EMPIRE telecom

January 29, 2015

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

Regarding:	Notice of Exempt Modification – Addition of 3 radio heads previously approved
Property Address:	39 West Street, Danbury, CT (the "Property")
Applicant:	AT&T Mobility ("AT&T")

Dear Ms. Bachman:

AT&T currently maintains a wireless telecommunications facility on an existing rooftop self-supporting lattice tower ("tower") location, with a top height of 72.5 feet, on the Property. AT&T's facility consists of nine (9) wireless telecommunications antenna at 69 feet. The tower is controlled by AT&T Towers. The Council approved the previous application on August 24, 2011, reference number EM-CING-034-110805. This application (attached) granted AT&T the use of 6 radio heads at this location. The approval expired one year from the issue date. During that time AT&T made the changes to the site per the approval but only installed three (3) of the six (6) radio heads that they received approval. AT&T would now like to install the additional three(3) radio heads that were originally approved under EM-CING-034-110805.

Please accept this application 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 the Mayor and the City Planner for the City of Danbury. A copy of this letter is also being sent to AT&T Towers, the owner of the structure that AT&T is located.

The planned modifications to AT&T's facility fall squarely within those activities explicitly provided for in R.C.S.A. § 16-50j-72(b)(2).

1. The planned modifications will not result in an increase in the height of the existing structure. AT&T's additional, previously approved 3 radio heads will be installed at 63 foot level of the 72.5 foot rooftop lattice tower.
2. The proposed modifications will not involve any changes to ground-mounted equipment and, therefore will not require an extension of the site boundary.
3. The proposed modification will not increase the noise level at the facility by six decibel or more, or to levels that exceed state and local criteria.
4. The operation of the modified facility will not increase radio frequency (RF) emissions at the facility to a level at or above the Federal Communications Commission (FCC) safety

16 Esquire Road, Billerica, MA 01862 Mobile 617-639-4908 Email: Dcooper@empiretelecomm.com

EMPIRE telecom

standard. An RF emissions calculation (attached) for AT&T's modified facility was provided in the application which led to the August 24, 2011 Decision.

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 AT&T's proposed modifications. (Please see attached Structural analysis completed by CHA dated July 27, 2011).

For the foregoing reasons AT&T respectfully requests that the proposed addition of 3 radio heads previously approved be allowed within the exempt modifications under R.C.S.A. § 16-50j-72(b)(2).

Sincerely,

David P. Cooper
Director of Site Acquisition
Empire Telecom

CC: Mark D. Boughton, Mayor, City of Danbury
Dennis Elpern, Director, Planning and Zoning, City of Danbury
AT&T Towers

16 Esquire Road, Billerica, MA 01862 Mobile 617-639-4908 Email: Dcooper@empiretelecomm.com

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

CT2133

August 24, 2011

Douglas L. Culp, Real Estate Consultant
New Cingular Wireless PCS, LLC
500 Enterprise Drive
Rocky Hill, CT 06067-3900

RE: **EM-CING-034-110805** - New Cingular Wireless PCS, LLC notice of intent to modify an existing telecommunications facility located at 39 West Street, Danbury, Connecticut.

Dear Mr. Culp:

The Connecticut Siting Council (Council) hereby acknowledges your notice to modify this existing telecommunications facility, pursuant to Section 16-50j-73 of the Regulations of Connecticut State Agencies with the following conditions:

- Any deviation from the proposed modification as specified in this notice and supporting materials with Council shall render this acknowledgement invalid;
- Any material changes to this modification as proposed shall require the filing of a new notice with the Council;
- Not less than 45 days after completion of construction, the Council shall be notified in writing that construction has been completed;
- The validity of this action shall expire one year from the date of this letter; and
- The applicant may file a request for an extension of time beyond the one year deadline provided that such request is submitted to the Council not less than 60 days prior to the expiration;

The proposed modifications including the placement of all necessary equipment and shelters within the tower compound are to be implemented as specified here and in your notice dated <date>, 2011. The modifications are in compliance with the exception criteria in Section 16-50j-72 (b) of the Regulations of Connecticut State Agencies as changes to an existing facility site that would not increase tower height, extend the boundaries of the tower site, increase noise levels at the tower site boundary by six decibels, and increase the total radio frequencies electromagnetic radiation power density measured at the tower site boundary to or above the standard adopted by the State Department of Environmental Protection pursuant to General Statutes § 22a-162. This facility has also been carefully modeled to ensure that radio frequency emissions are conservatively below State and federal standards applicable to the frequencies now used on this tower.

This decision is under the exclusive jurisdiction of the Council. Please be advised that the validity of this action shall expire one year from the date of this letter. Any additional change to this facility will require explicit notice to this agency pursuant to Regulations of Connecticut State Agencies Section 16-50j-73. Such notice shall include all relevant information regarding the proposed change with cumulative worst-case modeling of radio frequency exposure at the closest point of uncontrolled access to the tower base, consistent with Federal Communications Commission, Office of Engineering and Technology, Bulletin 65. Thank you for your attention and cooperation.

Very truly yours,

Linda Roberts NHB

Linda Roberts
Executive Director

LR/CDM/laf

c: The Honorable Mark D. Boughton, Mayor, City of Danbury
Dennis Elpern, City Planner, City of Danbury
Christopher B. Fisher, Esq., Cuddy & Feder LLP

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

August 10, 2011

The Honorable Mark D. Boughton
Mayor
City of Danbury
City Hall
155 Deer Hill Avenue
Danbury, CT 06810

RE: **EM-CING-034-110805** - New Cingular Wireless PCS, LLC notice of intent to modify an existing telecommunications facility located at 39 West Street, Danbury, Connecticut.

Dear Mayor Boughton:

The Connecticut Siting Council (Council) received this request to modify an existing telecommunications facility, pursuant to Regulations of Connecticut State Agencies Section 16-50j-72.

If you have any questions or comments regarding this proposal, please call me or inform the Council by August 24, 2011.

Thank you for your cooperation and consideration.

Very truly yours,

LRoberts

Linda Roberts
Executive Director

LR/jbw

Enclosure: Notice of Intent

c: Dennis Elpern, City Planner, City of Danbury

CSC
CONNECTICUT SITING COUNCIL

EM-CING-034-110805

Cingular Wireless PCS, LLC
500 Enterprise Drive
Rocky Hill, Connecticut 06067-3900
Phone: (860) 463-5511
Fax: (860) 513-7190

Douglas L. Culp
Real Estate Consultant

HAND DELIVERED

August 5, 2011

Ms. Linda Roberts
Executive Director
Connecticut Siting Council
10 Franklin Square
New Britain, Connecticut 06051

Re: New Cingular Wireless PCS, LLC notice of intent to modify an existing telecommunications facility located at 39 West Street Danbury, CT (owner AT&T Corp.)

Dear Ms. Roberts:

In order to accommodate technological changes, implement Uniform Mobile Telecommunications System ("UMTS") and/or Long Term Evolution ("LTE") capabilities, and enhance system performance in the State of Connecticut, New Cingular Wireless PCS, LLC ("AT&T") plans to modify the equipment configurations at many of its existing cell sites. Please accept this letter and attachments as notification, pursuant to R.C.S.A. Section 16-50j-73, of construction which constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2). In compliance with R.C.S.A. Section 16-50j-73, a copy of this letter and attachments is being sent to the chief elected official of the municipality in which the affected cell site is located.

UMTS technology offers services to mobile computer and phone users anywhere in the world. Based on the Global System for Mobile ("GSM") communication standard, UMTS is the planned worldwide standard for mobile users. UMTS, fully implemented, gives computer and phone users high-speed access to the Internet as they travel. They have the same capabilities even when they roam, through both terrestrial wireless and satellite transmissions.

LTE is a new high-performance air interface for cellular mobile communications. It is designed to increase the capacity and speed of mobile telephone networks.

Attached is a summary of the planned modifications, including power density calculations reflecting the change in AT&T's operations at the site. Also included is documentation of the structural sufficiency of the tower to accommodate the revised antenna configuration.

The changes to the facility do not constitute modifications as defined in Connecticut General Statutes ("C.G.S.") Section 16-50i(d) because the general physical characteristics of the facility will not be significantly changed or altered. Rather, the planned changes to the facility fall squarely within those activities explicitly provided for in R.C.S.A. Section 16-50j-72(b)(2).

1. The height of the overall structure will be unaffected.

2. The proposed changes will not extend the site boundaries. There will be no effect on the site compound other than some enlarged equipment pads as may be noted in the attachments.

3. The proposed changes will not increase the noise level at the existing facility by six decibels or more.

4. Radio frequency power density may increase due to use of one or more GSM channel for UMTS transmissions. Moreover, LTE will utilize additional radio frequencies newly-licensed by the FCC for cellular mobile communications. However, the changes will not increase the calculated "worst case" power density for the combined operations at the site to a level at or above the applicable standard for uncontrolled environments as calculated for a mixed frequency site.

For the foregoing reasons, AT&T respectfully submits that the proposed changes at the referenced site constitute exempt modifications under R.C.S.A. Section 16-50j-72(b)(2).

Please feel free to call me at (860) 463-5511 with questions concerning this matter. Thank you for your consideration.

Sincerely,

Douglas L. Culp / SLL

Douglas L. Culp
Real Estate Consultant

Attachments

NEW CINGULAR WIRELESS PCS, LLC
Equipment Modification

39 West Street Danbury, CT
Site Number 2124
Docket 75.1, Petition 448, Ex. Mods. 9/92, 9/02, and 12/05

Tower Owner/Manager: AT&T Wireless

Equipment configuration: Lattice Structure on Rooftop

Current and/or approved:
Three PowerWave 7770 antennas @ 69 ft
Six PowerWave TMA's @ 69 ft
Nine runs 1 1/4 inch coax to 69 ft
Antenna Shroud
Equipment Room

Planned Modifications:
Retain existing PowerWave Antenna's and TMA's at 69 ft
Retain all existing Coax Cabling
Install three KMW 14-65 antennas or equivalent @ 63 ft
Install six remote radio heads (Ericsson RRUS-11) and surge arrestor/fiber connector (RayCap DC6-48-60-18-8F) @ 63 ft
Install one fiber and two DC power cables to 63ft
Extend antenna shroud to encompass additional antennas

Power Density:

Worst-case calculations for existing wireless operations at the site, using standard parameters for other carriers, indicate a radio frequency electromagnetic radiation power density, measured at ground level beside the Tower, of approximately 26.7% of the standard adopted by the FCC. As depicted in the second table below, the total radio frequency electromagnetic radiation power density following proposed modifications would be approximately 37.9% of the standard.

Existing

Company	Centerline Ht (feet)	Frequency (MHz)	Number of Channels	Power Per Channel (Watts)	Power Density (mW/cm^2)	Standard Limits (mW/cm^2)	Percent of Limit
Other Users							0.00
AT&T TDMA	69	880	16	40	0.0483	0.5867	8.24
AT&T GSM	69	800	4	296	0.0894	0.5867	15.24
AT&T GSM	69	1930	1	427	0.0322	1.0000	3.22
Total							**26.7%**

* Data are from Siting Council records.

Proposed

Company	Centerline Ht (feet)	Frequency (MHz)	Number of Channels	Power Per Channel (Watts)	Power Density (mW/cm^2)	Standard Limits (mW/cm^2)	Percent of Limit
Other Users							0.00
AT&T GSM	69	880 - 894	4	296	0.0894	0.5867	15.24
AT&T GSM	69	1900 Band	1	427	0.0322	1.0000	3.22
AT&T UMTS	69	880 - 894	1	500	0.0378	0.5867	6.44
AT&T UMTS	69	1900 Band	1	500	0.0378	1.0000	3.78
AT&T LTE	63	740 - 746	1	500	0.0453	0.4933	9.18
Total							**37.9%** *

* Data are from Siting Council records

Structural information:

The attached structural analysis demonstrates that the rooftop tower and underlying support structures have adequate structural capacity to accommodate the proposed modifications. (Clough Harbor Assoc. Group. dated 7-27-11).

NEW CINGULAR WIRELESS PCS, LLC
WIRELESS COMMUNICATIONS FACILITY CT2124
DANBURY CENTRAL

39 WEST STREET
DANBURY, CONNECTICUT

PROJECT SUMMARY

SITE NUMBER:	CT2124
SITE NAME:	DANBURY CENTRAL
SITE ADDRESS:	39 WEST STREET DANBURY, CT 06810
STRUCTURE OWNER:	AT&T CORP.
APPLICANT:	NEW CINGULAR WIRELESS PCS, LLC 500 ENTERPRISE DRIVE ROCKY HILL, CT 06067
CONTACT:	MICHAEL D. FOLEY (203) 414-1184
COORDINATES:	41° 23' 33.67"N 73° 27' 14.6"W
HORIZONTAL DATUM:	NAD 83
ENGINEER:	CHA, INC. 2139 SILAS DEANE HIGHWAY SUITE 212 ROCKY HILL, CT 06067
CONTACT:	PAUL LUSITANI (860) 257-4557

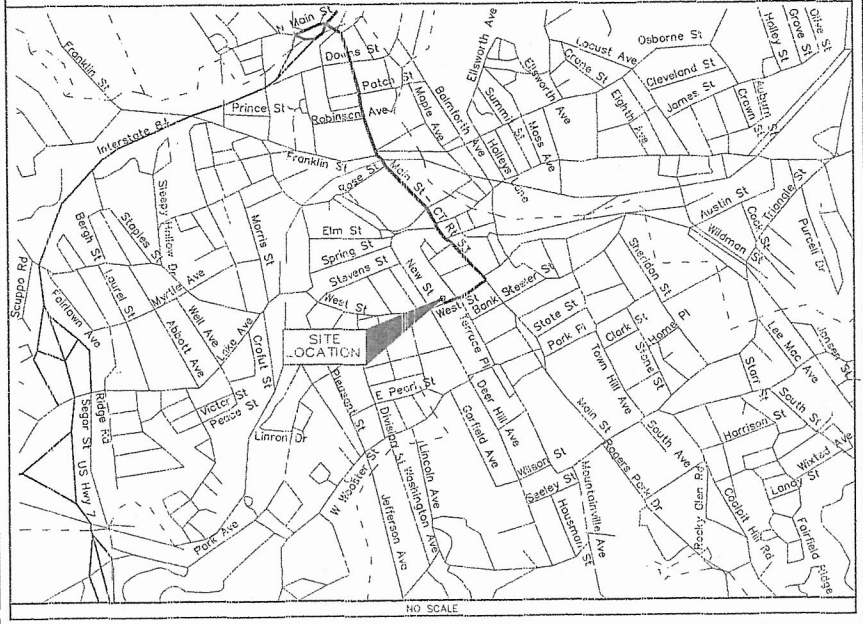
DRIVING DIRECTIONS

FROM HARTFORD:
1. MERGE ONTO I-84 W.
2. TAKE EXIT 5 FOR CT-39 TOWARD CT-53/DOWNTOWN DANBURY/BETHEL
3. TURN RIGHT ONTO N MAIN ST.
4. CONTINUE ONTO MAIN STREET/CT ROUTE 53
5. TURN RIGHT ONTO WEST ST.
6. TOWER IS ON TOP OF BUILDING LOCATED AT 39 WEST STREET.

