Robinson+Cole

KENNETH C. BALDWIN

280 Trumbull Street
Hartford, CT 06103-3597
Main (860) 275-8200
Fax (860) 275-8299
kbaldwin@rc.com
Direct (860) 275-8345

Also admitted in Massachusetts

March 27, 2017

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

Re: **Notice of Exempt Modification – Facility Modification**
60 South Main Street, East Granby, Connecticut

Dear Ms. Bachman:

Cellco Partnership d/b/a Verizon Wireless ("Cellco") currently maintains twelve (12) antennas at the 67-foot level on an existing 98-foot tower at 60 South Main in East Granby, Connecticut (the "Property"). The tower is owned by Crown Castle ("Crown"). The Council approved Cellco's use of this tower in 2010. Cellco now intends to replace six (6) of its existing antennas with three (3) model SBNHH-1D65B, 700 MHz antennas and three (3) model SBNHH-1D65B, 2100 MHz antennas, all at the same level on the tower. Cellco also intends to install six (6) remote radio heads ("RRHs") and two (2) HYBRIFLEX™ fiber optic antenna cables. Included in Attachment 1 are specifications for Cellco's replacement antennas, RRHs and HYBRIFLEX™ cables.

Please accept this letter as notification pursuant to R.C.S.A. § 16-50j-73, for construction that constitutes an exempt modification pursuant to R.C.S.A. § 16-50j-72(b)(2). In accordance with R.C.S.A. § 16-50j-73, a copy of this letter is being sent to James M. Hayden, First Selectman of the Town of East Granby; Gary Haynes, East Granby Director of Community Development; Galasso Holdings LLC, the Property owner; and Crown, the tower owner.

The planned modifications to the facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The proposed modifications will not result in an increase in the height of the existing structure. Cellco's replacement antennas and RRHs will be installed on its existing platform at the 67-foot level on the tower.

2. The proposed modifications will not involve any change to ground-mounted equipment and, therefore, will not require the extension of the site boundary.

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

4. The operation of the replacement antennas will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety standard. Far Field Approximation tables for each of Cellco's operating frequencies are included behind Attachment 2. The Far Field calculations demonstrate that Cellco's modified facility will operate well within the RF emissions limits established by the FCC.

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

6. The tower and its foundation can support Cellco's proposed modifications. (*See* Structural Analysis Report included in Attachment 3).

A copy of the East Hampton parcel map and property owner information is included in Attachment 4.

For the foregoing reasons, Cellco respectfully submits that the proposed modifications to the above-referenced telecommunications facility constitutes an exempt modification under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

Kenneth C. Baldwin

Enclosures
Copy to:
James M. Hayden, East Granby First Selectman
Gary Haynes, East Granby Director of Community Development
Galasso Holdings LLC
Crown Castle
Tim Parks

ATTACHMENT 1

Product Specifications

COMMSCOPE®

SBNHH-1D65B

Multiband Antenna, 698–896 and 2x 1695–2360 MHz, 65° horizontal beamwidth, internal RET. Both high bands share the same electrical tilt.

- Interleaved dipole technology providing for attractive, low wind load mechanical package

Electrical Specifications

Frequency Band, MHz	698–806	806–896	1695–1880	1850–1990	1920–2200	2300–2360
Gain, dBi	14.9	14.7	17.7	18.2	18.6	18.6
Beamwidth, Horizontal, degrees	68	66	69	66	63	58
Beamwidth, Vertical, degrees	12.1	10.7	5.6	5.2	5.0	4.5
Beam Tilt, degrees	0–14	0–14	0–7	0–7	0–7	0–7
USLS (First Lobe), dB	14	13	15	15	15	13
Front-to-Back Ratio at 180°, dB	27	29	28	28	28	27
Isolation, dB	25	25	25	25	25	25
Isolation, Intersystem, dB	30	30	30	30	30	30
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
PIM, 3rd Order, 2 x 20 W, dBc	-153	-153	-153	-153	-153	-153
Input Power per Port, maximum, watts	350	350	350	350	350	300
Polarization	±45°	±45°	±45°	±45°	±45°	±45°
Impedance	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	1920–2200	2300–2360
Gain by all Beam Tilts, average, dBi	14.5	14.3	17.4	17.9	18.2	18.3
Gain by all Beam Tilts Tolerance, dB	±0.5	±0.8	±0.4	±0.3	±0.5	±0.3
Gain by Beam Tilt, average, dBi	0 ° | 14.6	0 ° | 14.5	0 ° | 17.4	0 ° | 17.8	0 ° | 18.1	0 ° | 18.2
	7 ° | 14.6	7 ° | 14.4	3 ° | 17.5	3 ° | 17.9	3 ° | 18.3	3 ° | 18.4
	14 ° | 14.2	14 ° | 13.6	7 ° | 17.4	7 ° | 17.9	7 ° | 18.2	7 ° | 18.4
Beamwidth, Horizontal Tolerance, degrees	±2.2	±3.4	±2	±4.6	±5.7	±4.3
Beamwidth, Vertical Tolerance, degrees	±0.8	±1	±0.3	±0.2	±0.3	±0.2
USLS, beampeak to 20° above beampeak, dB	16	14	16	16	16	15
Front-to-Back Total Power at 180° ± 30°, dB	25	26	27	26	26	26
CPR at Boresight, dB	22	23	21	20	20	22
CPR at Sector, dB	13	11	16	12	11	4

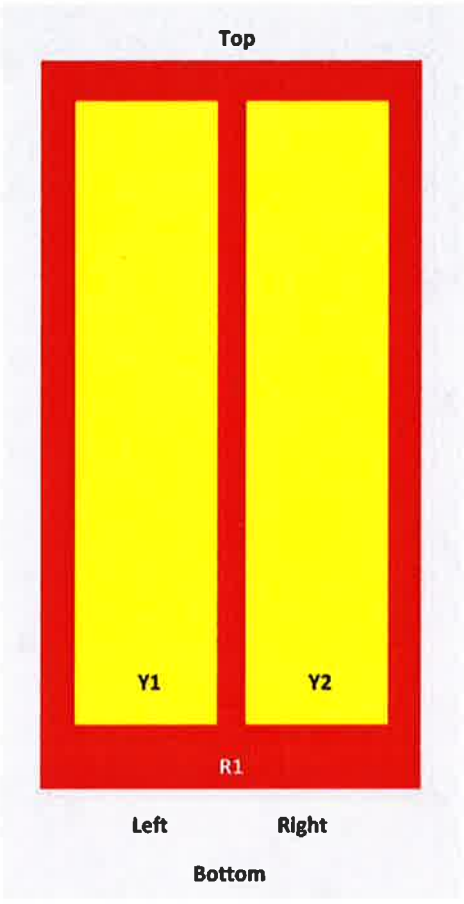
* CommScope® supports NGMN recommendations on Base Station Antenna Standards (BASTA). To learn more about the benefits of BASTA, download the whitepaper Time to Raise the Bar on BSAs.

Array Layout

Product Specifications

SBNHH-1D65B

SBNHH 65



Array	Freq (MHz)	Conns	RET (MRET)	AISG RET UID
R1	698-896	1-2	1	ANxxxxxxxxxxxxxxxx.1
Y1	1695-2360	3-4	2	ANxxxxxxxxxxxxxxxx.2
Y2	1695-2360	5-6		

View from the front of the antenna

(Sizes of colored boxes are not true depictions of array sizes)

General Specifications

Operating Frequency Band	1695 – 2360 MHz | 698 – 896 MHz
Antenna Type	Sector
Band	Multiband
Performance Note	Outdoor usage

Mechanical Specifications

RF Connector Quantity, total	6
RF Connector Quantity, low band	2
RF Connector Quantity, high band	4
RF Connector Interface	7-16 DIN Female

Product Specifications

SBNHH-1D65B

Color	Light gray
Grounding Type	RF connector inner conductor and body grounded to reflector and mounting bracket
Radiator Material	Aluminum | Low loss circuit board
Radome Material	Fiberglass, UV resistant
Reflector Material	Aluminum
RF Connector Location	Bottom
Wind Loading, frontal	618.0 N @ 150 km/h 138.9 lbf @ 150 km/h
Wind Loading, lateral	197.0 N @ 150 km/h 44.3 lbf @ 150 km/h
Wind Loading, rear	728.0 N @ 150 km/h 163.7 lbf @ 150 km/h
Wind Speed, maximum	241 km/h | 150 mph

Dimensions

Length	1851.0 mm | 72.9 in
Width	301.0 mm | 11.9 in
Depth	180.0 mm | 7.1 in
Net Weight, without mounting kit	18.4 kg | 40.6 lb

Remote Electrical Tilt (RET) Information

Input Voltage	10–30 Vdc
Internal RET	High band (1) | Low band (1)
Power Consumption, idle state, maximum	2.0 W
Power Consumption, normal conditions, maximum	13.0 W
Protocol	3GPP/AISG 2.0 (Multi-RET)
RET Interface	8-pin DIN Female | 8-pin DIN Male
RET Interface, quantity	1 female | 1 male

Packed Dimensions

Length	2025.0 mm | 79.7 in
Width	390.0 mm | 15.4 in
Depth	296.0 mm | 11.7 in
Shipping Weight	31.0 kg | 68.3 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

Product Specifications

SBNHH-1D65B

Included Products

BSAMNT-1 — Wide Profile Antenna Downtilt Mounting Kit for 2.4 - 4.5 in (60 - 115 mm) OD round members. Kit contains one scissor top bracket set and one bottom bracket set.

* Footnotes

Performance Note	Severe environmental conditions may degrade optimum performance

ALCATEL-LUCENT B13 RRH4X30-4R

Alcatel-Lucent B13 Remote Radio Head 4x30-4R is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering.

Supporting 2Tx/4Tx MIMO and 4-way Rx diversity, Alcatel-Lucent B13 RRH4x30-4R allows operators to have a compact radio solution to deploy LTE in the 700U band (700 MHz, 3GPP band 13), providing them with the means to achieve high capacity, high quality and high coverage with minimum site requirements.

The Alcatel-Lucent B13 RRH4x30-4R product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x60 W or 4x30 W RF output power. It supports also 4-way Rx diversity and up to 10MHz instantaneous bandwidth.

The Alcatel-Lucent B13 RRH4x30-4R is a near zero-footprint solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

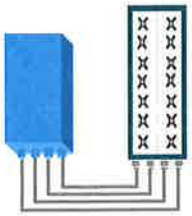
Its compactness and slim design makes the Alcatel-Lucent B13 RRH4x30-4R easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 700 MHz band (700U, 3GPP band 13)
- LTE 2Tx or 4Tx MIMO (SW switchable)
- Output power: Up to 2x60W or 4x30W
- 10MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports

BENEFITS

- Compact to reduce additional footprint when adding LTE in 700U band
- MIMO scheme operation selection (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through MIMO4
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall



4x30W with 4T4R
or
2x60W with 2T4R

Can be switched between modes via SW w/o site visit

Alcatel·Lucent

TECHNICAL SPECIFICATIONS

Features & performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R by SW)
Frequency band	U700 (C) (3GPP bands 13): DL: 746 - 756 MHz / UL: 777 - 787 MHz
Instantaneous bandwidth - #carriers	10MHz – 1 LTE carrier (in 10MHz occupied bandwidth)
LTE carrier bandwidth	10 MHz
RF output power	2x60W or 4x30W (by SW)
Noise figure – RX Diversity scheme	2 dB typ. (<2.5 dB max) – 2 or 4 way Rx diversity
Sizes (HxWxD) in mm (in.) **Volume in L** **Weight in kg (lb) (w/o mounting HW)**	550 x 305 x 230 (21.6" x 12.0" x 9") (with solar shield) 38 (with solar shield) 26 (57.2) (with solar shield)
DC voltage range **DC power consumption**	-40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 550W typical @100% RF load (in 2Tx or 4TX mode)
Environmental conditions **Wind load (@150km/h or 93mph)**	-40°C (-40°F) /+55°C (+131°F) IP65 Frontal:<200N / Lateral :<150N
Antenna ports	4 ports 7/16 DIN female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate7, 9.8 Gbps) SFP single mode dual fiber
AISG interfaces	1 AISG2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) – 4 RF Tx & 4 RF Rx monitor ports - 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27

ALCATEL-LUCENT B66A RRH4X45

The Alcatel-Lucent B66a Remote Radio Head 4x45 is the newest addition of Remote Radio Head to the extended product line of Alcatel-Lucent's distributed Base Station solutions, aimed at facilitating smooth RF site acquisition and related civil engineering. Its operational range covers beyond that of B4 (AWS) and B10 (AWS+).

Supporting 2Tx/4Tx MIMO and 2-way/4-way Rx diversity, the Alcatel-Lucent B66a RRH4x45 allows operators to have a compact radio solution to deploy LTE in the 2100 band (3GPP band 4, 10, and 66), providing them with the means to achieve high capacity, high quality, high reliability, large instantaneous bandwidth, and high coverage with minimum site requirements.

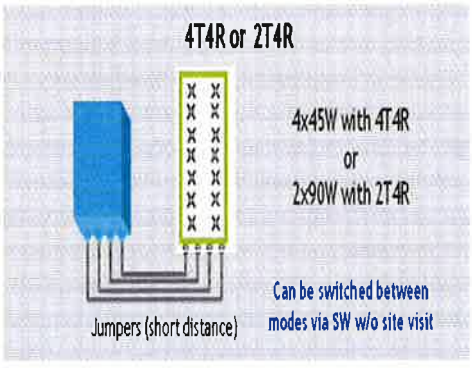
The Alcatel-Lucent B66a RRH4x45 product has four transmit RF paths, offering the possibility to **select, via software only, 2Tx or 4Tx MIMO configurations** with either 2x90W or 4x45W RF output power. It also supports 4-way Rx diversity at the 70 MHz instantaneous bandwidth.

The Alcatel-Lucent B66a RRH4x45 is a compact (near zero-footprint) solution and operates noise free, simplifying negotiations with site property owners and minimizing environmental impacts.

Its compactness and slim design makes the Alcatel-Lucent B66a RRH4x45 easy to install close to the antenna: operators can therefore locate this Remote Radio Head where RF design conditions are deemed ideal, minimizing trade-offs between available sites and RF optimum sites, together with reducing the RF feeder needs and installation costs.

