

TELECOMMUNICATIONS LEASE AGREEMENT
(Major Road/Route 1)

This lease agreement ("Agreement") is entered into this 31 day of December, 2018, between the Township of South Brunswick, a municipal corporation of New Jersey, located at the Municipal Complex, 540 Ridge Road, Monmouth Junction, NJ 08852 ("Lessor") and T-Mobile Northeast LLC ("Lessee"), located at 12920 SE 38th Street, Bellevue, WA 98006.

In consideration of the mutual covenants contained herein, and for good and valuable consideration the receipt and sufficiency of which is hereby acknowledged, the parties agree as follows:

1. Premises. Lessor is the owner of the following parcel:
Lot 8.04 in Block 85, located at 3960 Route 1, South Brunswick Township, on which is located a water storage facility and 2 radio towers ("Land"). Lessor hereby leases the following portion of said property to Lessee: A 10' x 12' portion of ground space located next to the existing monopole on the property for the location of an equipment enclosure. Space for 12 panel style antennas will be on the existing monopole at a centerline elevation of approximately 181± feet. The ground space and monopole space are collectively referred to as the Premises, as depicted in Exhibit A.
2. Use. The Premises may be used by Lessee only in connection with the provision of communications services, including without limitation, the transmission and the reception of radio communication signals on various frequencies, and for the construction, maintenance and operation of necessary facilities, including but not limited to the monopole and antennas and an air conditioned equipment shelter. Lessor agrees to cooperate with Lessee, at Lessee's expense, in making application for obtaining all licenses, permits and any and all other necessary approvals that may be required for Lessee's intended use of the Premises.
3. Tests and Construction. Lessee shall have the right at any time following the full execution of this Agreement to enter upon the Land for the purpose of making necessary engineering surveys and inspections and soil test borings and other reasonably necessary tests ("Tests"), if needed, and for the purpose of constructing the Lessee's Facilities (as defined in Paragraph 6(a) below) and installing the Site Equipment (as defined in Paragraph 9(a) below) (collectively "Construction"). During any Tests or Construction, Lessee will provide Lessor with a certificate of insurance including Lessor as an additional insured and evidencing liability insurance in the amounts set forth in Paragraph 14 of this Agreement. In conducting any Tests or Construction, Lessee will coordinate the scheduling of same with Lessor as well as cooperate with Lessor so as to minimize any interference with the business operations currently conducted by Lessor on the Land. No Construction shall occur unless the proposed Facilities and Site Equipment are first reviewed and approved by Lessor. A structural analysis of the monopole shall be provided to Lessor prior to Construction in order to ensure that the monopole is able to safely accommodate the proposed Construction. Any unused cables located at the top of the monopole must be removed from outside or inside the monopole before additional lines can be added.

4. Term. The term of this Agreement shall be five (5) years commencing on the later of the date Lessee begins commercial operation of the Lessee Facilities (which facilities are defined in Paragraph 6(a) below) or on November 1, 2018 ("Commencement Date") and terminating on the fifth anniversary of the Commencement Date (the "Term") unless otherwise terminated as provided in Paragraph 12. This Agreement shall automatically be extended for three (3) successive five (5) year periods (the "Renewal Terms"), unless either party notifies the other not less than one hundred and eighty (180) days prior to the respective expiration date of its intention not to extend.

5. Rent.

(a) Within 15 days after the Commencement Date and on the first day of each month thereafter, Lessee shall pay to the Lessor as rent Three Thousand Seven Hundred Dollars and Ninety-Three Cents (\$3,700.93) per month ("Rent"). If the Commencement Date is a date other than the first of the month, the Rent for the first calendar month shall be prorated on the basis of the number of actual days in such partial month. Rent shall be payable to Lessor at Township of South Brunswick, 540 Ridge Road, P.O. Box 190, Monmouth Junction, NJ 08852, Attention: Township Treasurer.

(b) For any Renewal Term, Lessee shall pay the current Rent, increased by two percent (2%) per annum or any percentage increase which occurred in the Consumer Price Index ("CPI") for the New York-Northeastern New Jersey Metropolitan Statistical Area during the preceding five (5) year period, whichever is higher, which calculations shall be provided by the Township.

(c) If this Agreement is terminated prior to its expiration, Rent shall be prorated as of the date of termination.

6. Improvements; Liability; Utilities; Access.

(a) Lessee has the right to erect, maintain and operate on the Premises communications facilities including utility lines, an air conditioned equipment shelter, radio transmitting and receiving antennas and supporting structures thereto ("Lessee Facilities"). In connection therewith, Lessee has the right to do all work necessary to prepare, maintain and alter as per approved site plan, the Premises for Lessee's business operations and to install transmission lines connecting the antennas to the transmitters and receivers. All of Lessee's construction and installation work shall be performed at Lessee's sole cost and expense and in a good and workmanlike manner. Title to the Lessee Facilities shall be held by Lessee. All of the Lessee Facilities shall constitute personal property and are not fixtures. Lessee has the right to remove the Lessee Facilities at its sole expense on or before the expiration or earlier termination of the Term or any Renewal Term. At the end of the Agreement, Lessee shall remove all facilities which it placed or allowed to be placed on the site and Lessee shall restore the Premises to its current condition, reasonable wear and tear excepted.

(b) Whenever Lessee desires to undertake any construction, repairs or maintenance work upon or about the antenna location it shall:

(1) Provide a work schedule to the South Brunswick Township Information

Manager at least seven (7) days in advance, listing the dates that the work will be done on the property. However, in an emergency Lessee may notify Lessor by calling 732-329-4646 for immediate access to perform repairs;

- (2) Take all reasonable corrective actions at the conclusion of the work day to prevent the work area from becoming an attractive nuisance which could invite entry by members of the public into the work area;
- (3) Restore the entire area disturbed by the work at least to the condition in which it had existed prior to the work; and
- (4) Comply with all ordinances, regulations and statutes governing the work and obtain all necessary permits therefor, and post performance and/or maintenance bonds if required by the Lessor or any other governmental entity or agency having an interest in the work.

