

**STATE OF CONNECTICUT
CONNECTICUT SITING COUNCIL**

RE: PETITION BY T-MOBILE
NORTHEAST LLC FOR A
DECLARATORY RULING THAT NO
CERTIFICATE OF ENVIRONMENTAL
COMPATIBILITY AND PUBLIC NEED IS
REQUIRED TO MODIFY THE
TELECOMMUNICATIONS FACILITY
AT 100 BERLIN ROAD (CHRISTIAN
HILL ROAD) IN THE TOWN OF
CROMWELL, CONNECTICUT

PETITION NO. _____

Date: December 18, 2014

PETITION FOR DECLARATORY RULING

Pursuant to General Statutes § 16-50g *et seq.* and § 16-50j-1 *et seq.* of the Regulations of Connecticut State Agencies, T-Mobile Northeast LLC ("T-Mobile") submits this Petition for a Declaratory Ruling ("Petition") for a determination that T-Mobile does not require a Certificate of Environmental Compatibility and Public Need ("Certificate") for the modification of the wireless telecommunications facility at 100 Berlin Road (aka Christian Hill Road), in the Town of Cromwell ("Cromwell Facility" or "Facility"). T-Mobile respectfully requests that the Connecticut Siting Council ("Council") issue a declaratory ruling that the modified Cromwell Facility would not have a substantial adverse impact on the environment and, accordingly, T-Mobile does not need to obtain a Certificate for the modifications to the Cromwell Facility. T-Mobile's existing and proposed upgraded facility qualifies as an "eligible facility" pursuant to §6409 of the Middle Class Tax Relief and Job Creation Act of 2012. Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96 §6409(a), 126 Stat. 156. Further, T-Mobile's proposed upgraded facility qualifies as an exempt and an eligible

facility as referenced by the FCC In The Matter Of Acceleration Of Broadband Deployment By Improving Wireless Facilities Siting Policies, FCC 14-153, 2014 WL 5374631 (F.C.C.)(Adopted October 17, 2014).

II. BACKGROUND INFORMATION

A. The Applicant

T-Mobile is a limited liability company, organized under the laws of Delaware, with a Connecticut office at 35 Griffin Road South, Bloomfield, Connecticut 06002. The company and its affiliated entities are licensed by the Federal Communications Commission ("FCC") to construct and operate a personal wireless services system in Connecticut, which has been interpreted as a "cellular system" within the meaning of General Statutes § 16-50i (a) (6). T-Mobile does not conduct any other business in the State of Connecticut other than the provision of cellular services under FCC rules and regulations.

Correspondence and/or communications regarding this Petition should be addressed to the attorney for the Applicant:

Cohen and Wolf, P.C.
1115 Broad Street
Bridgeport, CT 06604
Telephone: (203) 368-0211
Attention: Julie D. Kohler, Esq.

B. The Cromwell Facility

In Petition No. 750, the Council approved T-Mobile's request to construct a 111 foot pole that would be centered within and attached to the existing 86 foot tower that

had been built upon an abandoned billboard.¹ T-Mobile subsequently modified the Facility in a notice to intent captioned EM-T-MOBILE-033-090515B.

Copies of the Petition No. 750 approval and the EM-T-MOBILE-033-090515B acknowledgement are attached hereto as Exhibit A.

II. PROPOSED MODIFICATIONS TO THE CROMWELL FACILITY

T-Mobile seeks to modify the existing Cromwell Facility by:

- Replacing six (6) antennas at a centerline of 108 feet;
- Adding three (3) RRUs (remote radio units) at a centerline of 108 feet;
- Removing three (3) TMAs (tower mounted amplifiers) and relocating three (3) existing TMAs at a centerline of 108 feet;
- Adding one (1) GPS antenna at a centerline of 50 feet;
- Installing GPS cable; and
- Installing fiber hybrid cable and reusing existing coax cables.

Plans (revised to December 17, 2014) detailing these proposed modifications are attached hereto as Exhibit B.

The majority of proposed modifications to this Facility qualify for acknowledgement as an exempt modification. However, as the proposed antennas must be located at a centerline of 108 feet, the top of the antennas will extend slightly (approximately one foot) above the top of the tower. The top of the antenna will be at a height of 112 AGL. Although this is not a substantial change, it is a deviation from the

¹ The Petition No. 750 staff report indicates that "(t)he top of the antennas would be flush with the top of the proposed pole".

Petition No. 750 approval and T-Mobile seeks a Petition to allow for this minor increase in antenna height.²

III. STATEMENT OF NEED

The Facility is an integral component of T-Mobile's wireless network in the Cromwell and the surrounding area. It is imperative that T-Mobile upgrade its antennas and equipment so that it may provide improved wireless services to people living in and traveling through this area of the State.

T-Mobile has acquired 700 MHz wireless spectrum in Connecticut to improve the service provided to customers. As T-Mobile's current spectrum deployment is in the PCS (1900 MHz) and AWS (2100 MHz) bands, this new spectrum provides an opportunity to significantly improve coverage for wireless subscribers throughout the area. The 700 MHz spectrum is primarily intended to improve in-building coverage for voice and E911 services. The 700 MHz spectrum has a better ability to penetrate building structures so it will provide superior coverage and will now become the priority use of spectrum for customers that attempt to utilize their phones in poorly covered areas.

As part of this new deployment, T-Mobile has chosen to use the best antennas available so that the best possible service can be provided to customers. The proposed antennas have a gain of 16.7 dBi, which is 1 dB more than a shorter model. This additional gain allows each existing antenna installation to provide the absolute maximum possible coverage from that location. The incremental coverage from each site will provide additional in-building coverage to residents in the area and will ensure

² T-Mobile also seeks approval of the other proposed facility modifications identified in Section II.

fewer areas are out of coverage. Ensuring maximum possible coverage will provide voice service to more customers and provides the ability for E911 services to more area. It will also minimize the need to build additional facilities in the town.

To summarize, the antenna type and length does provide a significant amount of additional coverage that is necessary to implement the full utilization of this T-Mobile installation, which will then provide better voice coverage and E911 services to residents.

IV. THE PROPOSED MODIFICATIONS WILL NOT HAVE A SUBSTANTIAL ADVERSE ENVIRONMENTAL EFFECT

As indicated above, the only reason this proposed modification is being filed as a Petition is the slight extension of the antennas above the top of the tower. These antennas will only extend approximately one foot above the top of the tower. This de minimus modification will not result in an adverse environmental effect. The remainder of the proposed site modifications fall within the exempt modification criteria, so by regulation have been established to not have a substantial adverse environmental effect.

A. No Site Impacts

T-Mobile is already collocated on this Facility and it seeks to install a necessary equipment upgrade. The proposed modifications would be situated on the existing structure, without any additional disturbance to the Property or surrounding area. Further, T-Mobile does not propose any generators or HVAC units. Accordingly, the

proposed modifications to the Facility would not have a significant adverse impact on the environment.

B. Compliance with MPE Limits

The operation of the proposed antennas will not increase the total radio frequency (RF) power density, measured at the base of the tower, to a level at or above the applicable standard. According to a Radio Frequency Emissions Analysis Report prepared by EBI Consulting dated November 13, 2014 T-Mobile's operations would add 10.74% of the FCC Standard. Therefore, the calculated "worst case" power density for the planned combined operation at the site including all of the proposed antennas would be 59.23% of the FCC Standard as calculated for a mixed frequency site as evidenced by the engineering exhibit attached hereto as Exhibit C.

C. Structural Analysis

The Cromwell Facility is structurally capable of supporting T-Mobile's proposed antennas. The Structural Analysis Report dated October 31, 2014 (and attached hereto as Exhibit D) concluded that "the subject tower is adequate to support the proposed modified antenna configuration."

D. Other Environmental Factors

T-Mobile's continued collocation on the Cromwell Facility is consistent with the Petition No. 750 approval as it relates to other environmental factors. As such, the modified Cromwell Facility will not have a significant adverse effect on any of the

following: the natural environment; ecological balance; public health and safety; scenic, historic, and recreational values; forests and parks; air; water purity; and fish, aquaculture, and wildlife.

V. NOTICE REQUIRED

In accordance with R.C.S.A. § 16-50j-40(a), T-Mobile sent notice of its intent to file this Petition to each person appearing of record as an owner of property that abuts the site, as well as the appropriate municipal officials. A copy of the notice, list of the property owners, municipal officials³ to whom the notice was sent and a certification of such notice are included in Exhibit E.

VI. CONCLUSION

The information and exhibits referenced above demonstrate that a Petition should issue for the modifications T-Mobile proposes at this Facility.

This Petition and the accompanying materials and documentation demonstrate that the only aspect of the proposal that would not receive acknowledgement as an exempt activity is the location of the proposed antennas at the 108 foot elevation.

The top of the T-Mobile antennas will be a mere one foot above the top of the tower, which would not have any substantial adverse environmental effect. T-Mobile therefore respectfully requests that the Council issue a declaratory ruling approving the Cromwell Facility modifications as proposed.

³ The Cromwell Facility is within 2500 feet of the City of Middletown, therefore notice was provided to the Mayor of Middletown as well as the Mayor of Cromwell.

Respectfully Submitted,

T-MOBILE NORTHEAST LLC

By:



Julie D. Kohler, Esq.

Cohen and Wolf, P.C.

1115 Broad Street

Bridgeport, CT 06604

Tel. (203) 368-0211

Fax (203) 394-9901

jkohler@cohenandwolf.com

EXHIBIT A

Connecticut Siting Council

Staff Reports

Petition No. 750
Omnipoint Communications, Inc., a/k/a T-Mobile (T-Mobile)
Cromwell, Connecticut
Staff Report
January 25, 2006

On December 13, 2005, Connecticut Siting Council (Council) member Philip T. Ashton and Christina Lepage of Council staff met at the proposed site located at 100 Berlin Road in Cromwell to review this petition. T-Mobile proposes to construct a 111-foot pole. T-Mobile is petitioning the Council for a declaratory ruling that no Certificate of Environmental Compatibility and Public Need (Certificate) is required for this facility.

An existing structure is located at the proposed site. This structure was built upon an abandoned billboard. The existing structure includes an 86-foot tower with multiple antennas that bring the total height to approximately 100 feet above ground level (agl). T-Mobile proposes to build a 111-foot pole that would be centered within and attached to the existing structure for support. The top of the antennas would be flush with the top of the proposed pole.

The current structure is made up of four I-beams with associated bracing. Two of the I-beams with x-bracing can be removed during the installation of the proposed pole provided that additional bracing be installed on the remaining two I-beams.

The associated equipment would be located on a ten-foot by five-foot concrete slab would be located to the south of the proposed pole. The existing 15-foot by 15-foot leased area is currently enclosed by chain link and barbed wire fence. The existing leased area would have to be expanded to fully enclose the proposed equipment.

The existing structure is located on a parcel that is zoned general business (BUS) and currently is the location of the Crowne Plaza Hotel (Cromwell). The property to the south and southeast of the parcel are also zoned BUS. The property to the east and north of the parcel are zoned residential.

T-Mobile has proposed this project to fill an existing gap in coverage along the Interstate 91 (I-91) corridor and its interchange with Route 372 in Cromwell.

The proposed cumulative radio frequency electromagnetic radiation is below the ANSI/IEEE standard.

Content Last Modified on 1/26/2006 9:40:18 AM



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

Internet: ct.gov/csc

Daniel F. Caruso

Chairman

June 23, 2009

Thomas J. Regan, Esq.
Brown Rudnick LLP
City Place I, 185 Asylum Street
Hartford, CT 06103

RE: **EM-T-MOBILE-033-090515B** - T-Mobile USA, Inc. notice of intent to modify an existing telecommunications facility located at Christian Hill Road, a/k/a 100 Berlin Road, Cromwell, Connecticut.

Dear Attorney Regan:

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.

The proposed modifications are to be implemented as specified here and in your notice dated May 15, 2009, including the placement of all necessary equipment and shelters within the tower compound. 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. Any deviation from this format may result in the Council implementing enforcement proceedings pursuant to General Statutes § 16-50u including, without limitation, imposition of expenses resulting from such failure and of civil penalties in an amount not less than one thousand dollars per day for each day of construction or operation in material violation.

Thank you for your attention and cooperation.

Very truly yours,

S. Derek Phelps
Executive Director

SDP/MP/jb

c: The Honorable Jeremy J. Shingleton, First Selectman, Town of Cromwell
Frederic Curtin, Zoning Enforcement Officer, Town of Cromwell
Shaner Hotel Group Properties



CONNECTICUT SITING COUNCIL

Affirmative Action / Equal Opportunity Employer

EXHIBIT B



ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE SUBJECT TO APPROVAL BY LESSEE/LICENSEE'S STRUCTURAL & RF ENGINEERS. LOCATIONS OF POWER & TELEPHONE FACILITIES ARE SUBJECT TO APPROVAL BY UTILITY COMPANIES.

KEY MAP

SCALE: N.T.S



PROJECT : L700

CONFIGURATION

702CC

SUBMITTALS

LE REV A	08.18.14
LE REV 0	08.27.14
LE REV 1	08.28.14
LE REV 2	09.03.14
LE REV 3	09.05.14
LE REV 4	12.16.14
LE REV 5	12.17.14

ATLANTIS GROUP

1340 Centre Street
Suite 212
Newton, MA 02459
Office: 617-965-0789
Fax: 617-213-5056

LEASE EXHIBIT

SITE NUMBER:
CTHA240A

SITE NAME:
HA240/VERIZON_BB

SITE ADDRESS:
CHRISTIAN HILL RD / 100 BERLIN RD
CROMWELL, CT, 06416

NORTHEAST SITE SOLUTIONS

54 MAIN STREET, UNIT 3
STURBRIDGE, MA 01566
(508) 434-5237

FOR

T-MOBILE NORTHEAST, LLC

35 GRIFFIN ROAD SOUTH
BLOOMFIELD, CT 06002
OFFICE: (860) 692-7100
FAX: (860) 692-7159

DRAWN BY: FG

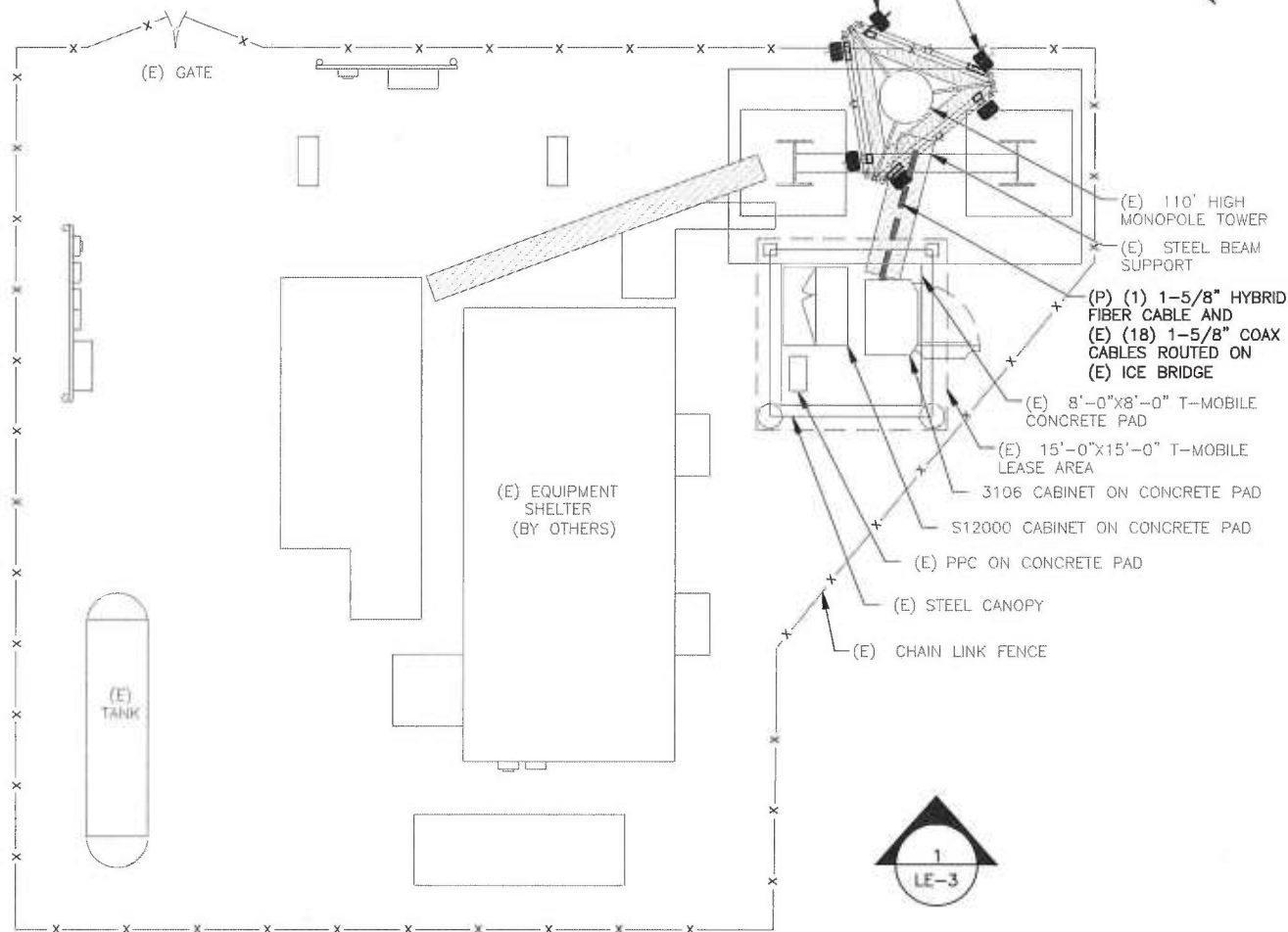
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PAGE 1 OF 3



(P) COMMSCOPE DUAL POLE ANTENNA AND (P) RRU
TO REPLACE (E) UMTS QUAD POLE ANTENNA
(E) DDB4 TO BE RELOCATED TO OTHER ANTENNA
(TYP 1/SECTOR, TOTAL OF 3)

(P) GSM/UMTS QUAD POLE AND
(E) RELOCATED ddb4 TMA
(TYP 1/SECTOR, TOTAL OF 3)
TO REPLACE (E) GSM QUAD POLE ANTENNA AND
(E) (1) ddb2 TMA (TOTAL 3) TO BE REMOVED



ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND ARE
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SITE PLAN

SCALE: 1" = 10'-0"



PROJECT : L700

CONFIGURATION

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CHECKED BY: SM

PAGE 2 OF 3

(P) COMMSCOPE DUAL POLE ANTENNA AND (P) RRU
TO REPLACE (E) UMTS QUAD POLE ANTENNA
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(P) GSM/UMTS QUAD POLE AND
(E) RELOCATED ddb4 TMA
(TYP 1/SECTOR, TOTAL OF 3)
TO REPLACE (E) GSM QUAD POLE ANTENNA AND
(E) (1) dB2 TMA (TOTAL 3) TO BE REMOVED
(E) ANTENNAS (BY OTHERS)

(E) 110' HIGH MONOPOLE TOWER

(P) (1) 1-5/8" HYBRID FIBER CABLE
AND (E) (18) 1-5/8" COAX CABLES

(E) STEEL BEAM SUPPORT

(P) (1) GPS ANTENNA

(P) (1) 1/2" GPS CABLE

(E) STEEL CANOPY

(E) 3106 CABINET ON CONCRETE PAD

(E) S12000 CABINET ON CONCRETE PAD

(E) PPC ON CONCRETE PAD

(E) CHAIN LINK FENCE

TOP OF (P) T-MOBILE ANTENNAS

ELEV.= 112'± AGL

TOP OF EXISTING TOWER

ELEV.= 111'± (AGL)

RAD CENTER OF (P) T-MOBILE ANTENNAS

ELEV.= 108'± AGL

CENTER OF EXISTING ANTENNAS

ELEV.= 95'± (AGL)

CENTER OF EXISTING ANTENNAS

ELEV.= 80'± (AGL)

RAD CENTER OF (P) T-MOBILE GPS

ELEV.= 50'± AGL

ALL EQUIPMENT LOCATIONS ARE APPROXIMATE AND
ARE SUBJECT TO APPROVAL BY LESSEE/LICENSEE'S
STRUCTURAL & RF ENGINEERS. LOCATIONS OF
POWER & TELEPHONE FACILITIES ARE SUBJECT TO
APPROVAL BY UTILITY COMPANIES.

ELEVATION

SCALE: 1/16" = 1'-0"



PROJECT : L700

CONFIGURATION

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CHECKED BY: SM

PAGE 3 OF 3

EXHIBIT C

**RADIO FREQUENCY EMISSIONS ANALYSIS REPORT
EVALUATION OF HUMAN EXPOSURE POTENTIAL
TO NON-IONIZING EMISSIONS**

T-Mobile Existing Facility

Site ID: CTHA240A

**HA240 / Verizon BB
Christian Hill Road / 100 Berlin Road
Cromwell, CT 06416**

November 13, 2014

EBI Project Number: 62146100

Site Compliance Summary	
Compliance Status:	COMPLIANT
Site total MPE% of FCC general public allowable limit:	59.23 %

November 13, 2014

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

Emissions Analysis for Site: **CTHA240A – HA240 / Verizon BB**

EBI Consulting was directed to analyze the proposed T-Mobile facility located at **Christian Hill Road / 100 Berlin Road, Cromwell, CT**, for the purpose of determining whether the emissions from the Proposed T-Mobile Antenna Installation located on this property are within specified federal limits.

All information used in this report was analyzed as a percentage of current Maximum Permissible Exposure (% MPE) as listed in the FCC OET Bulletin 65 Edition 97-01 and ANSI/IEEE Std C95.1. The FCC regulates Maximum Permissible Exposure in units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$). The number of $\mu\text{W}/\text{cm}^2$ calculated at each sample point is called the power density. The exposure limit for power density varies depending upon the frequencies being utilized. Wireless Carriers and Paging Services use different frequency bands each with different exposure limits, therefore it is necessary to report results and limits in terms of percent MPE rather than power density.

All results were compared to the FCC (Federal Communications Commission) radio frequency exposure rules, 47 CFR 1.1307(b)(1) – (b)(3), to determine compliance with the Maximum Permissible Exposure (MPE) limits for General Population/Uncontrolled environments as defined below.

General population/uncontrolled exposure limits apply to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Therefore, members of the general public would always be considered under this category when exposure is not employment related, for example, in the case of a telecommunications tower that exposes persons in a nearby residential area.

Public exposure to radio frequencies is regulated and enforced in units of microwatts per square centimeter ($\mu\text{W}/\text{cm}^2$). The general population exposure limit for the 700 MHz Band is $467 \mu\text{W}/\text{cm}^2$, and the general population exposure limit for the PCS and AWS bands is $1000 \mu\text{W}/\text{cm}^2$. Because each carrier will be using different frequency bands, and each frequency band has different exposure limits, it is necessary to report percent of MPE rather than power density.

Occupational/controlled exposure limits apply to situations in which persons are exposed as a consequence of their employment and in which those persons who are exposed have been made fully aware of the potential for exposure and can exercise control over their exposure. Occupational/controlled exposure limits also apply where exposure is of a transient nature as a result of incidental passage through a location where exposure levels may be above general population/uncontrolled limits (see below), as long as the exposed person has been made fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Additional details can be found in FCC OET 65.

CALCULATIONS

Calculations were done for the proposed T-Mobile Wireless antenna facility located at **Christian Hill Road / 100 Berlin Road, Cromwell, CT**, using the equipment information listed below. All calculations were performed per the specifications under FCC OET 65. Since T-Mobile is proposing highly focused directional panel antennas, which project most of the emitted energy out toward the horizon, all calculations were performed assuming a lobe representing the maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was focused at the base of the tower. For this report the sample point is the top of a 6 foot person standing at the base of the tower.

For all calculations, all equipment was calculated using the following assumptions:

- 1) 2 GSM channels (PCS Band - 1900 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel
- 2) 2 UMTS channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 30 Watts per Channel.
- 3) 2 LTE channels (AWS Band – 2100 MHz) were considered for each sector of the proposed installation. These Channels have a transmit power of 60 Watts per Channel.
- 4) 1 LTE channel (700 MHz Band) was considered for each sector of the proposed installation. This channel has a transmit power of 30 Watts.
- 5) All radios at the proposed installation were considered to be running at full power and were uncombined in their RF transmissions paths per carrier prescribed configuration. Per FCC OET Bulletin No. 65 - Edition 97-01 recommendations to achieve the maximum anticipated value at each sample point, all power levels emitting from the proposed antenna installation are increased by a factor of 2.56 to account for possible in-phase reflections from the surrounding environment. This is rarely the case, and if so, is never continuous.

- 6) For the following calculations the sample point was the top of a six foot person standing at the base of the tower. The maximum gain of the antenna per the antenna manufactures supplied specifications minus 10 dB was used in this direction. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 7) The antennas used in this modeling are the **Ericsson AIR21 B4A/B2P** for 1900 MHz (PCS) and 2100 MHz (AWS) channels and the **Ericsson AIR21 B4A/B12P** for 2100 MHz (AWS) and 700 MHz channels. This is based on feedback from the carrier with regards to anticipated antenna selection. The **Ericsson AIR21 B4A/B2P** has a maximum gain of **15.5 dBd** at its main lobe for 1900 MHz and 2100 MHz channels. The **Ericsson AIR21 B4A/B12P** has a maximum gain of **15.5 dBd** at its main lobe for 2100 MHz channels and **13.5 dBd** at its main lobe for 700 MHz channels. The maximum gain of the antenna per the antenna manufactures supplied specifications, minus 10 dB, was used for all calculations. This value is a very conservative estimate as gain reductions for these particular antennas are typically much higher in this direction.
- 8) The antenna mounting height centerline of the proposed antennas is **108 feet** above ground level (AGL).
- 9) Emissions values for additional carriers were taken from the Connecticut Siting Council active database. Values in this database are provided by the individual carriers themselves.

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

T-Mobile Site Inventory and Power Data

Sector:	A	Sector:	B	Sector:	C
Antenna #:	1	Antenna #:	1	Antenna #:	1
Make / Model:	Ericsson AIR21 B4A/B2P	Make / Model:	Ericsson AIR21 B4A/B2P	Make / Model:	Ericsson AIR21 B4A/B2P
Gain:	15.5 dBd	Gain:	15.5 dBd	Gain:	15.5 dBd
Height (AGL):	108	Height (AGL):	108	Height (AGL):	108
Frequency Bands	1900 MHz(PCS) / 2100 MHz(AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz(AWS)	Frequency Bands	1900 MHz(PCS) / 2100 MHz(AWS)
Channel Count	4	Channel Count	4	# PCS Channels:	4
Total TX Power:	120	Total TX Power:	120	# AWS Channels:	120
ERP (W):	1,880.91	ERP (W):	1,880.91	ERP (W):	1,880.91
Antenna A1 MPE%	1.47	Antenna B1 MPE%	1.47	Antenna C1 MPE%	1.47
Antenna #:	2	Antenna #:	2	Antenna #:	2
Make / Model:	Ericsson AIR21 B4A/B12P-8	Make / Model:	Ericsson AIR21 B4A/B12P-8	Make / Model:	Ericsson AIR21 B4A/B12P-8
Gain:	15.5 dBd / 13.5 dBd	Gain:	15.5 dBd / 13.5 dBd	Gain:	15.5 dBd / 13.5 dBd
Height (AGL):	108	Height (AGL):	108	Height (AGL):	108
Frequency Bands	2100 MHz(AWS) / 700 MHz	Frequency Bands	2100 MHz(AWS) / 700 MHz	Frequency Bands	2100 MHz(AWS) / 700 MHz
Channel Count	3	Channel Count	3	Channel Count	3
Total TX Power:	150	Total TX Power:	150	Total TX Power:	150
ERP (W):	2,311.60	ERP (W):	2,311.60	ERP (W):	2,311.60
Antenna A2 MPE%	2.11	Antenna B2 MPE%	2.11	Antenna C2 MPE%	2.11

Site Composite MPE%	
Carrier	MPE%
T-Mobile	10.74
AT&T	33.48 %
Verizon Wireless	15.01 %
Site Total MPE %:	59.23 %

T-Mobile Sector 1 Total:	3.58 %
T-Mobile Sector 2 Total:	3.58 %
T-Mobile Sector 3 Total:	3.58 %
Site Total:	59.23 %

Summary

All calculations performed for this analysis yielded results that were **within** the allowable limits for general public exposure to RF Emissions.

The anticipated maximum composite contributions from the T-Mobile facility as well as the site composite emissions value with regards to compliance with FCC's allowable limits for general public exposure to RF Emissions are shown here:

T-Mobile Sector	Power Density Value (%)
Sector 1:	3.58 %
Sector 2:	3.58 %
Sector 3 :	3.58 %
T-Mobile Total:	10.74 %
Site Total:	59.23 %
Site Compliance Status:	COMPLIANT

The anticipated composite MPE value for this site assuming all carriers present is **59.23%** of the allowable FCC established general public limit sampled at the ground level. This is based upon values listed in the Connecticut Siting Council database for existing carrier emissions.

FCC guidelines state that if a site is found to be out of compliance (over allowable thresholds), that carriers over a 5% contribution to the composite value will require measures to bring the site into compliance. For this facility, the composite values calculated were well within the allowable 100% threshold standard per the federal government.



Scott Heffernan
RF Engineering Director

EBI Consulting

21 B Street
Burlington, MA 01803

EXHIBIT D

Structural Analysis Report

82' Sign Structure w/ 111' Pipe Mast

*Proposed T-Mobile
Antenna Upgrade*

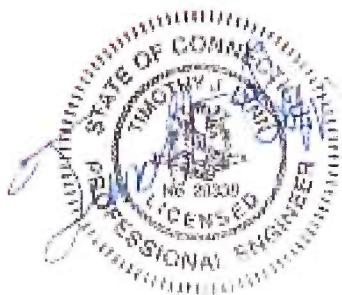
T-Mobile Site Ref: CTHA240A

Verizon Site Ref: Cromwell SW

*100 Berlin Road
Cromwell, CT*

Centek Project No. 14033.019

Date: October 31, 2014



Prepared for:
T-Mobile USA
35 Griffin Road
Bloomfield, CT 06002

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Introduction

The purpose of this report is to summarize the results of the non-linear, P- Δ structural analysis of the antenna installation proposed by T-Mobile on the existing 82-ft sign structure owned and operated by Verizon Wireless, located in Cromwell, Connecticut.

The host structure is a 82-ft sign structure with a 111-ft pipe mast. The existing structure geometry, member sizes and foundation system were obtained from a previous structural design report prepared by Centek job no. 13001.070 dated December 11, 2013.

Antenna and appurtenance information the aforementioned Centek structural analysis, a tower mapping report prepared by Eastern Communications dated October 28, 2014 and a T-Mobile RF data sheet.

The structure is made up of two (2) W24x68 vertical steel legs, one (1) HSS18x0.5 steel pipe mast, L5x5x5/16 horizontal and diagonal steel bracing and WT6x15 steel bracing.

T-Mobile proposes the removal of six (6) panel antennas and three (3) TMA's and the installation of six (6) panel antennas and three (3) remote radio heads mounted to the existing low profile platform. Refer to the Antenna and Appurtenance Summary below for a detailed description of the proposed antenna and appurtenance configuration.

Antenna and Appurtenance Summary

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

- AT&T: (Existing)
Antennas: Six (6) Powerwave 7770.00 panel antennas, twelve (12) Powerwave LPG21401 TMA's, three (3) KMW AM-X-CD-16-65-00T panel antennas, six (6) Ericsson RRUS-11 and one (1) Raycap DC6-48-60-18-8F surge arrestor mounted on pipe mounts to the existing Verizon Wireless low profile platform with a RAD center elevation of 98-ft AGL.
Coax Cables: Twelve (12) 1-5/8" $\varnothing$ coax cables, one (1) fiber cable and two (2) dc control cables run on the exterior of existing sign structure.
- Verizon (Reserved):
Antennas: Six (6) Antel LPA-80063-6CF panel antennas, six (6) Antel BXA-70063-6CF panel antennas, six (6) LPA-171063-12CF panel antennas, six (6) RRH's and one (1) main distribution box mounted on a low profile platform with a RAD center elevation of 88-ft AGL.
Coax Cables: Eighteen (18) 1-5/8" $\varnothing$ coax cables and one (1) 1-1/4" fiber cable run on the exterior of the existing sign structure.
- MetroPCS (Existing)
Antennas: Three (3) RFS APXV18-206517S-C panel antennas mounted to the steel flanges (legs) of the existing sign structure with a RAD center elevation of 77-ft AGL.
Coax Cable: Six (6) 1-5/8" $\varnothing$ coaxial cables vertically supported on the existing legs of the sign structure.

- T-MOBILE (Existing/Reserved)
Antennas: One (1) VIC-100 GPS antenna on a side arm mounted to the leg of the sign structure with a RAD center elevation of 50-ft AGL.
Coax Cables: One (1) 1/2" Ø coax cable run on the exterior of the existing sign structure.
- T-MOBILE: (Existing to Remain)
Antennas: Three (3) Ericsson KRY-112 TMA's mounted on a low profile platform mounted with a RAD center elevation of 108-ft AGL.
Coax Cables: Eighteen (18) 1-5/8" Ø coax cables, nine (9) within existing 111-ft pipe mast and nine (9) on the exterior of the pipe mast.
- T-MOBILE: (Existing to Remove)
Antennas: Six (6) RFS APX16 panel antennas and three (3) TMA's mounted on a low profile platform mounted with a RAD center elevation of 108-ft AGL.
- **T-MOBILE (Proposed):**
Antennas: Three (3) Ericsson AIR 21 B2A/B4P panel antennas, three (3) Ericsson AIR B4A/B12P-8 panel antennas and three (3) Ericsson RRUS-11 remote radio heads mounted on a low profile platform mounted with a RAD center elevation of 108-ft AGL.
Coax Cable: One (1) 1-5/8" Ø fiber cable running on the exterior of the pipe mast.

Primary Assumptions Used in the Analysis

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

A n a l y s i s

The existing tower was analyzed using a comprehensive computer program entitled RISA 3D.

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

The controlling wind speed is determined by evaluating the local available wind speed data as provided in Appendix K of the CSBC¹ and the wind speed data available in the TIA/EIA-222-F-96 Standard. The higher of the two wind speeds is utilized in preparation on the tower analysis.

L o a d i n g

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

Basic Wind Speed:	Middlesex; v = 85 mph (fastest mile)	[Section 16 of TIA/EIA-222-F-96]
	Cromwell; v = 100 mph (3 second gust) equivalent to v = 80 mph (fastest mile)	[Appendix K of the 2005 CT Building Code Supplement]
	<i>TIA/EIA-222-F wind speed controls.</i>	
Load Cases:	<u>Load Case 1</u> ; 85 mph wind speed w/ no ice plus gravity load – used in calculation of tower stresses and rotation.	[Section 2.3.16 of TIA/EIA-222-F-96]
	<u>Load Case 2</u> ; 74 mph wind speed w/ ½" radial ice plus gravity load – used in calculation of tower stresses. The 74 mph wind speed velocity represents 75% of the wind pressure generated by the 85 mph wind speed.	[Section 2.3.16 of TIA/EIA-222-F-96]
	<u>Load Case 3</u> ; Seismic – not checked	[Section 1614.5 of State Bldg. Code 2005] does not control in the design of this structure type

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

Structure Capacity

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

Calculated stresses were found to be within allowable limits. In Load Case 6, per RISA-3D "Steel Code Checks", this structure was found to be at **99.2%** of its total capacity.

Tower Section	Elevation	Stress Ratio (percentage of capacity)	Result
Leg 2	1.25'	99.2%	PASS

Foundation and Anchors

The existing foundation consists of an 55-ft long (approx) x 8.5-ft wide x 3-ft deep reinforced concrete strip footing with concrete column pedestals. The sub-grade conditions used in the analysis of the existing foundation were based on normal soil values as permitted by EIA/TIA-222-F Section 7.1.3. The base of the sign structure is connected to the foundation by means of (20) 1"Ø, (assumed ASTM A-615-75) anchor bolts embedded into the existing concrete foundation. The base of the communications pipe structure is connected to the foundation by means of (10) 1.75"Ø, ASTM A615-75 anchor bolts embedded into the existing concrete foundation.

- The foundation was found to be within allowable limits.

Foundation	Design Limit	IBC 2003/2005 CT State Building Code Section 3108.4.2	Proposed Loading	Result
Reinf. Conc. Pad w/ Pedestals	OTM	2.0	3.6	PASS

Note: OTM denotes Overturning Moment

- The structure anchor bolts, base plate and flange plates were found to be within allowable limits.

Structure Component	Design Limit	Stress Ratio (percentage of capacity)	Result
Anchor Bolts (Mast)	Tension	57.0%	PASS
Base Plate (Mast)	Bending	43.0%	PASS
Flange Bolts	Tension	70.4%	PASS
Flange Plate	Bending	61.0%	PASS
Anchor Bolts (Leg)	Tension	52.5%	PASS
Base Plate (Leg)	Bending	96.0%	PASS

CEN TEK engineering, Inc.
Structural Analysis – 82' Sign Structure
T-Mobile Antenna Upgrade – CTHA240A
Cromwell, CT
October 31, 2014

Conclusion

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

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

Please feel free to call with any questions or comments.

Respectfully Submitted by:



Timothy J. Lynn, PE
Structural Engineer



CEN TEK engineering, Inc.
Structural Analysis – 82' Sign Structure
T-Mobile Antenna Upgrade – CTHA240A
Cromwell, CT
October 31, 2014

*Standard Conditions for Furnishing of
Professional Engineering Services on
Existing Structures*

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

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

GENERAL DESCRIPTION OF STRUCTURAL ANALYSIS PROGRAM ~ RISA - 3 D

RISA-3D Structural Analysis Program is an integrated structural analysis and design software package for buildings, bridges, tower structures, etc.

Modeling Features:

- Comprehensive CAD-like graphic drawing/editing capabilities that let you draw, modify and load elements as well as snap, move, rotate, copy, mirror, scale, split, merge, mesh, delete, apply, etc.
- Versatile drawing grids (orthogonal, radial, skewed)
- Universal snaps and object snaps allow drawing without grids
- Versatile general truss generator
- Powerful graphic select/unselect tools including box, line, polygon, invert, criteria, spreadsheet selection, with locking
- Saved selections to quickly recall desired selections
- Modification tools that modify single items or entire selections
- Real spreadsheets with cut, paste, fill, math, sort, find, etc.
- Dynamic synchronization between spreadsheets and views so you can edit or view any data in the plotted views or in the spreadsheets
- Simultaneous view of multiple spreadsheets
- Constant in-stream error checking and data validation
- Unlimited undo/redo capability
- Generation templates for grids, disks, cylinders, cones, arcs, trusses, tanks, hydrostatic loads, etc.
- Support for all units systems & conversions at any time
- Automatic interaction with RISASection libraries
- Import DXF, RISA-2D, STAAD and ProSteel 3D files
- Export DXF, SDNF and ProSteel 3D files

Analysis Features:

- Static analysis and P-Delta effects
- Multiple simultaneous dynamic and response spectra analysis using Gupta, CQC or SRSS mode combinations
- Automatic inclusion of mass offset (5% or user defined) for dynamic analysis
- Physical member modeling that does not require members to be broken up at intermediate joints
- State of the art 3 or 4 node plate/shell elements
- High-end automatic mesh generation — draw a polygon with any number of sides to create a mesh of well-formed quadrilateral (NOT triangular) elements.
- Accurate analysis of tapered wide flanges - web, top and bottom flanges may all taper independently
- Automatic rigid diaphragm modeling
- Area loads with one-way or two-way distributions
- Multiple simultaneous moving loads with standard AASHTO loads and custom moving loads for bridges, cranes, etc.
- Torsional warping calculations for stiffness, stress and design
- Automatic Top of Member offset modeling
- Member end releases & rigid end offsets
- Joint master-slave assignments
- Joints detachable from diaphragms

CEN TEK engineering, Inc.
Structural Analysis – 82' Sign Structure
T-Mobile Antenna Upgrade – CTHA240A
Cromwell, CT
October 31, 2014

- Enforced joint displacements
- 1-Way members, for tension only bracing, slipping, etc.
- 1-Way springs, for modeling soils and other effects
- Euler members that take compression up to their buckling load, then turn off.
- Stress calculations on any arbitrary shape
- Inactive members, plates, and diaphragms allows you to quickly remove parts of structures from consideration
- Story drift calculations provide relative drift and ratio to height
- Automatic self-weight calculations for members and plates
- Automatic subgrade soil spring generator

Graphics Features:

- Unlimited simultaneous model view windows
- Extraordinary “true to scale” rendering, even when drawing
- High-speed redraw algorithm for instant refreshing
- Dynamic scrolling stops right where you want
- Plot & print virtually everything with color coding & labeling
- Rotate, zoom, pan, scroll and snap views
- Saved views to quickly restore frequent or desired views
- Full render or wire-frame animations of deflected model and dynamic mode shapes with frame and speed control
- Animation of moving loads with speed control
- High quality customizable graphics printing

Design Features:

- Designs concrete, hot rolled steel, cold formed steel and wood
- ACI 1999/2002, BS 8110-97, CSA A23.3-94, IS456:2000, EC 2-1992 with consistent bar sizes through adjacent spans
- Exact integration of concrete stress distributions using parabolic or rectangular stress blocks
- Concrete beam detailing (Rectangular, T and L)
- Concrete column interaction diagrams
- Steel Design Codes: AISC ASD 9th, LRFD 2nd & 3rd, HSS Specification, CAN/CSA-S16.1-1994 & 2004, BS 5950-1-2000, IS 800-1984, Euro 3-1993 including local shape databases
- AISI 1999 cold formed steel design
- NDS 1991/1997/2001 wood design, including Structural Composite Lumber, multi-ply, full sawn
- Automatic spectra generation for UBC 1997, IBC 2000/2003
- Generation of load combinations: ASCE, UBC, IBC, BOCA, SBC, ACI
- Unbraced lengths for physical members that recognize connecting elements and full lengths of members
- Automatic approximation of K factors
- Tapered wide flange design with either ASD or LRFD codes
- Optimization of member sizes for all materials and all design codes, controlled by standard or user-defined lists of available sizes and criteria such as maximum depths
- Automatic calculation of custom shape properties
- Steel Shapes: AISC, HSS, CAN, ARBED, British, Euro, Indian, Chilean
- Light Gage Shapes: AISI, SSMA, Dale / Incor, Dietrich, MarinoWARE
- Wood Shapes: Complete NDS species/grade database
- Full seamless integration with RISAFoot (Ver 2 or better) for advanced footing design and detailing
- Plate force summation tool

CEN TEK engineering, Inc.
Structural Analysis – 82' Sign Structure
T-Mobile Antenna Upgrade – CTHA240A
Cromwell, CT
October 31, 2014

Results Features:

- Graphic presentation of color-coded results and plotted designs
- Color contours of plate stresses and forces with quadratic smoothing, the contours may also be animated
- Spreadsheet results with sorting and filtering of: reactions, member & joint deflections, beam & plate forces/stresses, optimized sizes, code designs, concrete reinforcing, material takeoffs, frequencies and mode shapes
- Standard and user-defined reports
- Graphic member detail reports with force/stress/deflection diagrams and detailed design calculations and expanded diagrams that display magnitudes at any dialed location
- Saved solutions quickly restore analysis and design results.