FEATURES

- Supporting LTE in 2110 - 2180 MHz band/DL, 1710-1780MHz/UL (3GPP band 4, 10, and 66a)
- LTE 2Tx or 4Tx MIMO (SW selectable)
- Configuration: 2T2R/2T4R/4T4R
- Output power: Up to 2x90W or 4x45W (SW configurable)
- 70MHz LTE carrier with 4Rx Diversity
- Convection-cooled (fan-less)
- Supports AISG 2.0 ALD devices (RET, TMA) through RS485 or RF ports



BENEFITS

- Compact to reduce additional footprint when adding LTE in AWS 1-3 band
- Selection of MIMO configuration (2Tx or 4Tx) by software only
- Improves downlink spectral efficiency through 4Tx MIMO
- Increases LTE coverage thanks to 4Rx diversity capability and best in class Rx sensitivity
- Flexible mounting options: Pole or Wall

Features & Performance	
Number of TX/RX paths	4 duplexed (either 4T4R or 2T4R selectable by SW)
Frequency band	AWS 1-3, B4/B66a DL: 2110-2180 MHz / UL: 1710-1780 MHz
Instantaneous bandwidth - #carriers	70 MHz – 4 LTE MIMO carriers (in 70 MHz occupied bandwidth)
LTE carrier bandwidth	5, 10, 15, 20 MHz
RF output power	2x90W or 4x45W (selectable by SW)
Noise figure – RX Diversity scheme **Receiver Sensivity (FRC A1-3)**	2 dB typical (<2.5 dB max) – 2 or 4 way Rx diversity -104.5 dBm maximum
Sizes (HxWxD) in mm (in.) **Volume in Liters** **Weight in kg (lb) (w/o mounting HW)**	655x299x182 (25.8x11.8x7.2) (with solar shield) 640x290x160 (25.2x11.4x6.3) (without solar shield) 35.5 (with solar shield) 29.7 (without solar shield) 25.8kg (56.8lb) (with solar shield)
DC voltage range **DC power consumption**	Nominal: -48V, -40.5 to -57V at full performance, -38 to -57V with relaxation on power consumption 750W typical @100% RF load (in 2Tx or 4Tx mode); Add 58W for 2A*29V for AISG
Environmental conditions **Wind load (@150km/h or 93mph)**	-40°C (-40°F) /+55°C (+131°F) UL50E Type 4 Enclosure 250N (56lb) Frontal/150N (34lb) Lateral
Antenna ports	4 ports 4.3-10 female (50 ohms) VSWR < 1.5
CPRI ports	2 CPRI ports (HW ready for Rate 7, 9.8 Gbps) SFP: SMDF (HW supports also SMSF and MMDF)
AISG interfaces	1 AISG 2.0 output (RS485) Integrated Smart Bias Tees (x2)
Misc. Interfaces	4 external alarms (1 connector) 1 DC connector (2 pins)
Installation conditions	Pole and wall mounting
Regulatory compliance	3GPP 36.141 / 3GPP 36.113 / GR-487 / GR-1089-CORE / GR-3108-CORE / UL 60950-1 / FCC Part 27 / FCC Part 15 / GR-3178-CORE

Product Data Sheet **HB158-1-08U8-S8J18**

HYBRIFLEX™ RRH Hybrid Feeder Cabling Solution, 1-5/8", Single-Mode Fiber

Product Description

RFS' HYBRIFLEX Remote Radio Head (RRH) hybrid feeder cabling solution combines optical fiber and DC power for RRHs in a single lightweight aluminum corrugated cable, making it the world's most innovative solution for RRH deployments.

It was developed to reduce installation complexity and costs at Cellular sites. HYBRIFLEX allows mobile operators deploying an RRH architecture to standardize the RRH installation process and eliminate the need for and cost of cable grounding. HYBRIFLEX combines optical fiber (multi-mode or single-mode) and power in a single corrugated cable. It eliminates the need for junction boxes and can connect multiple RRHs with a single feeder. Standard RFS CELLFLEX® accessories can be used with HYBRIFLEX cable. Both pre-connectorized and on-site options are available.

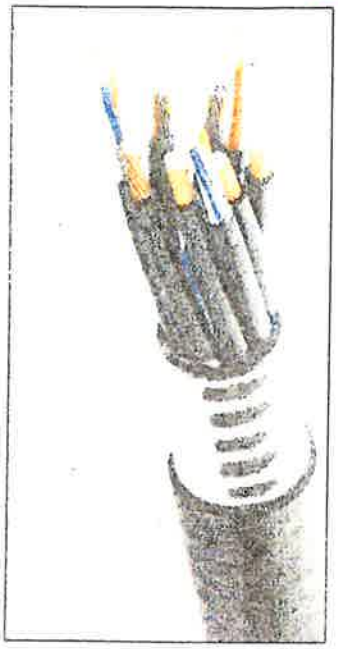


Figure 1: HYBRIFLEX Series

Features/Benefits

- Aluminum corrugated armor with outstanding bending characteristics – minimizes installation time and enables mechanical protection and shielding
- Same accessories as 1 5/8" coaxial cable
- Outer conductor grounding – Eliminates typical grounding requirements and saves on installation costs
- Lightweight solution and compact design – Decreases tower loading
- Robust cabling – Eliminates need for expensive cable trays and ducts
- Installation of tight bundled fiber optic cable pairs directly to the RRH – Reduces CAPEX and wind load by eliminating need for interconnection
- Optical fiber and power cables housed in single corrugated cable – Saves CAPEX by standardizing RRH cable installation and reducing installation requirements
- Outdoor polyethylene jacket – Ensures long-lasting cable protection

Technical Specifications

Outer Conductor Armor:	Corrugated Aluminum	[mm (in)]	46.5 (1.83)
Jacket:	Polyethylene, PE	[mm (in)]	50.3 (1.98)
UV-Protection:	Individual and External Jacket		Yes
Weight, Approximate		[kg/m (lb/ft)]	1.9 (1.30)
Minimum Bending Radius, Single Bending		[mm (in)]	200 (8)
Minimum Bending Radius, Repeated Bending		[mm (in)]	500 (20)
Recommended/Maximum Clamp Spacing		[m (ft)]	1.0 / 1.2 (3.25 / 4.0)
DC-Resistance Outer Conductor Armor		[Ω/km (Ω/1000ft)]	068 (0.205)
DC-Resistance Power Cable, 8.4mm² (8AWG)		[Ω/km (Ω/1000ft)]	2.1 (0.307)
Version			Single-mode OM3
Quantity, Fiber Count			16 (8 pairs)
Core/Clad		[µm]	50/125
Primary Coating (Acrylate)		[µm]	245
Buffer Diameter, Nominal		[µm]	900
Secondary Protection, Jacket, Nominal		[mm (in)]	2.0 (0.08)
Minimum Bending Radius		[mm (in)]	104 (4.1)
Insertion Loss @ wavelength 850nm		dB/km	3.0
Insertion Loss @ wavelength 1310nm		dB/km	1.0
Standards (Meets or exceeds)			UL94-V0, UL1666 RoHS Compliant
Size (Power)		[mm² (AWG)]	8.4 (8)
Quantity, Wire Count (Power)			16 (8 pairs)
Size (Alarm)		[mm² (AWG)]	0.8 (18)
Quantity, Wire Count (Alarm)			4 (2 pairs)
Type			UV protected
Strands			19
Primary Jacket Diameter, Nominal		[mm (in)]	6.8 (0.27)
Standards (Meets or exceeds)			NFPA 130, ICEA S-93-658 UL Type XHHW-2, UL 44 UL-LS Limited Smoke, UL VW-1 IEEE-383 (1974), IEEE1202/FT4 RoHS Compliant
Installation Temperature		[°C (°F)]	-40 to +65 (-40 to149)
Operation Temperature		[°C (°F)]	-40 to +65 (-40 to149)

* This data is provisional and subject to change

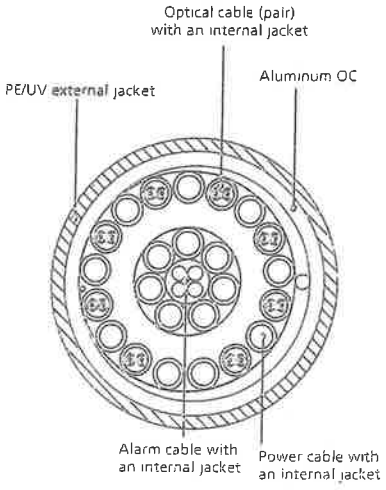


Figure 2: Construction Detail

ATTACHMENT 2

Far Field Approximation
with downtilt variation

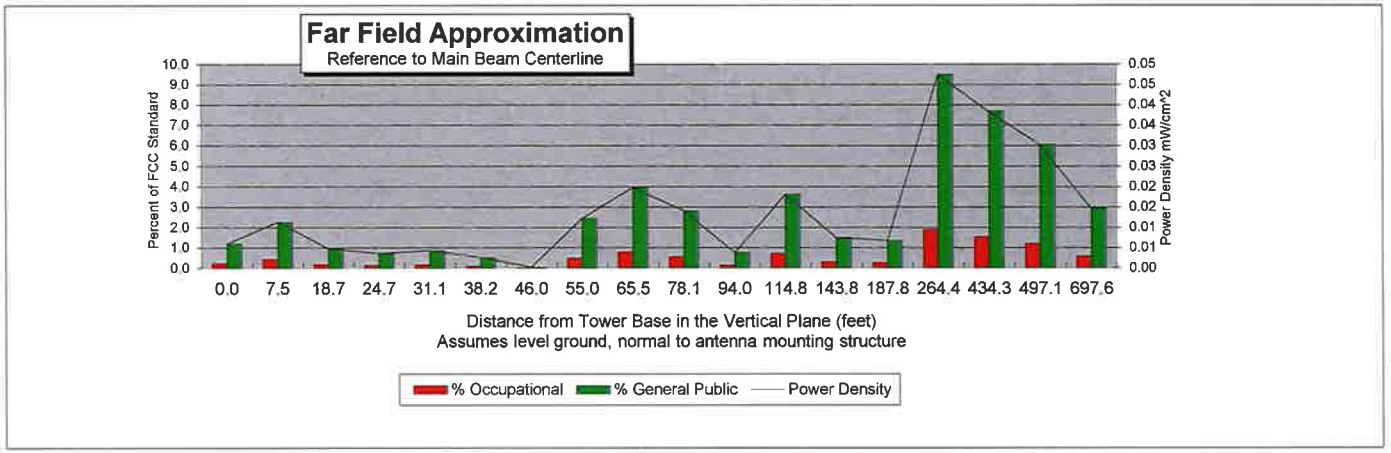
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	E Granby 3 CT
Site #:	67412
Date:	03/23/17
Name:	Kelly Lemay
File Name:	E Granby 3, CT - LTE FF Power

Operating Freq. (MHz)	**746.0**
Antenna Height (ft):	**64.0**
Antenna Gain (dBi):	**14.8**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**3.0**
Feedline Loss (dB):	**2.0**
Power @ J4 (w):	**1827.0**
Number of channels:	



Calc Angle	90.0	83.0	73.0	68.0	63.0	58.0	53.0	48.0	43.0	38.0	33.0	28.0	23.0	18.0	13.0	8.0	7.0	5.0	
Solve for r, dx to antenna	61.0	61.5	63.8	65.8	68.5	72.0	76.4	82.1	89.5	99.1	112.1	130.0	156.2	197.5	271.3	438.5	500.8	700.3	
Distance from Antenna Structure Base in Horizontal plane	0.0	7.5	18.7	24.7	31.1	38.2	46.0	55.0	65.5	78.1	94.0	114.8	143.8	187.8	264.4	434.3	497.1	697.6	
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2	
dB down from centerline (referenced to centerline)	25.34	22.48	25.88	26.87	25.74	27.56	39.12	19.62	16.81	17.39	22.02	13.95	16.18	14.59	3.37	0.12	0	0.21	
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	
Power Density (mW/cm^2)	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.02	0.01	0.00	0.02	0.01	0.01	0.05	0.04	0.03	0.01	
Percent of Occupational Standard	0.2	0.5	0.2	0.1	0.2	0.1	0.0	0.5	0.8	0.6	0.2	0.7	0.3	0.3	1.9	1.5	1.2	0.6	
Percent of General Population Standard	1.2	2.3	1.0	0.7	0.9	0.5	0.0	2.5	4.0	2.8	0.8	3.6	1.5	1.4	9.5	7.7	6.1	3.0	

Antenna Type SBNHH-1D65B
Max% 9.51%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Po
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

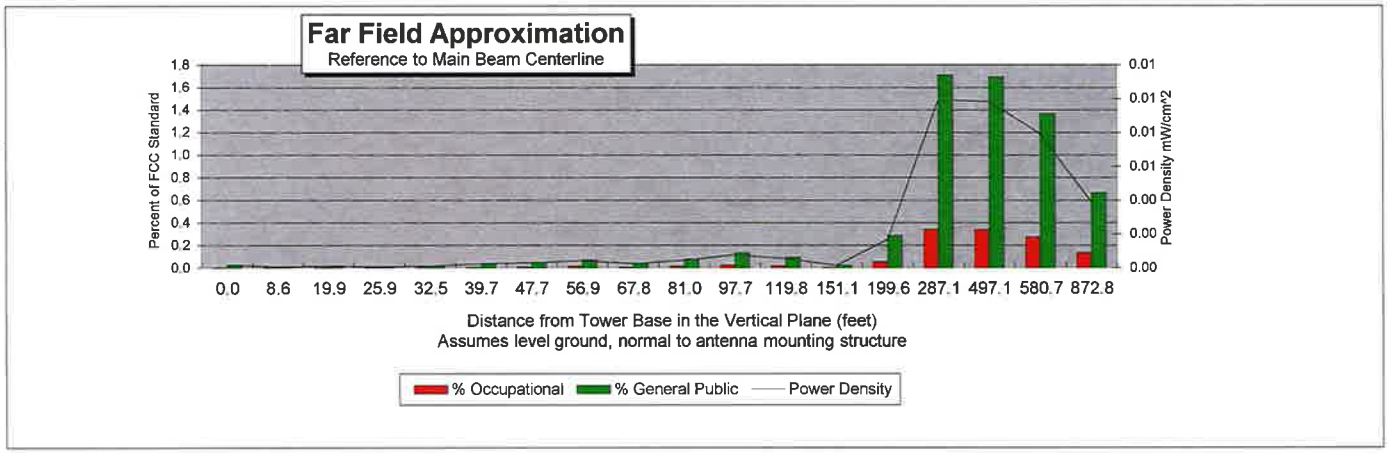
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	E Granby 3 CT
Site #:	67412
Date:	03/23/17
Name:	Kelly Lemay
File Name:	E Granby 3, CT - Cellular FF Power