(c) Lessee shall have the right to draw electricity from the electric supply on the land, if available. If Lessee submeters its power from Lessor's electric supply, Lessee shall reimburse Lessor for the actual electricity it consumes at the rate paid by Lessor to the utility provider. Lessee shall have the right, at its option and expense, to obtain electrical service from any utility provider that provides electric service to the Premises, including the installation of a separate meter and main breaker. Lessee has the right to improve the present utilities on the Premises and to install new utilities (including a standby power generator for Lessee's exclusive use at a location on the Premises acceptable to both parties). Lessee also has the right to bring utilities to the Land in order to service the Premises as per the plan to be approved by the Township. The location of the utility lines shall be as required by Lessee and the applicable utility provider. At Lessee's reasonable request, Lessor shall execute necessary documents evidencing such utility easement rights, including a utility easement in favor of Lessee or the applicable utility provider. Lessee shall pay for the utilities it consumes in its operations.

(d) Lessor shall provide to Lessee, Lessee's employees, agents and subcontractors access over the Land to the Premises twenty-four (24) hours a day, seven days a week, at no additional charge to Lessee. Prior notice must be given to South Brunswick Police Dispatch before entering the property except in cases of emergency, in which event the Police shall be notified in a reasonable period of time.

7. Inspections. Lessee agrees, during construction, to bear the reasonable cost and expense incurred by Lessor for inspection of the operation conducted hereunder and the Lessor shall have the right, in its sole discretion, to designate such inspectors and engineers or specialized engineering firm deemed necessary for the protection of its property rights and the rights of the public. Said inspectors, engineers, or specialized engineering firm so retained shall not be considered agents, servants or employees of either Lessee or the Lessor and their duties shall be limited to the inspection of the operation and the submission to the Lessor of reports concerning the status of the work.

8. Interference.

- (a) Lessee shall not operate the Lessee Facilities in a manner that will cause interference to Lessor and other lessees of the land whose installation predates the Lessee Facilities. All operations by Lessee shall be lawful and in compliance with all Federal Communications Commission ("FCC") requirements.
- (b) Subsequent to the installation of the Lessee Facilities, Lessor shall not permit itself, its lessees or licensees to install new equipment at the Premises if such equipment is likely to cause interference with the operations of Lessee's Facilities. Such interference shall be deemed a material breach of this Agreement by Lessor, and Lessee shall have the right to bring a court action against the interfering party of terminate this Agreement.

9. Equipment.

(a) Lessee shall provide all transmitters and receivers and all related electronic equipment, cables and associated equipment ("Site Equipment") required for the installation and operation of Lessee's system. The Site Equipment is and shall remain the sole property of the Lessee and may be removed from the Premises at any time by the Lessee. Lessee shall remove all Site Equipment from the Premises at Lessee's expense upon the termination of this Agreement.

(b) Lessee shall provide all of the equipment and labor necessary for the installation of Lessee's system including the antennas, associated feed lines, isolation equipment and electrical terminals. The equipment provided by Lessee shall remain the sole personal property of Lessee and shall not be deemed fixtures.

(c) Lessee shall, at its sole cost and expense, maintain and repair its Site Equipment.

(d) Title to the Site Equipment placed on the Premises by Lessee shall be held by Lessee. All of the Site Equipment shall remain the property of Lessee and are not fixtures. Lessee has the right to remove all the Site Equipment at its sole expense on or before the expiration or termination of this Agreement. Lessor acknowledges that Lessee may enter into financing arrangements including promissory notes and financial and security agreements for the financing of the Site Equipment (the "Collateral") with a third party financing entity and may in the future enter into additional financing arrangements with other financing entities. In connection therewith, Lessor (i) consents to the installation of the Collateral to the extent that the Collateral is part of the approved Lessee's Facilities; (ii) disclaims any interest in the Collateral, as fixtures or otherwise, whether arising at law or otherwise, including, but not limited to any statutory landlord's lien ; and (iii) agrees that the Collateral shall be exempt from execution, foreclosure, sale, levy, attachment, or distress for any Rent due or to become due and that such Collateral may be removed at any time without recourse to legal proceedings. No financing arrangements permitted by this section shall in any way act or serve as a lien or encumbrance on the Premises, Land or any other real or personal property not owned by Lessee.

10. Indemnification.

(a) Lessee hereby agrees to defend, indemnify and save harmless Lessor, its officials, servants and employees, and each and every one of them from and against all suits, costs, claims, expenses, and judgments of every kind and description against Lessor by agents, servants, employees and contractors of Lessee and from and against all damages and expenses to which the Lessor or any of its officials, servants and employees may be subject to the extent caused by the construction, reconstruction, maintenance, repair, alteration or operations of the Lessee Facilities, except to the extent that such damage or expense is caused by the negligence or willful misconduct of Lessor or any of its officials, servants, employees, agents or contractors.

(b) Lessor agrees to defend, indemnify and save harmless Lessee, its officers, employees, contractors and subcontractors from and against any claims, suits, losses, damages, liabilities and expenses arising out of or in connection with Lessor's negligent acts or omissions or willful misconduct.

11. Restoration; Removal of Antenna System. Lessee agrees that it shall, at its sole cost and expense, restore all of Lessor's real or personal property which is in any way disturbed by the construction and installation herein authorized or by any future maintenance of the installation to at least the condition it was in prior to entry by the Lessee reasonable wear and tear excepted. If the restoration has not been completed within ninety (90) days of completion of the construction or maintenance, the Lessor may give notice to the Lessee and thirty (30) days thereafter may perform the restoration with its own or a contracted work force at Lessee's sole cost and expense. Within ninety (90) days of termination of this Agreement, or any renewal thereof, subject to any force majeure event, Lessee shall remove the Lessee Facilities and Site Equipment from the Premises. If Lessee fails to remove the Lessee Facilities or Site Equipment, the Lessor may effect such removal, with its own or a contracted work force at Lessee's sole cost and expense.