**Development of Design Heights, Exposure Coefficients,
 and Velocity Pressures Per TIA/EIA**

Wind Speeds

Basic Wind Speed, V	$V := 85$	mph	
Basic Wind Speed with Ice, V_i	$V_i := 74$	mph	(per TIA/EIA-222-F Section 2.3.16)

Heights above ground level, z

Leg Member Section 1 =	$z_1 := 10$	ft
Leg Member Section 2 =	$z_2 := 30$	ft
Leg Member Section 3 =	$z_3 := 50$	ft
Leg Member Section 4 =	$z_4 := 70$	ft
Bracing Members =	$z_{Br} := 40$	ft

Exposure Coefficients, k_z

(per TIA/EIA-222-F Section 2.3.3)

Leg Member Section 1 =	$Kz_1 := \left(\frac{z_1}{33} \right)^{\frac{2}{7}} = 0.711$
Leg Member Section 2 =	$Kz_2 := \left(\frac{z_2}{33} \right)^{\frac{2}{7}} = 0.973$
Leg Member Section 3 =	$Kz_3 := \left(\frac{z_3}{33} \right)^{\frac{2}{7}} = 1.126$
Leg Member Section 4 =	$Kz_4 := \left(\frac{z_4}{33} \right)^{\frac{2}{7}} = 1.24$
Bracing Members =	$Kz_{Br} := \left(\frac{z_{Br}}{33} \right)^{\frac{2}{7}} = 1.057$

Velocity Pressure without ice, q_z

(per TIA/EIA-222-F Section 2.3.3)

Leg Member Section 1 =	$qz_1 := 0.00256 \cdot Kz_1 \cdot V^2 = 13.15$
Leg Member Section 2 =	$qz_2 := 0.00256 \cdot Kz_2 \cdot V^2 = 17.999$
Leg Member Section 3 =	$qz_3 := 0.00256 \cdot Kz_3 \cdot V^2 = 20.827$
Leg Member Section 4 =	$qz_4 := 0.00256 \cdot Kz_4 \cdot V^2 = 22.929$
Bracing Members =	$qz_{Br} := 0.00256 \cdot Kz_{Br} \cdot V^2 = 19.541$

Velocity Pressure with ice, q_{zICE}

(per TIA/EIA-222-F Section 2.3.3)

$$\text{Leg Member Section 1} = q_{zICE1} := 0.00256 \cdot K_{z1} \cdot V_i^2 = 9.967$$

$$\text{Leg Member Section 2} = q_{zICE2} := 0.00256 \cdot K_{z2} \cdot V_i^2 = 13.642$$

$$\text{Leg Member Section 3} = q_{zICE3} := 0.00256 \cdot K_{z3} \cdot V_i^2 = 15.786$$

$$\text{Leg Member Section 4} = q_{zICE4} := 0.00256 \cdot K_{z4} \cdot V_i^2 = 17.379$$

$$\text{Bracing Members} = q_{zICE_{Br}} := 0.00256 \cdot K_{z_{Br}} \cdot V_i^2 = 14.811$$

TIA/EIA Common Factors:

$$\text{Gust Response Factor} = G_H := 1.69 \quad (\text{per TIA/EIA-222-F Section 2.3.4})$$

$$\text{Gust Response Factor Multiplier} = m := 1.25 \quad (\text{per TIA/EIA-222-F Section 2.3.4.4})$$

$$\text{Radial Ice Thickness} = I_r := 0.50 \quad \text{in} \quad (\text{per TIA/EIA-222-F Section 2.3.1})$$

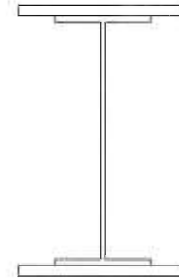
$$\text{Radial Ice Density} = I_d := 56.00 \quad \text{pcf}$$

Development of Wind & Ice Load on W24x68 w/ Plate

(per TIA/EIA-222-F-1996 Criteria)

W24x68 w/ Plate Data:

Shape =	Flat
Depth =	$d := 25.75$ in
Length =	$L := 20$ ft
Flange Width =	$b_f := 16$ in
Flange Thickness =	$t_f := 2.585$ in
Web Thickness =	$t_w := .415$ in
Member Cross Sectional Area =	$A_{member} := 52.1$ in ²



Gravity Loads (without ice)

Weight of the Member =

Self Weight (Computed internally by Risa-3D) plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot =

$$A_{I_{member}} := 2(t_f + 2 \cdot l_r)(b_f + 2 \cdot l_r) + (d - 2t_f - 2l_r)(t_w + 2 \cdot l_r) - A_{member} = 97.5$$

Weight of Ice on Member =

$$W_{ICE_member} := l_d \cdot \frac{A_{I_{member}}}{144} = 38 \text{ plf} \quad \text{BLC 3}$$

Wind Perpendicular to Flange:

Member Aspect Ratio =

$$A_{r_{member}} := \frac{12L}{b_f} = 15.0$$

Member Force Coefficient =

$C_{a_{member}} = 1.67$ (per TIA/EIA-222-F Table 3)

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Flange Projected Surface Area =

$$A_{member} := \frac{b_f}{12} = 1.333 \text{ ft}$$

Section 1 Flange Wind Force =

$$qz_1 \cdot G_H \cdot C_{a_{member}} \cdot A_{member} = 49 \text{ plf} \quad \text{BLC 7}$$

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Flange Projected Surface Area w/ Ice =

$$A_{ICE_member} := \frac{(b_f + 2 \cdot l_r)}{12} = 1.417 \text{ ft}$$

Section 1 Flange Wind Force w/ Ice =

$$qz_{ICE_1} \cdot G_H \cdot C_{a_{member}} \cdot A_{ICE_member} = 40 \text{ plf} \quad \text{BLC 6}$$

Subject:

Wind Loading on Structural Members

Location:

Cromwell, CT

Rev. 0: 10/30/14

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Wind Perpendicular to Web

Member Aspect Ratio = $A_{r_{member}} := \frac{12L}{d} = 9.3$

Member Force Coefficient = $C_{a_{member}} = 1.48$ (per TIA/EIA-222-F Table 3)

Wind Load (without ice) (per TIA/EIA-222-F-1996 Section 2.3.2)

Web Projected Surface Area = $A_{member} := \frac{d}{12} = 2.146$ ft

Section 1 Web Wind Force = $qz_1 \cdot G_H \cdot C_{a_{member}} \cdot A_{member} = 70$ plf **BLC 5**

Wind Load (with ice) (per TIA/EIA-222-F-1996 Section 2.3.2)

Web Projected Surface Area w/ Ice = $A_{ICE_{member}} := \frac{(d + 2 \cdot I_r)}{12} = 2.229$ ft

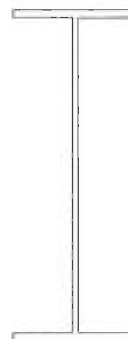
Section 1 Web Wind Force w/ Ice = $qz_{ICE1} \cdot G_H \cdot C_{a_{member}} \cdot A_{ICE_{member}} = 55$ plf **BLC 4**

Development of Wind & Ice Load on W24x68

(per TIA/EIA-222-F-1996 Criteria)

W24x68 Data:

Shape =	Flat
Depth =	$d := 23.75$ in
Length =	$L := 20$ ft
Flange Width =	$b_f := 9$ in
Flange Thickness =	$t_f := .585$ in
Web Thickness =	$t_w := .415$ in
Member Cross Sectional Area =	$A_{member} := 20.1$ in ²



Gravity Loads (without ice)

Weight of the Member =

Self Weight (Computed internally by Risa-3D) plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot =

$$A_{i_member} := 2(t_f + 2lr)(b_f + 2lr) + (d - 2t_f - 2lr)(t_w + 2lr) - A_{member} = 42.1$$

Weight of Ice on Member =

$$W_{ICE_member} := Id \cdot \frac{A_{i_member}}{144} = 16 \text{ plf } \mathbf{BLC 3}$$

Wind Perpendicular to Flange:

Member Aspect Ratio =

$$A_{r_member} := \frac{12L}{b_f} = 26.7$$

Member Force Coefficient =

$$C_{a_member} = 2 \quad (\text{per TIA/EIA-222-F Table 3})$$

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Flange Projected Surface Area =

$$A_{member} := \frac{b_f}{12} = 0.75 \text{ ft}$$

Section 2 Flange Wind Force =

$$qz_2 \cdot G_H \cdot C_{a_member} \cdot A_{member} = 46 \text{ plf } \mathbf{BLC 7}$$

Section 3 Flange Wind Force =

$$qz_3 \cdot G_H \cdot C_{a_member} \cdot A_{member} = 53 \text{ plf } \mathbf{BLC 7}$$

Section 4 Flange Wind Force =

$$qz_4 \cdot G_H \cdot C_{a_member} \cdot A_{member} = 58 \text{ plf } \mathbf{BLC 7}$$

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Flange Projected Surface Area w/ Ice =

$$A_{ICE_member} := \frac{(b_f + 2lr)}{12} = 0.833 \text{ ft}$$

Section 2 Flange Wind Force w/ Ice =

$$qz_{ICE2} \cdot G_H \cdot C_{a_member} \cdot A_{ICE_member} = 38 \text{ plf } \mathbf{BLC 6}$$

Section 3 Flange Wind Force w/ Ice =

$$qz_{ICE3} \cdot G_H \cdot C_{a_member} \cdot A_{ICE_member} = 44 \text{ plf } \mathbf{BLC 6}$$

Section 4 Flange Wind Force w/ Ice =

$$qz_{ICE4} \cdot G_H \cdot C_{a_member} \cdot A_{ICE_member} = 49 \text{ plf } \mathbf{BLC 6}$$

Subject:

Wind Loading on Structural Members

Location:

Cromwell, CT

Rev. 0: 10/30/14

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Wind Perpendicular to Web

Member Aspect Ratio =

$$A_{r_member} := \frac{12L}{d} = 10.1$$

Member Force Coefficient =

$$C_{a_member} = 1.5 \quad (\text{per TIA/EIA-222-F Table 3})$$

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Web Projected Surface Area =

$$A_{member} := \frac{d}{12} = 1.979 \quad \text{ft}$$

Section 2 Web Wind Force =

$$qz_2 \cdot G_H \cdot C_{a_member} \cdot A_{member} = 91 \quad \text{plf} \quad \text{BLC 5}$$

Section 3 Web Wind Force =

$$qz_3 \cdot G_H \cdot C_{a_member} \cdot A_{member} = 105 \quad \text{plf} \quad \text{BLC 5}$$

Section 4 Web Wind Force =

$$qz_4 \cdot G_H \cdot C_{a_member} \cdot A_{member} = 115 \quad \text{plf} \quad \text{BLC 5}$$

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Web Projected Surface Area w/ Ice =

$$A_{ICE_member} := \frac{(d + 2 \cdot I_r)}{12} = 2.063 \quad \text{ft}$$

Section 2 Web Wind Force w/ Ice =

$$qz_{ICE2} \cdot G_H \cdot C_{a_member} \cdot A_{ICE_member} = 71 \quad \text{plf} \quad \text{BLC 4}$$

Section 3 Web Wind Force w/ Ice =

$$qz_{ICE3} \cdot G_H \cdot C_{a_member} \cdot A_{ICE_member} = 83 \quad \text{plf} \quad \text{BLC 4}$$

Section 4 Web Wind Force w/ Ice =

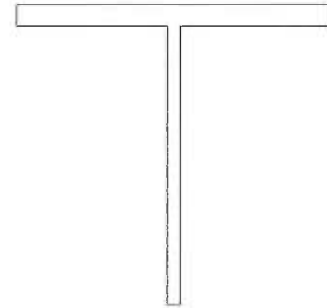
$$qz_{ICE4} \cdot G_H \cdot C_{a_member} \cdot A_{ICE_member} = 91 \quad \text{plf} \quad \text{BLC 4}$$

Development of Wind & Ice Load on WT 6x15

(per TIA/EIA-222-F-1996 Criteria)

WT 6x15 Data:

Shape = Flat
Depth = $d := 6.17$ in
Length = $L := 10$ ft
Flange Width = $b_f := 6.52$ in
Flange Thickness = $t_f := 0.44$ in
Web Thickness = $t_w := 0.26$ in
Member Cross Sectional Area = $A_{\text{member}} := 4.4$ in²



Member Aspect Ratio = $A_{r_{\text{member}}} := \frac{12L}{b_f} = 18.4$

Member Force Coefficient = $C_{a_{\text{member}}} = 1.78$ (per TIA/EIA-222-F Table 3)

Gravity Loads (without ice)

Weight of the Member = Self Weight (Computed internally by Risa-3D) plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot = $A_{i_{\text{member}}} := [(t_f + 2 \cdot l_r) \cdot (b_f + 2 \cdot l_r) + (d - t_f)(t_w + 2 \cdot l_r) - A_{\text{member}}] = 13.6$

Weight of Ice on Member = $W_{\text{ICE_member}} := l_d \cdot \frac{A_{i_{\text{member}}}}{144} = 5$ plf **BLC 3**

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Member Projected Surface Area = $A_{\text{member}} := \frac{b_f}{12} = 0.543$ ft

Total Member Wind Force = $qz_{Br} \cdot G_H \cdot C_{a_{\text{member}}} \cdot A_{\text{member}} = 32$ plf **BLC 5,7**

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Member Projected Surface Area w/ Ice = $A_{\text{ICE_member}} := \frac{(b_f + 2 \cdot l_r)}{12} = 0.627$ ft

Total Member Wind Force w/ Ice = $qz_{ICE} \cdot G_H \cdot C_{a_{\text{member}}} \cdot A_{\text{ICE_member}} = 28$ plf **BLC 4,6**

Subject:

Wind Loading on Structural Members

Location:

Cromwell, CT

Rev. 0: 10/30/14

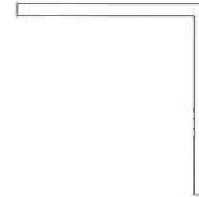
Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Development of Wind & Ice Load on L5x5x5/16

(per TIA/EIA-222-F-1996 Criteria)

L5x5x5/16 Data:

Shape = Flat
 Length = L := 32 ft
 Width = b := 5 in
 Thickness = t := 0.3125 in
 Member Cross Sectional Area = $A_{\text{member}} := 3.03 \text{ in}^2$
 Member Aspect Ratio = $A_{\text{rmember}} := \frac{12L}{b} = 76.8$



Member Force Coefficient =

$C_{\text{amember}} = 2$ (per TIA/EIA-222-F Table 3)

Gravity Loads (without ice)

Weight of the Member =

Self Weight (Computed internally by Risa-3D) plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot =

$A_{\text{imember}} := (b - t)(t + 2 \cdot l_r) + (b + 2 \cdot l_r)(t + 2 \cdot l_r) - A_{\text{member}} = 11$

Weight of Ice on Member =

$W_{\text{ICE_member}} := l_d \cdot \frac{A_{\text{imember}}}{144} = 4$ plf **BLC 3**

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Member Projected Surface Area =

$A_{\text{member}} := \frac{b}{12} = 0.417$ ft

Total Member Wind Force =

$qz_{\text{Br}} \cdot G_H \cdot C_{\text{amember}} \cdot A_{\text{member}} = 28$ plf **BLC 7**

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Member Projected Surface Area w/ Ice =

$A_{\text{ICE_member}} := \frac{(b + 2 \cdot l_r)}{12} = 0.5$ ft

Total Member Wind Force w/ Ice =

$qz_{\text{ICE}} \cdot G_H \cdot C_{\text{amember}} \cdot A_{\text{ICE_member}} = 25$ plf **BLC 6**

Development of Wind & Ice Load on L3.5x3.5x5/16

(per TIA/EIA-222-F-1996 Criteria)

L3.5x3.5x5/16 Data:

Shape = Flat

Length = $L := 20$ ft

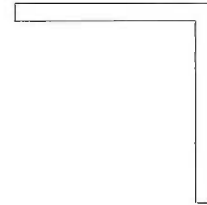
Width = $b := 3.5$ in

Thickness = $t := 0.3125$ in

Member Cross Sectional Area = $A_{\text{member}} := 2.09$ in²

Member Aspect Ratio = $Ar_{\text{member}} := \frac{12L}{b} = 68.6$

Member Force Coefficient = $Ca_{\text{member}} = 2$ (per TIA/EIA-222-F Table 3)



Gravity Loads (without ice)

Weight of the Member = Self Weight (Computed internally by Risa-3D) plf **BLC 1**

Gravity Loads (ice only)

Ice Area per Linear Foot = $A_{i_{\text{member}}} := [(b - t)(t + 2 \cdot l_r) + (b + 2 \cdot l_r)(t + 2 \cdot l_r)] - A_{\text{member}} = 8$

Weight of Ice on Member = $W_{ICE_member} := l_d \cdot \frac{A_{i_{\text{member}}}}{144} = 3$ plf **BLC 3**

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Member Projected Surface Area = $A_{\text{member}} := \frac{b}{12} = 0.292$ ft

Total Member Wind Force = $qz_{Br} \cdot G_H \cdot Ca_{\text{member}} \cdot A_{\text{member}} = 19$ plf **BLC 7**

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Member Projected Surface Area w/ Ice = $A_{ICE_member} := \frac{(b + 2 \cdot l_r)}{12} = 0.375$ ft

Total Member Wind Force w/ Ice = $qz_{ICE} \cdot G_H \cdot Ca_{\text{member}} \cdot A_{ICE_member} = 19$ plf **BLC 6**

**Development of Design Heights, Exposure Coefficients,
and Velocity Pressures Per TIA/EIA**

Wind Speeds

Basic Wind Speed, V	V := 85	mph	
Basic Wind Speed with Ice, V _i	V _i := 74	mph	(per TIA/EIA-222-F Section 2.3.16)

Heights above ground level, z

Mast 1 =	z _{mast1} := 15	ft
Mast 2 =	z _{mast2} := 45	ft
Mast 3 =	z _{mast3} := 75	ft
Mast 4 =	z _{mast4} := 100	ft
Verizon =	z _{vz} := 88	ft
AT&T =	z _{att} := 98	ft
T-Mobile =	z _{t_mb} := 108	ft
MetroPCS =	z _{metro} := 77	ft
GPS =	z _{gps} := 50	ft

Exposure Coefficients, k_z

(per TIA/EIA-222-F Section 2.3.3)

Mast 1 =	$Kz_{mast1} := \left(\frac{z_{mast1}}{33} \right)^{\frac{2}{7}} = 0.798$
Mast 2 =	$Kz_{mast2} := \left(\frac{z_{mast2}}{33} \right)^{\frac{2}{7}} = 1.093$
Mast 3 =	$Kz_{mast3} := \left(\frac{z_{mast3}}{33} \right)^{\frac{2}{7}} = 1.264$
Mast 4 =	$Kz_{mast4} := \left(\frac{z_{mast4}}{33} \right)^{\frac{2}{7}} = 1.373$
Verizon =	$Kz_{vz} := \left(\frac{z_{vz}}{33} \right)^{\frac{2}{7}} = 1.323$
AT&T =	$Kz_{att} := \left(\frac{z_{att}}{33} \right)^{\frac{2}{7}} = 1.365$
T-Mobile =	$Kz_{t_mb} := \left(\frac{z_{t_mb}}{33} \right)^{\frac{2}{7}} = 1.403$

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

Prepared by: T.J.L. Checked by: C.F.C.
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$$\text{MetroPCS} = Kz_{\text{metro}} := \left(\frac{z_{\text{metro}}}{33} \right)^{\frac{2}{7}} = 1.274$$

$$\text{GPS} = Kz_{\text{gps}} := \left(\frac{z_{\text{gps}}}{33} \right)^{\frac{2}{7}} = 1.126$$

Velocity Pressure without ice, qz

(per TIA/EIA-222-F Section 2.3.3)

$$\text{Mast 1} = qz_{\text{mast1}} := 0.00256 \cdot Kz_{\text{mast1}} \cdot V^2 = 14.765$$

$$\text{Mast 2} = qz_{\text{mast2}} := 0.00256 \cdot Kz_{\text{mast2}} \cdot V^2 = 20.21$$

$$\text{Mast 3} = qz_{\text{mast3}} := 0.00256 \cdot Kz_{\text{mast3}} \cdot V^2 = 23.386$$

$$\text{Mast 4} = qz_{\text{mast4}} := 0.00256 \cdot Kz_{\text{mast4}} \cdot V^2 = 25.389$$

$$\text{Verizon} = qz_{\text{vz}} := 0.00256 \cdot Kz_{\text{vz}} \cdot V^2 = 24.478$$

$$\text{AT\&T} = qz_{\text{att}} := 0.00256 \cdot Kz_{\text{att}} \cdot V^2 = 25.243$$

$$\text{T-Mobile} = qz_{\text{tmb}} := 0.00256 \cdot Kz_{\text{tmb}} \cdot V^2 = 25.953$$

$$\text{MetroPCS} = qz_{\text{metro}} := 0.00256 \cdot Kz_{\text{metro}} \cdot V^2 = 23.562$$

$$\text{GPS} = qz_{\text{gps}} := 0.00256 \cdot Kz_{\text{gps}} \cdot V^2 = 20.827$$

Velocity Pressure with ice, qz_{ICE}

(per TIA/EIA-222-F Section 2.3.3)

$$\text{Mast 1} = qz_{ICE_{\text{mast1}}} := 0.00256 \cdot Kz_{\text{mast1}} \cdot V_i^2 = 11.191$$

$$\text{Mast 2} = qz_{ICE_{\text{mast2}}} := 0.00256 \cdot Kz_{\text{mast2}} \cdot V_i^2 = 15.318$$

$$\text{Mast 3} = qz_{ICE_{\text{mast3}}} := 0.00256 \cdot Kz_{\text{mast3}} \cdot V_i^2 = 17.725$$

$$\text{Mast 4} = qz_{ICE_{\text{mast4}}} := 0.00256 \cdot Kz_{\text{mast4}} \cdot V_i^2 = 19.243$$

$$\text{Verizon} = qz_{ICE_{\text{vz}}} := 0.00256 \cdot Kz_{\text{vz}} \cdot V_i^2 = 18.553$$

$$\text{AT\&T} = qz_{ICE_{\text{att}}} := 0.00256 \cdot Kz_{\text{att}} \cdot V_i^2 = 19.132$$

$$\text{T-Mobile} = qz_{ICE_{\text{tmb}}} := 0.00256 \cdot Kz_{\text{tmb}} \cdot V_i^2 = 19.671$$

$$\text{MetroPCS} = qz_{ICE_{\text{metro}}} := 0.00256 \cdot Kz_{\text{metro}} \cdot V_i^2 = 17.858$$

$$\text{GPS} = qz_{ICE_{\text{gps}}} := 0.00256 \cdot Kz_{\text{gps}} \cdot V_i^2 = 15.786$$

TIA/EIA Common Factors:

Gust Response Factor =

$$G_H := 1.69$$

(per TIA/EIA-222-F Section 2.3.4)

Gust Response Factor Multiplier =

$$m := 1.25$$

(per TIA/EIA-222-F Section 2.3.4.4)

Radial Ice Thickness =

$$I_r := 0.50$$

in

(per TIA/EIA-222-F Section 2.3.1)

Radial Ice Density =

$$I_d := 56.00$$

pcf

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

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 Job No. 14033.019

Development of Wind & Ice Load on PCS Mast

(per TIA/EIA-222-F-1996 Criteria)

PCS Mast Data:

Mast Shape =	Round
Mast Diameter =	$D_{mast} := 18$ in (HSS18x0.5)
Mast Length =	$L_{mast} := 111$ ft
Mast Thickness =	$t_{mast} := .465$ in
Velocity Coefficient =	$C := \left(\sqrt{Kz_{mast1}} \right) \cdot V \cdot \frac{D_{mast}}{12} = 113.918$
Structure Force Coefficient =	$C_{Fmast} = 0.59$ (per TIA/EIA-222-F Table 1 for round pde)

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Mast Projected Surface Area =	$A_{mast} := \frac{D_{mast}}{12} = 1.5$	sf/ft
Total Mast Wind Force =	$qz_{mast1} \cdot G_H \cdot C_{Fmast} \cdot A_{mast} = 22$	plf BLC 5,7
Total Mast Wind Force =	$qz_{mast2} \cdot G_H \cdot C_{Fmast} \cdot A_{mast} = 30$	plf BLC 5,7
Total Mast Wind Force =	$qz_{mast3} \cdot G_H \cdot C_{Fmast} \cdot A_{mast} = 35$	plf BLC 5,7
Total Mast Wind Force =	$qz_{mast4} \cdot G_H \cdot C_{Fmast} \cdot A_{mast} = 38$	plf BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Mast Projected Surface Area w/ Ice =	$A_{ICE_{mast}} := \frac{(D_{mast} + 2 \cdot Ir)}{12} = 1.583$	sf/ft
Total Mast Wind Force w/ Ice =	$qz_{ICE_{mast1}} \cdot G_H \cdot C_{Fmast} \cdot A_{ICE_{mast}} = 18$	plf BLC 4,6
Total Mast Wind Force w/ Ice =	$qz_{ICE_{mast2}} \cdot G_H \cdot C_{Fmast} \cdot A_{ICE_{mast}} = 24$	plf BLC 4,6
Total Mast Wind Force w/ Ice =	$qz_{ICE_{mast3}} \cdot G_H \cdot C_{Fmast} \cdot A_{ICE_{mast}} = 28$	plf BLC 4,6
Total Mast Wind Force w/ Ice =	$qz_{ICE_{mast4}} \cdot G_H \cdot C_{Fmast} \cdot A_{ICE_{mast}} = 30$	plf BLC 4,6

Gravity Loads (without ice)

Weight of the mast =	Self Weight (Computed internally by Risa-3D)	plf BLC 1
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Gravity Loads (ice only)

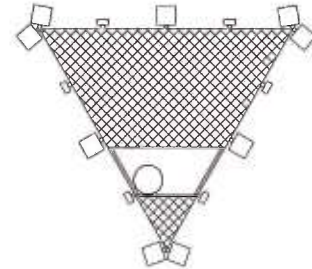
Ice Area per Linear Foot =	$A_{i_{mast}} := \frac{\pi}{4} \left[(D_{mast} + Ir \cdot 2)^2 - D_{mast}^2 \right] = 29.1$	sq in
Weight of Ice on Mast =	$W_{ICE_{mast}} := Id \cdot \frac{A_{i_{mast}}}{144} = 11$	plf BLC 3

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	Antel BXA-70063/6CF	(Verizon)
Antenna Shape =	Flat	
Antenna Height =	$L_{ant} := 71.0$	in
Antenna Width =	$W_{ant} := 11.2$	in
Antenna Thickness =	$T_{ant} := 4.5$	in
Antenna Weight =	$WT_{ant} := 17.0$	lbs
Number of Antennas =	$N_{ant} := 6$	
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 6.3$	
Antenna Force Coefficient =	$Ca_{ant} = 1.4$	(per TIA/EIA-222-F-1996 Table 3)

**Wind Load (without ice)**

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 5.5$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 33.1$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 1919$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 6.1$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 36.6$	sf
Total Antenna Wind Force w/ Ice =	$F_{Iant} := qz_{ICE} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 1607$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 102$	lbs BLC 2
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Gravity Load (ice only)

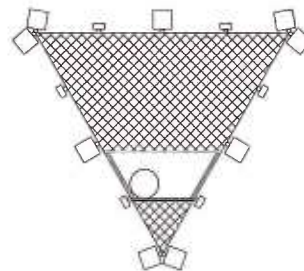
Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 3578$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1253$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 41$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 244$	lbs BLC 3

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	Antel LPA-80063/6CF	(Verizon)
Antenna Shape =	Flat	
Antenna Height =	$L_{ant} := 70.9$	in
Antenna Width =	$W_{ant} := 14.96$	in
Antenna Thickness =	$T_{ant} := 13.07$	in
Antenna Weight =	$WT_{ant} := 27$	lbs
Number of Antennas =	$N_{ant} := 6$	
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.7$	
Antenna Force Coefficient =	$Ca_{ant} = 1.4$	(per TIA/EIA-222-F-1996 Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 7.4$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 44.2$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 2560$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 8$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 47.8$	sf
Total Antenna Wind Force w/ Ice =	$F_{Iant} := qz_{ICEvz} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 2099$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 162$	lbs BLC 2
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Gravity Load (ice only)

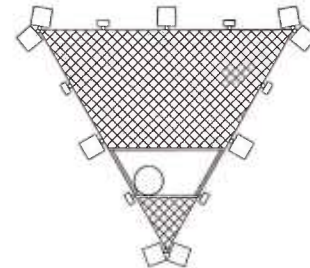
Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1 \times 10^4$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 2283$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 74$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 444$	lbs BLC 3

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	Antel LPA-171063-12CF	(Verizon)
Antenna Shape =	Flat	
Antenna Height =	$L_{ant} := 73.9$	in
Antenna Width =	$W_{ant} := 7.9$	in
Antenna Thickness =	$T_{ant} := 8$	in
Antenna Weight =	$WT_{ant} := 12$	lbs
Number of Antennas =	$N_{ant} := 6$	
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 9.4$	
Antenna Force Coefficient =	$Ca_{ant} := 1.48$	(per TIA/EIA-222-F-1996 Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 4.1$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 24.3$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 1488$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 4.6$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 27.8$	sf
Total Antenna Wind Force w/ Ice =	$F_{Iant} := qz_{ICEvz} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 1288$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 72$	lbs BLC 2
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Gravity Load (ice only)

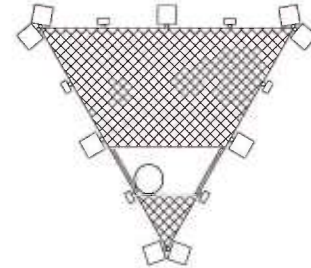
Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 4670$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1329$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 43$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 258$	lbs BLC 3

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	RRH	(Verizon)
Antenna Shape =	Flat	
Antenna Height =	$L_{ant} := 24.4$	in
Antenna Width =	$W_{ant} := 10.62$	in
Antenna Thickness =	$T_{ant} := 6.7$	in
Antenna Weight =	$WT_{ant} := 44$	lbs
Number of Antennas =	$N_{ant} := 6$	
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 2.3$	
Antenna Force Coefficient =	$Ca_{ant} = 1.4$	(per TIA/EIA-222-F-1996 Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 1.8$	sf
Antenna Projected Surface Area =	$A_{ant} := 0$	(Shielded by antenna) sf

Total Antenna Wind Force =

$$F_{ant} := qz_{vz} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 0 \quad \text{lbs} \quad \text{BLC 5,7}$$

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 2$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := 0$	(Shielded by antenna) sf

Total Antenna Wind Force w/ Ice =

$$F_{ant} := qz_{ICEvz} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 0 \quad \text{lbs} \quad \text{BLC 4,6}$$

Gravity Load (without ice)

Weight of All Antennas =

$$WT_{ant} \cdot N_{ant} = 264 \quad \text{lbs} \quad \text{BLC 2}$$

Gravity Load (ice only)

Volume of Each Antenna =

$$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1736 \quad \text{cu in}$$

Volume of Ice on Each Antenna =

$$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 536 \quad \text{cu in}$$

Weight of Ice on Each Antenna =

$$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 17 \quad \text{lbs}$$

Weight of Ice on All Antennas =

$$W_{ICEant} \cdot N_{ant} = 104 \quad \text{lbs} \quad \text{BLC 3}$$

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

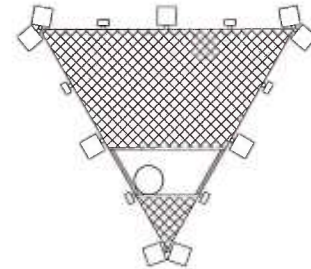
Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Development of Wind & Ice Load on Platform

(per TIA/EIA-222-F-1996 Criteria)

Platform Data:

Platform Model =	13' Platform w/ Handrails	(Verizon)
Platform Shape =	Flat	
(Force Coefficient Value Included in Area)	Platform Area =	$CaA_{plt} := 31.3$ sq ft
(Force Coefficient Value Included in Area)	Platform Area w/ Ice =	$CaA_{ICEplt} := 40.2$ sq ft
	Platform Weight =	$WT_{plt} := 1822$ lbs
	Platform Weight w/ Ice =	$WT_{ICEplt} := 2452$ lbs



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Total Platform Wind Force =

$$F_{plt} := qZ_{vz} \cdot G_H \cdot CaA_{plt} = 1295$$

lbs **BLC 5,7**

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Total Platform Wind Force w/ Ice =

$$F_{iplt} := qz_{ICE} \cdot G_H \cdot CaA_{ICEplt} = 1260$$

lbs **BLC 4,6**

Gravity Load (without ice)

Weight of Platform =

$$WT_{plt} = 1822$$

lbs **BLC 2**

Gravity Load (ice only)

Weight of Ice on Platform =

$$WT_{ICEplt} - WT_{plt} = 630$$

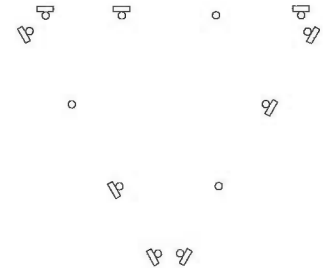
lbs **BLC 3**

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	Powerwave 7770	(AT&T)
Antenna Shape =	Flat	
Antenna Height =	$L_{ant} := 55$	in
Antenna Width =	$W_{ant} := 11$	in
Antenna Thickness =	$T_{ant} := 5$	in
Antenna Weight =	$WT_{ant} := 35$	lbs
Number of Antennas =	$N_{ant} := 6$	
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 5.0$	
Antenna Force Coefficient =	$Ca_{ant} = 1.4$	(per TIA/EIA-222-F-1996 Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 4.2$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 25.2$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{att} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 1506$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 4.7$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 28$	sf
Total Antenna Wind Force w/ Ice =	$F_{Iant} := qz_{ICEatt} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 1267$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 210$	lbs BLC 2
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Gravity Load (ice only)

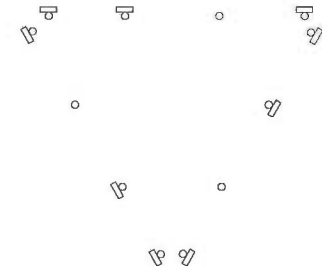
Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 3025$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1007$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 33$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 196$	lbs BLC 3

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	KMW AM-X-Cd-16-65-00T (AT&T)
Antenna Shape =	Flat
Antenna Height =	$L_{ant} := 72$ in
Antenna Width =	$W_{ant} := 11.8$ in
Antenna Thickness =	$T_{ant} := 5.9$ in
Antenna Weight =	$WT_{ant} := 49$ lbs
Number of Antennas =	$N_{ant} := 3$
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 6.1$
Antenna Force Coefficient =	$Ca_{ant} = 1.4$ (per TIA/EIA-222-F-1996 Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 5.9$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 17.7$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{att} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 1057$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1)(W_{ant} + 1)}{144} = 6.5$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 19.5$	sf
Total Antenna Wind Force w/ Ice =	$F_{ICEant} := qz_{ICEant} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 881$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 147$	lbs BLC 2
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Gravity Load (ice only)

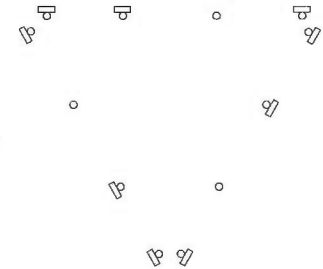
Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5013$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1)(W_{ant} + 1)(T_{ant} + 1) - V_{ant} = 1435$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot \rho_{ice} = 46$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 139$	lbs BLC 3

Development of Wind & Ice Load on TMA's

(per TIA/EIA-222-F-1996 Criteria)

TMA Data:

TMA Model =	Powerwave LGP214	(AT&T)
TMA Shape =	Flat	
TMA Height =	$L_{TMA} := 14.4$	in
TMA Width =	$W_{TMA} := 9.2$	in
TMA Thickness =	$T_{TMA} := 2.6$	in
TMA Weight =	$WT_{TMA} := 14.1$	lbs
Number of TMA's =	$N_{TMA} := 12$	
TMA Aspect Ratio =	$Ar_{TMA} := \frac{L_{TMA}}{W_{TMA}} = 1.6$	
TMA Force Coefficient =	$Ca_{TMA} = 1.4$	(per TIA/EIA-222-F Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on TMA's

Surface Area for One TMA =	$SA_{TMA} := \frac{L_{TMA} \cdot W_{TMA}}{144} = 0.9$	sf
TMA Projected Surface Area =	$A_{TMA} := SA_{TMA} \cdot N_{TMA} = 11$	sf
Total TMA Wind Force =	$F_{TMA} := qz_{att} \cdot G_H \cdot Ca_{TMA} \cdot A_{TMA} = 659$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on TMA's

Surface Area for One TMA w/ Ice =	$SA_{ICETMA} := \frac{(L_{TMA} + 1) \cdot (W_{TMA} + 1)}{144} = 1.1$	sf
TMA Projected Surface Area w/ Ice =	$A_{ICETMA} := SA_{ICETMA} \cdot N_{TMA} = 13.1$	sf
Total TMA Wind Force w/ Ice =	$F_{ITMA} := qz_{ICE_{att}} \cdot G_H \cdot Ca_{TMA} \cdot A_{ICETMA} = 593$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All TMA's =	$WT_{TMA} \cdot N_{TMA} = 169$	lbs BLC 2
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Gravity Load (ice only)

Volume of Each TMA =	$V_{TMA} := L_{TMA} \cdot W_{TMA} \cdot T_{TMA} = 344$	cu in
Volume of Ice on Each TMA =	$V_{ice} := (L_{TMA} + 1) \cdot (W_{TMA} + 1) \cdot (T_{TMA} + 1) - V_{TMA} = 221$	cu in
Weight of Ice on Each TMA =	$W_{ICETMA} := \frac{V_{ice}}{1728} \cdot Id = 7$	lbs
Weight of Ice on All TMA's	$W_{ICETMA} \cdot N_{TMA} = 86$	lbs BLC 3

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Development of Wind & Ice Load on RRU's

(per TIA/EIA-222-F-1996 Criteria)

RRU Data:

RRU Model =	Ericsson RRU-11	(AT&T)
RRU Shape =	Flat	
RRU Height =	$L_{RRU} := 17.8$	in
RRU Width =	$W_{RRU} := 17.3$	in
RRU Thickness =	$T_{RRU} := 7.2$	in
RRU Weight =	$W_{T_{RRU}} := 50$	lbs
Number of RRU's =	$N_{RRU} := 6$	
RRU Aspect Ratio =	$A_{RRU} := \frac{L_{RRU}}{W_{RRU}} = 1$	
RRU Force Coefficient =	$C_{a_{RRU}} = 1.4$	(per TIA/EIA-222-F Table 3)

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on RRU's

Surface Area for One RRU =	$SA_{RRU} := \frac{L_{RRU} \cdot W_{RRU}}{144} = 2.1$	sf
RRU Projected Surface Area =	$A_{RRU} := SA_{RRU} \cdot N_{RRU} = 12.8$	sf
Total RRU Wind Force =	$F_{RRU} := qz_{att} \cdot G_H \cdot C_{a_{RRU}} \cdot A_{RRU} = 766$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on RRU's

Surface Area for One RRU w/ Ice =	$SA_{ICERRU} := \frac{(L_{RRU} + 1) \cdot (W_{RRU} + 1)}{144} = 2.4$	sf
RRU Projected Surface Area w/ Ice =	$A_{ICERRU} := SA_{ICERRU} \cdot N_{RRU} = 14.3$	sf
Total RRU Wind Force w/ Ice =	$F_{ICERRU} := qz_{ICE} \cdot G_H \cdot C_{a_{RRU}} \cdot A_{ICERRU} = 649$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All RRU's =

$$W_{T_{RRU}} \cdot N_{RRU} = 300 \quad \text{lbs} \quad \text{BLC 2}$$

Gravity Load (ice only)

Volume of Each RRU =

$$V_{RRU} := L_{RRU} \cdot W_{RRU} \cdot T_{RRU} = 2 \times 10^3 \quad \text{cu in}$$

Volume of Ice on Each RRU =

$$V_{ice} := (L_{RRU} + 1)(W_{RRU} + 1)(T_{RRU} + 1) - V_{RRU} = 604 \quad \text{cu in}$$

Weight of Ice on Each RRU =

$$W_{ICERRU} := \frac{V_{ice}}{1728} \cdot \rho_{ice} = 20 \quad \text{lbs}$$

Weight of Ice on All RRU's

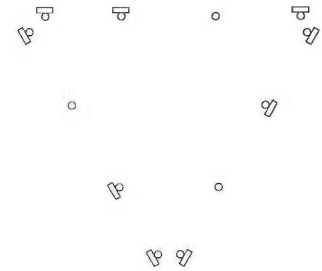
$$W_{ICERRU} \cdot N_{RRU} = 117 \quad \text{lbs} \quad \text{BLC 3}$$

Development of Wind & Ice Load on Surge Arrestor

(per TIA/EIA-222-F-1996 Criteria)

Surge Arrestor Data:

Surge Arrestor Model =	DC6-48-60-18-8F	(AT&T)
Surge Arrestor Shape =	Flat	
Surge Arrestor Height =	$L_{SA} := 23.5$	in
Surge Arrestor Width =	$W_{SA} := 9.7$	in
Surge Arrestor Thickness =	$T_{SA} := 9.7$	in
Surge Arrestor Weight =	$WT_{SA} := 20$	lbs
Number of Surge Arrestor =	$N_{SA} := 1$	
Surge Arrestor Aspect Ratio =	$Ar_{SA} := \frac{L_{SA}}{W_{SA}} = 2.4$	
Surge Arrestor Force Coefficient =	$Ca_{SA} := 1.4$	(per TIA/EIA-222-F Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Surge Arrestor

Surface Area for One Surge Arrestor =	$SA_{SA} := \frac{L_{SA} \cdot W_{SA}}{144} = 1.6$	sf
Surge Arrestor Projected Surface Area =	$A_{SA} := SA_{SA} \cdot N_{SA} = 1.6$	sf
Total Surge Arrestor Wind Force =	$F_{SA} := qz_{att} \cdot G_H \cdot Ca_{SA} \cdot A_{SA} = 95$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Surge Arrestor

Surface Area for One Surge Arrestor w/ Ice =	$SA_{ICESA} := \frac{(L_{SA} + 1) \cdot (W_{SA} + 1)}{144} = 1.8$	sf
Surge Arrestor Projected Surface Area w/ Ice =	$A_{ICESA} := SA_{ICESA} \cdot N_{SA} = 1.8$	sf
Total Surge Arrestor Wind Force w/ Ice =	$F_{ISA} := qz_{ICE} \cdot G_H \cdot Ca_{SA} \cdot A_{ICESA} = 82$	lbs BLC 4,6

Gravity Load (without ice)

Weight of Surge Arrestor =	$WT_{SA} \cdot N_{SA} = 20$	lbs BLC 2
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Gravity Load (ice only)