Operating Freq. (MHz)	**869.0**
Antenna Height (ft):	**64.0**
Antenna Gain (dBi):	**16.7**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**2.0**
Feedline Loss (dB):	**2.0**
Power @ J4 (w):	**463.0**
Number of channels:	



Calc Angle	90.0	82.0	72.0	67.0	62.0	57.0	52.0	47.0	42.0	37.0	32.0	27.0	22.0	17.0	12.0	7.0	6.0	4.0
Solve for r, dx to antenna	61.0	61.6	64.2	66.3	69.1	72.8	77.4	83.4	91.2	101.4	115.2	134.4	162.9	208.7	293.5	500.8	583.9	874.9
Distance from Antenna Structure Base in Horizontal plane	0.0	8.6	19.9	25.9	32.5	39.7	47.7	56.9	67.8	81.0	97.7	119.8	151.1	199.6	287.1	497.1	580.7	872.8
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	45	40	35	30	25	20	15	10	5	4	2
dB down from centerline (referenced to centerline)	37.2	40.5	38.4	39.8	37.7	33.8	32.3	30.1	31.8	28.1	24.6	24.8	29.1	16.1	5.4	0.8	0.4	0
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.01	0.00
Percent of Occupational Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.3	0.3	0.3	0.1
Percent of General Population Standard	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.0	0.3	1.7	1.7	1.4	0.7

Antenna Type LPA-80063/6CF
Max% 1.71%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Power
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

Far Field Approximation
with downtilt variation

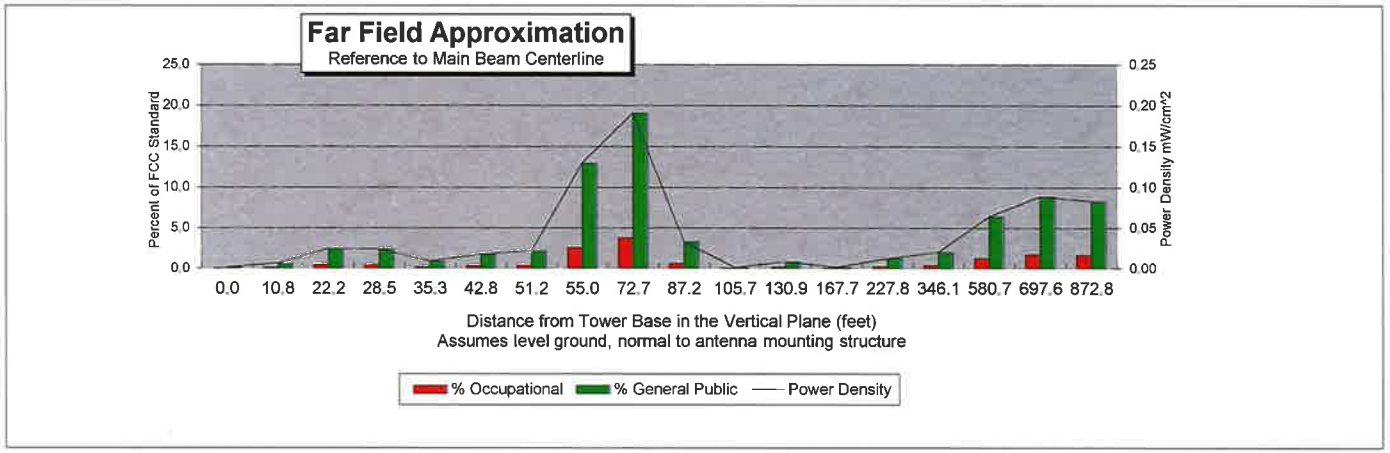
Estimated Radiated Emission

Single Emitter Far Field Model

Dipole / Wire/ Yagi Antenna Types

Location:	E Granby 3 CT
Site #:	67252
Date:	03/23/17
Name:	Kelly Lemay
File Name:	E Granby 3, CT - LTE FF Power

Operating Freq. (MHz):	**2145.0**
Antenna Height (ft):	**64.0**
Antenna Gain (dBi):	**18.6**
Antenna Size (in.):	**72.0**
Downtilt (degrees):	**0.0**
Feedline Loss (dB):	**2.0**
Power @ J4 (w):	**7418.0**
Number of channels:	



Calc Angle	90.0	80.0	70.0	65.0	60.0	55.0	50.0	48.0	40.0	35.0	30.0	25.0	20.0	15.0	10.0	6.0	5.0	4.0
Solve for r, dx to antenna	61.0	61.9	64.9	67.3	70.5	74.5	79.7	82.1	94.9	106.4	122.1	144.4	178.4	235.8	351.5	583.9	700.3	874.9
Distance from Antenna Structure Base in Horizontal plane	0.0	10.8	22.2	28.5	35.3	42.8	51.2	55.0	72.7	87.2	105.7	130.9	167.7	227.8	346.1	580.7	697.6	872.8
Angle from Main Beam (reference to horizontal plane)	90	80	70	65	60	55	50	48	40	35	30	25	20	15	10	6	5	4
dB down from centerline (referenced to centerline)	41.58	34.92	28.58	28.45	32.22	28.96	27.38	19.29	16.36	23.02	37.27	26.39	32.09	20.46	14.83	5.3	2.33	0.67
Reflection Coefficient (1 to 4, 2.56 typical)	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56	2.56
Power Density (mW/cm^2)	0.00	0.01	0.02	0.02	0.01	0.02	0.02	0.13	0.19	0.03	0.00	0.01	0.00	0.01	0.02	0.06	0.09	0.08
Percent of Occupational Standard	0.0	0.1	0.5	0.5	0.2	0.3	0.4	2.6	3.8	0.7	0.0	0.2	0.0	0.2	0.4	1.3	1.8	1.7
Percent of General Population Standard	0.1	0.6	2.4	2.3	0.9	1.7	2.1	13.0	19.1	3.3	0.1	0.8	0.1	1.2	2.0	6.4	8.9	8.3

Antenna Type SBNHH-1D65B
Max% 19.08%

Instructions:

1) Fill in Site Location, Site number, Date, Name of Person Responsible for Date, and enter File Name to ba saved as.
2) References to J4 refer to a point where the transmission line exits the equipment shelter and proceeds to the antenna(s). There is typically a connector located here where power measurements are made.
3) Enter Antenna Height (in feet to bottom of antenna), Antenna Gain (expressed as dBi, add 2.17 to dBd to obtain dBi), Antenna Size (vertical size in inches), Downtilt (in Degrees, enter zero if none), Feedline loss from J4 to Antenna, and J4 Pow
4) From manufacturer's plots, or data sheet, input Angle from mainbeam and dB below mainbeam centerline.
5) Enter Reflection coefficient (2.56 would be typical, 1 for free space)
6) Spreadsheet calculates actual power density, then relates as Occupational or General Population percentage of FCC Standard.
7) An odd distance may be entered in the rightmost column of the lower table.

ATTACHMENT 3

PJF PAUL J. FORD & COMPANY

Date: **November 04, 2016**

Sean Dempsey
Crown Castle
3530 Toringdon Way Suite 300
Charlotte, NC 28277
704.405.6565

Paul J. Ford and Company
250 East Broad St., Suite 600
Columbus, Ohio
614.221.6679
jjohnson@pjfweb.com

Subject: **Structural Analysis Report**

Carrier Designation:	***Verizon Wireless* Co-Locate**	
	Carrier Site Number:	N/A
	Carrier Site Name:	East Granby 3
Crown Castle Designation:	**Crown Castle BU Number:**	876399
	Crown Castle Site Name:	(F) E. GRANBY 4Q2000 / GALASSO
	Crown Castle JDE Job Number:	404174
	Crown Castle Work Order Number:	1320178
	Crown Castle Application Number:	362644 Rev. 0
Engineering Firm Designation:	**Paul J. Ford and Company Project Number:**	37516-3532.001.7805
Site Data:	**60 South Main St., EAST GRANBY, Hartford County, CT**	
	Latitude *41° 56' 29.59"*, Longitude *-72° 44' 19.248"*	
	98 Foot - Monopole Tower	

Dear Sean Dempsey,

Paul J. Ford and Company is pleased to submit this **"Structural Analysis Report"** to determine the structural integrity of the above mentioned tower. This analysis has been performed in accordance with the Crown Castle Structural 'Statement of Work' and the terms of Crown Castle Purchase Order Number 966632, in accordance with application 362644, revision 0.

The purpose of the analysis is to determine acceptability of the tower stress level. Based on our analysis we have determined the tower stress level for the structure and foundation, under the following load case, to be:

LC5: Existing + Proposed Equipment **Sufficient Capacity**
Note: See Table I and Table II for the proposed and existing loading, respectively.

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 120 mph converted to a nominal 3-second gust wind speed of 93 mph per Section 1609.3 and Appendix N as required for use in the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1. Risk Category II, Exposure Category C and Topographic Category 1 with a maximum Topographic Factor, Kzt, of 1.0 were used in this analysis.

We at *Paul J. Ford and Company* appreciate the opportunity of providing our continuing professional services to you and Crown Castle. If you have any questions or need further assistance on this or any other projects please give us a call.

Respectfully submitted by:

Joshua Johnson, EI
Structural Designer

STATE OF CONNECTICUT
JUSTIN T. KLINE
No. 30301
LICENSED PROFESSIONAL ENGINEER
11.7.16

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1) INTRODUCTION

This tower is a 98 ft Monopole tower designed by ENGINEERED ENDEAVORS, INC. in September of 2000. The tower was originally designed for a wind speed of 85 mph per TIA/EIA-222-F.

2) ANALYSIS CRITERIA

This analysis has been performed in accordance with the 2016 Connecticut State Building Code based upon an ultimate 3-second gust wind speed of 120 mph converted to a nominal 3-second gust wind speed of 93 mph per Section 1609.3 and Appendix N as required for use in the ANSI/TIA-222-G-2005 Standard, "Structural Standard for Antenna Supporting Structures and Antennas", with ANSI/TIA-222-G-1-2007 and ANSI/TIA-222-G-2-2009 Addenda per Exception #5 of Section 1609.1.1. Risk Category II, Exposure Category C and Topographic Category 1 with a maximum Topographic Factor, Kzt, of 1.0 were used in this analysis.

Table 1 - Proposed Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
67.0	67.0	3	alcatel lucent	B13 RRH 4X30	2	1-3/8	-
		3	alcatel lucent	B66A RRH4X45			
		2	commscope	RC2DC-3315-PF-48			
		6	commscope	SBNHH-1D65B w/ Mount Pipe			

Table 2 - Existing Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
94.0	96.0	1	andrew	HBX-6516DS-VTM w/ Mount Pipe	6 2	1-1/4 7/8	1
		1	antel	BXA-80063/4CF w/ Mount Pipe			
		4	decibel	DB980H65E-M w/ Mount Pipe			
	94.0	1	tower mounts	Platform Mount [LP 305-1]			
89.0	90.0	3	commscope	ATBT-BOTTOM-24V	12	7/8	1
		3	commscope	LNX-6515DS-VTM w/ Mount Pipe			
		3	rfs celwave	APXV18-209014-C w/ Mount Pipe			
		3	rfs celwave	ATMPP1412D-1CWA			
	89.0	1	tower mounts	Platform Mount [LP 305-1]			

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)	Note
74.0	76.0	6	powerwave technologies	7770.00 w/ Mount Pipe	1 2 12 1	3/8 3/4 7/8 2" Conduit	1
		3	powerwave technologies	P65-17-XLH-RR w/ Mount Pipe			
		3	ericsson	RRUS-11			
		6	powerwave technologies	LGP21401			
		6	powerwave technologies	LGP21903			
		1	raycap	DC6-48-60-18-8F			
	74.0	1	tower mounts	Platform Mount [LP 303-1]			
67.0	67.0	3	antel	BXA-171063-12BF w/ Mount Pipe	6	1-5/8	2
		3	antel	BXA-70063/6CFx2 w/ Mount Pipe			
		6	antel	LPA-80063/6CFx2 w/ Mount Pipe	12	1-5/8	1
		1	tower mounts	Platform Mount [LP 303-1]			
52.0	54.0	1	lucent	KS24019-L112A	1	1/2	1
	52.0	1	tower mounts	Side Arm Mount [SO 701-1]			

Notes:
1) Existing Equipment
2) Equipment To Be Removed

Table 3 - Design Antenna and Cable Information

Mounting Level (ft)	Center Line Elevation (ft)	Number of Antennas	Antenna Manufacturer	Antenna Model	Number of Feed Lines	Feed Line Size (in)
-	-	-	-	-	-	-

3) ANALYSIS PROCEDURE

Table 4 - Documents Provided

Document	Remarks	Reference	Source
4-GEOTECHNICAL REPORTS	Dr. Clarence Welti, 7/25/2000	1531971	CCISITES
4-POST-MODIFICATION INSPECTION	IETS, 2010-70158, 7/7/2010	2682749	CCISITES
4-POST-MODIFICATION INSPECTION	PJF, 32912-0138 MO, 3/13/2013	3713020	CCISITES
4-POST-MODIFICATION INSPECTION	ETS, 160019, 3/16/2016	6139057	CCISITES
4-TOWER FOUNDATION DRAWINGS/DESIGN/SPECS	EEI, 7832 Rev 1, 9/22/2000	2066334	CCISITES
4-TOWER MANUFACTURER DRAWINGS	EEI, 7832, 9/22/2000	1613691	CCISITES

3.1) Analysis Method

tnxTower (version 7.0.5.1), a commercially available analysis software package, was used to create a three-dimensional model of the tower and calculate member stresses for various loading cases. Selected output from the analysis is included in Appendix A.

3.2) Assumptions

1) Tower and structures were built in accordance with the manufacturer's specifications.
2) The tower and structures have been maintained in accordance with the manufacturer's specification.
3) The configuration of antennas, transmission cables, mounts and other appurtenances are as specified in Tables 1 and 2 and the referenced drawings.
4) For existing modifications: monopole was modified in conformance with the referenced modification drawings.
5) The existing monopole shaft has been reinforced using a Crown-approved system in accordance with the above referenced document (CCI #3713020). However, in this analysis we found that due to the change from the EIA/TIA-222-F Standard (the Standard used in the original reinforcing design) to the TIA-222-G-2 Standard (the most current Standard) the shaft reinforcing was found to be ineffective and, therefore, not considered in this analysis.