PROJECT DESCRIPTION

THIS PROJECT ADDS THREE ANTENNAS, SIX RRH, SURGE ARRESTORS, AND A RADIO CABINET TO AN EXISTING TELECOMMUNICATIONS SITE

VICINITY MAP



NO SCALE

AUGUST 3, 2011

SHEET INDEX

SHEET NO:	SHEET TITLE	REVISION HISTORY NO:	REVISION HISTORY DATE
T01	TITLE SHEET	1	08 / 03 / 11
C01	ROOF PLAN	1	08 / 03 / 11
C02	EQUIPMENT ROOM PLAN	1	08 / 03 / 11
C03	ELEVATION AND ANTENNA PLAN	1	08 / 03 / 11
C04	STRUCTURAL DETAILS	1	08 / 03 / 11
E01	GROUNDING DETAILS & PLUMBING DIAGRAM	1	08 / 03 / 11
E02	WALL PENETRATION DETAILS	1	08 / 03 / 11
GN01	GENERAL NOTES	1	08 / 03 / 11

DO NOT SCALE DRAWINGS

CONTRACTOR SHALL VERIFY ALL PLANS & EXISTING DIMENSIONS & CONDITIONS ON THE JOB SITE & SHALL IMMEDIATELY NOTIFY THE ENGINEER IN WRITING OF ANY DISCREPANCIES BEFORE PROCEEDING WITH THE WORK OR BE RESPONSIBLE FOR SAME

at&t
Your world. Delivered.

NEW CINGULAR WIRELESS PCS, LLC
500 ENTERPRISE DRIVE
ROCKY HILL, CT 06067

CHA
2139 Silas Deane Highway, Suite 212 Rocky Hill, CT 06067-2338
Main (860) 257-4557 • www.chacompanies.com

CHA PROJECT NO:
22702 – 1005 – 43000

NO.	SUBMITTAL		
0	03/11/11	ISSUED FOR REVIEW	
	BY: JDV	CHK: PAL	APP'D: JPS
1	08/03/11	ISSUED FOR CONSTRUCTION	
	BY: PA	CHK: PAL	APP'D: JPS

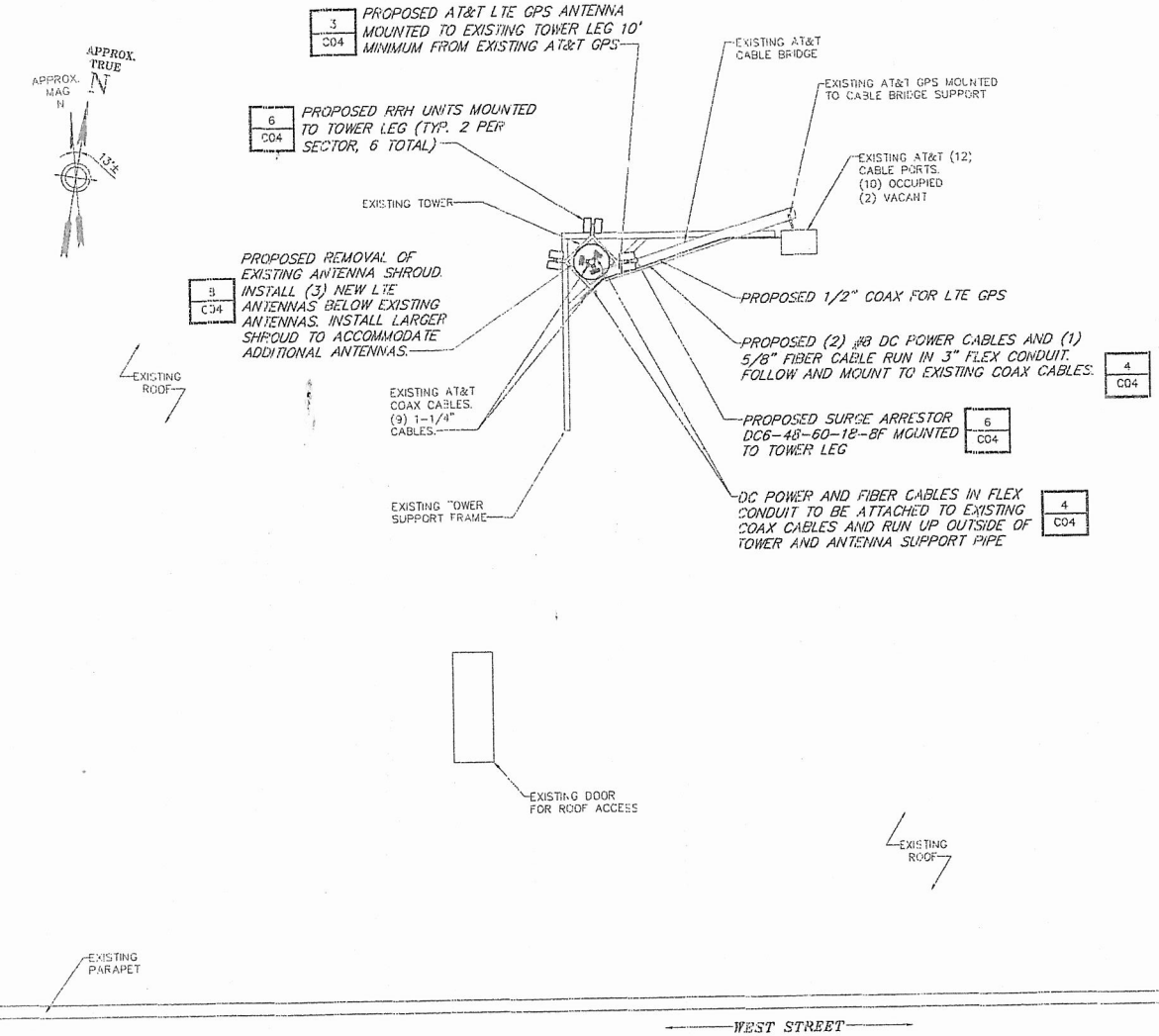
STATE OF CONNECTICUT
JOHN P. SOBIECH
No. 17827
LICENSED PROFESSIONAL ENGINEER

IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

SITE ID:
CT2124
SITE NAME:
DANBURY CENTRAL
SITE ADDRESS:
39 WEST STREET
DANBURY, CT
06810
FAIRFIELD COUNTY

SHEET TITLE
TITLE SHEET

SHEET NUMBER
T01



1 C01 ROOF PLAN

GRAPHIC SCALE

10 0 5 10

IN FEET

at&t
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NEW CINGULAR WIRELESS PCS, LLC
500 ENTERPRISE DRIVE
ROCKY HILL, CT 06067

CHA

2139 Silas Deane Highway, Suite 212 Rocky Hill, CT (860) 529-4349
Main (860) 257-4507 • www.chadesignpartners.com

CHA PROJECT NO:
22702 – 1005 – 43000

NO.	SUBMITTAL		
0	03/11/11	ISSUED FOR REVIEW	
	BY: JDV	CHK: FHL	APP'D: JPS
1	08/03/11	ISSUED FOR CONSTRUCTION	
	BY: PA	CHK: FHL	APP'D: JPS

STATE OF CONNECTICUT
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SITE ID:
CT2124
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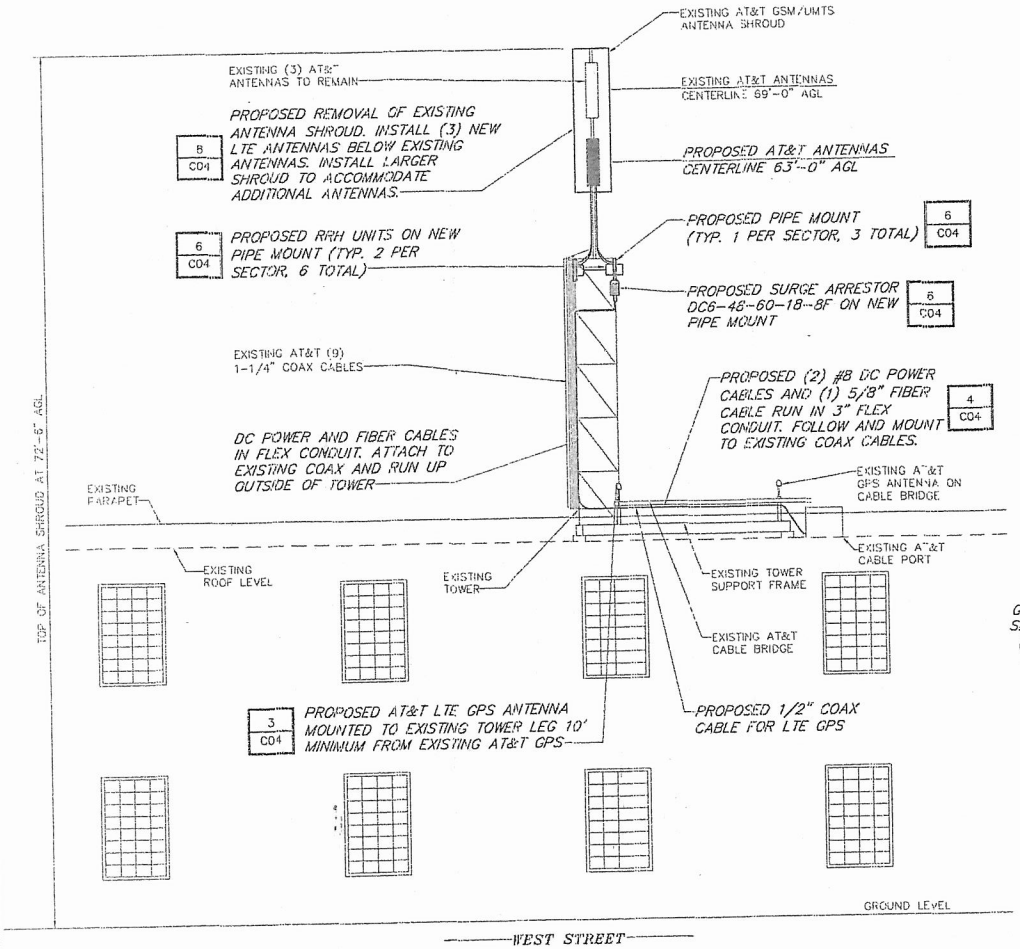
DANBURY CENTRAL
SITE ADDRESS:
39 WEST STREET
DANBURY, CT
06810
FAIRFIELD COUNTY

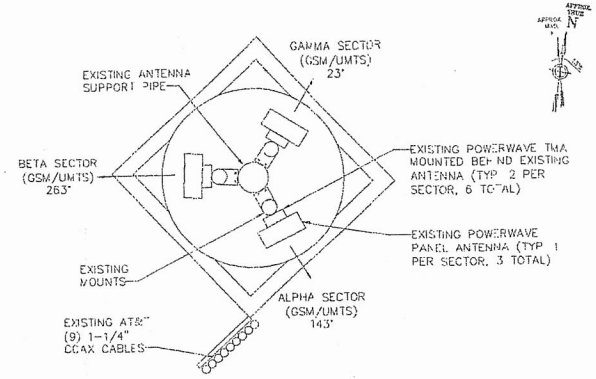
SHEET TITLE
ROOF PLAN

SHEET NUMBER
C01

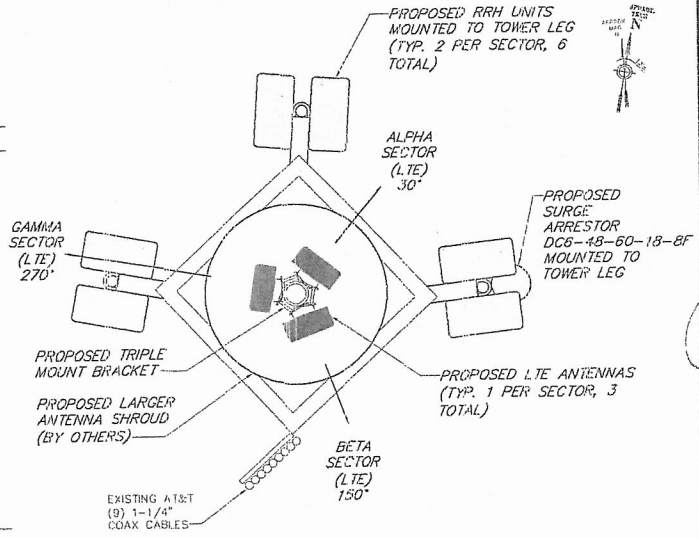


1 C03 **TOWER ELEVATION**
SCALE: 1" = 5' FULL SIZE
1" = 10' 11 x 17
GRAPHIC SCALE
10 0 5 10
IN FEET

NOTE:
A STRUCTURAL ANALYSIS OF THE EXISTING TOWER AND BUILDING HAS NOT BEEN PERFORMED. AN ANALYSIS OF THE EXISTING STRUCTURES MUST BE PERFORMED PRIOR TO CONSTRUCTION TO CONFIRM STRUCTURE IS CAPABLE OF SUPPORTING PROPOSED LOADS.



EXISTING CONFIGURATION @ 69' AGL



PROPOSED CONFIGURATION @ 63' AGL

2 C03 **ANTENNA PLANS**
SCALE: N.T.S.

NOTE:
REFER TO FINAL RFDS FOR FINAL SECTOR CONFIGURATIONS.

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NEW CINGULAR WIRELESS PCS, LLC
500 ENTERPRISE DRIVE
ROCKY HILL, CT 06067

CHA
2129 Elias Boyce Highway, Suite 212 · Rocky Hill, CT (860) 257-4237 · www.chaarchitects.com

CHA PROJECT NO:
22702 – 1005 – 43000

NO.	SUBMITTAL	
0	03/11/11	ISSUED FOR REVIEW
	BY: JDP	CHK: PAL / APP'D: JPS
1	06/03/11	ISSUED FOR CONSTRUCTION
	BY: PA	CHK: PAL / APP'D: JPS

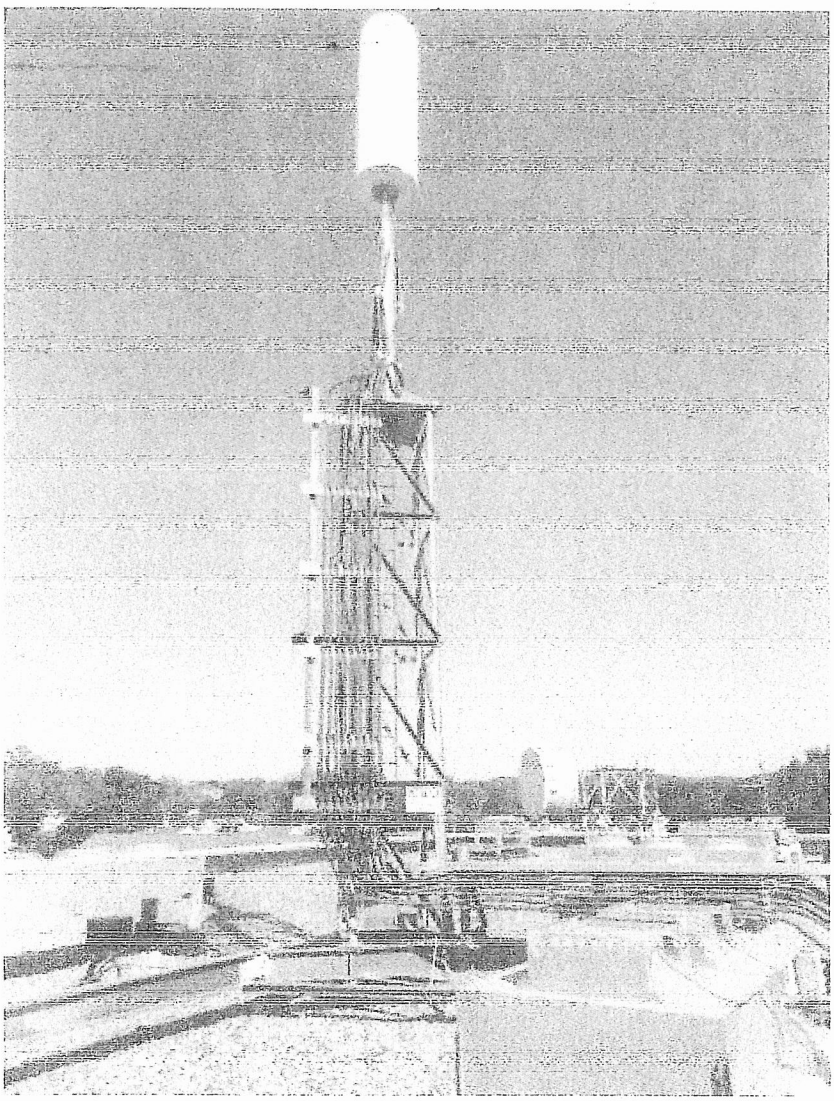
STATE OF CONNECTICUT
JOHN P. SOBIESK
No. 17827
LICENSED PROFESSIONAL ENGINEER

SITE ID:
CT2124
SITE NAME:
DANBURY CENTRAL
SITE ADDRESS:
39 WEST STREET
DANBURY, CT
06810
FAIRFIELD COUNTY

SHEET TITLE
ELEVATION AND ANTENNA PLAN

SHEET NUMBER
C03

Danbury Central
CT2124
Fairfield County, Connecticut



Prepared for:
New Cingular Wireless PCS, LLC
500 Enterprise Drive
Rocky Hill, CT 06067
July 27, 2011