Volume of Each Surge Arrestor =	$V_{SA} := L_{SA} \cdot W_{SA} \cdot T_{SA} = 2 \times 10^3$	cu in
Volume of Ice on Each Surge Arrestor =	$V_{ice} := (L_{SA} + 1) \cdot (W_{SA} + 1) \cdot (T_{SA} + 1) - V_{SA} = 594$	cu in
Weight of Ice on Each Surge Arrestor =	$W_{ICESA} := \frac{V_{ice}}{1728} \cdot Id = 19$	lbs
Weight of Ice on All Surge Arrestor =	$W_{ICESA} \cdot N_{SA} = 19$	lbs BLC 3

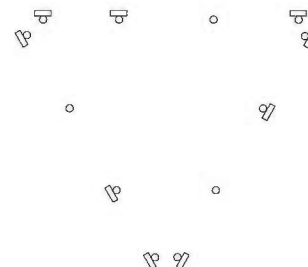
Development of Wind & Ice Load on Antenna Mounts

(per TIA/EIA-222-F-1996 Criteria)

Mount Data:

Mount Type =
 Mount Shape =
 Pipe Mount Length =
 Exposed Pipe Mount Length =
 4 inch Pipe Mount Linear Weight =
 Pipe Mount Outside Diameter =
 Number of Mounting Pipes =
 Mount Aspect Ratio =
 Mount Force Factor =

4" Φ Pipes (AT&T)
 Round
 $L_{mnt} := 120$ in
 $L_{exp.mnt} := 65$ (Antennas shield top 55" of pipe)
 $W_{mnt} := 10.8$ plf
 $D_{mnt} := 4.5$ in
 $N_{mnt} := 12$
 $A_{r.mnt} := \frac{L_{mnt}}{D_{mnt}} = 27$
 $C_{a.mnt} := 1.2$ (per TIA/EIA-222-F Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Surface Area for One Mount =
 Mount Projected Surface Area =

$$SA_{mnt} := \frac{D_{mnt} \cdot L_{exp.mnt}}{144} = 2.031 \text{ sf}$$

$$A_{mnt} := SA_{mnt} \cdot N_{mnt} = 24.375 \text{ sf}$$

Total Mount Wind Force =

$$F_{mnt} := qz_{att} \cdot G_H \cdot C_{a.mnt} \cdot A_{mnt} = 1248 \text{ lbs} \quad \text{BLC 5,7}$$

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Surface Area for One Mount w/ Ice =
 Mount Projected Surface Area w/ Ice =

$$SA_{ICEmnt} := \frac{(D_{mnt} + 2 \cdot I_r) \cdot L_{exp.mnt}}{144} = 2.483 \text{ sf}$$

$$A_{ICEmnt} := SA_{ICEmnt} \cdot N_{mnt} = 29.792 \text{ sf}$$

Total Mount Wind Force =

$$F_{mnt} := qz_{ICE} \cdot G_H \cdot C_{a.mnt} \cdot A_{ICEmnt} = 1156 \text{ lbs} \quad \text{BLC 4,6}$$

Gravity Loads (without ice)

(per TIA/EIA-222-F-1996)

Weight Each Pipe Mount =

$$WT_{mnt} := W_{mnt} \cdot \frac{L_{mnt}}{12} = 108 \text{ lbs}$$

Weight of All Mounts =

$$WT_{mnt} \cdot N_{mnt} = 1296 \text{ lbs} \quad \text{BLC 2}$$

Gravity Loads (ice only)

(per TIA/EIA-222-F-1996)

Volume of Each Pipe =

$$V_{mnt} := \frac{\pi}{4} \cdot D_{mnt}^2 \cdot L_{mnt} = 1909 \text{ cu in}$$

Volume of Ice on Each Pipe =

$$V_{ice} := \left[\frac{\pi}{4} \cdot (D_{mnt} + 1)^2 \cdot (L_{mnt} + 1) \right] - V_{mnt} = 966 \text{ cu in}$$

Weight of Ice each mount (incl. hardware) =

$$W_{ICEmnt} := \frac{V_{ice}}{1728} \cdot I_d = 31 \text{ lbs}$$

Weight of Ice on All Mounts =

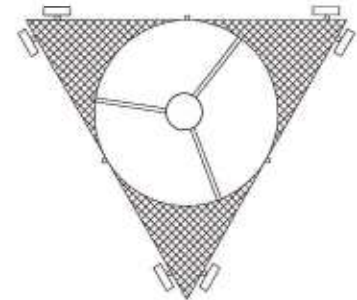
$$W_{ICEmnt} \cdot N_{mnt} + 5 = 381 \text{ lbs} \quad \text{BLC 3}$$

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	Ericsson AIR 21 B4A/B 12P-8	(T-Mobile)
Antenna Shape =	Flat	
Antenna Height =	$L_{ant} := 96$	in
Antenna Width =	$W_{ant} := 12.1$	in
Antenna Thickness =	$T_{ant} := 8.7$	in
Antenna Weight =	$WT_{ant} := 126$	lbs
Number of Antennas =	$N_{ant} := 3$	
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 7.9$	
Antenna Force Coefficient =	$Ca_{ant} = 1.43$	(per TIA/EIA-222-F-1996 Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 8.1$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 24.2$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{t_mb} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 1519$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1)(W_{ant} + 1)}{144} = 8.8$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 26.5$	sf
Total Antenna Wind Force w/ Ice =	$F_{ant} := qz_{ICEt_mb} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 1259$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 378$	lbs BLC 2
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Gravity Load (ice only)

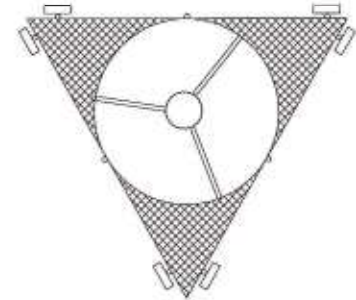
Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1 \times 10^4$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1)(W_{ant} + 1)(T_{ant} + 1) - V_{ant} = 2220$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 72$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 216$	lbs BLC 3

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	Ericsson AIR 21 B2A/B4P	(T-Mobile)
Antenna Shape =	Flat	
Antenna Height =	$L_{ant} := 56$	in
Antenna Width =	$W_{ant} := 12$	in
Antenna Thickness =	$T_{ant} := 7.9$	in
Antenna Weight =	$WT_{ant} := 95$	lbs
Number of Antennas =	$N_{ant} := 3$	
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 4.7$	
Antenna Force Coefficient =	$Ca_{ant} = 1.4$	(per TIA/EIA-222-F-1996 Table 3)



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 4.7$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 14$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{t_mb} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 860$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 5.1$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 15.4$	sf
Total Antenna Wind Force w/ Ice =	$F_{ICEant} := qz_{ICEt_mb} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 718$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 285$	lbs BLC 2
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Gravity Load (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 5309$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 1286$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 42$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 125$	lbs BLC 3

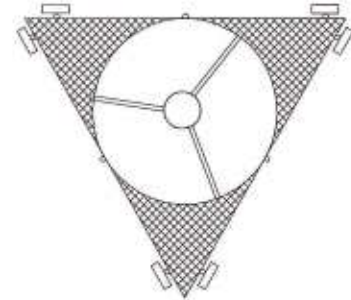
Development of Wind & Ice Load on RRU's

(per TIA/EIA-222-F-1996 Criteria)

RRU Data:

RRU Model =	Ericsson RRU-11
RRU Shape =	Flat
RRU Height =	$L_{RRU} := 17.8$ in
RRU Width =	$W_{RRU} := 17.3$ in
RRU Thickness =	$T_{RRU} := 7.2$ in
RRU Weight =	$W_{T_{RRU}} := 50$ lbs
Number of RRU's =	$N_{RRU} := 3$
RRU Aspect Ratio =	$A_{r_{RRU}} := \frac{L_{RRU}}{W_{RRU}} = 1$
RRU Force Coefficient =	$C_{a_{RRU}} = 1.4$

(T-Mobile)



(per TIA/EIA-222-F Table 3)

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on RRU's

Surface Area for One RRU =	$SA_{RRU} := \frac{L_{RRU} \cdot W_{RRU}}{144} = 2.1$	sf
RRU Projected Surface Area =	$A_{RRU} := SA_{RRU} \cdot N_{RRU} = 6.4$	sf
Total RRU Wind Force =	$F_{RRU} := qZ_{L_{mb}} \cdot G_H \cdot C_{a_{RRU}} \cdot A_{RRU} = 394$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on RRU's

Surface Area for One RRU w/ Ice =	$SA_{ICERRU} := \frac{(L_{RRU} + 1) \cdot (W_{RRU} + 1)}{144} = 2.4$	sf
RRU Projected Surface Area w/ Ice =	$A_{ICERRU} := SA_{ICERRU} \cdot N_{RRU} = 7.2$	sf
Total RRU Wind Force w/ Ice =	$F_{ICERRU} := qZ_{ICE} \cdot L_{mb} \cdot G_H \cdot C_{a_{RRU}} \cdot A_{ICERRU} = 334$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All RRU's =	$W_{T_{RRU}} \cdot N_{RRU} = 150$	lbs BLC 2
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Gravity Load (ice only)

Volume of Each RRU =	$V_{RRU} := L_{RRU} \cdot W_{RRU} \cdot T_{RRU} = 2 \times 10^3$	cu in
Volume of Ice on Each RRU =	$V_{ice} := (L_{RRU} + 1) \cdot (W_{RRU} + 1) \cdot (T_{RRU} + 1) - V_{RRU} = 604$	cu in
Weight of Ice on Each RRU =	$W_{ICERRU} := \frac{V_{ice}}{1728} \cdot \rho_{ice} = 20$	lbs
Weight of Ice on All RRU's	$W_{ICERRU} \cdot N_{RRU} = 59$	lbs BLC 3

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

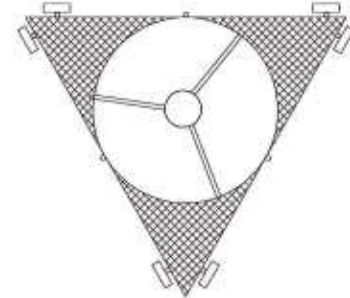
Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Development of Wind & Ice Load on Platform

(per TIA/EIA-222-F-1996 Criteria)

Platform Data:

Platform Model =	13' Low Profile Platform	(T-Mobile)
Platform Shape =	Flat	
(Force Coefficient Value Included in Area)	Platform Area =	$CaA_{plt} := 15.7$ sq ft
(Force Coefficient Value Included in Area)	Platform Area w/ Ice =	$CaA_{ICEplt} := 20.1$ sq ft
	Platform Weight =	$WT_{plt} := 1300$ lbs
	Platform Weight w/ Ice =	$WT_{ICEplt} := 1765$ lbs



Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Total Platform Wind Force =

$$F_{plt} := qZ_{tmb} \cdot G_H \cdot CaA_{plt} = 689$$

lbs **BLC 5,7**

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Total Platform Wind Force w/ Ice =

$$F_{iplt} := qZ_{ICEtmb} \cdot G_H \cdot CaA_{ICEplt} = 668$$

lbs **BLC 4,6**

Gravity Load (without ice)

Weight of Platform =

$$WT_{plt} = 1300$$

lbs **BLC 2**

Gravity Load (ice only)

Weight of Ice on Platform =

$$WT_{ICEplt} - WT_{plt} = 465$$

lbs **BLC 3**

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 14033.019

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	GPS VIC-100	(T-Mobile)
Antenna Shape =	Flat	
Antenna Height =	$L_{ant} := 3.9$	in
Antenna Width =	$W_{ant} := 3.5$	in
Antenna Thickness =	$T_{ant} := 3.5$	in
Antenna Weight =	$WT_{ant} := 8$	lbs
Number of Antennas =	$N_{ant} := 1$	
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 1.1$	
Antenna Force Coefficient =	$Ca_{ant} = 1.4$	(per TIA/EIA-222-F-1996 Table 3)

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 0.1$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 0.1$	sf

Total Antenna Wind Force =

$$F_{ant} := qz_{gps} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 5 \quad \text{lbs} \quad \text{BLC 5,7}$$

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 0.2$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 0.2$	sf

Total Antenna Wind Force w/ Ice =

$$F_{ant} := qz_{ICE} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 6 \quad \text{lbs} \quad \text{BLC 4,6}$$

Gravity Load (without ice)

Weight of All Antennas =

$$WT_{ant} \cdot N_{ant} = 8 \quad \text{lbs} \quad \text{BLC 2}$$

Gravity Load (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 48$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 51$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 2$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 2$	lbs

Development of Wind & Ice Load on Antennas

(per TIA/EIA-222-F-1996 Criteria)

Antenna Data:

Antenna Model =	RFS APX V18-2065 17-S-C	(MetroPCS)	
Antenna Shape =	Flat		
Antenna Height =	$L_{ant} := 72.0$	in	
Antenna Width =	$W_{ant} := 6.8$	in	
Antenna Thickness =	$T_{ant} := 3.15$	in	
Antenna Weight =	$WT_{ant} := 32.5$	lbs	
Number of Antennas =	$N_{ant} := 3$		
Antenna Aspect Ratio =	$Ar_{ant} := \frac{L_{ant}}{W_{ant}} = 10.6$		
Antenna Force Coefficient =	$Ca_{ant} = 1.52$	(per TIA/EIA-222-F-1996 Table 3)	

Wind Load (without ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna =	$SA_{ant} := \frac{L_{ant} \cdot W_{ant}}{144} = 3.4$	sf
Antenna Projected Surface Area =	$A_{ant} := SA_{ant} \cdot N_{ant} = 10.2$	sf
Total Antenna Wind Force =	$F_{ant} := qz_{metro} \cdot G_H \cdot Ca_{ant} \cdot A_{ant} = 617$	lbs BLC 5,7

Wind Load (with ice)

(per TIA/EIA-222-F-1996 Section 2.3.2)

Assumes Maximum Possible Wind Pressure on Antennas

Surface Area for One Antenna w/ Ice =	$SA_{ICEant} := \frac{(L_{ant} + 1) \cdot (W_{ant} + 1)}{144} = 4$	sf
Antenna Projected Surface Area w/ Ice =	$A_{ICEant} := SA_{ICEant} \cdot N_{ant} = 11.9$	sf
Total Antenna Wind Force w/ Ice =	$F_{ICEant} := qz_{ICE} \cdot G_H \cdot Ca_{ant} \cdot A_{ICEant} = 544$	lbs BLC 4,6

Gravity Load (without ice)

Weight of All Antennas =	$WT_{ant} \cdot N_{ant} = 98$	lbs BLC 2
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Gravity Load (ice only)

Volume of Each Antenna =	$V_{ant} := L_{ant} \cdot W_{ant} \cdot T_{ant} = 1542$	cu in
Volume of Ice on Each Antenna =	$V_{ice} := (L_{ant} + 1) \cdot (W_{ant} + 1) \cdot (T_{ant} + 1) - V_{ant} = 821$	cu in
Weight of Ice on Each Antenna =	$W_{ICEant} := \frac{V_{ice}}{1728} \cdot Id = 27$	lbs
Weight of Ice on All Antennas =	$W_{ICEant} \cdot N_{ant} = 80$	lbs BLC 3

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

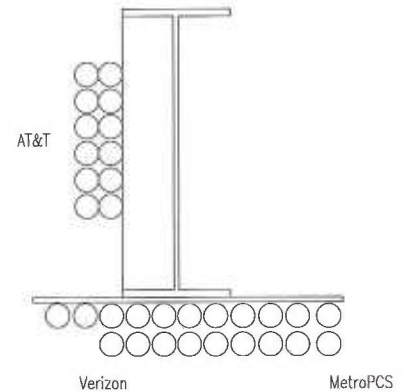
Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Development of Wind & Ice Load on Coax Cables

(per TIA/EIA-222-F-1996 Criteria)

Coax Cable Data:

Coax Type:	Use HELIAX 1-5/8"
Shape:	Round
Coax Outside Diameter =	$D_{\text{coax}} := 1.98$ in
Coax Cable Length =	$L_{\text{coax}} := 110$ ft
Weight of Coax per foot =	$WT_{\text{coax}} := 1.04$ plf
Total Number of Coax =	$N_{\text{coax}} := 32$
Number of Projected Coax =	$NP_{\text{coax}} := 5$
Coax aspect ratio =	$Ar_{\text{coax}} := L_{\text{coax}} \cdot \frac{12}{D_{\text{coax}}} = 667$
Coax Cable Force Factor =	$Ca_{\text{coax}} = 1.2$ TIA/EIA-222-F Table 3



Wind Load (without ice)

Surface Area for One Coax =	$SA_{\text{coax}} := \frac{D_{\text{coax}}}{12} = 0.17$ sf/ft
Coax Projected Surface Area =	$A_{\text{coax}} := SA_{\text{coax}} \cdot NP_{\text{coax}} = 0.825$ sf/ft
Coax Wind Force =	$F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{mast}} \cdot G_H \cdot A_{\text{coax}} = 34$ plf BLC 5,7

Wind Load (with ice)

Coax Projected Surface Area w/ Ice =	$A_{\text{ICEcoax}} := \frac{D_{\text{coax}}}{12} \cdot NP_{\text{coax}} + 2 \cdot \frac{Ir}{12} = 0.908$ sf/ft
Coax Wind Force w/ Ice =	$F_{\text{icecoax}} := Ca_{\text{coax}} \cdot qz_{\text{ICE}} \cdot G_H \cdot A_{\text{ICEcoax}} = 28$ plf BLC 4,6

Gravity Loads (without ice)

Weight of all cables w/o ice =	$WT_{\text{coax}} \cdot N_{\text{coax}} = 33$ plf BLC 2
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Gravity Loads (ice only)

Ice Area per Linear Foot =	$A_{\text{icecoax}} := \frac{\pi}{4} \left[(D_{\text{coax}} + 2 \cdot Ir)^2 - D_{\text{coax}}^2 \right] = 3.9$ si
Ice Weight per Linear Foot =	$WT_{\text{icecoax}} := Id \cdot \frac{A_{\text{icecoax}}}{144} = 2$ plf
Ice Weight All Coax per foot =	$WT_{\text{icecoax}} \cdot N_{\text{coax}} = 48$ plf BLC 3

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

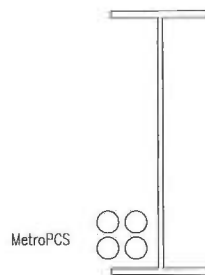
Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Development of Wind & Ice Load on Coax Cables

(per TIA/EIA-222-F-1996 Criteria)

Coax Cable Data:

Coax Type:	Use HELIAX 1-5/8"
Shape:	Round
Coax Outside Diameter =	$D_{\text{coax}} := 1.98$ in
Coax Cable Length =	$L_{\text{coax}} := 110$ ft
Weight of Coax per foot =	$WT_{\text{coax}} := 1.04$ plf
Total Number of Coax =	$N_{\text{coax}} := 4$
Number of Projected Coax =	$NP_{\text{coax}} := 0$
Coax aspect ratio =	$Ar_{\text{coax}} := L_{\text{coax}} \cdot \frac{12}{D_{\text{coax}}} = 667$
Coax Cable Force Factor =	$Ca_{\text{coax}} = 1.2$ TIA/EIA-222-F Table 3



Wind Load (without ice)

per TIA/EIA-222-F Section 2.3.2

Surface Area for One Coax =	$SA_{\text{coax}} := \frac{D_{\text{coax}}}{12} = 0.17$	sf/ft
Coax Projected Surface Area =	$A_{\text{coax}} := SA_{\text{coax}} \cdot NP_{\text{coax}} = 0$	sf/ft
Coax Wind Force =	$F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{mast2}} \cdot G_H \cdot A_{\text{coax}} = 0$	plf BLC 5,7

Wind Load (with ice)

per TIA/EIA-222-F Section 2.3.2

Coax Projected Surface Area w/ Ice =	$A_{\text{ICEcoax}} := \frac{D_{\text{coax}}}{12} \cdot NP_{\text{coax}} = 0$	sf/ft
Coax Wind Force w/ Ice =	$F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{ICE}} \cdot G_H \cdot A_{\text{ICEcoax}} = 0$	plf BLC 4,6

Gravity Loads (without ice)

Weight of all cables w/o Ice =	$WT_{\text{coax}} \cdot N_{\text{coax}} = 4$	plf BLC 2
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Gravity Loads (ice only)

Ice Area per Linear Foot =	$A_{\text{ice}} := \frac{\pi}{4} \left[(D_{\text{coax}} + 2 \cdot Ir)^2 - D_{\text{coax}}^2 \right] = 3.9$	si
Ice Weight per Linear Foot =	$WT_{\text{ice}} := Id \cdot \frac{A_{\text{ice}}}{144} = 2$	plf
Ice Weight All Coax per foot =	$WT_{\text{ice}} \cdot N_{\text{coax}} = 6$	plf BLC 3

Development of Wind & Ice Load on Coax Cables

(per TIA/EIA-222-F-1996 Criteria)

Coax Cable Data:

Coax Type:

Use HELIAX 1-5/8"

Shape:

Round

Coax Outside Diameter =

$D_{\text{coax}} := 1.98$ in

T-Mobile
 0'-90'

Coax Cable Length =

$L_{\text{coax}} := 110$ ft

Weight of Coax per foot =

$WT_{\text{coax}} := 1.04$ plf

Total Number of Coax =

$N_{\text{coax}} := 19$ (18 Coax 1 Fiber)

Number of Projected Coax =

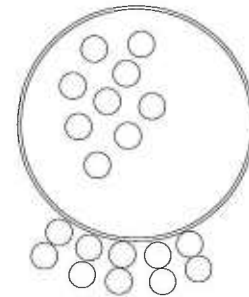
$NP_{\text{coax}} := 2$

Coax aspect ratio =

$Ar_{\text{coax}} := L_{\text{coax}} \cdot \frac{12}{D_{\text{coax}}} = 667$

Coax Cable Force Factor =

$Ca_{\text{coax}} = 1.2$ TIA/EIA-222-F Table 3



Wind Load per (without ice)

per TIA/EIA-222-F Section 2.3.2

Surface Area for One Coax =

$SA_{\text{coax}} := \frac{D_{\text{coax}}}{12} = 0.17$ sf/ft

Coax Projected Surface Area =

$A_{\text{coax}} := SA_{\text{coax}} \cdot NP_{\text{coax}} = 0.33$ sf/ft

Coax Wind Force =

$F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{mast}} \cdot G_H \cdot A_{\text{coax}} = 16$ plf **BLC 5,7**

Wind Load per (with ice)

per TIA/EIA-222-F Section 2.3.2

Coax Projected Surface Area w/ Ice =

$A_{\text{ICEcoax}} := \frac{D_{\text{coax}}}{12} \cdot NP_{\text{coax}} + 2 \cdot \frac{Ir}{12} = 0.413$ sf/ft

Coax Wind Force w/ Ice =

$F_{\text{coax}} := Ca_{\text{coax}} \cdot qz_{\text{ICE}} \cdot G_H \cdot A_{\text{ICEcoax}} = 15$ plf **BLC 4,6**

Gravity Loads (without ice)

Weight of all cables w/o ice =

$WT_{\text{coax}} \cdot N_{\text{coax}} = 20$ plf **BLC 2**

Gravity Loads (ice only)

Ice Area per Linear Foot =

$A_{\text{icecoax}} := \frac{\pi}{4} \left[(D_{\text{coax}} + 2 \cdot Ir)^2 - D_{\text{coax}}^2 \right] = 3.9$ si

Ice Weight per Linear Foot =

$WT_{\text{icecoax}} := Id \cdot \frac{A_{\text{icecoax}}}{144} = 2$ plf

Ice Weight All Coax per foot =

$WT_{\text{icecoax}} \cdot \frac{N_{\text{coax}}}{2} = 14$ plf **BLC 3**

Subject:

Wind Loading on Antennas and Mounts

Location:

Cromwell, CT

Rev. 0: 10/30/14

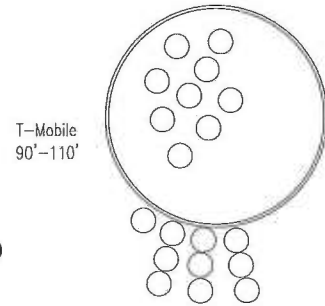
Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Development of Wind & Ice Load on Coax Cables

(per TIA/EIA-222-F-1996 Criteria)

Coax Cable Data:

Coax Type: Use HELIAX 1-5/8"
 Shape: Round
 Coax Outside Diameter = $D_{coax} := 1.98$ in
 Coax Cable Length = $L_{coax} := 110$ ft
 Weight of Coax per foot = $WT_{coax} := 1.04$ plf
 Total Number of Coax = $N_{coax} := 19$ (18 Coax 1 Fiber)
 Number of Projected Coax = $NP_{coax} := 3$



T-Mobile
 90'-110'

Coax aspect ratio = $Ar_{coax} := L_{coax} \cdot \frac{12}{D_{coax}} = 667$

Coax Cable Force Factor = $Ca_{coax} = 1.2$ TIA/EIA-222-F Table 3

Wind Load per (without ice)

per TIA/EIA-222-F Section 2.3.2

Surface Area for One Coax = $SA_{coax} := \frac{D_{coax}}{12} = 0.17$ sf/ft
 Coax Projected Surface Area = $A_{coax} := SA_{coax} \cdot NP_{coax} = 0.495$ sf/ft
 Coax Wind Force = $F_{coax} := Ca_{coax} \cdot qz_{mast3} \cdot G_H \cdot A_{coax} = 23$ plf **BLC 5,7**

Wind Load per (with ice)

per TIA/EIA-222-F Section 2.3.2

Coax Projected Surface Area w/ Ice = $A_{ICEcoax} := \frac{D_{coax}}{12} \cdot NP_{coax} + 2 \cdot \frac{lr}{12} = 0.578$ sf/ft
 Coax Wind Force w/ Ice = $F_{coax} := Ca_{coax} \cdot qz_{ICE_{mast3}} \cdot G_H \cdot A_{ICEcoax} = 21$ plf **BLC 4,6**

Gravity Loads (without ice)

Weight of all cables w/o ice = $WT_{coax} \cdot N_{coax} = 20$ plf **BLC 2**

Gravity Loads (ice only)

Ice Area per Linear Foot = $Ai_{coax} := \frac{\pi}{4} \left[(D_{coax} + 2 \cdot lr)^2 - D_{coax}^2 \right] = 3.9$ si
 Ice Weight per Linear Foot = $WTi_{coax} := Id \cdot \frac{Ai_{coax}}{144} = 2$ plf
 Ice Weight All Coax per foot = $WTi_{coax} \cdot \frac{N_{coax}}{2} = 14$ plf **BLC 3**



Company : Centek Engineering
 Designer : TJL/CFC
 Job Number : 14033.019
 Model Name : 82' Sign Structure with 111' Pipe Mast

Oct 31, 2014

Checked By: _____

Global

Display Sections for Member Calcs	5
Max Internal Sections for Member Calcs	97
Include Shear Deformation?	Yes
Include Warping?	Yes
Trans Load Btwn Intersecting Wood Wall?	Yes
Increase Nailing Capacity for Wind?	Yes
Area Load Mesh (in^2)	144
Merge Tolerance (in)	.12
P-Delta Analysis Tolerance	0.50%
Include P-Delta for Walls?	Yes
Automaticly Iterate Stiffness for Walls?	No
Maximum Iteration Number for Wall Stiffness	3
Gravity Acceleration (ft/sec^2)	32.2
Wall Mesh Size (in)	12
Eigensolution Convergence Tol. (1.E-)	4
Vertical Axis	Y
Global Member Orientation Plane	XZ
Static Solver	Sparse Accelerated
Dynamic Solver	Accelerated Solver

Hot Rolled Steel Code	AISC 9th: ASD
RISAConnection Code	AISC 14th(360-10): ASD
Cold Formed Steel Code	AISI 1999: ASD
Wood Code	AF&PA NDS-97: ASD
Wood Temperature	< 100F
Concrete Code	ACI 318-02
Masonry Code	ACI 530-05: ASD
Aluminum Code	AA ADM1-05: ASD - Building

Number of Shear Regions	4
Region Spacing Increment (in)	4
Biaxial Column Method	PCA Load Contour
Parme Beta Factor (PCA)	.65
Concrete Stress Block	Rectangular
Use Cracked Sections?	Yes
Use Cracked Sections Slab?	Yes
Bad Framing Warnings?	No
Unused Force Warnings?	Yes
Min 1 Bar Diam. Spacing?	No
Concrete Rebar Set	REBAR_SET_ASTMA615
Min % Steel for Column	1
Max % Steel for Column	8



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Global, Continued

Seismic Code	UBC 1997
Seismic Base Elevation (ft)	Not Entered
Add Base Weight?	No
Ct Z	.035
Ct X	.035
T Z (sec)	Not Entered
T X (sec)	Not Entered
R Z	8.5
R X	8.5
Ca	.36
Cv	.54
Nv	1
Occupancy Category	4
Seismic Zone	3
Seismic Detailing Code	ASCE 7-05
Om Z	1
Om X	1
Rho Z	1
Rho X	1

Footing Overturning Safety Factor	1.5
Check Concrete Bearing	No
Footing Concrete Weight (k/ft^3)	0
Footing Concrete f'c (ksi)	3
Footing Concrete Ec (ksi)	4000
Lamda	1
Footing Steel fy (ksi)	60
Minimum Steel	0.0018
Maximum Steel	0.0075
Footing Top Bar	#3
Footing Top Bar Cover (in)	3.5
Footing Bottom Bar	#3
Footing Bottom Bar Cover (in)	3.5
Pedestal Bar	#3
Pedestal Bar Cover (in)	1.5
Pedestal Ties	#3

Hot Rolled Steel Properties

	Label	E [ksi]	G [ksi]	Nu	Therm (1...	Density[k/ft^3]	Yield[ksi]	Ry	Fu[ksi]	Rt
1	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
2	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	58	1.2
3	A992	29000	11154	.3	.65	.49	50	1.1	58	1.2
4	A500 Gr.42	29000	11154	.3	.65	.49	42	1.3	58	1.1
5	A500 Gr.46	29000	11154	.3	.65	.49	46	1.2	58	1.1

Hot Rolled Steel Design Parameters

	Label	Shape	Leng...	Lbyy[ft]	Lbzz[ft]	Lcomp ...	Lcomp ...	Kyy	Kzz	Cm...Cm...	Cb	y s... z s...	Functi...
1	CROS...	L5x5x5/16	15.207	7.5	7.5								Lateral
2	CROS...	L5x5x5/16	15.207	7.5	7.5								Lateral
3	CROS...	L5x5x5/16	15.207	7.5	7.5								Lateral



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Hot Rolled Steel Design Parameters (Continued)

	Label	Shape	Leng...	Lbyy[ft]	Lbzz[ft]	Lcomp...	Lcomp...	Kyy	Kzz	Cm...	Cm...	Cb	y s...	z s...	Functi...
4	CROS...	L5x5x5/16	15.207	7.5	7.5										Lateral
5	CROS...	L3.5x3.5x5/16	18.916	9.5	9.5										Lateral
6	CROS...	L3.5x3.5x5/16	18.916	9.5	9.5										Lateral
7	CROS...	L5x5x5/16	33.126												Lateral
8	CROS...	L5x5x5/16	33.126												Lateral
9	HORZ1	L5x5x5/16	13.509	7	7										Lateral
10	HORZ2	L5x5x5/16	13.509	7	7										Lateral
11	HORZ3	L5x5x5/16	13.509	7	7										Lateral
12	HORZ4	L5x5x5/16	13.509	7	7										Lateral
13	HORZ5	L5x5x5/16	13.509	7	7										Lateral
14	HORZ6	L5x5x5/16	13.509	7	7										Lateral
15	HORZ7	L5x5x5/16	13.509	7	7										Lateral
16	HORZ8	L5x5x5/16	13.509	7	7										Lateral
17	HORZ9	L5x5x5/16	13.509	7	7										Lateral
18	HORZ10	L5x5x5/16	13.509	7	7										Lateral
19	HORZ11	Tube8x4x5/16	13.5	1	1	1	1								Lateral
20	LEG1	W24x68	60	Segment	Segment	20	14								Lateral
21	LEG2	W24x68	60	Segment	Segment	20	13.5								Lateral
22	LEG...	W24x68 w/ pl	20.5	Segment	Segment	20.5									Lateral
23	LEG...	W24x68 w/ pl	20.5	Segment	Segment	20.5									Lateral
24	WT1	WT6x15	10.091												Lateral
25	WT2	WT6x15	10.091												Lateral
26	WT3	WT6x15	10.091												Lateral
27	WT4	WT6x15	10.091												Lateral
28	WT5	WT6x15	10.091												Lateral
29	WT6	WT6x15	10.091												Lateral
30	WT7	WT6x15	10.091												Lateral
31	WT8	WT6x15	10.091												Lateral
32	WT9	WT6x15	10.091												Lateral
33	WT10	WT6x15	10.091												Lateral
34	WT11	WT6x15	10.091												Lateral
35	WT12	WT6x15	10.091												Lateral
36	WT13	WT6x15	10.091												Lateral
37	WT14	WT6x15	10.091												Lateral
38	WT15	WT6x15	10.091												Lateral
39	WT16	WT6x15	10.091												Lateral
40	WT17	WT6x15	10.091												Lateral
41	WT18	WT6x15	10.091												Lateral
42	WT19	WT6x15	10.091												Lateral
43	WT20	WT6x15	10.091												Lateral
44	Mast1	HSS18x0.5	29	Segment	Segment										Lateral
45	Mast2	HSS18x0.5	27.5	Segment	Segment										Lateral
46	Mast3	HSS18x0.5	27.5	Segment	Segment										Lateral
47	Mast4	HSS18x0.5	27	Segment	Segment										Lateral
48	Horz 12	Tube8x4x5/16	13.5	1	1	1	1								Lateral

Hot Rolled Steel Section Sets

	Label	Shape	Type	Design List	Material	Design Ru...	A [in ²]	Iyy [in ⁴]	Izz [in ⁴]	J [in ⁴]
1	W24x68	W24x68	Beam	Wide Flan..	A992	Typical	20.1	70.4	1830	1.87
2	L5x5x5/16	L5x5x5	Beam	Wide Flan..	A36 Gr.36	Typical	3.07	7.44	7.44	.108

Hot Rolled Steel Section Sets (Continued)

	Label	Shape	Type	Design List	Material	Design Ru...	A [in ²]	I _{yy} [in ⁴]	I _{zz} [in ⁴]	J [in ⁴]
3	L3.5x3.5x5/16	L3.5x3.5x5	Beam	Wide Flan..	A36 Gr.36	Typical	2.1	2.44	2.44	.073
4	Tube8x4x5/16	TU8X4X5	Beam	Wide Flan..	A500 Gr.46	Typical	6.86	18.1	53.9	45.2
5	HSS18x0.5	HSS18X0.5	Beam	Wide Flan..	A500 Gr.42	Typical	25.6	985	985	1970
6	WT6x15	WT6x15	Beam	W Tee	A572 Gr.50	Typical	4.4	10.2	13.5	.228
7	W24x68 w/ pl	new	Beam	Wide Flan..	A992	Typical	52.1	753.067	6733.167	10

Member Primary Data

	Label	I Joint	J Joint	K Joint	Rotate(d...	Section/Shape	Type	Design List	Material	Design R...
1	CROSSDIA...	5	10			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
2	CROSSDIA...	9	6			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
3	CROSSDIA...	9	12			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
4	CROSSDIA...	11	10			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
5	CROSSDIA...	13	18			L3.5x3.5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
6	CROSSDIA...	17	14			L3.5x3.5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
7	CROSSDIA...	19	TOPLE...			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
8	CROSSDIA...	TOPLE...	20			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
9	HORZ1	3	6			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
10	HORZ2	5	4			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
11	HORZ3	11	14			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
12	HORZ4	13	12			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
13	HORZ5	17	20			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
14	HORZ6	19	18			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
15	HORZ7	23	26			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
16	HORZ8	25	24			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
17	HORZ9	29	32			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
18	HORZ10	31	30			L5x5x5/16	Beam	Wide Flange	A36 Gr.36	Typical
19	HORZ11	TOPLE...	TOPLE...			Tube8x4x5/16	Beam	Wide Flange	A500 Gr.46	Typical
20	LEG1	TOPPLT1	TOPLE...		90	W24x68	Beam	Wide Flange	A992	Typical
21	LEG2	TOPPLT2	TOPLE...		90	W24x68	Beam	Wide Flange	A992	Typical
22	LEG_W_PL...	BOTLE...	TOPPLT1		90	W24x68 w/ pl	Beam	Wide Flange	A992	Typical
23	LEG_W_PL...	BOTLE...	TOPPLT2		90	W24x68 w/ pl	Beam	Wide Flange	A992	Typical
24	WT1	1	MC1		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
25	WT2	MC1	2		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
26	WT3	MC1	7		90	WT6x15	Beam	W Tee	A572 Gr.50	Typical
27	WT4	MC1	8		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
28	WT5	MC2	7		90	WT6x15	Beam	W Tee	A572 Gr.50	Typical
29	WT6	MC2	8		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
30	WT7	MC2	15		90	WT6x15	Beam	W Tee	A572 Gr.50	Typical
31	WT8	MC2	16		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
32	WT9	16	MC3		90	WT6x15	Beam	W Tee	A572 Gr.50	Typical
33	WT10	15	MC3		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
34	WT11	21	MC3		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
35	WT12	MC3	22		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
36	WT13	21	MC4		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
37	WT14	22	MC4		90	WT6x15	Beam	W Tee	A572 Gr.50	Typical
38	WT15	MC4	27		90	WT6x15	Beam	W Tee	A572 Gr.50	Typical
39	WT16	MC4	28		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
40	WT17	MC5	27		90	WT6x15	Beam	W Tee	A572 Gr.50	Typical
41	WT18	MC5	28		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
42	WT19	MC5	33		90	WT6x15	Beam	W Tee	A572 Gr.50	Typical



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Member Primary Data (Continued)

	Label	I Joint	J Joint	K Joint	Rotate(d...)	Section/Shape	Type	Design List	Material	Design R...
43	WT20	MC5	34		270	WT6x15	Beam	W Tee	A572 Gr.50	Typical
44	Mast1	BOTMA...	FC1			HSS18x0.5	Beam	Wide Flange	A500 Gr.42	Typical
45	Mast2	FC1	FC2			HSS18x0.5	Beam	Wide Flange	A500 Gr.42	Typical
46	Mast3	FC2	FC3			HSS18x0.5	Beam	Wide Flange	A500 Gr.42	Typical
47	Mast4	FC3	TOPMA...			HSS18x0.5	Beam	Wide Flange	A500 Gr.42	Typical
48	Horz 12	TOPL...	TOPL...			Tube8x4x5/16	Beam	Wide Flange	A500 Gr.46	Typical

Joint Coordinates and Temperatures

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
1	1	0	12	0	0	
2	2	13.5	12	0	0	
3	3	0	23	0	0	
4	4	13.5	23	0	0	
5	5	0	23.5	0	0	
6	6	13.5	23.5	0	0	
7	7	0	25.75	0	0	
8	8	13.5	25.75	0	0	
9	9	0	30.5	0	0	
10	10	13.5	30.5	0	0	
11	11	0	37.5	0	0	
12	12	13.5	37.5	0	0	
13	13	0	38	0	0	
14	14	13.5	38	0	0	
15	15	0	39.5	0	0	
16	16	13.5	39.5	0	0	
17	17	0	51.25	0	0	
18	18	13.5	51.25	0	0	
19	19	0	51.75	0	0	
20	20	13.5	51.75	0	0	
21	21	0	53.25	0	0	
22	22	13.5	53.25	0	0	
23	23	0	55.25	0	0	
24	24	13.5	55.25	0	0	
25	25	0	55.75	0	0	
26	26	13.5	55.75	0	0	
27	27	0	67	0	0	
28	28	13.5	67	0	0	
29	29	0	75.5	0	0	
30	30	13.5	75.5	0	0	
31	31	0	76	0	0	
32	32	13.5	76	0	0	
33	33	0	80.75	0	0	
34	34	13.5	80.75	0	0	
35	BOTLEG1	0	1.5	0	0	
36	BOTLEG2	13.5	1.5	0	0	
37	BOTMAST	6.75	0	3	0	
38	MC1	6.75	18.875	3	0	
39	MC2	6.75	32.625	3	0	
40	MC3	6.75	46.375	3	0	
41	MC4	6.75	60.125	3	0	



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Joint Coordinates and Temperatures (Continued)

	Label	X [ft]	Y [ft]	Z [ft]	Temp [F]	Detach From Dia...
42	MC5	6.75	73.875	3	0	
43	TOPLEG1	0	82	0	0	
44	TOPLEG2	13.5	82	0	0	
45	TOPMAST	6.75	111	3	0	
46	TOPPLT1	0	22	0	0	
47	TOPPLT2	13.5	22	0	0	
48	T MOBILE	6.75	107.5	3	0	
49	METRO	0	77	0	0	
50	METRO2	13.5	77	0	0	
51	FC1	6.75	29	3	0	
52	FC2	6.75	56.5	3	0	
53	FC3	6.75	84	3	0	
54	GPS	0	50	0	0	

Joint Boundary Conditions

	Joint Label	X [k/in]	Y [k/in]	Z [k/in]	X Rot.[k-ft/rad]	Y Rot.[k-ft/rad]	Z Rot.[k-ft/rad]	Footing
1	BOTLEG1	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
2	BOTMAST	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
3	BOTLEG2	Reaction	Reaction	Reaction	Reaction	Reaction	Reaction	
4	TOPLEG1							
5	TOPLEG2							
6	FC3							
7	FC2							
8	FC1							

Member Point Loads

Member Label	Direction	Magnitude[k,k-ft]	Location[ft,%]
No Data to Print ...			