This analysis may be affected if any assumptions are not valid or have been made in error. Paul J. Ford and Company should be notified to determine the effect on the structural integrity of the tower.

4) ANALYSIS RESULTS

Table 5 - Section Capacity (Summary)

Section No.	Elevation (ft)	Component Type	Size	Critical Element	P (K)	SF*P_allow (K)	% Capacity	Pass / Fail
L1	98 - 82.79	Pole	TP15.28x12x0.1875	1	-3.32	644.24	19.4	Pass
L2	82.79 - 45.29	Pole	TP22.86x14.3831x0.25	2	-11.82	1290.12	82.7	Pass
L3	45.29 - 0	Pole	TP32x21.6338x0.3125	3	-21.33	2327.26	92.9	Pass
							Summary	
						Pole (L3)	92.9	Pass
						RATING =	**92.9**	**Pass**

Table 6 - Tower Component Stresses vs. Capacity – LC5

Notes	Component	Elevation (ft)	% Capacity	Pass / Fail
1	Anchor Rods	0	58.2	Pass
1	Base Plate	0	74.6	Pass
1	Base Foundation Steel	0	74.1	Pass
1	Base Foundation Soil Interaction	0	46.4	Pass

Structure Rating (max from all components) =	**92.9%**

Notes:
1) See additional documentation in "Appendix C – Additional Calculations" for calculations supporting the % capacity consumed.

4.1) Recommendations

The monopole and its foundation have sufficient capacity to carry the proposed loading configuration. No modifications are required at this time.

APPENDIX A

TNXTOWER OUTPUT

Tower Input Data

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

1) ASCE 7-10 Wind Data is used (wind speeds converted to nominal values).
2) Basic wind speed of 93 mph.
3) Structure Class II.
4) Exposure Category C.
5) Topographic Category 1.
6) Crest Height 0.00 ft.
7) Nominal ice thickness of 1.0000 in.
8) Ice thickness is considered to increase with height.
9) Ice density of 56 pcf.
10) A wind speed of 50 mph is used in combination with ice.
11) Temperature drop of 50 °F.
12) Deflections calculated using a wind speed of 60 mph.
13) A non-linear (P-delta) analysis was used.
14) Pressures are calculated at each section.
15) Stress ratio used in pole design is 1.
16) Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

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

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	98.00-82.79	15.21	2.42	18	12.0000	15.2800	0.1875	0.7500	A572-65 (65 ksi)
L2	82.79-45.29	39.92	3.42	18	14.3831	22.8600	0.2500	1.0000	A572-65 (65 ksi)
L3	45.29-0.00	48.71		18	21.6338	32.0000	0.3125	1.2500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in^2	I in^4	r in	C in	I/C in^3	J in^4	It/Q in^2	w in	w/t
L1	12.1851	7.0299	123.9285	4.1934	6.0960	20.3295	248.0200	3.5156	1.7820	9.504
	15.5157	8.9819	258.4813	5.3578	7.7622	33.2998	517.3028	4.4918	2.3593	12.583
L2	15.1268	11.2146	283.0087	5.0173	7.3066	38.7331	566.3897	5.6084	2.0914	8.366
	23.2127	17.9410	1158.7402	8.0266	11.6129	99.7806	2319.0051	8.9722	3.5834	14.333
L3	22.7066	21.1480	1214.6018	7.5691	10.9900	110.5192	2430.8017	10.5760	3.2575	10.424
	32.4937	31.4300	3987.1110	11.2491	16.2560	245.2701	7979.4683	15.7180	5.0820	16.262

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number		C_AA_A ft^2/ft	Weight plf
LDF5-50A(7/8")	C	No	Inside Pole	94.00 - 0.00	2	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
LDF6-50A(1-1/4")	C	No	Inside Pole	94.00 - 0.00	6	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
****								
AVA5-50(7/8")	C	No	Inside Pole	89.00 - 0.00	6	No Ice	0.00	0.30
						1/2" Ice	0.00	0.30
						1" Ice	0.00	0.30
LDF5-50A(7/8")	C	No	Inside Pole	89.00 - 0.00	6	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
****								
LDF5-50A(7/8")	C	No	Inside Pole	74.00 - 0.00	12	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
FB-L98B-002-75000(3/8")	C	No	Inside Pole	74.00 - 0.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
WR-VG86ST-BRD(3/4")	C	No	Inside Pole	74.00 - 0.00	2	No Ice	0.00	0.58
						1/2" Ice	0.00	0.58
						1" Ice	0.00	0.58
2" (Nominal) Conduit	C	No	Inside Pole	74.00 - 0.00	1	No Ice	0.00	0.72
						1/2" Ice	0.00	0.72
						1" Ice	0.00	0.72
****								
AVA7-50(1-5/8")	C	No	CaAa (Out Of Face)	67.00 - 0.00	6	No Ice	0.00	0.72
						1/2" Ice	0.00	2.23
						1" Ice	0.00	4.36
AVA7-50(1-5/8")	C	No	CaAa (Out Of Face)	67.00 - 0.00	10	No Ice	0.00	0.72
						1/2" Ice	0.00	2.23
						1" Ice	0.00	4.36
AVA7-50(1-5/8")	C	No	CaAa (Out Of Face)	67.00 - 0.00	2	No Ice	0.20	0.72
						1/2" Ice	0.30	2.23
						1" Ice	0.40	4.36
MLCH 6/12 LOW INDUCTION(1-3/8")	C	No	CaAa (Out Of Face)	67.00 - 0.00	2	No Ice	0.00	1.70
						1/2" Ice	0.00	2.90
						1" Ice	0.00	4.72
****								
LDF4-50A(1/2")	C	No	Inside Pole	52.00 - 0.00	1	No Ice	0.00	0.15
						1/2" Ice	0.00	0.15
						1" Ice	0.00	0.15
****								
1" Flat Reinforcement	C	No	CaAa (Out Of Face)	60.50 - 0.00	1	No Ice	0.17	15.00
						1/2" Ice	0.28	15.69
						1" Ice	0.39	16.73

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	98.00-82.79	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.08
L2	82.79-45.29	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	11.132	1.07
L3	45.29-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	25.483	2.07

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft^2	A_F ft^2	C_AA_A In Face ft^2	C_AA_A Out Face ft^2	Weight K
L1	98.00-82.79	A	2.211	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.08
L2	82.79-45.29	A	2.134	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	37.809	6.22
L3	45.29-0.00	A	1.923	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	85.610	12.19

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
L1	98.00-82.79	0.0000	0.0000	0.0000	0.0000
L2	82.79-45.29	-0.3514	0.2029	-0.7610	0.4394
L3	45.29-0.00	-0.5783	0.3339	-1.2235	0.7064

Shielding Factor Ka

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

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft / Vert ft / Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
(2) DB980H65E-M w/ Mount Pipe	A	From Leg	4.00 / 0.00 / 2.00	0.0000	94.00	No Ice	4.04	3.62	0.03
						1/2" Ice	4.50	4.48	0.07
						1" Ice	4.95	5.22	0.11
HBX-6516DS-VTM w/ Mount Pipe	B	From Leg	4.00 / 0.00 / 2.00	0.0000	94.00	No Ice	3.60	3.24	0.03
						1/2" Ice	4.00	3.91	0.06
						1" Ice	4.39	4.56	0.10
BXA-80063/4CF w/ Mount Pipe	B	From Leg	4.00 / 0.00 / 2.00	0.0000	94.00	No Ice	4.95	3.42	0.03
						1/2" Ice	5.32	4.02	0.07
						1" Ice	5.71	4.64	0.12
(2) DB980H65E-M w/ Mount Pipe	C	From Leg	4.00 / 0.00	0.0000	94.00	No Ice	4.04	3.62	0.03
						1/2"	4.50	4.48	0.07

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
			2.00			Ice	4.95	5.22	0.11
						1" Ice			
Platform Mount [LP 305-1]	C	None		0.0000	94.00	No Ice	18.01	18.01	1.12
						1/2" Ice	23.33	23.33	1.35
						1" Ice	28.65	28.65	1.58
2.375" OD x 6' Mount Pipe	A	From Leg	4.00	0.0000	94.00	No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
2.375" OD x 6' Mount Pipe	B	From Leg	4.00	0.0000	94.00	No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
2.375" OD x 6' Mount Pipe	C	From Leg	4.00	0.0000	94.00	No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
****									
APXV18-209014-C w/ Mount Pipe	A	From Leg	4.00	0.0000	89.00	No Ice	3.72	3.31	0.04
			0.00			1/2" Ice	4.13	4.02	0.07
			1.00			1" Ice	4.54	4.68	0.11
APXV18-209014-C w/ Mount Pipe	B	From Leg	4.00	0.0000	89.00	No Ice	3.72	3.31	0.04
			0.00			1/2" Ice	4.13	4.02	0.07
			1.00			1" Ice	4.54	4.68	0.11
APXV18-209014-C w/ Mount Pipe	C	From Leg	4.00	0.0000	89.00	No Ice	3.72	3.31	0.04
			0.00			1/2" Ice	4.13	4.02	0.07
			1.00			1" Ice	4.54	4.68	0.11
LNX-6515DS-VTM w/ Mount Pipe	A	From Leg	4.00	0.0000	89.00	No Ice	11.68	9.84	0.08
			0.00			1/2" Ice	12.40	11.37	0.17
			1.00			1" Ice	13.14	12.91	0.27
LNX-6515DS-VTM w/ Mount Pipe	B	From Leg	4.00	0.0000	89.00	No Ice	11.68	9.84	0.08
			0.00			1/2" Ice	12.40	11.37	0.17
			1.00			1" Ice	13.14	12.91	0.27
LNX-6515DS-VTM w/ Mount Pipe	C	From Leg	4.00	0.0000	89.00	No Ice	11.68	9.84	0.08
			0.00			1/2" Ice	12.40	11.37	0.17
			1.00			1" Ice	13.14	12.91	0.27
ATBT-BOTTOM-24V	A	From Leg	4.00	0.0000	89.00	No Ice	0.10	0.06	0.00
			0.00			1/2" Ice	0.15	0.10	0.00
			1.00			1" Ice	0.20	0.15	0.01
ATBT-BOTTOM-24V	B	From Leg	4.00	0.0000	89.00	No Ice	0.10	0.06	0.00
			0.00			1/2" Ice	0.15	0.10	0.00
			1.00			1" Ice	0.20	0.15	0.01
ATBT-BOTTOM-24V	C	From Leg	4.00	0.0000	89.00	No Ice	0.10	0.06	0.00
			0.00			1/2" Ice	0.15	0.10	0.00
			1.00			1" Ice	0.20	0.15	0.01
ATMPP1412D-1CWA	A	From Leg	4.00	0.0000	89.00	No Ice	1.00	0.38	0.01
			0.00			1/2" Ice	1.13	0.48	0.02
			1.00			1" Ice	1.27	0.58	0.03
ATMPP1412D-1CWA	B	From Leg	4.00	0.0000	89.00	No Ice	1.00	0.38	0.01
			0.00			1/2" Ice	1.13	0.48	0.02
			1.00			1" Ice	1.27	0.58	0.03
ATMPP1412D-1CWA	C	From Leg	4.00	0.0000	89.00	No Ice	1.00	0.38	0.01
			0.00			1/2"	1.13	0.48	0.02

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
			1.00			Ice	1.27	0.58	0.03
						1" Ice			
Platform Mount [LP 305-1]	C	None		0.0000	89.00	No Ice	18.01	18.01	1.12
						1/2" Ice	23.33	23.33	1.35
						1" Ice	28.65	28.65	1.58
2.375" OD x 6' Mount Pipe	A	From Leg	4.00	0.0000	89.00	No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
2.375" OD x 6' Mount Pipe	B	From Leg	4.00	0.0000	89.00	No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
2.375" OD x 6' Mount Pipe	C	From Leg	4.00	0.0000	89.00	No Ice	1.43	1.43	0.03
			0.00			1/2" Ice	1.92	1.92	0.04
			0.00			1" Ice	2.29	2.29	0.05
****									
(2) 7770.00 w/ Mount Pipe	A	From Leg	4.00	0.0000	74.00	No Ice	5.83	4.74	0.09
			0.00			1/2" Ice	6.27	5.51	0.14
			2.00			1" Ice	6.70	6.21	0.21
(2) 7770.00 w/ Mount Pipe	B	From Leg	4.00	0.0000	74.00	No Ice	5.83	4.74	0.09
			0.00			1/2" Ice	6.27	5.51	0.14
			2.00			1" Ice	6.70	6.21	0.21
(2) 7770.00 w/ Mount Pipe	C	From Leg	4.00	0.0000	74.00	No Ice	5.83	4.74	0.09
			0.00			1/2" Ice	6.27	5.51	0.14
			2.00			1" Ice	6.70	6.21	0.21
P65-17-XLH-RR w/ Mount Pipe	A	From Leg	4.00	0.0000	74.00	No Ice	11.82	9.06	0.09
			0.00			1/2" Ice	12.59	10.62	0.18
			2.00			1" Ice	13.38	12.21	0.28
P65-17-XLH-RR w/ Mount Pipe	B	From Leg	4.00	0.0000	74.00	No Ice	11.82	9.06	0.09
			0.00			1/2" Ice	12.59	10.62	0.18
			2.00			1" Ice	13.38	12.21	0.28
P65-17-XLH-RR w/ Mount Pipe	C	From Leg	4.00	0.0000	74.00	No Ice	11.82	9.06	0.09
			0.00			1/2" Ice	12.59	10.62	0.18
			2.00			1" Ice	13.38	12.21	0.28
(2) LGP21903	A	From Leg	4.00	0.0000	74.00	No Ice	0.23	0.16	0.01
			0.00			1/2" Ice	0.29	0.21	0.01
			2.00			1" Ice	0.36	0.28	0.02
(2) LGP21903	B	From Leg	4.00	0.0000	74.00	No Ice	0.23	0.16	0.01
			0.00			1/2" Ice	0.29	0.21	0.01
			2.00			1" Ice	0.36	0.28	0.02
(2) LGP21903	C	From Leg	4.00	0.0000	74.00	No Ice	0.23	0.16	0.01
			0.00			1/2" Ice	0.29	0.21	0.01
			2.00			1" Ice	0.36	0.28	0.02
(2) LGP21401	A	From Leg	4.00	0.0000	74.00	No Ice	1.10	0.35	0.01
			0.00			1/2" Ice	1.24	0.44	0.02
			2.00			1" Ice	1.38	0.54	0.03
(2) LGP21401	B	From Leg	4.00	0.0000	74.00	No Ice	1.10	0.35	0.01
			0.00			1/2" Ice	1.24	0.44	0.02
			2.00			1" Ice	1.38	0.54	0.03
(2) LGP21401	C	From Leg	4.00	0.0000	74.00	No Ice	1.10	0.35	0.01
			0.00			1/2"	1.24	0.44	0.02