12. Termination.

(a) This Agreement may be terminated without further liability on thirty (30) days prior written notice as follows: (i) by either party upon a default of any covenant or term hereof by the other party, which default is not cured within sixty (60) days of receipt of written notice of default, provided that the grace period for any monetary default is fifteen (15) days from receipt of notice; or (ii) by Lessee for any reason or for no reason provided Lessee delivers written notice of early termination to Lessor prior to the Commencement Date of this Agreement; or (iii) by Lessee if it does not obtain or maintain any license, permit or approval necessary to the construction and operation of Lessee Facilities; or (iv) by Lessee if Lessee is unable to occupy and utilize the Premises due to an action of the FCC, including without limitation, a take back of channels or change in frequencies; or (v) by Lessee if Lessee determines that the Premises are not appropriate for its operations for economic, environmental or technological reasons, including, without limitation, signal interference.

13. Termination in the Event of Casualty or Condemnation.

(a) In the event of any damage, destruction or condemnation of the Premises or any part thereof, which renders the Premises unusable or inoperable, Lessee shall have the right, but not

the obligation, to terminate this Agreement and all of its duties and obligations herein by giving written notice to Lessor within thirty (30) days after such damage, destruction or condemnation, if by virtue of such casualty or condemnation the Premises are no longer adequate for Lessee to continue its operations or any repairs to the Premises have not been completed or cannot reasonably be completed within sixty (60) days from the date of the damage. Rent shall abate as of the date of the damage, destruction or condemnation.

(b) If Lessee does not terminate this Agreement: (1) the Rent payable herein shall be reduced or abated in proportion to the actual reduction or abatement of use of the Premises; and (2) within sixty days from the date of such damage or destruction, Lessor shall make any necessary repairs to the Premises caused by any such damage or destruction.

(c) In the event of condemnation, unless Lessee is allowed by the condemning authority to continue its operations on the Premises, this Agreement shall terminate as of the date title to the land vests in the condemning authority or Lessee is required to cease its operations, whichever is earlier. Lessee shall be entitled to share in the proceeds of any condemnation to the extent that the proceeds include the value of any of Lessee's improvements which are transferred to the condemning authority, moving expenses, prepaid rent and business dislocation expenses.

14. Insurance.

(a) Lessee, at Lessee's sole cost and expense, shall procure and maintain on the Premises and on Lessee's Site Equipment, bodily injury and property damage insurance with a combined single limit of at least One Million and 00/100 Dollars (\$1,000,000.00) per occurrence. Such insurance shall insure, on an occurrence basis, against all liability of Lessee, its employees, and agents arising out of or in connection with Lessee's use of the Premises, all as provided for herein. Lessor shall be included as an additional insured on Lessee's policy. Lessee shall provide to Lessor a certificate of insurance evidencing the coverage required by this paragraph.

(b) All commercial general liability insurance required under this Agreement shall:

(1) Be issued as a primary policy; and

(2) Contain an endorsement requiring thirty (30) days written notice from the insurance company to both parties before cancellation or change in the coverage, scope, and amount of any policy that would not meet the insurance required. Each certification of the policy shall be deposited with Lessor within thirty (30) days of the Commencement Date annually.

(c) Lessor shall procure and maintain commercial general liability and property insurance in commercially reasonable amounts.

15. Waiver of Subrogation. Lessor and Lessee release each other and their respective principals, employees, representatives and agents, from any claims for damage to any person or the Premises or to the Lessee Facilities or Site Equipment thereon caused by, or resulting from,

risks insured against under any insurance policies carried by the parties and in force at the time of such damage. Lessor and Lessee shall cause each insurance policy obtained by it to provide that the insurance company waives all right of recovery by way of subrogation against the other in connection with any damage covered by any policy. Neither Lessor nor Lessee shall be liable to the other for damage caused by fire or any of the risks insured against under the insurance policy required by paragraph 14.

16. Premises. Lessee shall maintain the Premises and operate its facilities thereon in such a manner as will best enable it to fulfill its service requirements, and in accordance with the specifications herein mentioned. Lessor reserves the right to support antenna systems for its emergency and government communications systems, including the utilization of sufficient space in the Land for an equipment building. Except for emergencies, Lessor shall provide Lessee with at least 48 hours prior notice, via telephone, mail, fax or e-mail, of any maintenance or other work to be performed by Lessor within ten (10') feet of Lessee's antennas in order to allow Lessee to power down its antennas, if necessary. Lessee shall provide Lessor with a telephone number(s) where Lessee's representative can be reached 24 hours per day, 7 days per week. Lessee shall have a non-exclusive right of access to and from the site 7 days a week, 24 hours a day, on foot or motor vehicle, including small trucks and vans. Lessee has the right to survey the property, which survey shall be attached as a lease exhibit. Cost for such work shall be borne by the Lessee.

17. Assignment. The Agreement shall not be sold, transferred or assigned by Lessee without prior approval of Lessor, except to Lessee's principals, affiliates, subsidiaries or to any entity which acquires all or substantially all of the Lessee's assets in the wireless communications market by reason of a merger, acquisition or other business reorganization. As to other parties, this Agreement may not be sold, assigned or transferred without the written consent of the Lessor, which consent will not be unreasonably withheld or delayed. Notwithstanding anything to the contrary contained in this Agreement, Lessee may assign, mortgage, pledge, hypothecate or otherwise transfer without consent, but upon thirty (30) days written notice to Lessor, its interest in this Agreement to any financing entity, or agent on behalf of any financing entity to whom Lessee (i) has obligations for borrowed money or in respect of guaranties thereof, (ii) has obligations evidenced by loans, bonds, debentures, notes or similar instruments, or (iii) has obligations under or with respect to letters of credit, bankers acceptances and similar facilities or in respect of guaranties thereof, provided Lessee remains primarily liable under the terms and conditions of the Agreement. In every Assignment of Lessee's interests in this Agreement, Lessee shall notify Lessor of the name and address of the assignee within ten (10) days of the effective date of the Assignment.

18. Warranty of Title.

(a) Lessor warrants that: (i) Lessor owns the land in fee simple or has an easement thereon and has rights of access thereto; (ii) Lessor has full right to make this Agreement.

(b) Lessor warrants that the making of this Agreement and the performance thereof will not violate any laws, ordinances, restrictive covenants, or the provision of any

mortgage, lease, or other agreements under which Lessor is bound and which restricts the Lessor in any way with respect to the use or disposition of the Land.

19. Repairs. Lessee shall not be required to make any repairs to the Premises or Land unless such repairs shall be necessitated by reason of the default or negligence of Lessee, its agent, servants or employees as specified herein.