CHA
2139 Silas Deane Highway
Suite 212
Rocky Hill, CT 06067-2336
Tel: (860) 257-4557

CHA Project No. 22702.1005.28000

July 27, 2011

New Cingular Wireless PCS, LLC
500 Enterprise Drive
Rocky Hill, CT 06067

RE: **Structural Analysis of the Danbury Central Rooftop Tower**
CT2124
Located in Fairfield County, CT
CHA Project No. 22702.1005.28000

To Whom It May Concern:

CHA has performed a structural analysis under the provisions of TIA-EIA-222-F of the referenced lattice tower for the purpose of evaluating its ability to support the existing equipment loads in addition to the new equipment proposed by New Cingular Wireless PCS, LLC. In summary, our analysis indicates that the tower *is* structurally capable of supporting the existing and proposed loads.

Our analysis and design is based on the following information:

- Tower member sizes and configuration obtained from a site investigation report by NE Towers, dated July 15, 2011.
- Proposed equipment information, including antenna models and elevations, provided by New Cingular Wireless PCS, LLC.
- A site visit performed by CHA, dated March 21, 2011.

Our analysis includes data for the following proposed antennas and cables:

New Cingular Wireless:

- (3) KMW AM-X-CD-14-65-00T-RET panel antennas mounted on (3) pipe mounts, supported by the existing tower top post within a new concealment shroud at an antenna centerline elevation of 63'AGL with (2) #8 DC power cables and (1) 5/8" fiber cable run inside (1) 2" diameter innerduct.
- (6) Remote Radio Units attached to the existing tower leg at an antenna centerline elevation of 54' AGL.

- (1) Raycap DC6-48-60-18-8F surge arrester mounted to the existing tower leg, at an antenna centerline elevation of 51' AGL.

Existing Equipment:

- (3) Powerwave 7770 panel antennas mounted on (3) pipe mounts, supported by the existing tower top post at an antenna centerline elevation of 69'AGL with (9) 1-1/4" coaxial cables.
- (6) Powerwave LGP21401 TMA's.

The existing and proposed antenna elevations and coaxial cable sizes have been listed in the attached Executive Summary.

With this information, TIA/EIA-222-F, *Structural Standards for Steel Antenna Towers and Antenna Supporting Structures,* and the Connecticut State Building Code the analysis was performed to determine the structural integrity of the tower. Based on the data provided, section properties, member strengths, and projected areas, applicable loads were calculated. Knowing the projected area of the tower and all of its appurtenances, 85 mph wind loads were calculated with and without radial ice loads of 1/2". These wind and ice loads were then reduced to member forces in the tower components through RISA Tower structural analysis software. The member forces were then compared to the maximum allowable stress for each member type.

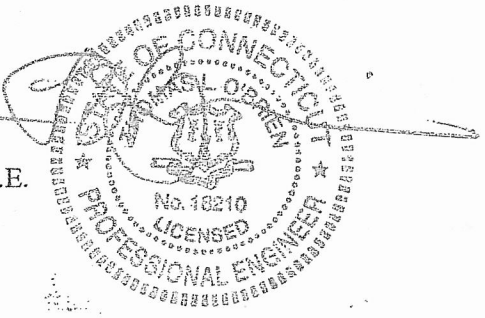
The analysis indicates that the existing tower ***is*** capable of supporting the existing and proposed loads under TIA/EIA-222-F.

The existing steel framing at the base of the tower was analyzed based on the reactions due to the existing and proposed loads. Based on this information, it can be concluded that the tower steel platform base ***is*** adequate for supporting the existing and proposed loads.

As requested, we have included a copy of the governing structural analysis calculations referenced above for your review and use. If you have any questions, or if we can be of further assistance, please do not hesitate to call.

Very truly yours,

Thomas L. O'Brien, P.E.
Partner



CHA

EXECUTIVE SUMMARY

Danbury Central Tower
CT2124

July 27, 2011

Tower Information:

Tower Owner:	Unknown
Tower Manufacturer:	Unknown.
Tower Height:	20 feet
Tower Type:	4-sided Lattice

Proposed Antenna Data:

New Cingular Wireless:

- (3) KMW AM-X-CD-14-65-00T-RET panel antennas mounted on (3) pipe mounts, supported by the existing tower top post within a new concealment shroud at an antenna centerline elevation of 63'AGL with (2) #8 DC power cables and (1) 5/8" fiber cable run inside (1) 2" diameter innerduct.
- (6) Remote Radio Units attached to the existing tower leg at an antenna centerline elevation of 54' AGL.
- (1) Raycap DC6-48-60-18-8F surge arrester mounted to the existing tower leg, at an antenna centerline elevation of 51' AGL.

Existing Antenna and Appurtenance Data:

Unknown Carrier:

- (3) Powerwave 7770 panel antennas, mounted on (3) pipe mounts, supported by the existing tower top post at an antenna centerline elevation of 69'AGL with (9)1-5/8" coaxial cables.
- (6) Powerwave LGP21401 TMA's.

Code Data:

Applicable Code: - TIA/EIA-222-F, Structural Standards for Steel Antenna Towers and Antenna Supporting Structures
- Connecticut State Building Code

Load Cases:

(1) Weight of Tower, Antennas, and Appurtenances plus Wind Load without radial ice at a wind speed of 85 mph.
(2) Weight of Tower, Antennas, and Appurtenances plus Wind Load on iced tower plus weight of 1/2" radial ice in conjunction with a wind speed of 74 mph.

Tower Leg Members: (A36 steel - Assumed)

0 – 20': L3 x 3 x 1/4" [Assumed angle thickness]

Tower Diagonal Members:

0' – 20': L2 1/2 x 2 x 3/16" (36 ksi)

Tower Horizontal Members:

0' – 20': L2 1/2 x 3 x 1/4" (36 ksi)

Top Girt Member:

20': L3x3x1/4 (36 ksi)

Tower Base Platform Analysis: (Existing and Proposed Equipment)

An analysis of the existing steel platform tower base was performed, and was found to be *adequate* for the proposed current analysis loads. The analysis calculations can be found within this report.

Conclusion:

The analysis indicates that the existing tower is structurally capable of supporting the existing and proposed loads.

Tower Superstructure:

The tower members are stressed at the following governing capacities for the load cases 1 & 2:

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	SF*P_{allow} lb	% Capacity	Pass Fail
T1	51.6 - 31.6	Leg	L3x3x1/4	3	-13743.90	24581.32	55.9	Pass
		Diagonal	L2 1/2x2x3/16	11	-3508.07	6535.54	53.7	Pass
		Horizontal	L2 1/2x3x1/4	15	-1789.66	28505.54	6.3	Pass
							20.8 (b)	
							Summary	
						Leg (T1)	55.9	Pass
						Diagonal (T1)	53.7	Pass
						Horizontal (T1)	20.8	Pass
						Bolt Checks	43.0	Pass
						RATING =	55.9	Pass

*The governing tower member is stressed at 55.9%.

68.1 ft

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
waveguide ladder (Ladder)	51.6	DC6-48-60-18 (SA)	51.6
7770.00	51.6	8' x 9" Panel w/ Mounting Pipe (S)	51.6
7770.00	51.6	8' x 9" Panel w/ Mounting Pipe (S)	51.6
7770.00	51.6	8' x 9" Panel w/ Mounting Pipe (S)	51.6
(2) RRU (SA)	51.6	waveguide ladder (Ladder)	36.6
(2) RRU (SA)	51.6	waveguide ladder (Ladder)	41.6
(2) RRU (SA)	51.6	waveguide ladder (Ladder)	36.6

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

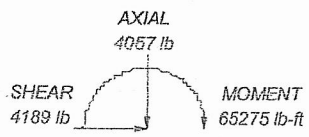
1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 60 mph wind.
5. 4.50 ft Shroud Post is included for load transfer only.
6. Weld together tower sections have flange connections.
7. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
8. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
9. Welds are fabricated with ER-70S-6 electrodes.

51.6 ft

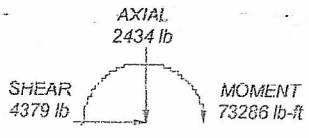
Section	T1							
Legs	L3x3x1/4							
Leg Grade	A36							
Diagonals	L2 1/2x2x3/16							
Diagonal Grade	A36							
Horizontals	L2 * /2x3x1/4							
Face Width (ft)	3.375							
# Panels @ (ft)	4 @ 5							
Weight (lb)	898.4							

31.6 ft

MAX. CORNER REACTIONS AT BASE:
DOWN: 15954 lb
UPLIFT: -14975 lb
SHEAR: 2023 lb



TORQUE 463 lb-ft
74 mph WIND - 0.5000 in ICE



TORQUE 297 lb-ft
REACTIONS - 85 mph WIND

CHA Consulting, Inc.
III Winners Circle
Albany, NY 12205
Phone: (518) 453-4500
FAX: (518) 453-4712

Job: CT2124 - Danbury Central			
Project: 22702-1005-28000			
Client: SAI	Drawn by: Tony Marruso	App'd:	
Code: TIA/EIA-222-F	Date: 07/27/11	Scale: NTS	
Path:		Dwg No. E-1	

New Cingular Wireless PCS, LLC
500 Enterprise Drive
Rocky Hill, Connecticut 06067-3900
Phone: (860) 463-5511
Fax: (860) 513-7190

Douglas L. Culp
Real Estate Consultant

August 5, 2011

Mayor Mark D. Boughton
City of Danbury
Danbury City Hall
155 Deer Hill Ave
Danbury, CT 06810

Re: Telecommunications Facility – 39 West Street Danbury, CT

Dear Mayor Boughton:

In order to accommodate technological changes, implement Uniform Mobile Telecommunications System ("UMTS") and Long Term Evolution ("LTE") capabilities, and enhance system performance in the State of Connecticut, New Cingular Wireless PCS, LLC ("AT&T") will be changing its equipment configuration at certain cell sites.

As required by Regulations of Connecticut State Agencies ("R.C.S.A.") Section 16-50j-73, the Connecticut Siting Council has been notified of the changes and will review AT&T's proposal. Please accept this letter as notification under Section 16-50j-73 of construction which constitutes an exempt modification pursuant to R.C.S.A. Section 16-50j-72(b)(2).

The accompanying letter to the Siting Council fully describes Cingular's proposal for the referenced cell site. However, if you have any questions or require any further information on our plans or the Siting Council's procedures; please call me at (860) 463-5511 or Ms. Linda Roberts, Executive Director, Connecticut Siting Council at (860) 827-2935.

Sincerely,

Douglas L. Culp /SLL

Douglas L. Culp
Real Estate Consultant

Enclosure

Danbury Central

CT2124

Fairfield County, Connecticut

Prepared for:

New Cingular Wireless PCS, LLC

500 Enterprise Drive

Rocky Hill, CT 06067

July 27, 2011

CHA

2139 Silas Deane Highway

Suite 212

Rocky Hill, CT 06067-2336

Tel: (860) 257-4557

CHA Project No. 22702.1005.28000

July 27, 2011

New Cingular Wireless PCS, LLC
500 Enterprise Drive
Rocky Hill, CT 06067

RE: Structural Analysis of the Danbury Central Rooftop Tower
CT2124
Located in Fairfield County, CT
CHA Project No. 22702.1005.28000

To Whom It May Concern:

CHA has performed a structural analysis under the provisions of TIA-EIA-222-F of the referenced lattice tower for the purpose of evaluating its ability to support the existing equipment loads in addition to the new equipment proposed by New Cingular Wireless PCS, LLC. In summary, our analysis indicates that the tower ***is*** structurally capable of supporting the existing and proposed loads.

Our analysis and design is based on the following information:

- Tower member sizes and configuration obtained from a site investigation report by NE Towers, dated July 15, 2011.
- Proposed equipment information, including antenna models and elevations, provided by New Cingular Wireless PCS, LLC.
- A site visit performed by CHA, dated March 21, 2011.

Our analysis includes data for the following proposed antennas and cables:

New Cingular Wireless:

- (3) KMW AM-X-CD-14-65-00T-RET panel antennas mounted on (3) pipe mounts, supported by the existing tower top post within a new concealment shroud at an antenna centerline elevation of 63'AGL with (2) #8 DC power cables and (1) 5/8" fiber cable run inside (1) 2" diameter innerduct.
- (6) Remote Radio Units attached to the existing tower leg at an antenna centerline elevation of 54' AGL.

- (1) Raycap DC6-48-60-18-8F surge arrester mounted to the existing tower leg, at an antenna centerline elevation of 51' AGL.

Existing Equipment:

- (3) Powerwave 7770 panel antennas mounted on (3) pipe mounts, supported by the existing tower top post at an antenna centerline elevation of 69'AGL with (9) 1-1/4" coaxial cables.
- (6) Powerwave LGP21401 TMA's.

The existing and proposed antenna elevations and coaxial cable sizes have been listed in the attached Executive Summary.

With this information, TIA/EIA-222-F, *Structural Standards for Steel Antenna Towers and Antenna Supporting Structures*, and the Connecticut State Building Code the analysis was performed to determine the structural integrity of the tower. Based on the data provided, section properties, member strengths, and projected areas, applicable loads were calculated. Knowing the projected area of the tower and all of its appurtenances, 85 mph wind loads were calculated with and without radial ice loads of 1/2". These wind and ice loads were then reduced to member forces in the tower components through RISA Tower structural analysis software. The member forces were then compared to the maximum allowable stress for each member type.

The analysis indicates that the existing tower ***is*** capable of supporting the existing and proposed loads under TIA/EIA-222-F.

The existing steel framing at the base of the tower was analyzed based on the reactions due to the existing and proposed loads. Based on this information, it can be concluded that the tower steel platform base ***is*** adequate for supporting the existing and proposed loads.

As requested, we have included a copy of the governing structural analysis calculations referenced above for your review and use. If you have any questions, or if we can be of further assistance, please do not hesitate to call.

