	A572-50 (50 ksi)
T3 140.00-120.00	Pipe	P5x0.5	A500-50 (50 ksi)	Single Angle	L2 1/2x2 1/2x1/4	A572-50 (50 ksi)
T4 120.00-100.00	Pipe	P5x0.5	A500-50 (50 ksi)	Single Angle	L3 1/2x3x1/4	A572-50 (50 ksi)
T5 100.00-80.00	Pipe	P5x0.5	A500-50 (50 ksi)	Single Angle	L3 1/2x3x1/4	A572-50 (50 ksi)
T6 80.00-60.00	Pipe	P8x.5	A500-50 (50 ksi)	Single Angle	L4x3 1/2x5/16	A572-50 (50 ksi)
T7 60.00-40.00	Pipe	P8x.5	A500-50 (50 ksi)	Single Angle	L4x3 1/2x3/8	A572-50 (50 ksi)
T8 40.00-20.00	Pipe	P8x.5	A500-50 (50 ksi)	Single Angle	L4x4x3/8	A572-50 (50 ksi)
T9 20.00-0.00	Pipe	P10x.5	A500-50 (50 ksi)	Single Angle	L5x5x5/16	A572-50 (50 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 180.00-160.00	Equal Angle	L2x2x1/8	A36 (36 ksi)	Solid Round		A36 (36 ksi)

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T1 180.00-160.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T2 160.00-140.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Elevation ft	Gusset Area (per face) ft^2	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
T3 140.00-120.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T4 120.00-100.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T5 100.00-80.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T6 80.00-60.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T7 60.00-40.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T8 40.00-20.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000
T9 20.00-0.00	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000	36.0000

Tower Section Geometry *(cont'd)*

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	K Factors[1] Legs	X Brace Diags X Y	K Brace Diags X Y	Single Diags X Y	Girts X Y	Horiz. X Y	Sec. Horiz. X Y	Inner Brace X Y
T1 180.00-160.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T2 160.00-140.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T3 140.00-120.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T4 120.00-100.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T5 100.00-80.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T6 80.00-60.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T7 60.00-40.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T8 40.00-20.00	Yes	Yes	1	1 1	1 1	1 1	1 1	1 1	1 1	1 1
T9 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 180.00-160.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T2 160.00-140.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T3 140.00-120.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T4 120.00-100.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T5 100.00-80.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T6 80.00-60.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T7 60.00-40.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T8 40.00-20.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75
T9 20.00-0.00	0.0000	1	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75	0.0000	0.75

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 180.00-160.00	Flange	0.7500 A325N	0	0.6250 A325X	1	0.6250 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T2 160.00-140.00	Flange	0.7500 A325N	0	0.6250 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T3 140.00-120.00	Flange	0.7500 A325N	0	0.6250 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T4 120.00-100.00	Flange	1.5000 A325N	0	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T5 100.00-80.00	Flange	1.5000 A325N	0	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T6 80.00-60.00	Flange	1.5000 A325N	0	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T7 60.00-40.00	Flange	1.5000 A325N	0	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T8 40.00-20.00	Flange	1.5000 A325N	0	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0
T9 20.00-0.00	Flange	1.5000 F1554-105	6	0.7500 A325X	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0

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 (Eversource)	B	No	Ar (CaAa)	180.00 - 8.00	0.0000	0.36	4	2	1.9800	1.9800		1.04

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
7/8 (Eversource)	B	No	Ar (CaAa)	180.00 - 8.00	0.0000	0.34	1	1	1.1100	1.1100		0.54
1/2 (Eversource)	B	No	Ar (CaAa)	180.00 - 8.00	0.0000	0.34	1	1	0.5800	0.5800		0.25
1 (Eversource)	B	No	Ar (CaAa)	180.00 - 8.00	0.0000	0.32	1	1	1.2500	1.2500		0.58
WE65 (Eversource)	B	No	Ar (CaAa)	175.00 - 8.00	0.0000	0.42	6	3	1.5836	1.5836		0.53
WE65 (Eversource)	B	No	Ar (CaAa)	164.00 - 8.00	0.0000	0.38	2	2	1.5836	1.5836		0.53
7/8 (Eversource)	B	No	Ar (CaAa)	158.00 - 8.00	0.0000	0.3	2	1	1.1100	1.1100		0.54
HYBRIFLEX 1-1/4" (Sprint)	C	No	Ar (CaAa)	130.00 - 8.00	0.0000	-0.4	4	4	1.5400	1.5400		1.30
1 5/8 (Future Carrier)	A	No	Ar (CaAa)	120.00 - 8.00	0.0000	0.3	21	11	1.9800	1.9800		1.04
1 5/8 (Future Carrier)	B	No	Ar (CaAa)	110.00 - 8.00	0.0000	-0.3	21	11	1.9800	1.9800		1.04
1 5/8 (Future Carrier)	C	No	Ar (CaAa)	100.00 - 8.00	0.0000	0.3	21	11	1.9800	1.9800		1.04

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	180.00-160.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	37.239	0.000	0.16
		C	0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	51.053	0.000	0.21
		C	0.000	0.000	0.000	0.000	0.00
T3	140.00-120.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	51.497	0.000	0.22
		C	0.000	0.000	6.160	0.000	0.05
T4	120.00-100.00	A	0.000	0.000	83.160	0.000	0.44
		B	0.000	0.000	93.077	0.000	0.44
		C	0.000	0.000	12.320	0.000	0.10
T5	100.00-80.00	A	0.000	0.000	83.160	0.000	0.44
		B	0.000	0.000	134.657	0.000	0.65
		C	0.000	0.000	95.480	0.000	0.54
T6	80.00-60.00	A	0.000	0.000	83.160	0.000	0.44
		B	0.000	0.000	134.657	0.000	0.65
		C	0.000	0.000	95.480	0.000	0.54
T7	60.00-40.00	A	0.000	0.000	83.160	0.000	0.44
		B	0.000	0.000	134.657	0.000	0.65
		C	0.000	0.000	95.480	0.000	0.54
T8	40.00-20.00	A	0.000	0.000	83.160	0.000	0.44
		B	0.000	0.000	134.657	0.000	0.65
		C	0.000	0.000	95.480	0.000	0.54
T9	20.00-0.00	A	0.000	0.000	49.896	0.000	0.26
		B	0.000	0.000	80.794	0.000	0.39

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
		C	0.000	0.000	57.288	0.000	0.32

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	180.00-160.00	A	2.945	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	122.241	0.000	2.72
		C		0.000	0.000	0.000	0.000	0.00
T2	160.00-140.00	A	2.909	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	183.751	0.000	3.87
		C		0.000	0.000	0.000	0.000	0.00
T3	140.00-120.00	A	2.867	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	184.965	0.000	3.86
		C		0.000	0.000	22.557	0.000	0.45
T4	120.00-100.00	A	2.820	0.000	0.000	121.547	0.000	3.94
		B		0.000	0.000	243.836	0.000	5.75
		C		0.000	0.000	44.802	0.000	0.88
T5	100.00-80.00	A	2.764	0.000	0.000	121.209	0.000	3.90
		B		0.000	0.000	302.028	0.000	7.58
		C		0.000	0.000	165.642	0.000	4.76
T6	80.00-60.00	A	2.695	0.000	0.000	120.794	0.000	3.84
		B		0.000	0.000	298.868	0.000	7.41
		C		0.000	0.000	164.777	0.000	4.68
T7	60.00-40.00	A	2.606	0.000	0.000	120.257	0.000	3.76
		B		0.000	0.000	294.761	0.000	7.19
		C		0.000	0.000	163.655	0.000	4.57
T8	40.00-20.00	A	2.476	0.000	0.000	119.476	0.000	3.65
		B		0.000	0.000	288.788	0.000	6.88
		C		0.000	0.000	162.025	0.000	4.42
T9	20.00-0.00	A	2.219	0.000	0.000	70.759	0.000	2.06
		B		0.000	0.000	166.165	0.000	3.77
		C		0.000	0.000	95.283	0.000	2.48

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	180.00-160.00	5.0894	1.8428	2.5391	0.8865
T2	160.00-140.00	6.9381	2.5952	4.0233	1.3833
T3	140.00-120.00	7.8683	3.2783	5.1931	2.0047
T4	120.00-100.00	3.5018	-5.9550	3.4434	-2.9211
T5	100.00-80.00	0.3520	-3.4771	1.4120	-1.8168
T6	80.00-60.00	0.3828	-3.8635	1.5850	-2.1003
T7	60.00-40.00	0.4199	-4.3111	1.7278	-2.3776
T8	40.00-20.00	0.4562	-4.7498	1.8425	-2.6789
T9	20.00-0.00	0.4009	-4.2139	1.5620	-2.5424

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
T1	1	1 5/8	160.00 - 180.00	0.6000	0.4660
T1	2	7/8	160.00 - 180.00	0.6000	0.4660
T1	3	1/2	160.00 - 180.00	0.6000	0.4660
T1	4	1	160.00 - 180.00	0.6000	0.4660
T1	5	WE65	160.00 - 175.00	0.6000	0.4660
T1	6	WE65	160.00 - 164.00	0.6000	0.4660
T2	1	1 5/8	140.00 - 160.00	0.6000	0.5525
T2	2	7/8	140.00 - 160.00	0.6000	0.5525
T2	3	1/2	140.00 - 160.00	0.6000	0.5525
T2	4	1	140.00 - 160.00	0.6000	0.5525
T2	5	WE65	140.00 - 160.00	0.6000	0.5525
T2	6	WE65	140.00 - 160.00	0.6000	0.5525
T2	7	7/8	140.00 - 158.00	0.6000	0.5525
T3	1	1 5/8	120.00 - 140.00	0.6000	0.6000
T3	2	7/8	120.00 - 140.00	0.6000	0.6000
T3	3	1/2	120.00 - 140.00	0.6000	0.6000
T3	4	1	120.00 - 140.00	0.6000	0.6000
T3	5	WE65	120.00 - 140.00	0.6000	0.6000
T3	6	WE65	120.00 - 140.00	0.6000	0.6000
T3	7	7/8	120.00 - 140.00	0.6000	0.6000
T3	9	HYBRIFLEX 1-1/4"	120.00 - 130.00	0.6000	0.6000
T4	1	1 5/8	100.00 - 120.00	0.6000	0.6000
T4	2	7/8	100.00 - 120.00	0.6000	0.6000
T4	3	1/2	100.00 - 120.00	0.6000	0.6000
T4	4	1	100.00 - 120.00	0.6000	0.6000
T4	5	WE65	100.00 - 120.00	0.6000	0.6000
T4	6	WE65	100.00 - 120.00	0.6000	0.6000
T4	7	7/8	100.00 - 120.00	0.6000	0.6000
T4	9	HYBRIFLEX 1-1/4"	100.00 -	0.6000	0.6000

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K_a No Ice	K_a Ice
			120.00		
T4	10	1 5/8	100.00 - 120.00	0.6000	0.6000
T4	11	1 5/8	100.00 - 110.00	0.6000	0.6000
T5	1	1 5/8	80.00 - 100.00	0.6000	0.6000
T5	2	7/8	80.00 - 100.00	0.6000	0.6000
T5	3	1/2	80.00 - 100.00	0.6000	0.6000
T5	4	1	80.00 - 100.00	0.6000	0.6000
T5	5	WE65	80.00 - 100.00	0.6000	0.6000
T5	6	WE65	80.00 - 100.00	0.6000	0.6000
T5	7	7/8	80.00 - 100.00	0.6000	0.6000
T5	9	HYBRIFLEX 1-1/4"	80.00 - 100.00	0.6000	0.6000
T5	10	1 5/8	80.00 - 100.00	0.6000	0.6000
T5	11	1 5/8	80.00 - 100.00	0.6000	0.6000
T5	12	1 5/8	80.00 - 100.00	0.6000	0.6000
T6	1	1 5/8	60.00 - 80.00	0.6000	0.6000
T6	2	7/8	60.00 - 80.00	0.6000	0.6000
T6	3	1/2	60.00 - 80.00	0.6000	0.6000
T6	4	1	60.00 - 80.00	0.6000	0.6000
T6	5	WE65	60.00 - 80.00	0.6000	0.6000
T6	6	WE65	60.00 - 80.00	0.6000	0.6000
T6	7	7/8	60.00 - 80.00	0.6000	0.6000
T6	9	HYBRIFLEX 1-1/4"	60.00 - 80.00	0.6000	0.6000
T6	10	1 5/8	60.00 - 80.00	0.6000	0.6000
T6	11	1 5/8	60.00 - 80.00	0.6000	0.6000
T6	12	1 5/8	60.00 - 80.00	0.6000	0.6000
T7	1	1 5/8	40.00 - 60.00	0.6000	0.6000
T7	2	7/8	40.00 - 60.00	0.6000	0.6000
T7	3	1/2	40.00 - 60.00	0.6000	0.6000
T7	4	1	40.00 - 60.00	0.6000	0.6000
T7	5	WE65	40.00 - 60.00	0.6000	0.6000
T7	6	WE65	40.00 - 60.00	0.6000	0.6000
T7	7	7/8	40.00 - 60.00	0.6000	0.6000
T7	9	HYBRIFLEX 1-1/4"	40.00 - 60.00	0.6000	0.6000
T7	10	1 5/8	40.00 - 60.00	0.6000	0.6000
T7	11	1 5/8	40.00 - 60.00	0.6000	0.6000
T7	12	1 5/8	40.00 - 60.00	0.6000	0.6000
T8	1	1 5/8	20.00 - 40.00	0.6000	0.6000
T8	2	7/8	20.00 - 40.00	0.6000	0.6000
T8	3	1/2	20.00 - 40.00	0.6000	0.6000
T8	4	1	20.00 - 40.00	0.6000	0.6000
T8	5	WE65	20.00 - 40.00	0.6000	0.6000
T8	6	WE65	20.00 - 40.00	0.6000	0.6000
T8	7	7/8	20.00 - 40.00	0.6000	0.6000
T8	9	HYBRIFLEX 1-1/4"	20.00 - 40.00	0.6000	0.6000
T8	10	1 5/8	20.00 - 40.00	0.6000	0.6000
T8	11	1 5/8	20.00 - 40.00	0.6000	0.6000
T8	12	1 5/8	20.00 - 40.00	0.6000	0.6000
T9	1	1 5/8	8.00 - 20.00	0.6000	0.6000
T9	2	7/8	8.00 - 20.00	0.6000	0.6000
T9	3	1/2	8.00 - 20.00	0.6000	0.6000
T9	4	1	8.00 - 20.00	0.6000	0.6000
T9	5	WE65	8.00 - 20.00	0.6000	0.6000
T9	6	WE65	8.00 - 20.00	0.6000	0.6000
T9	7	7/8	8.00 - 20.00	0.6000	0.6000
T9	9	HYBRIFLEX 1-1/4"	8.00 - 20.00	0.6000	0.6000
T9	10	1 5/8	8.00 - 20.00	0.6000	0.6000
T9	11	1 5/8	8.00 - 20.00	0.6000	0.6000
T9	12	1 5/8	8.00 - 20.00	0.6000	0.6000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
DS9A09F36D-N	A	From Leg	1.00	0.0000	189.40	No Ice	5.78	5.78	0.05
(Eversource)			0.00			1/2" Ice	7.73	7.73	0.09
			0.00			1" Ice	9.71	9.71	0.15
24' x 6" Omni	B	From Leg	1.00	0.0000	189.00	No Ice	7.36	7.36	0.10
(Eversource)			0.00			1/2" Ice	16.86	16.86	0.20
			0.00			1" Ice	19.33	19.33	0.31
CO-41A	C	From Leg	1.00	0.0000	187.00	No Ice	2.27	2.27	0.01
(Eversource)			0.00			1/2" Ice	3.71	3.71	0.03
			0.00			1" Ice	5.16	5.16	0.06
Tower Top Amplifier	A	From Leg	1.00	0.0000	180.00	No Ice	2.67	1.03	0.04
(Eversource)			0.00			1/2" Ice	2.87	1.17	0.06
			0.00			1" Ice	3.08	1.32	0.08
531-70HD	A	From Leg	6.00	0.0000	158.00	No Ice	6.00	6.00	0.04
(Eversource)			0.00			1/2" Ice	6.90	6.90	0.05
			0.00			1" Ice	7.80	7.80	0.06
SD212	A	From Leg	6.00	0.0000	158.00	No Ice	2.14	2.14	0.03
(Eversource)			0.00			1/2" Ice	3.71	3.71	0.06
			0.00			1" Ice	5.28	5.28	0.08
ROHN 6-ft Side Arm	A	From Leg	3.00	0.0000	158.00	No Ice	6.68	6.68	0.08
(Eversource)			0.00			1/2" Ice	10.00	10.00	0.10
			0.00			1" Ice	13.32	13.32	0.13
24' x 6" Omni	B	From Leg	6.00	0.0000	156.00	No Ice	7.52	7.52	0.10
(Eversource)			0.00			1/2" Ice	16.86	16.86	0.20
			0.00			1" Ice	19.33	19.33	0.31
ROHN 6-ft Side Arm	B	From Leg	3.00	0.0000	153.00	No Ice	6.68	6.68	0.08
(Eversource)			0.00			1/2" Ice	10.00	10.00	0.10
			0.00			1" Ice	13.32	13.32	0.13
ROHN 3-ft Side Arm	B	From Leg	3.00	0.0000	144.40	No Ice	3.10	3.10	0.07
(Eversource)			0.00			1/2" Ice	5.00	5.00	0.10
			0.00			1" Ice	6.90	6.90	0.13
NNVV-65B-R4	A	From Leg	3.00	0.0000	135.00	No Ice	14.61	9.17	0.11
(Sprint - Proposed)			3.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32
AAHC	A	From Leg	3.00	0.0000	135.00	No Ice	4.20	2.06	0.10
(Sprint - Proposed)			-3.00			1/2" Ice	4.46	2.25	0.14
			0.00			1" Ice	4.72	2.45	0.17
NNVV-65B-R4	B	From Leg	3.00	0.0000	135.00	No Ice	14.61	9.17	0.11
(Sprint - Proposed)			3.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32
AAHC	B	From Leg	3.00	0.0000	135.00	No Ice	4.20	2.06	0.10
(Sprint - Proposed)			-3.00			1/2" Ice	4.46	2.25	0.14
			0.00			1" Ice	4.72	2.45	0.17
NNVV-65B-R4	C	From Leg	3.00	0.0000	135.00	No Ice	14.61	9.17	0.11
(Sprint - Proposed)			3.00			1/2" Ice	15.13	9.63	0.21
			0.00			1" Ice	15.65	10.11	0.32
AAHC	C	From Leg	3.00	0.0000	135.00	No Ice	4.20	2.06	0.10
(Sprint - Proposed)			-3.00			1/2" Ice	4.46	2.25	0.14
			0.00			1" Ice	4.72	2.45	0.17
FD-RRH 2x50 800	A	From Leg	3.00	0.0000	135.00	No Ice	0.00	1.93	0.06