Joint Loads and Enforced Displacements (BLC 2 : Weight of Equipment)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOPLEG1	L	Y	-.051
2	TOPLEG2	L	Y	-.051
3	TOPLEG1	L	Y	-.081
4	TOPLEG2	L	Y	-.081
5	TOPLEG1	L	Y	-.036
6	TOPLEG2	L	Y	-.036
7	TOPLEG1	L	Y	-.132
8	TOPLEG2	L	Y	-.132
9	TOPLEG1	L	Y	-.911
10	TOPLEG2	L	Y	-.911
11	TOPLEG1	L	Y	-.105
12	TOPLEG2	L	Y	-.105
13	TOPLEG1	L	Y	-.074
14	TOPLEG2	L	Y	-.074
15	TOPLEG1	L	Y	-.085
16	TOPLEG2	L	Y	-.085



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Joint Loads and Enforced Displacements (BLC 2 : Weight of Equipment) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
17	TOPLEG1	L	Y	-.15
18	TOPLEG2	L	Y	-.15
19	TOPLEG1	L	Y	-.01
20	TOPLEG2	L	Y	-.01
21	TOPLEG1	L	Y	-.648
22	TOPLEG2	L	Y	-.648
23	T MOBILE	L	Y	-.378
24	T MOBILE	L	Y	-.285
25	T MOBILE	L	Y	-.15
26	T MOBILE	L	Y	-1.3
27	GPS	L	Y	-.008
28	METRO2	L	Y	-.033
29	METRO	L	Y	-.066
30	TOPLEG1	L	Y	-.066
31	TOPLEG2	L	Y	-.066

Joint Loads and Enforced Displacements (BLC 3 : Weight of Ice)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOPLEG1	L	Y	-.122
2	TOPLEG2	L	Y	-.122
3	TOPLEG1	L	Y	-.222
4	TOPLEG2	L	Y	-.222
5	TOPLEG1	L	Y	-.129
6	TOPLEG2	L	Y	-.129
7	TOPLEG1	L	Y	-.052
8	TOPLEG2	L	Y	-.052
9	TOPLEG1	L	Y	-.315
10	TOPLEG2	L	Y	-.315
11	TOPLEG1	L	Y	-.098
12	TOPLEG2	L	Y	-.098
13	TOPLEG1	L	Y	-.07
14	TOPLEG2	L	Y	-.07
15	TOPLEG1	L	Y	-.043
16	TOPLEG2	L	Y	-.043
17	TOPLEG1	L	Y	-.059
18	TOPLEG2	L	Y	-.059
19	TOPLEG1	L	Y	-.01
20	TOPLEG2	L	Y	-.01
21	TOPLEG1	L	Y	-.191
22	TOPLEG2	L	Y	-.191
23	T MOBILE	L	Y	-.216
24	T MOBILE	L	Y	-.125
25	T MOBILE	L	Y	-.059
26	T MOBILE	L	Y	-.465
27	GPS	L	Y	-.002
28	METRO2	L	Y	-.027
29	METRO	L	Y	-.053
30	TOPLEG1	L	Y	-.026
31	TOPLEG2	L	Y	-.026



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Joint Loads and Enforced Displacements (BLC 4 : TIA/EIA Wind with Ice (+X))

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOPLEG1	L	X	2.502
2	TOPLEG2	L	X	2.502
3	TOPLEG1	L	X	1.853
4	TOPLEG2	L	X	1.853
5	TOPLEG1	L	Y	4.12
6	TOPLEG2	L	Y	-4.12
7	T MOBILE	L	X	1.259
8	T MOBILE	L	X	.718
9	T MOBILE	L	X	.334
10	T MOBILE	L	X	.668
11	GPS	L	X	.006
12	METRO2	L	X	.181
13	METRO	L	X	.363

Joint Loads and Enforced Displacements (BLC 5 : TIA/EIA Wind (+X))

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOPLEG1	L	X	2.905
2	TOPLEG2	L	X	2.905
3	TOPLEG1	L	X	2.133
4	TOPLEG2	L	X	2.133
5	TOPLEG1	L	Y	4.74
6	TOPLEG2	L	Y	-4.74
7	T MOBILE	L	X	1.519
8	T MOBILE	L	X	.86
9	T MOBILE	L	X	.394
10	T MOBILE	L	X	.689
11	GPS	L	X	.005
12	METRO2	L	X	.206
13	METRO	L	X	.411

Joint Loads and Enforced Displacements (BLC 6 : TIA/EIA Wind with Ice(+Z))

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOPLEG1	L	Z	2.502
2	TOPLEG2	L	Z	2.502
3	TOPLEG1	L	Z	1.853
4	TOPLEG2	L	Z	1.853
5	TOPLEG1	L	Mx	27.8
6	TOPLEG2	L	Mx	27.8
7	T MOBILE	L	Z	1.259
8	T MOBILE	L	Z	.718
9	T MOBILE	L	Z	.334
10	T MOBILE	L	Z	.668
11	GPS	L	Z	.006
12	METRO2	L	Z	.181
13	METRO	L	Z	.363

Joint Loads and Enforced Displacements (BLC 7 : TIA/EIA Wind (+Z))

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
1	TOPLEG1	L	Z	2.905
2	TOPLEG2	L	Z	2.905

Joint Loads and Enforced Displacements (BLC 7 : TIA/EIA Wind (+Z)) (Continued)

	Joint Label	L,D,M	Direction	Magnitude[(k,k-ft), (in,rad), (k*s^2/ft, k*s^2*ft)]
3	TOPLEG1	L	Z	2.133
4	TOPLEG2	L	Z	2.133
5	TOPLEG1	L	Mx	32
6	TOPLEG2	L	Mx	32
7	T MOBILE	L	Z	1.519
8	T MOBILE	L	Z	.86
9	T MOBILE	L	Z	.394
10	T MOBILE	L	Z	.689
11	GPS	L	Z	.005
12	METRO2	L	Z	.206
13	METRO	L	Z	.411

Member Distributed Loads (BLC 2 : Weight of Equipment)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	LEG W PLT1	Y	-.004	-.004	0	0
2	LEG1	Y	-.004	-.004	0	0
3	LEG W PLT2	Y	-.033	-.033	0	0
4	LEG2	Y	-.033	-.033	0	0
5	Mast1	Y	-.02	-.02	0	0
6	Mast2	Y	-.02	-.02	0	0
7	Mast3	Y	-.02	-.02	0	0
8	Mast4	Y	-.02	-.02	0	0

Member Distributed Loads (BLC 3 : Weight of Ice)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	CROSSDIAG1	Y	-.004	-.004	0	0
2	CROSSDIAG2	Y	-.004	-.004	0	0
3	CROSSDIAG3	Y	-.004	-.004	0	0
4	CROSSDIAG4	Y	-.004	-.004	0	0
5	CROSSDIAG5	Y	-.003	-.003	0	0
6	CROSSDIAG6	Y	-.003	-.003	0	0
7	CROSSDIAG7	Y	-.004	-.004	0	0
8	CROSSDIAG8	Y	-.004	-.004	0	0
9	HORZ1	Y	-.004	-.004	0	0
10	HORZ2	Y	-.004	-.004	0	0
11	HORZ3	Y	-.004	-.004	0	0
12	HORZ4	Y	-.004	-.004	0	0
13	HORZ5	Y	-.004	-.004	0	0
14	HORZ6	Y	-.004	-.004	0	0
15	HORZ7	Y	-.004	-.004	0	0
16	HORZ8	Y	-.004	-.004	0	0
17	HORZ9	Y	-.004	-.004	0	0
18	HORZ10	Y	-.004	-.004	0	0
19	HORZ11	Y	-.004	-.004	0	0
20	LEG1	Y	-.016	-.016	0	0
21	LEG2	Y	-.016	-.016	0	0
22	LEG W PLT1	Y	-.006	-.006	0	0
23	LEG1	Y	-.006	-.006	0	0
24	LEG W PLT2	Y	-.048	-.048	0	0
25	LEG2	Y	-.048	-.048	0	0

Member Distributed Loads (BLC 3 : Weight of Ice) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
26	LEG W PLT1	Y	-.038	-.038	0	0
27	LEG W PLT2	Y	-.038	-.038	0	0
28	Mast4	Y	-.011	-.011	0	0
29	Mast1	Y	-.011	-.011	0	0
30	Mast2	Y	-.011	-.011	0	0
31	Mast3	Y	-.011	-.011	0	0
32	WT1	Y	-.005	-.005	0	0
33	WT2	Y	-.005	-.005	0	0
34	WT3	Y	-.005	-.005	0	0
35	WT4	Y	-.005	-.005	0	0
36	WT5	Y	-.005	-.005	0	0
37	WT6	Y	-.005	-.005	0	0
38	WT7	Y	-.005	-.005	0	0
39	WT8	Y	-.005	-.005	0	0
40	WT9	Y	-.005	-.005	0	0
41	WT10	Y	-.005	-.005	0	0
42	WT11	Y	-.005	-.005	0	0
43	WT12	Y	-.005	-.005	0	0
44	WT13	Y	-.005	-.005	0	0
45	WT14	Y	-.005	-.005	0	0
46	WT15	Y	-.005	-.005	0	0
47	WT16	Y	-.005	-.005	0	0
48	WT17	Y	-.005	-.005	0	0
49	WT18	Y	-.005	-.005	0	0
50	WT19	Y	-.005	-.005	0	0
51	WT20	Y	-.005	-.005	0	0
52	Mast1	Y	-.014	-.014	0	0
53	Mast2	Y	-.014	-.014	0	0
54	Mast3	Y	-.014	-.014	0	0
55	Mast4	Y	-.014	-.014	0	0

Member Distributed Loads (BLC 4 : TIA/EIA Wind with Ice (+X))

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	LEG1	X	.071	.071	0	20
2	LEG1	X	.083	.083	20	40
3	LEG1	X	.091	.091	40	60
4	LEG2	X	.013	.013	0	0
5	LEG W PLT1	X	.055	.055	0	0
6	Mast1	X	.018	.018	0	0
7	Mast1	X	.015	.015	0	0
8	Mast2	X	.024	.024	0	0
9	Mast2	X	.015	.015	0	0
10	Mast3	X	.028	.028	0	0
11	Mast3	X	.015	.015	0	0
12	Mast4	X	.03	.03	0	0
13	Mast4	X	.021	.021	0	20
14	WT1	X	.028	.028	0	0
15	WT2	X	.028	.028	0	0
16	WT3	X	.028	.028	0	0
17	WT4	X	.028	.028	0	0
18	WT5	X	.028	.028	0	0



Company : Centek Engineering
 Designer : TJL/CFC
 Job Number : 14033.019
 Model Name : 82' Sign Structure with 111' Pipe Mast

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Member Distributed Loads (BLC 4 : TIA/EIA Wind with Ice (+X)) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
19	WT6	X	.028	.028	0	0
20	WT7	X	.028	.028	0	0
21	WT8	X	.028	.028	0	0
22	WT9	X	.028	.028	0	0
23	WT10	X	.028	.028	0	0
24	WT11	X	.028	.028	0	0
25	WT12	X	.028	.028	0	0
26	WT13	X	.028	.028	0	0
27	WT14	X	.028	.028	0	0
28	WT15	X	.028	.028	0	0
29	WT16	X	.028	.028	0	0
30	WT17	X	.028	.028	0	0
31	WT18	X	.028	.028	0	0
32	WT19	X	.028	.028	0	0
33	WT20	X	.028	.028	0	0

Member Distributed Loads (BLC 5 : TIA/EIA Wind (+X))

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	LEG1	X	.115	.115	40	60
2	LEG1	X	.105	.105	20	40
3	LEG1	X	.091	.091	0	20
4	LEG2	X	.014	.014	0	0
5	LEG W PLT1	X	.07	.07	0	0
6	Mast1	X	.022	.022	0	0
7	Mast1	X	.016	.016	0	0
8	Mast2	X	.03	.03	0	0
9	Mast2	X	.016	.016	0	0
10	Mast3	X	.035	.035	0	0
11	Mast3	X	.016	.016	0	0
12	Mast4	X	.038	.038	0	0
13	Mast4	X	.023	.023	0	20
14	WT1	X	.032	.032	0	0
15	WT2	X	.032	.032	0	0
16	WT3	X	.032	.032	0	0
17	WT4	X	.032	.032	0	0
18	WT5	X	.032	.032	0	0
19	WT6	X	.032	.032	0	0
20	WT7	X	.032	.032	0	0
21	WT8	X	.032	.032	0	0
22	WT9	X	.032	.032	0	0
23	WT10	X	.032	.032	0	0
24	WT11	X	.032	.032	0	0
25	WT12	X	.032	.032	0	0
26	WT13	X	.032	.032	0	0
27	WT14	X	.032	.032	0	0
28	WT15	X	.032	.032	0	0
29	WT16	X	.032	.032	0	0
30	WT17	X	.032	.032	0	0
31	WT18	X	.032	.032	0	0
32	WT19	X	.032	.032	0	0
33	WT20	X	.032	.032	0	0



Company : Centek Engineering
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Member Distributed Loads (BLC 6 : TIA/EIA Wind with Ice(+Z))

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	CROSSDIAG1	Z	.025	.025	0	0
2	CROSSDIAG2	Z	.025	.025	0	0
3	CROSSDIAG3	Z	.025	.025	0	0
4	CROSSDIAG4	Z	.025	.025	0	0
5	CROSSDIAG5	Z	.019	.019	0	0
6	CROSSDIAG6	Z	.019	.019	0	0
7	CROSSDIAG7	Z	.025	.025	0	0
8	CROSSDIAG8	Z	.025	.025	0	0
9	HORZ1	Z	.025	.025	0	0
10	HORZ2	Z	.025	.025	0	0
11	HORZ3	Z	.025	.025	0	0
12	HORZ4	Z	.025	.025	0	0
13	HORZ5	Z	.025	.025	0	0
14	HORZ6	Z	.025	.025	0	0
15	HORZ7	Z	.025	.025	0	0
16	HORZ8	Z	.025	.025	0	0
17	HORZ9	Z	.025	.025	0	0
18	HORZ10	Z	.025	.025	0	0
19	HORZ11	Z	.025	.025	0	0
20	LEG1	Z	.038	.038	0	20
21	LEG1	Z	.044	.044	20	40
22	LEG1	Z	.049	.049	40	60
23	LEG2	Z	.038	.038	0	20
24	LEG2	Z	.044	.044	20	40
25	LEG2	Z	.049	.049	40	60
26	LEG2	Z	.028	.028	0	0
27	LEG W PLT1	Z	.04	.04	0	0
28	LEG W PLT2	Z	.04	.04	0	0
29	Mast1	Z	.018	.018	0	0
30	Mast1	Z	.015	.015	0	0
31	Mast2	Z	.024	.024	0	0
32	Mast2	Z	.015	.015	0	0
33	Mast3	Z	.028	.028	0	0
34	Mast3	Z	.015	.015	0	0
35	Mast4	Z	.03	.03	0	0
36	Mast4	Z	.021	.021	0	20
37	WT1	Z	.028	.028	0	0
38	WT2	Z	.028	.028	0	0
39	WT3	Z	.028	.028	0	0
40	WT4	Z	.028	.028	0	0
41	WT5	Z	.028	.028	0	0
42	WT6	Z	.028	.028	0	0
43	WT7	Z	.028	.028	0	0
44	WT8	Z	.028	.028	0	0
45	WT9	Z	.028	.028	0	0
46	WT10	Z	.028	.028	0	0
47	WT11	Z	.028	.028	0	0
48	WT12	Z	.028	.028	0	0
49	WT13	Z	.028	.028	0	0
50	WT14	Z	.028	.028	0	0
51	WT15	Z	.028	.028	0	0
52	WT16	Z	.028	.028	0	0



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Member Distributed Loads (BLC 6 : TIA/EIA Wind with Ice(+Z)) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
53	WT17	Z	.028	.028	0	0
54	WT18	Z	.028	.028	0	0
55	WT19	Z	.028	.028	0	0
56	WT20	Z	.028	.028	0	0

Member Distributed Loads (BLC 7 : TIA/EIA Wind (+Z))

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft,%]	End Location[ft,%]
1	CROSSDIAG1	Z	.028	.028	0	0
2	CROSSDIAG2	Z	.028	.028	0	0
3	CROSSDIAG3	Z	.028	.028	0	0
4	CROSSDIAG4	Z	.028	.028	0	0
5	CROSSDIAG5	Z	.019	.019	0	0
6	CROSSDIAG6	Z	.019	.019	0	0
7	CROSSDIAG7	Z	.028	.028	0	0
8	CROSSDIAG8	Z	.028	.028	0	0
9	HORZ1	Z	.028	.028	0	0
10	HORZ2	Z	.028	.028	0	0
11	HORZ3	Z	.028	.028	0	0
12	HORZ4	Z	.028	.028	0	0
13	HORZ5	Z	.028	.028	0	0
14	HORZ6	Z	.028	.028	0	0
15	HORZ7	Z	.028	.028	0	0
16	HORZ8	Z	.028	.028	0	0
17	HORZ9	Z	.028	.028	0	0
18	HORZ10	Z	.028	.028	0	0
19	HORZ11	Z	.028	.028	0	0
20	LEG1	Z	.046	.046	0	20
21	LEG1	Z	.053	.053	20	40
22	LEG1	Z	.058	.058	40	60
23	LEG2	Z	.046	.046	0	20
24	LEG2	Z	.053	.053	20	40
25	LEG2	Z	.058	.058	40	60
26	LEG2	Z	.034	.034	0	0
27	LEG W PLT1	Z	.049	.049	0	0
28	LEG W PLT2	Z	.049	.049	0	0
29	Mast1	Z	.022	.022	0	0
30	Mast1	Z	.016	.016	0	0
31	Mast2	Z	.03	.03	0	0
32	Mast2	Z	.016	.016	0	0
33	Mast3	Z	.035	.035	0	0
34	Mast3	Z	.016	.016	0	0
35	Mast4	Z	.038	.038	0	0
36	Mast4	Z	.023	.023	0	20
37	WT1	Z	.032	.032	0	0
38	WT2	Z	.032	.032	0	0
39	WT3	Z	.032	.032	0	0
40	WT4	Z	.032	.032	0	0
41	WT5	Z	.032	.032	0	0
42	WT6	Z	.032	.032	0	0
43	WT7	Z	.032	.032	0	0
44	WT8	Z	.032	.032	0	0

Member Distributed Loads (BLC 7 : TIA/EIA Wind (+Z)) (Continued)

	Member Label	Direction	Start Magnitude[k/ft,F]	End Magnitude[k/ft,F]	Start Location[ft, %]	End Location[ft, %]
45	WT9	Z	.032	.032	0	0
46	WT10	Z	.032	.032	0	0
47	WT11	Z	.032	.032	0	0
48	WT12	Z	.032	.032	0	0
49	WT13	Z	.032	.032	0	0
50	WT14	Z	.032	.032	0	0
51	WT15	Z	.032	.032	0	0
52	WT16	Z	.032	.032	0	0
53	WT17	Z	.032	.032	0	0
54	WT18	Z	.032	.032	0	0
55	WT19	Z	.032	.032	0	0
56	WT20	Z	.032	.032	0	0

Basic Load Cases

	BLC Description	Category	X Gra...	Y Gra...	Z Grav...	Joint	Point	Distrib...	Area(...	Surfac...
1	Self Weight	None		-1						
2	Weight of Equipment	None				31		8		
3	Weight of Ice	None				31		55		
4	TIA/EIA Wind with Ice (+X)	None				13		33		
5	TIA/EIA Wind (+X)	None				13		33		
6	TIA/EIA Wind with Ice(+Z)	None				13		56		
7	TIA/EIA Wind (+Z)	None				13		56		

Load Combinations

	Description	Solve	PDelta	SRSS	B...	Fa...	BLC Fa...	BLC Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...	B...	Fa...
1	TIA/EIA Wind + Ice in +X Dire...	Yes			1	1	2	1	3	1	4	1						
2	TIA/EIA Wind in +X Direction	Yes			1	1	2	1	5	1								
3	TIA/EIA Wind + Ice in +Z Direc...	Yes			1	1	2	1	3	1	6	1						
4	TIA/EIA Wind in +Z Direction	Yes			1	1	2	1	7	1								
5	TIA/EIA Wind + Ice in -Z' Direc...	Yes			1	1	2	1	3	1	6	-1						
6	TIA/EIA Wind in -Z' Direction	Yes			1	1	2	1	7	-1								
7	Self Weight				1	1												

Envelope Member Section Forces

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC Torque[...	LC y-y Mo...	LC z-z Mo...	LC			
1	CROSSDI...	1	max	2.347	4	.098	1	.213	6	.002	6	0	1	0	1
2			min	-8.056	2	.071	2	-.213	4	-.002	4	0	1	0	1
3		2	max	2.328	4	.049	1	.106	6	.002	6	.58	5	.287	6
4			min	-8.075	2	.035	2	-.106	4	-.002	4	-.287	4	-.58	3
5		3	max	2.31	4	0	1	0	1	.002	6	.773	5	.383	6
6			min	-8.093	2	0	1	0	1	-.002	4	-.383	4	-.773	3
7		4	max	2.292	4	-.035	6	.106	4	.002	6	.58	5	.287	6
8			min	-8.111	2	-.049	3	-.106	6	-.002	4	-.287	4	-.58	3
9		5	max	2.274	4	-.071	6	.213	4	.002	6	0	1	0	1
10			min	-8.13	2	-.098	3	-.213	6	-.002	4	0	1	0	1
11	CROSSDI...	1	max	8.547	2	.098	1	.213	6	.001	4	0	1	0	1
12			min	-5.01	6	.071	4	-.213	4	-.001	6	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[K]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
13		2	max	8.565	2	.049	1	.106	6	.001	4	.58	5	.287	6
14			min	-4.992	6	.035	4	-.106	4	-.001	6	-.287	4	-.58	3
15		3	max	8.584	2	0	1	0	1	.001	4	.773	5	.383	6
16			min	-4.974	6	0	1	0	1	-.001	6	-.383	4	-.773	3
17		4	max	8.602	2	-.035	2	.106	4	.001	4	.58	5	.287	6
18			min	-4.955	6	-.049	3	-.106	6	-.001	6	-.287	4	-.58	3
19		5	max	8.62	2	-.071	2	.213	4	.001	4	0	1	0	1
20			min	-4.937	6	-.098	3	-.213	6	-.001	6	0	1	0	1
21	CROSSDI...	1	max	1.495	6	.098	3	.213	6	.001	6	0	1	0	1
22			min	-13.338	2	.071	2	-.213	4	-.001	4	0	1	0	1
23		2	max	1.477	6	.049	3	.106	6	.001	6	.58	5	.287	6
24			min	-13.356	2	.035	2	-.106	4	-.001	4	-.287	4	-.58	3
25		3	max	1.459	6	0	1	0	1	.001	6	.773	5	.383	6
26			min	-13.374	2	0	1	0	1	-.001	4	-.383	4	-.773	3
27		4	max	1.44	6	-.035	4	.106	4	.001	6	.58	5	.287	6
28			min	-13.393	2	-.049	1	-.106	6	-.001	4	-.287	4	-.58	3
29		5	max	1.422	6	-.071	4	.213	4	.001	6	0	1	0	1
30			min	-13.411	2	-.098	1	-.213	6	-.001	4	0	1	0	1
31	CROSSDI...	1	max	13.485	2	.098	5	.213	6	0	4	0	1	0	1
32			min	-2.76	6	.071	4	-.213	4	0	6	0	1	0	1
33		2	max	13.503	2	.049	5	.106	6	0	4	.58	5	.287	6
34			min	-2.742	6	.035	4	-.106	4	0	6	-.287	4	-.58	3
35		3	max	13.521	2	0	1	0	1	0	4	.773	5	.383	6
36			min	-2.724	6	0	1	0	1	0	6	-.383	4	-.773	3
37		4	max	13.54	2	-.035	6	.106	4	0	4	.58	5	.287	6
38			min	-2.706	6	-.049	1	-.106	6	0	6	-.287	4	-.58	3
39		5	max	13.558	2	-.071	6	.213	4	0	4	0	1	0	1
40			min	-2.687	6	-.098	1	-.213	6	0	6	0	1	0	1
41	CROSSDI...	1	max	8.009	6	.068	1	.18	5	0	6	0	1	0	1
42			min	-12.974	2	.048	2	-.18	4	0	4	0	1	0	1
43		2	max	7.985	6	.034	1	.09	5	0	6	.622	5	.33	6
44			min	-12.998	2	.024	2	-.09	4	0	4	-.33	4	-.622	3
45		3	max	7.961	6	0	1	0	1	0	6	.83	5	.44	6
46			min	-13.022	2	0	1	0	1	0	4	-.44	4	-.83	3
47		4	max	7.938	6	-.024	6	.09	3	0	6	.622	5	.33	6
48			min	-13.045	2	-.034	3	-.09	6	0	4	-.33	4	-.622	3
49		5	max	7.914	6	-.048	6	.18	3	0	6	0	1	0	1
50			min	-13.069	2	-.068	3	-.18	6	0	4	0	1	0	1
51	CROSSDI...	1	max	14.5	2	.068	5	.18	5	0	4	0	1	0	1
52			min	-3.503	4	.048	2	-.18	3	0	6	0	1	0	1
53		2	max	14.524	2	.034	5	.09	5	0	4	.622	5	.33	6
54			min	-3.479	4	.024	2	-.09	3	0	6	-.33	4	-.622	3
55		3	max	14.548	2	0	1	0	1	0	4	.83	5	.44	6
56			min	-3.456	4	0	1	0	1	0	6	-.44	4	-.83	3
57		4	max	14.571	2	-.024	6	.09	4	0	4	.622	5	.33	6
58			min	-3.432	4	-.034	1	-.09	6	0	6	-.33	4	-.622	3
59		5	max	14.595	2	-.048	6	.18	4	0	4	0	1	0	1
60			min	-3.408	4	-.068	1	-.18	6	0	6	0	1	0	1
61	CROSSDI...	1	max	0	5	.098	1	0	5	.001	2	0	1	0	1
62			min	-26.518	2	0	5	-.464	4	0	4	0	1	0	1
63		2	max	0	5	.049	1	0	5	.001	2	.428	1	0	5
64			min	-26.597	2	0	5	-.232	4	0	4	-1.727	4	-2.346	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
65		3	max	0	5	0	1	0	1	.001	2	.571	1	0	5
66			min	-26.676	2	0	1	0	1	0	4	-2.303	4	-3.129	4
67		4	max	0	5	0	5	.232	4	.001	2	.428	1	0	5
68			min	-26.755	2	-.049	3	0	1	0	4	-1.727	4	-2.346	4
69		5	max	0	5	0	5	.464	4	.001	2	0	1	0	1
70			min	-26.834	2	-.098	3	0	1	0	4	0	1	0	1
71	CROSSDI...	1	max	0	1	.098	3	0	1	0	4	0	1	0	1
72			min	-4.813	4	0	1	-.464	4	0	1	0	1	0	1
73		2	max	0	1	.049	3	0	1	0	4	0	1	0	1
74			min	-4.734	4	0	1	-.232	4	0	1	-1.727	4	-2.346	4
75		3	max	0	1	0	1	0	1	0	4	0	1	0	1
76			min	-4.655	4	0	1	0	1	0	1	-2.303	4	-3.129	4
77		4	max	0	1	0	1	.232	4	0	4	0	1	0	1
78			min	-4.576	4	-.049	3	0	1	0	1	-1.727	4	-2.346	4
79		5	max	0	1	0	1	.464	4	0	4	0	1	0	1
80			min	-4.497	4	-.098	3	0	1	0	1	0	1	0	1
81	HORZ1	1	max	6.523	4	.098	5	.189	6	0	6	0	1	0	1
82			min	-6.651	6	.071	4	-.189	4	-.001	2	0	1	0	1
83		2	max	6.522	4	.049	5	.095	6	0	6	.477	5	.212	6
84			min	-6.652	6	.035	4	-.095	4	-.001	2	-.212	4	-.477	3
85		3	max	6.521	4	0	1	0	1	0	6	.636	5	.283	6
86			min	-6.654	6	0	1	0	1	-.001	2	-.283	4	-.636	3
87		4	max	6.519	4	-.035	2	.095	4	0	6	.477	5	.212	6
88			min	-6.655	6	-.049	1	-.095	6	-.001	2	-.212	4	-.477	3
89		5	max	6.518	4	-.071	2	.189	4	0	6	0	1	0	1
90			min	-6.656	6	-.098	1	-.189	6	-.001	2	0	1	0	1
91	HORZ2	1	max	6.645	4	.098	1	.189	6	0	6	0	1	0	1
92			min	-6.718	6	.071	2	-.189	4	-.001	2	0	1	0	1
93		2	max	6.647	4	.049	1	.095	6	0	6	.477	5	.212	6
94			min	-6.717	6	.035	2	-.095	4	-.001	2	-.212	4	-.477	3
95		3	max	6.648	4	0	1	0	1	0	6	.636	5	.283	6
96			min	-6.716	6	0	1	0	1	-.001	2	-.283	4	-.636	3
97		4	max	6.649	4	-.035	4	.095	4	0	6	.477	5	.212	6
98			min	-6.714	6	-.049	3	-.095	6	-.001	2	-.212	4	-.477	3
99		5	max	6.65	4	-.071	4	.189	4	0	6	0	1	0	1
100			min	-6.713	6	-.098	3	-.189	6	-.001	2	0	1	0	1
101	HORZ3	1	max	3.257	4	.098	5	.189	6	0	6	0	1	0	1
102			min	-3.462	6	.071	4	-.189	4	-.001	2	0	1	0	1
103		2	max	3.255	4	.049	5	.095	6	0	6	.477	5	.212	6
104			min	-3.464	6	.035	6	-.095	4	-.001	2	-.212	4	-.477	3
105		3	max	3.254	4	0	1	0	1	0	6	.636	5	.283	6
106			min	-3.465	6	0	1	0	1	-.001	2	-.283	4	-.636	3
107		4	max	3.253	4	-.035	2	.095	4	0	6	.477	5	.212	6
108			min	-3.466	6	-.049	1	-.095	6	-.001	2	-.212	4	-.477	3
109		5	max	3.251	4	-.071	2	.189	4	0	6	0	1	0	1
110			min	-3.467	6	-.098	1	-.189	6	-.001	2	0	1	0	1
111	HORZ4	1	max	3.995	4	.098	3	.189	6	0	6	0	1	0	1
112			min	-4.159	6	.071	6	-.189	4	-.001	2	0	1	0	1
113		2	max	3.996	4	.049	3	.095	6	0	6	.477	5	.212	6
114			min	-4.158	6	.035	6	-.095	4	-.001	2	-.212	4	-.477	3
115		3	max	3.997	4	0	1	0	1	0	6	.636	5	.283	6
116			min	-4.157	6	0	1	0	1	-.001	2	-.283	4	-.636	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
117		4	max	3.999	4	-.035	2	.095	4	0	6	.477	5	.212	6
118			min	-4.155	6	-.049	1	-.095	6	-.001	2	-.212	4	-.477	3
119		5	max	4	4	-.071	2	.189	4	0	6	0	1	0	1
120			min	-4.154	6	-.098	1	-.189	6	-.001	2	0	1	0	1
121	HORZ5	1	max	2.143	4	.098	1	.189	6	0	6	0	1	0	1
122			min	-2.026	2	.071	2	-.189	4	-.002	2	0	1	0	1
123		2	max	2.142	4	.049	1	.095	6	0	6	.477	5	.212	6
124			min	-2.027	2	.035	2	-.095	4	-.002	2	-.212	4	-.477	3
125		3	max	2.141	4	0	1	0	1	0	6	.636	5	.283	6
126			min	-2.029	2	0	1	0	1	-.002	2	-.283	4	-.636	3
127		4	max	2.14	4	-.035	6	.095	4	0	6	.477	5	.212	6
128			min	-2.03	2	-.049	5	-.095	6	-.002	2	-.212	4	-.477	3
129		5	max	2.138	4	-.071	6	.189	4	0	6	0	1	0	1
130			min	-2.031	2	-.098	3	-.189	6	-.002	2	0	1	0	1
131	HORZ6	1	max	7.21	2	.098	3	.189	6	0	6	0	1	0	1
132			min	-3.015	6	.071	4	-.189	4	-.002	2	0	1	0	1
133		2	max	7.211	2	.049	3	.095	6	0	6	.477	5	.212	6
134			min	-3.014	6	.035	4	-.095	4	-.002	2	-.212	4	-.477	3
135		3	max	7.212	2	0	1	0	1	0	6	.636	5	.283	6
136			min	-3.012	6	0	1	0	1	-.002	2	-.283	4	-.636	3
137		4	max	7.213	2	-.035	2	.095	4	0	6	.477	5	.212	6
138			min	-3.011	6	-.049	1	-.095	6	-.002	2	-.212	4	-.477	3
139		5	max	7.215	2	-.071	2	.189	4	0	6	0	1	0	1
140			min	-3.01	6	-.098	1	-.189	6	-.002	2	0	1	0	1
141	HORZ7	1	max	1.808	6	.098	1	.189	6	0	6	0	1	0	1
142			min	-2.86	2	.071	4	-.189	4	-.002	2	0	1	0	1
143		2	max	1.807	6	.049	1	.095	6	0	6	.477	5	.212	6
144			min	-2.862	2	.035	4	-.095	4	-.002	2	-.212	4	-.477	3
145		3	max	1.805	6	0	1	0	1	0	6	.636	5	.283	6
146			min	-2.863	2	0	1	0	1	-.002	2	-.283	4	-.636	3
147		4	max	1.804	6	-.035	2	.095	4	0	6	.477	5	.212	6
148			min	-2.864	2	-.049	3	-.095	6	-.002	2	-.212	4	-.477	3
149		5	max	1.803	6	-.071	2	.189	4	0	6	0	1	0	1
150			min	-2.865	2	-.098	3	-.189	6	-.002	2	0	1	0	1
151	HORZ8	1	max	3.92	2	.098	5	.189	6	0	6	0	1	0	1
152			min	-.61	4	.071	2	-.189	4	-.002	2	0	1	0	1
153		2	max	3.921	2	.049	5	.095	6	0	6	.477	5	.212	6
154			min	-.608	4	.035	2	-.095	4	-.002	2	-.212	4	-.477	3
155		3	max	3.922	2	0	1	0	1	0	6	.636	5	.283	6
156			min	-.607	4	0	1	0	1	-.002	2	-.283	4	-.636	3
157		4	max	3.923	2	-.035	4	.095	4	0	6	.477	5	.212	6
158			min	-.606	4	-.049	1	-.095	6	-.002	2	-.212	4	-.477	3
159		5	max	3.925	2	-.071	4	.189	4	0	6	0	1	0	1
160			min	-.604	4	-.098	1	-.189	6	-.002	2	0	1	0	1
161	HORZ9	1	max	2.323	6	.098	3	.189	6	0	6	0	1	0	1
162			min	-1.872	2	.071	2	-.189	4	-.002	2	0	1	0	1
163		2	max	2.321	6	.049	3	.095	6	0	6	.477	5	.212	6
164			min	-1.873	2	.035	2	-.095	4	-.002	2	-.212	4	-.477	3
165		3	max	2.32	6	0	1	0	1	0	6	.636	5	.283	6
166			min	-1.874	2	0	1	0	1	-.002	2	-.283	4	-.636	3
167		4	max	2.319	6	-.035	4	.095	4	0	6	.477	5	.212	6
168			min	-1.876	2	-.049	1	-.095	6	-.002	2	-.212	4	-.477	3

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
169		5	max	2.318	6	-.071	4	.189	4	0	6	0	1	0	1
170			min	-1.877	2	-.098	1	-.189	6	-.002	2	0	1	0	1
171	HORZ10	1	max	2.389	2	.098	3	.189	6	0	6	0	1	0	1
172			min	-1.766	4	.071	6	-.189	4	-.002	2	0	1	0	1
173		2	max	2.39	2	.049	3	.095	6	0	6	.477	5	.212	6
174			min	-1.765	4	.035	6	-.095	4	-.002	2	-.212	4	-.477	3
175		3	max	2.391	2	0	1	0	1	0	6	.636	5	.283	6
176			min	-1.764	4	0	1	0	1	-.002	2	-.283	4	-.636	3
177		4	max	2.393	2	-.035	2	.095	4	0	6	.477	5	.212	6
178			min	-1.762	4	-.049	1	-.095	6	-.002	2	-.212	4	-.477	3
179		5	max	2.394	2	-.071	2	.189	4	0	6	0	1	0	1
180			min	-1.761	4	-.098	1	-.189	6	-.002	2	0	1	0	1
181	HORZ11	1	max	6.59	6	.212	5	.19	6	.235	6	.22	4	2.541	6
182			min	-5.314	4	.123	2	-.19	4	-.795	2	-.224	6	-1.638	4
183		2	max	6.59	6	.12	5	.096	6	.235	6	.259	6	2.024	6
184			min	-5.314	4	.044	2	-.095	4	-.795	2	-.261	4	-2.13	4
185		3	max	6.59	6	.035	6	.001	6	.235	6	.423	6	1.774	6
186			min	-5.314	4	-.036	1	-.005	2	-.795	2	-.423	4	-2.355	4
187		4	max	6.59	6	-.044	6	.094	4	.235	6	.268	6	1.79	6
188			min	-5.314	4	-.129	1	-.093	6	-.795	2	-.266	4	-2.314	4
189		5	max	6.59	6	-.123	6	.188	4	.235	6	.21	4	2.071	6
190			min	-5.314	4	-.221	1	-.188	6	-.795	2	-.206	6	-2.008	4
191	LEG1	1	max	240.98	6	14.901	6	3.461	4	.028	2	10.485	4	224.948	6
192			min	-221.205	4	-15.042	4	-3.538	6	-.003	4	-13.065	2	-228.248	4
193		2	max	197.238	6	6.244	6	1.473	2	.03	2	4.567	4	95.634	6
194			min	-181.583	4	-6.215	4	-.284	6	-.006	6	-4.451	6	-98.738	4
195		3	max	142.58	6	1.314	6	.508	4	.033	2	2.157	4	48.593	6
196			min	-125.044	4	-1.162	4	-3.402	2	-.011	6	-3.197	6	-53.679	4
197		4	max	93.522	6	1.015	2	.846	2	.055	2	2.468	2	35.653	6
198			min	-79.089	4	-.546	4	-.464	4	-.022	6	-.923	6	-37.804	4
199		5	max	7.757	3	5.693	6	13.18	6	.065	2	5.081	6	32.47	6
200			min	-1.972	2	-5.692	4	-12.525	4	-.023	6	-3.277	4	-32.051	4
201	LEG2	1	max	242.529	6	16.514	6	4.014	6	.027	2	12.281	6	234.387	6
202			min	-219.406	4	-16.682	4	-3.882	4	-.014	6	-13.141	2	-236.301	4
203		2	max	199.147	6	6.024	6	1.196	2	.029	2	3.729	6	99.588	6
204			min	-180.878	4	-6.303	4	-.007	4	-.01	6	-3.679	4	-97.739	4
205		3	max	146.032	6	.889	6	2.277	6	.034	2	2.754	2	55.92	6
206			min	-128.085	4	-1.081	4	-3.524	2	-.008	6	-1.738	4	-50.968	4
207		4	max	93.921	6	.733	6	.429	2	.055	2	2.247	2	35.451	6
208			min	-79.615	4	-.743	2	.048	5	-.01	6	-.494	4	-33.321	4
209		5	max	32.006	2	5.688	6	13.478	4	.065	2	4.016	4	31.53	6
210			min	2.768	6	-5.689	4	-13.18	6	-.014	6	-4.142	6	-31.948	4
211	LEG_W_P...	1	max	253.734	6	19.977	6	5.261	6	.026	2	114.276	2	583.471	6
212			min	-226.087	4	-19.993	4	-14.829	2	-.005	4	-30.205	6	-588.341	4
213		2	max	252.805	6	19.726	6	5.261	6	.026	2	39.196	2	481.73	6
214			min	-227.016	4	-19.742	4	-14.47	2	-.005	4	-3.241	6	-486.522	4
215		3	max	251.876	6	19.475	6	5.261	6	.026	2	23.722	6	381.276	6
216			min	-227.945	4	-19.49	4	-14.112	2	-.005	4	-34.045	2	-385.99	4
217		4	max	241.909	6	15.152	6	3.461	4	.028	2	7.789	6	301.958	6
218			min	-220.276	4	-15.293	4	-3.538	6	-.003	4	-26.498	2	-305.981	4
219		5	max	240.98	6	14.901	6	3.461	4	.028	2	10.485	4	224.948	6
220			min	-221.205	4	-15.042	4	-3.538	6	-.003	4	-13.065	2	-228.248	4



Company : Centek Engineering
 Designer : TJL/CFC
 Job Number : 14033.019
 Model Name : 82' Sign Structure with 111' Pipe Mast

Oct 31, 2014

Checked By: _____

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC	
221	LEG_W_P...	1	max	256.411	6	21.823	6	5.091	4	.026	2	113.218	2	628.415	6	
222			min	-224.159	4	-21.836	4	-14.397	2	-.016	6	-26.699	4	-632.149	4	
223		2	max	255.333	6	21.572	6	5.091	4	.026	2	39.431	2	517.216	6	
224			min	-225.237	4	-21.585	4	-14.397	2	-.016	6	-.608	4	-520.883	4	
225		3	max	254.255	6	21.321	6	5.091	4	.026	2	25.482	4	407.303	6	
226			min	-226.314	4	-21.334	4	-14.397	2	-.016	6	-34.355	2	-410.905	4	
227		4	max	243.607	6	16.765	6	4.014	6	.027	2	7.828	4	319.663	6	
228			min	-218.328	4	-16.933	4	-3.882	4	-.014	6	-25.858	2	-322.44	4	
229		5	max	242.529	6	16.514	6	4.014	6	.027	2	12.281	6	234.387	6	
230			min	-219.406	4	-16.682	4	-3.882	4	-.014	6	-13.141	2	-236.301	4	
231		WT1	1	max	13.254	6	.148	4	.162	1	.003	6	0	1	0	1
232				min	-24.026	2	-.148	6	.011	6	-.003	4	0	1	0	1
233		2	max	13.204	6	.074	4	.081	1	.003	6	.306	1	.279	6	
234			min	-23.997	2	-.074	6	.005	6	-.003	4	.02	6	-.279	4	
235		3	max	13.154	6	0	1	0	1	.003	6	.408	1	.372	6	
236			min	-23.969	2	0	1	0	1	-.003	4	.027	6	-.372	4	
237		4	max	13.104	6	.074	6	-.005	6	.003	6	.306	1	.279	6	
238			min	-23.941	2	-.074	4	-.081	1	-.003	4	.02	6	-.279	4	
239		5	max	13.055	6	.148	6	-.011	6	.003	6	0	1	0	1	
240			min	-23.913	2	-.148	4	-.162	1	-.003	4	0	1	0	1	
241	WT2	1	max	24.832	2	.148	4	.113	3	.003	4	0	1	0	1	
242			min	-13.418	4	-.148	6	-.045	2	-.003	6	0	1	0	1	
243		2	max	24.912	2	.074	4	.056	3	.003	4	.214	3	.279	6	
244			min	-13.416	4	-.074	6	-.023	2	-.003	6	-.086	2	-.279	4	
245		3	max	24.992	2	0	1	0	1	.003	4	.285	3	.372	6	
246			min	-13.415	4	0	1	0	1	-.003	6	-.114	2	-.372	4	
247		4	max	25.071	2	.074	6	.023	2	.003	4	.214	3	.279	6	
248			min	-13.413	4	-.074	4	-.056	3	-.003	6	-.086	2	-.279	4	
249		5	max	25.151	2	.148	6	.045	2	.003	4	0	1	0	1	
250			min	-13.411	4	-.148	4	-.113	3	-.003	6	0	1	0	1	
251		WT3	1	max	28.835	2	.148	4	.045	2	.001	4	0	1	0	1
252				min	-18.233	6	-.148	6	-.113	5	-.001	6	0	1	0	1
253		2	max	28.755	2	.074	4	.023	2	.001	4	.086	2	.279	6	
254			min	-18.235	6	-.074	6	-.056	5	-.001	6	-.214	5	-.279	4	
255		3	max	28.676	2	0	1	0	1	.001	4	.114	2	.372	6	
256			min	-18.237	6	0	1	0	1	-.001	6	-.285	5	-.372	4	
257		4	max	28.596	2	.074	6	.056	5	.001	4	.086	2	.279	6	
258			min	-18.238	6	-.074	4	-.023	2	-.001	6	-.214	5	-.279	4	
259		5	max	28.516	2	.148	6	.113	5	.001	4	0	1	0	1	
260			min	-18.24	6	-.148	4	-.045	2	-.001	6	0	1	0	1	
261	WT4	1	max	18.318	4	.148	4	.162	1	.001	6	0	1	0	1	
262			min	-29.65	2	-.148	6	.011	4	-.001	4	0	1	0	1	
263		2	max	18.268	4	.074	4	.081	1	.001	6	.306	1	.279	6	
264			min	-29.622	2	-.074	6	.005	4	-.001	4	.02	4	-.279	4	
265		3	max	18.218	4	0	1	0	1	.001	6	.408	1	.372	6	
266			min	-29.594	2	0	1	0	1	-.001	4	.027	4	-.372	4	
267		4	max	18.169	4	.074	6	-.005	4	.001	6	.306	1	.279	6	
268			min	-29.565	2	-.074	4	-.081	1	-.001	4	.02	4	-.279	4	
269		5	max	18.119	4	.148	6	-.011	4	.001	6	0	1	0	1	
270			min	-29.537	2	-.148	4	-.162	1	-.001	4	0	1	0	1	
271		WT5	1	max	40.428	6	.148	4	-.011	6	.003	6	0	1	0	1
272				min	-40.485	4	-.148	6	-.162	1	-.003	4	0	1	0	1