Very truly yours,

Thomas L. O'Brien, P.E.
Partner

STATE OF CONNECTICUT
THOMAS L. O'BRIEN
No. 18210
LICENSED
PROFESSIONAL ENGINEER

CHA

EXECUTIVE SUMMARY

Danbury Central Tower
CT2124

July 27, 2011

Tower Information:

Tower Owner:	Unknown
Tower Manufacturer:	Unknown.
Tower Height:	20 feet
Tower Type:	4-sided Lattice

Proposed Antenna Data:

New Cingular Wireless:

- (3) KMW AM-X-CD-14-65-00T-RET panel antennas mounted on (3) pipe mounts, supported by the existing tower top post within a new concealment shroud at an antenna centerline elevation of 63'AGL with (2) #8 DC power cables and (1) 5/8" fiber cable run inside (1) 2" diameter innerduct.
- (6) Remote Radio Units attached to the existing tower leg at an antenna centerline elevation of 54' AGL.
- (1) Raycap DC6-48-60-18-8F surge arrester mounted to the existing tower leg, at an antenna centerline elevation of 51' AGL.

Existing Antenna and Appurtenance Data:

Unknown Carrier:

- (3) Powerwave 7770 panel antennas, mounted on (3) pipe mounts, supported by the existing tower top post at an antenna centerline elevation of 69'AGL with (9)1-5/8" coaxial cables.
- (6) Powerwave LGP21401 TMA's.

Code Data:

Applicable Code: - TIA/EIA-222-F, Structural Standards for Steel Antenna Towers and Antenna Supporting Structures
- Connecticut State Building Code

Load Cases:

(1) Weight of Tower, Antennas, and Appurtenances plus Wind Load without radial ice at a wind speed of 85 mph.
(2) Weight of Tower, Antennas, and Appurtenances plus Wind Load on iced tower plus weight of 1/2" radial ice in conjunction with a wind speed of 74 mph.

Tower Leg Members: (A36 steel - Assumed)

0 – 20': L3 x 3 x 1/4" [Assumed angle thickness]

Tower Diagonal Members:

0' – 20': L2 1/2 x 2 x 3/16" (36 ksi)

Tower Horizontal Members:

0' – 20': L2 1/2 x 3 x 1/4" (36 ksi)

Top Girt Member:

20': L3x3x1/4 (36 ksi)

Tower Base Platform Analysis: (Existing and Proposed Equipment)

An analysis of the existing steel platform tower base was performed, and was found to be *adequate* for the proposed current analysis loads. The analysis calculations can be found within this report.

Conclusion:

The analysis indicates that the existing tower is structurally capable of supporting the existing and proposed loads.

Tower Superstructure:

The tower members are stressed at the following governing capacities for the load cases 1 & 2:

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	51.6 - 31.6	Leg	L3x3x1/4	3	-13743.90	24581.32	55.9	Pass
		Diagonal	L2 1/2x2x3/16	11	-3508.07	6535.54	53.7	Pass
		Horizontal	L2 1/2x3x1/4	15	-1789.66	28505.54	6.3	Pass
							20.8 (b)	
							Summary	
						Leg (T1)	55.9	Pass
						Diagonal (T1)	53.7	Pass
						Horizontal (T1)	20.8	Pass
						Bolt Checks	43.0	Pass
						RATING =	55.9	Pass

*The governing tower member is stressed at 55.9%.

TOWER ELEVATION

68.1 ft

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
waveguide ladder (Ladder)	51.6	DC6-48-60-18 (SA)	51.6
7770.00	51.6	6' x 9" Panel w/ Mounting Pipe (E)	51.6
7770.00	51.6	6' x 9" Panel w/ Mounting Pipe (F)	51.6
7770.00	51.6	6' x 9" Panel w/ Mounting Pipe (F)	51.6
(2) RRU (SA)	51.6	waveguide ladder (Ladder)	46.6
(2) RRU (SA)	51.6	waveguide ladder (Ladder)	41.6
(2) RRU (SA)	51.6	waveguide ladder (Ladder)	36.6

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Fairfield County, Connecticut.
2. Tower designed for a 85 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 74 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 60 mph wind.
5. 4.50 ft Shroud Post is included for load transfer only.
6. Weld together tower sections have flange connections.
7. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
8. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
9. Welds are fabricated with ER-70S-6 electrodes.

51.6 ft

Section	T1
Legs	L3x3x1/4
Leg Grade	A36
Diagonals	L2 1/2x2x3/16
Diagonal Grade	A36
Horizontals	L2 1/2x3x1/4
Face Width (ft)	1.375
# Panels @ (ft)	4 @ 5
Weight (lb)	896.4

31.6 ft

MAX. CORNER REACTIONS AT BASE:
DOWN: 15954 lb
UPLIFT: -14975 lb
SHEAR: 2023 lb

AXIAL
4057 lb
SHEAR 4189 lb
MOMENT 65275 lb-ft
TORQUE 463 lb-ft
74 mph WIND - 0.5000 in ICE

AXIAL
2434 lb
SHEAR 4379 lb
MOMENT 73286 lb-ft
TORQUE 297 lb-ft
REACTIONS - 85 mph WIND

CHA Consulting, Inc.
III Winners Circle
Albany, NY 12205
Phone: (518) 453-4500
FAX: (518) 453-4712

Job: CT2124 - Danbury Central			
Project: 22702-1005-28000			
Client: SAI	Drawn by: Tony Marruso	App'd:	
Code: TIA/EIA-222-F	Date: 07/27/11	Scale: NTS	
Path:		Dwg No E-1	

TOWER COMPONENTS ANALYSIS

CHA COMPUTATION PAD

COMPLETED BY:	
CHECKED BY:	
PROJECT NAME:	Danbury Central CT 2124
PROJECT LOCATION:	39 West St. Danbury, CT 06810

PROJECT	PHASE	OPG
22722	1005	28000

SHEET #: 7 OF

DATE: 7.22.11

SUBJECT: Tower Component Analysis

<u>Existing Pipe Mast Analysis</u>: Exist Configuration = P8 std. (Assumed) w/ 5' x 2' shroud. | Remarks 7/15/11

Prop. Configuration - P8 std. (Cut Down) w/ 12' x 3' shroud
↳ (In order to keep exist. Ant. @ elev.)

Wind Loads ; $V = 85$ mph (Fairfield County) | TIA-222-F

$q_z = 0.00256\ K_z V^2$

$K_z = (z/33)^{2/7} = (53.75'/33)^{2/7} = 1.15$

$G_h = 0.65 + 0.60/(h/33)^{1/7} = 0.65 + 0.60/(26.5'/33)^{1/7} = 1.23$ | 2;3.4.1

$q_z = 0.00256\ (1.15)(85)^2 = 21.3$ psf

$G_h q_z = (1.23)(21.3\text{ psf}) = \underline{26.2\text{ psf}}$

Ice Loads : 1/2" ice per TIA-222-F

$\rho = 56$ pcf

P8 std. Pipe (OD = 8.625")

$A = \pi\left[\left(\frac{8.625"+1"}{2}\right)^2 - \left(\frac{8.625"}{2}\right)^2\right]$

$= 14.33\ in^2 = 0.10\ ft^2$

$V = 4.5' \times 0.10 ft^2 = 0.45\ ft^3$

$Wt._{Ice} = (56\text{ pcf})(0.45 ft^3) = \underline{25.2^{lb.}}$

Wind Load w/ Ice: ⇒ $q_z = .00256\ (53.75'/33)^{2/7}(74)^2 = 16.1$ psf

$G_h q_z = (1.23)(16.1\text{ psf}) = \underline{19.8\text{ psf}}$

Ice Loads: (Cont'd)

12' x 4' Antenna Shroud: O.D. = 4' (Assumed - Not Yet Designed)

$$A = \pi\left[\left(\frac{4.083'}{2}\right)^2 - \left(\frac{4.0}{2}\right)^2\right] = 0.17\ ft^2$$

$$V = 12' \times 0.17\ ft^2 = 2.01\ ft^3$$

$$Wt.\ Ice = (56\ pcf)(2.01\ ft^3) = \underline{112.7\ lb.}$$

For Rev Model: DL: Steel cut of PB std. = 28.55 PLF
Shroud w/ Antennas w/o ice = 500 lb. (Assumed)
Shroud w/ Antennas w/ ice = 612.7 lb.
Wt. Ice on PB std = 25.2 lb.

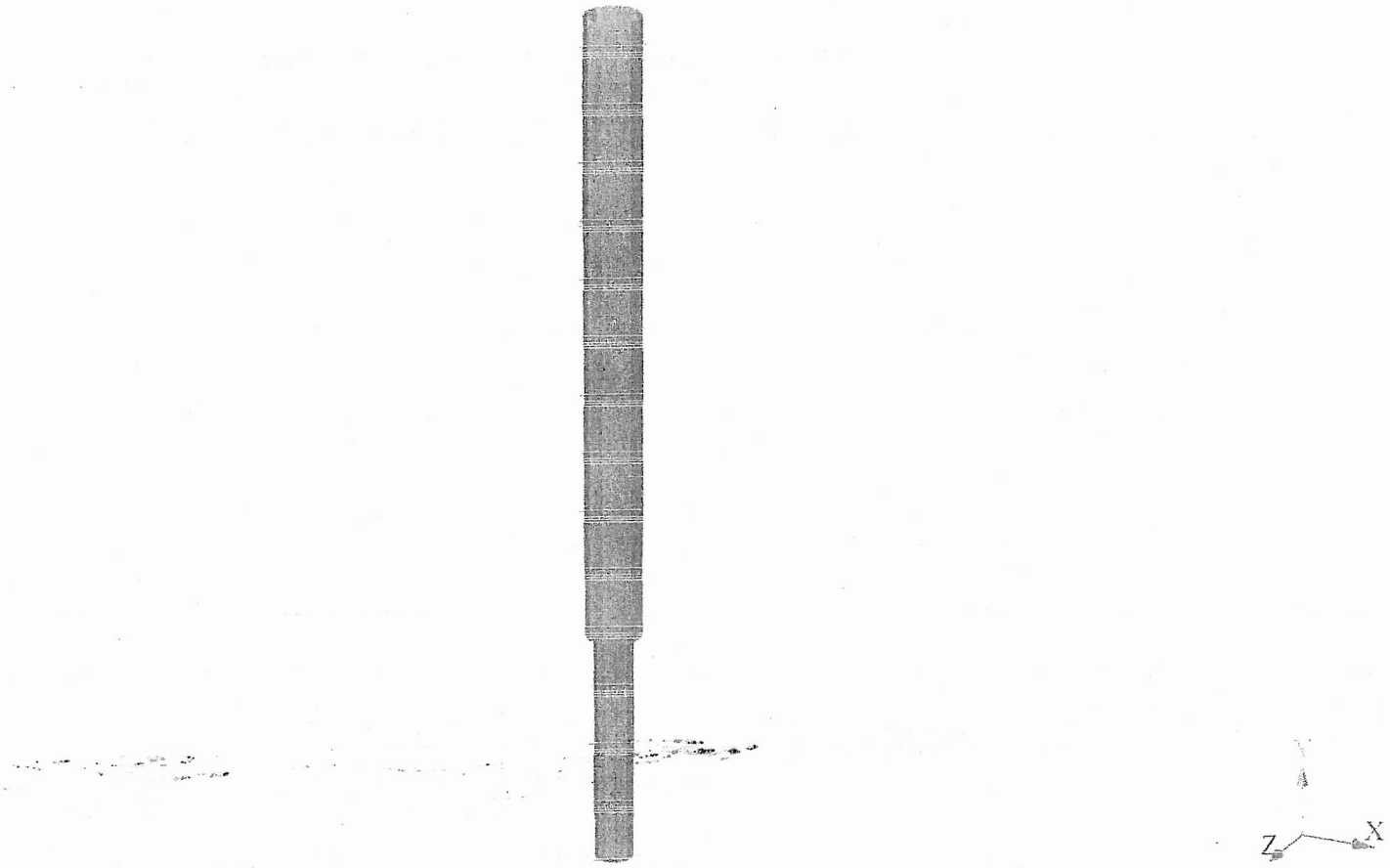
Wind Loads: W_x; W_z: w/o ice = 26.2 psf
w/ ice = 19.8 psf

w/o ice: $F_{wind\ on\ shroud} = (26.2\ psf)(4')(0.8) = 83.8\ plf$
$F_{wind\ on\ PB} = 14\ psf$ As Previous

w/ ice: $F_{wind\ on\ shroud} = (19.8\ psf)(4')(0.8) = 63.5\ plf$

Per Rev Analysis: Existing PB std. Pipe ✓ (OK) (P. 3)
Max Stress Ratio = 0.09

Per Loading: Existing PB std ✓ (OK) (Analysis by others - P.6)
P_u/ϕ_c = 3.3/304 = 0.11 << 1.0 ✓ (OK)
Δ_{max} = 0.122" << 1.0". ✓ (OK)


Y
Z
X

CHA, Inc.
Current Date: 7/27/2011 8:44 AM
Units system: English
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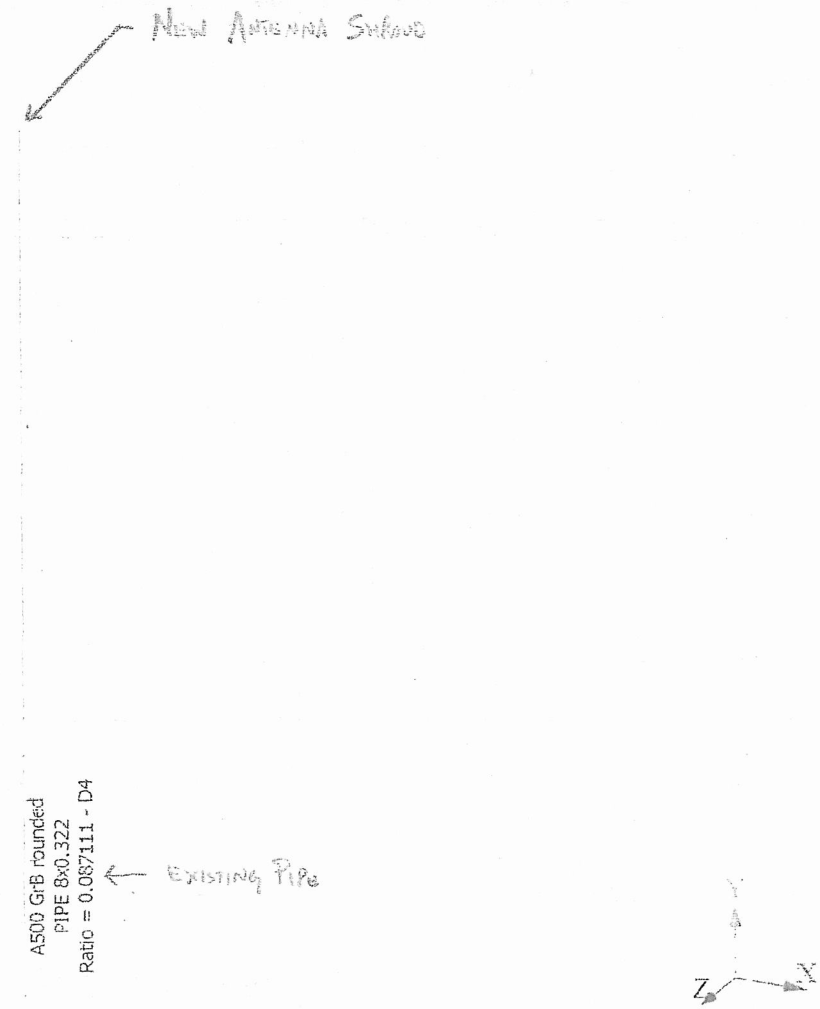
P. 4