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Sprint - Proposed)			0.00			1/2" Ice	0.00	2.11	0.09
			0.00			1" Ice	0.00	2.29	0.11
FD-RRH 2x50 800	B	From Leg	3.00	0.0000	135.00	No Ice	0.00	1.93	0.06
(Sprint - Proposed)			0.00			1/2" Ice	0.00	2.11	0.09
			0.00			1" Ice	0.00	2.29	0.11
FD-RRH 2x50 800	C	From Leg	3.00	0.0000	135.00	No Ice	0.00	1.93	0.06
(Sprint - Proposed)			0.00			1/2" Ice	0.00	2.11	0.09
			0.00			1" Ice	0.00	2.29	0.11
FD-RRH 4x45 1900	A	From Leg	3.00	0.0000	135.00	No Ice	0.00	2.38	0.06
(Sprint - Proposed)			0.00			1/2" Ice	0.00	2.59	0.08
			0.00			1" Ice	0.00	2.80	0.11
FD-RRH 4x45 1900	B	From Leg	3.00	0.0000	135.00	No Ice	0.00	2.38	0.06
(Sprint - Proposed)			0.00			1/2" Ice	0.00	2.59	0.08
			0.00			1" Ice	0.00	2.80	0.11
FD-RRH 4x45 1900	C	From Leg	3.00	0.0000	135.00	No Ice	0.00	2.38	0.06
(Sprint - Proposed)			0.00			1/2" Ice	0.00	2.59	0.08
			0.00			1" Ice	0.00	2.80	0.11
FD-RRH 2x50 800	A	From Leg	3.00	0.0000	135.00	No Ice	2.06	1.93	0.06
(Sprint - Proposed)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	B	From Leg	3.00	0.0000	135.00	No Ice	2.06	1.93	0.06
(Sprint - Proposed)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
FD-RRH 2x50 800	C	From Leg	3.00	0.0000	135.00	No Ice	2.06	1.93	0.06
(Sprint - Proposed)			0.00			1/2" Ice	2.24	2.11	0.09
			0.00			1" Ice	2.43	2.29	0.11
14' V-Boom	A	From Leg	2.00	0.0000	135.00	No Ice	13.00	13.00	0.04
(Sprint - Proposed)			0.00			1/2" Ice	15.00	15.00	0.06
			0.00			1" Ice	17.00	17.00	0.07
14' V-Boom	B	From Leg	2.00	0.0000	135.00	No Ice	13.00	13.00	0.04
(Sprint - Proposed)			0.00			1/2" Ice	15.00	15.00	0.06
			0.00			1" Ice	17.00	17.00	0.07
14' V-Boom	C	From Leg	2.00	0.0000	135.00	No Ice	13.00	13.00	0.04
(Sprint - Proposed)			0.00			1/2" Ice	15.00	15.00	0.06
			0.00			1" Ice	17.00	17.00	0.07
(4) 8' x1' Panel	A	From Leg	3.00	0.0000	125.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00			1/2" Ice	12.08	7.38	0.09
			0.00			1" Ice	12.71	7.98	0.16
(4) 8' x1' Panel	B	From Leg	3.00	0.0000	125.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00			1/2" Ice	12.08	7.38	0.09
			0.00			1" Ice	12.71	7.98	0.16
(4) 8' x1' Panel	C	From Leg	3.00	0.0000	125.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00			1/2" Ice	12.08	7.38	0.09
			0.00			1" Ice	12.71	7.98	0.16
(4) RRUS-11	A	From Leg	3.00	0.0000	125.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00			1/2" Ice	0.00	1.21	0.07
			0.00			1" Ice	0.00	1.36	0.09
(4) RRUS-11	B	From Leg	3.00	0.0000	125.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00			1/2" Ice	0.00	1.21	0.07
			0.00			1" Ice	0.00	1.36	0.09
(4) RRUS-11	C	From Leg	3.00	0.0000	125.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00			1/2" Ice	0.00	1.21	0.07
			0.00			1" Ice	0.00	1.36	0.09
(3) RC2DC-3315-PF-48	A	From Leg	3.00	0.0000	125.00	No Ice	0.00	1.96	0.03
(Future Carrier)			0.00			1/2" Ice	0.00	2.15	0.05
			0.00			1" Ice	0.00	2.35	0.08
14' V-Boom	A	From Leg	2.00	0.0000	125.00	No Ice	13.00	13.00	0.04

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Offsets: Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(Future Carrier)			0.00				1/2" Ice	15.00	15.00	0.06
			0.00				1" Ice	17.00	17.00	0.07
14' V-Boom	B	From Leg	2.00		0.0000	125.00	No Ice	13.00	13.00	0.04
(Future Carrier)			0.00				1/2" Ice	15.00	15.00	0.06
			0.00				1" Ice	17.00	17.00	0.07
14' V-Boom	C	From Leg	2.00		0.0000	125.00	No Ice	13.00	13.00	0.04
(Future Carrier)			0.00				1/2" Ice	15.00	15.00	0.06
			0.00				1" Ice	17.00	17.00	0.07
(4) 8' x1' Panel	A	From Leg	3.00		0.0000	115.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00				1/2" Ice	12.08	7.38	0.09
			0.00				1" Ice	12.71	7.98	0.16
(4) 8' x1' Panel	B	From Leg	3.00		0.0000	115.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00				1/2" Ice	12.08	7.38	0.09
			0.00				1" Ice	12.71	7.98	0.16
(4) 8' x1' Panel	C	From Leg	3.00		0.0000	115.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00				1/2" Ice	12.08	7.38	0.09
			0.00				1" Ice	12.71	7.98	0.16
(4) RRUS-11	A	From Leg	3.00		0.0000	115.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00				1/2" Ice	0.00	1.21	0.07
			0.00				1" Ice	0.00	1.36	0.09
(4) RRUS-11	B	From Leg	3.00		0.0000	115.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00				1/2" Ice	0.00	1.21	0.07
			0.00				1" Ice	0.00	1.36	0.09
(4) RRUS-11	C	From Leg	3.00		0.0000	115.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00				1/2" Ice	0.00	1.21	0.07
			0.00				1" Ice	0.00	1.36	0.09
(3) RC2DC-3315-PF-48	A	From Leg	3.00		0.0000	115.00	No Ice	0.00	1.96	0.03
(Future Carrier)			0.00				1/2" Ice	0.00	2.15	0.05
			0.00				1" Ice	0.00	2.35	0.08
14' V-Boom	A	From Leg	2.00		0.0000	115.00	No Ice	13.00	13.00	0.04
(Future Carrier)			0.00				1/2" Ice	15.00	15.00	0.06
			0.00				1" Ice	17.00	17.00	0.07
14' V-Boom	B	From Leg	2.00		0.0000	115.00	No Ice	13.00	13.00	0.04
(Future Carrier)			0.00				1/2" Ice	15.00	15.00	0.06
			0.00				1" Ice	17.00	17.00	0.07
14' V-Boom	C	From Leg	2.00		0.0000	115.00	No Ice	13.00	13.00	0.04
(Future Carrier)			0.00				1/2" Ice	15.00	15.00	0.06
			0.00				1" Ice	17.00	17.00	0.07
(4) 8' x1' Panel	A	From Leg	3.00		0.0000	105.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00				1/2" Ice	12.08	7.38	0.09
			0.00				1" Ice	12.71	7.98	0.16
(4) 8' x1' Panel	B	From Leg	3.00		0.0000	105.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00				1/2" Ice	12.08	7.38	0.09
			0.00				1" Ice	12.71	7.98	0.16
(4) 8' x1' Panel	C	From Leg	3.00		0.0000	105.00	No Ice	11.47	6.80	0.03
(Future Carrier)			0.00				1/2" Ice	12.08	7.38	0.09
			0.00				1" Ice	12.71	7.98	0.16
(4) RRUS-11	A	From Leg	3.00		0.0000	105.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00				1/2" Ice	0.00	1.21	0.07
			0.00				1" Ice	0.00	1.36	0.09
(4) RRUS-11	B	From Leg	3.00		0.0000	105.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00				1/2" Ice	0.00	1.21	0.07
			0.00				1" Ice	0.00	1.36	0.09
(4) RRUS-11	C	From Leg	3.00		0.0000	105.00	No Ice	0.00	1.07	0.05
(Future Carrier)			0.00				1/2" Ice	0.00	1.21	0.07
			0.00				1" Ice	0.00	1.36	0.09
(3) RC2DC-3315-PF-48	A	From Leg	3.00		0.0000	105.00	No Ice	0.00	1.96	0.03

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
(Future Carrier)			0.00			1/2" Ice	0.00	2.15	0.05
			0.00			1" Ice	0.00	2.35	0.08
14' V-Boom	A	From Leg	2.00	0.0000	105.00	No Ice	13.00	13.00	0.04
(Future Carrier)			0.00			1/2" Ice	15.00	15.00	0.06
			0.00			1" Ice	17.00	17.00	0.07
14' V-Boom	B	From Leg	2.00	0.0000	105.00	No Ice	13.00	13.00	0.04
(Future Carrier)			0.00			1/2" Ice	15.00	15.00	0.06
			0.00			1" Ice	17.00	17.00	0.07
14' V-Boom	C	From Leg	2.00	0.0000	105.00	No Ice	13.00	13.00	0.04
(Future Carrier)			0.00			1/2" Ice	15.00	15.00	0.06
			0.00			1" Ice	17.00	17.00	0.07

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft		Aperture Area ft^2	Weight K
8' Dish	A	Paraboloid w/o	From	1.00	0.0000		175.00	8.00	No Ice	50.27	0.10
(Eversource)		Radome	Leg	0.00					1/2" Ice	51.32	0.26
				0.00					1" Ice	52.37	0.49
8' Dish	B	Paraboloid w/o	From	1.00	0.0000		175.00	8.00	No Ice	50.27	0.10
(Eversource)		Radome	Leg	0.00					1/2" Ice	51.32	0.26
				0.00					1" Ice	52.37	0.49
8' Dish	C	Paraboloid w/o	From	1.00	0.0000		175.00	8.00	No Ice	50.27	0.10
(Eversource)		Radome	Leg	0.00					1/2" Ice	51.32	0.26
				0.00					1" Ice	52.37	0.49
8' Dish	A	Paraboloid w/o	From	1.00	0.0000		164.00	8.00	No Ice	50.27	0.10
(Eversource)		Radome	Leg	0.00					1/2" Ice	51.32	0.26
				0.00					1" Ice	52.37	0.49

Tower Pressures - No Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg % %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1	170.00	1.415	33	124.798	A	10.802	9.599	9.599	47.05	0.000	0.000
180.00-160.00					B	10.802	9.599		47.05	37.239	0.000
					C	10.802	9.599		47.05	0.000	0.000
T2	150.00	1.378	32	165.841	A	12.137	11.686	11.686	49.05	0.000	0.000
160.00-140.00					B	12.137	11.686		49.05	51.053	0.000
					C	12.137	11.686		49.05	0.000	0.000
T3	130.00	1.337	31	209.283	A	14.377	18.574	18.574	56.37	0.000	0.000

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
140.00-120.00					B	14.377	18.574		56.37	51.497	0.000
					C	14.377	18.574		56.37	6.160	0.000
T4	110.00	1.291	30	249.283	A	23.101	18.574	18.574	44.57	83.160	0.000
120.00-100.00					B	23.101	18.574		44.57	93.077	0.000
					C	23.101	18.574		44.57	12.320	0.000
T5	90.00	1.238	29	289.283	A	26.242	18.574	18.574	41.45	83.160	0.000
100.00-80.00					B	26.242	18.574		41.45	134.657	0.000
					C	26.242	18.574		41.45	95.480	0.000
T6 80.00-60.00	70.00	1.174	28	334.393	A	24.133	28.798	28.798	54.41	83.160	0.000
					B	24.133	28.798		54.41	134.657	0.000
					C	24.133	28.798		54.41	95.480	0.000
T7 60.00-40.00	50.00	1.094	26	374.393	A	26.363	28.798	28.798	52.21	83.160	0.000
					B	26.363	28.798		52.21	134.657	0.000
					C	26.363	28.798		52.21	95.480	0.000
T8 40.00-20.00	30.00	0.982	23	414.393	A	28.747	28.798	28.798	50.04	83.160	0.000
					B	28.747	28.798		50.04	134.657	0.000
					C	28.747	28.798		50.04	95.480	0.000
T9 20.00-0.00	10.00	0.85	20	457.939	A	38.722	35.893	35.893	48.10	49.896	0.000
					B	38.722	35.893		48.10	80.794	0.000
					C	38.722	35.893		48.10	57.288	0.000