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
273		2	max	40.477	6	.074	4	-.005	6	.003	6	-.02	6	.279	6
274			min	-40.484	4	-.074	6	-.081	1	-.003	4	-.306	1	-.279	4
275		3	max	40.527	6	0	1	0	1	.003	6	-.027	6	.372	6
276			min	-40.482	4	0	1	0	1	-.003	4	-.408	1	-.372	4
277		4	max	40.577	6	.074	6	.081	1	.003	6	-.02	6	.279	6
278			min	-40.48	4	-.074	4	.005	6	-.003	4	-.306	1	-.279	4
279		5	max	40.627	6	.148	6	.162	1	.003	6	0	1	0	1
280			min	-40.479	4	-.148	4	.011	6	-.003	4	0	1	0	1
281	WT6	1	max	45.564	6	.148	4	.113	3	.002	4	0	1	0	1
282			min	-44.59	4	-.148	6	-.045	2	-.002	6	0	1	0	1
283		2	max	45.613	6	.074	4	.056	3	.002	4	.214	3	.279	6
284			min	-44.589	4	-.074	6	-.023	2	-.002	6	-.086	2	-.279	4
285		3	max	45.663	6	0	1	0	1	.002	4	.285	3	.372	6
286			min	-44.587	4	0	1	0	1	-.002	6	-.114	2	-.372	4
287		4	max	45.713	6	.074	6	.023	2	.002	4	.214	3	.279	6
288			min	-44.585	4	-.074	4	-.056	3	-.002	6	-.086	2	-.279	4
289		5	max	45.763	6	.148	6	.045	2	.002	4	0	1	0	1
290			min	-44.583	4	-.148	4	-.113	3	-.002	6	0	1	0	1
291	WT7	1	max	32.26	4	.148	4	.045	2	.002	4	0	1	0	1
292			min	-32.035	6	-.148	6	-.113	5	-.003	6	0	1	0	1
293		2	max	32.21	4	.074	4	.023	2	.002	4	.086	2	.279	6
294			min	-32.037	6	-.074	6	-.056	5	-.003	6	-.214	5	-.279	4
295		3	max	32.16	4	0	1	0	1	.002	4	.114	2	.372	6
296			min	-32.038	6	0	1	0	1	-.003	6	-.285	5	-.372	4
297		4	max	32.111	4	.074	6	.056	5	.002	4	.086	2	.279	6
298			min	-32.04	6	-.074	4	-.023	2	-.003	6	-.214	5	-.279	4
299		5	max	32.061	4	.148	6	.113	5	.002	4	0	1	0	1
300			min	-32.042	6	-.148	4	-.045	2	-.003	6	0	1	0	1
301	WT8	1	max	36.347	4	.148	4	.162	1	.002	2	0	1	0	1
302			min	-37.11	6	-.148	6	.011	4	-.002	4	0	1	0	1
303		2	max	36.298	4	.074	4	.081	1	.002	2	.306	1	.279	6
304			min	-37.111	6	-.074	6	.005	4	-.002	4	.02	4	-.279	4
305		3	max	36.248	4	0	1	0	1	.002	2	.408	1	.372	6
306			min	-37.113	6	0	1	0	1	-.002	4	.027	4	-.372	4
307		4	max	36.198	4	.074	6	-.005	4	.002	2	.306	1	.279	6
308			min	-37.115	6	-.074	4	-.081	1	-.002	4	.02	4	-.279	4
309		5	max	36.148	4	.148	6	-.011	4	.002	2	0	1	0	1
310			min	-37.117	6	-.148	4	-.162	1	-.002	4	0	1	0	1
311	WT9	1	max	43.099	6	.148	4	.045	2	0	4	0	1	0	1
312			min	-42.42	4	-.148	6	-.113	3	-.005	2	0	1	0	1
313		2	max	43.049	6	.074	4	.023	2	0	4	.086	2	.279	6
314			min	-42.422	4	-.074	6	-.056	3	-.005	2	-.214	3	-.279	4
315		3	max	42.999	6	0	1	0	1	0	4	.114	2	.372	6
316			min	-42.423	4	0	1	0	1	-.005	2	-.285	3	-.372	4
317		4	max	42.95	6	.074	6	.056	3	0	4	.086	2	.279	6
318			min	-42.425	4	-.074	4	-.023	2	-.005	2	-.214	3	-.279	4
319		5	max	42.9	6	.148	6	.113	3	0	4	0	1	0	1
320			min	-42.427	4	-.148	4	-.045	2	-.005	2	0	1	0	1
321	WT10	1	max	39.032	6	.148	4	.162	1	.003	6	0	1	0	1
322			min	-39.465	4	-.148	6	.011	6	-.005	2	0	1	0	1
323		2	max	38.982	6	.074	4	.081	1	.003	6	.306	1	.279	6
324			min	-39.466	4	-.074	6	.005	6	-.005	2	.02	6	-.279	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...]	LC	y-y Mo...	LC	z-z Mo...	LC
325		3	max	38.932	6	0	1	0	1	.003	6	.408	1	.372	6
326			min	-39.468	4	0	1	0	1	-.005	2	.027	6	-.372	4
327		4	max	38.883	6	.074	6	-.005	6	.003	6	.306	1	.279	6
328			min	-39.47	4	-.074	4	-.081	1	-.005	2	.02	6	-.279	4
329		5	max	38.833	6	.148	6	-.011	6	.003	6	0	1	0	1
330			min	-39.472	4	-.148	4	-.162	1	-.005	2	0	1	0	1
331	WT11	1	max	36.245	4	.148	4	.113	5	.004	2	0	1	0	1
332			min	-35.935	6	-.148	6	-.045	2	-.002	6	0	1	0	1
333		2	max	36.295	4	.074	4	.056	5	.004	2	.214	5	.279	6
334			min	-35.933	6	-.074	6	-.023	2	-.002	6	-.086	2	-.279	4
335		3	max	36.344	4	0	1	0	1	.004	2	.285	5	.372	6
336			min	-35.932	6	0	1	0	1	-.002	6	-.114	2	-.372	4
337		4	max	36.394	4	.074	6	.023	2	.004	2	.214	5	.279	6
338			min	-35.93	6	-.074	4	-.056	5	-.002	6	-.086	2	-.279	4
339		5	max	36.444	4	.148	6	.045	2	.004	2	0	1	0	1
340			min	-35.928	6	-.148	4	-.113	5	-.002	6	0	1	0	1
341	WT12	1	max	39.472	4	.148	4	.162	1	.004	2	0	1	0	1
342			min	-40.107	6	-.148	6	.011	4	0	4	0	1	0	1
343		2	max	39.422	4	.074	4	.081	1	.004	2	.306	1	.279	6
344			min	-40.108	6	-.074	6	.005	4	0	4	.02	4	-.279	4
345		3	max	39.372	4	0	1	0	1	.004	2	.408	1	.372	6
346			min	-40.11	6	0	1	0	1	0	4	.027	4	-.372	4
347		4	max	39.322	4	.074	6	-.005	4	.004	2	.306	1	.279	6
348			min	-40.112	6	-.074	4	-.081	1	0	4	.02	4	-.279	4
349		5	max	39.273	4	.148	6	-.011	4	.004	2	0	1	0	1
350			min	-40.113	6	-.148	4	-.162	1	0	4	0	1	0	1
351	WT13	1	max	34.064	6	.148	4	.162	1	.002	6	0	1	0	1
352			min	-33.096	4	-.148	6	.011	6	-.009	2	0	1	0	1
353		2	max	34.014	6	.074	4	.081	1	.002	6	.306	1	.279	6
354			min	-33.097	4	-.074	6	.005	6	-.009	2	.02	6	-.279	4
355		3	max	33.964	6	0	1	0	1	.002	6	.408	1	.372	6
356			min	-33.099	4	0	1	0	1	-.009	2	.027	6	-.372	4
357		4	max	33.915	6	.074	6	-.005	6	.002	6	.306	1	.279	6
358			min	-33.101	4	-.074	4	-.081	1	-.009	2	.02	6	-.279	4
359		5	max	33.865	6	.148	6	-.011	6	.002	6	0	1	0	1
360			min	-33.103	4	-.148	4	-.162	1	-.009	2	0	1	0	1
361	WT14	1	max	33.903	6	.148	4	.045	2	.003	6	0	1	0	1
362			min	-34.459	4	-.148	6	-.113	3	-.009	2	0	1	0	1
363		2	max	33.854	6	.074	4	.023	2	.003	6	.086	2	.279	6
364			min	-34.461	4	-.074	6	-.056	3	-.009	2	-.214	3	-.279	4
365		3	max	33.804	6	0	1	0	1	.003	6	.114	2	.372	6
366			min	-34.463	4	0	1	0	1	-.009	2	-.285	3	-.372	4
367		4	max	33.754	6	.074	6	.056	3	.003	6	.086	2	.279	6
368			min	-34.465	4	-.074	4	-.023	2	-.009	2	-.214	3	-.279	4
369		5	max	33.704	6	.148	6	.113	3	.003	6	0	1	0	1
370			min	-34.466	4	-.148	4	-.045	2	-.009	2	0	1	0	1
371	WT15	1	max	53.222	4	.148	4	.045	2	.008	2	0	1	0	1
372			min	-53.827	6	-.148	6	-.113	5	-.004	6	0	1	0	1
373		2	max	53.172	4	.074	4	.023	2	.008	2	.086	2	.279	6
374			min	-53.828	6	-.074	6	-.056	5	-.004	6	-.214	5	-.279	4
375		3	max	53.123	4	0	1	0	1	.008	2	.114	2	.372	6
376			min	-53.83	6	0	1	0	1	-.004	6	-.285	5	-.372	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
377		4	max	53.073	4	.074	6	.056	5	.008	2	.086	2	.279	6
378			min	-53.832	6	-.074	4	-.023	2	-.004	6	-.214	5	-.279	4
379		5	max	53.023	4	.148	6	.113	5	.008	2	0	1	0	1
380			min	-53.834	6	-.148	4	-.045	2	-.004	6	0	1	0	1
381	WT16	1	max	54.567	4	.148	4	.162	1	.008	2	0	1	0	1
382			min	-53.666	6	-.148	6	.011	4	0	6	0	1	0	1
383		2	max	54.517	4	.074	4	.081	1	.008	2	.306	1	.279	6
384			min	-53.668	6	-.074	6	.005	4	0	6	.02	4	-.279	4
385		3	max	54.467	4	0	1	0	1	.008	2	.408	1	.372	6
386			min	-53.669	6	0	1	0	1	0	6	.027	4	-.372	4
387		4	max	54.418	4	.074	6	-.005	4	.008	2	.306	1	.279	6
388			min	-53.671	6	-.074	4	-.081	1	0	6	.02	4	-.279	4
389		5	max	54.368	4	.148	6	-.011	4	.008	2	0	1	0	1
390			min	-53.673	6	-.148	4	-.162	1	0	6	0	1	0	1
391	WT17	1	max	52.709	6	.148	4	-.011	6	.008	6	0	1	0	1
392			min	-52.24	4	-.148	6	-.162	1	-.011	2	0	1	0	1
393		2	max	52.758	6	.074	4	-.005	6	.008	6	-.02	6	.279	6
394			min	-52.238	4	-.074	6	-.081	1	-.011	2	-.306	1	-.279	4
395		3	max	52.808	6	0	1	0	1	.008	6	-.027	6	.372	6
396			min	-52.237	4	0	1	0	1	-.011	2	-.408	1	-.372	4
397		4	max	52.858	6	.074	6	.081	1	.008	6	-.02	6	.279	6
398			min	-52.235	4	-.074	4	.005	6	-.011	2	-.306	1	-.279	4
399		5	max	52.908	6	.148	6	.162	1	.008	6	0	1	0	1
400			min	-52.233	4	-.148	4	.011	6	-.011	2	0	1	0	1
401	WT18	1	max	52.968	6	.148	4	.113	3	.003	4	0	1	0	1
402			min	-53.743	4	-.148	6	-.045	2	-.011	2	0	1	0	1
403		2	max	53.017	6	.074	4	.056	3	.003	4	.214	3	.279	6
404			min	-53.741	4	-.074	6	-.023	2	-.011	2	-.086	2	-.279	4
405		3	max	53.067	6	0	1	0	1	.003	4	.285	3	.372	6
406			min	-53.74	4	0	1	0	1	-.011	2	-.114	2	-.372	4
407		4	max	53.117	6	.074	6	.023	2	.003	4	.214	3	.279	6
408			min	-53.738	4	-.074	4	-.056	3	-.011	2	-.086	2	-.279	4
409		5	max	53.167	6	.148	6	.045	2	.003	4	0	1	0	1
410			min	-53.736	4	-.148	4	-.113	3	-.011	2	0	1	0	1
411	WT19	1	max	23.534	4	.148	4	.045	2	.015	2	0	1	0	1
412			min	-24.065	6	-.148	6	-.113	5	-.001	4	0	1	0	1
413		2	max	23.485	4	.074	4	.023	2	.015	2	.086	2	.279	6
414			min	-24.067	6	-.074	6	-.056	5	-.001	4	-.214	5	-.279	4
415		3	max	23.435	4	0	1	0	1	.015	2	.114	2	.372	6
416			min	-24.069	6	0	1	0	1	-.001	4	-.285	5	-.372	4
417		4	max	23.385	4	.074	6	.056	5	.015	2	.086	2	.279	6
418			min	-24.07	6	-.074	4	-.023	2	-.001	4	-.214	5	-.279	4
419		5	max	23.336	4	.148	6	.113	5	.015	2	0	1	0	1
420			min	-24.072	6	-.148	4	-.045	2	-.001	4	0	1	0	1
421	WT20	1	max	25.031	4	.148	4	.162	1	.015	2	0	1	0	1
422			min	-24.299	6	-.148	6	.011	4	-.007	6	0	1	0	1
423		2	max	24.981	4	.074	4	.081	1	.015	2	.306	1	.279	6
424			min	-24.301	6	-.074	6	.005	4	-.007	6	.02	4	-.279	4
425		3	max	24.931	4	0	1	0	1	.015	2	.408	1	.372	6
426			min	-24.303	6	0	1	0	1	-.007	6	.027	4	-.372	4
427		4	max	24.882	4	.074	6	-.005	4	.015	2	.306	1	.279	6
428			min	-24.304	6	-.074	4	-.081	1	-.007	6	.02	4	-.279	4

Envelope Member Section Forces (Continued)

	Member	Sec		Axial[k]	LC	y Shear...	LC	z Shear...	LC	Torque[...	LC	y-y Mo...	LC	z-z Mo...	LC
429		5	max	24.832	4	.148	6	-.011	4	.015	2	0	1	0	1
430			min	-24.306	6	-.148	4	-.162	1	-.007	6	0	1	0	1
431	Mast1	1	max	494.169	4	5.142	2	2.84	6	.079	2	91.636	4	60.557	2
432			min	-466.221	6	-.047	6	-2.812	4	-.022	6	-91.048	6	-.327	6
433		2	max	493.393	4	4.867	2	2.564	6	.079	2	72.25	4	24.274	2
434			min	-466.998	6	-.047	6	-2.536	4	-.022	6	-71.457	6	.008	4
435		3	max	492.616	4	4.591	2	2.289	6	.079	2	54.862	4	.358	6
436			min	-467.774	6	-.047	6	-2.261	4	-.022	6	-53.864	6	-10.011	2
437		4	max	449.309	4	.017	6	1.542	4	.076	2	49.613	4	.516	6
438			min	-425.078	6	-2.557	2	-1.626	6	-.021	6	-48.734	6	-22.541	2
439		5	max	448.532	4	.017	6	1.817	4	.076	2	61.788	4	.394	6
440			min	-425.855	6	-2.832	2	-1.902	6	-.021	6	-61.521	6	-3.006	2
441	Mast2	1	max	448.532	4	.017	6	1.817	4	.076	2	61.788	4	.394	6
442			min	-425.855	6	-2.832	2	-1.902	6	-.021	6	-61.521	6	-3.006	2
443		2	max	342.93	4	.058	6	2.202	6	.07	2	61.37	4	7.567	2
444			min	-321.059	6	-.076	2	-2.174	4	-.02	6	-61.318	6	-.036	4
445		3	max	342.193	4	.058	6	1.886	6	.07	2	47.512	4	9.176	2
446			min	-321.795	6	-.392	2	-1.858	4	-.02	6	-47.267	6	-.25	6
447		4	max	233.776	4	3.137	2	2.675	6	.058	2	31.96	4	.46	2
448			min	-215.207	6	-.017	6	-2.731	4	-.016	6	-31.799	6	-.405	6
449		5	max	233.04	4	2.821	2	2.358	6	.058	2	14.269	4	.13	3
450			min	-215.943	6	-.017	6	-2.415	4	-.016	6	-14.497	6	-20.021	2
451	Mast3	1	max	233.04	4	2.821	2	2.358	6	.058	2	14.269	4	.13	3
452			min	-215.943	6	-.017	6	-2.415	4	-.016	6	-14.497	6	-20.021	2
453		2	max	112.67	4	.006	3	10.481	4	.035	2	39.643	4	12.337	2
454			min	-97.572	6	-13.083	2	-10.45	6	-.01	6	-39.974	6	-.174	6
455		3	max	111.934	4	.006	3	10.832	4	.035	2	112.909	4	103.487	2
456			min	-98.308	6	-13.433	2	-10.801	6	-.01	6	-113.023	6	-.06	6
457		4	max	7.453	5	5.299	2	5.299	6	0	1	135.031	4	135.031	2
458			min	5.741	4	0	3	-5.299	4	0	1	-135.031	6	0	3
459		5	max	6.545	5	4.948	2	4.948	6	0	1	99.808	4	99.808	2
460			min	5.005	4	0	3	-4.948	4	0	1	-99.808	6	0	3
461	Mast4	1	max	6.545	3	4.948	2	4.948	6	0	1	99.808	4	99.808	2
462			min	5.005	6	0	3	-4.948	4	0	1	-99.808	6	0	3
463		2	max	5.653	3	4.536	2	4.536	6	0	1	67.799	4	67.799	2
464			min	4.282	6	0	3	-4.536	4	0	1	-67.799	6	0	3
465		3	max	4.762	3	4.124	2	4.124	6	0	1	38.569	4	38.569	2
466			min	3.559	6	0	3	-4.124	4	0	1	-38.569	6	0	3
467		4	max	3.87	3	3.718	2	3.718	6	0	1	12.117	4	12.117	2
468			min	2.836	6	0	3	-3.718	4	0	1	-12.117	6	0	3
469		5	max	0	1	0	1	0	1	0	1	0	1	0	1
470			min	0	1	0	1	0	1	0	1	0	1	0	1
471	Horz 12	1	max	6.59	6	.192	6	.001	6	.235	6	.201	6	2.541	6
472			min	-5.314	4	.121	1	-.005	2	-.795	2	-.206	4	-1.638	4
473		2	max	6.59	6	.114	6	.001	6	.235	6	.206	6	2.024	6
474			min	-5.314	4	.042	1	-.005	2	-.795	2	-.208	4	-2.13	4
475		3	max	6.59	6	.035	6	.001	6	.235	6	.21	6	1.774	6
476			min	-5.314	4	-.036	1	-.005	2	-.795	2	-.21	4	-2.355	4
477		4	max	6.59	6	-.044	6	.001	6	.235	6	.215	6	1.79	6
478			min	-5.314	4	-.115	1	-.005	2	-.795	2	-.213	4	-2.314	4
479		5	max	6.59	6	-.123	6	.001	6	.235	6	.22	6	2.071	6
480			min	-5.314	4	-.194	1	-.005	2	-.795	2	-.215	4	-2.008	4



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 Designer : TJL/CFC
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Envelope Member Section Stresses

	Member	Sec		Axial[ksi]	LC y Shear[...]	LC z Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC						
1	CROSSDIAG1	1	max	.764	4	.075	1	.164	6	0	1	0	1	0	1		
2			min	-2.624	2	.054	2	-.164	4	0	1	0	1	0	1		
3		2	max	.758	4	.037	1	.082	6	2.008	3	.994	6	4.016	5	2.186	4
4			min	-2.63	2	.027	2	-.082	4	-.994	6	-2.008	3	-1.988	4	-4.415	5
5		3	max	.752	4	0	1	0	1	2.677	3	1.325	6	5.355	5	2.914	4
6			min	-2.636	2	0	1	0	1	-1.325	6	-2.677	3	-2.651	4	-5.887	5
7		4	max	.747	4	-.027	6	.082	4	2.008	3	.994	6	4.016	5	2.186	4
8			min	-2.642	2	-.037	3	-.082	6	-.994	6	-2.008	3	-1.988	4	-4.415	5
9		5	max	.741	4	-.054	6	.164	4	0	1	0	1	0	1	0	1
10			min	-2.648	2	-.075	3	-.164	6	0	1	0	1	0	1	0	1
11	CROSSDIAG2	1	max	2.784	2	.075	1	.164	6	0	1	0	1	0	1	0	1
12			min	-1.632	6	.054	4	-.164	4	0	1	0	1	0	1	0	1
13		2	max	2.79	2	.037	1	.082	6	2.008	3	.994	6	4.016	5	2.186	4
14			min	-1.626	6	.027	4	-.082	4	-.994	6	-2.008	3	-1.988	4	-4.415	5
15		3	max	2.796	2	0	1	0	1	2.677	3	1.325	6	5.355	5	2.914	4
16			min	-1.62	6	0	1	0	1	-1.325	6	-2.677	3	-2.651	4	-5.887	5
17		4	max	2.802	2	-.027	2	.082	4	2.008	3	.994	6	4.016	5	2.186	4
18			min	-1.614	6	-.037	3	-.082	6	-.994	6	-2.008	3	-1.988	4	-4.415	5
19		5	max	2.808	2	-.054	2	.164	4	0	1	0	1	0	1	0	1
20			min	-1.608	6	-.075	3	-.164	6	0	1	0	1	0	1	0	1
21	CROSSDIAG3	1	max	.487	6	.075	3	.164	6	0	1	0	1	0	1	0	1
22			min	-4.345	2	.054	2	-.164	4	0	1	0	1	0	1	0	1
23		2	max	.481	6	.037	3	.082	6	2.008	3	.994	6	4.016	5	2.186	4
24			min	-4.351	2	.027	2	-.082	4	-.994	6	-2.008	3	-1.988	4	-4.415	5
25		3	max	.475	6	0	1	0	1	2.677	3	1.325	6	5.355	5	2.914	4
26			min	-4.357	2	0	1	0	1	-1.325	6	-2.677	3	-2.651	4	-5.887	5
27		4	max	.469	6	-.027	4	.082	4	2.008	3	.994	6	4.016	5	2.186	4
28			min	-4.362	2	-.037	1	-.082	6	-.994	6	-2.008	3	-1.988	4	-4.415	5
29		5	max	.463	6	-.054	4	.164	4	0	1	0	1	0	1	0	1
30			min	-4.368	2	-.075	1	-.164	6	0	1	0	1	0	1	0	1
31	CROSSDIAG4	1	max	4.392	2	.075	5	.164	6	0	1	0	1	0	1	0	1
32			min	-.899	6	.054	4	-.164	4	0	1	0	1	0	1	0	1
33		2	max	4.398	2	.037	5	.082	6	2.008	3	.994	6	4.016	5	2.186	4
34			min	-.893	6	.027	4	-.082	4	-.994	6	-2.008	3	-1.988	4	-4.415	5
35		3	max	4.404	2	0	1	0	1	2.677	3	1.325	6	5.355	5	2.914	4
36			min	-.887	6	0	1	0	1	-1.325	6	-2.677	3	-2.651	4	-5.887	5
37		4	max	4.41	2	-.027	6	.082	4	2.008	3	.994	6	4.016	5	2.186	4
38			min	-.881	6	-.037	1	-.082	6	-.994	6	-2.008	3	-1.988	4	-4.415	5
39		5	max	4.416	2	-.054	6	.164	4	0	1	0	1	0	1	0	1
40			min	-.875	6	-.075	1	-.164	6	0	1	0	1	0	1	0	1
41	CROSSDIAG5	1	max	3.814	6	.075	1	.197	5	0	1	0	1	0	1	0	1
42			min	-6.178	2	.053	2	-.197	4	0	1	0	1	0	1	0	1
43		2	max	3.802	6	.038	1	.099	5	4.534	3	2.402	6	9.102	5	5.559	4
44			min	-6.19	2	.026	2	-.099	4	-2.402	6	-4.534	3	-4.822	4	-10.495	5
45		3	max	3.791	6	0	1	0	1	6.046	3	3.203	6	12.137	5	7.412	4
46			min	-6.201	2	0	1	0	1	-3.203	6	-6.046	3	-6.429	4	-13.993	5
47		4	max	3.78	6	-.026	6	.099	3	4.534	3	2.402	6	9.102	5	5.559	4
48			min	-6.212	2	-.038	3	-.099	6	-2.402	6	-4.534	3	-4.822	4	-10.495	5
49		5	max	3.769	6	-.053	6	.197	3	0	1	0	1	0	1	0	1
50			min	-6.223	2	-.075	3	-.197	6	0	1	0	1	0	1	0	1
51	CROSSDIAG6	1	max	6.905	2	.075	5	.197	5	0	1	0	1	0	1	0	1



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Envelope Member Section Stresses (Continued)

Member	Sec		Axial[ksi]	LC y	Shear[...]	LC z	Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC
52		min	-1.668	4	.053	2	-.197	3	0	1	0	1
53		2 max	6.916	2	.038	5	.099	5	4.534	3	2.402	6
54		min	-1.657	4	.026	2	-.099	3	-2.402	6	-4.534	3
55		3 max	6.927	2	0	1	0	1	6.046	3	3.203	6
56		min	-1.646	4	0	1	0	1	-3.203	6	-6.046	3
57		4 max	6.939	2	-.026	6	.099	4	4.534	3	2.402	6
58		min	-1.634	4	-.038	1	-.099	6	-2.402	6	-4.534	3
59		5 max	6.95	2	-.053	6	.197	4	0	1	0	1
60		min	-1.623	4	-.075	1	-.197	6	0	1	0	1
61	CROSSDIAG7	1 max	0	5	.075	1	0	1	0	1	0	1
62		min	-8.638	2	0	5	-.356	4	0	1	0	1
63		2 max	0	5	.037	1	0	1	8.124	4	0	5
64		min	-8.663	2	0	5	-.178	4	0	5	-8.124	4
65		3 max	0	5	0	1	0	1	10.832	4	0	5
66		min	-8.689	2	0	1	0	1	0	5	-10.832	4
67		4 max	0	5	0	5	.178	4	8.124	4	0	5
68		min	-8.715	2	-.037	3	0	1	0	5	-8.124	4
69		5 max	0	5	0	5	.356	4	0	1	0	1
70		min	-8.741	2	-.075	3	0	1	0	1	0	1
71	CROSSDIAG8	1 max	0	1	.075	3	0	1	0	1	0	1
72		min	-1.568	4	0	1	-.356	4	0	1	0	1
73		2 max	0	1	.037	3	0	1	8.124	4	0	1
74		min	-1.542	4	0	1	-.178	4	0	1	-8.124	4
75		3 max	0	1	0	1	0	1	10.832	4	0	1
76		min	-1.516	4	0	1	0	1	0	1	-10.832	4
77		4 max	0	1	0	1	.178	4	8.124	4	0	1
78		min	-1.49	4	-.037	3	0	1	0	1	-8.124	4
79		5 max	0	1	0	1	.356	4	0	1	0	1
80		min	-1.465	4	-.075	3	0	1	0	1	0	1
81	HORZ1	1 max	2.125	4	.075	5	.145	6	0	1	0	1
82		min	-2.166	6	.054	4	-.145	4	0	1	0	1
83		2 max	2.124	4	.037	5	.073	6	1.652	3	.736	6
84		min	-2.167	6	.027	4	-.073	4	-.736	6	-1.652	3
85		3 max	2.124	4	0	1	0	1	2.202	3	.981	6
86		min	-2.167	6	0	1	0	1	-.981	6	-2.202	3
87		4 max	2.124	4	-.027	2	.073	4	1.652	3	.736	6
88		min	-2.168	6	-.037	1	-.073	6	-.736	6	-1.652	3
89		5 max	2.123	4	-.054	2	.145	4	0	1	0	1
90		min	-2.168	6	-.075	1	-.145	6	0	1	0	1
91	HORZ2	1 max	2.165	4	.075	1	.145	6	0	1	0	1
92		min	-2.188	6	.054	2	-.145	4	0	1	0	1
93		2 max	2.165	4	.037	1	.073	6	1.652	3	.736	6
94		min	-2.188	6	.027	2	-.073	4	-.736	6	-1.652	3
95		3 max	2.165	4	0	1	0	1	2.202	3	.981	6
96		min	-2.187	6	0	1	0	1	-.981	6	-2.202	3
97		4 max	2.166	4	-.027	4	.073	4	1.652	3	.736	6
98		min	-2.187	6	-.037	3	-.073	6	-.736	6	-1.652	3
99		5 max	2.166	4	-.054	4	.145	4	0	1	0	1
100		min	-2.187	6	-.075	3	-.145	6	0	1	0	1
101	HORZ3	1 max	1.061	4	.075	5	.145	6	0	1	0	1
102		min	-1.128	6	.054	4	-.145	4	0	1	0	1
103		2 max	1.06	4	.037	5	.073	6	1.652	3	.736	6



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Envelope Member Section Stresses (Continued)

	Member	Sec		Axial[ksi]	LC y Shear[...]	LC z Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC
104			min	-1.128	6 .027	6 -.073	4 -.736	6 -1.652	3 -1.472	4 -3.633	5
105		3	max	1.06	4 0	1 0	1 2.202	3 .981	6 4.406	5 2.157	4
106			min	-1.129	6 0	1 0	1 -.981	6 -2.202	3 -1.962	4 -4.844	5
107		4	max	1.06	4 -.027	2 .073	4 1.652	3 .736	6 3.305	5 1.618	4
108			min	-1.129	6 -.037	1 -.073	6 -.736	6 -1.652	3 -1.472	4 -3.633	5
109		5	max	1.059	4 -.054	2 .145	4 0	1 0	1 0	1 0	1
110			min	-1.129	6 -.075	1 -.145	6 0	1 0	1 0	1 0	1
111	HORZ4	1	max	1.301	4 .075	3 .145	6 0	1 0	1 0	1 0	1
112			min	-1.355	6 .054	6 -.145	4 0	1 0	1 0	1 0	1
113		2	max	1.302	4 .037	3 .073	6 1.652	3 .736	6 3.305	5 1.618	4
114			min	-1.354	6 .027	6 -.073	4 -.736	6 -1.652	3 -1.472	4 -3.633	5
115		3	max	1.302	4 0	1 0	1 2.202	3 .981	6 4.406	5 2.157	4
116			min	-1.354	6 0	1 0	1 -.981	6 -2.202	3 -1.962	4 -4.844	5
117		4	max	1.302	4 -.027	2 .073	4 1.652	3 .736	6 3.305	5 1.618	4
118			min	-1.354	6 -.037	1 -.073	6 -.736	6 -1.652	3 -1.472	4 -3.633	5
119		5	max	1.303	4 -.054	2 .145	4 0	1 0	1 0	1 0	1
120			min	-1.353	6 -.075	1 -.145	6 0	1 0	1 0	1 0	1
121	HORZ5	1	max	.698	4 .075	1 .145	6 0	1 0	1 0	1 0	1
122			min	-.66	2 .054	2 -.145	4 0	1 0	1 0	1 0	1
123		2	max	.698	4 .037	1 .073	6 1.652	3 .736	6 3.305	5 1.618	4
124			min	-.66	2 .027	2 -.073	4 -.736	6 -1.652	3 -1.472	4 -3.633	5
125		3	max	.697	4 0	1 0	1 2.202	3 .981	6 4.406	5 2.157	4
126			min	-.661	2 0	1 0	1 -.981	6 -2.202	3 -1.962	4 -4.844	5
127		4	max	.697	4 -.027	6 .073	4 1.652	3 .736	6 3.305	5 1.618	4
128			min	-.661	2 -.037	5 -.073	6 -.736	6 -1.652	3 -1.472	4 -3.633	5
129		5	max	.696	4 -.054	6 .145	4 0	1 0	1 0	1 0	1
130			min	-.662	2 -.075	3 -.145	6 0	1 0	1 0	1 0	1
131	HORZ6	1	max	2.348	2 .075	3 .145	6 0	1 0	1 0	1 0	1
132			min	-.982	6 .054	4 -.145	4 0	1 0	1 0	1 0	1
133		2	max	2.349	2 .037	3 .073	6 1.652	3 .736	6 3.305	5 1.618	4
134			min	-.982	6 .027	4 -.073	4 -.736	6 -1.652	3 -1.472	4 -3.633	5
135		3	max	2.349	2 0	1 0	1 2.202	3 .981	6 4.406	5 2.157	4
136			min	-.981	6 0	1 0	1 -.981	6 -2.202	3 -1.962	4 -4.844	5
137		4	max	2.35	2 -.027	2 .073	4 1.652	3 .736	6 3.305	5 1.618	4
138			min	-.981	6 -.037	1 -.073	6 -.736	6 -1.652	3 -1.472	4 -3.633	5
139		5	max	2.35	2 -.054	2 .145	4 0	1 0	1 0	1 0	1
140			min	-.98	6 -.075	1 -.145	6 0	1 0	1 0	1 0	1
141	HORZ7	1	max	.589	6 .075	1 .145	6 0	1 0	1 0	1 0	1
142			min	-.932	2 .054	4 -.145	4 0	1 0	1 0	1 0	1
143		2	max	.588	6 .037	1 .073	6 1.652	3 .736	6 3.305	5 1.618	4
144			min	-.932	2 .027	4 -.073	4 -.736	6 -1.652	3 -1.472	4 -3.633	5
145		3	max	.588	6 0	1 0	1 2.202	3 .981	6 4.406	5 2.157	4
146			min	-.933	2 0	1 0	1 -.981	6 -2.202	3 -1.962	4 -4.844	5
147		4	max	.588	6 -.027	2 .073	4 1.652	3 .736	6 3.305	5 1.618	4
148			min	-.933	2 -.037	3 -.073	6 -.736	6 -1.652	3 -1.472	4 -3.633	5
149		5	max	.587	6 -.054	2 .145	4 0	1 0	1 0	1 0	1
150			min	-.933	2 -.075	3 -.145	6 0	1 0	1 0	1 0	1
151	HORZ8	1	max	1.277	2 .075	5 .145	6 0	1 0	1 0	1 0	1
152			min	-.199	4 .054	2 -.145	4 0	1 0	1 0	1 0	1
153		2	max	1.277	2 .037	5 .073	6 1.652	3 .736	6 3.305	5 1.618	4
154			min	-.198	4 .027	2 -.073	4 -.736	6 -1.652	3 -1.472	4 -3.633	5
155		3	max	1.278	2 0	1 0	1 2.202	3 .981	6 4.406	5 2.157	4



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Envelope Member Section Stresses (Continued)

	Member	Sec		Axial[ksi]	LC y	Shear[...]	LC z	Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC				
156			min	-.198	4	0	1	0	1	-.981	6	-2.202	3	-1.962	4	-4.844	5
157		4	max	1.278	2	-.027	4	.073	4	1.652	3	.736	6	3.305	5	1.618	4
158			min	-.197	4	-.037	1	-.073	6	-.736	6	-1.652	3	-1.472	4	-3.633	5
159		5	max	1.278	2	-.054	4	.145	4	0	1	0	1	0	1	0	1
160			min	-.197	4	-.075	1	-.145	6	0	1	0	1	0	1	0	1
161	HORZ9	1	max	.757	6	.075	3	.145	6	0	1	0	1	0	1	0	1
162			min	-.61	2	.054	2	-.145	4	0	1	0	1	0	1	0	1
163		2	max	.756	6	.037	3	.073	6	1.652	3	.736	6	3.305	5	1.618	4
164			min	-.61	2	.027	2	-.073	4	-.736	6	-1.652	3	-1.472	4	-3.633	5
165		3	max	.756	6	0	1	0	1	2.202	3	.981	6	4.406	5	2.157	4
166			min	-.61	2	0	1	0	1	-.981	6	-2.202	3	-1.962	4	-4.844	5
167		4	max	.755	6	-.027	4	.073	4	1.652	3	.736	6	3.305	5	1.618	4
168			min	-.611	2	-.037	1	-.073	6	-.736	6	-1.652	3	-1.472	4	-3.633	5
169		5	max	.755	6	-.054	4	.145	4	0	1	0	1	0	1	0	1
170			min	-.611	2	-.075	1	-.145	6	0	1	0	1	0	1	0	1
171	HORZ10	1	max	.778	2	.075	3	.145	6	0	1	0	1	0	1	0	1
172			min	-.575	4	.054	6	-.145	4	0	1	0	1	0	1	0	1
173		2	max	.779	2	.037	3	.073	6	1.652	3	.736	6	3.305	5	1.618	4
174			min	-.575	4	.027	6	-.073	4	-.736	6	-1.652	3	-1.472	4	-3.633	5
175		3	max	.779	2	0	1	0	1	2.202	3	.981	6	4.406	5	2.157	4
176			min	-.575	4	0	1	0	1	-.981	6	-2.202	3	-1.962	4	-4.844	5
177		4	max	.779	2	-.027	2	.073	4	1.652	3	.736	6	3.305	5	1.618	4
178			min	-.574	4	-.037	1	-.073	6	-.736	6	-1.652	3	-1.472	4	-3.633	5
179		5	max	.78	2	-.054	2	.145	4	0	1	0	1	0	1	0	1
180			min	-.574	4	-.075	1	-.145	6	0	1	0	1	0	1	0	1
181	HORZ11	1	max	.961	6	.042	5	.076	6	1.459	4	2.262	6	.291	4	.297	6
182			min	-.775	4	.025	2	-.076	4	-2.262	6	-1.459	4	-.297	6	-.291	4
183		2	max	.961	6	.024	5	.038	6	1.897	4	1.803	6	.343	6	.346	4
184			min	-.775	4	.009	2	-.038	4	-1.803	6	-1.897	4	-.346	4	-.343	6
185		3	max	.961	6	.007	6	0	6	2.097	4	1.58	6	.561	6	.561	4
186			min	-.775	4	-.007	1	-.002	2	-1.58	6	-2.097	4	-.561	4	-.561	6
187		4	max	.961	6	-.009	6	.038	4	2.061	4	1.594	6	.356	6	.352	4
188			min	-.775	4	-.026	1	-.037	6	-1.594	6	-2.061	4	-.352	4	-.356	6
189		5	max	.961	6	-.025	6	.075	4	1.788	4	1.844	6	.279	4	.273	6
190			min	-.775	4	-.044	1	-.075	6	-1.844	6	-1.788	4	-.273	6	-.279	4
191	LEG1	1	max	11.989	6	1.515	6	.33	4	17.736	4	17.48	6	8.016	4	9.988	2
192			min	-11.005	4	-1.529	4	-.337	6	-17.48	6	-17.736	4	-9.988	2	-8.016	4
193		2	max	9.813	6	.635	6	.14	2	7.672	4	7.431	6	3.492	4	3.403	6
194			min	-9.034	4	-.632	4	-.027	6	-7.431	6	-7.672	4	-3.403	6	-3.492	4
195		3	max	7.094	6	.134	6	.048	4	4.171	4	3.776	6	1.649	4	2.444	6
196			min	-6.221	4	-.118	4	-.324	2	-3.776	6	-4.171	4	-2.444	6	-1.649	4
197		4	max	4.653	6	.103	2	.081	2	2.938	4	2.77	6	1.887	2	.706	6
198			min	-3.935	4	-.055	4	-.044	4	-2.77	6	-2.938	4	-.706	6	-1.887	2
199		5	max	.386	3	.579	6	1.256	6	2.491	4	2.523	6	3.884	6	2.505	4
200			min	-.098	2	-.579	4	-1.193	4	-2.523	6	-2.491	4	-2.505	4	-3.884	6
201	LEG2	1	max	12.066	6	1.679	6	.383	6	18.362	4	18.213	6	9.388	6	10.046	2
202			min	-10.916	4	-1.696	4	-.37	4	-18.213	6	-18.362	4	-10.046	2	-9.388	6
203		2	max	9.908	6	.613	6	.114	2	7.595	4	7.739	6	2.851	6	2.812	4
204			min	-8.999	4	-.641	4	0	4	-7.739	6	-7.595	4	-2.812	4	-2.851	6
205		3	max	7.265	6	.09	6	.217	6	3.96	4	4.345	6	2.105	2	1.329	4
206			min	-6.372	4	-.11	4	-.336	2	-4.345	6	-3.96	4	-1.329	4	-2.105	2
207		4	max	4.673	6	.074	6	.041	2	2.589	4	2.755	6	1.718	2	.378	4



Company : Centek Engineering
 Designer : TJL/CFC
 Job Number : 14033.019
 Model Name : 82' Sign Structure with 111' Pipe Mast

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Envelope Member Section Stresses (Continued)