Current Date: 7/27/2011 8:41 AM
Units system: English
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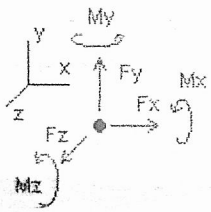
Analysis Results

Envelope for nodal reactions

Note.- Ic is the controlling load condition



Direction of positive forces and moments

Envelope of nodal reactions for :

D1=DL
D2=DL+I
D3=0.6DL+I
D4=DL+Wxo
D5=0.6DL+Wxo
D6=DL+I+Wxo
D7=DL+I+Wzo
D8=DL+I+Wxi
D9=DL+I+Wzi
D10=0.6DL+0.6I+Wxo
D11=0.6DL+0.6I+Wzo
D12=0.6DL+0.6I+Wxi
D13=0.6DL+0.6I+Wzi

Node		Forces						Moments					
		Fx [Kip]	Ic	Fy [Kip]	Ic	Fz [Kip]	Ic	Mx [Kip*ft]	Ic	My [Kip*ft]	Ic	Mz [Kip*ft]	Ic
1	Max	1.875	D4	0.064	D1	1.875	D7	2.57880	D7	0.00000	D1	0.00000	D1
	Min	0.000	D1	0.038	D3	0.000	D1	0.00000	D1	0.00000	D1	-2.57880	D4
2	Max	0.000	D1	1.165	D1	0.000	D1	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-2.967	D4	0.699	D3	-2.967	D7	0.00000	D1	0.00000	D1	0.00000	D1

Title :
Dsgnr:
Description :

Job #
Date: 9:00AM, 27 JUL 11

Scope :

Steel Column

Description P1 (formerly P8 STD, Sailboard Support Pole)

General Information

Code Ref: AISC 9th ASD, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Steel Section	P8STD	Fy	46.00 ksi	X-X Sidesway :	Sway Allowed
		Duration Factor	1.330	Y-Y Sidesway :	Sway Allowed
Column Height	4.500 ft	Elastic Modulus	29,000.00 ksi		
End Fixity	Fix-Free	X-X Unbraced	4.500 ft	Kxx	1.000
Live & Short Term Loads Combined		Y-Y Unbraced	4.500 ft	Kyy	1.000

Loads

Axial Load...

Dead Load	0.70 k	Ecc. for X-X Axis Moments	0.000 in
Live Load	k	Ecc. for Y-Y Axis Moments	0.000 in
Short Term Load	k		

Point lateral Loads...

	DL	LL	ST	Height
Along Y-Y (strong axis moments)		1.080	k	4.500 ft
Along X-X (y moments)			k	ft

Distributed lateral Loads...

	DL	LL	ST		Start		End
Along Y-Y	0.020	0.050		k/ft		-->	4.500 ft
Along X-X				k/ft		-->	ft

Applied Moments

X-X Axis Moments	DL	LL	ST	Height
At TOP		1.00	k-ft	
Between Ends			k-ft	0.000 ft
At BOTTOM			k-ft	

Summary

Column Design OK

Section : P8STD, Height = 4.50ft, Axial Loads: DL = 0.70, LL = 0.00, ST = 0.00k, Ecc. = 0.000in
Unbraced Lengths: X-X = 4.50ft, Y-Y = 4.50ft

Combined Stress Ratios	Dead	Live	DL + LL	DL + ST + (LL if Chosen)
AISC Formula H1 - 1				
AISC Formula H1 - 2				
AISC Formula H1 - 3	0.0079	0.1027	0.1107	0.0832

XX Axis : Fa calc'd per Eq. E2-1, K*L/r < Cc
YY Axis : Fa calc'd per Eq. E2-1, K*L/r < Cc

Stresses

Allowable & Actual Stresses	Dead	Live	DL + LL	DL + Short
Fa : Allowable	26.26 ksi	26.26 ksi	26.26 ksi	34.93 ksi
fa : Actual	0.08 ksi	0.00 ksi	0.08 ksi	0.08 ksi
Fb:xx : Allow [F1-6]	30.36 ksi	30.36 ksi	30.36 ksi	40.38 ksi
Fb:xx : Allow [F1-7] & [F1-8]	30.36 ksi	30.36 ksi	30.36 ksi	40.38 ksi
fb : xx Actual	0.14 ksi	3.12 ksi	3.26 ksi	3.26 ksi
Fb:yy : Allow [F1-6]	30.36 ksi	30.36 ksi	30.36 ksi	40.38 ksi
Fb:yy : Allow [F1-7] & [F1-8]	30.36 ksi	30.36 ksi	30.36 ksi	40.38 ksi
fb : yy Actual	0.00 ksi	0.00 ksi	0.00 ksi	0.00 ksi

Title :
Dsgnr:
Description :

Job #
Date: 9:00AM, 27 JUL 11

Scope :

Description P1

Analysis Values

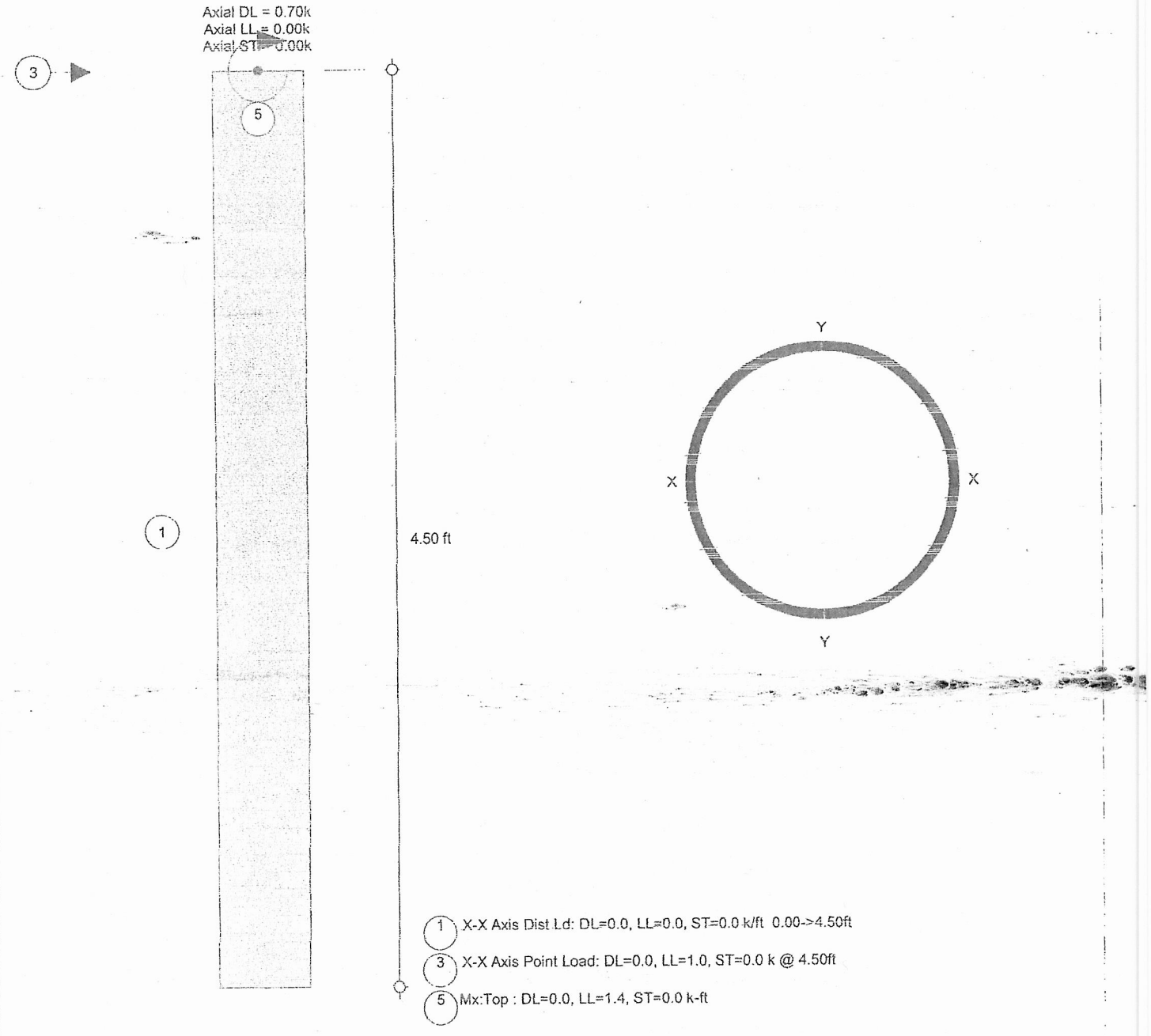
F'ex : DL+LL	442.000 psi	Cm:x DL+LL	0.85	Cb:x DL+LL	1.00
F'ey : DL+LL	442,000 psi	Cm:y DL+LL	0.85	Cb:y DL+LL	1.75
F'ex : DL+LL+ST	587,860 psi	Cm:x DL+LL+ST	0.85	Cb:x DL+LL+ST	1.00
F'ey : DL+LL+ST	587,860 psi	Cm:y DL+LL+ST	0.85	Cb:y DL+LL+ST	1.75

Max X-X Axis Deflection -0.022 in at 4.500 ft Max Y-Y Axis Deflection 0.000 in at 0.000 ft

Section Properties P8STD

Diameter	8.630 in	Weight	28.53 #/ft	Values for LRFD Design....	
		Ixx	72.500 in4	J	145.000 in4
		Iyy	72.500 in4		0.00
Thickness	0.322 in	Sxx	16.800 in3	Zx	22.200 in3
Area	8.40 in2	Syy	16.800 in3	Zy	22.200 in3
		Rxx	2.940 in		0.000
		Ryy	2.940 in		

Section Type = Pipe



SHROUD LOAD : $A = 12' \times 8' = 96\ ft^2$

$F_W = (26.2\ psf)(96\ ft^2)(0.8) = 2150.4\ lb/2 = 1.08^k$ SHEAR

$M_W\ (SHROUD) = \frac{(26.2\ psf)(12')^2}{8} = 0.98^{k\cdot ft}$ (SAY $1^{k\cdot ft}$)

CHA COMPUTATION PAD

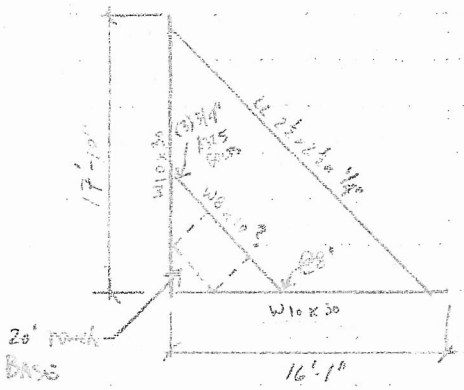
COMPLETED BY: [illegible]
CHECKED BY:
PROJECT NAME: Cr 218
PROJECT LOCATION: FAIRFIELD Co.

PROJECT [illegible] PHASE [illegible] ORG [illegible]
SHEET #: 9 OF
DATE: 7.22.11
SUBJECT: TOWER BASE ANALYSIS

CHK STEEL RAFTERS @ BASE OF TOWER

AXIAL (DOWN) = 16.0^K
UPLIFT = -13.0^K
SHEAR = 2.0^K
} PER RISA TOWER 5.4. output

EAST STEEL RAFTERS:



PLAN VIEW

CHK: W8x10, 3/4" A325 BOLTS, W10x30

PER AISC TOWER 7th Ed.

PER ENDPLATE: W8x10 √(OK) $P_u/\phi R_n$ = 0.696 P. 10
R_{max} = 3.13^K

W10x30 √(OK) $P_u/\phi R_n$ = 0.453 P. 12
R_{max} = 5.28^K

BOLTS - 3/4" A325: R_{max} = 5.28^K / 3 BOLTS = 1.81^K
CAPACITY (SHEAR) = 9.3^K > 1.81^K √(OK)
TENSION = 15.0^K / 2 BOLTS = 7.5^K/BOLT < 19.9^K ALLOWABLE √(OK) AISC-9TH P. 9-5

Title :
Dsgnr:
Description :

Job #
Date: 9:20AM, 27 JUL 11

Scope :

Steel Beam Design

Description Base W8

General Information

Code Ref: AISC 9th ASD, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Steel Section : W8X10

Center Span	8.33 ft	Pinned-Pinned		Fy	36.00 ksi
Left Cant.	0.00 ft	Bm Wt. Added to Loads		Load Duration Factor	1.00
Right Cant	0.00 ft	LL & ST Don't Act Together		Elastic Modulus	29,000.0 ksi
Lu : Unbraced Length	8.33 ft				

Distributed Loads

Note! Short Term Loads Are WIND Loads.

	#1	#2	#3	#4	#5	#6	#7	
DL								k/ft
LL	-0.500							k/ft
ST								k/ft
Start Location								ft
End Location	8.330							ft

Point Loads

Note! Short Term Loads Are WIND Loads.

	#1	#2	#3	#4	#5	#6	#7	
Dead Load								k
Live Load	1.000	1.000						k
Short Term								k
Location	2.500	5.750						ft

Summary

Beam OK

Static Load Case Governs Stress

Using: W8X10 section, Span = 8.33ft, Fy = 36.0ksi
End Fixity = Pinned-Pinned, Lu = 8.33ft, LDF = 1.000

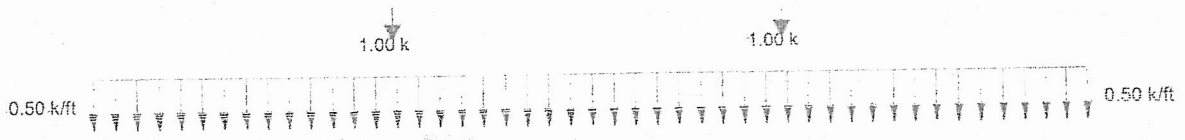
	Actual	Allowable		
Moment	6.964 k-ft	10.000 k-ft	Max. Deflection	-0.099 in
fb : Bending Stress	10.700 ksi	15.364 ksi	Length/DL Defl	81,973.8 : 1
fb / Fb	0.696 : 1		Length/(DL+LL Defl)	1,007.7 : 1
Shear	3.134 k	19.315 k		
fv : Shear Stress	2.337 ksi	14.400 ksi		
fv / Fv	0.162 : 1			

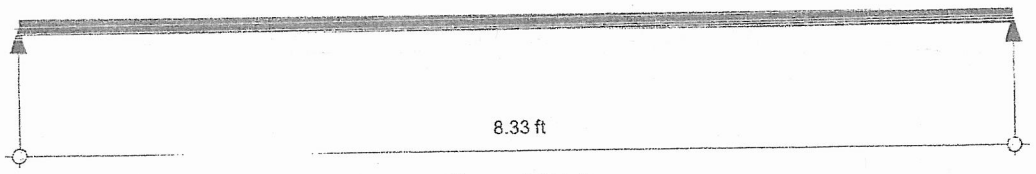
Force & Stress Summary

<<-- These columns are Dead + Live Load placed as noted -->>

	Maximum	DL Only	LL @ Center	LL+ST @ Center	LL @ Cants	LL+ST @ Cants	
Max. M +	6.96 k-ft	0.09	6.96				k-ft
Max. M -							k-ft
Max. M @ Left							k-ft
Max. M @ Right							k-ft
Shear @ Left	3.13 k	0.04	3.13				k
Shear @ Right	3.11 k	0.04	3.11				k
Center Defl.	-0.099 in	-0.001	-0.099	-0.001	0.000	0.000	in
Left Cant Defl	0.000 in	0.000	0.000	0.000	0.000	0.000	in
Right Cant Defl	0.000 in	0.000	0.000	0.000	0.000	0.000	in
...Query Defl @	0.000 ft	0.000	0.000	0.000	0.000	0.000	in
Reaction @ Left	3.13	0.04	3.13	0.04			k
Reaction @ Rt	3.11	0.04	3.11	0.04			k

Fa calc'd per Eq. E2-2, K*L/r > Cc
I Beam, Major Axis, (102,000 * Cb / Fy)^.5 <= L/rT <= (510,000 * Cb / Fy)^.5 , Fb per Eq. F1-6





Mmax = 6.96 k-ft

Dmax = -0.0991 in

Lmax = 3.133 k

Vmax @ left = 3.133 k

Rmax = 3.114 k

Vmax @ rt = 3.114 k

Title :
Dsgnr:
Description :
Scope :

Job #
Date: 9:21AM, 27 JUL 11

Steel Beam Design

Description Base W10

General Information

Code Ref: AISC 9th ASD, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Steel Section : W10X30

Center Span	17.83 ft	Pinned-Pinned		Fy	36.00ksi
Left Cant.	0.00 ft	Bm Wt. Added to Loads		Load Duration Factor	1.00
Right Cant	0.00 ft	LL & ST Don't Act Together		Elastic Modulus	29,000.0 ksi
Lu : Unbraced Length	9.83 ft				

Distributed Loads

Note! Short Term Loads Are WIND Loads.