Tower Pressure - With Ice

$G_H = 0.850$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G 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	170.00	1.415	8	2.9453	134.628	A	10.802	61.083	29.268	40.71	0.000	0.000
180.00-160.00						B	10.802	61.083		40.71	122.241	0.000
						C	10.802	61.083		40.71	0.000	0.000
T2	150.00	1.378	7	2.9087	175.548	A	12.137	66.414	31.110	39.60	0.000	0.000
160.00-140.00						B	12.137	66.414		39.60	183.751	0.000
						C	12.137	66.414		39.60	0.000	0.000
T3	130.00	1.337	7	2.8674	218.853	A	14.377	70.700	37.722	44.34	0.000	0.000
140.00-120.00						B	14.377	70.700		44.34	184.965	0.000
						C	14.377	70.700		44.34	22.557	0.000
T4	110.00	1.291	7	2.8199	258.695	A	23.101	74.629	37.405	38.27	121.547	0.000
120.00-100.00						B	23.101	74.629		38.27	243.836	0.000
						C	23.101	74.629		38.27	44.802	0.000
T5 100.00-80.00	90.00	1.238	7	2.7638	298.508	A	26.242	78.476	37.030	35.36	121.209	0.000
						B	26.242	78.476		35.36	302.028	0.000
						C	26.242	78.476		35.36	165.642	0.000
T6 80.00-60.00	70.00	1.174	6	2.6952	343.388	A	24.133	79.319	46.796	45.23	120.794	0.000
						B	24.133	79.319		45.23	298.868	0.000
						C	24.133	79.319		45.23	164.777	0.000
T7 60.00-40.00	50.00	1.094	6	2.6061	383.091	A	26.363	80.553	46.201	43.21	120.257	0.000
						B	26.363	80.553		43.21	294.761	0.000
						C	26.363	80.553		43.21	163.655	0.000
T8 40.00-20.00	30.00	0.982	5	2.4763	422.658	A	28.747	80.926	45.334	41.34	119.476	0.000
						B	28.747	80.926		41.34	288.788	0.000
						C	28.747	80.926		41.34	162.025	0.000
T9 20.00-0.00	10.00	0.85	5	2.2186	465.344	A	38.722	85.073	50.709	40.96	70.759	0.000
						B	38.722	85.073		40.96	166.165	0.000
						C	38.722	85.073		40.96	95.283	0.000

Tower Pressure - Service

G_H = 0.850

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
T1	170.00	1.415	29	124.798	A	10.802	9.599	9.599	47.05	0.000	0.000
180.00-160.00					B	10.802	9.599		47.05	37.239	0.000
					C	10.802	9.599		47.05	0.000	0.000
T2	150.00	1.378	28	165.841	A	12.137	11.686	11.686	49.05	0.000	0.000
160.00-140.00					B	12.137	11.686		49.05	51.053	0.000
					C	12.137	11.686		49.05	0.000	0.000
T3	130.00	1.337	27	209.283	A	14.377	18.574	18.574	56.37	0.000	0.000
140.00-120.00					B	14.377	18.574		56.37	51.497	0.000
					C	14.377	18.574		56.37	6.160	0.000
T4	110.00	1.291	26	249.283	A	23.101	18.574	18.574	44.57	83.160	0.000
120.00-100.00					B	23.101	18.574		44.57	93.077	0.000
					C	23.101	18.574		44.57	12.320	0.000
T5	90.00	1.238	25	289.283	A	26.242	18.574	18.574	41.45	83.160	0.000
100.00-80.00					B	26.242	18.574		41.45	134.657	0.000
					C	26.242	18.574		41.45	95.480	0.000
T6 80.00-60.00	70.00	1.174	24	334.393	A	24.133	28.798	28.798	54.41	83.160	0.000
					B	24.133	28.798		54.41	134.657	0.000
					C	24.133	28.798		54.41	95.480	0.000
T7 60.00-40.00	50.00	1.094	22	374.393	A	26.363	28.798	28.798	52.21	83.160	0.000
					B	26.363	28.798		52.21	134.657	0.000
					C	26.363	28.798		52.21	95.480	0.000
T8 40.00-20.00	30.00	0.982	20	414.393	A	28.747	28.798	28.798	50.04	83.160	0.000
					B	28.747	28.798		50.04	134.657	0.000
					C	28.747	28.798		50.04	95.480	0.000
T9 20.00-0.00	10.00	0.85	17	457.939	A	38.722	35.893	35.893	48.10	49.896	0.000
					B	38.722	35.893		48.10	80.794	0.000
					C	38.722	35.893		48.10	57.288	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.16	0.79	A	0.163	2.723	33	1	1	16.265	1.89	94.35	C
180.00-160.00			B	0.163	2.723		1	1	16.265			
			C	0.163	2.723		1	1	16.265			
T2	0.21	1.17	A	0.144	2.795	32	1	1	18.562	2.28	113.81	C
160.00-140.00			B	0.144	2.795		1	1	18.562			
			C	0.144	2.795		1	1	18.562			
T3	0.27	2.50	A	0.157	2.744	31	1	1	22.921	2.61	130.49	C
140.00-120.00			B	0.157	2.744		1	1	22.921			
			C	0.157	2.744		1	1	22.921			
T4	0.98	2.94	A	0.167	2.709	30	1	1	31.802	5.15	257.52	C
120.00-100.00			B	0.167	2.709		1	1	31.802			
			C	0.167	2.709		1	1	31.802			
T5	1.63	3.11	A	0.155	2.753	29	1	1	34.948	7.04	352.04	C
100.00-80.00			B	0.155	2.753		1	1	34.948			

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
			C	0.155	2.753		1	1	34.948			
T6	1.63	4.34	A	0.158	2.741	28	1	1	36.314	6.76	337.79	C
80.00-60.00			B	0.158	2.741		1	1	36.314			
			C	0.158	2.741		1	1	36.314			
T7	1.63	4.86	A	0.147	2.781	26	1	1	38.382	6.45	322.58	C
60.00-40.00			B	0.147	2.781		1	1	38.382			
			C	0.147	2.781		1	1	38.382			
T8	1.63	5.22	A	0.139	2.813	23	1	1	40.644	5.94	297.14	C
40.00-20.00			B	0.139	2.813		1	1	40.644			
			C	0.139	2.813		1	1	40.644			
T9 20.00-0.00	0.98	6.28	A	0.163	2.724	20	1	1	53.991	4.42	221.05	C
			B	0.163	2.724		1	1	53.991			
			C	0.163	2.724		1	1	53.991			
Sum Weight:	9.13	31.22						OTM	3219.69 kip-ft	42.54		

Tower Forces - No Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.16	0.79	A	0.163	2.723	33	0.8	1	14.104	1.72	86.02	C
180.00-160.00			B	0.163	2.723		0.8	1	14.104			
			C	0.163	2.723		0.8	1	14.104			
T2	0.21	1.17	A	0.144	2.795	32	0.8	1	16.135	2.09	104.45	C
160.00-140.00			B	0.144	2.795		0.8	1	16.135			
			C	0.144	2.795		0.8	1	16.135			
T3	0.27	2.50	A	0.157	2.744	31	0.8	1	20.046	2.40	119.93	C
140.00-120.00			B	0.157	2.744		0.8	1	20.046			
			C	0.157	2.744		0.8	1	20.046			
T4	0.98	2.94	A	0.167	2.709	30	0.8	1	27.182	4.83	241.34	C
120.00-100.00			B	0.167	2.709		0.8	1	27.182			
			C	0.167	2.709		0.8	1	27.182			
T5	1.63	3.11	A	0.155	2.753	29	0.8	1	29.700	6.68	334.14	C
100.00-80.00			B	0.155	2.753		0.8	1	29.700			
			C	0.155	2.753		0.8	1	29.700			
T6	1.63	4.34	A	0.158	2.741	28	0.8	1	31.487	6.45	322.25	C
80.00-60.00			B	0.158	2.741		0.8	1	31.487			
			C	0.158	2.741		0.8	1	31.487			
T7	1.63	4.86	A	0.147	2.781	26	0.8	1	33.109	6.13	306.53	C
60.00-40.00			B	0.147	2.781		0.8	1	33.109			
			C	0.147	2.781		0.8	1	33.109			
T8	1.63	5.22	A	0.139	2.813	23	0.8	1	34.894	5.62	281.24	C
40.00-20.00			B	0.139	2.813		0.8	1	34.894			
			C	0.139	2.813		0.8	1	34.894			
T9 20.00-0.00	0.98	6.28	A	0.163	2.724	20	0.8	1	46.246	4.06	203.10	C
			B	0.163	2.724		0.8	1	46.246			
			C	0.163	2.724		0.8	1	46.246			
Sum Weight:	9.13	31.22						OTM	3017.09 kip-ft	39.98		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.16	0.79	A	0.163	2.723	33	0.85	1	14.644	1.76	88.10	C
180.00-160.00			B	0.163	2.723		0.85	1	14.644			
			C	0.163	2.723		0.85	1	14.644			
T2	0.21	1.17	A	0.144	2.795	32	0.85	1	16.742	2.14	106.79	C
160.00-140.00			B	0.144	2.795		0.85	1	16.742			
			C	0.144	2.795		0.85	1	16.742			
T3	0.27	2.50	A	0.157	2.744	31	0.85	1	20.765	2.45	122.57	C
140.00-120.00			B	0.157	2.744		0.85	1	20.765			
			C	0.157	2.744		0.85	1	20.765			
T4	0.98	2.94	A	0.167	2.709	30	0.85	1	28.337	4.91	245.38	C
120.00-100.00			B	0.167	2.709		0.85	1	28.337			
			C	0.167	2.709		0.85	1	28.337			
T5	1.63	3.11	A	0.155	2.753	29	0.85	1	31.012	6.77	338.62	C
100.00-80.00			B	0.155	2.753		0.85	1	31.012			
			C	0.155	2.753		0.85	1	31.012			
T6	1.63	4.34	A	0.158	2.741	28	0.85	1	32.694	6.52	326.14	C
80.00-60.00			B	0.158	2.741		0.85	1	32.694			
			C	0.158	2.741		0.85	1	32.694			
T7	1.63	4.86	A	0.147	2.781	26	0.85	1	34.427	6.21	310.55	C
60.00-40.00			B	0.147	2.781		0.85	1	34.427			
			C	0.147	2.781		0.85	1	34.427			
T8	1.63	5.22	A	0.139	2.813	23	0.85	1	36.332	5.70	285.22	C
40.00-20.00			B	0.139	2.813		0.85	1	36.332			
			C	0.139	2.813		0.85	1	36.332			
T9 20.00-0.00	0.98	6.28	A	0.163	2.724	20	0.85	1	48.183	4.15	207.59	C
			B	0.163	2.724		0.85	1	48.183			
			C	0.163	2.724		0.85	1	48.183			
Sum Weight:	9.13	31.22						OTM	3067.74 kip-ft	40.62		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	2.72	6.26	A	0.534	1.86	8	1	1	53.799	1.03	51.38	C
180.00-160.00			B	0.534	1.86		1	1	53.799			
			C	0.534	1.86		1	1	53.799			
T2	3.87	7.16	A	0.447	1.978	7	1	1	55.841	1.35	67.55	C
160.00-140.00			B	0.447	1.978		1	1	55.841			
			C	0.447	1.978		1	1	55.841			
T3	4.30	9.13	A	0.389	2.087	7	1	1	59.019	1.53	76.59	C
140.00-120.00			B	0.389	2.087		1	1	59.019			
			C	0.389	2.087		1	1	59.019			
T4	10.57	11.00	A	0.378	2.11	7	1	1	69.887	2.35	117.49	C
120.00-100.00			B	0.378	2.11		1	1	69.887			
			C	0.378	2.11		1	1	69.887			
T5	16.23	11.75	A	0.351	2.17	7	1	1	74.612	2.95	147.45	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
100.00-80.00			B	0.351	2.17		1	1	74.612			
			C	0.351	2.17		1	1	74.612			
T6	15.92	12.56	A	0.301	2.293	6	1	1	71.671	2.80	139.79	C
80.00-60.00			B	0.301	2.293		1	1	71.671			
			C	0.301	2.293		1	1	71.671			
T7	15.53	13.24	A	0.279	2.353	6	1	1	74.106	2.64	131.90	C
60.00-40.00			B	0.279	2.353		1	1	74.106			
			C	0.279	2.353		1	1	74.106			
T8	14.96	13.84	A	0.259	2.409	5	1	1	76.281	2.39	119.44	C
40.00-20.00			B	0.259	2.409		1	1	76.281			
			C	0.259	2.409		1	1	76.281			
T9 20.00-0.00	8.31	15.70	A	0.266	2.39	5	1	1	88.839	1.62	80.90	C
			B	0.266	2.39		1	1	88.839			
			C	0.266	2.39		1	1	88.839			
Sum Weight:	92.41	100.64						OTM	1515.79 kip-ft	18.65		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	2.72	6.26	A	0.534	1.86	8	0.8	1	51.638	1.00	50.06	C
180.00-160.00			B	0.534	1.86		0.8	1	51.638			
			C	0.534	1.86		0.8	1	51.638			
T2	3.87	7.16	A	0.447	1.978	7	0.8	1	53.413	1.32	66.02	C
160.00-140.00			B	0.447	1.978		0.8	1	53.413			
			C	0.447	1.978		0.8	1	53.413			
T3	4.30	9.13	A	0.389	2.087	7	0.8	1	56.144	1.49	74.73	C
140.00-120.00			B	0.389	2.087		0.8	1	56.144			
			C	0.389	2.087		0.8	1	56.144			
T4	10.57	11.00	A	0.378	2.11	7	0.8	1	65.267	2.29	114.58	C
120.00-100.00			B	0.378	2.11		0.8	1	65.267			
			C	0.378	2.11		0.8	1	65.267			
T5	16.23	11.75	A	0.351	2.17	7	0.8	1	69.363	2.88	144.19	C
100.00-80.00			B	0.351	2.17		0.8	1	69.363			
			C	0.351	2.17		0.8	1	69.363			
T6	15.92	12.56	A	0.301	2.293	6	0.8	1	66.844	2.74	136.78	C
80.00-60.00			B	0.301	2.293		0.8	1	66.844			
			C	0.301	2.293		0.8	1	66.844			
T7	15.53	13.24	A	0.279	2.353	6	0.8	1	68.834	2.58	128.76	C
60.00-40.00			B	0.279	2.353		0.8	1	68.834			
			C	0.279	2.353		0.8	1	68.834			
T8	14.96	13.84	A	0.259	2.409	5	0.8	1	70.532	2.33	116.30	C
40.00-20.00			B	0.259	2.409		0.8	1	70.532			
			C	0.259	2.409		0.8	1	70.532			
T9 20.00-0.00	8.31	15.70	A	0.266	2.39	5	0.8	1	81.095	1.55	77.26	C
			B	0.266	2.39		0.8	1	81.095			
			C	0.266	2.39		0.8	1	81.095			
Sum Weight:	92.41	100.64						OTM	1479.68 kip-ft	18.17		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	2.72	6.26	A	0.534	1.86	8	0.85	1	52.179	1.01	50.39	C
180.00-160.00			B	0.534	1.86		0.85	1	52.179			
			C	0.534	1.86		0.85	1	52.179			
T2	3.87	7.16	A	0.447	1.978	7	0.85	1	54.020	1.33	66.40	C
160.00-140.00			B	0.447	1.978		0.85	1	54.020			
			C	0.447	1.978		0.85	1	54.020			
T3	4.30	9.13	A	0.389	2.087	7	0.85	1	56.863	1.50	75.20	C
140.00-120.00			B	0.389	2.087		0.85	1	56.863			
			C	0.389	2.087		0.85	1	56.863			
T4	10.57	11.00	A	0.378	2.11	7	0.85	1	66.422	2.31	115.31	C
120.00-100.00			B	0.378	2.11		0.85	1	66.422			
			C	0.378	2.11		0.85	1	66.422			
T5	16.23	11.75	A	0.351	2.17	7	0.85	1	70.675	2.90	145.00	C
100.00-80.00			B	0.351	2.17		0.85	1	70.675			
			C	0.351	2.17		0.85	1	70.675			
T6	15.92	12.56	A	0.301	2.293	6	0.85	1	68.051	2.75	137.53	C
80.00-60.00			B	0.301	2.293		0.85	1	68.051			
			C	0.301	2.293		0.85	1	68.051			
T7	15.53	13.24	A	0.279	2.353	6	0.85	1	70.152	2.59	129.55	C
60.00-40.00			B	0.279	2.353		0.85	1	70.152			
			C	0.279	2.353		0.85	1	70.152			
T8	14.96	13.84	A	0.259	2.409	5	0.85	1	71.969	2.34	117.09	C
40.00-20.00			B	0.259	2.409		0.85	1	71.969			
			C	0.259	2.409		0.85	1	71.969			
T9 20.00-0.00	8.31	15.70	A	0.266	2.39	5	0.85	1	83.031	1.56	78.17	C
			B	0.266	2.39		0.85	1	83.031			
			C	0.266	2.39		0.85	1	83.031			
Sum Weight:	92.41	100.64						OTM	1488.71 kip-ft	18.29		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.16	0.79	A	0.163	2.723	29	1	1	16.265	1.64	82.04	C
180.00-160.00			B	0.163	2.723		1	1	16.265			
			C	0.163	2.723		1	1	16.265			
T2	0.21	1.17	A	0.144	2.795	28	1	1	18.562	1.98	98.97	C
160.00-140.00			B	0.144	2.795		1	1	18.562			
			C	0.144	2.795		1	1	18.562			
T3	0.27	2.50	A	0.157	2.744	27	1	1	22.921	2.27	113.47	C
140.00-120.00			B	0.157	2.744		1	1	22.921			
			C	0.157	2.744		1	1	22.921			
T4	0.98	2.94	A	0.167	2.709	26	1	1	31.802	4.48	223.93	C
120.00-100.00			B	0.167	2.709		1	1	31.802			
			C	0.167	2.709		1	1	31.802			
T5	1.63	3.11	A	0.155	2.753	25	1	1	34.948	6.12	306.12	C