	Member	Sec		Axial[ksi]	LC y	Shear[...]	LC z	Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC				
208			min	-3.961	4	-.076	2	.005	5	-2.755	6	-2.589	4	-1.718	2		
209		5	max	1.592	2	.578	6	1.284	4	2.483	4	2.45	6	3.07	4	3.167	6
210			min	.138	6	-.578	4	-1.256	6	-2.45	6	-2.483	4	-3.167	6	-3.07	4
211	LEG_W_PLT1	1	max	4.87	6	2.031	6	.5	6	12.425	4	12.323	6	8.194	2	2.166	6
212			min	-4.339	4	-2.033	4	-1.408	2	-12.323	6	-12.425	4	-2.166	6	-8.194	2
213		2	max	4.852	6	2.006	6	.5	6	10.275	4	10.174	6	2.811	2	.232	6
214			min	-4.357	4	-2.007	4	-1.374	2	-10.174	6	-10.275	4	-.232	6	-2.811	2
215		3	max	4.834	6	1.98	6	.5	6	8.152	4	8.052	6	1.701	6	2.441	2
216			min	-4.375	4	-1.982	4	-1.34	2	-8.052	6	-8.152	4	-2.441	2	-1.701	6
217		4	max	4.643	6	1.541	6	.329	4	6.462	4	6.377	6	.559	6	1.9	2
218			min	-4.228	4	-1.555	4	-.336	6	-6.377	6	-6.462	4	-1.9	2	-.559	6
219		5	max	4.625	6	1.515	6	.329	4	4.82	4	4.751	6	.752	4	.937	2
220			min	-4.246	4	-1.529	4	-.336	6	-4.751	6	-4.82	4	-.937	2	-.752	4
221	LEG_W_PLT2	1	max	4.922	6	2.219	6	.483	4	13.351	4	13.272	6	8.118	2	1.914	4
222			min	-4.302	4	-2.22	4	-1.367	2	-13.272	6	-13.351	4	-1.914	4	-8.118	2
223		2	max	4.901	6	2.193	6	.483	4	11.001	4	10.923	6	2.828	2	.044	4
224			min	-4.323	4	-2.195	4	-1.367	2	-10.923	6	-11.001	4	-.044	4	-2.828	2
225		3	max	4.88	6	2.168	6	.483	4	8.678	4	8.602	6	1.827	4	2.463	2
226			min	-4.344	4	-2.169	4	-1.367	2	-8.602	6	-8.678	4	-2.463	2	-1.827	4
227		4	max	4.676	6	1.705	6	.381	6	6.81	4	6.751	6	.561	4	1.854	2
228			min	-4.191	4	-1.722	4	-.369	4	-6.751	6	-6.81	4	-1.854	2	-.561	4
229		5	max	4.655	6	1.679	6	.381	6	4.991	4	4.95	6	.881	6	.942	2
230			min	-4.211	4	-1.696	4	-.369	4	-4.95	6	-4.991	4	-.942	2	-.881	6
231	WT1	1	max	3.012	6	.11	4	.068	1	0	1	0	1	0	1	0	1
232			min	-5.46	2	-.11	6	.004	6	0	1	0	1	0	1	0	1
233		2	max	3.001	6	.055	4	.034	1	.315	4	1.216	6	1.174	1	-.077	6
234			min	-5.454	2	-.055	6	.002	6	-.315	6	-1.216	4	.077	6	-1.174	1
235		3	max	2.99	6	0	1	0	1	.42	4	1.621	6	1.565	1	-1.103	6
236			min	-5.448	2	0	1	0	1	-.42	6	-1.621	4	.103	6	-1.565	1
237		4	max	2.978	6	.055	6	-.002	6	.315	4	1.216	6	1.174	1	-.077	6
238			min	-5.441	2	-.055	4	-.034	1	-.315	6	-1.216	4	.077	6	-1.174	1
239		5	max	2.967	6	.11	6	-.004	6	0	1	0	1	0	1	0	1
240			min	-5.435	2	-.11	4	-.068	1	0	1	0	1	0	1	0	1
241	WT2	1	max	5.644	2	.11	4	.047	3	0	1	0	1	0	1	0	1
242			min	-3.05	4	-.11	6	-.019	2	0	1	0	1	0	1	0	1
243		2	max	5.662	2	.055	4	.024	3	.315	4	1.216	6	.819	3	.328	2
244			min	-3.049	4	-.055	6	-.009	2	-.315	6	-1.216	4	-.328	2	-.819	3
245		3	max	5.68	2	0	1	0	1	.42	4	1.621	6	1.092	3	.438	2
246			min	-3.049	4	0	1	0	1	-.42	6	-1.621	4	-.438	2	-1.092	3
247		4	max	5.698	2	.055	6	.009	2	.315	4	1.216	6	.819	3	.328	2
248			min	-3.048	4	-.055	4	-.024	3	-.315	6	-1.216	4	-.328	2	-.819	3
249		5	max	5.716	2	.11	6	.019	2	0	1	0	1	0	1	0	1
250			min	-3.048	4	-.11	4	-.047	3	0	1	0	1	0	1	0	1
251	WT3	1	max	6.553	2	.11	4	.019	2	0	1	0	1	0	1	0	1
252			min	-4.144	6	-.11	6	-.047	5	0	1	0	1	0	1	0	1
253		2	max	6.535	2	.055	4	.009	2	.315	4	1.216	6	.328	2	.819	5
254			min	-4.144	6	-.055	6	-.024	5	-.315	6	-1.216	4	-.819	5	-.328	2
255		3	max	6.517	2	0	1	0	1	.42	4	1.621	6	.438	2	1.092	5
256			min	-4.145	6	0	1	0	1	-.42	6	-1.621	4	-1.092	5	-.438	2
257		4	max	6.499	2	.055	6	.024	5	.315	4	1.216	6	.328	2	.819	5
258			min	-4.145	6	-.055	4	-.009	2	-.315	6	-1.216	4	-.819	5	-.328	2
259		5	max	6.481	2	.11	6	.047	5	0	1	0	1	0	1	0	1



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 Job Number : 14033.019
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Envelope Member Section Stresses (Continued)

Member	Sec		Axial[ksi]	LC y Shear[...]	LC z Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC
260		min	-4.145	6	-.11	4	-.019	2	0	1
261	WT4	1	max	4.163	4	.11	4	.068	1	0
262		min	-6.739	2	-.11	6	.004	4	0	1
263		2	max	4.152	4	.055	4	.034	1	.315
264			min	-6.732	2	-.055	6	.002	4	-.315
265		3	max	4.141	4	0	1	0	1	.42
266			min	-6.726	2	0	1	0	1	-.42
267		4	max	4.129	4	.055	6	-.002	4	.315
268			min	-6.719	2	-.055	4	-.034	1	-.315
269		5	max	4.118	4	.11	6	-.004	4	0
270			min	-6.713	2	-.11	4	-.068	1	0
271	WT5	1	max	9.188	6	.11	4	-.004	6	0
272			min	-9.201	4	-.11	6	-.068	1	0
273		2	max	9.199	6	.055	4	-.002	6	.315
274			min	-9.201	4	-.055	6	-.034	1	-.315
275		3	max	9.211	6	0	1	0	1	.42
276			min	-9.2	4	0	1	0	1	-.42
277		4	max	9.222	6	.055	6	.034	1	.315
278			min	-9.2	4	-.055	4	.002	6	-.315
279		5	max	9.233	6	.11	6	.068	1	0
280			min	-9.2	4	-.11	4	.004	6	0
281	WT6	1	max	10.355	6	.11	4	.047	3	0
282			min	-10.134	4	-.11	6	-.019	2	0
283		2	max	10.367	6	.055	4	.024	3	.315
284			min	-10.134	4	-.055	6	-.009	2	-.315
285		3	max	10.378	6	0	1	0	1	.42
286			min	-10.133	4	0	1	0	1	-.42
287		4	max	10.389	6	.055	6	.009	2	.315
288			min	-10.133	4	-.055	4	-.024	3	-.315
289		5	max	10.401	6	.11	6	.019	2	0
290			min	-10.133	4	-.11	4	-.047	3	0
291	WT7	1	max	7.332	4	.11	4	.019	2	0
292			min	-7.281	6	-.11	6	-.047	5	0
293		2	max	7.32	4	.055	4	.009	2	.315
294			min	-7.281	6	-.055	6	-.024	5	-.315
295		3	max	7.309	4	0	1	0	1	.42
296			min	-7.281	6	0	1	0	1	-.42
297		4	max	7.298	4	.055	6	.024	5	.315
298			min	-7.282	6	-.055	4	-.009	2	-.315
299		5	max	7.287	4	.11	6	.047	5	0
300			min	-7.282	6	-.11	4	-.019	2	0
301	WT8	1	max	8.261	4	.11	4	.068	1	0
302			min	-8.434	6	-.11	6	.004	4	0
303		2	max	8.249	4	.055	4	.034	1	.315
304			min	-8.434	6	-.055	6	.002	4	-.315
305		3	max	8.238	4	0	1	0	1	.42
306			min	-8.435	6	0	1	0	1	-.42
307		4	max	8.227	4	.055	6	-.002	4	.315
308			min	-8.435	6	-.055	4	-.034	1	-.315
309		5	max	8.216	4	.11	6	-.004	4	0
310			min	-8.436	6	-.11	4	-.068	1	0
311	WT9	1	max	9.795	6	.11	4	.019	2	0

Envelope Member Section Stresses (Continued)

Member	Sec		Axial[ksi]	LC y	Shear[...]	LC z	Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC
312		min	-9.641	4	-.11	6	-.047	3	0	1	0	1
313	2	max	9.784	6	.055	4	.009	2	.315	4	1.216	6
314		min	-9.641	4	-.055	6	-.024	3	-.315	6	-1.216	4
315	3	max	9.773	6	0	1	0	1	.42	4	1.621	6
316		min	-9.642	4	0	1	0	1	-.42	6	-1.621	4
317	4	max	9.761	6	.055	6	.024	3	.315	4	1.216	6
318		min	-9.642	4	-.055	4	-.009	2	-.315	6	-1.216	4
319	5	max	9.75	6	.11	6	.047	3	0	1	0	1
320		min	-9.642	4	-.11	4	-.019	2	0	1	0	1
321	WT10	1	max	8.871	6	.11	4	.068	1	0	1	0
322		min	-8.969	4	-.11	6	.004	6	0	1	0	1
323	2	max	8.86	6	.055	4	.034	1	.315	4	1.216	6
324		min	-8.97	4	-.055	6	.002	6	-.315	6	-1.216	4
325	3	max	8.848	6	0	1	0	1	.42	4	1.621	6
326		min	-8.97	4	0	1	0	1	-.42	6	-1.621	4
327	4	max	8.837	6	.055	6	-.002	6	.315	4	1.216	6
328		min	-8.97	4	-.055	4	-.034	1	-.315	6	-1.216	4
329	5	max	8.826	6	.11	6	-.004	6	0	1	0	1
330		min	-8.971	4	-.11	4	-.068	1	0	1	0	1
331	WT11	1	max	8.238	4	.11	4	.047	5	0	1	0
332		min	-8.167	6	-.11	6	-.019	2	0	1	0	1
333	2	max	8.249	4	.055	4	.024	5	.315	4	1.216	6
334		min	-8.167	6	-.055	6	-.009	2	-.315	6	-1.216	4
335	3	max	8.26	4	0	1	0	1	.42	4	1.621	6
336		min	-8.166	6	0	1	0	1	-.42	6	-1.621	4
337	4	max	8.271	4	.055	6	.009	2	.315	4	1.216	6
338		min	-8.166	6	-.055	4	-.024	5	-.315	6	-1.216	4
339	5	max	8.283	4	.11	6	.019	2	0	1	0	1
340		min	-8.165	6	-.11	4	-.047	5	0	1	0	1
341	WT12	1	max	8.971	4	.11	4	.068	1	0	1	0
342		min	-9.115	6	-.11	6	.004	4	0	1	0	1
343	2	max	8.96	4	.055	4	.034	1	.315	4	1.216	6
344		min	-9.116	6	-.055	6	.002	4	-.315	6	-1.216	4
345	3	max	8.948	4	0	1	0	1	.42	4	1.621	6
346		min	-9.116	6	0	1	0	1	-.42	6	-1.621	4
347	4	max	8.937	4	.055	6	-.002	4	.315	4	1.216	6
348		min	-9.116	6	-.055	4	-.034	1	-.315	6	-1.216	4
349	5	max	8.926	4	.11	6	-.004	4	0	1	0	1
350		min	-9.117	6	-.11	4	-.068	1	0	1	0	1
351	WT13	1	max	7.742	6	.11	4	.068	1	0	1	0
352		min	-7.522	4	-.11	6	.004	6	0	1	0	1
353	2	max	7.73	6	.055	4	.034	1	.315	4	1.216	6
354		min	-7.522	4	-.055	6	.002	6	-.315	6	-1.216	4
355	3	max	7.719	6	0	1	0	1	.42	4	1.621	6
356		min	-7.523	4	0	1	0	1	-.42	6	-1.621	4
357	4	max	7.708	6	.055	6	-.002	6	.315	4	1.216	6
358		min	-7.523	4	-.055	4	-.034	1	-.315	6	-1.216	4
359	5	max	7.697	6	.11	6	-.004	6	0	1	0	1
360		min	-7.523	4	-.11	4	-.068	1	0	1	0	1
361	WT14	1	max	7.705	6	.11	4	.019	2	0	1	0
362		min	-7.832	4	-.11	6	-.047	3	0	1	0	1
363	2	max	7.694	6	.055	4	.009	2	.315	4	1.216	6



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Envelope Member Section Stresses (Continued)

	Member	Sec		Axial[ksi]	LC y	Shear[...]	LC z	Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC				
364			min	-7.832	4	-.055	6	-.024	3	-.315	6	-1.216	4	-.819	3	-.328	2
365		3	max	7.683	6	0	1	0	1	.42	4	1.621	6	.438	2	1.092	3
366			min	-7.832	4	0	1	0	1	-.42	6	-1.621	4	-1.092	3	-.438	2
367		4	max	7.671	6	.055	6	.024	3	.315	4	1.216	6	.328	2	.819	3
368			min	-7.833	4	-.055	4	-.009	2	-.315	6	-1.216	4	-.819	3	-.328	2
369		5	max	7.66	6	.11	6	.047	3	0	1	0	1	0	1	0	1
370			min	-7.833	4	-.11	4	-.019	2	0	1	0	1	0	1	0	1
371	WT15	1	max	12.096	4	.11	4	.019	2	0	1	0	1	0	1	0	1
372			min	-12.233	6	-.11	6	-.047	5	0	1	0	1	0	1	0	1
373		2	max	12.085	4	.055	4	.009	2	.315	4	1.216	6	.328	2	.819	5
374			min	-12.234	6	-.055	6	-.024	5	-.315	6	-1.216	4	-.819	5	-.328	2
375		3	max	12.073	4	0	1	0	1	.42	4	1.621	6	.438	2	1.092	5
376			min	-12.234	6	0	1	0	1	-.42	6	-1.621	4	-1.092	5	-.438	2
377		4	max	12.062	4	.055	6	.024	5	.315	4	1.216	6	.328	2	.819	5
378			min	-12.234	6	-.055	4	-.009	2	-.315	6	-1.216	4	-.819	5	-.328	2
379		5	max	12.051	4	.11	6	.047	5	0	1	0	1	0	1	0	1
380			min	-12.235	6	-.11	4	-.019	2	0	1	0	1	0	1	0	1
381	WT16	1	max	12.402	4	.11	4	.068	1	0	1	0	1	0	1	0	1
382			min	-12.197	6	-.11	6	.004	4	0	1	0	1	0	1	0	1
383		2	max	12.39	4	.055	4	.034	1	.315	4	1.216	6	1.174	1	-.077	4
384			min	-12.197	6	-.055	6	.002	4	-.315	6	-1.216	4	.077	4	-1.174	1
385		3	max	12.379	4	0	1	0	1	.42	4	1.621	6	1.565	1	-.103	4
386			min	-12.198	6	0	1	0	1	-.42	6	-1.621	4	.103	4	-1.565	1
387		4	max	12.368	4	.055	6	-.002	4	.315	4	1.216	6	1.174	1	-.077	4
388			min	-12.198	6	-.055	4	-.034	1	-.315	6	-1.216	4	.077	4	-1.174	1
389		5	max	12.356	4	.11	6	-.004	4	0	1	0	1	0	1	0	1
390			min	-12.198	6	-.11	4	-.068	1	0	1	0	1	0	1	0	1
391	WT17	1	max	11.979	6	.11	4	-.004	6	0	1	0	1	0	1	0	1
392			min	-11.873	4	-.11	6	-.068	1	0	1	0	1	0	1	0	1
393		2	max	11.991	6	.055	4	-.002	6	.315	4	1.216	6	-.077	6	1.174	1
394			min	-11.872	4	-.055	6	-.034	1	-.315	6	-1.216	4	-1.174	1	.077	6
395		3	max	12.002	6	0	1	0	1	.42	4	1.621	6	-.103	6	1.565	1
396			min	-11.872	4	0	1	0	1	-.42	6	-1.621	4	-1.565	1	.103	6
397		4	max	12.013	6	.055	6	.034	1	.315	4	1.216	6	-.077	6	1.174	1
398			min	-11.872	4	-.055	4	.002	6	-.315	6	-1.216	4	-1.174	1	.077	6
399		5	max	12.024	6	.11	6	.068	1	0	1	0	1	0	1	0	1
400			min	-11.871	4	-.11	4	.004	6	0	1	0	1	0	1	0	1
401	WT18	1	max	12.038	6	.11	4	.047	3	0	1	0	1	0	1	0	1
402			min	-12.214	4	-.11	6	-.019	2	0	1	0	1	0	1	0	1
403		2	max	12.049	6	.055	4	.024	3	.315	4	1.216	6	.819	3	.328	2
404			min	-12.214	4	-.055	6	-.009	2	-.315	6	-1.216	4	-.328	2	-.819	3
405		3	max	12.061	6	0	1	0	1	.42	4	1.621	6	1.092	3	.438	2
406			min	-12.214	4	0	1	0	1	-.42	6	-1.621	4	-.438	2	-1.092	3
407		4	max	12.072	6	.055	6	.009	2	.315	4	1.216	6	.819	3	.328	2
408			min	-12.213	4	-.055	4	-.024	3	-.315	6	-1.216	4	-.328	2	-.819	3
409		5	max	12.083	6	.11	6	.019	2	0	1	0	1	0	1	0	1
410			min	-12.213	4	-.11	4	-.047	3	0	1	0	1	0	1	0	1
411	WT19	1	max	5.349	4	.11	4	.019	2	0	1	0	1	0	1	0	1
412			min	-5.469	6	-.11	6	-.047	5	0	1	0	1	0	1	0	1
413		2	max	5.337	4	.055	4	.009	2	.315	4	1.216	6	.328	2	.819	5
414			min	-5.47	6	-.055	6	-.024	5	-.315	6	-1.216	4	-.819	5	-.328	2
415		3	max	5.326	4	0	1	0	1	.42	4	1.621	6	.438	2	1.092	5



Company : Centek Engineering
 Designer : TJL/CFC
 Job Number : 14033.019
 Model Name : 82' Sign Structure with 111' Pipe Mast

Oct 31, 2014

Checked By: _____

Envelope Member Section Stresses (Continued)

	Member	Sec		Axial[ksi]	LC y	Shear[...]	LC z	Shear[...]	LC y-Top[ksi]	LC y-Bot[ksi]	LC z-Top[ksi]	LC z-Bot[ksi]	LC				
416			min	-5.47	6	0	1	0	1	-.42	6	-1.621	4	-1.092	5	-.438	2
417		4	max	5.315	4	.055	6	.024	5	.315	4	1.216	6	.328	2	.819	5
418			min	-5.471	6	-.055	4	-.009	2	-.315	6	-1.216	4	-.819	5	-.328	2
419		5	max	5.304	4	.11	6	.047	5	0	1	0	1	0	1	0	1
420			min	-5.471	6	-.11	4	-.019	2	0	1	0	1	0	1	0	1
421	WT20	1	max	5.689	4	.11	4	.068	1	0	1	0	1	0	1	0	1
			min	-5.523	6	-.11	6	.004	4	0	1	0	1	0	1	0	1
422		2	max	5.678	4	.055	4	.034	1	.315	4	1.216	6	1.174	1	-.077	4
424			min	-5.523	6	-.055	6	.002	4	-.315	6	-1.216	4	.077	4	-1.174	1
425		3	max	5.666	4	0	1	0	1	.42	4	1.621	6	1.565	1	-.103	4
426			min	-5.523	6	0	1	0	1	-.42	6	-1.621	4	.103	4	-1.565	1
427		4	max	5.655	4	.055	6	-.002	4	.315	4	1.216	6	1.174	1	-.077	4
428			min	-5.524	6	-.055	4	-.034	1	-.315	6	-1.216	4	.077	4	-1.174	1
429		5	max	5.644	4	.11	6	-.004	4	0	1	0	1	0	1	0	1
430			min	-5.524	6	-.11	4	-.068	1	0	1	0	1	0	1	0	1
431	Mast1	1	max	19.303	4	.402	2	.222	6	.036	6	6.64	2	10.047	4	9.983	6
432			min	-18.212	6	-.004	6	-.22	4	-6.64	2	-.036	6	-9.983	6	-10.047	4
433		2	max	19.273	4	.38	2	.2	6	0	4	2.662	2	7.922	4	7.835	6
434			min	-18.242	6	-.004	6	-.198	4	-2.662	2	0	4	-7.835	6	-7.922	4
435		3	max	19.243	4	.359	2	.179	6	1.098	2	.039	6	6.015	4	5.906	6
436			min	-18.272	6	-.004	6	-.177	4	-.039	6	-1.098	2	-5.906	6	-6.015	4
437		4	max	17.551	4	.001	6	.12	4	2.472	2	.057	6	5.44	4	5.343	6
438			min	-16.605	6	-.2	2	-.127	6	-.057	6	-2.472	2	-5.343	6	-5.44	4
439		5	max	17.521	4	.001	6	.142	4	.33	2	.043	6	6.775	4	6.745	6
440			min	-16.635	6	-.221	2	-.149	6	-.043	6	-.33	2	-6.745	6	-6.775	4
441	Mast2	1	max	17.521	4	.001	6	.142	4	.33	2	.043	6	6.775	4	6.745	6
442			min	-16.635	6	-.221	2	-.149	6	-.043	6	-.33	2	-6.745	6	-6.775	4
443		2	max	13.396	4	.005	6	.172	6	.004	4	.83	2	6.729	4	6.723	6
444			min	-12.541	6	-.006	2	-.17	4	-.83	2	-.004	4	-6.723	6	-6.729	4
445		3	max	13.367	4	.005	6	.147	6	.027	6	1.006	2	5.209	4	5.183	6
446			min	-12.57	6	-.031	2	-.145	4	-1.006	2	-.027	6	-5.183	6	-5.209	4
447		4	max	9.132	4	.245	2	.209	6	.044	6	.05	2	3.504	4	3.487	6
448			min	-8.407	6	-.001	6	-.213	4	-.05	2	-.044	6	-3.487	6	-3.504	4
449		5	max	9.103	4	.22	2	.184	6	2.195	2	.014	3	1.565	4	1.59	6
450			min	-8.435	6	-.001	6	-.189	4	-.014	3	-2.195	2	-1.59	6	-1.565	4
451	Mast3	1	max	9.103	4	.22	2	.184	6	2.195	2	.014	3	1.565	4	1.59	6
452			min	-8.435	6	-.001	6	-.189	4	-.014	3	-2.195	2	-1.59	6	-1.565	4
453		2	max	4.401	4	0	3	.819	4	.019	6	1.353	2	4.347	4	4.383	6
454			min	-3.811	6	-1.022	2	-.816	6	-1.353	2	-.019	6	-4.383	6	-4.347	4
455		3	max	4.372	4	0	3	.846	4	.007	6	11.347	2	12.38	4	12.392	6
456			min	-3.84	6	-1.049	2	-.844	6	-11.347	2	-.007	6	-12.392	6	-12.38	4
457		4	max	.291	5	.414	2	.414	6	0	3	14.805	2	14.805	4	14.805	6
458			min	.224	4	0	3	-.414	4	-14.805	2	0	3	-14.805	6	-14.805	4
459		5	max	.256	5	.387	2	.387	6	0	3	10.943	2	10.943	4	10.943	6
460			min	.196	4	0	3	-.387	4	-10.943	2	0	3	-10.943	6	-10.943	4
461	Mast4	1	max	.256	3	.387	2	.387	6	0	3	10.943	2	10.943	4	10.943	6
462			min	.196	6	0	3	-.387	4	-10.943	2	0	3	-10.943	6	-10.943	4
463		2	max	.221	3	.354	2	.354	6	0	3	7.434	2	7.434	4	7.434	6
464			min	.167	6	0	3	-.354	4	-7.434	2	0	3	-7.434	6	-7.434	4
465		3	max	.186	3	.322	2	.322	6	0	3	4.229	2	4.229	4	4.229	6
466			min	.139	6	0	3	-.322	4	-4.229	2	0	3	-4.229	6	-4.229	4
467		4	max	.151	3	.291	2	.291	6	0	3	1.329	2	1.329	4	1.329	6

Envelope Member Section Stresses (Continued)

	Member	Sec		Axial[ksi]	LC	y Shear[...]	LC	z Shear[...]	LC	y-Top[ksi]	LC	y-Bot[ksi]	LC	z-Top[ksi]	LC	z-Bot[ksi]	LC
468			min	.111	6	0	3	-.291	4	-1.329	2	0	3	-1.329	6	-1.329	4
469		5	max	0	1	0	1	0	1	0	1	0	1	0	1	0	1
470			min	0	1	0	1	0	1	0	1	0	1	0	1	0	1
471	Horz 12	1	max	.961	6	.038	6	0	6	1.459	4	2.262	6	.267	6	.273	4
472			min	-.775	4	.024	1	-.002	2	-2.262	6	-1.459	4	-.273	4	-.267	6
473		2	max	.961	6	.023	6	0	6	1.897	4	1.803	6	.273	6	.276	4
474			min	-.775	4	.008	1	-.002	2	-1.803	6	-1.897	4	-.276	4	-.273	6
475		3	max	.961	6	.007	6	0	6	2.097	4	1.58	6	.279	6	.279	4
476			min	-.775	4	-.007	1	-.002	2	-1.58	6	-2.097	4	-.279	4	-.279	6
477		4	max	.961	6	-.009	6	0	6	2.061	4	1.594	6	.285	6	.282	4
478			min	-.775	4	-.023	1	-.002	2	-1.594	6	-2.061	4	-.282	4	-.285	6
479		5	max	.961	6	-.025	6	0	6	1.788	4	1.844	6	.291	6	.285	4
480			min	-.775	4	-.039	1	-.002	2	-1.844	6	-1.788	4	-.285	4	-.291	6

Envelope Joint Reactions

Joint			X [k]	LC	Y [k]	LC	Z [k]	LC	MX [k-ft]	LC	MY [k-ft]	LC	MZ [k-ft]	LC
1	BOTLEG1	max	5.261	6	253.734	6	19.977	6	583.471	6	.026	2	114.276	2
2		min	-14.829	2	-226.087	4	-19.993	4	-588.341	4	-.005	4	-30.205	6
3	BOTMAST	max	.047	6	494.169	4	2.84	6	91.048	6	.079	2	60.557	2
4		min	-5.142	2	-466.221	6	-2.812	4	-91.636	4	-.022	6	-.327	6
5	BOTLEG2	max	5.091	4	256.411	6	21.823	6	628.415	6	.026	2	113.218	2
6		min	-14.397	2	-224.159	4	-21.836	4	-632.149	4	-.016	6	-26.699	4
7	Totals:	max	0	4	60.369	3	44.64	6						
8		min	-34.369	2	43.923	6	-44.64	4						

Envelope Joint Displacements

Joint			X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation...LC	Y Rotation...LC	Z Rotation...LC			
1	1	max	.29	2	.019	4	.262	4	3.75e-3	4	3.841e-5	4	1.789e-4	6
2		min	-.057	6	-.021	6	-.26	6	-3.713e-3	6	-2.108e-4	2	-2.611e-3	2
3	2	max	.289	2	.019	4	.281	4	4.014e-3	4	1.251e-4	6	-3.304e-7	6
4		min	-.044	4	-.021	6	-.28	6	-3.986e-3	6	-2.076e-4	2	-2.605e-3	2
5	3	max	.488	2	.041	4	.942	4	6.593e-3	4	7.277e-5	4	5.487e-4	6
6		min	-.023	6	-.045	6	-.933	6	-6.517e-3	6	-5.646e-4	2	-5.788e-4	4
7	4	max	.488	2	.041	4	1.007	4	6.997e-3	4	3.043e-4	6	5.021e-4	4
8		min	-.016	6	-.046	6	-1	6	-6.943e-3	6	-5.555e-4	2	-4.944e-4	6
9	5	max	.487	2	.043	4	.984	4	6.877e-3	4	7.977e-5	4	1.011e-3	6
10		min	-.028	6	-.048	6	-.973	6	-6.798e-3	6	-6.372e-4	2	-1.044e-3	4
11	6	max	.487	2	.043	4	1.051	4	7.289e-3	4	3.41e-4	6	1.04e-3	4
12		min	-.011	6	-.048	6	-1.043	6	-7.233e-3	6	-6.269e-4	2	-1.045e-3	6
13	7	max	.473	2	.054	4	1.189	4	8.035e-3	4	1.025e-4	4	9.125e-4	6
14		min	-.066	6	-.059	6	-1.176	6	-7.938e-3	6	-9.671e-4	2	-9.168e-4	4
15	8	max	.472	2	.053	4	1.268	4	8.471e-3	4	4.992e-4	6	9.369e-4	4
16		min	-.03	4	-.059	6	-1.259	6	-8.406e-3	6	-9.513e-4	2	-9.605e-4	6
17	9	max	.542	2	.072	4	1.711	4	1.006e-2	4	1.759e-4	6	9.587e-4	4
18		min	-.038	6	-.079	6	-1.691	6	-9.921e-3	6	-1.71e-3	2	-1.409e-3	2
19	10	max	.543	2	.071	4	1.815	4	1.051e-2	4	7.762e-4	6	1.123e-3	6
20		min	-.008	6	-.079	6	-1.802	6	-1.043e-2	6	-1.681e-3	2	-1.444e-3	2
21	11	max	.624	2	.098	4	2.66	4	1.229e-2	4	4.129e-4	6	8.547e-4	6
22		min	-.028	6	-.107	6	-2.627	6	-1.21e-2	6	-2.805e-3	2	-1.261e-3	2



Company : Centek Engineering
 Designer : TJL/CFC
 Job Number : 14033.019
 Model Name : 82' Sign Structure with 111' Pipe Mast

Oct 31, 2014

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Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation...	LC	Y Rotation...	LC	Z Rotation...	LC
23	12	max	.625	2	.097	4	2.803	4	1.273e-2	4	1.145e-3	6	6.914e-4	4
24		min	-.027	6	-.108	6	-2.783	6	-1.268e-2	6	-2.757e-3	2	-1.196e-3	2
25	13	max	.633	2	.1	4	2.735	4	1.242e-2	4	4.308e-4	6	9.674e-4	6
26		min	-.034	6	-.109	6	-2.701	6	-1.222e-2	6	-2.882e-3	2	-1.339e-3	2
27	14	max	.633	2	.099	4	2.88	4	1.286e-2	4	1.17e-3	6	7.947e-4	4
28		min	-.022	6	-.11	6	-2.86	6	-1.281e-2	6	-2.834e-3	2	-1.247e-3	2
29	15	max	.657	2	.105	4	2.962	4	1.278e-2	4	4.865e-4	6	8.344e-4	6
30		min	-.052	6	-.115	6	-2.925	6	-1.257e-2	6	-3.115e-3	2	-1.285e-3	2
31	16	max	.654	2	.104	4	3.115	4	1.321e-2	4	1.243e-3	6	7.241e-4	4
32		min	-.007	6	-.116	6	-3.095	6	-1.317e-2	6	-3.062e-3	2	-1.131e-3	2
33	17	max	.837	2	.136	4	4.934	4	1.499e-2	4	1.156e-3	6	2.443e-4	4
34		min	-.042	6	-.149	6	-4.859	6	-1.465e-2	6	-5.234e-3	2	-2.243e-3	2
35	18	max	.833	2	.135	4	5.144	4	1.535e-2	4	1.754e-3	6	7.571e-4	6
36		min	-.036	6	-.15	6	-5.125	6	-1.542e-2	6	-5.14e-3	2	-2.214e-3	2
37	19	max	.851	2	.137	4	5.025	4	1.506e-2	4	1.185e-3	6	1.801e-4	4
38		min	-.041	6	-.15	6	-4.947	6	-1.471e-2	6	-5.324e-3	2	-2.386e-3	2
39	20	max	.846	2	.136	4	5.237	4	1.542e-2	4	1.775e-3	6	7.455e-4	6
40		min	-.04	6	-.152	6	-5.218	6	-1.55e-2	6	-5.228e-3	2	-2.355e-3	2
41	21	max	.895	2	.141	4	5.298	4	1.528e-2	4	1.273e-3	6	3.124e-4	6
42		min	-.044	6	-.155	6	-5.214	6	-1.491e-2	6	-5.584e-3	2	-2.359e-3	2
43	22	max	.891	2	.14	4	5.516	4	1.562e-2	4	1.838e-3	6	4.528e-4	6
44		min	-.052	6	-.156	6	-5.499	6	-1.572e-2	6	-5.494e-3	2	-2.461e-3	2
45	23	max	.948	2	.144	4	5.668	4	1.555e-2	4	1.424e-3	6	4.187e-4	6
46		min	-.054	6	-.159	6	-5.575	6	-1.516e-2	6	-6.028e-3	2	-2.039e-3	2
47	24	max	.947	2	.143	4	5.895	4	1.588e-2	4	1.94e-3	6	9.559e-5	6
48		min	-.057	6	-.16	6	-5.881	6	-1.601e-2	6	-5.944e-3	2	-2.115e-3	2
49	25	max	.96	2	.145	4	5.762	4	1.562e-2	4	1.462e-3	6	3.81e-4	6
50		min	-.057	6	-.16	6	-5.667	6	-1.522e-2	6	-6.139e-3	2	-2.009e-3	2
51	26	max	.959	2	.144	4	5.99	4	1.594e-2	4	1.966e-3	6	9.019e-5	6
52		min	-.058	6	-.161	6	-5.977	6	-1.608e-2	6	-6.056e-3	2	-2.028e-3	2
53	27	max	1.215	2	.163	4	7.962	4	1.691e-2	4	2.316e-3	6	3.22e-4	6
54		min	-.086	6	-.182	6	-7.805	6	-1.641e-2	6	-8.636e-3	2	-2.088e-3	2
55	28	max	1.204	2	.163	4	8.226	4	1.711e-2	4	2.539e-3	6	1.021e-4	4
56		min	-.074	6	-.183	6	-8.239	6	-1.734e-2	6	-8.589e-3	2	-2.131e-3	2
57	29	max	1.436	2	.165	4	9.73	4	1.775e-2	4	3.323e-3	6	6.15e-4	4
58		min	-.104	6	-.185	6	-9.519	6	-1.721e-2	6	-1.108e-2	2	-1.797e-3	2
59	30	max	1.436	2	.164	4	10.01	4	1.786e-2	4	2.961e-3	6	7.842e-4	6
60		min	-.103	6	-.186	6	-10.049	6	-1.813e-2	6	-1.106e-2	2	-1.886e-3	2
61	31	max	1.447	2	.165	4	9.837	4	1.779e-2	4	3.382e-3	6	7.184e-4	4
62		min	-.101	6	-.185	6	-9.623	6	-1.726e-2	6	-1.123e-2	2	-1.74e-3	2
63	32	max	1.447	2	.164	4	10.117	4	1.79e-2	4	2.986e-3	6	8.714e-4	6
64		min	-.108	6	-.187	6	-10.158	6	-1.818e-2	6	-1.121e-2	2	-1.801e-3	2
65	33	max	1.533	2	.166	4	10.864	4	1.827e-2	4	3.945e-3	6	9.758e-4	6
66		min	-.09	6	-.187	6	-10.619	6	-1.773e-2	6	-1.259e-2	2	-1.311e-3	2
67	34	max	1.532	2	.164	4	11.15	4	1.837e-2	4	3.222e-3	6	9.963e-4	4
68		min	-.134	6	-.189	6	-11.207	6	-1.864e-2	6	-1.259e-2	2	-1.244e-3	2
69	BOTLEG1	max	0	2	0	4	0	4	0	4	0	4	0	6
70		min	0	6	0	6	0	6	0	6	0	2	0	2
71	BOTLEG2	max	0	2	0	4	0	4	0	4	0	6	0	4
72		min	0	4	0	6	0	6	0	6	0	2	0	2
73	BOTMAST	max	0	2	0	6	0	4	0	4	0	6	0	6
74		min	0	6	0	4	0	6	0	6	0	2	0	2

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation...	LC	Y Rotation...	LC	Z Rotation...	LC
75	MC1	max	.323	2	.143	6	.813	4	6.409e-3	4	2.715e-6	6	6.684e-6	4
76		min	0	6	-.15	4	-.804	6	-6.328e-3	6	-9.761e-6	2	-1.359e-3	2
77	MC2	max	.442	2	.237	6	2.169	4	1.032e-2	4	4.652e-6	6	2.564e-5	4
78		min	-.002	4	-.25	4	-2.143	6	-1.02e-2	6	-1.66e-5	2	-5.477e-4	2
79	MC3	max	.578	2	.309	6	4.209	4	1.407e-2	4	6.438e-6	6	2.023e-5	4
80		min	-.007	4	-.326	4	-4.163	6	-1.394e-2	6	-2.294e-5	2	-1.137e-3	2
81	MC4	max	.749	2	.356	6	6.697	4	1.565e-2	4	7.909e-6	6	7.974e-6	4
82		min	-.009	4	-.378	4	-6.629	6	-1.552e-2	6	-2.814e-5	2	-4.272e-4	2
83	MC5	max	.977	2	.378	6	9.576	4	2.108e-2	4	8.796e-6	6	5.906e-6	4
84		min	-.01	4	-.403	4	-9.489	6	-2.097e-2	6	-3.13e-5	2	-4.621e-3	2
85	TOPLEG1	max	1.552	2	.166	4	11.14	4	1.839e-2	4	4.095e-3	6	1.254e-3	6
86		min	-.111	6	-.187	6	-10.887	6	-1.786e-2	6	-1.302e-2	2	-1.323e-3	4
87	TOPLEG2	max	1.55	2	.164	4	11.427	4	1.849e-2	4	3.315e-3	6	1.385e-3	4
88		min	-.116	6	-.189	6	-11.488	6	-1.876e-2	6	-1.302e-2	2	-1.173e-3	6
89	TOPMAST	max	6.846	2	.376	6	22.777	4	3.31e-2	4	8.796e-6	6	5.906e-6	4
90		min	-.012	4	-.406	4	-22.64	6	-3.299e-2	6	-3.13e-5	2	-1.664e-2	2
91	TOPPLT1	max	.483	2	.036	4	.865	4	5.994e-3	4	5.869e-5	4	2.828e-4	4
92		min	-.023	6	-.04	6	-.856	6	-5.927e-3	6	-4.196e-4	2	-9.029e-4	2
93	TOPPLT2	max	.482	2	.036	4	.925	4	6.378e-3	4	2.308e-4	6	5.134e-4	6
94		min	-.015	6	-.041	6	-.918	6	-6.329e-3	6	-4.129e-4	2	-9.209e-4	2
95	T MOBILE	max	6.147	2	.376	6	21.387	4	3.31e-2	4	8.796e-6	6	5.906e-6	4
96		min	-.012	4	-.406	4	-21.255	6	-3.299e-2	6	-3.13e-5	2	-1.664e-2	2
97	METRO	max	1.467	2	.165	4	10.051	4	1.789e-2	4	3.501e-3	6	7.897e-4	4
98		min	-.094	6	-.186	6	-9.83	6	-1.735e-2	6	-1.151e-2	2	-1.644e-3	2
99	METRO2	max	1.467	2	.164	4	10.332	4	1.8e-2	4	3.036e-3	6	9.239e-4	6
100		min	-.119	6	-.187	6	-10.377	6	-1.827e-2	6	-1.15e-2	2	-1.661e-3	2
101	FC1	max	.421	2	.212	6	1.747	4	9.127e-3	4	4.141e-6	6	2.247e-5	4
102		min	-.001	4	-.224	4	-1.726	6	-9.01e-3	6	-1.48e-5	2	-5.069e-4	2
103	FC2	max	.719	2	.344	6	6.019	4	1.546e-2	4	7.521e-6	6	9.632e-6	4
104		min	-.008	4	-.365	4	-5.957	6	-1.533e-2	6	-2.677e-5	2	-8.844e-4	2
105	FC3	max	1.96	2	.377	6	12.558	4	2.75e-2	4	8.796e-6	6	5.906e-6	4
106		min	-.011	4	-.404	4	-12.458	6	-2.739e-2	6	-3.13e-5	2	-1.104e-2	2
107	GPS	max	.807	2	.133	4	4.711	4	1.479e-2	4	1.085e-3	6	3.582e-4	4
108		min	-.044	6	-.145	6	-4.64	6	-1.447e-2	6	-5.008e-3	2	-1.793e-3	2

Envelope AISC ASD Steel Code Checks

Me...	Shape	Code Check	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Fa ...Ft [...]	Fb y-y [ksi]	FbC...C...AS...
1	CR... L5x5x5	.092	15.207	2	.011	15.207	z	4	17...28...	- Code check ba...	H2-1
2	CR... L5x5x5	.159	15.207	2	.011	15.207	z	6	17...28...	- Code check ba...	H1-1
3	CR... L5x5x5	.152	15.207	2	.011	15.207	z	6	17...28...	- Code check ba...	H2-1
4	CR... L5x5x5	.249	15.207	2	.010	15.207	z	4	17...28...	- Code check ba...	H1-1
5	CR... L3.5x3...	.531	0	6	.011	0	z	4	7.1...28...	- Code check ba...	H1-1
6	CR... L3.5x3...	.967	18.916	2	.011	0	z	6	7.1...28...	- Code check ba...	H1-1
7	CR... L5x5x5	.304	33.126	2	.019	0	z	4	1.2...28...	- Code check ba...	H2-1
8	CR... L5x5x5	.054	0	4	.020	0	z	4	1.2...28...	- Code check ba...	H2-1
9	HO... L5x5x5	.115	0	4	.008	13.509	z	6	18...28...	- Code check ba...	H1-1
10	HO... L5x5x5	.117	13.509	4	.008	13.509	z	6	18...28...	- Code check ba...	H1-1
11	HO... L5x5x5	.057	0	4	.008	13.509	z	6	18...28...	- Code check ba...	H1-1
12	HO... L5x5x5	.070	13.509	4	.008	13.509	z	6	18...28...	- Code check ba...	H1-1
13	HO... L5x5x5	.038	0	4	.008	13.509	z	6	18...28...	- Code check ba...	H1-1



Company : Centek Engineering
 Designer : TJL/CFC
 Job Number : 14033.019
 Model Name : 82' Sign Structure with 111' Pipe Mast

Oct 31, 2014

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Envelope AISC ASD Steel Code Checks (Continued)