	# 1	# 2	# 3	# 4	# 5	# 6	# 7	
DL								k/ft
LL	0.500	Nominal						k/ft
ST								k/ft
Start Location								ft
End Location								ft

Point Loads

Note! Short Term Loads Are WIND Loads.

	# 1	# 2	# 3	# 4	# 5	# 6	# 7	
Dead Load								k
Live Load	1.000	← Fy = 16^k - 15^k = 1.0^k						k
Short Term								k
Location	8.000							ft

Summary

Beam OK

Static Load Case Governs Stress

Using: W10X30 section, Span = 17.83ft, Fy = 36.0ksi
End Fixity = Pinned-Pinned, Lu = 9.83ft, LDF = 1.000

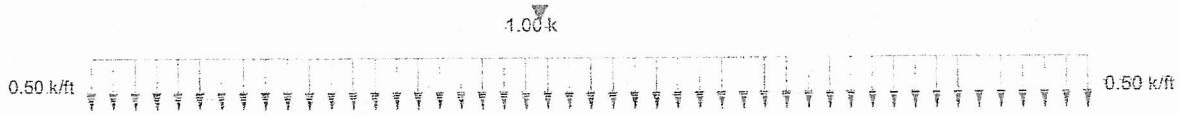
	Actual	Allowable		
Moment	25.259 k-ft	58.320 k-ft	Max. Deflection	-0.285 in
fb : Bending Stress	9.355 ksi	21.600 ksi	Length/DL Defl	15,441.0 : 1
fb / Fb	**0.433 : 1**		Length/(DL+LL Defl)	749.8 : 1
Shear	5.277 k	45.230 k		
fv : Shear Stress	1.680 ksi	14.400 ksi		
fv / Fv	**0.117 : 1**			

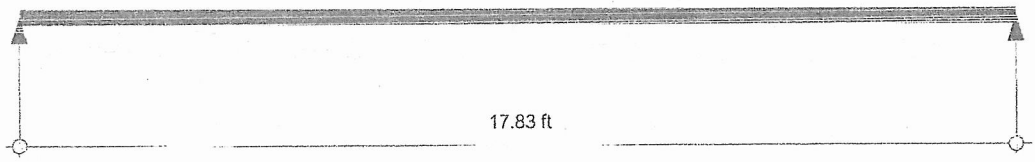
Force & Stress Summary

<<-- These columns are Dead + Live Load placed as noted -->>

	Maximum	DL Only	LL @ Center	LL+ST @ Center	LL @ Cants	LL+ST @ Cants	
Max. M +	25.26 k-ft	1.19	25.26				k-ft
Max. M -							k-ft
Max. M @ Left							k-ft
Max. M @ Right							k-ft
Shear @ Left	5.28 k	0.27	5.28				k
Shear @ Right	5.17 k	0.27	5.17				k
Center Defl.	-0.285 in	-0.014	-0.285	-0.014	0.000	0.000	in
Left Cant Defl	0.000 in	0.000	0.000	0.000	0.000	0.000	in
Right Cant Defl	0.000 in	0.000	0.000	0.000	0.000	0.000	in
...Query Defl @	0.000 ft	0.000	0.000	0.000	0.000	0.000	in
Reaction @ Left	5.28	0.27	5.28	0.27			k
Reaction @ Rt	5.17	0.27	5.17	0.27			k

Fa calc'd per Eq. E2-2, K*L/r > Cc
I Beam, Major Axis, (102,000 * Cb / Fy)^.5 <= L/rT <= (510,000 * Cb / Fy)^.5 , Fb per Eq. F1-6
I Beam, Major Axis, Fb per Eq. F1-8, Fb = 12,000 Cb Af / (l * d)





Mmax = 25.25 k-ft

Dmax = -0.2854 in

Lmax = 5.277 k

Vmax @ left = 5.277 k

Rmax = 5.174 k

Vmax @ rt = 5.174 k

ANALYSIS SUMMARY
PER TIA/EIA-222-F
(Existing and Proposed Equipment)

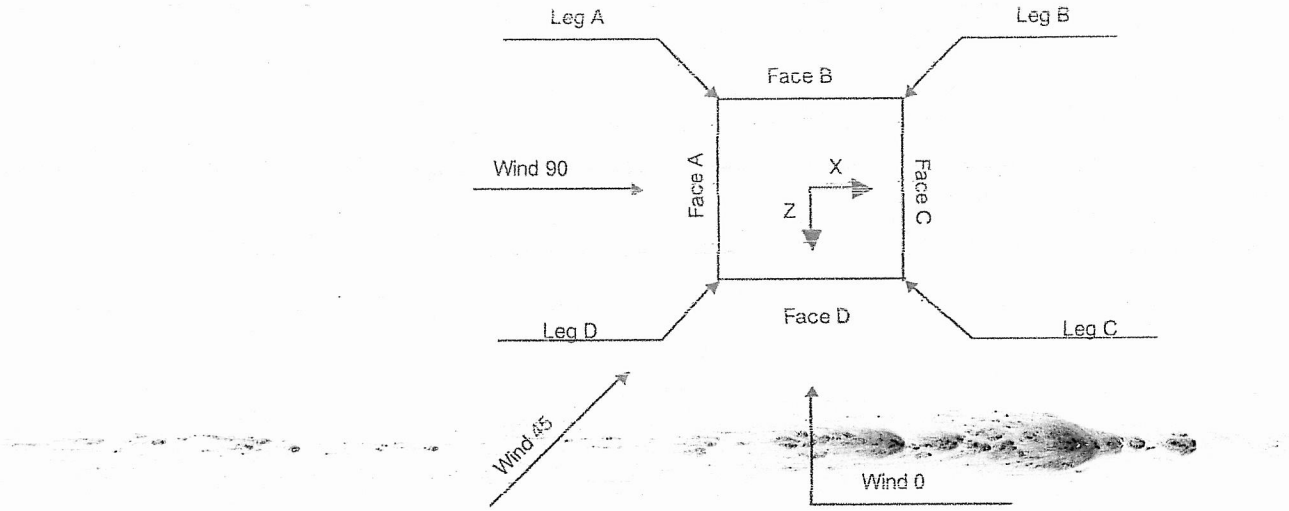
Tower Input Data

The main tower is a 4x free standing tower with an overall height of 51.60 ft above the ground line.
The base of the tower is set at an elevation of 31.60 ft above the ground line.
The face width of the tower is 3.38 ft at the top and 3.38 ft at the base.
This tower is designed using the TIA/EIA-222-F standard.
The following design criteria apply:

Tower is located in Fairfield County, Connecticut.
Basic wind speed of 85 mph.
Nominal ice thickness of 0.5000 in.
Ice density of 56 pcf.
A wind speed of 74 mph is used in combination with ice.
Temperature drop of 50 °F.
Deflections calculated using a wind speed of 60 mph.
Weld together tower sections have flange connections..
Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..
Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..
Welds are fabricated with ER-70S-6 electrodes..
A non-linear (P-delta) analysis was used.
Pressures are calculated at each section.
Stress ratio used in tower member design is 1.333.
Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

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



Square Tower

Tower Section Geometry

Tower Section	Tower Elevation ft	Assembly Database	Description	Section Width ft	Number of Sections	Section Length ft
T1	51.60-31.60			3.38	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	51.60-31.60	5.00	Diag Down	No	Yes	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 51.60-31.60	Equal Angle	L3x3x1/4	A36 (36 ksi)	Single Angle	L2 1/2x2x3/16	A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	No. of Mid Girts	Mid Girt Type	Mid Girt Size	Mid Girt Grade	Horizontal Type	Horizontal Size	Horizontal Grade
T1 51.60-31.60	None	Flat Bar		A36 (36 ksi)	Single Angle	L2 1/2x3x1/4	A36 (36 ksi)

Tower Section Geometry (cont'd)

Tower Elevation ft	Gusset Area (per face) ft²	Gusset Thickness in	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in
T1 51.60-31.60	0.00	0.0000	A36 (36 ksi)	1	1	1	36.0000	36.0000

Tower Section Geometry (cont'd)

Tower Elevation ft	Calc K Single Angles	Calc K Solid Rounds	Legs	K Factors[1] 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 51.60-31.60	No	No	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 Net Width Deduct in	U	Diagonal Net Width Deduct in	U	Top Girt Net Width Deduct in	U	Bottom Girt Net Width Deduct in	U	Mid Girt Net Width Deduct in	U	Long Horizontal Net Width Deduct in	U	Short Horizontal Net Width Deduct in	U
T1 51.60-31.60	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 Bolt Size in	Leg No.	Diagonal Bolt Size in	Diagonal No.	Top Girt Bolt Size in	Top Girt No.	Bottom Girt Bolt Size in	Bottom Girt No.	Mid Girt Bolt Size in	Mid Girt No.	Long Horizontal Bolt Size in	Long Horizontal No.	Short Horizontal Bolt Size in	Short Horizontal No.
T1 51.60-31.60	Flange	0.6250 A325N	0	0.6250 A325N	1	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	0	0.6250 A325N	1	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
LDF7-50A (1-5/8 FOAM) (E)	C	No	Ar (CaAa)	51.60 - 31.60	0.0000	0.5	9	9	0.5000	1.9800		0.82
2" Rigid Conduit (SAI)	C	No	Ar (CfAe)	51.60 - 31.60	0.0000	0.2	1	1	2.0000	2.0000		2.80

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 lb
T1	51.60-31.60	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	3.333	0.000	35.640	0.000	203.60
		D	0.000	0.000	0.000	0.000	0.00

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 lb
T1	51.60-31.60	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		5.000	0.000	72.093	0.000	532.70
		D		0.000	0.000	0.000	0.000	0.00

Feed Line Center of Pressure

Section	Elevation ft	CP_X in	CP_Z in	CP_X Ice in	CP_Z Ice in
T1	51.60-31.60	3.8516	3.4835	3.9006	3.5618

Antenna Pole Forces *Shroud Post*

Length of Pole	Ix	Iy	Modulus E		Antenna Pole C_AA_A	Antenna Pole Weight	Length of Beacon	Beacon C_AA_A	Beacon Weight
ft	in^4	in^4	ksi		ft^2/ft	plf	ft	ft^2	lb
4.50	70.5859	70.5859	29000	No Ice	2.59	28.55	12.00	38.40	400.00
				With Ice	2.89	53.75		39.50	550.00

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 lb
waveguide ladder (Ladder)	A	From Leg	1.00	0.00	0.0000	36.60	No Ice	3.63	2.29	50.00
				0.00			1/2" Ice	4.01	2.65	69.83
waveguide ladder (Ladder)	A	From Leg	1.00	0.00	0.0000	41.60	No Ice	3.63	2.29	50.00
				0.00			1/2" Ice	4.01	2.65	69.83
waveguide ladder (Ladder)	A	From Leg	1.00	0.00	0.0000	46.60	No Ice	3.63	2.29	50.00
				0.00			1/2" Ice	4.01	2.65	69.83
waveguide ladder (Ladder)	A	From Leg	1.00	0.00	0.0000	51.60	No Ice	3.63	2.29	50.00
				0.00			1/2" Ice	4.01	2.65	69.83
7770.00	A	None			0.0000	51.60	No Ice	0.00	0.00	51.73
							1/2" Ice	0.00	0.00	94.70
7770.00	B	None			0.0000	51.60	No Ice	0.00	0.00	51.73
							1/2" Ice	0.00	0.00	94.70
7770.00	C	None			0.0000	51.60	No Ice	0.00	0.00	51.73
							1/2" Ice	0.00	0.00	94.70
(2) RRU (SAI)	A	From Leg	0.50	0.00	0.0000	51.60	No Ice	1.76	0.97	44.00
				0.00			1/2" Ice	1.94	1.12	56.83
(2) RRU (SAI)	B	From Leg	0.50	0.00	0.0000	51.60	No Ice	1.76	0.97	44.00
				0.00			1/2" Ice	1.94	1.12	56.83
(2) RRU (SAI)	C	From Leg	0.50	0.00	0.0000	51.60	No Ice	1.76	0.97	44.00
				0.00			1/2" Ice	1.94	1.12	56.83
DC6-48-60-18 (SAI)	B	From Leg	0.50	0.00	0.0000	51.60	No Ice	2.59	1.08	20.00
				0.00			1/2" Ice	2.81	1.24	36.69
Existing 6' x 9" Panel w/ Mounting Pipe (E)	A	From Leg	0.00	0.00	0.0000	51.60	No Ice	0.00	0.00	54.74
				0.00			1/2" Ice	0.00	0.00	111.15
6' x 9" Panel w/ Mounting Pipe (E)	B	From Leg	0.00	0.00	0.0000	51.60	No Ice	0.00	0.00	54.74
				0.00			1/2" Ice	0.00	0.00	111.15
6' x 9" Panel w/ Mounting	C	From Leg	0.00	0.0000		51.60	No Ice	0.00	0.00	54.74

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 lb
Pipe (E)			0.00 0.00				1/2" Ice	0.00	0.00	111.15

Tower Pressures - No Ice

$G_H = 1.250$

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 51.60-31.60	41.60	1.068	20	70.337	A	17.259	0.000	10.000	57.94	0.000	0.000
					B	17.259	0.000		57.94	0.000	0.000
					C	17.259	3.333		48.56	35.640	0.000
					D	17.259	0.000		57.94	0.000	0.000

Tower Pressure - With Ice

$G_H = 1.250$

Section Elevation ft	z ft	K_Z	q_z psf	t_Z in	A_G ft^2	Face	A_F ft^2	A_R ft^2	A_{leg} ft^2	Leg %	C_AA_A In Face ft^2	C_AA_A Out Face ft^2
T1 51.60-31.60	41.60	1.068	15	0.5000	72.003	A	17.259	6.237	13.333	56.75	0.000	0.000
						B	17.259	6.237		56.75	0.000	0.000
						C	17.259	11.237		46.79	72.093	0.000
						D	17.259	6.237		56.75	0.000	0.000