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
			2.00			Ice 1" Ice	1.38	0.54	0.03
RRUS-11	A	From Leg	4.00 0.00 2.00	0.0000	74.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	0.05 0.07 0.09
RRUS-11	B	From Leg	4.00 0.00 2.00	0.0000	74.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	0.05 0.07 0.09
RRUS-11	C	From Leg	4.00 0.00 2.00	0.0000	74.00	No Ice 1/2" Ice 1" Ice	2.79 3.00 3.21	1.19 1.34 1.50	0.05 0.07 0.09
DC6-48-60-18-8F	A	From Leg	4.00 0.00 2.00	0.0000	74.00	No Ice 1/2" Ice 1" Ice	0.92 1.46 1.64	0.92 1.46 1.64	0.02 0.04 0.06
Platform Mount [LP 303-1]	C	None		0.0000	74.00	No Ice 1/2" Ice 1" Ice	14.66 18.87 23.08	14.66 18.87 23.08	1.25 1.48 1.71
***									
(2) LPA-80063/6CFx2 w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	9.83 10.40 10.93	10.22 11.38 12.27	0.05 0.14 0.25
(2) LPA-80063/6CFx2 w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	9.83 10.40 10.93	10.22 11.38 12.27	0.05 0.14 0.25
(2) LPA-80063/6CFx2 w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	9.83 10.40 10.93	10.22 11.38 12.27	0.05 0.14 0.25
Platform Mount [LP 303-1]	C	None		0.0000	67.00	No Ice 1/2" Ice 1" Ice	14.66 18.87 23.08	14.66 18.87 23.08	1.25 1.48 1.71
(2) SBNHH-1D65B w/ Mount Pipe	A	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	8.40 8.96 9.49	7.07 8.26 9.18	0.07 0.14 0.21
(2) SBNHH-1D65B w/ Mount Pipe	B	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	8.40 8.96 9.49	7.07 8.26 9.18	0.07 0.14 0.21
(2) SBNHH-1D65B w/ Mount Pipe	C	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	8.40 8.96 9.49	7.07 8.26 9.18	0.07 0.14 0.21
B13 RRH 4X30	A	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	2.06 2.24 2.43	1.32 1.48 1.64	0.06 0.07 0.09
B13 RRH 4X30	B	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	2.06 2.24 2.43	1.32 1.48 1.64	0.06 0.07 0.09
B13 RRH 4X30	C	From Leg	4.00 0.00 0.00	0.0000	67.00	No Ice 1/2" Ice 1" Ice	2.06 2.24 2.43	1.32 1.48 1.64	0.06 0.07 0.09
B66A RRH4X45	A	From Leg	4.00 0.00	0.0000	67.00	No Ice 1/2"	2.58 2.79	1.63 1.81	0.07 0.09

Description	Face or Leg	Offset Type	Offsets: Horz Lateral ft	Vert ft	Azimuth Adjustment °	Placement ft		C_AA_A Front ft^2	C_AA_A Side ft^2	Weight K
			0.00				Ice	3.01	2.00	0.11
							1" Ice			
B66A RRH4X45	B	From Leg	4.00	0.0000		67.00	No Ice	2.58	1.63	0.07
			0.00				1/2"	2.79	1.81	0.09
			0.00				Ice	3.01	2.00	0.11
							1" Ice			
B66A RRH4X45	C	From Leg	4.00	0.0000		67.00	No Ice	2.58	1.63	0.07
			0.00				1/2"	2.79	1.81	0.09
			0.00				Ice	3.01	2.00	0.11
							1" Ice			
RC2DC-3315-PF-48	A	From Leg	4.00	0.0000		67.00	No Ice	3.79	2.51	0.03
			0.00				1/2"	4.04	2.72	0.06
			0.00				Ice	4.30	2.94	0.10
							1" Ice			
RC2DC-3315-PF-48	B	From Leg	4.00	0.0000		67.00	No Ice	3.79	2.51	0.03
			0.00				1/2"	4.04	2.72	0.06
			0.00				Ice	4.30	2.94	0.10
							1" Ice			
****										
KS24019-L112A	C	From Leg	4.00	0.0000		52.00	No Ice	0.14	0.14	0.01
			0.00				1/2"	0.20	0.20	0.01
			2.00				Ice	0.26	0.26	0.01
							1" Ice			
Side Arm Mount [SO 701-1]	C	None		0.0000		52.00	No Ice	0.85	1.67	0.07
							1/2"	1.14	2.34	0.08
							Ice	1.43	3.01	0.09
							1" Ice			

Tower Pressures - No Ice

G_H = 1.100

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
L1 98.00-82.79	90.09	1.238	26	17.555	A	0.000	17.555	17.555	100.00	0.000	0.000
					B	0.000	17.555		100.00	0.000	0.000
					C	0.000	17.555		100.00	0.000	0.000
L2 82.79-45.29	63.01	1.148	24	59.905	A	0.000	59.905	59.905	100.00	0.000	0.000
					B	0.000	59.905		100.00	0.000	0.000
					C	0.000	59.905		100.00	0.000	11.132
L3 45.29-0.00	22.26	0.922	19	104.167	A	0.000	104.167	104.167	100.00	0.000	0.000
					B	0.000	104.167		100.00	0.000	0.000
					C	0.000	104.167		100.00	0.000	25.483

Tower Pressure - With Ice

G_H = 1.100

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
L1 98.00-82.79	90.09	1.238	8	2.2113	23.161	A	0.000	23.161	23.161	100.00	0.000	0.000
						B	0.000	23.161		100.00	0.000	0.000
						C	0.000	23.161		100.00	0.000	0.000
L2 82.79-45.29	63.01	1.148	7	2.1336	73.726	A	0.000	73.726	73.726	100.00	0.000	0.000
						B	0.000	73.726		100.00	0.000	0.000
						C	0.000	73.726		100.00	0.000	37.809
L3 45.29-0.00	22.26	0.922	6	1.9227	120.273	A	0.000	120.273	120.273	100.00	0.000	0.000

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft²	Face	A_F ft²	A_R ft²	A_{leg} ft²	Leg %	C_AA_A In Face ft²	C_AA_A Out Face ft²
						B	0.000	120.273		100.00	0.000	0.000
						C	0.000	120.273		100.00	0.000	85.610

Tower Pressure - Service

G_H = 1.100

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
L1 98.00-82.79	90.09	1.238	10	17.555	A	0.000	17.555	17.555	100.00	0.000	0.000
					B	0.000	17.555		100.00	0.000	0.000
					C	0.000	17.555		100.00	0.000	0.000
L2 82.79-45.29	63.01	1.148	9	59.905	A	0.000	59.905	59.905	100.00	0.000	0.000
					B	0.000	59.905		100.00	0.000	0.000
					C	0.000	59.905		100.00	0.000	11.132
L3 45.29-0.00	22.26	0.922	7	104.167	A	0.000	104.167	104.167	100.00	0.000	0.000
					B	0.000	104.167		100.00	0.000	0.000
					C	0.000	104.167		100.00	0.000	25.483

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
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

Comb. No.	Description
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
L1	98 - 82.79	Pole	Max Tension	20	0.00	-0.00	-0.00
			Max. Compression	26	-10.78	0.13	-0.03
			Max. Mx	20	-3.32	36.08	0.18
			Max. My	14	-3.33	-0.20	-35.87
			Max. Vy	20	-5.53	36.08	0.18
			Max. Vx	14	5.51	-0.20	-35.87
			Max. Torque	5			0.10
L2	82.79 - 45.29	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-38.89	4.59	-1.90
			Max. Mx	20	-11.82	471.71	1.11
			Max. My	14	-11.82	-0.82	-470.88
			Max. Vy	20	-16.67	471.71	1.11
			Max. Vx	14	16.67	-0.82	-470.88
			Max. Torque	11			0.33
L3	45.29 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	26	-61.11	17.81	-9.46
			Max. Mx	20	-21.33	1389.05	1.94
			Max. My	14	-21.33	-0.91	-1387.58
			Max. Vy	20	-20.94	1389.05	1.94
			Max. Vx	14	20.95	-0.91	-1387.58
			Max. Torque	24			0.98

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	26	61.11	-0.00	0.00
	Max. H_x	21	16.03	20.90	0.04
	Max. H_z	3	16.03	0.04	20.90
	Max. M_x	2	1385.33	0.04	20.90
	Max. M_z	8	1384.73	-20.90	-0.04
	Max. Torsion	24	0.98	10.48	18.12
	Min. Vert	21	16.03	20.90	0.04
	Min. H_x	9	16.03	-20.90	-0.04
	Min. H_z	15	16.03	-0.04	-20.90
	Min. M_x	14	-1387.58	-0.04	-20.90
	Min. M_z	20	-1389.05	20.90	0.04
	Min. Torsion	12	-0.98	-10.48	-18.12

Tower Mast Reaction Summary

Load Combination	Vertical K	$Shear_x$ K	$Shear_z$ K	Overturning Moment, M_x kip-ft	Overturning Moment, M_z kip-ft	Torque kip-ft

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	17.81	0.00	-0.00	0.90	1.73	-0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	21.37	-0.04	-20.90	-1385.33	5.24	-0.95
0.9 Dead+1.6 Wind 0 deg - No Ice	16.03	-0.04	-20.90	-1365.47	4.63	-0.95
1.2 Dead+1.6 Wind 30 deg - No Ice	21.37	10.42	-18.09	-1198.26	-688.75	-0.67
0.9 Dead+1.6 Wind 30 deg - No Ice	16.03	10.42	-18.09	-1181.04	-679.22	-0.67
1.2 Dead+1.6 Wind 60 deg - No Ice	21.37	18.08	-10.42	-689.56	-1197.60	-0.20
0.9 Dead+1.6 Wind 60 deg - No Ice	16.03	18.08	-10.42	-679.77	-1180.64	-0.21
1.2 Dead+1.6 Wind 90 deg - No Ice	21.37	20.90	0.04	4.20	-1384.73	0.31
0.9 Dead+1.6 Wind 90 deg - No Ice	16.03	20.90	0.04	3.86	-1365.12	0.31
1.2 Dead+1.6 Wind 120 deg - No Ice	21.37	18.12	10.48	697.12	-1200.63	0.75
0.9 Dead+1.6 Wind 120 deg - No Ice	16.03	18.12	10.48	686.67	-1183.62	0.74
1.2 Dead+1.6 Wind 150 deg - No Ice	21.37	10.48	18.12	1203.55	-694.04	0.98
0.9 Dead+1.6 Wind 150 deg - No Ice	16.03	10.48	18.12	1185.70	-684.43	0.98
1.2 Dead+1.6 Wind 180 deg - No Ice	21.37	0.04	20.90	1387.58	-0.91	0.95
0.9 Dead+1.6 Wind 180 deg - No Ice	16.03	0.04	20.90	1367.14	-1.42	0.95
1.2 Dead+1.6 Wind 210 deg - No Ice	21.37	-10.42	18.09	1200.50	693.07	0.67
0.9 Dead+1.6 Wind 210 deg - No Ice	16.03	-10.42	18.09	1182.71	682.42	0.67
1.2 Dead+1.6 Wind 240 deg - No Ice	21.37	-18.08	10.42	691.81	1201.91	0.21
0.9 Dead+1.6 Wind 240 deg - No Ice	16.03	-18.08	10.42	681.45	1183.84	0.21
1.2 Dead+1.6 Wind 270 deg - No Ice	21.37	-20.90	-0.04	-1.94	1389.05	-0.31
0.9 Dead+1.6 Wind 270 deg - No Ice	16.03	-20.90	-0.04	-2.18	1368.32	-0.31
1.2 Dead+1.6 Wind 300 deg - No Ice	21.37	-18.12	-10.48	-694.86	1204.96	-0.75
0.9 Dead+1.6 Wind 300 deg - No Ice	16.03	-18.12	-10.48	-684.99	1186.83	-0.74
1.2 Dead+1.6 Wind 330 deg - No Ice	21.37	-10.48	-18.12	-1201.29	698.38	-0.98
0.9 Dead+1.6 Wind 330 deg - No Ice	16.03	-10.48	-18.12	-1184.03	687.64	-0.98
1.2 Dead+1.0 Ice+1.0 Temp	61.11	0.00	-0.00	9.46	17.81	-0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	61.11	-0.01	-7.14	-554.25	18.96	-0.71
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	61.11	3.56	-6.18	-478.17	-263.26	-0.48
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	61.11	6.18	-3.56	-271.45	-470.21	-0.12
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	61.11	7.14	0.01	10.60	-546.29	0.28
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	61.11	6.19	3.58	292.35	-471.32	0.59
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	61.11	3.58	6.19	498.30	-265.22	0.75
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	61.11	0.01	7.14	573.19	16.73	0.71
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	61.11	-3.56	6.18	497.17	298.97	0.48
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	61.11	-6.18	3.56	290.40	505.88	0.11
1.2 Dead+1.0 Wind 270	61.11	-7.14	-0.01	8.37	581.95	-0.28

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
deg+1.0 Ice+1.0 Temp 1.2 Dead+1.0 Wind 300	61.11	-6.19	-3.58	-273.38	507.01	-0.59
deg+1.0 Ice+1.0 Temp 1.2 Dead+1.0 Wind 330	61.11	-3.58	-6.19	-479.33	300.91	-0.75
deg+1.0 Ice+1.0 Temp Dead+Wind 0 deg - Service	17.81	-0.01	-4.87	-319.63	2.51	0.06
Dead+Wind 30 deg - Service	17.81	2.43	-4.21	-276.33	-157.92	0.00
Dead+Wind 60 deg - Service	17.81	4.21	-2.43	-158.73	-275.55	-0.05
Dead+Wind 90 deg - Service	17.81	4.86	0.01	1.65	-318.87	-0.09
Dead+Wind 120 deg - Service	17.81	4.22	2.44	161.83	-276.26	-0.11
Dead+Wind 150 deg - Service	17.81	2.44	4.22	278.91	-159.15	-0.09
Dead+Wind 180 deg - Service	17.81	0.01	4.87	321.50	1.09	-0.06
Dead+Wind 210 deg - Service	17.81	-2.43	4.21	278.20	161.52	-0.00
Dead+Wind 240 deg - Service	17.81	-4.21	2.43	160.60	279.15	0.05
Dead+Wind 270 deg - Service	17.81	-4.86	-0.01	0.23	322.46	0.09
Dead+Wind 300 deg - Service	17.81	-4.22	-2.44	-159.96	279.86	0.11
Dead+Wind 330 deg - Service	17.81	-2.44	-4.22	-277.04	162.75	0.09