20. Environmental Conditions. Lessor states that to the best of its knowledge the Land has not been used for the generation, storage, treatment or disposal of hazardous substances or hazardous wastes. In addition, Lessor states that to the best of its knowledge no hazardous substances, hazardous wastes, pollutants, asbestos, polychlorinated biphenyls (PCBs) petroleum or other fuels (including crude oil or any fraction or derivative thereof) or underground storage tanks (collectively "Environmental Hazards") are located on or about the Land. For purposes of this Agreement, the term "hazardous substances" shall be as defined in the Comprehensive Environmental Response Compensation and Liability Act (42 U.S.C. Section 9601 et seq.) (CERCLA), and any regulation promulgated pursuant thereto. The term "hazardous wastes" shall be as defined in the Resource Conservation and Recovery Act (42 U.S.C. Section 6901 et seq.) (RCRA), any regulations as defined in the Clean Water Act (33 U.S.C. Section 1251 et seq.), and any regulations promulgated pursuant thereto.

21. Miscellaneous.

(a) This Agreement, the Notice of Public Auction and Specific Instructions attached hereto as Exhibit B, constitute the entire agreement and understanding between the parties, and supersedes all offers, negotiations and other agreements concerning the subject matter contained herein. There are no representations or understandings of any kind not set forth herein. Any amendments to this Agreement must be made in writing and executed by both parties.

(b) If any provision of this Agreement is invalid or unenforceable with respect to any party, the remainder of this Agreement or the application of such provision to persons other than those as to whom it is held invalid or unenforceable, shall not be affected and each provision of this Agreement shall be valid and enforceable to the fullest extent by law.

(c) This Agreement shall be binding on and inure to the benefit of the successors and permitted assignees of the respective parties.

(d) The captions of this Agreement have been inserted for convenience only and are not to be construed as part of this Agreement or in any way limiting the scope or intent of its provision.

(e) Any notice or demand required to be given herein (except for the notice required under paragraph 16 and paragraph 6 in emergencies) shall be made by certified or registered mail, return receipt requested, or reliable overnight courier to the address of the respective parties set forth below:

Lessor: Township of South Brunswick
540 Ridge Road
P.O. Box 190
Monmouth Junction NJ 08852
Attention: Township Manager

With a Copy to: Township of South Brunswick
540 Ridge Road
P.O. Box 190
Monmouth Junction NJ 08852
Attention: Information Technology Manager

Lessee: T-Mobile Northeast LLC
12920 SE 38th Street
Bellevue, Washington 98006
Attn: Property Management

Lessor or Lessee may from time to time designate any other address for this purpose by written notice to the other party.

(f) This Agreement shall be construed in accordance with the laws of the State of New Jersey, and the laws of the State of New Jersey will apply to any dispute concerning or arising out of it. The Superior Court of New Jersey with venue in Middlesex County shall be the forum for resolving any dispute concerning or arising out of this Agreement.

(g) Except as specifically provided herein, all rentals paid to the termination date shall be retained by the Lessor.

(h) Lessor acknowledges that a Memorandum of Agreement may be recorded by Lessee in the Official Records of the County where the Land is located. A copy of any proposed Memorandum of Agreement shall be provided by Lessee to Lessor at least seven (7) days prior to any recording thereof.

22. Quiet Enjoyment. Lessor covenants that Lessee, on paying the rent and performing the covenants, shall peaceably and quietly have, hold and enjoy the Premises.

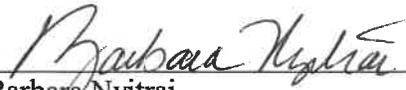
22. Mortgage Subordination. At Lessor's option, this Agreement shall be subordinate to any mortgage by Lessor provided, however, that every such mortgage shall recognize the validity of this Agreement in the event of foreclosure of Lessor's interest and Lessee's right to remain in occupancy of and have access to the Land as long as Lessee is not in default of this Agreement. At Lessee's request, Lessor will furnish to Lessee a non-disturbance agreement for each such

mortgage encumbering the Land. Lessee shall execute whatever instruments may reasonably be required to evidence this subordination clause.

IN WITNESS WHEREOF, the parties have executed this agreement as of the date first above written.

ATTEST:

LESSOR: Township of South Brunswick



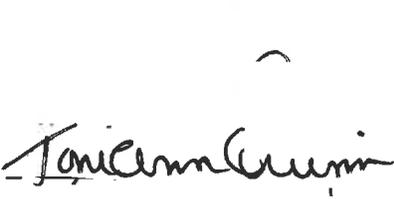
Barbara Nyitrai
Township Clerk

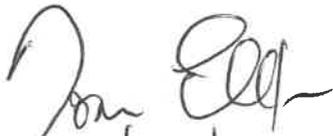
By: 

Charles Carley, Mayor

ATTEST/WITNESS:

LESSEE: T-Mobile Northeast LLC



By: 
_____ 12/20/18

Tom Ellefson
SVP, Northeast Region
Engineering & Operations


T-Mobile Legal Approval
Lois Duran

STATE OF NEW JERSEY:
SS
COUNTY OF MIDDLESEX:

I CERTIFY that on DECEMBER 31, 2018, BARBARA NYITRAI personally came before me and she acknowledged under oath, to my satisfaction, that:

- (a) she is the Township Clerk of the Township of South Brunswick, the municipal corporation named in this document;
- (b) she is the attesting witness to the signing of this document by Charles Carley, who is the Mayor of the Township of South Brunswick;
- (c) this document was signed and delivered by the Township of South Brunswick as its voluntary act duly authorized by a proper resolution of the Township Council;
- (d) she knows the proper seal of the Township of South Brunswick which was affixed to this document; and
- (e) she signed this proof to attest to the truth of these facts.

Signed and sworn to before me
On December 31, 2018


Bernard P. Hvozdovic, Jr.
An Attorney at Law
In the State of New Jersey

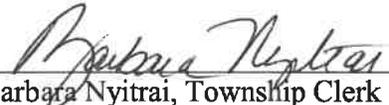

Barbara Nyitrai, Township Clerk

EXHIBIT A

(Approved site plan)

Please see attached.