Tower Pressure - Service

$G_H = 1.250$

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 51.60-31.60	41.60	1.068	10	70.337	A	17.259	0.000	10.000	57.94	0.000	0.000
					B	17.259	0.000		57.94	0.000	0.000
					C	17.259	3.333		48.56	35.640	0.000
					D	17.259	0.000		57.94	0.000	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	203.60	898.42	A	0.245	2.793	0.601	1	1	17.259	2127.59	106.38	C
51.60-31.60			B	0.245	2.793	0.601	1	1	17.259			
			C	0.293	2.616	0.614	1	1	19.305			
			D	0.245	2.793	0.601	1	1	17.259			
Sum Weight:	203.60	898.42						OTM	21275.86 lb-ft	2127.59		

Tower Forces - No Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	203.60	898.42	A	0.245	2.793	0.601	1.184	1.184	20.435	2377.03	118.85	C
51.60-31.60			B	0.245	2.793	0.601	1.184	1.184	20.435			
			C	0.293	2.616	0.614	1.2	1.2	23.165			
			D	0.245	2.793	0.601	1.184	1.184	20.435			
Sum Weight:	203.60	898.42						OTM	23770.31 lb-ft	2377.03		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	532.70	1457.50	A	0.326	2.501	0.624	1	1	21.153	2378.33	118.92	C
51.60-31.60			B	0.326	2.501	0.624	1	1	21.153			
			C	0.396	2.292	0.65	1	1	24.561			
			D	0.326	2.501	0.624	1	1	21.153			
Sum Weight:	532.70	1457.50						OTM	23783.32 lb-ft	2378.33		

Tower Forces - With Ice - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	532.70	1457.50	A	0.326	2.501	0.624	1.2	1.2	25.383	2586.87	129.34	C
51.60-31.60			B	0.326	2.501	0.624	1.2	1.2	25.383			
			C	0.396	2.292	0.65	1.2	1.2	29.474			
			D	0.326	2.501	0.624	1.2	1.2	25.383			

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
Sum Weight:	532.70	1457.50						OTM	25868.75 lb-ft	2586.87		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	203.60	898.42	A	0.245	2.793	0.601	1	1	17.259	1060.11	53.01	C
51.60-31.60			B	0.245	2.793	0.601	1	1	17.259			
			C	0.293	2.616	0.614	1	1	19.305			
			D	0.245	2.793	0.601	1	1	17.259			
Sum Weight:	203.60	898.42						OTM	10601.12 lb-ft	1060.11		

Tower Forces - Service - Wind 45 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	Face	e	C_F	R_R	D_F	D_R	A_E ft²	F lb	w plf	Ctrl. Face
T1	203.60	898.42	A	0.245	2.793	0.601	1.184	1.184	20.435	1184.40	59.22	C
51.60-31.60			B	0.245	2.793	0.601	1.184	1.184	20.435			
			C	0.293	2.616	0.614	1.2	1.2	23.165			
			D	0.245	2.793	0.601	1.184	1.184	20.435			
Sum Weight:	203.60	898.42						OTM	11844.03 lb-ft	1184.40		

Discrete Appurtenance Pressures - No Ice

G_H = 1.250 (base tower), 1.250 (antenna pole)

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft²	C_AA_C Side ft²
Antenna Pole	0.0000	128.47	0.00	0.00	53.85	1.150	21	11.64	11.64
Antenna Beacon	0.0000	400.00	0.00	0.00	62.10	1.198	22	38.40	38.40
waveguide ladder	315.0000	50.00	-2.39	-2.39	36.60	1.030	19	3.63	2.29
waveguide ladder	315.0000	50.00	-2.39	-2.39	41.60	1.068	20	3.63	2.29
waveguide ladder	315.0000	50.00	-2.39	-2.39	46.60	1.104	20	3.63	2.29
waveguide ladder	315.0000	50.00	-2.39	-2.39	51.60	1.136	21	3.63	2.29
7770.00	0.0000	51.73	0.00	0.00	51.60	1.136	21	0.00	0.00
7770.00	0.0000	51.73	0.00	0.00	51.60	1.136	21	0.00	0.00
7770.00	0.0000	51.73	0.00	0.00	51.60	1.136	21	0.00	0.00
RRU	315.0000	88.00	-2.04	-2.04	51.60	1.136	21	3.52	1.95
RRU	45.0000	88.00	2.04	-2.04	51.60	1.136	21	3.52	1.95
RRU	135.0000	88.00	2.04	2.04	51.60	1.136	21	3.52	1.95
DC6-48-60-18	45.0000	20.00	2.04	-2.04	51.60	1.136	21	2.59	1.08

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
6' x 9" Panel w/ Mounting Pipe	315.0000	54.74	-1.69	-1.69	51.60	1.136	21	0.00	0.00
6' x 9" Panel w/ Mounting Pipe	45.0000	54.74	1.69	-1.69	51.60	1.136	21	0.00	0.00
6' x 9" Panel w/ Mounting Pipe	135.0000	54.74	1.69	1.69	51.60	1.136	21	0.00	0.00
	Sum Weight:	1331.89							

Discrete Appurtenance Pressures - With Ice

G_H = 1.250 (base tower), 1.250 (antenna pole)

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2	t_z in
Antenna Pole	0.0000	241.88	0.00	0.00	53.85	1.150	16	12.99	12.99	0.5000
Antenna Beacon	0.0000	550.00	0.00	0.00	62.10	1.198	17	39.50	39.50	0.5000
waveguide ladder	315.0000	69.83	-2.39	-2.39	36.60	1.030	14	4.01	2.65	0.5000
waveguide ladder	315.0000	69.83	-2.39	-2.39	41.60	1.068	15	4.01	2.65	0.5000
waveguide ladder	315.0000	69.83	-2.39	-2.39	46.60	1.104	15	4.01	2.65	0.5000
waveguide ladder	315.0000	69.83	-2.39	-2.39	51.60	1.136	16	4.01	2.65	0.5000
7770.00	0.0000	94.70	0.00	0.00	51.60	1.136	16	0.00	0.00	0.5000
7770.00	0.0000	94.70	0.00	0.00	51.60	1.136	16	0.00	0.00	0.5000
7770.00	0.0000	94.70	0.00	0.00	51.60	1.136	16	0.00	0.00	0.5000
RRU	315.0000	113.65	-2.04	-2.04	51.60	1.136	16	3.88	2.24	0.5000
RRU	45.0000	113.65	2.04	-2.04	51.60	1.136	16	3.88	2.24	0.5000
RRU	135.0000	113.65	2.04	2.04	51.60	1.136	16	3.88	2.24	0.5000
DC6-48-60-18	45.0000	36.69	2.04	-2.04	51.60	1.136	16	2.81	1.24	0.5000
6' x 9" Panel w/ Mounting Pipe	315.0000	111.15	-1.69	-1.69	51.60	1.136	16	0.00	0.00	0.5000
6' x 9" Panel w/ Mounting Pipe	45.0000	111.15	1.69	-1.69	51.60	1.136	16	0.00	0.00	0.5000
6' x 9" Panel w/ Mounting Pipe	135.0000	111.15	1.69	1.69	51.60	1.136	16	0.00	0.00	0.5000
	Sum Weight:	2066.38								

Discrete Appurtenance Pressures - Service

G_H = 1.250 (base tower), 1.250 (antenna pole)

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
Antenna Pole	0.0000	128.47	0.00	0.00	53.85	1.150	11	11.64	11.64
Antenna Beacon	0.0000	400.00	0.00	0.00	62.10	1.198	11	38.40	38.40
waveguide ladder	315.0000	50.00	-2.39	-2.39	36.60	1.030	9	3.63	2.29
waveguide ladder	315.0000	50.00	-2.39	-2.39	41.60	1.068	10	3.63	2.29
waveguide ladder	315.0000	50.00	-2.39	-2.39	46.60	1.104	10	3.63	2.29
waveguide ladder	315.0000	50.00	-2.39	-2.39	51.60	1.136	10	3.63	2.29
7770.00	0.0000	51.73	0.00	0.00	51.60	1.136	10	0.00	0.00
7770.00	0.0000	51.73	0.00	0.00	51.60	1.136	10	0.00	0.00
7770.00	0.0000	51.73	0.00	0.00	51.60	1.136	10	0.00	0.00
RRU	315.0000	88.00	-2.04	-2.04	51.60	1.136	10	3.52	1.95
RRU	45.0000	88.00	2.04	-2.04	51.60	1.136	10	3.52	1.95
RRU	135.0000	88.00	2.04	2.04	51.60	1.136	10	3.52	1.95
DC6-48-60-18	45.0000	20.00	2.04	-2.04	51.60	1.136	10	2.59	1.08
6' x 9" Panel w/	315.0000	54.74	-1.69	-1.69	51.60	1.136	10	0.00	0.00

Description	Aiming Azimuth °	Weight lb	$Offset_x$ ft	$Offset_z$ ft	z ft	K_z	q_z psf	C_AA_C Front ft^2	C_AA_C Side ft^2
Mounting Pipe 6' x 9" Panel w/ Mounting Pipe	45.0000	54.74	1.69	-1.69	51.60	1.136	10	0.00	0.00
Mounting Pipe 6' x 9" Panel w/ Mounting Pipe	135.0000	54.74	1.69	1.69	51.60	1.136	10	0.00	0.00
	Sum Weight:	1331.89							

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Leg Weight	392.00					
Bracing Weight	506.42					
Total Member Self-Weight	898.42			-504.85	-194.30	
Total Weight	2433.90			-504.85	-194.30	
Wind 0 deg - No Ice		-67.87	-4061.43	-70155.65	673.94	295.13
Wind 45 deg - No Ice		3000.26	-3000.26	-50905.30	-50594.75	249.01
Wind 90 deg - No Ice		4061.43	67.87	363.39	-69845.10	-95.45
Wind 135 deg - No Ice		3096.24	3096.24	51123.48	-51822.63	-281.60
Wind 180 deg - No Ice		67.87	4061.43	69145.94	-1062.55	-295.13
Wind 225 deg - No Ice		-3000.26	3000.26	49895.60	50206.14	-249.01
Wind 270 deg - No Ice		-4061.43	-67.87	-1373.10	69456.49	95.45
Wind 315 deg - No Ice		-3096.24	-3096.24	-52133.18	51434.02	281.60
Member Ice	559.09					
Total Weight Ice	4056.59			-351.99	-768.47	
Wind 0 deg - Ice		-51.58	-3929.23	-62524.24	-107.83	435.03
Wind 45 deg - Ice		2889.37	-2889.37	-45321.89	-45738.37	461.37
Wind 90 deg - Ice		3929.23	51.58	308.65	-62940.72	87.76
Wind 135 deg - Ice		2962.32	2962.32	45552.20	-46672.66	-249.72
Wind 180 deg - Ice		51.58	3929.23	61820.26	-1429.11	-435.03
Wind 225 deg - Ice		-2889.37	2889.37	44617.91	44201.43	-461.37
Wind 270 deg - Ice		-3929.23	-51.58	-1012.63	61403.79	-87.76
Wind 315 deg - Ice		-2962.32	-2962.32	-46256.18	45135.72	249.72
Total Weight	2433.90			-504.85	-194.30	
Wind 0 deg - Service		-33.82	-2023.69	-35496.62	598.73	147.06
Wind 45 deg - Service		1494.94	-1494.94	-25904.76	-24946.91	124.08
Wind 90 deg - Service		2023.69	33.82	-359.11	-34538.78	-47.56
Wind 135 deg - Service		1542.76	1542.76	24933.11	-25558.73	-140.31
Wind 180 deg - Service		33.82	2023.69	33913.17	-266.51	-147.06
Wind 225 deg - Service		-1494.94	1494.94	24321.30	25279.14	-124.08
Wind 270 deg - Service		-2023.69	-33.82	-1224.35	34871.01	47.56
Wind 315 deg - Service		-1542.76	1542.76	-26516.57	25890.96	140.31

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	IBC .6 Dead+Wind 0 deg - No Ice
4	Dead+Wind 45 deg - No Ice

Comb. No.	Description
5	IBC .6 Dead+Wind 45 deg - No Ice
6	Dead+Wind 90 deg - No Ice
7	IBC .6 Dead+Wind 90 deg - No Ice
8	Dead+Wind 135 deg - No Ice
9	IBC .6 Dead+Wind 135 deg - No Ice
10	Dead+Wind 180 deg - No Ice
11	IBC .6 Dead+Wind 180 deg - No Ice
12	Dead+Wind 225 deg - No Ice
13	IBC .6 Dead+Wind 225 deg - No Ice
14	Dead+Wind 270 deg - No Ice
15	IBC .6 Dead+Wind 270 deg - No Ice
16	Dead+Wind 315 deg - No Ice
17	IBC .6 Dead+Wind 315 deg - No Ice
18	Dead+Ice+Temp
19	Dead+Wind 0 deg+Ice+Temp
20	IBC .6 Dead+Wind 0 deg+.6 Ice+Temp
21	Dead+Wind 45 deg+Ice+Temp
22	IBC .6 Dead+Wind 45 deg+.6 Ice+Temp
23	Dead+Wind 90 deg+Ice+Temp
24	IBC .6 Dead+Wind 90 deg+.6 Ice+Temp
25	Dead+Wind 135 deg+Ice+Temp
26	IBC .6 Dead+Wind 135 deg+.6 Ice+Temp
27	Dead+Wind 180 deg+Ice+Temp
28	IBC .6 Dead+Wind 180 deg+.6 Ice+Temp
29	Dead+Wind 225 deg+Ice+Temp
30	IBC .6 Dead+Wind 225 deg+.6 Ice+Temp
31	Dead+Wind 270 deg+Ice+Temp
32	IBC .6 Dead+Wind 270 deg+.6 Ice+Temp
33	Dead+Wind 315 deg+Ice+Temp
34	IBC .6 Dead+Wind 315 deg+.6 Ice+Temp
35	Dead+Wind 0 deg - Service
36	Dead+Wind 45 deg - Service
37	Dead+Wind 90 deg - Service
38	Dead+Wind 135 deg - Service
39	Dead+Wind 180 deg - Service
40	Dead+Wind 225 deg - Service
41	Dead+Wind 270 deg - Service
42	Dead+Wind 315 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
T1	51.6 - 31.6	Leg	Max Tension	17	12876.95	48.50	25.46
			Max. Compression	8	-13743.93	0.00	-0.00
			Max. Mx	28	5645.83	88.57	-53.68
			Max. My	30	-2144.00	78.14	-93.79
			Max. Vy	14	-129.38	-10.38	-1.50
			Max. Vx	31	128.07	-0.29	44.68
		Diagonal	Max Tension	10	3509.77	0.00	0.00
			Max. Compression	2	-3508.07	0.00	0.00
			Max. Mx	23	1478.98	-12.46	0.00
			Max. My	19	-84.73	0.00	0.02
			Max. Vy	23	8.26	0.00	0.00
			Max. Vx	19	-0.02	0.00	0.00
		Horizontal	Max Tension	2	1781.48	0.00	0.00
			Max. Compression	10	-1789.66	0.00	0.00
			Max. Mx	18	15.79	-9.94	0.00