Solution Summary

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX	PY	PZ	PX	PY	PZ	% Error
	K	K	K	K	K	K	
1	0.00	-17.81	0.00	-0.00	17.81	0.00	0.003%
2	-0.04	-21.37	-20.91	0.04	21.37	20.90	0.008%
3	-0.04	-16.03	-20.91	0.04	16.03	20.90	0.006%
4	10.42	-21.37	-18.09	-10.42	21.37	18.09	0.000%
5	10.42	-16.03	-18.09	-10.42	16.03	18.09	0.000%
6	18.08	-21.37	-10.42	-18.08	21.37	10.42	0.000%
7	18.08	-16.03	-10.42	-18.08	16.03	10.42	0.000%
8	20.90	-21.37	0.04	-20.90	21.37	-0.04	0.008%
9	20.90	-16.03	0.04	-20.90	16.03	-0.04	0.006%
10	18.12	-21.37	10.48	-18.12	21.37	-10.48	0.000%
11	18.12	-16.03	10.48	-18.12	16.03	-10.48	0.000%
12	10.48	-21.37	18.12	-10.48	21.37	-18.12	0.000%
13	10.48	-16.03	18.12	-10.48	16.03	-18.12	0.000%
14	0.04	-21.37	20.91	-0.04	21.37	-20.90	0.009%
15	0.04	-16.03	20.91	-0.04	16.03	-20.90	0.006%
16	-10.42	-21.37	18.09	10.42	21.37	-18.09	0.000%
17	-10.42	-16.03	18.09	10.42	16.03	-18.09	0.000%
18	-18.08	-21.37	10.42	18.08	21.37	-10.42	0.000%
19	-18.08	-16.03	10.42	18.08	16.03	-10.42	0.000%
20	-20.90	-21.37	-0.04	20.90	21.37	0.04	0.009%
21	-20.90	-16.03	-0.04	20.90	16.03	0.04	0.006%
22	-18.12	-21.37	-10.48	18.12	21.37	10.48	0.000%
23	-18.12	-16.03	-10.48	18.12	16.03	10.48	0.000%
24	-10.48	-21.37	-18.12	10.48	21.37	18.12	0.000%
25	-10.48	-16.03	-18.12	10.48	16.03	18.12	0.000%
26	0.00	-61.11	0.00	-0.00	61.11	0.00	0.001%
27	-0.01	-61.11	-7.14	0.01	61.11	7.14	0.002%
28	3.56	-61.11	-6.18	-3.56	61.11	6.18	0.002%
29	6.18	-61.11	-3.56	-6.18	61.11	3.56	0.001%
30	7.15	-61.11	0.01	-7.14	61.11	-0.01	0.002%
31	6.19	-61.11	3.58	-6.19	61.11	-3.58	0.001%
32	3.58	-61.11	6.19	-3.58	61.11	-6.19	0.001%
33	0.01	-61.11	7.14	-0.01	61.11	-7.14	0.002%
34	-3.56	-61.11	6.18	3.56	61.11	-6.18	0.001%
35	-6.18	-61.11	3.56	6.18	61.11	-3.56	0.001%
36	-7.15	-61.11	-0.01	7.14	61.11	0.01	0.002%

Load Comb.	Sum of Applied Forces PX K	PY K	PZ K	Sum of Reactions PX K	PY K	PZ K	% Error
37	-6.19	-61.11	-3.58	6.19	61.11	3.58	0.001%
38	-3.58	-61.11	-6.19	3.58	61.11	6.19	0.001%
39	-0.01	-17.81	-4.87	0.01	17.81	4.87	0.003%
40	2.43	-17.81	-4.21	-2.43	17.81	4.21	0.003%
41	4.21	-17.81	-2.43	-4.21	17.81	2.43	0.003%
42	4.87	-17.81	0.01	-4.86	17.81	-0.01	0.003%
43	4.22	-17.81	2.44	-4.22	17.81	-2.44	0.003%
44	2.44	-17.81	4.22	-2.44	17.81	-4.22	0.003%
45	0.01	-17.81	4.87	-0.01	17.81	-4.87	0.003%
46	-2.43	-17.81	4.21	2.43	17.81	-4.21	0.003%
47	-4.21	-17.81	2.43	4.21	17.81	-2.43	0.003%
48	-4.87	-17.81	-0.01	4.86	17.81	0.01	0.003%
49	-4.22	-17.81	-2.44	4.22	17.81	2.44	0.003%
50	-2.44	-17.81	-4.22	2.44	17.81	4.22	0.003%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	16	0.00009583	0.00013669
3	Yes	16	0.00006177	0.00010033
4	Yes	21	0.00000001	0.00009324
5	Yes	20	0.00000001	0.00012782
6	Yes	21	0.00000001	0.00009464
7	Yes	20	0.00000001	0.00012982
8	Yes	16	0.00009581	0.00012036
9	Yes	16	0.00006176	0.00008920
10	Yes	21	0.00000001	0.00009538
11	Yes	20	0.00000001	0.00013066
12	Yes	21	0.00000001	0.00009486
13	Yes	20	0.00000001	0.00012997
14	Yes	16	0.00009581	0.00012346
15	Yes	16	0.00006177	0.00009120
16	Yes	21	0.00000001	0.00009527
17	Yes	20	0.00000001	0.00013048
18	Yes	21	0.00000001	0.00009404
19	Yes	20	0.00000001	0.00012871
20	Yes	16	0.00009577	0.00012580
21	Yes	16	0.00006174	0.00009349
22	Yes	21	0.00000001	0.00009556
23	Yes	20	0.00000001	0.00013086
24	Yes	21	0.00000001	0.00009590
25	Yes	20	0.00000001	0.00013130
26	Yes	15	0.00000001	0.00000473
27	Yes	19	0.00014441	0.00002691
28	Yes	19	0.00014357	0.00014469
29	Yes	20	0.00008025	0.00008701
30	Yes	19	0.00014451	0.00001950
31	Yes	20	0.00008012	0.00009319
32	Yes	20	0.00008012	0.00008805
33	Yes	19	0.00014423	0.00002659
34	Yes	20	0.00007993	0.00010273
35	Yes	20	0.00007993	0.00009879
36	Yes	19	0.00014413	0.00002024
37	Yes	20	0.00008001	0.00009455
38	Yes	20	0.00008001	0.00009953
39	Yes	16	0.00000001	0.00003957
40	Yes	16	0.00000001	0.00005243
41	Yes	16	0.00000001	0.00005453
42	Yes	16	0.00000001	0.00003966
43	Yes	16	0.00000001	0.00005165
44	Yes	16	0.00000001	0.00005589
45	Yes	16	0.00000001	0.00003974
46	Yes	16	0.00000001	0.00005446
47	Yes	16	0.00000001	0.00005259
48	Yes	16	0.00000001	0.00004008

49	Yes	16	0.00000001	0.00005711
50	Yes	16	0.00000001	0.00005260

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	98 - 82.79	23.721	49	1.9578	0.0020
L2	85.21 - 45.29	18.507	49	1.9133	0.0019
L3	48.71 - 0	6.107	48	1.1842	0.0008

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
94.00	(2) DB980H65E-M w/ Mount Pipe	49	22.079	1.9518	0.0020	21096
89.00	APXV18-209014-C w/ Mount Pipe	49	20.038	1.9365	0.0019	11714
74.00	(2) 7770.00 w/ Mount Pipe	49	14.135	1.7675	0.0017	3718
67.00	(2) LPA-80063/6CFx2 w/ Mount Pipe	49	11.597	1.6297	0.0015	2769
52.00	KS24019-L112A	48	6.944	1.2680	0.0009	1791

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	98 - 82.79	102.184	20	8.4679	0.0074
L2	85.21 - 45.29	79.749	22	8.2754	0.0057
L3	48.71 - 0	26.355	22	5.1195	0.0034

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
94.00	(2) DB980H65E-M w/ Mount Pipe	20	95.118	8.4420	0.0073	5123
89.00	APXV18-209014-C w/ Mount Pipe	20	86.333	8.3756	0.0066	2843
74.00	(2) 7770.00 w/ Mount Pipe	22	60.937	7.6442	0.0049	890
67.00	(2) LPA-80063/6CFx2 w/ Mount Pipe	22	50.009	7.0475	0.0044	659
52.00	KS24019-L112A	22	29.963	5.4821	0.0035	421

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	A in^2	P_u K	ϕP_n K	Ratio $\frac{P_u}{\phi P_n}$
L1	98 - 82.79 (1)	TP15.28x12x0.1875	15.21	0.00	0.0	8.6713	-3.32	644.24	0.005
L2	82.79 - 45.29 (2)	TP22.86x14.3831x0.25	39.92	0.00	0.0	17.3648	-11.82	1290.12	0.009
L3	45.29 - 0 (3)	TP32x21.6338x0.3125	48.71	0.00	0.0	31.4300	-21.33	2327.26	0.009

Pole Bending Design Data

Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{nx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy} kip-ft	ϕM_{ny} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
L1	98 - 82.79 (1)	TP15.28x12x0.1875	36.20	192.07	0.188	0.00	192.07	0.000
L2	82.79 - 45.29 (2)	TP22.86x14.3831x0.25	472.62	578.51	0.817	0.00	578.51	0.000
L3	45.29 - 0 (3)	TP32x21.6338x0.3125	1390.95	1513.43	0.919	0.00	1513.43	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	98 - 82.79 (1)	TP15.28x12x0.1875	5.55	322.12	0.017	0.00	384.61	0.000
L2	82.79 - 45.29 (2)	TP22.86x14.3831x0.25	16.70	645.06	0.026	0.16	1158.43	0.000
L3	45.29 - 0 (3)	TP32x21.6338x0.3125	20.98	1163.63	0.018	0.75	3030.57	0.000

Pole Interaction Design Data

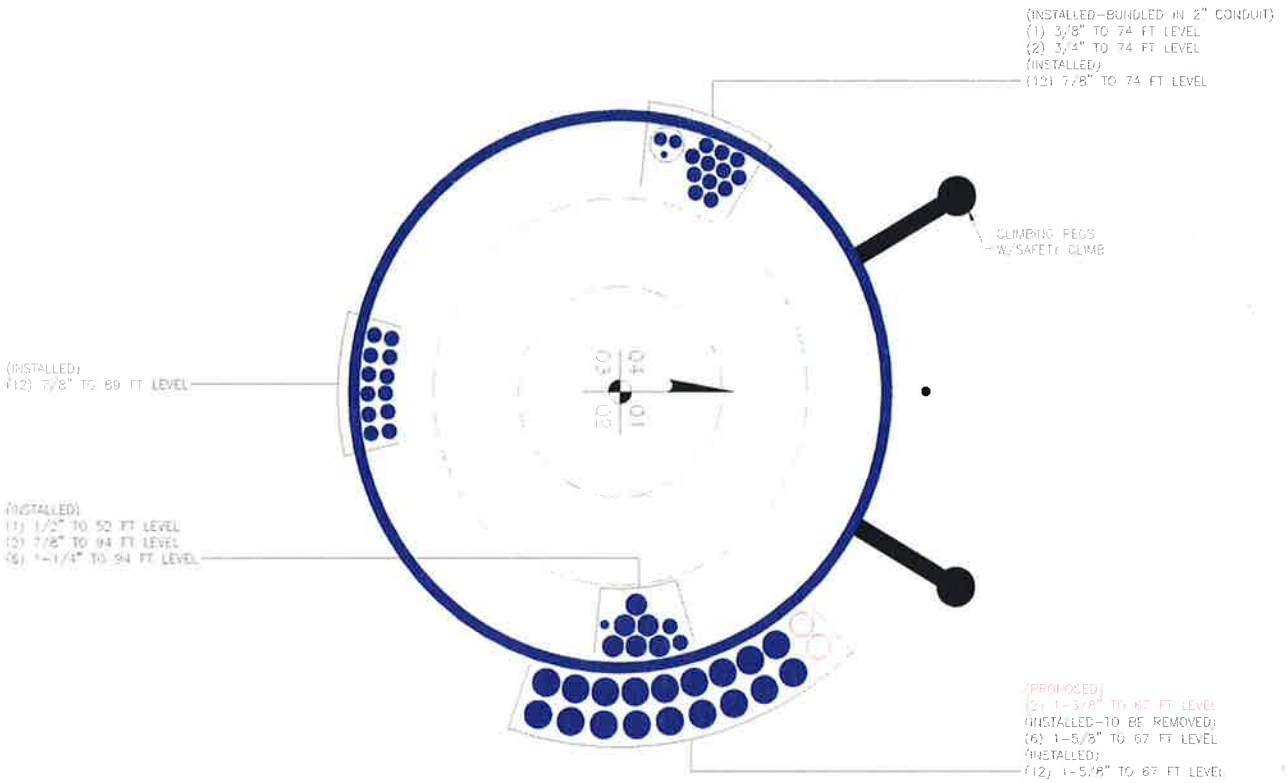
Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	98 - 82.79 (1)	0.005	0.188	0.000	0.017	0.000	0.194 ✔	1.000	4.8.2 ✔
L2	82.79 - 45.29 (2)	0.009	0.817	0.000	0.026	0.000	0.827 ✔	1.000	4.8.2 ✔
L3	45.29 - 0 (3)	0.009	0.919	0.000	0.018	0.000	0.929 ✔	1.000	4.8.2 ✔

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	98 - 82.79	Pole	TP15.28x12x0.1875	1	-3.32	644.24	19.4	Pass
L2	82.79 - 45.29	Pole	TP22.86x14.3831x0.25	2	-11.82	1290.12	82.7	Pass
L3	45.29 - 0	Pole	TP32x21.6338x0.3125	3	-21.33	2327.26	92.9	Pass
							Summary	
						Pole (L3)	92.9	Pass
						RATING =	**92.9**	**Pass**