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
100.00-80.00			B	0.155	2.753		1	1	34.948			
			C	0.155	2.753		1	1	34.948			
T6	1.63	4.34	A	0.158	2.741	24	1	1	36.314	5.87	293.73	C
80.00-60.00			B	0.158	2.741		1	1	36.314			
			C	0.158	2.741		1	1	36.314			
T7	1.63	4.86	A	0.147	2.781	22	1	1	38.382	5.61	280.51	C
60.00-40.00			B	0.147	2.781		1	1	38.382			
			C	0.147	2.781		1	1	38.382			
T8	1.63	5.22	A	0.139	2.813	20	1	1	40.644	5.17	258.38	C
40.00-20.00			B	0.139	2.813		1	1	40.644			
			C	0.139	2.813		1	1	40.644			
T9 20.00-0.00	0.98	6.28	A	0.163	2.724	17	1	1	53.991	3.84	192.22	C
			B	0.163	2.724		1	1	53.991			
			C	0.163	2.724		1	1	53.991			
Sum Weight:	9.13	31.22						OTM	2799.73 kip-ft	36.99		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft²	F K	w plf	Ctrl. Face
T1	0.16	0.79	A	0.163	2.723	29	0.8	1	14.104	1.50	74.80	C
180.00-160.00			B	0.163	2.723		0.8	1	14.104			
			C	0.163	2.723		0.8	1	14.104			
T2	0.21	1.17	A	0.144	2.795	28	0.8	1	16.135	1.82	90.83	C
160.00-140.00			B	0.144	2.795		0.8	1	16.135			
			C	0.144	2.795		0.8	1	16.135			
T3	0.27	2.50	A	0.157	2.744	27	0.8	1	20.046	2.09	104.28	C
140.00-120.00			B	0.157	2.744		0.8	1	20.046			
			C	0.157	2.744		0.8	1	20.046			
T4	0.98	2.94	A	0.167	2.709	26	0.8	1	27.182	4.20	209.86	C
120.00-100.00			B	0.167	2.709		0.8	1	27.182			
			C	0.167	2.709		0.8	1	27.182			
T5	1.63	3.11	A	0.155	2.753	25	0.8	1	29.700	5.81	290.56	C
100.00-80.00			B	0.155	2.753		0.8	1	29.700			
			C	0.155	2.753		0.8	1	29.700			
T6	1.63	4.34	A	0.158	2.741	24	0.8	1	31.487	5.60	280.22	C
80.00-60.00			B	0.158	2.741		0.8	1	31.487			
			C	0.158	2.741		0.8	1	31.487			
T7	1.63	4.86	A	0.147	2.781	22	0.8	1	33.109	5.33	266.55	C
60.00-40.00			B	0.147	2.781		0.8	1	33.109			
			C	0.147	2.781		0.8	1	33.109			
T8	1.63	5.22	A	0.139	2.813	20	0.8	1	34.894	4.89	244.56	C
40.00-20.00			B	0.139	2.813		0.8	1	34.894			
			C	0.139	2.813		0.8	1	34.894			
T9 20.00-0.00	0.98	6.28	A	0.163	2.724	17	0.8	1	46.246	3.53	176.61	C
			B	0.163	2.724		0.8	1	46.246			
			C	0.163	2.724		0.8	1	46.246			
Sum Weight:	9.13	31.22						OTM	2623.56 kip-ft	34.77		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	Face	e	C_F	q_z psf	D_F	D_R	A_E ft^2	F K	w plf	Ctrl. Face
T1	0.16	0.79	A	0.163	2.723	29	0.85	1	14.644	1.53	76.61	C
180.00-160.00			B	0.163	2.723		0.85	1	14.644			
			C	0.163	2.723		0.85	1	14.644			
T2	0.21	1.17	A	0.144	2.795	28	0.85	1	16.742	1.86	92.86	C
160.00-140.00			B	0.144	2.795		0.85	1	16.742			
			C	0.144	2.795		0.85	1	16.742			
T3	0.27	2.50	A	0.157	2.744	27	0.85	1	20.765	2.13	106.58	C
140.00-120.00			B	0.157	2.744		0.85	1	20.765			
			C	0.157	2.744		0.85	1	20.765			
T4	0.98	2.94	A	0.167	2.709	26	0.85	1	28.337	4.27	213.38	C
120.00-100.00			B	0.167	2.709		0.85	1	28.337			
			C	0.167	2.709		0.85	1	28.337			
T5	1.63	3.11	A	0.155	2.753	25	0.85	1	31.012	5.89	294.45	C
100.00-80.00			B	0.155	2.753		0.85	1	31.012			
			C	0.155	2.753		0.85	1	31.012			
T6	1.63	4.34	A	0.158	2.741	24	0.85	1	32.694	5.67	283.60	C
80.00-60.00			B	0.158	2.741		0.85	1	32.694			
			C	0.158	2.741		0.85	1	32.694			
T7	1.63	4.86	A	0.147	2.781	22	0.85	1	34.427	5.40	270.04	C
60.00-40.00			B	0.147	2.781		0.85	1	34.427			
			C	0.147	2.781		0.85	1	34.427			
T8	1.63	5.22	A	0.139	2.813	20	0.85	1	36.332	4.96	248.01	C
40.00-20.00			B	0.139	2.813		0.85	1	36.332			
			C	0.139	2.813		0.85	1	36.332			
T9 20.00-0.00	0.98	6.28	A	0.163	2.724	17	0.85	1	48.183	3.61	180.51	C
			B	0.163	2.724		0.85	1	48.183			
			C	0.163	2.724		0.85	1	48.183			
Sum Weight:	9.13	31.22						OTM	2667.60 kip-ft	35.32		

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	17.08					
Bracing Weight	14.14					
Total Member Self-Weight	31.22			-17.85	-6.55	
Total Weight	46.20			-17.85	-6.55	
Wind 0 deg - No Ice		0.00	-61.49	-5874.57	-6.55	10.49
Wind 30 deg - No Ice		30.29	-50.12	-4703.11	-2937.86	-2.64
Wind 60 deg - No Ice		50.27	-29.14	-2788.11	-4756.70	-13.75
Wind 90 deg - No Ice		58.06	-1.12	-213.02	-5434.45	-20.83
Wind 120 deg - No Ice		52.58	32.33	3170.31	-4952.53	-20.47
Wind 150 deg - No Ice		27.79	52.33	5040.91	-2506.76	-15.62
Wind 180 deg - No Ice		0.00	59.18	5670.21	-6.55	-10.02
Wind 210 deg - No Ice		-27.79	52.33	5040.91	2493.65	-1.94
Wind 240 deg - No Ice		-52.58	32.33	3170.31	4939.43	9.98

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M_x kip-ft	Sum of Overturning Moments, M_z kip-ft	Sum of Torques kip-ft
Wind 270 deg - No Ice		-58.06	-1.12	-213.02	5421.34	20.83
Wind 300 deg - No Ice		-50.27	-29.14	-2788.11	4743.60	23.77
Wind 330 deg - No Ice		-30.29	-50.12	-4703.11	2924.76	20.19
Member Ice	69.42					
Total Weight Ice	235.96			-119.87	-130.41	
Wind 0 deg - Ice		0.00	-25.96	-2638.15	-130.41	7.37
Wind 30 deg - Ice		12.86	-21.80	-2212.51	-1387.49	3.27
Wind 60 deg - Ice		21.75	-12.66	-1346.53	-2228.03	-1.42
Wind 90 deg - Ice		25.07	-0.28	-169.43	-2534.20	-5.60
Wind 120 deg - Ice		22.18	13.38	1205.19	-2264.48	-7.76
Wind 150 deg - Ice		12.22	22.36	2067.57	-1278.04	-8.21
Wind 180 deg - Ice		0.00	25.54	2370.90	-130.41	-7.27
Wind 210 deg - Ice		-12.22	22.36	2067.57	1017.23	-4.43
Wind 240 deg - Ice		-22.18	13.38	1205.19	2003.67	0.40
Wind 270 deg - Ice		-25.07	-0.28	-169.43	2273.39	5.60
Wind 300 deg - Ice		-21.75	-12.66	-1346.53	1967.21	8.69
Wind 330 deg - Ice		-12.86	-21.80	-2212.51	1126.68	9.37
Total Weight	46.20			-17.85	-6.55	
Wind 0 deg - Service		0.00	-53.47	-5096.21	-2.19	9.12
Wind 30 deg - Service		26.34	-43.59	-4077.55	-2551.16	-2.29
Wind 60 deg - Service		43.72	-25.34	-2412.33	-4132.76	-11.96
Wind 90 deg - Service		50.49	-0.97	-173.13	-4722.10	-18.11
Wind 120 deg - Service		45.73	28.11	2768.90	-4303.04	-17.80
Wind 150 deg - Service		24.16	45.50	4395.51	-2176.28	-13.58
Wind 180 deg - Service		0.00	51.46	4942.73	-2.19	-8.71
Wind 210 deg - Service		-24.16	45.50	4395.51	2171.90	-1.68
Wind 240 deg - Service		-45.73	28.11	2768.90	4298.66	8.68
Wind 270 deg - Service		-50.49	-0.97	-173.13	4717.72	18.11
Wind 300 deg - Service		-43.72	-25.34	-2412.33	4128.38	20.67
Wind 330 deg - Service		-26.34	-43.59	-4077.55	2546.78	17.56

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 30 deg - No Ice
5	0.9 Dead+1.6 Wind 30 deg - No Ice
6	1.2 Dead+1.6 Wind 60 deg - No Ice
7	0.9 Dead+1.6 Wind 60 deg - No Ice
8	1.2 Dead+1.6 Wind 90 deg - No Ice
9	0.9 Dead+1.6 Wind 90 deg - No Ice
10	1.2 Dead+1.6 Wind 120 deg - No Ice
11	0.9 Dead+1.6 Wind 120 deg - No Ice
12	1.2 Dead+1.6 Wind 150 deg - No Ice
13	0.9 Dead+1.6 Wind 150 deg - No Ice
14	1.2 Dead+1.6 Wind 180 deg - No Ice
15	0.9 Dead+1.6 Wind 180 deg - No Ice
16	1.2 Dead+1.6 Wind 210 deg - No Ice
17	0.9 Dead+1.6 Wind 210 deg - No Ice
18	1.2 Dead+1.6 Wind 240 deg - No Ice
19	0.9 Dead+1.6 Wind 240 deg - No Ice
20	1.2 Dead+1.6 Wind 270 deg - No Ice
21	0.9 Dead+1.6 Wind 270 deg - No Ice

Comb. No.	Description
22	1.2 Dead+1.6 Wind 300 deg - No Ice
23	0.9 Dead+1.6 Wind 300 deg - No Ice
24	1.2 Dead+1.6 Wind 330 deg - No Ice
25	0.9 Dead+1.6 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
T1	180 - 160	Leg	Max Tension	15	21.00	-0.45	0.01
			Max. Compression	2	-23.72	0.31	-0.03
			Max. Mx	10	11.51	0.59	-0.02
			Max. My	16	-4.83	0.13	-0.65
			Max. Vy	3	2.44	0.06	-0.01
			Max. Vx	2	-2.05	-0.03	0.14
		Diagonal	Max Tension	10	4.37	0.00	0.00
			Max. Compression	10	-4.36	0.00	0.00
			Max. Mx	29	0.56	0.04	0.01
			Max. My	10	-3.79	-0.00	0.01
			Max. Vy	29	0.05	0.04	0.01
			Max. Vx	10	-0.00	0.00	0.00
		Top Girt	Max Tension	15	0.65	0.00	0.00
			Max. Compression	18	-0.70	0.00	0.00
			Max. Mx	29	-0.01	-0.07	0.00
			Max. My	27	-0.02	0.00	0.00
			Max. Vy	29	0.06	0.00	0.00
			Max. Vx	27	0.00	0.00	0.00
T2	160 - 140	Leg	Max Tension	15	57.24	-0.07	0.01
			Max. Compression	2	-60.71	0.39	-0.06
			Max. Mx	14	30.52	-0.39	0.03
			Max. My	23	-15.40	0.14	-0.57
			Max. Vy	14	-0.24	-0.39	0.03
			Max. Vx	8	0.51	0.00	0.54