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
		Pole Antenna	Max. My	27	109.51	0.00	0.00
			Max. Vy	18	11.78	0.00	0.00
			Max. Vx	27	-0.00	0.00	0.00
			Max Tension	6	0.00	-0.00	-0.00
			Max. Compression	18	-791.88	-0.07	0.06
			Max. Mx	6	-524.17	-11870.76	3.91
			Max. My	2	-524.17	2.20	11870.76
			Max. Vy	6	1374.86	-11870.76	3.91
			Max. Vx	2	-1374.86	2.20	11870.76
			Max. Torque	8			-2.17

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Leg D	Max. Vert	12	15440.56	44.31	-1421.54
	Max. H_x	32	9621.89	59.64	31.54
	Max. H_z	2	-9687.74	-13.66	1946.21
	Min. Vert	5	-14645.39	-65.21	1443.55
	Min. H_x	24	-8611.79	-78.29	-22.01
	Min. H_z	10	10707.24	8.46	-1931.04
Leg C	Max. Vert	8	15861.93	-1456.93	-36.59
	Max. H_x	14	-9887.94	1966.51	4.12
	Max. H_z	20	-8670.82	-21.48	79.01
	Min. Vert	17	-14975.05	1479.98	58.53
	Min. H_x	6	11022.22	-1950.78	1.42
	Min. H_z	28	9954.04	31.22	-59.95
Leg B	Max. Vert	4	15647.60	-29.04	1479.86
	Max. H_x	32	-8412.13	67.67	6.85
	Max. H_z	2	10914.59	1.60	2008.26
	Min. Vert	13	-14520.83	49.79	-1501.86
	Min. H_x	24	9820.93	-48.99	-16.08
	Min. H_z	10	-9480.27	3.41	-2023.42
Leg A	Max. Vert	16	15953.77	1539.76	35.75
	Max. H_x	14	11113.92	1988.19	7.51
	Max. H_z	20	9880.05	86.53	48.62
	Min. Vert	9	-14919.65	-1562.84	-57.62
	Min. H_x	6	-9795.48	-2004.05	-13.29
	Min. H_z	28	-8745.07	-96.17	-67.56

Tower Mast Reaction Summary

Load Combination	Vertical lb	$Shear_x$ lb	$Shear_z$ lb	Overturning Moment, M_x lb-ft	Overturning Moment, M_z lb-ft	Torque lb-ft
Dead Only	2433.90	0.00	0.00	-505.09	-194.47	0.00
Dead+Wind 0 deg - No Ice	2433.90	-67.87	-4061.43	-70205.48	672.65	297.47
IBC .6 Dead+Wind 0 deg - No Ice	1460.34	-67.87	-4061.43	-69983.52	750.91	297.32
Dead+Wind 45 deg - No Ice	2433.90	3000.26	-3000.26	-50940.31	-50631.66	250.78
IBC .6 Dead+Wind 45 deg - No Ice	1460.34	3000.26	-3000.26	-50724.25	-50539.08	250.84

Load Combination	Vertical	$Shear_x$	$Shear_z$	Overturning Moment, M_x	Overturning Moment, M_z	Torque
	lb	lb	lb	lb-ft	lb-ft	lb-ft
Dead+Wind 90 deg - No Ice	2433.90	4061.43	67.87	364.86	-69894.86	-94.26
IBC .6 Dead+Wind 90 deg - No Ice	1460.34	4061.43	67.87	566.25	-69797.08	-94.02
Dead+Wind 135 deg - No Ice	2433.90	3096.24	3096.24	51160.19	-51858.56	-280.33
IBC .6 Dead+Wind 135 deg - No Ice	1460.34	3096.24	3096.24	51347.39	-51766.38	-280.05
Dead+Wind 180 deg - No Ice	2433.90	67.87	4061.43	69194.99	-1062.17	-293.55
IBC .6 Dead+Wind 180 deg - No Ice	1460.34	67.87	4061.43	69377.32	-984.58	-293.40
Dead+Wind 225 deg - No Ice	2433.90	-3000.26	3000.26	49930.01	50242.31	-246.95
IBC .6 Dead+Wind 225 deg - No Ice	1460.34	-3000.26	3000.26	50118.24	50305.59	-247.01
Dead+Wind 270 deg - No Ice	2433.90	-4061.43	-67.87	-1375.49	69505.78	97.82
IBC .6 Dead+Wind 270 deg - No Ice	1460.34	-4061.43	-67.87	-1172.58	69563.86	97.58
Dead+Wind 315 deg - No Ice	2433.90	-3096.24	-3096.24	-52170.99	51469.19	284.27
IBC .6 Dead+Wind 315 deg - No Ice	1460.34	-3096.24	-3096.24	-51953.91	51532.86	283.99
Dead+Ice+Temp	4056.59	0.00	0.00	-352.34	-769.48	-0.00
Dead+Wind 0 deg+Ice+Temp	4056.59	-51.58	-3929.23	-62579.54	-109.90	437.12
IBC .6 Dead+Wind 0 deg+.6 Ice+Temp	2433.95	-51.58	-3929.23	-62410.74	198.42	436.80
Dead+Wind 45 deg+Ice+Temp	4056.59	2889.37	-2889.37	-45360.72	-45779.78	462.89
IBC .6 Dead+Wind 45 deg+.6 Ice+Temp	2433.95	2889.37	-2889.37	-45200.04	-45451.36	462.77
Dead+Wind 90 deg+Ice+Temp	4056.59	3929.23	51.58	310.14	-62996.58	88.56
IBC .6 Dead+Wind 90 deg+.6 Ice+Temp	2433.95	3929.23	51.58	450.31	-62660.72	88.72
Dead+Wind 135 deg+Ice+Temp	4056.59	2962.32	2962.32	45592.59	-46712.94	-249.20
IBC .6 Dead+Wind 135 deg+.6 Ice+Temp	2433.95	2962.32	2962.32	45712.83	-46384.82	-248.86
Dead+Wind 180 deg+Ice+Temp	4056.59	51.58	3929.23	61874.65	-1429.41	-434.40
IBC .6 Dead+Wind 180 deg+.6 Ice+Temp	2433.95	51.58	3929.23	61987.84	-1121.64	-434.08
Dead+Wind 225 deg+Ice+Temp	4056.59	-2889.37	2889.37	44656.13	44240.51	-460.21
IBC .6 Dead+Wind 225 deg+.6 Ice+Temp	2433.95	-2889.37	2889.37	44777.44	44528.18	-460.10
Dead+Wind 270 deg+Ice+Temp	4056.59	-3929.23	-51.58	-1014.88	61457.68	-86.05
IBC .6 Dead+Wind 270 deg+.6 Ice+Temp	2433.95	-3929.23	-51.58	-873.06	61737.91	-86.21
Dead+Wind 315 deg+Ice+Temp	4056.59	-2962.32	-2962.32	-46297.63	45173.91	251.95
IBC .6 Dead+Wind 315 deg+.6 Ice+Temp	2433.95	-2962.32	-2962.32	-46135.88	45461.87	251.60
Dead+Wind 0 deg - Service	2433.90	-33.82	-2023.69	-35234.74	237.55	147.73
Dead+Wind 45 deg - Service	2433.90	1494.94	-1494.94	-25635.50	-25325.89	124.48
Dead+Wind 90 deg - Service	2433.90	2023.69	33.82	-71.61	-34924.20	-47.41
Dead+Wind 135 deg - Service	2433.90	1542.76	1542.76	25238.20	-25937.21	-140.17
Dead+Wind 180 deg - Service	2433.90	33.82	2023.69	34224.37	-626.86	-146.76
Dead+Wind 225 deg - Service	2433.90	-1494.94	1494.94	24625.18	24936.61	-123.52
Dead+Wind 270 deg - Service	2433.90	-2023.69	-33.82	-938.78	34535.00	48.29
Dead+Wind 315 deg - Service	2433.90	-1542.76	-1542.76	-26248.66	25547.93	141.15

Solution Summary

Load Comb.	Sum of Applied Forces PX lb	PY lb	PZ lb	Sum of Reactions PX lb	PY lb	PZ lb	% Error
1	0.00	-2433.90	0.00	0.00	2433.90	0.00	0.000%

	Sum of Applied Forces			Sum of Reactions			
Load Comb.	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	% Error
2	-67.87	-2433.90	-4061.43	67.87	2433.90	4061.43	0.000%
3	-67.87	-1460.34	-4061.43	67.87	1460.34	4061.43	0.000%
4	3000.26	-2433.90	-3000.26	-3000.26	2433.90	3000.26	0.000%
5	3000.26	-1460.34	-3000.26	-3000.26	1460.34	3000.26	0.000%
6	4061.43	-2433.90	67.87	-4061.43	2433.90	-67.87	0.000%
7	4061.43	-1460.34	67.87	-4061.43	1460.34	-67.87	0.000%
8	3096.24	-2433.90	3096.24	-3096.24	2433.90	-3096.24	0.000%
9	3096.24	-1460.34	3096.24	-3096.24	1460.34	-3096.24	0.000%
10	67.87	-2433.90	4061.43	-67.87	2433.90	-4061.43	0.000%
11	67.87	-1460.34	4061.43	-67.87	1460.34	-4061.43	0.000%
12	-3000.26	-2433.90	3000.26	3000.26	2433.90	-3000.26	0.000%
13	-3000.26	-1460.34	3000.26	3000.26	1460.34	-3000.26	0.000%
14	-4061.43	-2433.90	-67.87	4061.43	2433.90	67.87	0.000%
15	-4061.43	-1460.34	-67.87	4061.43	1460.34	67.87	0.000%
16	-3096.24	-2433.90	-3096.24	3096.24	2433.90	3096.24	0.000%
17	-3096.24	-1460.34	-3096.24	3096.24	1460.34	3096.24	0.000%
18	0.00	-4056.59	0.00	0.00	4056.59	0.00	0.000%
19	-51.58	-4056.59	-3929.23	51.58	4056.59	3929.23	0.000%
20	-51.58	-2433.95	-3929.23	51.58	2433.95	3929.23	0.000%
21	2889.37	-4056.59	-2889.37	-2889.37	4056.59	2889.37	0.000%
22	2889.37	-2433.95	-2889.37	-2889.37	2433.95	2889.37	0.000%
23	3929.23	-4056.59	51.58	-3929.23	4056.59	-51.58	0.000%
24	3929.23	-2433.95	51.58	-3929.23	2433.95	-51.58	0.000%
25	2962.32	-4056.59	2962.32	-2962.32	4056.59	-2962.32	0.000%
26	2962.32	-2433.95	2962.32	-2962.32	2433.95	-2962.32	0.000%
27	51.58	-4056.59	3929.23	-51.58	4056.59	-3929.23	0.000%
28	51.58	-2433.95	3929.23	-51.58	2433.95	-3929.23	0.000%
29	-2889.37	-4056.59	2889.37	2889.37	4056.59	-2889.37	0.000%
30	-2889.37	-2433.95	2889.37	2889.37	2433.95	-2889.37	0.000%
31	3929.23	-4056.59	-51.58	3929.23	4056.59	51.58	0.000%
32	-3929.23	-2433.95	-51.58	3929.23	2433.95	51.58	0.000%
33	-2962.32	-4056.59	-2962.32	2962.32	4056.59	2962.32	0.000%
34	-2962.32	-2433.95	-2962.32	2962.32	2433.95	2962.32	0.000%
35	-33.82	-2433.90	-2023.69	33.82	2433.90	2023.69	0.000%
36	1494.94	-2433.90	-1494.94	-1494.94	2433.90	1494.94	0.000%
37	2023.69	-2433.90	33.82	-2023.69	2433.90	-33.82	0.000%
38	1542.76	-2433.90	1542.76	-1542.76	2433.90	-1542.76	0.000%
39	33.82	-2433.90	2023.69	-33.82	2433.90	-2023.69	0.000%
40	-1494.94	-2433.90	1494.94	1494.94	2433.90	-1494.94	0.000%
41	-2023.69	-2433.90	-33.82	2023.69	2433.90	33.82	0.000%
42	-1542.76	-2433.90	-1542.76	1542.76	2433.90	1542.76	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	0.00000001

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	0.00000001
28	Yes	4	0.00000001	0.00000001
29	Yes	4	0.00000001	0.00000001
30	Yes	4	0.00000001	0.00000001
31	Yes	4	0.00000001	0.00000001
32	Yes	4	0.00000001	0.00000001
33	Yes	4	0.00000001	0.00000001
34	Yes	4	0.00000001	0.00000001
35	Yes	4	0.00000001	0.00000001
36	Yes	4	0.00000001	0.00000001
37	Yes	4	0.00000001	0.00000001
38	Yes	4	0.00000001	0.00000001
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

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
Pole	56.1 - 51.6	0.243	42	0.1278	0.0000
Antenna T1	51.6 - 31.6	0.158	42	0.0469	0.0140

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
51.60	waveguide ladder	42	0.158	0.0469	0.0140	10768
46.60	waveguide ladder	42	0.088	0.0000	0.0124	11624
41.60	waveguide ladder	42	0.045	0.0000	0.0091	17436
36.60	waveguide ladder	42	0.018	0.0000	0.0048	34873

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
Pole	56.1 - 51.6	0.487	16	0.2561	0.0000
Antenna					
T1	51.6 - 31.6	0.316	16	0.0937	0.0228

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
51.60	waveguide ladder	16	0.316	0.0937	0.0228	5391
46.60	waveguide ladder	16	0.177	0.0027	0.0202	5820
41.60	waveguide ladder	16	0.089	0.0024	0.0149	8729
36.60	waveguide ladder	25	0.036	0.0014	0.0079	17459

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Bolt Size in	Number Of Bolts	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	51.6	Diagonal	A325N	0.6250	1	3509.77	6117.19	0.574 ✓	1.333	Member Bearing
		Horizontal	A325N	0.6250	1	1789.66	6442.72	0.278 ✓	1.333	Bolt Shear

Compression Checks

Leg Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	51.6 - 31.6	L3x3x1/4	20.00	5.00	101.4 K=1.00	12.806	1.4400	-13743.90	18440.60	0.745 ✓

Diagonal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	51.6 - 31.6	L2 1/2x2x3/16	6.03	5.59	157.0 K=1.00	6.060	0.8090	-3508.07	4902.88	0.716

Horizontal Design Data (Compression)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	51.6 - 31.6	L2 1/2x3x1/4	3.38	3.13	71.0 K=1.00	16.324	1.3100	-1789.66	21384.50	0.084

Tension Checks

Leg Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	51.6 - 31.6	L3x3x1/4	20.00	5.00	64.5	21.600	1.4400	12890.70	31104.00	0.414

Diagonal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	51.6 - 31.6	L2 1/2x2x3/16	6.03	5.59	111.8	29.000	0.5013	3509.77	14537.20	0.241

Horizontal Design Data (Tension)

Section No.	Elevation ft	Size	L ft	L_u ft	Kl/r	F_a ksi	A in^2	Actual P lb	Allow. P_a lb	Ratio $\frac{P}{P_a}$
T1	51.6 - 31.6	L2 1/2x3x1/4	3.38	3.13	49.9	29.000	0.8419	1781.48	24414.40	0.073

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	$SF*P_{allow}$ lb	% Capacity	Pass Fail
T1	51.6 - 31.6	Leg	L3x3x1/4	3	-13743.90	24581.32	55.9	Pass
		Diagonal	L2 1/2x2x3/16	11	-3508.07	6535.54	53.7	Pass
		Horizontal	L2 1/2x3x1/4	15	-1789.66	28505.54	6.3	Pass
							20.8 (b)	
							Summary	
							Leg (T1) 55.9	Pass
							Diagonal (T1) 53.7	Pass
							Horizontal (T1) 20.8	Pass
							Bolt Checks 43.0	Pass
							RATING = 55.9	Pass