APPENDIX B

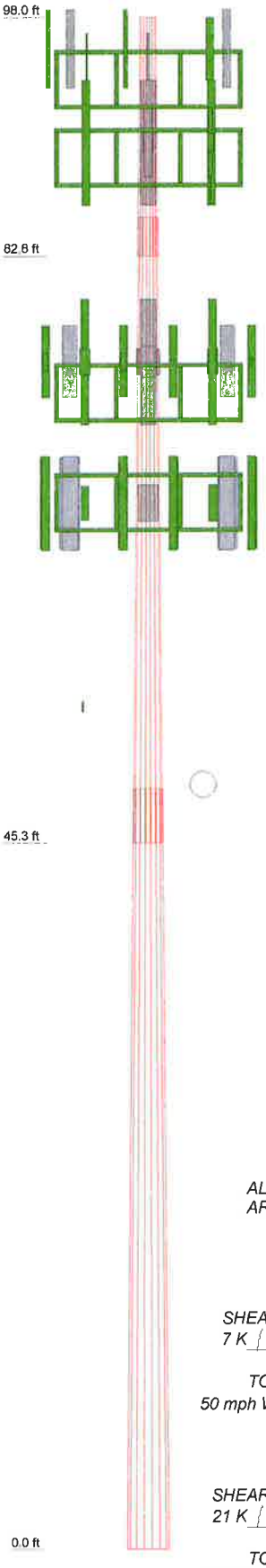
BASE LEVEL DRAWING



APPENDIX C

ADDITIONAL CALCULATIONS

Section	1	2	3
Length (ft)	15.21	39.92	48.71
Number of Sides	18	18	18
Thickness (in)	0.1875	0.2500	0.3125
Socket Length (ft)	2.42	3.42	
Top Dia (in)	12.0000	14.3831	21.6338
Bot Dia (in)	15.2800	22.8600	32.0000
Grade	A572-65		
Weight (K)	0.4	2.0	4.4



ALL REACTIONS ARE FACTORED

AXIAL 61 K
SHEAR 7 K
MOMENT 583 kip-ft
TORQUE 1 kip-ft
50 mph WIND - 1.0000 in ICE

AXIAL 21 K
SHEAR 21 K
MOMENT 1391 kip-ft
TORQUE 1 kip-ft
REACTIONS - 93 mph WIND

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) DB980H65E-M w/ Mount Pipe	94	P65-17-XLH-RR w/ Mount Pipe	74
HBX-6516DS-VTM w/ Mount Pipe	94	(2) LGP21903	74
BXA-80063/4CF w/ Mount Pipe	94	(2) LGP21903	74
(2) DB980H65E-M w/ Mount Pipe	94	(2) LGP21903	74
Platform Mount [LP 305-1]	94	(2) LGP21401	74
2.375" OD x 6' Mount Pipe	94	(2) LGP21401	74
2.375" OD x 6' Mount Pipe	94	(2) LGP21401	74
2.375" OD x 6' Mount Pipe	94	RRUS-11	74
APXV18-209014-C w/ Mount Pipe	89	RRUS-11	74
APXV18-209014-C w/ Mount Pipe	89	RRUS-11	74
APXV18-209014-C w/ Mount Pipe	89	DC6-48-60-18-8F	74
LNX-6515DS-VTM w/ Mount Pipe	89	Platform Mount [LP 303-1]	74
LNX-6515DS-VTM w/ Mount Pipe	89	(2) LPA-80063/6CFx2 w/ Mount Pipe	67
LNX-6515DS-VTM w/ Mount Pipe	89	(2) LPA-80063/6CFx2 w/ Mount Pipe	67
ATBT-BOTTOM-24V	89	(2) LPA-80063/6CFx2 w/ Mount Pipe	67
ATBT-BOTTOM-24V	89	Platform Mount [LP 303-1]	67
ATBT-BOTTOM-24V	89	(2) SBNHH-1D65B w/ Mount Pipe	67
ATMPP1412D-1CWA	89	(2) SBNHH-1D65B w/ Mount Pipe	67
ATMPP1412D-1CWA	89	(2) SBNHH-1D65B w/ Mount Pipe	67
ATMPP1412D-1CWA	89	B13 RRH 4X30	67
Platform Mount [LP 305-1]	89	B13 RRH 4X30	67
2.375" OD x 6' Mount Pipe	89	B13 RRH 4X30	67
2.375" OD x 6' Mount Pipe	89	B66A RRH4X45	67
2.375" OD x 6' Mount Pipe	89	B66A RRH4X45	67
(2) 7770.00 w/ Mount Pipe	74	B66A RRH4X45	67
(2) 7770.00 w/ Mount Pipe	74	RC2DC-3315-PF-48	67
(2) 7770.00 w/ Mount Pipe	74	RC2DC-3315-PF-48	67
P65-17-XLH-RR w/ Mount Pipe	74	KS24019-L112A	52
P65-17-XLH-RR w/ Mount Pipe	74	Side Arm Mount [SO 701-1]	52

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure C to the TIA-222-G Standard.
2. Tower designed for a 93 mph basic wind in accordance with the TIA-222-G Standard.
3. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Structure Class II.
6. Topographic Category 1 with Crest Height of 0.00 ft
7. TOWER RATING: 92.9%

Paul J. Ford and Company
250 East Broad St., Suite 600
Columbus, Ohio
Phone: 614.221.6679
FAX:

Job: 98ft Monopole / (F) E. Granby 4Q2000 / Galasso			
Project: 37516-3532 / BU 876399			
Client: Crown Castle	Drawn by: jjohnson	App'd:	
Code: TIA-222-G	Date: 11/07/16	Scale: N	
Path:		Dwg No.	

PAUL J. FORD & COMPANY
250 E Broad St, Ste 600 • Columbus, OH 43215
Phone 614.221.6679 www.pauljford.com

v4.4 - Effective 7-12-13

Date: 11/7/2016
PJF Project: 37516-3532.001.6000
Client Ref. # 876399
Site Name: (F) E. Granby 4Q2000 / Galasso
Description: 98ft Monopole
Owner: CCI
Engineer: JRJ

Asymmetric Anchor Rod Analysis

Moment =	1391	k-ft	TIA Ref.	G	Location =	Base Plate		
Axial =	21.0	kips	ASIF =	1.0000	η =	0.55	for BP, Rev. G Sect. 4.9.9	
Shear =	21.0	kips	Max Ratio =	105.0%	Threads =	N/A	for FP, Rev. G	
Anchor Qty =	12							

** For Post Installed Anchors: Check anchors for embedment, epoxy/grout bond, and capacity based on proof load. **

Item	Nominal Anchor Dia, in	Spec	Fy, ksi	Fu, ksi	Location, degrees	Anchor Circle, in	Area Override, in^2	Area, in^2	Max Net Compression, kips	Max Net Tension, kips	Load for Capacity Calc, kips	Capacity Override, kips	Capacity, kips	Capacity Ratio
1	2.250	#18J A615 Gr 75	75	100	0.0	40.00	0.00	3.98	133.90	130.41	137.08	0.00	260.00	52.7%
2	2.250	#18J A615 Gr 75	75	100	45.0	40.00	0.00	3.98	117.70	114.21	120.87	0.00	260.00	46.5%
3	2.250	#18J A615 Gr 75	75	100	90.0	40.00	0.00	3.98	127.65	124.16	130.83	0.00	260.00	50.3%
4	2.250	#18J A615 Gr 75	75	100	135.0	40.00	0.00	3.98	139.62	136.13	142.79	0.00	260.00	54.9%
5	2.250	#18J A615 Gr 75	75	100	180.0	40.00	0.00	3.98	131.98	128.49	135.15	0.00	260.00	52.0%
6	2.250	#18J A615 Gr 75	75	100	225.0	40.00	0.00	3.98	124.93	121.44	128.11	0.00	260.00	49.3%
7	2.250	#18J A615 Gr 75	75	100	270.0	40.00	0.00	3.98	138.88	135.39	142.05	0.00	260.00	54.6%
8	2.250	#18J A615 Gr 75	75	100	315.0	40.00	0.00	3.98	148.22	144.73	151.39	0.00	260.00	58.2%
9	0.000				0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0%
10	2.500	Williams R71	127.7	150	10.0	44.00	0.00	5.35	190.46	185.77	194.73	0.00	622.80	31.3%
11	2.500	Williams R71	127.7	150	110.0	44.00	0.00	5.35	199.99	195.30	204.26	0.00	622.80	32.8%
12	2.500	Williams R71	127.7	150	230.0	44.00	0.00	5.35	184.85	180.16	189.12	0.00	622.80	30.4%
								47.89						

Stiffened or Unstiffened, Ungrouted, Circular Base Plate - Any Rod Material

TIA Rev G Assumption: Clear space between bottom of leveling nut and top of concrete **not** exceeding (1)*(Rod Diameter)

Site Data

BU#:	
Site Name:	
App #:	
Pole Manufacturer:	*Other*

Reactions		
Mu:	974.26667	ft-kips
Axial, Pu:	14	kips
Shear, Vu:	14	kips
Eta Factor, η	0.5	TIA G (Fig. 4-4)

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

Anchor Rod Data		
Qty:	8	
Diam:	2.25	in
Rod Material:	A615-J	
Strength (Fu):	100	ksi
Yield (Fy):	75	ksi
Bolt Circle:	40	in

Plate Data		
Diam:	46	in
Thick:	1.5	in
Grade:	60	ksi
Single-Rod B-eff:	12.70	in

Stiffener Data (Welding at both sides)		
Config:	3	*
Weld Type:	Fillet	
Groove Depth:		<-- Disregard
Groove Angle:		<-- Disregard
Fillet H. Weld:	0.375	in
Fillet V. Weld:	0.375	in
Width:	6	in
Height:	18	in
Thick:	0.5	in
Notch:	0.5	in
Grade:	50	ksi
Weld str.:	70	ksi
Clear Space between Stiffeners (b):	10.4	in

Pole Data		
Diam:	32	in
Thick:	0.3125	in
Grade:	65	ksi
# of Sides:	18	"0" IF Round
Fu	80	ksi
Reinf. Fillet Weld	0	"0" if None

Anchor Rod Results

		Stiffened
Max Rod (Cu+ Vu/ń):	151.4 Kips	AISC LRFD
Allowable Axial, Φ*Fu*Anet:	260.0 Kips	φ*Tn
Anchor Rod Stress Ratio:	58.2% Pass	

Base Plate Results Flexural Check

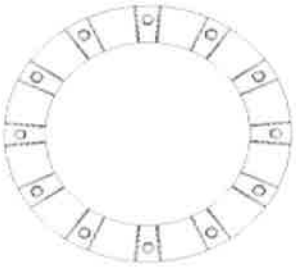
		Stiffened
Base Plate Stress:	40.3 ksi	AISC LRFD
Allowable Plate Stress:	54.0 ksi	φ*Fy
Base Plate Stress Ratio:	74.6% Pass	Y.L. Length: N/A, Roark

Stiffener Results

Horizontal Weld :	57.8% Pass
Vertical Weld:	19.8% Pass
Plate Flex+Shear, fb/Fb+(fv/Fv)^2:	11.6% Pass
Plate Tension+Shear, ft/Ft+(fv/Fv)^2	44.9% Pass
Plate Comp. (AISC Bracket):	48.2% Pass

Pole Results

Pole Punching Shear Check:	7.0% Pass



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

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

Factored Foundation Loads:

	LC1	LC2	
Factored Axial Load (+Comp, -Ten) =	72.54	54.405	kips
Factored Horiz. Load at Top of Pier =	21	21	kips
Factored OTM at Top of Pier =	1391	1391	kips

LRFD Resistance and Load Factors:

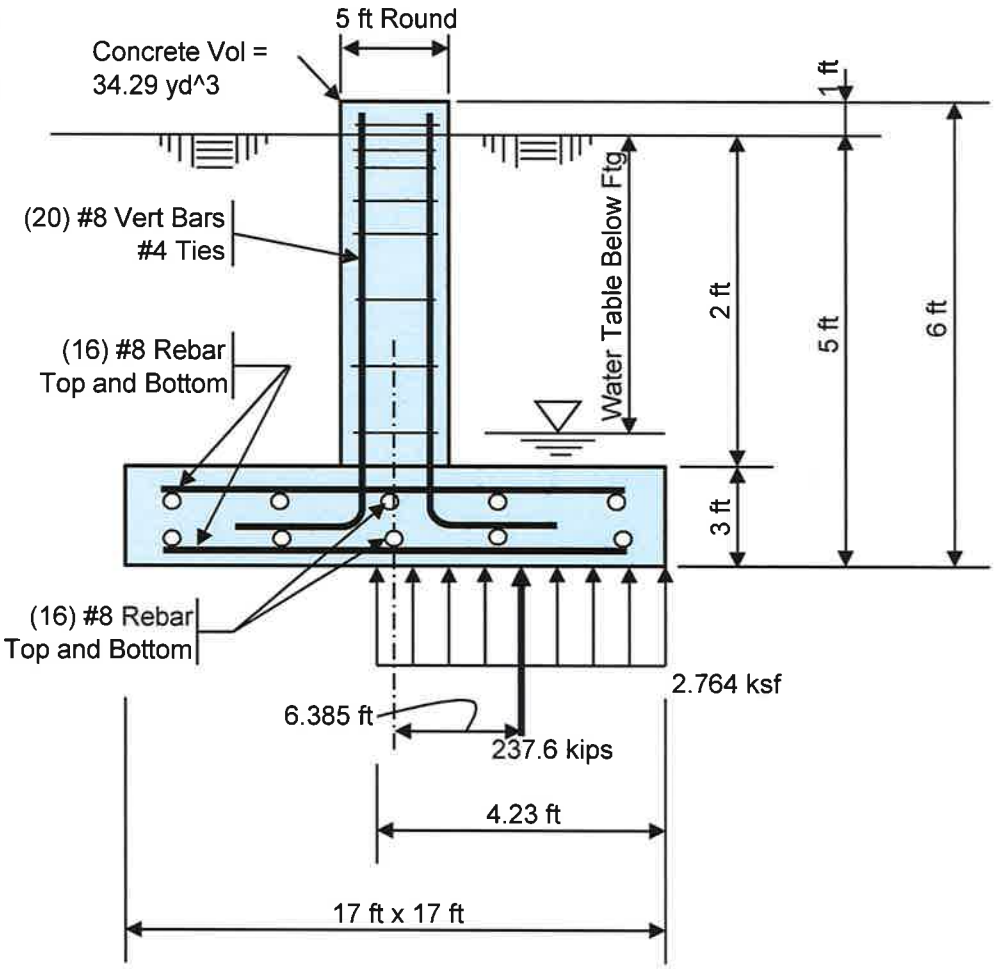
	Φ	Dead Load Factors	
Soil Bearing =	0.75		
Soil Weight =	0.75	1.2	0.9
Concrete Weight =	0.75	1.2	0.9