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
		Diagonal	Max Tension	24	5.47	0.00	0.00
			Max. Compression	10	-5.54	0.00	0.00
			Max. Mx	29	0.94	0.07	-0.01
			Max. My	27	-0.04	0.06	-0.01
			Max. Vy	29	0.07	0.07	-0.01
			Max. Vx	27	0.00	0.00	0.00
T3	140 - 120	Leg	Max Tension	15	91.57	-0.84	0.02
			Max. Compression	2	-98.61	1.61	-0.05
			Max. Mx	11	-97.47	1.65	0.12
			Max. My	8	-13.39	0.02	1.66
			Max. Vy	22	-1.32	-0.83	-0.02
			Max. Vx	8	1.37	0.01	0.82
		Diagonal	Max Tension	24	8.61	0.00	0.00
			Max. Compression	24	-8.66	0.00	0.00
			Max. Mx	29	1.66	0.12	0.02
			Max. My	27	0.09	0.11	-0.02
			Max. Vy	29	0.09	0.12	0.02
			Max. Vx	27	-0.01	0.00	0.00
T4	120 - 100	Leg	Max Tension	15	141.69	-1.10	0.02
			Max. Compression	2	-154.67	0.97	-0.01
			Max. Mx	11	-113.34	1.65	0.12
			Max. My	8	-14.25	0.02	1.66
			Max. Vy	22	-1.40	-1.08	-0.06
			Max. Vx	8	1.48	0.02	1.04
		Diagonal	Max Tension	24	13.47	0.00	0.00
			Max. Compression	24	-13.55	0.00	0.00
			Max. Mx	31	2.63	0.20	0.02
			Max. My	27	0.21	0.17	-0.03
			Max. Vy	29	0.13	0.19	0.02
			Max. Vx	27	-0.01	0.00	0.00
T5	100 - 80	Leg	Max Tension	15	202.10	-0.40	-0.01
			Max. Compression	2	-220.47	1.53	-0.06
			Max. Mx	10	-220.34	1.54	0.19
			Max. My	8	-21.22	0.06	1.47
			Max. Vy	19	-0.26	1.54	-0.13
			Max. Vx	8	-0.28	0.06	1.47
		Diagonal	Max Tension	24	15.12	0.00	0.00
			Max. Compression	24	-15.32	0.00	0.00
			Max. Mx	31	3.33	0.24	0.03
			Max. My	27	0.36	0.22	-0.03
			Max. Vy	29	0.15	0.24	0.03
			Max. Vx	27	-0.01	0.00	0.00
T6	80 - 60	Leg	Max Tension	15	257.02	-1.56	-0.01
			Max. Compression	10	-281.08	2.33	0.18
			Max. Mx	10	-281.08	2.33	0.18
			Max. My	12	-33.99	0.08	-1.82
			Max. Vy	19	-0.24	2.32	-0.15
			Max. Vx	8	-0.21	0.01	1.74
		Diagonal	Max Tension	24	18.09	0.00	0.00
			Max. Compression	24	-18.32	0.00	0.00
			Max. Mx	29	3.60	0.38	0.05
			Max. My	27	0.41	0.33	-0.05
			Max. Vy	29	0.19	0.38	0.05
			Max. Vx	27	-0.01	0.00	0.00
T7	60 - 40	Leg	Max Tension	15	316.28	-1.67	-0.00
			Max. Compression	10	-347.29	2.39	0.14
			Max. Mx	10	-347.29	2.39	0.14
			Max. My	12	-37.99	0.04	-1.95
			Max. Vy	33	0.30	-2.01	0.04
			Max. Vx	8	0.21	-0.02	1.91
		Diagonal	Max Tension	24	19.40	0.00	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
			Max. Compression	24	-19.69	0.00	0.00
			Max. Mx	29	4.10	0.46	0.06
			Max. My	27	0.08	0.44	-0.06
			Max. Vy	29	0.21	0.46	-0.06
			Max. Vx	27	-0.01	0.00	0.00
T8	40 - 20	Leg	Max Tension	15	374.13	-1.63	0.00
			Max. Compression	10	-412.48	3.03	0.09
			Max. Mx	29	41.09	-5.40	0.01
			Max. My	12	-41.85	-0.03	-2.52
			Max. Vy	33	0.81	-5.38	0.03
			Max. Vx	8	0.29	-0.08	2.46
		Diagonal	Max Tension	24	20.50	0.00	0.00
			Max. Compression	24	-20.87	0.00	0.00
			Max. Mx	29	2.87	0.54	0.07
			Max. My	37	-5.15	0.47	-0.07
			Max. Vy	29	0.24	0.52	-0.06
			Max. Vx	37	-0.01	0.00	0.00
T9	20 - 0	Leg	Max Tension	15	429.25	-3.31	0.00
			Max. Compression	10	-475.37	-0.00	-0.00
			Max. Mx	27	-196.37	8.50	0.10
			Max. My	12	-45.58	-0.03	-6.18
			Max. Vy	33	-1.27	-5.38	0.03
			Max. Vx	8	0.75	-0.12	5.97
		Diagonal	Max Tension	12	21.48	0.00	0.00
			Max. Compression	24	-21.83	0.00	0.00
			Max. Mx	29	0.88	0.77	0.08
			Max. My	37	-8.11	0.70	-0.09
			Max. Vy	29	0.27	0.77	0.08
			Max. Vx	37	0.01	0.00	0.00

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Leg C	Max. Vert	18	490.63	51.29	-30.10
	Max. H_x	18	490.63	51.29	-30.10
	Max. H_z	7	-429.15	-46.31	27.36
	Min. Vert	7	-429.15	-46.31	27.36
	Min. H_x	7	-429.15	-46.31	27.36
	Min. H_z	18	490.63	51.29	-30.10
Leg B	Max. Vert	10	491.32	-51.09	-30.47
	Max. H_x	23	-428.63	46.09	27.71
	Max. H_z	23	-428.63	46.09	27.71
	Min. Vert	23	-428.63	46.09	27.71
	Min. H_x	10	491.32	-51.09	-30.47
	Min. H_z	10	491.32	-51.09	-30.47
Leg A	Max. Vert	2	490.93	0.42	59.30
	Max. H_x	21	30.38	8.20	2.34
	Max. H_z	2	490.93	0.42	59.30
	Min. Vert	15	-442.90	-0.41	-54.91
	Min. H_x	9	30.38	-8.19	2.34
	Min. H_z	15	-442.90	-0.41	-54.91

Tower Mast Reaction Summary

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
Dead Only	46.20	0.00	0.00	-17.85	-6.55	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	55.44	-0.00	-98.39	-9410.46	-7.96	16.86
0.9 Dead+1.6 Wind 0 deg - No Ice	41.58	0.00	-98.39	-9400.47	-5.98	16.84
1.2 Dead+1.6 Wind 30 deg - No Ice	55.44	48.46	-80.20	-7532.29	-4707.21	-4.20
0.9 Dead+1.6 Wind 30 deg - No Ice	41.58	48.46	-80.20	-7523.27	-4702.90	-4.20
1.2 Dead+1.6 Wind 60 deg - No Ice	55.44	80.44	-46.62	-4462.53	-7622.82	-22.05
0.9 Dead+1.6 Wind 60 deg - No Ice	41.58	80.44	-46.62	-4454.98	-7617.12	-22.03
1.2 Dead+1.6 Wind 90 deg - No Ice	55.44	92.89	-1.79	-334.61	-8709.23	-33.43
0.9 Dead+1.6 Wind 90 deg - No Ice	41.58	92.89	-1.79	-329.03	-8703.01	-33.40
1.2 Dead+1.6 Wind 120 deg - No Ice	55.44	84.13	51.73	5089.64	-7936.79	-32.89
0.9 Dead+1.6 Wind 120 deg - No Ice	41.58	84.13	51.73	5092.46	-7930.96	-32.87
1.2 Dead+1.6 Wind 150 deg - No Ice	55.44	44.46	83.72	8088.42	-4015.79	-25.11
0.9 Dead+1.6 Wind 150 deg - No Ice	41.58	44.46	83.72	8089.77	-4011.92	-25.08
1.2 Dead+1.6 Wind 180 deg - No Ice	55.44	-0.00	94.68	9097.25	-7.97	-16.11
0.9 Dead+1.6 Wind 180 deg - No Ice	41.58	-0.00	94.68	9098.12	-5.99	-16.09
1.2 Dead+1.6 Wind 210 deg - No Ice	55.44	-44.46	83.72	8088.47	3999.89	-3.12
0.9 Dead+1.6 Wind 210 deg - No Ice	41.58	-44.46	83.72	8089.82	3999.98	-3.11
1.2 Dead+1.6 Wind 240 deg - No Ice	55.44	-84.13	51.73	5089.70	7920.98	16.04
0.9 Dead+1.6 Wind 240 deg - No Ice	41.58	-84.13	51.73	5092.51	7919.09	16.02
1.2 Dead+1.6 Wind 270 deg - No Ice	55.44	-92.89	-1.79	-334.63	8693.46	33.44
0.9 Dead+1.6 Wind 270 deg - No Ice	41.58	-92.89	-1.79	-329.05	8691.19	33.41
1.2 Dead+1.6 Wind 300 deg - No Ice	55.44	-80.44	-46.62	-4462.61	7607.02	38.15
0.9 Dead+1.6 Wind 300 deg - No Ice	41.58	-80.44	-46.62	-4455.06	7605.27	38.12
1.2 Dead+1.6 Wind 330 deg - No Ice	55.44	-48.46	-80.20	-7532.37	4691.35	32.41
0.9 Dead+1.6 Wind 330 deg - No Ice	41.58	-48.46	-80.20	-7523.35	4690.99	32.38
1.2 Dead+1.0 Ice+1.0 Temp	245.20	-0.00	0.00	-124.60	-133.67	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	245.20	-0.00	-25.96	-2669.53	-133.70	7.65
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	245.20	12.86	-21.80	-2239.18	-1404.12	3.41
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	245.20	21.75	-12.66	-1364.24	-2253.36	-1.42
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	245.20	25.07	-0.28	-174.90	-2562.63	-5.75

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	K	K	K	kip-ft	kip-ft	kip-ft
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	245.20	22.18	13.38	1214.61	-2290.18	-8.06
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	245.20	12.22	22.36	2086.02	-1293.16	-8.54
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	245.20	-0.00	25.54	2392.50	-133.74	-7.56
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	245.20	-12.22	22.36	2086.01	1025.70	-4.60
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	245.20	-22.18	13.38	1214.59	2022.74	0.38
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	245.20	-25.07	-0.28	-174.95	2295.21	5.77
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	245.20	-21.75	-12.66	-1364.29	1985.94	8.96
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	245.20	-12.86	-21.80	-2239.22	1136.72	9.69
Dead+Wind 0 deg - Service	46.20	0.00	-53.47	-5119.00	-6.59	9.15
Dead+Wind 30 deg - Service	46.20	26.34	-43.59	-4098.58	-2559.73	-2.32
Dead+Wind 60 deg - Service	46.20	43.72	-25.34	-2430.73	-4143.82	-11.98
Dead+Wind 90 deg - Service	46.20	50.49	-0.97	-187.97	-4734.09	-18.13
Dead+Wind 120 deg - Service	46.20	45.73	28.11	2759.04	-4314.42	-17.87
Dead+Wind 150 deg - Service	46.20	24.16	45.50	4388.27	-2184.10	-13.66
Dead+Wind 180 deg - Service	46.20	0.00	51.46	4936.38	-6.59	-8.75
Dead+Wind 210 deg - Service	46.20	-24.16	45.50	4388.29	2170.92	-1.67
Dead+Wind 240 deg - Service	46.20	-45.73	28.11	2759.05	4301.26	8.71
Dead+Wind 270 deg - Service	46.20	-50.49	-0.97	-187.98	4720.95	18.13
Dead+Wind 300 deg - Service	46.20	-43.72	-25.34	-2430.76	4130.68	20.72
Dead+Wind 330 deg - Service	46.20	-26.34	-43.59	-4098.61	2546.58	17.63

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	-46.20	0.00	0.00	46.20	0.00	0.000%
2	0.00	-55.44	-98.39	0.00	55.44	98.39	0.000%
3	0.00	-41.58	-98.39	-0.00	41.58	98.39	0.000%
4	48.46	-55.44	-80.20	-48.46	55.44	80.20	0.000%
5	48.46	-41.58	-80.20	-48.46	41.58	80.20	0.000%
6	80.44	-55.44	-46.62	-80.44	55.44	46.62	0.000%
7	80.44	-41.58	-46.62	-80.44	41.58	46.62	0.000%
8	92.89	-55.44	-1.79	-92.89	55.44	1.79	0.000%
9	92.89	-41.58	-1.79	-92.89	41.58	1.79	0.000%
10	84.13	-55.44	51.73	-84.13	55.44	-51.73	0.000%
11	84.13	-41.58	51.73	-84.13	41.58	-51.73	0.000%
12	44.46	-55.44	83.72	-44.46	55.44	-83.72	0.000%
13	44.46	-41.58	83.72	-44.46	41.58	-83.72	0.000%
14	0.00	-55.44	94.68	0.00	55.44	-94.68	0.000%
15	0.00	-41.58	94.68	0.00	41.58	-94.68	0.000%
16	-44.46	-55.44	83.72	44.46	55.44	-83.72	0.000%
17	-44.46	-41.58	83.72	44.46	41.58	-83.72	0.000%
18	-84.13	-55.44	51.73	84.13	55.44	-51.73	0.000%
19	-84.13	-41.58	51.73	84.13	41.58	-51.73	0.000%
20	-92.89	-55.44	-1.79	92.89	55.44	1.79	0.000%
21	-92.89	-41.58	-1.79	92.89	41.58	1.79	0.000%
22	-80.44	-55.44	-46.62	80.44	55.44	46.62	0.000%
23	-80.44	-41.58	-46.62	80.44	41.58	46.62	0.000%
24	-48.46	-55.44	-80.20	48.46	55.44	80.20	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX K	PY K	PZ K	PX K	PY K	PZ K	% Error
25	-48.46	-41.58	-80.20	48.46	41.58	80.20	0.000%
26	0.00	-245.20	0.00	0.00	245.20	-0.00	0.000%
27	0.00	-245.20	-25.96	0.00	245.20	25.96	0.000%
28	12.86	-245.20	-21.80	-12.86	245.20	21.80	0.000%
29	21.75	-245.20	-12.66	-21.75	245.20	12.66	0.000%
30	25.07	-245.20	-0.28	-25.07	245.20	0.28	0.000%
31	22.18	-245.20	13.38	-22.18	245.20	-13.38	0.000%
32	12.22	-245.20	22.36	-12.22	245.20	-22.36	0.000%
33	0.00	-245.20	25.54	0.00	245.20	-25.54	0.000%
34	-12.22	-245.20	22.36	12.22	245.20	-22.36	0.000%
35	-22.18	-245.20	13.38	22.18	245.20	-13.38	0.000%
36	-25.07	-245.20	-0.28	25.07	245.20	0.28	0.000%
37	-21.75	-245.20	-12.66	21.75	245.20	12.66	0.000%
38	-12.86	-245.20	-21.80	12.86	245.20	21.80	0.000%
39	0.00	-46.20	-53.47	-0.00	46.20	53.47	0.000%
40	26.34	-46.20	-43.59	-26.34	46.20	43.59	0.000%
41	43.72	-46.20	-25.34	-43.72	46.20	25.34	0.000%
42	50.49	-46.20	-0.97	-50.49	46.20	0.97	0.000%
43	45.73	-46.20	28.11	-45.73	46.20	-28.11	0.000%
44	24.16	-46.20	45.50	-24.16	46.20	-45.50	0.000%
45	0.00	-46.20	51.46	0.00	46.20	-51.46	0.000%
46	-24.16	-46.20	45.50	24.16	46.20	-45.50	0.000%
47	-45.73	-46.20	28.11	45.73	46.20	-28.11	0.000%
48	-50.49	-46.20	-0.97	50.49	46.20	0.97	0.000%
49	-43.72	-46.20	-25.34	43.72	46.20	25.34	0.000%
50	-26.34	-46.20	-43.59	26.34	46.20	43.59	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00000001
3	Yes	4	0.00000001	0.00000001
4	Yes	4	0.00000001	0.00000001
5	Yes	4	0.00000001	0.00000001
6	Yes	4	0.00000001	0.00000001
7	Yes	4	0.00000001	0.00000001
8	Yes	4	0.00000001	0.00000001
9	Yes	4	0.00000001	0.00000001
10	Yes	4	0.00000001	0.00000054
11	Yes	4	0.00000001	0.00000001
12	Yes	4	0.00000001	0.00000001
13	Yes	4	0.00000001	0.00000001
14	Yes	4	0.00000001	0.00000001
15	Yes	4	0.00000001	0.00000001
16	Yes	4	0.00000001	0.00000001
17	Yes	4	0.00000001	0.00000001
18	Yes	4	0.00000001	0.00000001
19	Yes	4	0.00000001	0.00000001
20	Yes	4	0.00000001	0.00000001
21	Yes	4	0.00000001	0.00000001
22	Yes	4	0.00000001	0.00000001
23	Yes	4	0.00000001	0.00000001
24	Yes	4	0.00000001	0.00000001
25	Yes	4	0.00000001	0.00000001