EXHIBIT B

NOTICE OF INVITATION TO BID

The Township of South Brunswick will be accepting sealed bids for the lease of space on its telecommunications monopole, with accompanying ground space for an equipment enclosure, located at 3960 Route 1, Monmouth Junction (South Brunswick Township), New Jersey, 08852, also known as Lot 8.04 in Block 85 on the tax maps of the Township of South Brunswick. This auction has been authorized by Resolution 2018-327.

All bids must be received no later than **Tuesday, October 16, 2018 at 2:00 p.m.** Bids shall be opened on **Thursday, October 18, 2018 at 2:00 p.m.** in the South Brunswick Municipal Building, 540 Ridge Road (Route 522), Monmouth Junction, New Jersey.

The minimum bid price shall be \$3,700.93 per month. Before any construction or site work is started, a site plan must be submitted to the Information Technology Manager for review and approval. The Township of South Brunswick already leases space at this location. Any equipment installed as a result of this lease shall not cause any interference with the existing operation on the site.

The successful bidder will be required to maintain liability insurance naming the Township of South Brunswick as an additional insured in an amount not less than a combined single limit of \$1,000,000.00 for injury or damage to one or more persons or property.

The successful bidder shall be subject to such other terms and conditions as are contained in a Telecommunications Lease Agreement, a copy of which may be obtained from the Township's website at www.sbtnj.net or in the Township Clerk's office. Interested parties may make arrangements to inspect the site during the week prior to the submission deadline by contacting the Information Technology Manager at 732-329-4000, Ext.7315.

Robert J. Mitchell
Purchasing Agent

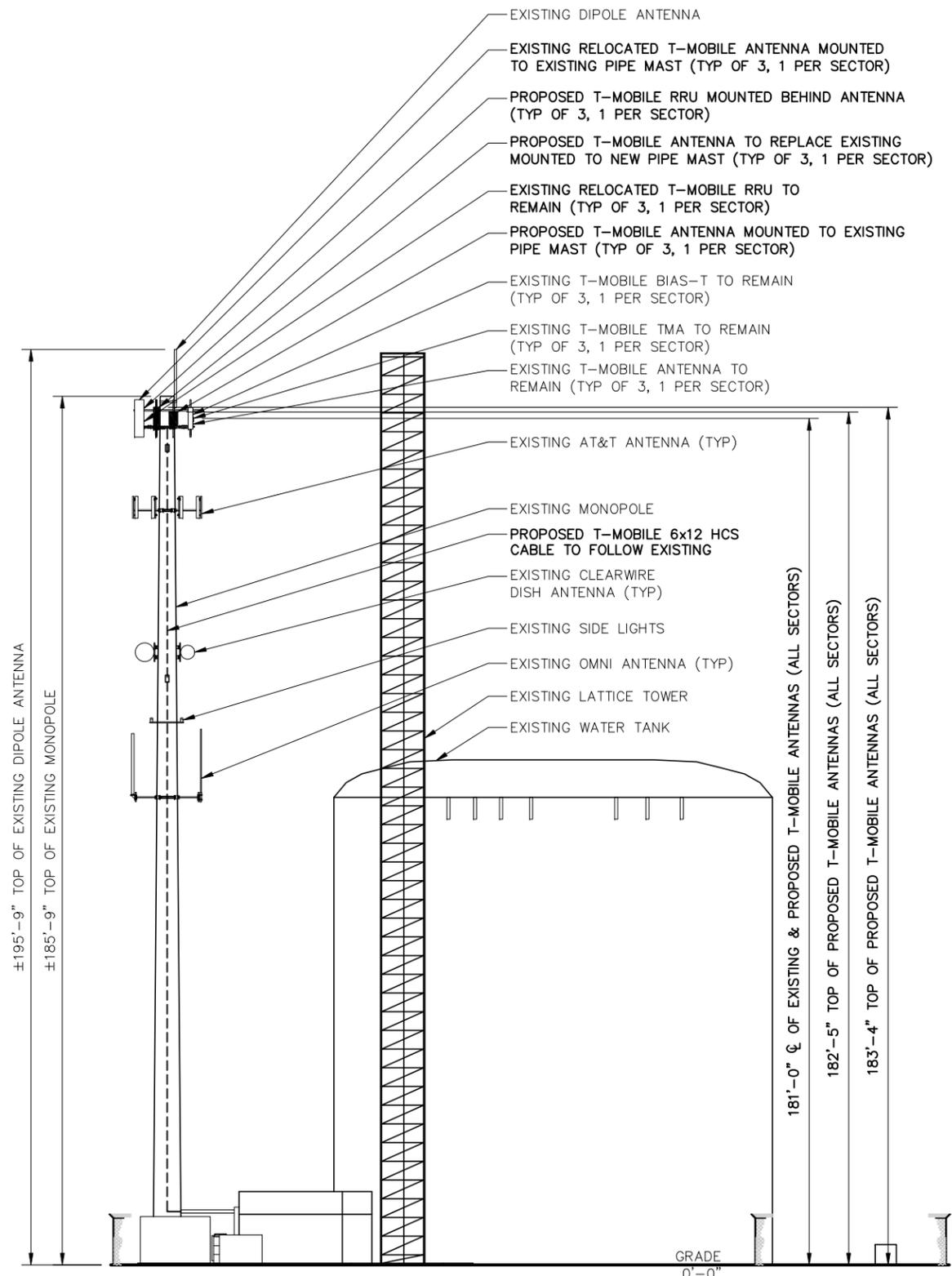
To be advertised: Tuesday, September 25, 2018
 Tuesday, October 2, 2018
 Home News Tribune

 Friday, September 28, 2018
 The Sentinel of North and South Brunswick

To be posted: Beginning Thursday, September 20, 2018
 Ending Tuesday, October 16, 2018
 www.sbtnj.net

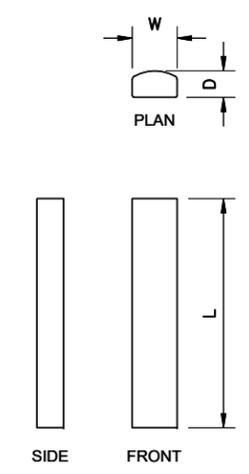
**Site Address: 3960 Route 1, South Brunswick, NJ 14
September 2018**

UNIVERSITY OF DOCUMENTS: THIS DOCUMENT AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, ARE THE PROPERTY OF KMB DESIGN GROUP, LLC AND ARE NOT TO BE USED, IN WHOLE OR IN PART, FOR OTHER PROJECTS WITHOUT THE WRITTEN AUTHORIZATION OF KMB DESIGN GROUP, LLC. IT IS UNLAWFUL FOR ANY PERSON TO AMEND ANY ASPECT OF THESE DRAWINGS UNLESS THEY HAVE THE APPROVAL OF THE LICENSED PROFESSIONAL IN WRITING.