Soil Properties:

Depth to Water Table = 9 ft

Uplift Cone from Top of footing

Layer Thk ft	Soil Density pcf	Cohesion ksf	Friction Angle degrees	Ult Bearing ksf	Depth ft
5	120	0	0	8	5.00



Dimensions:

Pier Shape =	Round	
Pier Width =	5	ft Diameter
Pier Height above Grade =	1	ft
Depth to Bottom of Footing =	5	ft
Footing Thickness =	3	ft
Footing Width, B =	17	ft
Footing Length, L =	17	ft

Concrete:

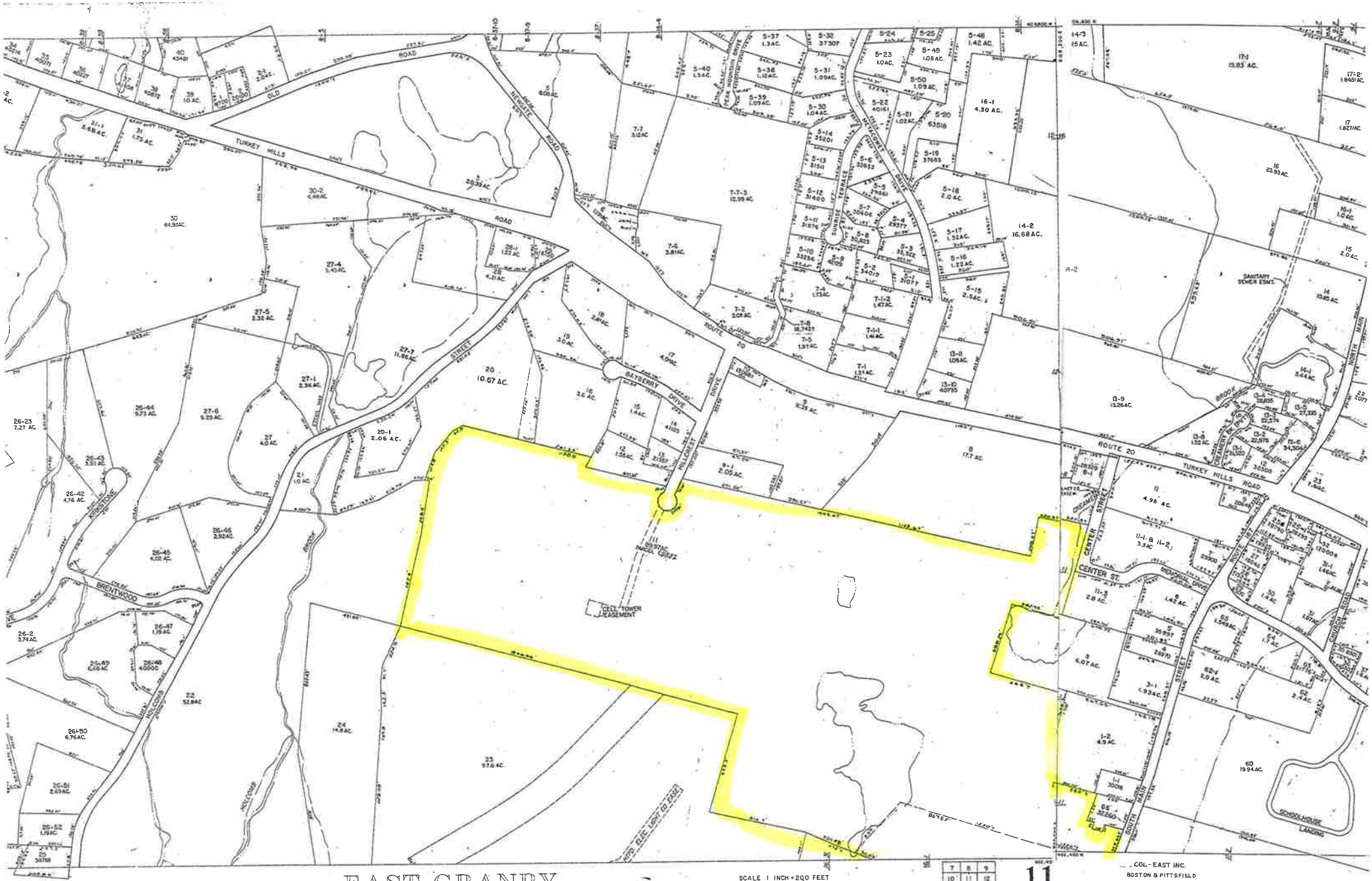
Concrete Strength =	3	ksi
Rebar Strength =	60	ksi

Total Pad Reinf Stl =	25.28	in^2 >= 13.22 in^2 = Min Stl, OK
Total Pier Reinf Stl =	15.80	in^2 >= 14.14 in^2 = Min Stl, OK
Footing Thickness =	3.00	ft >= 1.53 ft = Min Ftg Thk, OK

Summary Results:

	Required		Available		
Maximum Net Soil Bearing =	2.785	ksf	6.000	ksf	Stress Ratio = 46.4% in Soil Bearing
Uplift =	0.0	kips	152.7	kips	Stress Ratio = 0.0% in Uplift
Punching Shear Stress =	0.030	ksi	0.164	ksi	Stress Ratio = 18.5% in Punching Shear
Bending Shear Stress =	149.9	kips	527.9	kips	Stress Ratio = 28.4% in Bending Shear
Bending Moment =	733.09	k-ft	1750.3	k-ft	Stress Ratio = 41.9% in Bending Moment
Conc Pier Reinforcing Steel =	1454.0	k-ft	1962.1	k-ft	Stress Ratio = 74.1% in Pier Rebar

ATTACHMENT 4



EAST GRANBY

SCALE 1 INCH = 200 FEET

7	8	9
10	11	12
15	16	17

11

COL-EAST INC.
BOSTON & PITTSFIELD

60 SOUTH MAIN STREET

Location	60 SOUTH MAIN STREET	**Mblu**	11/ 11/ / /
Acct#	100819	**Owner**	GALASSO HOLDINGS LLC
Assessment	$1,281,200	**Appraisal**	$1,830,100
PID	341	**Building Count**	3

Current Value

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2013	$1,293,500	$536,600	$1,830,100
Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2013	$905,600	$375,600	$1,281,200

Owner of Record

Owner	GALASSO HOLDINGS LLC
Co-Owner	
Address	PO BOX 1776 EAST GRANBY, CT 06026

Sale Price	$0
Certificate	
Book & Page	0112/0814
Sale Date	03/06/1997

Ownership History

Ownership History				
Owner	**Sale Price**	**Certificate**	**Book & Page**	**Sale Date**
GALASSO HOLDINGS LLC	$0		0112/0814	03/06/1997

Building Information

Building 1 : Section 1

Year Built:	1969
Living Area:	43,230
Replacement Cost:	$933,768
Building Percent Good:	80
Replacement Cost Less Depreciation:	$747,000

Building Attributes	
Field	**Description**

STYLE	Garage
MODEL	Commercial
Grade	Average
Stories:	1
Occupancy	1
Exterior Wall A	Concr/Cinder
Exterior Wall B	
Roof Structure	Gable/Hip
Roof Cover	Tar & Gravel
Interior Wall A	Unfin/Minimum
Interior Wall B	
Interior Floor A	Concr-Finished
Interior Floor B	
Heating Fuel	Oil
Heating Type	Steam
AC Type	None
Bldg Use	Industrial MDL-94
Total Rooms	
Total Bedrms	00
Total Baths	0
1st Floor Use:	3-1C
Heat/AC	NONE
Frame Type	MASONRY
Baths/Plumbing	AVERAGE
Ceiling/Wall	NONE
Rooms/Prtns	AVERAGE
Wall Height	16
% Comn Wall	0

Building 2 : Section 1

Year Built: 1969
Living Area: 5,720
Replacement Cost: $242,083
Building Percent Good: 80
Replacement Cost Less Depreciation: $193,700

Building Attributes : Bldg 2 of 3	
Field	**Description**
STYLE	Light Indust
MODEL	Industrial
Grade	Average

Building Photo

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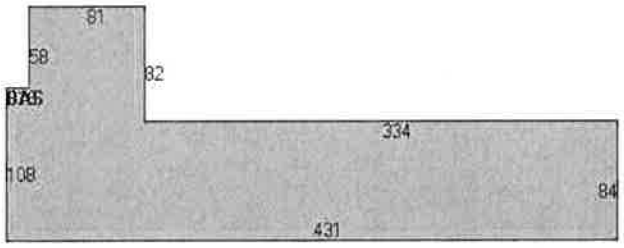
Building Layout



Building Sub-Areas (sq ft)			Legend
Code	**Description**	**Gross Area**	**Living Area**
BAS	First Floor	43,230	43,230
		43,230	43,230

Stories:	1
Occupancy	1
Exterior Wall A	Concr/Cinder
Exterior Wall B	
Roof Structure	Gable/Hip
Roof Cover	Asphalt
Interior Wall A	Unfin/Minimum
Interior Wall B	
Interior Floor A	Concr-Finished
Interior Floor B	Minimum/Plywd
Heating Fuel	Oil
Heating Type	Forced Air-Duc
AC Type	None
Bldg Use	Industrial MDL-96
Total Rooms	
Total Bedrms	00
Total Baths	0
1st Floor Use:	3-1
Heat/AC	NONE
Frame Type	MASONRY
Baths/Plumbing	AVERAGE
Ceiling/Wall	NONE
Rooms/Prtns	AVERAGE
Wall Height	10
% Comn Wall	0

Building Photo

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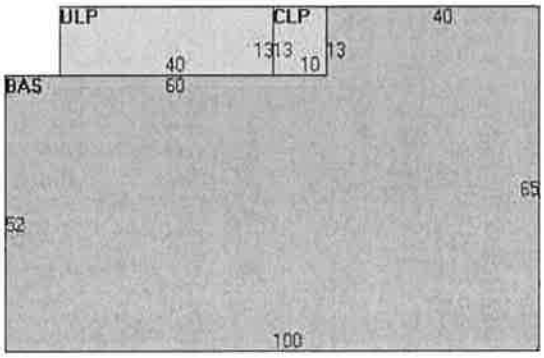
Building Layout



Building Sub-Areas (sq ft)			Legend
Code	Description	Gross Area	Living Area
BAS	First Floor	5,720	5,720
CLP	Loading Platform, Finished	130	0
ULP	Loading Platform, Unfinished	520	0
		6,370	5,720

Building 3 : Section 1

Year Built:	1972
Living Area:	8,000
Replacement Cost:	$347,440
Building Percent Good:	80
Replacement Cost Less Depreciation:	$278,000

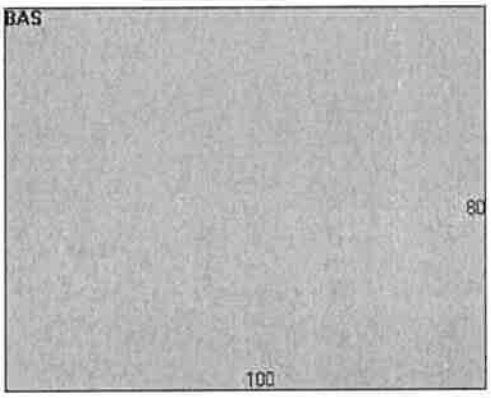
Building Attributes : Bldg 3 of 3	
Field	Description
STYLE	Light Indust
MODEL	Industrial

Grade	Average
Stories:	1
Occupancy	1
Exterior Wall A	Concr/Cinder
Exterior Wall B	
Roof Structure	Flat
Roof Cover	Rolled Compos
Interior Wall A	Unfin/Minimum
Interior Wall B	
Interior Floor A	Concr-Finished
Interior Floor B	
Heating Fuel	Oil
Heating Type	Steam
AC Type	None
Bldg Use	Industrial MDL-96
Total Rooms	0
Total Bedrms	0
Total Baths	0
1st Floor Use:	
Heat/AC	NONE
Frame Type	MASONRY
Baths/Plumbing	AVERAGE
Ceiling/Wall	NONE
Rooms/Prtns	AVERAGE
Wall Height	16
% Comn Wall	0

Building Photo

(http://images.vgsi.com/photos/EastGranbyCTPhotos//default.j

Building Layout



Building Sub-Areas (sq ft)			Legend
Code	Description	Gross Area	Living Area
BAS	First Floor	8,000	8,000
		8,000	8,000

Extra Features

Extra Features				Legend
Code	Description	Size	Value	Bldg #
MEZ	Mezzanine	960 S.F.	$11,500	3

Land

Land Use

Use Code	3-1C
Description	Industrial MDL-94
Zone	I
Neighborhood	

Land Line Valuation

Size (Acres)	89.97
Frontage	0
Depth	0
Assessed Value	$375,600

Alt Land Appr Category No

Appraised Value $536,600

Outbuildings

Outbuildings						Legend
Code	**Description**	**Sub Code**	**Sub Description**	**Size**	**Value**	**Bldg #**
SHED	Shed	A	Average	180 S.F.	$1,300	1
SHED	Shed	A	Average	640 S.F.	$3,500	2
LNT	Lean-To			350 S.F.	$1,400	1
SHED	Shed	A	Average	100 S.F.	$500	2
SHED	Shed	A	Average	200 S.F.	$3,600	3
LNT	Lean-To			240 S.F.	$1,000	2
SHED	Shed	A	Average	1250 S.F.	$11,300	1
GAR1	Garage	A	Average	1280 S.F.	$19,200	2
LNT	Lean-To			1472 S.F.	$8,800	1
SHED	Shed	A	Average	160 S.F.	$1,700	1
SHED	Shed	A	Average	252 S.F.	$1,400	2
SHED	Shed	A	Average	140 S.F.	$1,000	2
SHED	Shed	G	Good	360 S.F.	$8,600	1

Valuation History

Appraisal			
Valuation Year	**Improvements**	**Land**	**Total**
2012	$1,409,400	$359,400	$1,768,800
2007	$818,700	$429,800	$1,248,500
2003	$1,010,400	$367,100	$1,377,500

Assessment			
Valuation Year	**Improvements**	**Land**	**Total**
2012	$986,700	$251,600	$1,238,300
2007	$573,100	$300,900	$874,000
2003	$707,300	$256,900	$964,200