26	Yes	4	0.00000001	0.00000001
27	Yes	4	0.00000001	0.00000240
28	Yes	4	0.00000001	0.00000244
29	Yes	4	0.00000001	0.00000247
30	Yes	4	0.00000001	0.00000241
31	Yes	4	0.00000001	0.00000240
32	Yes	4	0.00000001	0.00000238
33	Yes	4	0.00000001	0.00000238
34	Yes	4	0.00000001	0.00000227
35	Yes	4	0.00000001	0.00000231
36	Yes	4	0.00000001	0.00000218
37	Yes	4	0.00000001	0.00000230
38	Yes	4	0.00000001	0.00000234
39	Yes	4	0.00000001	0.00000001
40	Yes	4	0.00000001	0.00000001
41	Yes	4	0.00000001	0.00000001
42	Yes	4	0.00000001	0.00000001
43	Yes	4	0.00000001	0.00000001
44	Yes	4	0.00000001	0.00000001
45	Yes	4	0.00000001	0.00000001
46	Yes	4	0.00000001	0.00000001
47	Yes	4	0.00000001	0.00000001
48	Yes	4	0.00000001	0.00000001
49	Yes	4	0.00000001	0.00000001
50	Yes	4	0.00000001	0.00000001

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	9.095	43	0.4303	0.0957
T2	160 - 140	7.265	43	0.4049	0.0835
T3	140 - 120	5.630	43	0.3378	0.0503
T4	120 - 100	4.233	43	0.3017	0.0367
T5	100 - 80	2.989	43	0.2539	0.0265
T6	80 - 60	1.941	43	0.1932	0.0165
T7	60 - 40	1.146	43	0.1488	0.0110
T8	40 - 20	0.552	43	0.0989	0.0068
T9	20 - 0	0.173	43	0.0448	0.0032

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
189.40	DS9A09F36D-N	43	9.095	0.4303	0.0957	84831
189.00	24' x 6" Omni	43	9.095	0.4303	0.0957	84831
187.00	CO-41A	43	9.095	0.4303	0.0957	84831
180.00	Tower Top Amplifier	43	9.095	0.4303	0.0957	84831
175.00	8' Dish	43	8.629	0.4271	0.0943	84831
164.00	8' Dish	43	7.620	0.4139	0.0880	26519
158.00	531-70HD	43	7.091	0.3992	0.0807	20968
156.00	24' x 6" Omni	43	6.919	0.3929	0.0776	20447
153.00	ROHN 6-ft Side Arm	43	6.665	0.3826	0.0724	19903
144.40	ROHN 3-ft Side Arm	43	5.968	0.3515	0.0570	18351

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
135.00	NNVV-65B-R4	43	5.261	0.3259	0.0449	20641
125.00	(4) 8' x1' Panel	43	4.565	0.3095	0.0388	31370
115.00	(4) 8' x1' Panel	43	3.908	0.2923	0.0344	35797
105.00	(4) 8' x1' Panel	43	3.284	0.2682	0.0293	27355

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	180 - 160	16.733	10	0.7911	0.1763
T2	160 - 140	13.369	10	0.7445	0.1538
T3	140 - 120	10.361	10	0.6213	0.0927
T4	120 - 100	7.790	10	0.5552	0.0676
T5	100 - 80	5.501	10	0.4673	0.0489
T6	80 - 60	3.574	10	0.3557	0.0304
T7	60 - 40	2.109	10	0.2739	0.0203
T8	40 - 20	1.016	10	0.1820	0.0125
T9	20 - 0	0.318	10	0.0826	0.0059

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
189.40	DS9A09F36D-N	10	16.733	0.7911	0.1763	46266
189.00	24' x 6" Omni	10	16.733	0.7911	0.1763	46266
187.00	CO-41A	10	16.733	0.7911	0.1763	46266
180.00	Tower Top Amplifier	10	16.733	0.7911	0.1763	46266
175.00	8' Dish	10	15.876	0.7853	0.1737	46266
164.00	8' Dish	10	14.022	0.7610	0.1620	14463
158.00	531-70HD	10	13.048	0.7341	0.1486	11431
156.00	24' x 6" Omni	10	12.732	0.7226	0.1429	11143
153.00	ROHN 6-ft Side Arm	10	12.265	0.7037	0.1334	10841
144.40	ROHN 3-ft Side Arm	10	10.983	0.6466	0.1050	10006
135.00	NNVV-65B-R4	10	9.683	0.5995	0.0826	11253
125.00	(4) 8' x1' Panel	10	8.402	0.5695	0.0714	17094
115.00	(4) 8' x1' Panel	10	7.192	0.5378	0.0634	19480
105.00	(4) 8' x1' Panel	10	6.045	0.4936	0.0540	14896

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	180	Diagonal	A325X	0.6250	1	4.37	9.75	0.449 ✔	1	Member Bearing

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
		Top Girt	A325X	0.6250	1	0.65	5.22	0.124 ✔	1	Member Bearing
T2	160	Diagonal	A325X	0.6250	1	5.54	14.63	0.379 ✔	1	Member Bearing
T3	140	Diagonal	A325X	0.6250	1	8.66	15.19	0.570 ✔	1	Bolt Shear
T4	120	Diagonal	A325X	0.7500	1	13.47	19.99	0.674 ✔	1	Member Bearing
T5	100	Diagonal	A325X	0.7500	1	15.12	19.99	0.757 ✔	1	Member Bearing
T6	80	Diagonal	A325X	0.7500	1	18.32	21.87	0.838 ✔	1	Bolt Shear
T7	60	Diagonal	A325X	0.7500	1	19.69	21.87	0.900 ✔	1	Bolt Shear
T8	40	Diagonal	A325X	0.7500	1	20.87	21.87	0.954 ✔	1	Bolt Shear
T9	20	Leg	F1554-105	1.5000	6	71.54	124.25	0.576 ✔	1	Bolt Tension
		Diagonal	A325X	0.7500	1	21.83	21.87	0.998 ✔	1	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	P2.5x.276	20.03	5.01	65.0 K=1.00	2.2535	-23.72	74.43	0.319 [1] ✔
T2	160 - 140	P3x.3	20.03	5.01	52.9 K=1.00	3.0159	-60.71	110.61	0.549 [1] ✔
T3	140 - 120	P5x0.5	20.03	6.68	44.5 K=1.00	7.9529	-98.61	309.54	0.319 [1] ✔
T4	120 - 100	P5x0.5	20.03	6.68	44.5 K=1.00	7.9529	-154.67	309.54	0.500 [1] ✔
T5	100 - 80	P5x0.5	20.03	6.68	44.5 K=1.00	7.9529	-220.47	309.54	0.712 [1] ✔
T6	80 - 60	P8x.5	20.03	10.02	41.8 K=1.00	12.7627	-281.08	505.56	0.556 [1] ✔
T7	60 - 40	P8x.5	20.03	10.02	41.8 K=1.00	12.7627	-347.29	505.56	0.687 [1] ✔
T8	40 - 20	P8x.5	20.03	10.02	41.8 K=1.00	12.7627	-412.48	505.56	0.816 [1] ✔
T9	20 - 0	P10x.5	20.03	10.02	33.1 K=1.00	16.1007	-475.37	668.66	0.711 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	8.40	4.04	122.0 K=1.00	0.4844	-4.36	7.34	0.594 [1] ✔
T2	160 - 140	L2x2x3/16	10.08	4.85	147.7 K=1.00	0.7150	-5.42	7.41	0.732 [1] ✔
T3	140 - 120	L2 1/2x2 1/2x1/4	12.58	6.05	147.8 K=1.00	1.1900	-8.66	12.31	0.704 [1] ✔
T4	120 - 100	L3 1/2x3x1/4	14.32	6.92	131.6 K=1.00	1.5600	-13.55	20.36	0.666 [1] ✔
T5	100 - 80	L3 1/2x3x1/4	16.11	7.82	148.7 K=1.00	1.5600	-15.32	15.94	0.961 [1] ✔
T6	80 - 60	L4x3 1/2x5/16	19.30	9.35	153.8 K=1.00	2.2500	-18.32	21.50	0.852 [1] ✔
T7	60 - 40	L4x3 1/2x3/8	21.03	10.22	168.8 K=1.00	2.6700	-19.69	21.18	0.930 [1] ✔
T8	40 - 20	L4x4x3/8	22.81	11.12	169.3 K=1.00	2.8600	-20.87	22.54	0.926 [1] ✔
T9	20 - 0	L5x5x5/16	24.62	11.93	144.0 K=1.00	3.0300	-21.83	33.01	0.661 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	5.00	4.52	136.5 K=1.00	0.4844	-0.70	5.88	0.120 [1] ✔

[1] P_u / ϕP_n controls

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	P2.5x.276	20.03	5.01	65.0	2.2535	21.00	101.41	0.207 [1] ✔
T2	160 - 140	P3x.3	20.03	5.01	52.9	3.0159	57.24	135.72	0.422 [1] ✔
T3	140 - 120	P5x0.5	20.03	6.68	44.5	7.9529	91.57	357.88	0.256 [1] ✔

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T4	120 - 100	P5x0.5	20.03	6.68	44.5	7.9529	141.69	357.88	0.396 [1] ✔
T5	100 - 80	P5x0.5	20.03	6.68	44.5	7.9529	202.10	357.88	0.565 [1] ✔
T6	80 - 60	P8x.5	20.03	10.02	41.8	12.7627	257.02	574.32	0.448 [1] ✔
T7	60 - 40	P8x.5	20.03	10.02	41.8	12.7627	316.28	574.32	0.551 [1] ✔
T8	40 - 20	P8x.5	20.03	10.02	41.8	12.7627	374.13	574.32	0.651 [1] ✔
T9	20 - 0	P10x.5	20.03	10.02	33.1	16.1007	429.25	724.53	0.592 [1] ✔

[1] P_u / ϕP_n controls

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	8.40	4.04	80.6	0.2930	4.37	14.28	0.306 [1] ✔
T2	160 - 140	L2x2x3/16	9.22	4.43	89.3	0.4308	5.47	21.00	0.261 [1] ✔
T3	140 - 120	L2 1/2x2 1/2x1/4	12.58	6.05	97.0	0.7519	8.61	36.65	0.235 [1] ✔
T4	120 - 100	L3 1/2x3x1/4	14.32	6.92	93.1	1.0059	13.47	49.04	0.275 [1] ✔
T5	100 - 80	L3 1/2x3x1/4	16.11	7.82	105.0	1.0059	15.12	49.04	0.308 [1] ✔
T6	80 - 60	L4x3 1/2x5/16	19.30	9.35	107.3	1.4824	18.09	72.27	0.250 [1] ✔
T7	60 - 40	L4x3 1/2x3/8	21.03	10.22	118.6	1.7564	19.40	85.62	0.227 [1] ✔
T8	40 - 20	L4x4x3/8	22.81	11.12	110.1	1.8989	20.50	92.57	0.221 [1] ✔
T9	20 - 0	L5x5x5/16	24.62	11.93	92.4	2.0674	21.48	100.79	0.213 [1] ✔

[1] P_u / ϕP_n controls

Top Girt Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
T1	180 - 160	L2x2x1/8	5.00	4.52	91.2	0.2930	0.65	12.74	0.051 [1]

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

[1] P_u / ϕP_n controls

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
T1	180 - 160	Leg	P2.5x.276	3	-23.72	74.43	31.9	Pass
T2	160 - 140	Leg	P3x.3	33	-60.71	110.61	54.9	Pass
T3	140 - 120	Leg	P5x0.5	60	-98.61	309.54	31.9	Pass
T4	120 - 100	Leg	P5x0.5	81	-154.67	309.54	50.0	Pass
T5	100 - 80	Leg	P5x0.5	102	-220.47	309.54	71.2	Pass
T6	80 - 60	Leg	P8x.5	122	-281.08	505.56	55.6	Pass
T7	60 - 40	Leg	P8x.5	137	-347.29	505.56	68.7	Pass
T8	40 - 20	Leg	P8x.5	152	-412.48	505.56	81.6	Pass
T9	20 - 0	Leg	P10x.5	167	-475.37	668.66	71.1	Pass
T1	180 - 160	Diagonal	L2x2x1/8	9	-4.36	7.34	59.4	Pass
T2	160 - 140	Diagonal	L2x2x3/16	37	-5.42	7.41	73.2	Pass
T3	140 - 120	Diagonal	L2 1/2x2 1/2x1/4	64	-8.66	12.31	70.4	Pass
T4	120 - 100	Diagonal	L3 1/2x3x1/4	85	-13.55	20.36	66.6 67.4 (b)	Pass
T5	100 - 80	Diagonal	L3 1/2x3x1/4	106	-15.32	15.94	96.1	Pass
T6	80 - 60	Diagonal	L4x3 1/2x5/16	127	-18.32	21.50	85.2	Pass
T7	60 - 40	Diagonal	L4x3 1/2x3/8	142	-19.69	21.18	93.0	Pass
T8	40 - 20	Diagonal	L4x4x3/8	157	-20.87	22.54	92.6 95.4 (b)	Pass
T9	20 - 0	Diagonal	L5x5x5/16	172	-21.83	33.01	66.1 99.8 (b)	Pass
T1	180 - 160	Top Girt	L2x2x1/8	5	-0.70	5.88	12.0 12.4 (b)	Pass
							Summary	
						Leg (T8)	81.6	Pass
						Diagonal (T9)	99.8	Pass
						Top Girt (T1)	12.4	Pass
						Bolt Checks	99.8	Pass
						RATING =	**99.8**	**Pass**

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

Subject: FOUNDATION ANALYSIS

Location: Manchester, CT

Rev. 0: 8/13/18

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 18116.00

Pier and Mat Foundation Analysis:

Input Data:

Tower Data

Overturning Moment =	$OM := 9429 \cdot ft \cdot kips$	(User Input from tnxTower)	
Shear Force =	$S_t := 99 \cdot kip$	(User Input from tnxTower)	
Axial Force =	$WT_t := 55 \cdot kip$	(User Input from tnxTower)	
Max Compression Force =	$C_t := 491 \cdot kip$	(User Input from tnxTower)	
Max Uplift Force =	$U_t := 443 \cdot kip$	(User Input from tnxTower)	
Tower Height =	$H_t := 180 \cdot ft$	(User Input)	
Tower Width =	$W_t := 23 \cdot ft$	(User Input)	
Tower Position on Foundation (1=offset, 2=centered) =	$Pos_t := 1$	(User Input)	

Footing Data:

Overall Depth of Footing =	$D_f := 6.0 \cdot ft$	(User Input)	
Length of Pier =	$L_p := 4.75 \cdot ft$	(User Input)	
Extension of Pier Above Grade =	$L_{pag} := 0.5 \cdot ft$	(User Input)	
Diameter of Pier =	$d_p := 4.0 \cdot ft$	(User Input)	
Thickness of Footing =	$T_f := 1.75 \cdot ft$	(User Input)	
Width of Footing =	$W_f := 34.0 \cdot ft$	(User Input)	

Material Properties:

Concrete Compressive Strength =	$f_c := 4500 \cdot psi$	(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 =	$q_s := 8000 \cdot psf$	(User Input)	
Unit Weight of Soil =	$\gamma_{soil} := 125 \cdot pcf$	(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 =	$NB_{pier} := 20$	(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 =	$BS_{top} := 10$	(User Input)	(Top of Pad)
Bar Diameter =	$d_{btop} := 1.27 \cdot in$	(User Input)	(Top of Pad)
Number of Bars =	$NB_{top} := 67$	(User Input)	(Top of Pad)
Bar Size =	$BS_{bot} := 10$	(User Input)	(Bottom of Pad)
Bar Diameter =	$d_{bbot} := 1.27 \cdot in$	(User Input)	(Bottom of Pad)
Number of Bars =	$NB_{bot} := 67$	(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 = $A_{btop} := \frac{\pi \cdot d_{btop}^2}{4} = 1.267 \cdot in^2$

Pad Bottom Reinforcement Bar Area = $A_{bbot} := \frac{\pi \cdot d_{bbot}^2}{4} = 1.267 \cdot in^2$

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

Load Factor = $LF := 1$

Stability of Footing:

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

Adjusted Soil Unit Weight = $\gamma_s := if(Bouyancy = 1, \gamma_{soil} - 62.4pcf, \gamma_{soil}) = 125 \cdot pcf$

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

$P_{pt} := K_p \cdot \gamma_s \cdot (D_f - T_f) + c \cdot 2 \cdot \sqrt{K_p} = 1.594 \cdot ksf$

$P_{top} := if[n < (D_f - T_f), P_{pt}, P_{pn}] = 1.594 \cdot ksf$

$P_{bot} := K_p \cdot \gamma_s \cdot D_f + c \cdot 2 \cdot \sqrt{K_p} = 2.25 \cdot ksf$

$P_{ave} := \frac{P_{top} + P_{bot}}{2} = 1.922 \cdot ksf$

$T_p := if[n < (D_f - T_f), T_f, (D_f - n)] = 1.75 \cdot ft$

$A_p := W_f \cdot T_p = 59.5 \cdot ft^2$

Ultimate Shear = $S_u := P_{ave} \cdot A_p = 114.352 \cdot kip$

Weight of Concrete = $WT_c := \left[\left(W_f^2 \cdot T_f\right) + (3) \cdot \left(\frac{d_p^2 \cdot \pi}{4} L_p\right)\right] \cdot \gamma_c = 330.311 \cdot kip$

Weight of Soil Above Footing = $WT_{s1} := \left[\left[W_f^2 - (3) \cdot \left(\frac{d_p^2 \cdot \pi}{4}\right)\right] \cdot \left(\left|L_p - L_{pag} - n\right|\right)\right] \cdot \gamma_s = 594.1 \cdot kip$

Weight of Soil Wedge at Back Face = $WT_{s2} := \left[\frac{(D_f - n)^2 \cdot \tan(\Phi_s)}{2} \cdot W_f\right] \cdot \gamma_s = 44.167 \cdot kip$

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

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

$X_t := if(Pos_t = 1, X_{t1}, X_{t2}) = 7.041$

$X_{off1} := \frac{W_f}{2} - \left[\frac{(W_t \cdot \cos(30 \cdot deg))}{3} + X_t\right] = 3.32$ $X_{off2} := 0$

$X_{off} := if(Pos_t = 1, X_{off1}, X_{off2})$ $X_{off} = 3.32 \cdot ft$

Total Weight = $WT_{tot} := 0.9WT_c + 0.75WT_{s1} = 742.9 \cdot kip$

Resisting Moment = $M_r := (WT_{tot}) \cdot \frac{W_f}{2} + 0.9WT_t \cdot \left(\frac{W_f}{2} - X_{off}\right) + 0.75\left(S_u \cdot \frac{T_p}{3}\right) + 0.75WT_{s2} \cdot \left[W_f + \frac{(D_f - n) \cdot \tan(\Phi_s)}{3}\right] = 14520 \cdot kip \cdot ft$

Overturning Moment = $M_{ot} := OM + S_t \cdot (L_p + T_f) = 10072.5 \cdot kip \cdot ft$

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

Factor of Safety Actual = $FS := \frac{M_r}{M_{ot}} = 1.44$

Factor of Safety Required = $FS_{req} := 1$ $OverTurning\_Moment\_Check := if(FS \geq FS_{req}, "Okay", "No Good")$

OverTurning_Moment_Check = "Okay"

Shear Capacity in Pier:

Shear Resistance of Pier = $S_p := \frac{P_{ave} \cdot A_p + \mu \cdot WT_{tot}}{FS_{req}} = 448.635 \cdot kips$

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

$Shear\_Check = "Okay"$

Bearing Pressure Caused by Footing:

Total Load = $Load_{tot} := WT_c + WT_{s1} + WT_t = 979 \cdot kip$

Area of the Mat = $A_{mat} := W_f^2 = 1.156 \times 10^3$

Section Modulus of Mat = $S := \frac{W_f^3}{6} = 6550.67 \cdot ft^3$

Maximum Pressure in Mat = $P_{max} := \frac{Load_{tot}}{A_{mat}} + \frac{M_{ot}}{S} = 2.385 \cdot ksf$

$Max\_Pressure\_Check := if(P_{max} < 0.75 q_s, "Okay", "No Good")$

$Max\_Pressure\_Check = "Okay"$

Minimum Pressure in Mat = $P_{min} := \frac{Load_{tot}}{A_{mat}} - \frac{M_{ot}}{S} = -0.69 \cdot ksf$

$Min\_Pressure\_Check := if[(P_{min} \geq 0) \cdot (P_{min} < 0.75 q_s), "Okay", "No Good"]$

$Min\_Pressure\_Check = "No Good"$

Distance to Resultant of Pressure Distribution = $X_p := \frac{P_{max}}{\frac{P_{max} - P_{min}}{W_f}} \cdot \frac{1}{3} = 8.789$

Distance to Kern = $X_k := \frac{W_f}{6} = 5.667$

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

Eccentricity = $e := \frac{M_{ot}}{Load_{tot}} = 10.284$

Adjusted Soil Pressure = $P_a := \frac{2 \cdot Load_{tot}}{3 \cdot W_f \cdot \left(\frac{W_f}{2} - e\right)} = 2.86 \cdot ksf$

$q_{adj} := if(P_{min} < 0, P_a, P_{max}) = 2.86 \cdot ksf$

$Pressure\_Check := if(q_{adj} < 0.75 q_s, "Okay", "No Good")$

$Pressure\_Check = "Okay"$

Concrete Bearing Capacity:

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

Bearing Strength Between Pier and Pad = $P_b := \Phi_c \cdot 0.85 \cdot f_c \cdot \frac{\pi \cdot d_p^2}{4} = 4.499 \times 10^3 \cdot kips$ (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)

$d := T_f - Cvr_{pad} - d_{bbot} = 16.73 \cdot in$

$FL := LF \cdot \frac{C_t}{W_f^2} = 0.425 \cdot ksf$

$V_{req} := FL \cdot (X_t - .5 \cdot d_p - d) \cdot W_f = 52.66 \cdot kips$

$V_{Avail} := \phi_c \cdot 2 \cdot \sqrt{f_c \cdot psi} \cdot W_f \cdot d = 778 \cdot kip$ (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 = $b_o := (d_p + d) \cdot \pi = 16.9$

Area Included Inside Perimeter = $A_{bo} := \frac{\pi \cdot (d_p + d)^2}{4} = 22.9$

Required Shear Strength = $V_{req} := FL \cdot (W_f^2 - A_{bo}) = 481 \cdot kips$

Available Shear Strength = $V_{Avail} := \phi_c \cdot 4 \cdot \sqrt{f_c \cdot psi} \cdot b_o \cdot d = 776 \cdot kip$ (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 = $M_{max} := 5340 \cdot kip \cdot ft$ (User Input)

Design Moment = $M_n := \frac{LF \cdot M_{max}}{\phi_m} = 5.933 \times 10^3 \cdot kips \cdot ft$

$$\beta := \begin{cases} 0.85 \text{ if } 2500 \cdot psi \le f_c \le 4000 \cdot psi \\ 0.65 \text{ if } f_c > 8000 \cdot psi \\ \left[0.85 - \left[\frac{\left(\frac{f_c}{psi} - 4000\right)}{1000}\right] \cdot 0.5\right] \text{ otherwise} \end{cases} = 0.6$$ (ACI-200810.2.7.3)

$b_{eff} := W_t \cdot \cos(30 \cdot deg) + d_p = 287.023 \cdot in$

$A_s := \frac{M_n}{(f_y \cdot d)} = 70.93 \cdot in^2$

$a := \frac{A_s \cdot f_y}{\beta \cdot f_c \cdot b_{eff}} = 5.492 \cdot in$

$A_s := \frac{M_n}{f_y \cdot \left(d - \frac{a}{2}\right)} = 84.858 \cdot in^2$

$\rho := \frac{A_s}{b_{eff} d} = 0.21206 \cdot in$

Required Reinforcement for Temperature and Shrinkage:

$$\rho_{sh} := \begin{cases} .0018 & \text{if } f_y \geq 60000 \cdot psi \\ .0020 & \text{otherwise} \end{cases} = 0.0018 \qquad \text{(ACI-2008 7.12.2.1)}$$

Check Bottom Bars:

$$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 84.9 \cdot in^2$$

$$As_{prov} := A_{bbot} \cdot NB_{bot} = 84.9 \cdot in^2$$

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

Pad_Reinforcement_Bot = "Okay"

Check top Bars:

$$As := if\left(\rho \geq \rho_{sh}, A_s, \rho_{sh} \cdot \frac{b_{eff}}{2} \cdot d\right) = 84.9 \cdot in^2$$

$$As_{prov} := A_{btop} \cdot NB_{top} = 84.9 \cdot in^2$$

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

Pad_Reinforcement_Top = "Okay"

Developement Length Pad Reinforcement:

Bar Spacing =

$$B_{sPad} := \frac{W_f - 2 \cdot Cvr_{pad} - NB_{bot} \cdot d_{bbot}}{NB_{bot} - 1} = 4.8 \cdot in$$

Spacing or Cover Dimension =

$$c := if\left(Cvr_{pad} < \frac{B_{sPad}}{2}, Cvr_{pad}, \frac{B_{sPad}}{2}\right) = 2.401 \cdot in$$

Transverse Reinforcement Index =

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

$$L_{dbt} := \frac{3 \cdot f_y \alpha_{pad} \cdot \beta_{pad} \cdot \gamma_{pad} \cdot \lambda_{pad}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \frac{c + k_{tr}}{d_{bbot}}} \cdot d_{bbot} = 45.1 \cdot in$$

Minimum Development Length =

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

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

Available Length in Pad =

$$L_{Pad} := \frac{W_f}{2} - \frac{W_t}{2} - Cvr_{pad} = 63 \cdot in$$

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

Lpad_Check = "Okay"

Steel Reinforcement in Pier:

Area of Pier = $A_p := \frac{\pi \cdot d_p^2}{4} = 1809.56 \cdot in^2$

$A_{smin} := 0.01 \cdot 0.5 \cdot A_p = 9.05 \cdot in^2$ (ACI-2008 10.8.4 & 10.9.1)

$A_{sprov} := NB_{pier} \cdot A_{bpier} = 15.71 \cdot in^2$

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

Steel_Area_Check = "Okay"

Bar Spacing In Pier = $B_{sPier} := \frac{d_p \cdot \pi}{NB_{pier}} - d_{bpier} = 6.54 \cdot in$

Diameter of Reinforcement Cage = $Diam_{cage} := d_p - 2 \cdot Cvr_{pier} = 42 \cdot in$

Maximum Moment in Pier = $M_p := S_t \cdot (L_p) \cdot LF = 5643 \cdot in \cdot kips$

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

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

$(D \ N \ n \ P_u \ M_{xu}) = (48 \ \ 20 \ \ 8 \ \ 654.503 \ \ 5.643 \times 10^3)$

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

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

$(\phi P_n \ \ \phi M_{xn} \ \ f_{sp} \ \ \rho) = (2.356 \times 10^3 \ \ 2.031 \times 10^4 \ \ -38.05 \ \ 8.731 \times 10^{-3})$

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

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:

$L_{pier} := L_p - Cvr_{pier} = 54 \cdot in$

$L_{pad} := T_f - Cvr_{pad} = 18 \cdot in$

Tension: (ACI-2008 12.2.3)

Spacing or Cover Dimension =

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

Transverse Reinforcement =

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

$L_{dbt} := \frac{3 \cdot f_y \cdot \alpha_{pier} \cdot \beta_{pier} \cdot \gamma_{pier} \cdot \lambda_{pier}}{40 \cdot \sqrt{f_c \cdot psi} \cdot \left(\frac{c + k_{tr}}{d_{bpier}}\right)} \cdot d_{bpier} = 22.36 \cdot in$

Minimum Development Length =

$L_{dh} := \frac{1200 \cdot d_{bpier}}{\sqrt{\frac{f_c}{psi}}} \cdot .7 = 12.522 \cdot in$ (ACI 12.2.1)

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

$L_{db} := \max\left(L_{dbt}, L_{dbmin}\right) = 22.361 \cdot in$

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

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

Compression: (ACI-2008 12.3.2)

$L_{dbc1} := \frac{.02 \cdot d_{bpier} \cdot f_y}{\sqrt{f_c \cdot psi}} = 17.889 \cdot in$

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

$L_{dbc} := if\left(L_{dbc1} \geq L_{dbmin}, L_{dbc1}, L_{dbmin}\right) = 18 \cdot in$

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

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

Site Data					
	Region: Northeast	**Market:**	**Northern CT**	Revision 2.7	Rev Date: 23-July-2018
	Cascade ID		**CT03XC067**	BTS OEM: ALU	RFDS Type: Preliminary
	Augment Import Code:		Augment: Relocation	Structure Type:	Tower
	Address: 250 South Olcott Street, Manchester CT 06040		Sprint Eng. Name: Bill Hastings	Bill.M.Hastings@sprint.com	Eng. Phone: 978-590-9700
	Latitude: 41.77000352 | Longitude: -72.55834028		Manager Name: Jonathan Hull	Jonathan.B.Hull@sprint.com	Manager Phone: 617-233-2920
	Detailed RFDS Description:		RFE:		RFE Phone:
	Tower Relocation		Filter Analysis Complete:	Border Analysis Complete:	Channel Plan Complete:

1900		Alpha	Beta	Gamma
	1900MHz_Azimuth	0	120	240
	1900MHz_No_of_Antennas	1	1	1
	1900MHz_RADCenter(ft)	135	135	135
	1900MHz_Antenna Make	CommScope	CommScope	CommScope
	1900MHz_Antenna Model	NNVV-65B-R4	NNVV-65B-R4	NNVV-65B-R4
	1900MHz_Horizontal_Beamwidth	68	68	68
	1900MHz_Vertical_Beamwidth	5.1	5.1	5.1
	1900MHz_Antenna Dimensions (ft) & Weight (lbs)	72 x 19.6 x 7.8 | 77.4 (lbs)	72 x 19.6 x 7.8 | 77.4 (lbs)	72 x 19.6 x 7.8 | 77.4 (lbs)
	1900MHz_AntennaGain(dBi)	18.8	18.8	18.8
	1900MHz_E_Tilt	0	0	
	1900MHz _M_Tilt	0	0	
	1900_Effective_Tilt	0	0	
	1900MHz_Carrier_Forecast_Year_2017			
	1900MHz_RRH Manufacturer	ALU	ALU	
	1900MHz_RRH Model	RRH 1900 4X45 65MHz	RRH 1900 4X45 65MHz	RRH 1900 4X45 65MHz
	1900MHz_RRH Count	1	1	1
	1900MHz_RRH Specs	25 x 11.1 x 11.4 (60 lbs)	25 x 11.1 x 11.4 (60 lbs)	25 x 11.1 x 11.4 (60 lbs)
	1900MHz_RRH Location	Top of the Pole/Tower	Top of the Pole/Tower	Top of the Pole/Tower
	1900MHz Combiner Model	No Combiner Required	No Combiner Required	No Combiner Required
	1900MHz Power Split Ratio (Main/Split)			
	1900MHz Splitter Manufacturer			
	1900MHz Splitter Model	No Splitter Required	No Splitter Required	No Splitter Required
	1900MHz Number of Splitters	0	0	0
	1900MHz_Top_Jumper #1_Length (RRH or Combiner-to-Antenna for TT or Main Coax to Antenna for Ground Mount, ft)	8	8	8
	1900MHz_Top_Jumper #1_Cable_Model (RRH or Combiner-to-Antenna for TT or Main Coax to Antenna for Ground Mount)	LCF12-50J	LCF12-50J	LCF12-50J

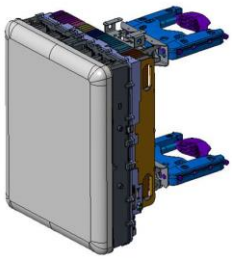
	1900MHz_Top_Jumper #2_Length (RRH to Combiner for TT if applicable, ft)			
	1900MHz_Top_Jumper #2_Cable_Model (RRH to Combiner for TT if applicable)			
	1900MHz_Main_Cable_Length (ft)	135	135	135
	1900MHz_Main_Cable_Model	HB114-1-08U4-M5F	HB114-1-08U4-M5F	HB114-1-08U4-M5F
	1900MHz_Bottom_Jumper #1_Length (Ground based RRH to Combiner OR-Main Coax, ft)			
	1900MHz_Bottom_Jumper #1_Cable_Model (Ground based RRH to Combiner-OR-Main Coax)			
	1900MHz_Bottom_Jumper #2_Length (Ground based-Combiner to Main Coax, ft)			
	1900MHz_Bottom_Jumper #2_Cable_Model (Ground based-Combiner to Main Coax)			
800	800MHz_Azimuth	0	120	240
	800MHz_No_of_Antennas	1	1	1
	800MHz_RADCenter(ft)	135	135	135
	800MHz_AntennaMake	NA	NA	NA
	800MHz_AntennaModel	Antenna assigned on a different band	Antenna assigned on a different band	Antenna assigned on a different band
	800MHz_Horizontal_Beamwidth	NA	NA	NA
	800MHz_Vertical_Beamwidth	NA	NA	NA
	800MHz_Antenna Dimensions (ft) & Weight (lbs)	NA | NA	NA | NA	NA | NA
	800MHz_AntennaGain (dBi)	NA	NA	NA
	800MHz_E_Tilt	0	0	0
	800MHz_M_Tilt	0	0	0
	800 MHz_Effective Tilt (degrees)	0	0	0
	800MHz_RRH Manufacturer	ALU	ALU	ALU
	800_Combiner_Model	No Combiner Required	No Combiner Required	No Combiner Required
	800MHz_RRH Model	RRH 800 MHz 2x50W	RRH 800 MHz 2x50W	RRH 800 MHz 2x50W
	800MHz_RRH Specs	15.8 x 13.0 x 14.0 (64 lbs)	15.8 x 13.0 x 14.0 (64 lbs)	15.8 x 13.0 x 14.0 (64 lbs)
	800MHz_RRH Count	2	2	2
	800MHz_RRH Location	Top of the Pole/Tower	Top of the Pole/Tower	Top of the Pole/Tower
	800MHz BILT Border Filter	na	na	na
	800MHz Splitter Manufacturer			
	800MHz Splitter Model			
	800MHz Number of Splitters	0	0	0
	800_Top_Jumper #1_Length (RRH to Antenna for TT or Main Coax to Antenna for GM)	8	8	8
	800_Top_Jumper_Cable_Model (RRH to Antenna for TT or Main Coax to Antenna for GM)	LCF12-50J	LCF12-50J	LCF12-50J

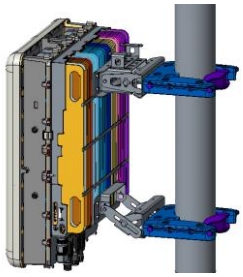
	800MHz_Main_Coax_Cable_Length (ft)	NA	NA	NA
	800MHz_Main_Coax_Cable_Model	NA	NA	NA
	800_Bottom_Jumper #1_Length (Ground based RRH to Main Coax)			
	800_Bottom_Jumper #1_Cable_Model (Ground based RRH to Main Coax)			
2500	2500MHz_Azimuth	0	120	240
	2500MHz_No_of_Antennas	1	1	1
	2500MHz_RADCenter(ft)	135	135	135
	2500MHz_AntennaMake	Nokia	Nokia	Nokia
	2500MHz_AntennaModel	AAHC (Nokia Massive MIMO RRU/Antenna Standard)	AAHC (Nokia Massive MIMO RRU/Antenna Standard)	AAHC (Nokia Massive MIMO RRU/Antenna Standard)
	2500MHz_Horizontal_Beamwidth	65	65	65
	2500MHz_Vertical_Beamwidth			
	2500MHz_AntennaHeight (ft)	25.6 x 19.7 x 9.64 | 103.7 (lbs)	25.6 x 19.7 x 9.64 | 103.7 (lbs)	25.6 x 19.7 x 9.64 | 103.7 (lbs)
	2500MHz_AntennaGain (dBi)			
	2500MHz_E_Tilt	0	0	0
	2500MHz_M_Tilt	0	0	0
	2500 MHz_Effective Tilt (degrees)	0	0	0
	2500MHz_RRH Manufacturer			
	2500_Combiner_Model	No Combiner Required	No Combiner Required	No Combiner Required
	2500MHz_RRH Model			
	2500MHz_RRH Count			
	2500MHz_RRH Location			
	2500MHz Power Split Ratio (Main/Split)			
	2500MHz Splitter Manufacturer			
	2500MHz Splitter Model			
	2500MHz Number of Splitters	0	0	0
	2500_Top_Jumper #1_Length (RRH to Antenna for TT or Main Coax to Antenna for GM)	8	8	8
	2500_Top_Jumper_Cable_Model (RRH to Antenna for TT or Main Coax to Antenna for GM)	LCF12-50J	LCF12-50J	LCF12-50J
	2500MHz_Main_Cable_Length (ft)	135		
	2500MHz_Main_Cable_Model	HB114-08U3M12-xxxF		
	2500_Bottom_Jumper #1_Length (Ground based RRH to Main Coax)			
	2500_Bottom_Jumper #1_Cable_Model (Ground based RRH to Main Coax)			
	Has_Split			
	Plumbing Scenario			

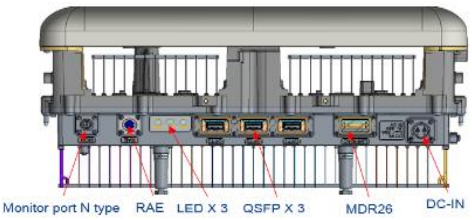
Comments				
	Date Updated			
	Update Description			
	Site Type			
	Comments			
	This RFDS is Deployment View			

Nokia Networks
6000 Connection Drive, Irvine, TX 75039, (972) 374 3000

TD LTE 2.5G Massive MIMO Adaptive Antenna (MAA) – AAHC







Category	Description	Unit	AAHC
Spectrum	3GPP Band		B41
	Operating frequency	MHz	2496-2690
RF characteristic	Number of TX/RX paths	#	64T64R
	Instantaneous Bandwidth IBW	MHz	194
	Occupied Bandwidth OBW	MHz	60
	Total Output power	W	120
	EIRP	dBm	74.8
	TX OBUE in B41 for sum of all 64 pipes at 1MHz offset	dBm/MHz	-13 sum of all ports
	Emission at IPWireless 2558-2568MHz	dBm/MHz	-57 sum of all ports
	Emission at NEXTRADAR at 2704-3000MHz	dBm/MHz	-27 sum of all ports
Power	Power inputs		2 pin, and with APPB/APPC
	Supply Voltage / Voltage Range	V	-48V DC voltage (-40.5V~-57V)
	Typical Power Consumption	W	75% duty cycle, 1400W for LTE
Interface	Optical Interface		3x QSFP (4 x 9.8G CPRI each)
	RAE Interface		Circle connector, AISG-ES-RAE v2.1.0
	LMI interface		MDR26
	Monitor interface		N_Female
Antenna Specifications	Antenna array		8x8x2
	Element Polarization	H/V or ± 45	± 45
	Gain [Broadcast 65 HBW]	dBi	15.2
	Horizontal BW [Broadcast] (@ -3dB)	Degrees	65
	Vertical BW [Broadcast] (@ -3dB)	Degrees	9
	Mechanical Downtilt Range	Degrees	± 5
	Electrical Downtilt Range	Degrees	± 10
	Cross Polar Isolation [Element]	dB	19
	Front-to-Back Ratio [Broadcast] (@ 180° ±15° cone)	dB	25
	Element Spacing	λ (mm)	horizontal 57.5, Vertical 80
	Upper Side Lobe Suppression (1st USLS) [Broadcast]	dB	16
	Cross Polar Discrimination [Broadcast] (@ -3dB)	dB	10
	Traffic (Service) Beam Azmithual Pan	Degrees	± 55
	Traffic (Service) Beam Elevational Tilt	Degrees	± 10
	Azimuth Beamwidth Squint (@ Boresight)	Degrees	configurable
	Broadcast Tracking @ ±60°	dBi	2
	Dimensions (LxWxD)	mm (in)	651x501x245 mm (25.6x19.7x9.6 in)
Mechanical Specifications	Weight	kg (lb)	47Kg (103.6lb)
	Max Wind Speed	kmh/mph	200kmh (125 mph)
	Wind Load Front/Side/Rear @ 150kmh	N(lbF)	349 /168/130 N (78.5 / 37.8 /29.2 lbF)
	Radom Material		PC
	Radom Color		Cold Gray
	Mounting Kit	mm (in)	FPKA/FPKB/FPKC
	Operational Temperature Range	C(F)	-40 ~ 55© -40 ~ 131(F)
	Ingress protection class		IP65
	Installation options		Pole, Wall
	Surge protection	kA	20

Product Specifications

COMMSCOPE®

NNVV-65B-R4

8-port sector antenna, 4x 698–896 and 4x 1695–2690 MHz, 65° HPBW, 4x RET

- Uses the 4.3-10 connector which is 40 percent smaller than the 7-16 DIN connector
- Supports re-configurable antenna sharing capability enabling control of the internal RET system using up to two separate RET compatible OEM radios
- All internal RET actuators are connected in "Cascaded MRET" configuration

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2500	2500–2690
Gain, dBi	14.5	14.9	16.8	17.2	17.5	18.1	17.8
Beamwidth, Horizontal, degrees	66	64	60	60	62	59	64
Beamwidth, Vertical, degrees	11.7	10.4	7.3	6.8	6.4	5.4	5.1
Beam Tilt, degrees	2–14	2–14	2–12	2–12	2–12	2–12	2–12
USLS (First Lobe), dB	16	18	14	16	15	16	18
Front-to-Back Ratio at 180°, dB	31	34	38	38	37	33	30
Isolation, dB	25	25	25	25	25	25	25
Isolation, Intersystem, dB	25	25	25	25	25	25	25
VSWR | Return Loss, dB	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0	1.5 | 14.0
PIM, 3rd Order, 2 x 20 W, dBc	-150	-150	-150	-150	-150	-150	-150
Input Power per Port at 50°C, maximum, watts	300	300	250	250	250	200	200
Polarization	±45°	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm	50 ohm

Electrical Specifications, BASTA*

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2180	2300–2500	2500–2690
Gain by all Beam Tilts, average, dBi	14.1	14.6	16.5	16.9	17.0	17.6	17.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.5	±0.7	±0.4	±0.5	±0.6	±0.7
Gain by Beam Tilt, average, dBi	2 ° | 14.2 8 ° | 14.2 14 ° | 13.9	2 ° | 14.7 8 ° | 14.7 14 ° | 14.2	2 ° | 16.6 7 ° | 16.7 12 ° | 16.2	2 ° | 16.8 7 ° | 17.1 12 ° | 16.7	2 ° | 16.9 7 ° | 17.2 12 ° | 16.7	2 ° | 17.5 7 ° | 17.9 12 ° | 17.3	2 ° | 16.9 7 ° | 17.5 12 ° | 17.0
Beamwidth, Horizontal Tolerance, degrees	±3.9	±3.9	±5.7	±2.7	±3.1	±7.9	±8
Beamwidth, Vertical Tolerance, degrees	±0.9	±0.8	±0.7	±0.5	±0.6	±0.4	±0.2
USLS, beampeak to 20° above beampeak, dB	16	18	14	15	14	14	14
Front-to-Back Total Power at 180° ± 30°, dB	20	20	31	31	28	28	26
CPR at Boresight, dB	21	20	18	18	19	19	20
CPR at Sector, dB	8	6	8	8	7	8	5

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

Array Layout

Product Specifications

NNVV-65B-R4

RF Connector Quantity, high band	4
RF Connector Interface	4.3-10 Female
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	685.0 N @ 150 km/h 154.0 lbf @ 150 km/h
Wind Loading, lateral	232.0 N @ 150 km/h 52.2 lbf @ 150 km/h
Wind Loading, maximum	889.0 N @ 150 km/h 199.9 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Length	1828.0 mm | 72.0 in
Width	498.0 mm | 19.6 in
Depth	197.0 mm | 7.8 in
Net Weight, without mounting kit	35.1 kg | 77.4 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal RET	High band (2) | Low band (2)
Power Consumption, idle state, maximum	1 W
Power Consumption, normal conditions, maximum	8 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Hardware	CommRET v2
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	1 female | 1 male

Packed Dimensions

Length	2010.0 mm | 79.1 in
Width	608.0 mm | 23.9 in
Depth	352.0 mm | 13.9 in
Shipping Weight	49.0 kg | 108.0 lb

Regulatory Compliance/Certifications

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