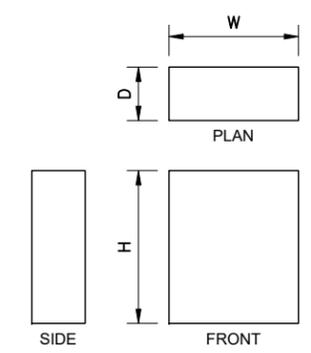


MANUF.: ERICSSON
 MODEL: AIR 32 B2/B66A (DUAL)
 LENGTH: 56.6"
 WIDTH: 12.9"
 DEPTH: 8.7"
 WEIGHT: 132.2 lbs

MANUF.: ERICSSON
 MODEL: AIR 6449 B41
 LENGTH: 33.1"
 WIDTH: 20.5"
 DEPTH: 8.3"
 WEIGHT: 103 lbs



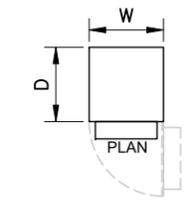
MANUF.: ERICSSON
 MODEL: Radio 4415 B25
 LENGTH: 14.9"
 WIDTH: 13.2"
 DEPTH: 5.4"
 WEIGHT: 46.3 lbs



2 PANEL ANTENNA

SCALE: NTS

MANUFACTURER: ERICSSON
 MODEL #: B160
 HEIGHT: 63.0"
 WIDTH: 26.0"
 DEPTH: 26.0"
 WEIGHT: 1,891.0 lbs
 AREA: 4.7 SF



NOTES:
 1. WEIGHT INCLUDES CUSTOMER EQUIPMENT OR BATTERIES.
 2. INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
 3. VERIFY BOLT LOCATIONS WITH CABINET MANUFACTURER.

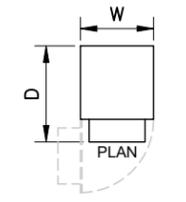
4 BATTERY CABINET

SCALE: NTS

3 REMOTE RADIO UNIT (RRU)

SCALE: NTS

MANUFACTURER: ERICSSON
 MODEL #: 6160
 HEIGHT: 63.0"
 WIDTH: 25.6"
 DEPTH: 33.5"
 WEIGHT: 605.0 lbs
 AREA: 4.6 SF



NOTES:
 1. WEIGHT INCLUDES CUSTOMER EQUIPMENT OR BATTERIES.
 2. INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
 3. VERIFY BOLT LOCATIONS WITH CABINET MANUFACTURER.

5 EQUIPMENT CABINET

SCALE: NTS

1 SOUTHEAST ELEVATION

11 x 17 SCALE: 1/32" = 1'-0" 24 x 36 SCALE: 1/16" = 1'-0"



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0	09-21-20	ISSUED AS FINAL	DBS	JES
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REV.	DATE	REVISION DESCRIPTION	DRAWN BY	CHKD. BY
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N.J. CERTIFICATE OF AUTHORIZATION: 24GA28150800



Stephen A. Bray
 PROFESSIONAL ENGINEER
 NJ LICENSE: 24GE04414400 9/21/20

PROJECT NUMBER:
300.5912.50J

SITE INFORMATION:
 MAJOR ROAD AND ROUTE 1
 SOUTH BRUNSWICK, NJ 08852
 MIDDLESEX COUNTY

NJ08012E

DESIGN TYPE:
 CO-LOCATION

SHEET TITLE:
 ELEVATION & DETAILS

SHEET NUMBER: REV.:

C02 0

K:\300_T-Mobile\300.5000_T-Mobile LTE\300.5912_NJ08012E_Major Road and Route 1\300.5912.50J_Anchor\300.5912.50J_CAD\300.5912.50J_Construction\300.5912.50J_C02.dwg, 9/21/2020 2:57:26 PM, CCreu

UNLESS OTHERWISE NOTED, THIS DOCUMENT AND THE IDEAS AND DESIGNS INCORPORATED HEREIN, AS AN INSTRUMENT OF PROFESSIONAL SERVICE, ARE THE PROPERTY OF KMB DESIGN GROUP, LLC, AND ARE NOT TO BE USED, IN WHOLE OR IN PART, FOR OTHER PROJECTS WITHOUT THE WRITTEN AUTHORIZATION OF KMB DESIGN GROUP, LLC. IT IS UNLAWFUL FOR ANY PERSON TO AMEND ANY ASPECT OF THESE DRAWINGS UNLESS THEY HAVE THE APPROVAL OF THE LICENSED PROFESSIONAL IN WRITING.

- GENERAL SPECIFICATIONS:**
- ALL WORK SHOULD BE DONE IN A NEAT WORKMANLIKE MANNER, LEFT CLEAN AND FREE FROM DEFECTS, AND COMPLETELY OPERABLE. THE CONTRACTOR SHALL PROVIDE ALL EQUIPMENT AS SCHEDULED ON THE DRAWINGS. ALL MATERIALS SHALL BE NEW AND ALL WORK AND MATERIALS SHALL BE GUARANTEED BY THE CONTRACTOR FOR A PERIOD OF ONE (1) YEAR FROM THE DATE OF ACCEPTANCE BY THE OWNER.
 - ALL WORK SHALL BE CAREFULLY COORDINATED WITH THE LANDLORD AND ALL TRADES INVOLVED, AND THE CONTRACTOR SHALL PROVIDE PROPER CONNECTIONS, FITTINGS, VALVES, PIPING, ETC. FOR ALL EQUIPMENT FURNISHED BY CARRIER OR OTHER TRADES INVOLVED IN THIS CONTRACT.
 - CONTRACTOR SHALL INFORM THE ENGINEER IMMEDIATELY OF ANY CONFLICT DISCOVERED BEFORE PERFORMING ANY WORK RELATED TO SUCH CONFLICT.
 - PROVIDE ALL REQUIRED TEMPORARY UTILITIES AND PAY ALL ASSOCIATED FEES AND OPERATING COSTS.
 - THE GENERAL CONTRACTORS SHALL PERFORM ALL CUTTING AND PATCHING AS REQUIRED FOR THEIR RESPECTIVE WORK, INCLUDING STRUCTURALLY FRAMED OPENINGS SHALL BE CUT AND FRAMED BY THE GENERAL CONTRACTOR. ALL HOLES IN MASONRY FLOORS AND WALLS SHALL BE CORE DRILLED.