	Me...	Shape	Code Check	Loc[ft]	LC	Shear ...	Loc[ft]	Dir	LC	Fa ...Ft [...]	Fb y-y [ksi]	FbC...C...AS...
14	HO...	L5x5x5	.127	13.509	2	.008	13.509	z	6	18...28...	- Code check ba...	H1-1
15	HO...	L5x5x5	.032	13.509	2	.009	13.509	z	6	18...28...	- Code check ba...	H2-1
16	HO...	L5x5x5	.069	13.509	2	.008	13.509	z	6	18...28...	- Code check ba...	H1-1
17	HO...	L5x5x5	.041	0	6	.009	13.509	z	6	18...28...	- Code check ba...	H1-1
18	HO...	L5x5x5	.042	13.509	2	.009	13.509	z	6	18...28...	- Code check ba...	H1-1
19	HO...	TU8X4X5	.089	0	6	.024	13.5	y	2	36...36...	40.47	40...85.85H1-2
20	LEG1	W24x68	.945	.625	6	.061	0	y	4	39...39...	49.987	36...93.85H1-2
21	LEG2	W24x68	.992	.625	6	.068	0	y	4	39...39...	49.987	37.5...85H1-2
22	LEG..	new	.475	0	6	.080	0	y	4	35...39...	49.987	39...85H1-2
23	LEG..	new	.497	0	6	.088	0	y	4	35...39...	49.987	39...85H1-2
24	WT1	WT6x15	.215	5.045	6	.007	0	y	4	19...39...	28.322	28...1 1 1 H1-1
25	WT2	WT6x15	.318	5.256	2	.006	10.091	y	4	19...39...	28.322	28...1 1 1 H1-1
26	WT3	WT6x15	.364	4.835	2	.005	0	y	6	19...39...	28.322	28...1 1 1 H1-1
27	WT4	WT6x15	.233	4.94	4	.005	10.091	y	4	19...39...	28.322	28...1 1 1 H1-1
28	WT5	WT6x15	.545	5.045	6	.007	0	y	6	19...39...	28.322	28...1 1 1 H1-1
29	WT6	WT6x15	.608	5.045	6	.006	0	y	4	19...39...	28.322	28...1 1 1 H1-1
30	WT7	WT6x15	.397	4.94	4	.007	0	y	6	19...39...	28.322	28...1 1 1 H1-1
31	WT8	WT6x15	.445	4.94	4	.006	10.091	y	4	19...39...	28.322	28...1 1 1 H1-1
32	WT9	WT6x15	.575	5.045	6	.006	0	y	2	19...39...	28.322	28...1 1 1 H1-1
33	WT10	WT6x15	.526	5.045	6	.007	0	z	2	19...39...	28.322	28...1 1 1 H1-1
34	WT11	WT6x15	.447	5.151	4	.006	10.091	y	6	19...39...	28.322	28...1 1 1 H1-1
35	WT12	WT6x15	.482	4.94	4	.006	10.091	z	2	19...39...	28.322	28...1 1 1 H1-1
36	WT13	WT6x15	.466	5.045	6	.010	10.091	z	2	19...39...	28.322	28...1 1 1 H1-1
37	WT14	WT6x15	.464	5.045	6	.010	0	y	2	19...39...	28.322	28...1 1 1 H1-1
38	WT15	WT6x15	.646	4.94	4	.008	10.091	y	2	19...39...	28.322	28...1 1 1 H1-1
39	WT16	WT6x15	.662	4.94	4	.009	0	z	2	19...39...	28.322	28...1 1 1 H1-1
40	WT17	WT6x15	.695	5.045	6	.012	0	z	2	19...39...	28.322	28...1 1 1 H1-1
41	WT18	WT6x15	.698	5.045	6	.011	0	y	2	19...39...	28.322	28...1 1 1 H1-1
42	WT19	WT6x15	.294	4.94	4	.015	0	y	2	19...39...	28.322	28...1 1 1 H1-1
43	WT20	WT6x15	.312	4.94	4	.015	10.091	z	2	19...39...	28.322	28...1 1 1 H1-1
44	Mast1	HSS18...	.847	0	4	.018	0		2	29...33...	36.951	36...1.85...H1-2
45	Mast2	HSS18...	.724	3.438	4	.012	17.474		2	33...33...	36.951	36...85.87H1-2
46	Mast3	HSS18...	.576	17.188	4	.048	17.188		2	31...33...	36.951	36...85...H1-2
47	Mast4	HSS18...	.302	0	2	.017	0		2	28...33...	36.951	36...6.85H1-2
48	Horz..	TU8X4X5	.089	0	6	.024	13.5	y	2	36...36...	40.47	40...85H1-2



Company : Centek Engineering
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Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	1	BOTLEG1	-12.506	-106.75	-1.299	48.703	.023	96.638
2	1	BOTMAST	-4.369	17.764	-.03	-.828	.068	51.429
3	1	BOTLEG2	-12.265	149.356	1.33	-53.602	.022	96.366
4	1	Totals:	-29.139	60.369	0			
5	1	COG (ft):	X: 8.303	Y: 51.932	Z: .977			



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Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	2	BOTLEG1	-14.829	-132.935	-1.502	58.409	.026	114.276
2	2	BOTMAST	-5.142	13.692	-.039	-.861	.079	60.557
3	2	BOTLEG2	-14.397	163.166	1.541	-63.069	.026	113.218
4	2	Totals:	-34.369	43.923	0			
5	2	COG (ft):	X: 8.559	Y: 51.343	Z: 1.06			



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Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	3	BOTLEG1	-4.337	-188.556	-17.282	-509.246	-.004	24.809
2	3	BOTMAST	-.028	432.145	-2.437	-79.288	.009	.237
3	3	BOTLEG2	4.365	-183.22	-18.784	-544.92	.01	-22.911
4	3	Totals:	0	60.369	-38.503			
5	3	COG (ft):	X: 7.381	Y: 51.932	Z: .977			



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Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	4	BOTLEG1	-5.055	-226.087	-19.993	-588.341	-.005	28.949
2	4	BOTMAST	-.036	494.169	-2.812	-91.636	.011	.268
3	4	BOTLEG2	5.091	-224.159	-21.836	-632.149	.012	-26.699
4	4	Totals:	0	43.923	-44.64			
5	4	COG (ft):	X: 7.102	Y: 51.343	Z: 1.06			



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Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	5	BOTLEG1	4.594	225.297	17.269	504.166	.001	-26.276
2	5	BOTMAST	.039	-396.169	2.46	78.515	-.018	-.245
3	5	BOTLEG2	-4.633	231.242	18.774	540.789	-.013	24.447
4	5	Totals:	0	60.369	38.503			
5	5	COG (ft):	X: 7.381	Y: 51.932	Z: .977			



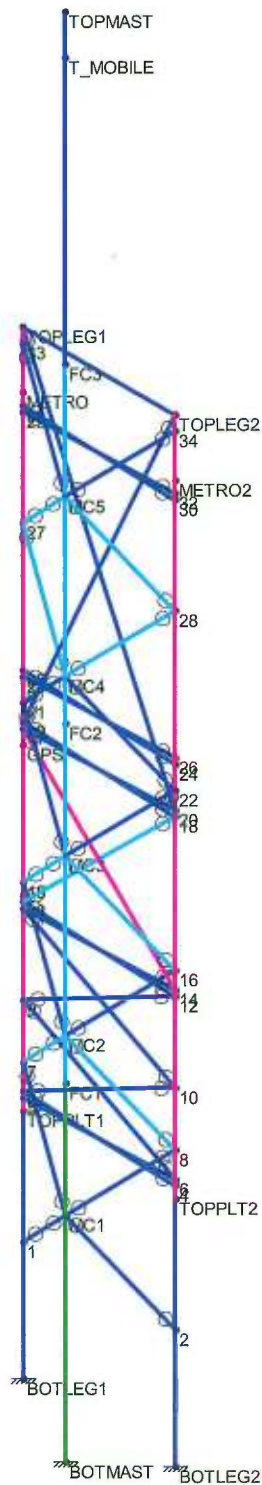
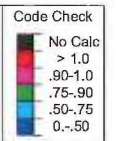
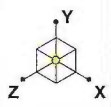
Company : Centek Engineering
Designer : TJL/CFC
Job Number : 14033.019
Model Name : 82' Sign Structure with 111' Pipe Mast

Oct 31, 2014

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Joint Reactions

	LC	Joint Label	X [k]	Y [k]	Z [k]	MX [k-ft]	MY [k-ft]	MZ [k-ft]
1	6	BOTLEG1	5.261	253.734	19.977	583.471	0	-30.205
2	6	BOTMAST	.047	-466.221	2.84	91.048	-.022	-.327
3	6	BOTLEG2	-5.308	256.411	21.823	628.415	-.016	27.873
4	6	Totals:	0	43.923	44.64			
5	6	COG (ft):	X: 7.102	Y: 51.343	Z: 1.06			



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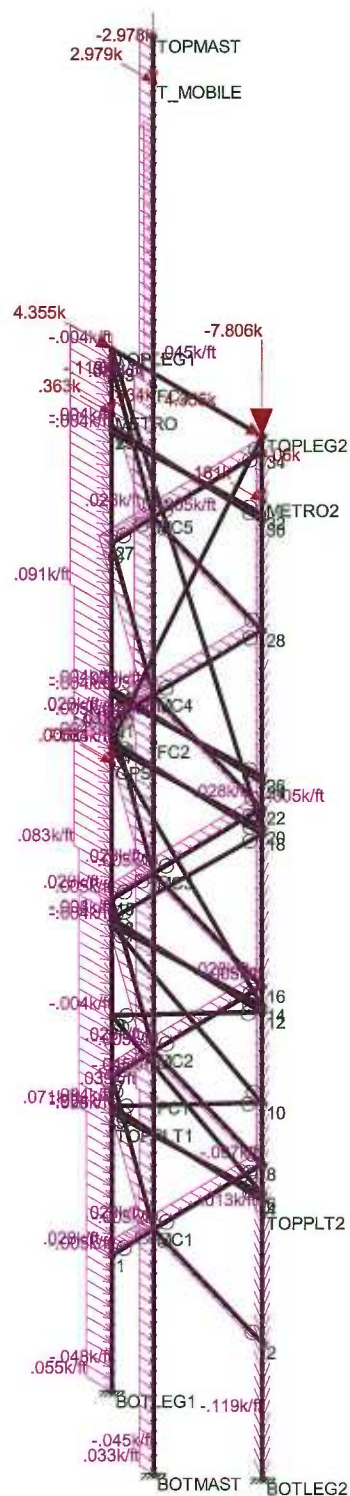
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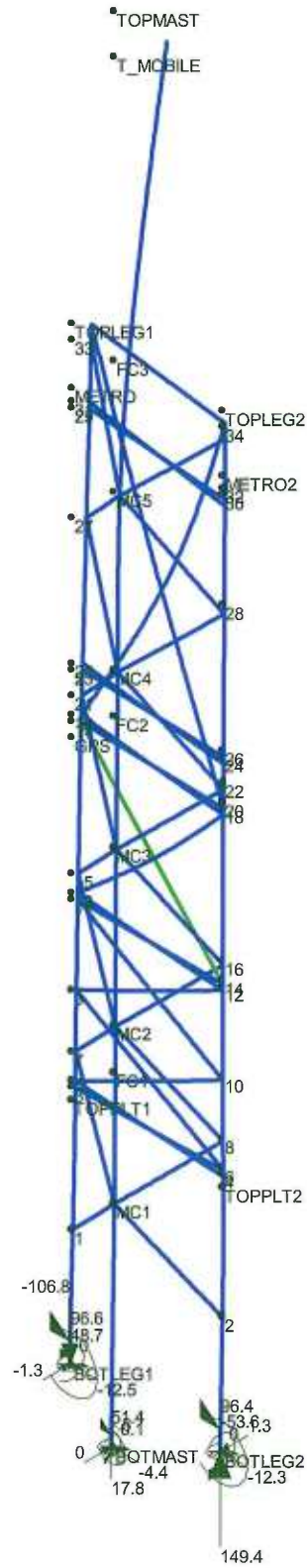
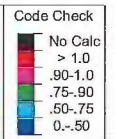
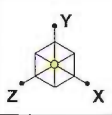
82' Sign Structure with 111' Pipe Mast

Unity Check

Oct 31, 2014 at 10:21 AM

82' Sign Structure.r3d





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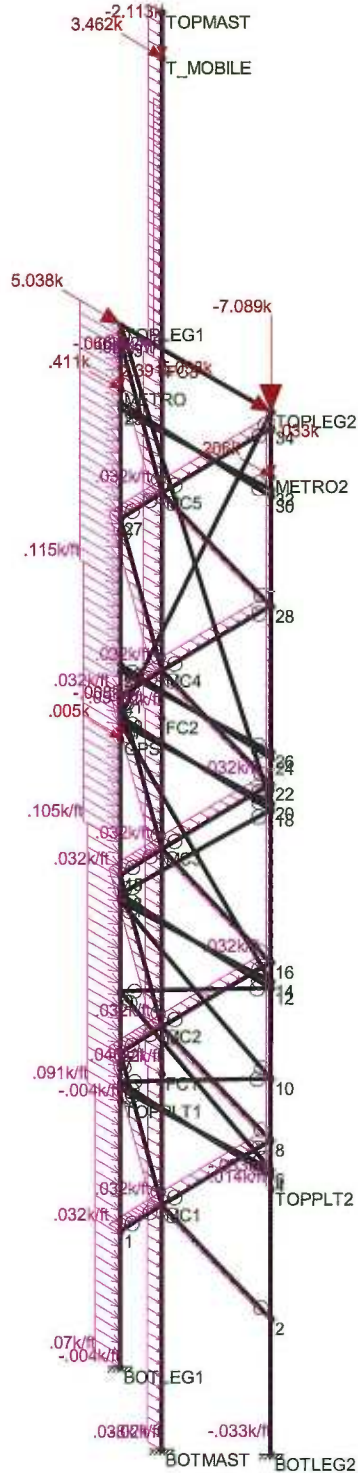
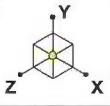
TJL/CFC

14033.019

82' Sign Structure with 111' Pipe Mast
LC #1 Reactions and Deflected Shape

Oct 31, 2014 at 10:17 AM

82' Sign Structure.r3d



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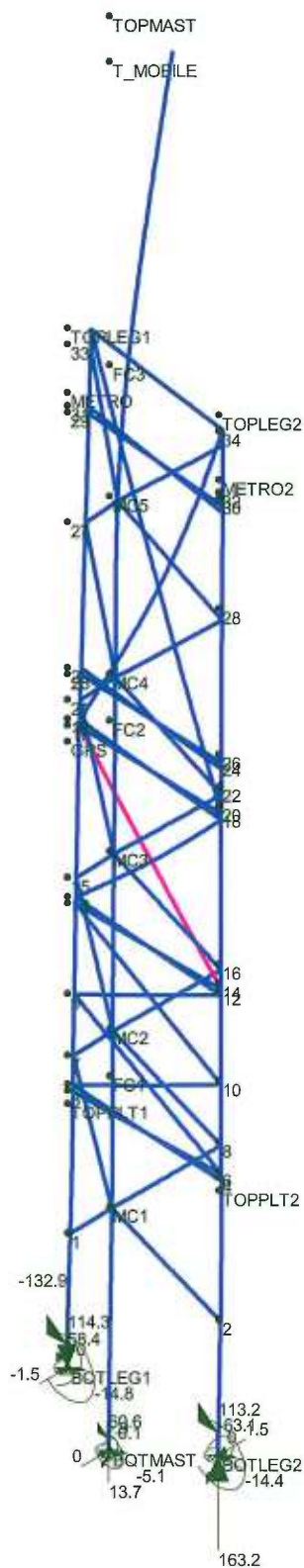
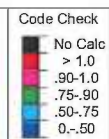
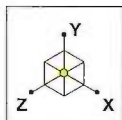
14033.019

82' Sign Structure with 111' Pipe Mast

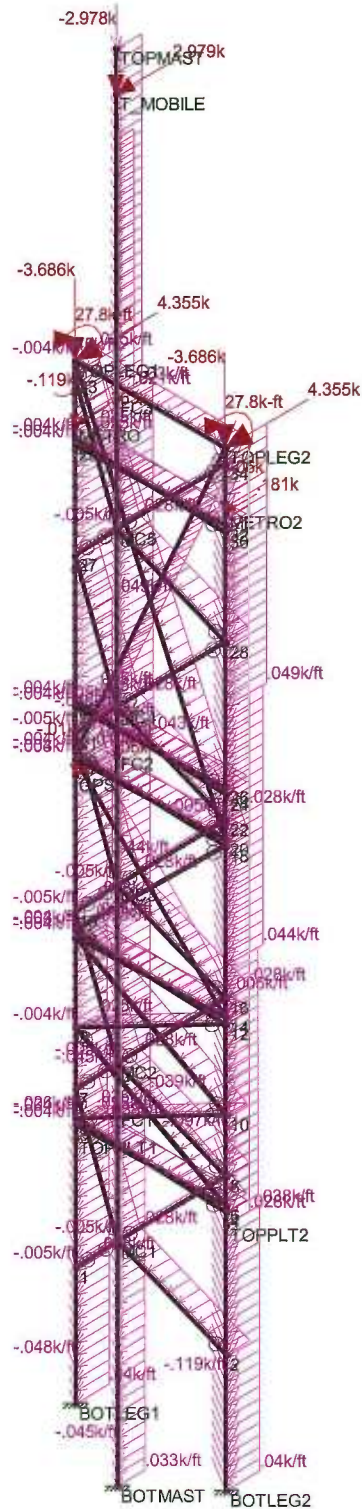
LC #2 Loads

Oct 31, 2014 at 10:14 AM

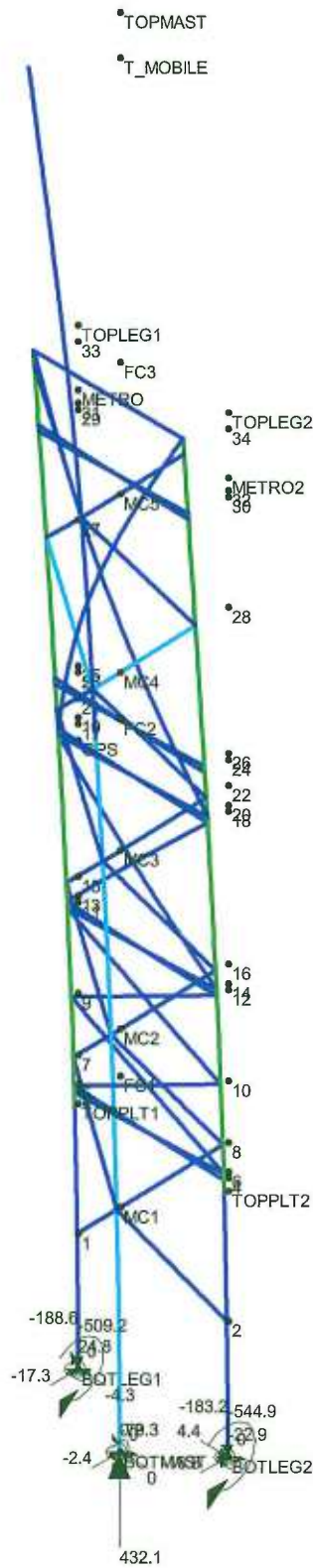
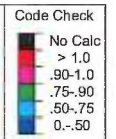
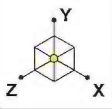
82' Sign Structure.r3d



Centek Engineering	82' Sign Structure with 111' Pipe Mast LC #2 Reactions and Deflected Shape	
TJL/CFC		Oct 31, 2014 at 10:17 AM
14033.019		82' Sign Structure.r3d



Centek Engineering	82' Sign Structure with 111' Pipe Mast LC #3 Loads	
TJL/CFC		Oct 31, 2014 at 10:14 AM
14033.019		82' Sign Structure.r3d



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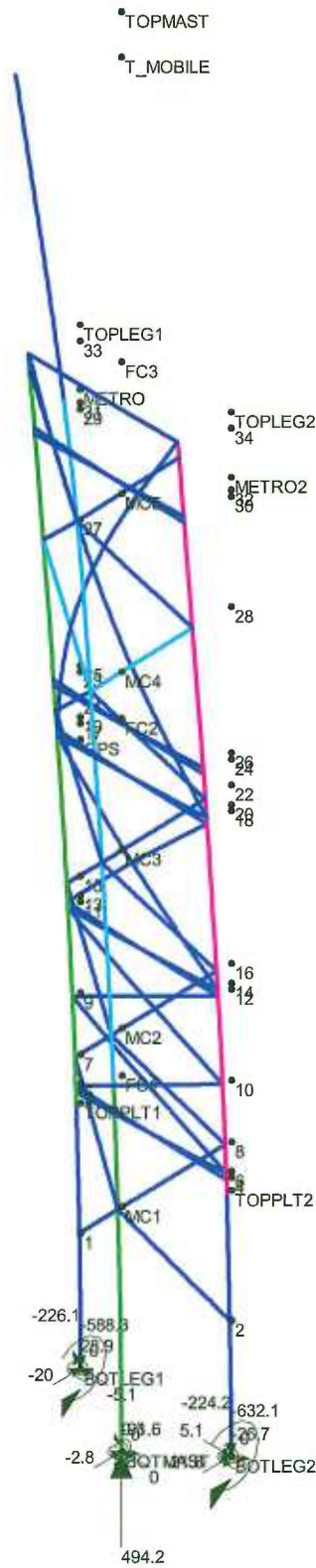
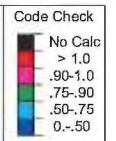
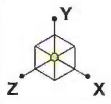
TJL/CFC

14033.019

82' Sign Structure with 111' Pipe Mast
LC #3 Reactions and Deflected Shape

Oct 31, 2014 at 10:19 AM

82' Sign Structure.r3d



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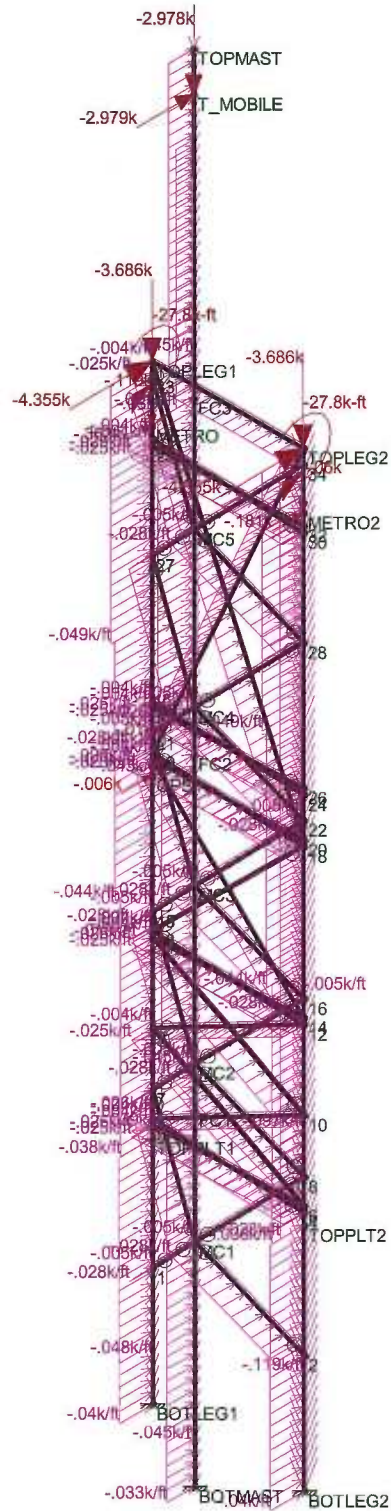
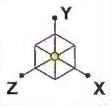
TJL/CFC

14033.019

82' Sign Structure with 111' Pipe Mast
LC #4 Reactions and Deflected Shape

Oct 31, 2014 at 10:19 AM

82' Sign Structure.r3d



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TJL/CFC

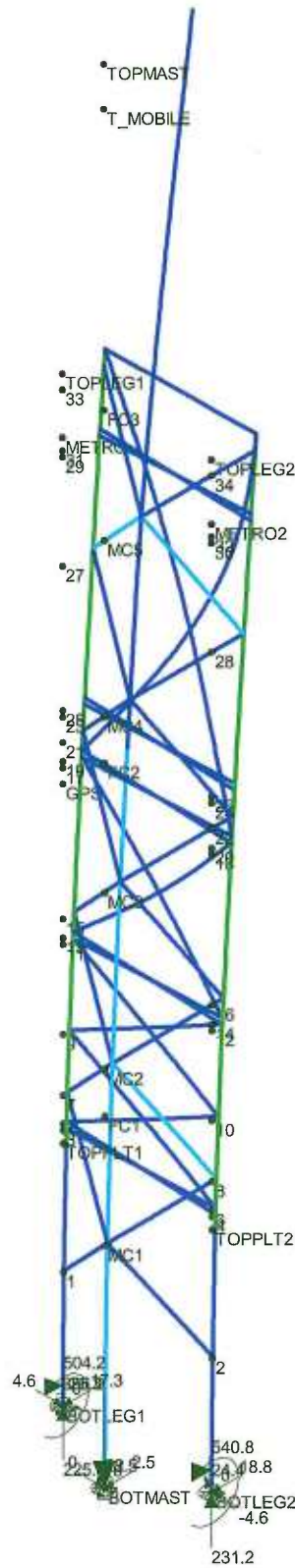
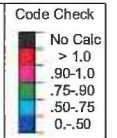
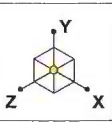
14033.019

82' Sign Structure with 111' Pipe Mast

LC #5 Loads

Oct 31, 2014 at 10:14 AM

82' Sign Structure.r3d



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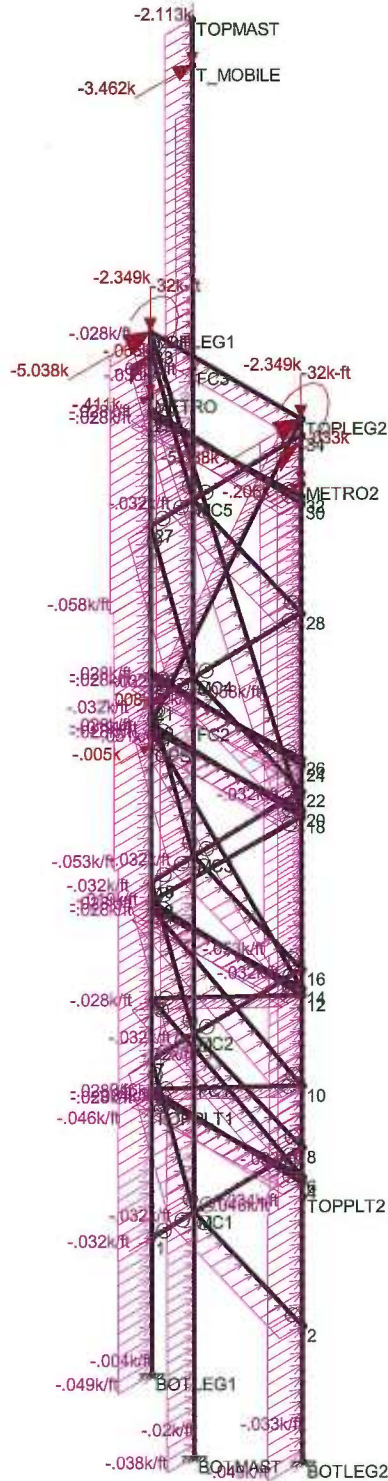
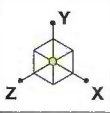
TJL/CFC

14033.019

82' Sign Structure with 111' Pipe Mast
LC #5 Reactions and Deflected Shape

Oct 31, 2014 at 10:20 AM

82' Sign Structure.r3d



Centek Engineering

TJL/CFC

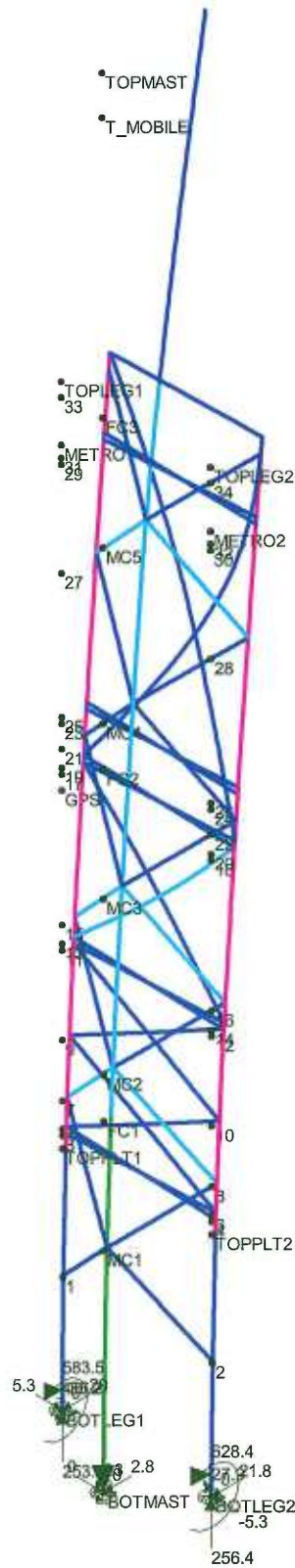
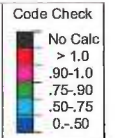
14033.019

82' Sign Structure with 111' Pipe Mast

LC #6 Loads

Oct 31, 2014 at 10:14 AM

82' Sign Structure.r3d



Centek Engineering	82' Sign Structure with 111' Pipe Mast LC #6 Reactions and Deflected Shape	
TJL/CFC		Oct 31, 2014 at 10:20 AM
14033.019		82' Sign Structure.r3d

Beam: **Mast2**

Shape: **HSS18X0.5**

Material: **A500 Gr.42**

Length: **27.5 ft**

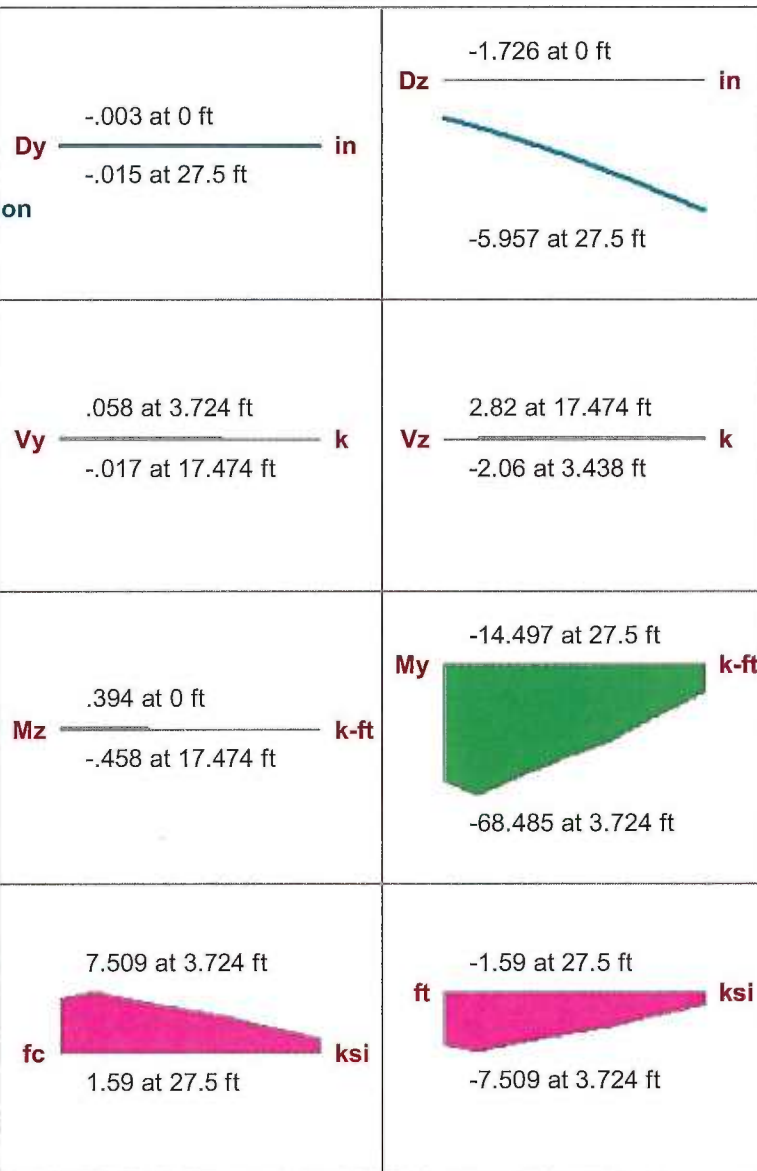
I Joint: **FC1**

J Joint: **FC2**

LC 6: TIA/EIA Wind in -Z' Direction

Code Check: **0.698 (bending)**

Report Based On 97 Sections



AISC 9th: ASD Code Check

Max Bending Check **0.698**

Location **3.438 ft**

Equation **H2-1**

Max Shear Check

0.010 (s)

Location

17.474 ft

Max Defl Ratio

L/78

Compact

Allowables Increase: **1.333**

Fy **42 ksi**

Fa **33.084 ksi**

Ft **33.592 ksi**

Fby **36.951 ksi**

Fbz **36.951 ksi**

Fvy **22.394 ksi**

Fvz **22.394 ksi**

Cb **1**

y-y

Cm **.85**

Lb **3.625 ft**

KL/r **7.013**

Sway **No**

L Comp Flange **27.5 ft**

Warp Length **NC**

z-z

.941

3.625 ft

7.013

No

Anchor Bolt and Base Plate Analysis:**Input Data:**Tower Reactions:

Overturning Moment =	OM := 91.1-ft-kips	(Input From Risa-3D LC #6)
Shear Force =	Shear := 3-kips	(Input From Risa-3D LC #6)
Axial Force =	Axial := -467-kips	(Input From Risa-3D LC #6)

Anchor Bolt Data:

Use ASTM A615 Grade 75	
Number of Anchor Bolts =	N := 10
Diameter of Bolt Circle =	D _{bc} := 24-in
Bolt "Column" Distance =	l := 3-in
Bolt Ultimate Strenght =	F _u := 100-ksi
Bolt Yeld Strenght =	F _y := 75-ksi
Bolt Modulus =	E := 29000-ksi
Diameter of Anchor Bolts =	D := 1.75-in
Threads per Inch =	n := 5

Base Plate Data:

Use ASTM A572 Mod 50	
Plate Yield Strength =	F _{ybp} := 50-ksi
Base Plate Thickness =	t _{bp} := 2.0-in
Base Plate Diameter =	D _{bp} := 30-in
Outer Pole Diameter =	D _{pole} := 18-in

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 12\text{-in}$

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

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

$d_1 = 7.05\text{-in}$	$d_6 = -7.05\text{-in}$
$d_2 = 11.41\text{-in}$	$d_7 = -11.41\text{-in}$
$d_3 = 11.41\text{-in}$	$d_8 = -11.41\text{-in}$
$d_4 = 7.05\text{-in}$	$d_9 = -7.05\text{-in}$
$d_5 = 0.00\text{-in}$	$d_{10} = -0.00\text{-in}$

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 9\text{-in}$

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

$MA_1 = 0.00\text{-in}$	$MA_6 = 0.00\text{-in}$
$MA_2 = 2.41\text{-in}$	$MA_7 = 0.00\text{-in}$
$MA_3 = 2.41\text{-in}$	$MA_8 = 0.00\text{-in}$
$MA_4 = 0.00\text{-in}$	$MA_9 = 0.00\text{-in}$
$MA_5 = 0.00\text{-in}$	$MA_{10} = 0.00\text{-in}$

Effective Width of Baseplate for Bending =

$$W_{eff} := .9 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2}\right)^2 - \left(\frac{D_{pole}}{2}\right)^2} = 21.6\text{-in}$$

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia =	$I_p := \sum_i (d_i)^2 = 720 \cdot \text{in}^2$
Gross Area of Bolt =	$A_g := \frac{\pi}{4} \cdot D^2 = 2.405 \cdot \text{in}^2$
Net Area of Bolt =	$A_n := \frac{\pi}{4} \left(D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 = 1.899 \cdot \text{in}^2$
Net Diameter =	$D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 1.555 \cdot \text{in}$
Radius of Gyration of Bolt =	$r := \frac{D_n}{4} = 0.389 \cdot \text{in}$
Section Modulus of Bolt =	$S_x := \frac{\pi \cdot D_n^3}{32} = 0.369 \cdot \text{in}^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force =	$T_{\text{Max}} := OM \cdot \frac{R_{bc}}{I_p} - \frac{\text{Axial}}{N} = 64.9 \cdot \text{kips}$	
Allowable Tensile Force =	$T_{\text{ALL.Gross}} := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) = 105.8 \cdot \text{kips}$	(1.333 increase allowed per TIA/EIA)
	$T_{\text{ALL.Net}} := 1.333 \cdot (0.60 \cdot A_n \cdot F_y) = 113.939 \cdot \text{kips}$	(1.333 increase allowed per TIA/EIA)
Bolt Tension % of Capacity =	$\frac{T_{\text{Max}}}{T_{\text{ALL.Net}}} = 57.0\%$	Bolts are "upset bolts". Use net area per AISC
Condition1 =	$\text{Condition1} := \text{if} \left(\frac{T_{\text{Max}}}{T_{\text{ALL.Net}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$	

Condition1 = "OK"

Check Anchor Bolt Bending Stress:

Maximum Bending Moment =	$M_x := \left(\frac{\text{Shear}}{N} \right) \cdot l = 0.075 \cdot \text{ft-kips}$	
Maximum Bending Stress =	$f_{bx} := \frac{M_x}{S_x} = 2.4 \cdot \text{ksi}$	
Allowable Bending Stress =	$F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 60 \cdot \text{ksi}$	(1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required."

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \text{ in}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0 \text{ ksi}$$

Check Anchor Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{l_p} + \frac{Axial}{N} = -28.5 \text{ kips}$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = -15 \text{ ksi}$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 87.364$$

$$F_a := \begin{cases} \frac{\left[1 - \frac{\left(\frac{K \cdot l}{r} \right)^2}{2 \cdot C_c^2} \right] \cdot F_y}{\frac{5}{3} + \frac{3 \left(\frac{K \cdot l}{r} \right)}{8 \cdot C_c} - \frac{\left(\frac{K \cdot l}{r} \right)^3}{8 \cdot C_c^3}} & \text{if } \frac{K \cdot l}{r} \leq C_c \\ \frac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r} \right)^2} & \text{if } \frac{K \cdot l}{r} > C_c \end{cases} = 45 \text{ ksi}$$

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 60 \text{ ksi} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \right) = -25.0 \%$$

Condition 2 =

$$\text{Condition2} := \text{if } \left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \right) \leq 1.00, \text{"OK"}, \text{"Overstressed"}$$

Condition2 = "OK"

Base Plate Analysis:

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

$C_1 = 57.4 \text{ kips}$	$C_6 = 36.0 \text{ kips}$
$C_2 = 64.0 \text{ kips}$	$C_7 = 29.4 \text{ kips}$
$C_3 = 64.0 \text{ kips}$	$C_8 = 29.4 \text{ kips}$
$C_4 = 57.4 \text{ kips}$	$C_9 = 36.0 \text{ kips}$
$C_5 = 46.7 \text{ kips}$	$C_{10} = 46.7 \text{ kips}$

Maximum Bending Stress in Plate =
$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot M A_i}{(W_{eff} t_{bp}^2)} = 21.5 \text{ ksi}$$

Allowable Bending Stress in Plate =
$$F_{bp} := 1.33 \cdot 0.75 \cdot F_y = 49.9 \text{ ksi}$$

Plate Bending Stress % of Capacity =
$$\frac{f_{bp}}{F_{bp}} = 43. \%$$

Condition3 =
$$\text{Condition3} := \text{if} \left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"} \right)$$

Condition3 = "Ok"

Flange Bolt and Plate Analysis:**Input Data:**Tower Reactions:

Overturning Moment =	OM := 68.5-ft-kips	(Input From Risa-3D LC #6)
Shear Force =	Shear := 3-kips	(Input From Risa-3D LC #6)
Axial Force =	Axial := -427-kips	(Input From Risa-3D LC #6)

Flange Bolt Data:

Use ASTM A325

Number of Flange Bolts =	N := 20
Diameter of Bolt Circle =	D _{bc} := 21.0-in
Bolt "Column" Distance =	l := .125-in
Bolt Ultimate Strenght =	F _u := 120-ksi
Bolt Yield Strenght =	F _y := 92-ksi
Bolt Modulus =	E := 29000-ksi
Diameter of Flange Bolts =	D := 1.00-in
Threads per Inch =	n := 8

Plate Data:

Use ASTM A572 Mod 50

Plate Yield Strength =	F _{ybp} := 50-ksi
Plate Thickness =	t _{bp} := 1.25-in
Plate Diameter =	D _{bp} := 24.00-in
Outer Pole Diameter =	D _{pole} := 18.00-in

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

Radius of Bolt Circle =: $R_{bc} := \frac{D_{bc}}{2} = 10.5 \text{ in}$

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

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

$d_1 = 3.24 \text{ in}$	$d_6 = 9.99 \text{ in}$
$d_2 = 6.17 \text{ in}$	$d_7 = 8.49 \text{ in}$
$d_3 = 8.49 \text{ in}$	$d_8 = 6.17 \text{ in}$
$d_4 = 9.99 \text{ in}$	$d_9 = 3.24 \text{ in}$
$d_5 = 10.50 \text{ in}$	$d_{10} = 0.00 \text{ in}$

Critical Distances For Bending in Plate:

Outer Pole Radius = $R_{pole} := \frac{D_{pole}}{2} = 9 \text{ in}$

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

$MA_1 = 0.00 \text{ in}$	$MA_6 = 0.99 \text{ in}$
$MA_2 = 0.00 \text{ in}$	$MA_7 = 0.00 \text{ in}$
$MA_3 = 0.00 \text{ in}$	$MA_8 = 0.00 \text{ in}$
$MA_4 = 0.99 \text{ in}$	$MA_9 = 0.00 \text{ in}$
$MA_5 = 1.50 \text{ in}$	$MA_{10} = 0.00 \text{ in}$

Effective Width of plate for Bending =

$$W_{eff} := .8 \cdot 2 \cdot \sqrt{\left(\frac{D_{bp}}{2} \right)^2 - \left(\frac{D_{pole}}{2} \right)^2} = 12.7 \text{ in}$$

Flange Bolt Analysis:

Calculated Flange Bolt Properties:

Polar Moment of Inertia = $I_p := \sum (d_i)^2 = 1102.5 \cdot \text{in}^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D^2 = 0.785 \cdot \text{in}^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D - \frac{0.9743 \cdot \text{in}}{n} \right)^2 = 0.606 \cdot \text{in}^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 0.878 \cdot \text{in}$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.22 \cdot \text{in}$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.066 \cdot \text{in}^3$

Check Flange Bolt Tension Force:

Maximum Tensile Force = $T_{\text{Max}} := OM \cdot \frac{R_{bc}}{I_p} - \frac{\text{Axial}}{N} = 29.2 \cdot \text{kips}$

Allowable Tensile Force = $T_{\text{ALL.Gross}} := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) = 41.5 \cdot \text{kips}$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{\text{Max}}}{T_{\text{ALL.Gross}}} = 70.4 \cdot \%$

Condition1 = $\text{Condition1} := \text{if} \left(\frac{T_{\text{Max}}}{T_{\text{ALL.Gross}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$

Condition1 = "OK"

Check Flange Bolt Bending Stress:

Maximum Bending Moment = $M_x := \left(\frac{\text{Shear}}{N} \right) \cdot l = 1.562 \times 10^{-3} \cdot \text{ft} \cdot \text{kips}$

Maximum Bending Stress = $f_{bx} := \frac{M_x}{S_x} = 0.3 \cdot \text{ksi}$

Allowable Bending Stress = $F_{bx} := 1.333 \cdot 0.6 \cdot F_y = 73.6 \cdot \text{ksi}$ (1.333 increase allowed per TIA/EIA)

Check Combined Stress Requirement:

Per ASCE Manual 72: "If the clearance between the base plate and concrete does not exceed two times the bolt diameter a bending stress analysis of the bolts is NOT normally required."

$$l := \begin{cases} l & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0. \text{ in}$$

$$f_{bx} := \begin{cases} f_{bx} & \text{if } l > 2 \cdot D_n \\ 0 & \text{otherwise} \end{cases} = 0. \text{ ksi}$$

Check Flange Bolt Compression/Combined Stress:

Maximum Compressive Force =

$$C_{Max} := OM \cdot \frac{R_{bc}}{I_p} + \frac{Axial}{N} = -13.5 \text{ kips}$$

Maximum Compressive Stress =

$$f_a := \frac{C_{Max}}{A_n} = -22.3 \text{ ksi}$$

$$K := 0.65$$

$$C_c := \sqrt{\frac{2 \cdot \pi^2 \cdot E}{F_y}} = 78.881$$

$$F_a := \begin{cases} \frac{\left[1 - \frac{\left(\frac{K \cdot l}{r} \right)^2}{2 \cdot C_c^2} \right] \cdot F_y}{\frac{5}{3} + \frac{3 \cdot \left(\frac{K \cdot l}{r} \right)}{8 \cdot C_c} - \frac{\left(\frac{K \cdot l}{r} \right)^3}{8 \cdot C_c^3}} & \text{if } \frac{K \cdot l}{r} \leq C_c \\ \frac{12 \cdot \pi^2 \cdot E}{23 \cdot \left(\frac{K \cdot l}{r} \right)^2} & \text{if } \frac{K \cdot l}{r} > C_c \end{cases} = 55.2 \text{ ksi}$$

Allowable Compressive Stress =

$$F_a := 1.333 \cdot F_a = 73.6 \text{ ksi} \quad (1.333 \text{ increase allowed per TIA/EIA})$$

Combined Stress % of Capacity =

$$\left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \right) = -30.336 \%$$

Condition 2 =

$$\text{Condition2} := \text{if} \left(\frac{f_a}{F_a} + \frac{f_{bx}}{F_{bx}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$$

Condition2 = "OK"

Plate Analysis:

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

$C_1 = 23.8 \text{ kips}$

$C_6 = 28.8 \text{ kips}$

$C_2 = 26.0 \text{ kips}$

$C_7 = 27.7 \text{ kips}$

$C_3 = 27.7 \text{ kips}$

$C_8 = 26.0 \text{ kips}$

$C_4 = 28.8 \text{ kips}$

$C_9 = 23.8 \text{ kips}$

$C_5 = 29.2 \text{ kips}$

$C_{10} = 21.3 \text{ kips}$

Maximum Bending Stress in Plate =
$$f_{bp} := \sum_i \frac{6 \cdot C_i \cdot M A_i}{(W_{eff} t_{bp})^2} = 30.4 \text{ ksi}$$

Allowable Bending Stress in Plate =
$$F_{bp} := 1.33 \cdot 0.75 \cdot F_y = 49.9 \text{ ksi}$$

Plate Bending Stresse % of Capacity =
$$\frac{f_{bp}}{F_{bp}} = 61. \%$$

Condition3 =
$$\text{Condition3} := \text{if} \left(\frac{f_{bp}}{F_{bp}} < 1.00, \text{"Ok"}, \text{"Overstressed"} \right)$$

Condition3 = "Ok"

Subject:

ANCHOR BOLT AND BASE PLATE ANALYSIS

Location:

Cromwell, CT

Rev. 0: 10/31/14

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Anchor Bolt and Base Plate Analysis:

Input Data:

Tower Reactions:

Overturing Moment =	OM := 632-ft-kips	(Input From Risa-3D LC # 4)
Shear Force =	Shear := 22-kips	(Input From Risa-3D LC # 4)
Axial Force =	Axial := -225-kips	(Input From Risa-3D LC # 4)

Anchor Bolt Data:

Use ASTM A36

Number of Anchor Bolts =	N := 20	(User Input)
Bolt Ultimate Strenght =	$F_u := 58\text{-ksi}$	(User Input)
Bolt Yeld Strenght =	$F_y := 36\text{-ksi}$	(User Input)
Bolt Modulus =	$E := 29000\text{-ksi}$	(User Input)
Diameter of Anchor Bolts =	$D_b := 1.5\text{-in}$	(User Input)
Threads per Inch =	$n_b := 6$	(User Input)

Base Plate Data:

Use ASTM 36

Plate Yield Strength =	$F_{ybp} := 36\text{-ksi}$	(User Input)
Base Plate Thickness =	$t_{bp} := 1.5\text{-in}$	(User Input)

Geometric Layout Data:

Distance from Bolts to Centroid of Pole:

$$d_1 := 17.125\text{in} \quad (\text{User Input})$$

$$d_2 := 11.25\text{in} \quad (\text{User Input})$$

$$d_3 := 4.9375\text{in} \quad (\text{User Input})$$

Number of Bolts at Distance:

$$N_1 := 12$$

$$N_2 := 4$$

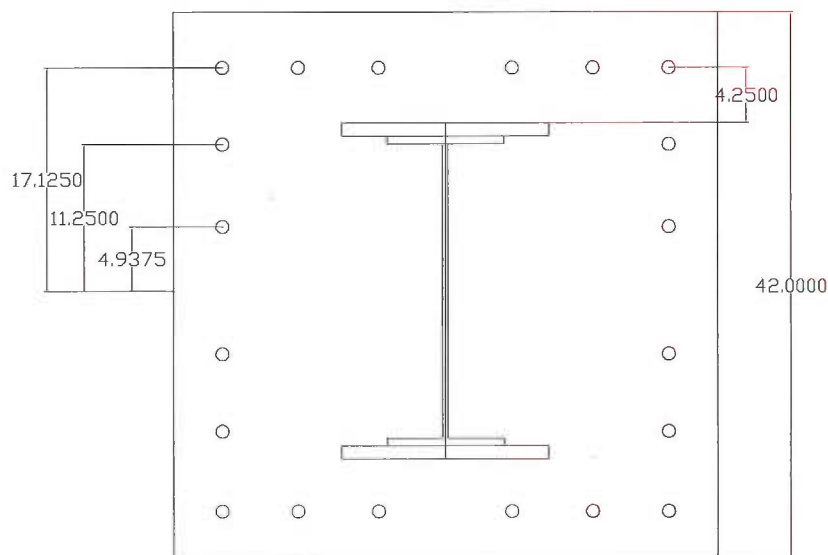
$$N_3 := 4$$

Critical Distances For Bending in Plate:

$$m_{a1} := 4.25\text{in} \quad (\text{User Input})$$

Effective Width of Baseplate for Bending =

$$B_{\text{eff}} := 42\text{in} \quad (\text{User Input})$$



ANCHOR BOLT AND PLATE GEOMETRY

Base Plate Analysis:

Length of Base Plate =

$$D := 42\text{in}$$

Width of Base Plate =

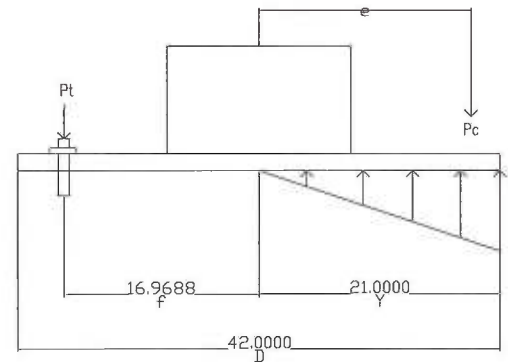
$$B := 42\text{in}$$

Length of Stress Distribution =

$$Y := 21\text{in}$$

Distance from NA to Bolts in Tension =

$$f := 17\text{in}$$



Modular Ratio =

$$n := \frac{E_s}{57 \cdot \sqrt{E_c}} = 9.29$$

Area of Steel in Tension Zone =

$$A_s := 7.5\text{in}^2$$

$$K_1 := \frac{6n \cdot A_s}{B} = 0.829\text{ft}$$

Eccentricity =

$$e := \frac{\left(K_1 \cdot f^2 + K_1 \cdot \frac{D}{2} \cdot f - K_1 \cdot f \cdot Y + \frac{3}{2} \cdot D \cdot Y^2 - Y^3 \right)}{\left(3 \cdot Y^2 + K_1 \cdot Y - K_1 \cdot \frac{D}{2} - K_1 \cdot f \right)} = 18.546\text{in}$$

Compression Force =

$$P_c := \frac{OM}{e} = 409\text{kips}$$

Uplift Force =

$$P_t := -P_c \left[\frac{\left(\frac{D}{2} - \frac{Y}{3} - e \right)}{\left(\frac{D}{2} - \frac{Y}{3} + f \right)} \right] = 60\text{kips}$$

Bearing Force on Grout =

$$\sigma_c := 2 \cdot \frac{(P_c + P_t)}{Y \cdot B} = 1063\text{psi}$$

Total Uplift Force =

$$F := P_t - 6 \cdot \frac{\text{Axial}}{N} = 127\text{kips}$$

Applied Bending Stress in Plate =

$$f_{bp} := \frac{6 \cdot (F \cdot m a_1)}{B_{eff} \cdot t_{bp}^2} = 34.4\text{ksi}$$

Subject:

ANCHOR BOLT AND BASE PLATE ANALYSIS

Location:

Cromwell, CT

Rev. 0: 10/31/14

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

Allowable Bending Stress in Plate =

$$F_{bp} := 1.33 \cdot 0.75 \cdot F_{ybp} = 35.9 \text{ ksi}$$

Plate Bending Stress % of Capacity =

$$\frac{f_{bp}}{F_{bp}} = 0.96$$

Check Plate Bending Stress

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

Plate_Bending_Stress = "Ok"

Allowable Bearing Capacity of Grout =

$$\sigma_{all} := 3000 \text{ psi}$$

Bearing Percent of Capacity =

$$\frac{\sigma_c}{\sigma_{all}} = 0.35$$

$$\text{Grout_Bearing_Capacity} := \text{if} (\sigma_{all} > \sigma_c, \text{"OK"}, \text{"NG"})$$

Grout_Bearing_Capacity = "OK"

Anchor Bolt Analysis:

Calculated Anchor Bolt Properties:

Polar Moment of Inertia = $I_p := \left[(d_1)^2 \cdot N_1 + (d_2)^2 \cdot N_2 + (d_3)^2 \cdot N_3 \right] = 4123 \cdot \text{in}^2$

Gross Area of Bolt = $A_g := \frac{\pi}{4} \cdot D_b^2 = 1.767 \cdot \text{in}^2$

Net Area of Bolt = $A_n := \frac{\pi}{4} \cdot \left(D_b - \frac{0.9743 \cdot \text{in}}{n_b} \right)^2 = 1.405 \cdot \text{in}^2$

Net Diameter = $D_n := \frac{2 \cdot \sqrt{A_n}}{\sqrt{\pi}} = 1.338 \cdot \text{in}$

Radius of Gyration of Bolt = $r := \frac{D_n}{4} = 0.334 \cdot \text{in}$

Section Modulus of Bolt = $S_x := \frac{\pi \cdot D_n^3}{32} = 0.235 \cdot \text{in}^3$

Check Anchor Bolt Tension Force:

Maximum Tensile Force = $T_{\text{Max}} := \frac{P_t}{6} - \frac{\text{Axial}}{N} = 21.2 \cdot \text{kips}$

Allowable Tensile Force (Gross Area) = $T_{\text{ALL.Gross}} := 1.333 \cdot (0.33 \cdot A_g \cdot F_u) = 45.1 \cdot \text{kips}$ (1.333 increase allowed per TIA/EIA)

Allowable Tensile Force (Net Area) = $T_{\text{ALL.Net}} := 1.333 \cdot (0.60 \cdot A_n \cdot F_y) = 40.5 \cdot \text{kips}$ (1.333 increase allowed per TIA/EIA)

Bolt Tension % of Capacity = $\frac{T_{\text{Max}}}{T_{\text{ALL.Net}}} \cdot 100 = 52.5$

Condition1 = $\text{Bolt_Tension} := \left(\frac{T_{\text{Max}}}{T_{\text{ALL.Net}}} \leq 1.00, \text{"OK"}, \text{"Overstressed"} \right)$

Bolt_Tension = "OK"

Note Shear stress is negligible

Subject:

FOUNDATION

Location:

Cromwell, CT

Rev. 0: 10/31/14

Prepared by: T.J.L. Checked by: C.F.C.
Job No. 14033.019

Foundation Check

Base Reactions:

$$OM_1 := 588\text{-kip}\cdot\text{ft}$$

$$Axial_1 := -226\text{-kips}$$

$$Shear_1 := 21\text{-kips}$$

$$OM_2 := 632\text{-kip}\cdot\text{ft}$$

$$Axial_2 := -224\text{-kips}$$

$$Shear_2 := 22\text{-kips}$$

$$OM_m := 92\text{-kip}\cdot\text{ft}$$

$$Axial_m := 494\text{-kips}$$

$$Shear_m := 3\text{-kips}$$

Foundation Data:

$$D1 := 1.29\text{-ft}$$

$$D2 := 2\text{-ft}$$

$$D3 := 3\text{-ft}$$

$$D4 := 3\text{-ft}$$

$$D_{tot} := 7.17\text{-ft}$$

$$W1 := 6\text{-ft}$$

$$W2 := 21.5\text{-ft}$$

$$W3 := 26.5\text{-ft}$$

$$W4 := 55\text{-ft}$$

$$L1 := 6\text{-ft}$$

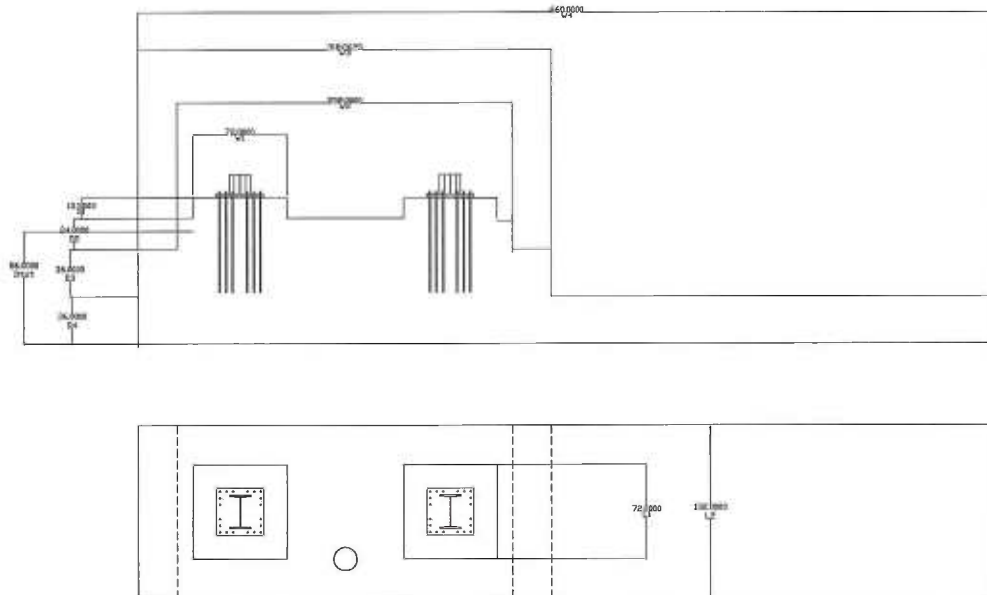
$$L2 := 11\text{-ft}$$

Material Data:

$$\gamma_{conc} := 150\text{-pcf}$$

$$\gamma_{soil} := 100\text{-pcf}$$

$$\phi_s := 30\text{-deg}$$



Volume of Concrete =

$$V_c := (D1 \cdot W1 \cdot L1) + (D2 \cdot W2 + D3 \cdot W3 + D4 \cdot W4) \cdot L2 = 3209 \cdot \text{ft}^3$$

Volume of Soil Above Footing =

$$V_{s1} := [(D2 - 10 \cdot \text{in}) \cdot (W3 - W2) + [(D2 - 10 \cdot \text{in}) + D3] \cdot (W4 - W3)] \cdot L2 = 1370 \cdot \text{ft}^3$$

Volume of Soil Wedge at Back Face =

$$V_{s2} := D_{\text{tot}}^2 \cdot W4 \cdot \tan(\phi_s) = 1632 \cdot \text{ft}^3$$

Volume of Soil Wedge at Back Face Corners =

$$V_{s3} := 2 \cdot \left[\left(D_{\text{tot}} \right)^3 \cdot \frac{\tan(\phi_s)}{3} \right] = 142 \cdot \text{ft}^3$$

Weight of Concrete =

$$W_c := V_c \cdot \gamma_{\text{conc}} = 481 \cdot \text{kips}$$

Weight of Soil Above Footing =

$$W_{s1} := V_{s1} \cdot \gamma_{\text{soil}} = 137 \cdot \text{kips}$$

Weight of Soil Wedge at Back Face =

$$W_{s2} := V_{s2} \cdot \gamma_{\text{soil}} = 163 \cdot \text{kips}$$

Weight of Soil Wedge at Back Face Corners =

$$W_{s3} := V_{s3} \cdot \gamma_{\text{soil}} = 14 \cdot \text{kips}$$

Subject:

FOUNDATION

Location:

Cromwell, CT

Rev. 0: 10/31/14

Prepared by: T.J.L. Checked by: C.F.C.
 Job No. 14033.019

$$M_r := (W_c + W_{s1} + Axial_1 + Axial_2 + Axial_m) \cdot \frac{L2}{2} + (W_{s2} + W_{s3}) \left(L2 + \frac{D_{tot} \cdot \tan(\Phi_s)}{2} \right) = 5962 \cdot \text{kip} \cdot \text{ft}$$

$$M_{ot} := OM_1 + OM_2 + OM_m + (Shear_1 + Shear_2 + Shear_m) \cdot D_{tot} = 1642 \cdot \text{kip} \cdot \text{ft}$$

$$FS := \frac{M_r}{M_{ot}} = 3.6$$

$$\text{Condition1} := \text{if} \left(\frac{M_r}{M_{ot}} > 2, \text{"OK"}, \text{"Overstressed"} \right)$$

Condition1 = "OK"

Network Modernization RFDS v3.0

T-Mobile

Site ID	CTHA240A	Latitude	41.60571
Site Name	HA240/Verizon_BB	Longitude	-72.70137
Address	Christian Hill Rd/ 100 Berlin Rd, Cromwell	Site Type	Monopole
Market	Connecticut	Site Class	
		Landlord	Verizon

Configuration
702CC

Approvals	
Market RF	
Market Development	

RFDS Revision	
RFDS Final	

Date 07/16/2014

Site Information								
Existing Configuration					Proposed Configuration			
1	2	3	4	Cabinet #	1	2	3	4
GSM				Technology	GSM/UMTS/LTE			
S8000				Cabinet type	6102			
				CBU				
				DUW30				
				DUL20				
				DUG20	1			
				DUS31	1			
				RBS6601				
3				dTRU/TRX				
				RU22 B4				
				RUS01 B2	6			
				RUS01 B4				

- ☐ Relocate cabinet
- ☐ Add cabinet
- ☒ Swap cabinet
- ☐ Remove cabinet
- ☐ Make cabinet dark

Comments

Swap cabinet for Ericsson 6102

ALPHA - Scope of Work		
☒ Add new mount ☐ Relocate antenna ☒ Add antenna ☐ Swap antenna ☐ Remove antenna ☐ Add TMA ☐ Swap TMA ☐ Remove TMA	☒ Add RRU ☐ Swap existing RRU ☐ Remove RRU ☐ Consolidate coax cables ☐ Add coax cables ☐ Add fiber cables ☐ Add hybrid combiner ☐ Add filter combiner	Add 8ft AIR antenna, Add RRU's at antenna

BETA - Scope of Work		
☒ Add new mount ☐ Relocate antenna ☒ Add antenna ☐ Swap antenna ☐ Remove antenna ☐ Add TMA ☐ Swap TMA ☐ Remove TMA	☒ Add RRU ☐ Swap existing RRU ☐ Remove RRU ☐ Consolidate coax cables ☐ Add coax cables ☐ Add fiber cables ☐ Add hybrid combiner ☐ Add filter combiner	Add 8ft AIR antenna, Add RRU's at antenna

GAMMA - Scope of Work		
☒ Add new mount ☐ Relocate antenna ☒ Add antenna ☐ Swap antenna ☐ Remove antenna ☐ Add TMA ☐ Swap TMA ☐ Remove TMA	☒ Add RRU ☐ Swap existing RRU ☐ Remove RRU ☐ Consolidate coax cables ☐ Add coax cables ☐ Add fiber cables ☐ Add hybrid combiner ☐ Add filter combiner	Add 8ft AIR antenna, Add RRU's at antenna

DELTA - Scope of Work		
☐ Add new mount ☐ Relocate antenna ☐ Add antenna ☐ Swap antenna ☐ Remove antenna ☐ Add TMA ☐ Swap TMA ☐ Remove TMA	☐ Add RRU ☐ Swap existing RRU ☐ Remove RRU ☐ Consolidate coax cables ☐ Add coax cables ☐ Add fiber cables ☐ Add hybrid combiner ☐ Add filter combiner	

Network Modernization RFDS v3.0

T-Mobile

Site ID	CTHA240A	Latitude	41.60571
Site Name	HA240/Verizon_BB	Longitude	-72.70137
Address	Christian Hill Rd/ 100 Berlin Rd, Cromwell	Site Type	Monopole
Market	Connecticut	Site Class	
		Landlord	Verizon

Configuration
702CC

Approvals	
Market RF	
Market Development	
RFDS Revision	
RFDS Final	
Date	07/16/2014

ALPHA (view from behind)

Existing Configuration				Mount	Proposed Configuration			
☒	☒	☒	☐		☒	☒	☒	☐
GSM B2 P	UMTS B4 P			Technology	GSM/UMTS B2 A	UMTS B4 P	LTE B4 A	LTE B12 P
Quad pole	Quad pole			Band	Quad pole	Quad pole	Quad pole	Quad pole
APX16PV_16PVL_T2	APX16PV_16PVL_T2			Active/Passive	AIR21 B2A/B4P	AIR21 B2A/B4P	AIR21 B4A/B12P-8	AIR21 B4A/B12P-8
RFS	RFS			Ant. Type	Ericsson	Ericsson	Ericsson	Ericsson
108	108			Ant. Model	108	108	108	108
25	25			Ant. Vendor	25	25	25	25
2	2			Ant. Height	Yes	Yes	Yes	yes
0	0			Ant. Azimuth	2	2	2	2
				RET deployed	0	0	0	0
				E-Tilt				
				M-Tilt				
				TMA #		1		
				TMA Type		dd B4		
				RRU #				
				RRU Type				
				Used Coax #		2		
				Coax Type		1-5/8"		
				Coax Length (ft)				
				Fiber (CPRI) #		2		
				Splitter #				
				Combiner #				
				Combiner Type				

☒ Add new mount	☒ Add RRU
☒ Relocate antenna	☐ Swap existing RRU
☒ Add antenna	☐ Remove RRU
☐ Swap antenna	☐ Consolidate coax cables
☐ Remove antenna	☐ Add coax cables
☐ Add TMA	☐ Add fiber cables
☐ Swap TMA	☐ Add hybrid combiner
☐ Remove TMA	☐ Add filter combiner

Scope of work
Add BFL AIR antenna, Add RRU's at antenna

BETA (view from behind)

Existing Configuration				Mount	Proposed Configuration			
☒	☒	☒	☐		☒	☒	☒	☐
GSM B2 P	UMTS B4 P			Technology	GSM/UMTS B2 A	UMTS B4 P	LTE B4 A	LTE B12 P
Quad pole	Quad pole			Band	Quad pole	Quad pole	Quad pole	Quad pole
APX16PV_16PVL_T2	APX16PV_16PVL_T2			Active/Passive	AIR21 B2A/B4P	AIR21 B2A/B4P	AIR21 B4A/B12P-8	AIR21 B4A/B12P-8
RFS	RFS			Ant. Type	Ericsson	Ericsson	Ericsson	Ericsson
108	108			Ant. Model	108	108	108	108
120	120			Ant. Vendor	120	120	120	120
2	2			Ant. Height	Yes	Yes	Yes	yes
0	0			Ant. Azimuth	2	2	2	2
				RET deployed	0	0	0	0
				E-Tilt				
				M-Tilt				
				TMA #		1		
				TMA Type		dd B4		
				RRU #				
				RRU Type				
				Used Coax #		2		
				Coax Type		1-5/8"		
				Coax Length (ft)				
				Fiber (CPRI) #		2		
				Splitter #				
				Combiner #				
				Combiner Type				

☒ Add new mount	☒ Add RRU
☒ Relocate antenna	☐ Swap existing RRU
☒ Add antenna	☐ Remove RRU
☐ Swap antenna	☐ Consolidate coax cables
☐ Remove antenna	☐ Add coax cables
☐ Add TMA	☐ Add fiber cables
☐ Swap TMA	☐ Add hybrid combiner
☐ Remove TMA	☐ Add filter combiner

Scope of work
Add BFL AIR antenna, Add RRU's at antenna

T-Mobile

Configuration
702CC

RFDS Revision		Date	07/16/2014
RFDS Final			

Existing Configuration

X		X		X		X		X	
GSM B2 P		UMTS B4 P		Technology Band Active/Passive		GSM/UMTS B2 A		UMTS B4 P	
Quad pole APX16PV_16PVL_T2		Quad pole APX16PV_16PVL_T2		Ant. Type Ant. Model Ant. Vendor Ant. Height Azimuth		Quad pole AIR21 B2A/B4P		Quad pole AIR21 B4A/B12P-8	
RFS 108 240		RFS 108 240		RET deployed E-Tilt M-Tilt		Ericsson 108 240		Ericsson 108 240	
Yes 2 0		Yes 2 0				Yes 2 0		Yes 2 0	
1 dd B2		1 dd B2		TMA # TMA Type RRU # RRU Type		1 dd B4		1 RRUS11_B12	
2 1-5/8" 210		2 1-5/8"		Used Coax # Coax Type Coax Length (ft) Fiber (CPRI) # Splitter # Combiner # Combiner Type		2 1-5/8"		2	

- | | | | |
|-------------------------------------|------------------|-------------------------------------|-------------------------|
| ☒ | Add new mount | ☒ | Add RRU |
| ☐ | Relocate antenna | ☐ | Swap existing RRU |
| ☒ | Add antenna | ☐ | Remove RRU |
| ☐ | Swap antenna | ☐ | Consolidate coax cables |
| ☐ | Remove antenna | ☐ | Add coax cables |
| ☐ | Add TMA | ☐ | Add fiber cables |
| ☐ | Swap TMA | ☐ | Add hybrid combiner |
| ☐ | Remove TMA | ☐ | Add filter combiner |

Scope of work
Add 8Fl AIR antenna. Add RRU's at antenna

Existing Configuration

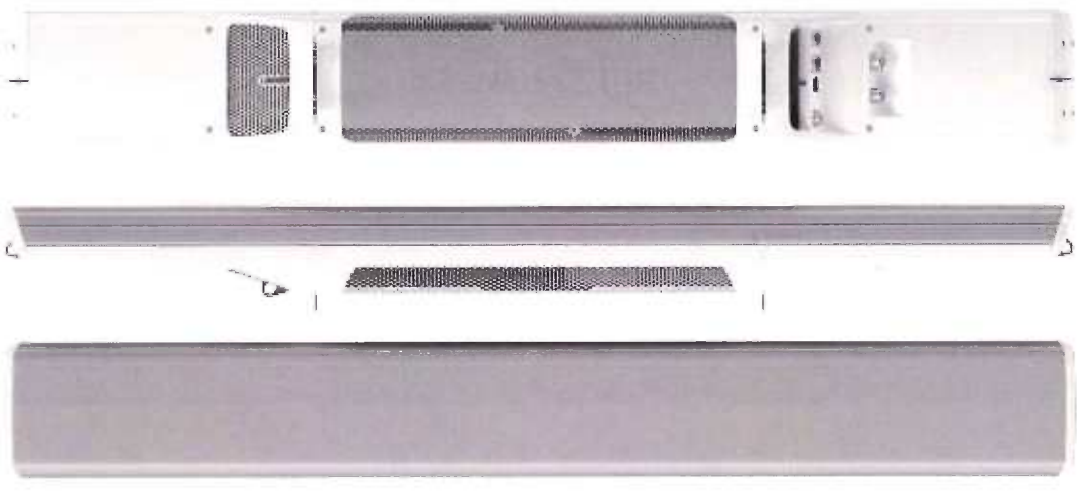
Antenna Configuration				RFR Configuration			
Technology Band Active/Passive Ant. Type Ant. Model Ant. Vendor Ant. Height Azimuth RET deployed E-Tilt M-Tilt				TMA # TMA Type RRU # RRU Type Used Coax # Coax Type Coax Length (ft) Splitter # Fiber (CPRI) # Combiner # Combiner Type			

- | | | | |
|--------------------------|------------------|--------------------------|-------------------------|
| ☐ | Add new mount | ☐ | Add RRU |
| ☐ | Relocate antenna | ☐ | Swap existing RRU |
| ☐ | Add antenna | ☐ | Remove RRU |
| ☐ | Swap antenna | ☐ | Consolidate coax cables |
| ☐ | Remove antenna | ☐ | Add coax cables |
| ☐ | Add TMA | ☐ | Add fiber cables |
| ☐ | Swap TMA | ☐ | Add hybrid combiner |
| ☐ | Remove TMA | ☐ | Add filler combiner |

Scope of work

8FT, AWS ACTIVE

AIR 21 B4A/B12P-B5P, 8 FT (KRC 118 048/1)



- > Frequency bands:
 - AWS (1700/2100 MHz) active 2TX/4RX dual X-pol vert. stacked
 - 698 MHz - 894 MHz passive single X-pol.
- > IBW (active part) = 20 MHz
- > Gain (active/passive): 18/16 dB (15.7 on A block)
- > Horiz. beamwidth (active/passive): 61°/68°
- > Vertical beamwidth (active/passive): 7°/9°
- > Integrated RET (AISG 2.0)
- > Interfaces
 - Two optical fiber ports (CPRI) for active antenna/radio
 - One power connector, -48 V DC
 - Two 7/16 female connectors for passive antenna, with RET support
- > Dimensions (H x W x D): 8.0' x 12.1" x 8.7"
- > Weight: ~126 lbs
- > Wind load: 1370 N @ 94 miles/hr

TECHNICAL SPECIFICATIONS AIR 21, 1.3M, B2A B4P

RADIO

Active frequency band:	Band 2 (1850-1910 / 1930-1990 MHz)
Passive frequency band (optional):	Band 4 (1710-1755 / 2110-2155 MHz)
Downlink EIRP in bore-sight direction for the active band:	2 x 62,5 dBm
Uplink sensitivity:	TBD*
Remote electrical tilt:	-2° to -12°, independently controlled per frequency band
MIMO:	2 x 2 for DL 4 RX branches to be used for diversity/ beam-steering /MIMO
Instantaneous bandwidth:	20 MHz
Capacity (single standard per sector):	Up to 8 carriers GSM Up to 4 carriers WCDMA with 2 x 2 DL MIMO Up to 20 MHz LTE with 2 x 2 DL MIMO
Multi-RAT capability:	Single standard or two simultaneous standards (Capacity above is reduced for multi-RAT)
Bore-sight antenna gain for passive antenna option:	17,5 dBi
Nominal beam-width, azimuth:	65°
Nominal beam-width, elevation:	7°
Additional antenna parameters:	See Antenna characteristics, page 3

MECHANICAL SPECIFICATION

Weight (excl. mounting brackets):	37,5 kg for active only 41,5 kg for active and passive
Size (H x W x D)	1422 mm x 307 mm x 200 mm
Wind load:	580 N / 300 N / 720 N (frontal/lateral/rear-side) @ 42 m/s wind speed

INTERFACES

AIR – DU:	DATA 1, Data 2: CPRI links (SFP modules with LC socket + flanges that match protective cover TYCO C20611458)
Power:	- 48 V DC (TYCO/Ericsson RPT 447 04)
Passive antenna (option).	TX/RX 1, TX/RX 2: RF connectors (7-16 female)
LMU RX sharing	RX1, RX2:, RF connectors (N female)

SUPPORTING BASE-BAND

RBS 6601:	One or two units depending on configuration.
-----------	--

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

** Other base-band configurations are available

RRUS 11

Frequency (AT&T)

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

RF Characteristics

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

RET/TMA Support

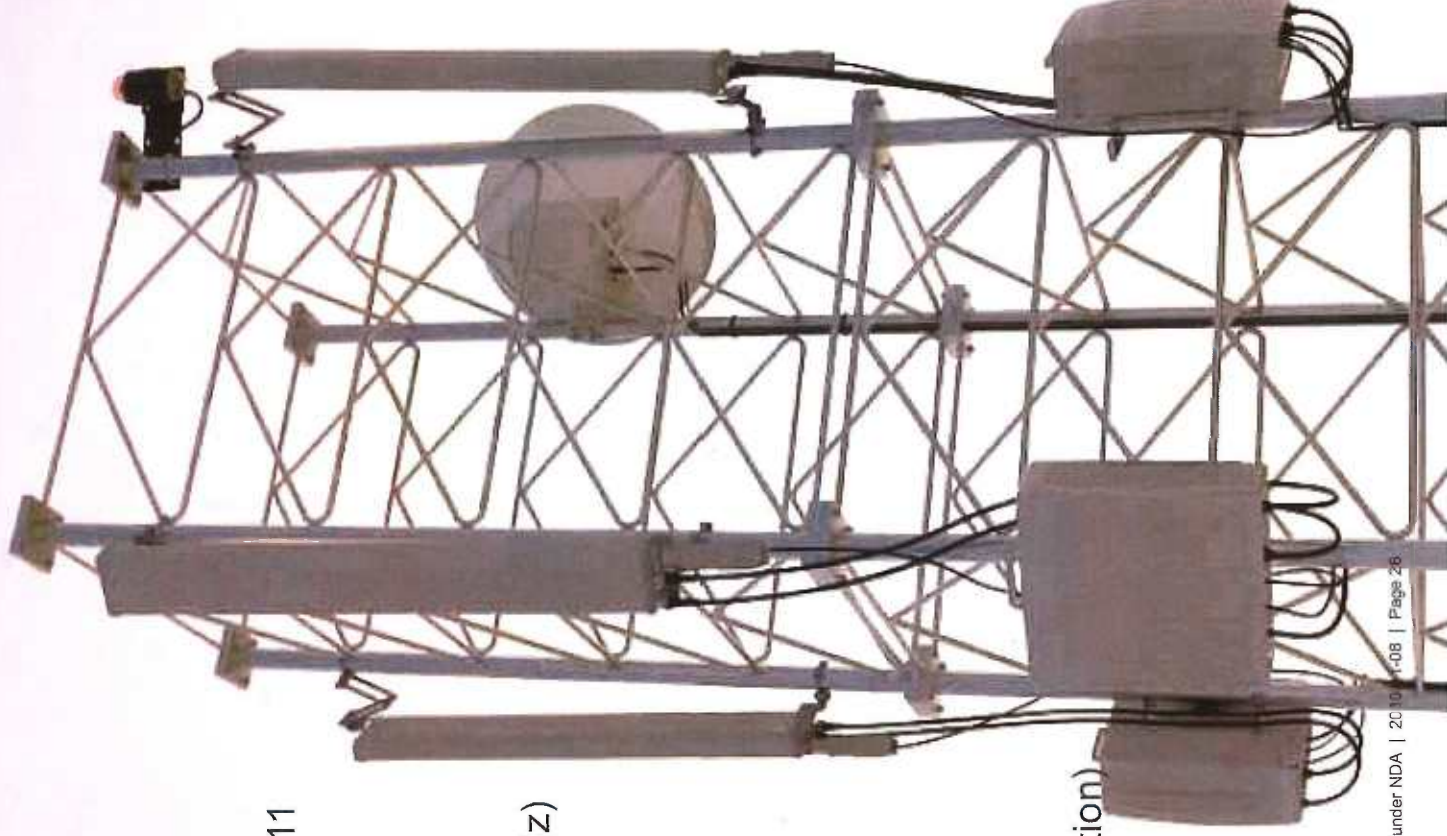
- ✓ AISG 2.0 Compatible
- ✓ Via RET Port and Centre Conductor
- ✓ Cascading
- ✓ 30 VDC Bias

Environmental

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

Power

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



RRUS 11 Mechanics

Wall and pole mounting brackets

- Reused from RRUW and RRU22
- Vertical Mount Only

Clearing distances:

- Above ≥ 16 in.
- Below ≥ 12 in.
- Side ≥ 0 mm

DC connector

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

CPRI connector

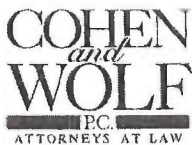
- LCD with proprietary cover
- Separate cover available from 1Q2011

Size & Weight

- Band 4: 44 lbs
- Band 12: 50 lbs
- 17.8" x 17.3" x 7.2" incl. sun shield



EXHIBIT E



JULIE D. KOHLER

PLEASE REPLY TO: Bridgeport
WRITER'S DIRECT DIAL: (203) 337-4157
E-Mail Address: jkohler@cohenandwolf.com

December 17, 2014

**VIA CERTIFIED MAIL
RETURN RECEIPT REQUESTED**

**Re: T-Mobile Northeast, LLC
Proposed Modifications to an Existing Telecommunications Facility
100 Berlin Road (aka Christian Hill Road), Cromwell, Connecticut
Petition to the Connecticut Siting Council**

To Whom It May Concern:

We are writing you on behalf of our client T-Mobile Northeast, LLC ("T-Mobile") with respect to the above referenced matter. T-Mobile is currently collocated on the telecommunications facility located at 100 Berlin Road, Cromwell, Connecticut and seeks to modify its existing installation to improve its coverage and service from this location.

The attached notice is being sent to you pursuant to the Regulations of Connecticut State Agencies, which require that owners of property that abut a parcel on which the facility is located be sent notice of an applicant's intent to file a Petition with the Connecticut Siting Council.

If you have any question regarding this notice or the Petition, please don't hesitate to contact the Connecticut Siting Council or the undersigned.

Sincerely,


Julie D. Kohler, Esq.

Enclosure

NOTICE

Pursuant to Section 16-50j-40(a) of the Regulations of Connecticut State Agencies, notice is hereby given that T-Mobile Northeast LLC ("T-Mobile") will file a Petition for Declaratory Ruling ("Petition") with the Connecticut Siting Council ("Council") on or after December 18, 2014. T-Mobile will seek a ruling that no Certificate of Environmental Compatibility and Public Need is required to modify its antenna site at the existing telecommunication facility at 100 Berlin Road (aka Christian Hill Road), Cromwell Connecticut ("Facility").

T-Mobile has an existing wireless telecommunications site at this Facility and an antenna array at the 108 foot centerline. It seeks to upgrade its equipment and replace six (6) antennas at a centerline of 108 feet, add three (3) RRUs (remote radio units) at a centerline of 108 feet; remove three (3) TMAs (tower mounted amplifiers) and relocate three (3) existing TMAs at a centerline of 108 feet; add one (1) GPS antenna at a centerline of 50 feet; add GPS cable; and install fiber hybrid cable and reusing existing coax cables. The proposed replacement antennas will extend one (1) foot above the top of the existing 111 foot tower.

The modifications to this Facility are being proposed to allow T-Mobile to provide improved wireless service to Cromwell and the surrounding area.

The Petition will set forth the need, purpose and benefits of the modifications to the Facility. The Petition provides plans, details of the proposed modifications and explains why T-Mobile submits that these modifications present no significant adverse environmental effect.

Copies of the Petition will be available for review during normal business hours on or after December 18, 2014 at the Connecticut Siting Council:

Connecticut Siting Council
10 Franklin Square
New Britain, CT 06051

or at the offices of T-Mobile's legal counsel:

Julie D. Kohler, Esq.
Cohen and Wolf, P.C.
1115 Broad Street
Bridgeport, CT 06604
Tel. (203) 368-0211
Fax (203) 394-9901

All inquiries should be addressed to the Council or to T-Mobile's legal counsel as listed above.

CERTIFICATION OF SERVICE

I hereby certify that on the 17th day of December, 2014, a copy of the foregoing letter and notice was mailed by certified mail, return receipt requested to each of the abutting properties owners on the accompanying list.



Julie D. Kohler, Esq.
Cohen and Wolf, P.C.
1115 Broad Street
Bridgeport, CT 06604

Attorney for:
T-Mobile Northeast, LLC
("T-Mobile")

ADJACENT PROPERTY OWNERS
100 BERLIN ROAD, CROMWELL, CT 06416

Main Street Equity LLC
c/o Anita Morrison
47 Woodbridge Avenue
East Hartford, CT 06108

95 Berlin Road LLC
c/o Thomas E. Porzio
400 Charcoal Avenue
Middlebury, CT 06762

Ganesha Hospitality LLC
113 Berlin Road
Cromwell, CT 06416

SUNOCO LLC
1735 Market St. STE. LL
Philadelphia, PA 19103

SHRI AMBE LLC
70 Timberridge Road
North Brunswick, NJ 08902

Guaranteed Maintenance and Development LLC
222 Williams Street East #105
Glastonbury CT 06033

Hector A. Ocampo
16 Christian Hill Road
Cromwell, CT 06416

Rondante P. Uy & Melinda Y Uy
17 Christian Hill Road
Cromwell, CT 06416

Jeffrey W. Newton & Sandra R. Newton
18 Christian Hill Road
Cromwell, CT 06416

Steve A. Falco & Eugenia Decobert Falco
20 Christian Hill Road
Cromwell, CT 06416

ADJACENT PROPERTY OWNERS
100 BERLIN ROAD, CROMWELL, CT 06416

Hector Novoa & Elizabeth Novoa
22 Christian Hill Road
Cromwell, CT 06416

David Putnam & Chang U. Putnam
24 Christian Hill Road
Cromwell, CT 06416

State of Connecticut
165 Capital Avenue
Hartford, CT 06106

Town of Cromwell
41 West Street
Cromwell, CT 06416

IRNM FEE Cromwell, LLC
914 Hartford Turnpike
Waterford, CT 06385

Steven J. Gorss
121 Berlin Drive,
Cromwell, CT 06416

Patricia K. Pikor
c/o Alliance Energy LLC,
404 Wyam Street, Suite 425
Waltham, MA 02451

Nadeka LLC
39 Harvest Woods Lane
Higganum, CT 06441

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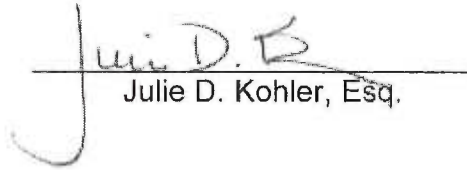
All inquiries should be addressed to the Council or to T-Mobile's legal counsel as listed
above.

CERTIFICATION OF SERVICE

I hereby certify that on the 17th day of December, 2014, copies of the attached notice of filing a Petition with the Connecticut Siting Council for a declaratory ruling was sent by certified mail, return receipt requested to the following:

Mayor Enzo Faienza
Town Hall
41 West Street, 1st Floor
Cromwell, CT 06416

Mayor Daniel T. Drew
City Hall
245 deKoven Drive
Middletown, CT 0645


Julie D. Kohler, Esq.