- GROUNDING NOTES:**
- ALL GROUNDING CONDUCTORS SHALL BE #2 SOLID TINNED COPPER, UNLESS OTHERWISE NOTED.
 - ALL EXTERIOR CONNECTIONS TO GROUND CONDUCTOR SHALL BE EXOTHERMICALLY WELDED (CADWELD).
 - ALL CONNECTIONS BELOW GRADE SHALL BE EXOTHERMICALLY WELDED (CADWELD).
 - CONNECTIONS TO GROUND BARS SHALL BE MADE UTILIZING TWO-HOLE LONG BARREL TYPE STAINLESS STEEL BOLTS, NUTS, AND LOCKWASHERS.
 - CONNECTIONS TO EQUIPMENT AND ENCLOSURES SHALL BE MADE UTILIZING TWO-HOLE GROUND LUGS WITH AN ANTI-OXIDENT COMPOUND.
 - THE GROUNDING SYSTEM SHALL BE TESTED UPON INSTALLATION. THE MAXIMUM RESISTANCE TO GROUND SHALL NOT EXCEED 5 OHMS.
 - WHERE GROUNDING CONNECTIONS ARE MADE TO PAINTED METAL. SURFACES SHALL BE SCRAPPED CLEAN TO BEAR METAL TO INSURE PROPER CONTACT. SURFACES SHALL BE RESTORED TO MATCH ORIGINAL FINISHES.
 - ALL BENDS IN GROUNDING CONDUCTORS SHALL NOT BE LESS THAN A 12" RADIUS.
 - BOND ALL METALLIC RACEWAYS, EQUIPMENT ENCLOSURES, AND BOXES.
 - ALL BONDING CONDUCTORS SHALL BE #6 AWG. STRANDED INSULATED COPPER.
 - CABLE TO CABLE CONNECTIONS SHALL BE EXOTHERMICALLY WELDED (CADWELD).
 - CABLE TO STEEL CONNECTIONS SHALL BE EXOTHERMICALLY WELDED (CADWELD), UNLESS OTHERWISE NOTED.
 - USE OF NINETY DEGREE BENDS SHALL BE AVOIDED. BENDS SHALL BE FORTY FIVE DEGREES WHERE POSSIBLE.
 - BOND ALL SERVICE RACEWAYS, EQUIPMENT ENCLOSURES, METER FITTINGS, BOXES, AND METALLIC RACEWAYS IN ACCORDANCE WITH SECTION 250.92 OF THE NATIONAL ELECTRIC CODE.

- ELECTRICAL SPECIFICATIONS:**
- GENERAL:
 - THE ELECTRICAL CONTRACTOR SHALL FURNISH ALL LABOR, MATERIALS, TOOLS, TRANSPORTATION EQUIPMENT, SERVICES AND FACILITIES REQUIRED FOR THE COMPLETE, PROPER AND SUBSTANTIAL INSTALLATION OF ALL ELECTRICAL WORK. ALL FIXTURES, DEVICES, AND EQUIPMENT SHOWN, NOTED OR REQUIRED ON THESE DRAWINGS, AND/OR CONTAINED HEREIN SHALL BE CONNECTED FROM THE SOURCE OF ELECTRIC POWER TO THE FINAL CONNECTION, TESTED AND MADE READY FOR SATISFACTORY OPERATION.
 - ALL CONTROL WIRING SHALL BE FURNISHED BY THE ELECTRICAL CONTRACTOR. OTHER CONTRACTORS SHALL PROVIDE STARTERS, ETC. FOR ALL EQUIPMENT THEY FURNISH, UNLESS SPECIFICALLY INDICATED ON THE ELECTRICAL DRAWINGS.
 - UNLESS OTHERWISE INDICATED, THE ARRANGEMENT, POSITION, CONNECTIONS, ETC. SHOWN ON THE DRAWINGS SHALL BE TAKEN DIAGRAMMATIC. THE RIGHT IS RESERVED BY THE ENGINEER TO MAKE MINOR CHANGES IN LOCATIONS AND ARRANGEMENTS WHEN REQUIRED BY JOB DEVELOPMENT WITHOUT ADDITIONAL COMPENSATION TO THE CONTRACTOR.
 - REFER TO THE GENERAL SPECIFICATION, THIS SHEET.
 - ALL WORK SHALL CONFORM TO THE ADOPTED EDITION OF THE NATIONAL ELECTRICAL CODE AND LOCAL, STATE AND APPLICABLE CODES.
 - PROVIDE AS-BUILT DRAWINGS TO OWNER AT CONCLUSION OF PROJECT.
 - OBTAIN ALL PERMITS AND APPROVALS FROM AUTHORITIES HAVING JURISDICTION AND PAYING ALL FEES REQUIRED.
 - WHEN A UTILITY COMPANY METER IS SPECIFIED, THE CONTRACTOR SHALL OBTAIN ALL ASSOCIATED CUT-IN CARDS, INSPECTIONS, ETC., NECESSARY TO HAVE THE METER SET. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO MEET WITH UTILITY COMPANY PRIOR TO CONSTRUCTION TO VERIFY SOURCE OF ELECTRIC SERVICE, TAP AND METER LOCATION.
 - GROUND RING DEPTH SHALL BE 30 INCHES MINIMUM BELOW FINISHED GRADE, OR 6 INCHES BELOW FROST LINE, WHICHEVER IS THE GREATER DISTANCE.
 - IDENTIFICATION:
 - PROVIDE TYPEWRITTEN DIRECTORIES FOR PANELS, INDICATING USE OF EACH BRANCH CIRCUIT AND DESIGNATING SPARE CIRCUITS. HANDWRITTEN DIRECTORIES ARE NOT ACCEPTABLE.
 - LABEL ALL CONDUITS AND WIRES WITH THEIR ASSOCIATED CONDUIT AND CIRCUIT/TERMINAL NUMBERS. MARKERS TO BE AS MANUFACTURED BY SETON NAMEPLATE CORP., OR EQUAL.
 - ALL PANELBOARDS, SWITCHES AND OTHER EQUIPMENT ENCLOSURES SHALL BEAR ENGRAVED NAMEPLATES AS MANUFACTURED BY SETON NAMEPLATE CORP., OR EQUAL LETTERING TO BE 1/2 INCH HIGH WHITE LETTERS ON BLACK BACKGROUND UNLESS NOTED OTHERWISE.
 - RACEWAYS:
 - MINIMUM CONDUIT SIZE SHALL BE 3/4" UNLESS OTHERWISE NOTED ON THE DRAWINGS.
 - EXPOSED RACEWAYS SHALL BE RUN TRUE, PLUMB, AND PARALLEL OR PERPENDICULAR TO BUILDING LINES.
 - CONDUIT SUPPORTS SHALL BE SPACED AT A MAXIMUM DISTANCE OF 10 FEET APART.
 - WIRING METHODS:
 - SINGLE CONDUCTOR CABLES SHALL BE USED FOR FEEDERS AND BRANCH CIRCUIT WIRING. MINIMUM SIZE WIRE SHALL BE #12 AWG UNLESS OTHERWISE INDICATED AND SHALL BE SIZED TO CONFORM TO NORMAL NEC VOLTAGE DROPS. WIRE SIZES #10 AWG AND SMALLER SHALL BE SOLID, #8 AWG AND LARGER SHALL BE STRANDED. ALL CONDUCTORS SHALL BE COPPER.
 - CONDUCTORS SHALL BE CONTINUOUS FROM ORIGIN TO PANEL OR EQUIPMENT WITHOUT SPLICES. WHERE TAP SPLICES ARE NECESSARY AND APPROVED, THEY SHALL BE MADE WITH SUITABLE CONNECTORS IN JUNCTION BOXES.
 - PHASE CONDUCTORS SHALL BE IDENTIFIED WITH THE FOLLOWING COLOR CODED TAPE AT BOTH ENDS:

120/208 VOLTS		277/480 VOLTS	
PHASE A	BLACK	BROWN	
PHASE B	RED	ORANGE	
PHASE C	BLUE	YELLOW	
NEUTRAL	WHITE	WHITE WITH GREY STRIPE	
GROUND	GREEN	GREEN	

- PROVIDE FIRESTOPPING AROUND ALL CONDUITS AT WALL AND FLOOR PENETRATIONS.
 - SEAL ALL EXTERIOR WALL PENETRATIONS AS REQUIRED.
 - THE CONTRACTOR SHALL CONCEAL ALL CONDUIT ROUTING PASSING THROUGH FINISHED AREAS. CONDUIT ROUTING THROUGH UNFINISHED AREAS SHALL BE SUPPORTED AS SPECIFIED IN DRAWINGS. UNLESS CLEARLY SPECIFIED, NO CONDUITS SHALL BE ROUTED ON EXTERIOR SURFACE OF BUILDING.
 - UNDERGROUND CONDUITS SHALL BE A MINIMUM OF 24" BELOW FINISHED GRADE. ALL UNDERGROUND WORK SHALL BE DOCUMENTED BY PHOTOGRAPH BEFORE ANY BACKFILL IS BEGUN. PHOTOS WILL BE REQUIRED AT TIME PUNCHLIST IS PERFORMED. FEEDERS SHALL BE INDIVIDUAL CONDUCTORS IN SCHEDULE 40 PVC, DIRECT BURIAL CONDUIT. WHEN BURIED CONDUITS ARE SUBJECT TO VEHICULAR TRAFFIC, CONDUITS SHALL BE ENCASED IN CONCRETE. ALL SWEEPS BELOW GRADE SHALL BE SCHEDULE 80 PVC.
 - ALL FEEDERS RUN INDOORS SHALL CONSIST OF EMT WITH INDIVIDUAL CONDUCTORS. FLEXIBLE METALLIC CONDUIT (MC) SHALL BE USED WHERE STRUCTURAL MEMBER PROHIBIT CONDUIT. MC MAY ALSO BE UTILIZED FOR LIGHTING WHIPS, BRANCH CIRCUITS AND OTHER MISCELLANEOUS APPLICATIONS PERMITTED BY CODE.
 - ALL FEEDERS IN "DAMP" OR "WET" LOCATIONS SHALL CONSIST OF INDIVIDUAL CONDUCTOR IN RIGID GALVANIZED STEEL OR RIGID ALUMINUM CONDUIT. LIQUID-TIGHT FLEXIBLE METALLIC CONDUIT SHALL BE UTILIZED WHEN CONNECTING TO EQUIPMENT CABINETS AND VIBRATING EQUIPMENT. THE MAXIMUM LENGTH FOR FLEXIBLE CONDUIT SHALL BE 6'-0".
- WIRING DEVICES:
 - SWITCHES, RECEPTACLES AND OTHER WIRING DEVICES SHALL BE SPECIFICATION GRADE OF TYPE, SIZE AND RATING INDICATED ON THE DRAWINGS.
 - DISCONNECT SWITCHES:
 - SWITCHES SHALL BE QUICK-MAKE, QUICK-BREAK, NEMA 1 FOR INDOOR USE AND NEMA 3R FOR OUTDOOR USE AS MANUFACTURED BY GENERAL ELECTRIC, SQUARE D OR EQUAL. ELECTRICAL CONTRACTOR TO PROVIDE ALL SAFETY DISCONNECTS.
 - SPECIAL REQUIREMENTS:
 - THE ELECTRICAL CONTRACTOR SHALL FURNISH AND INSTALL ALL POWER AND CONTROL WIRING FOR EQUIPMENT FURNISHED UNDER HVAC, PLUMBING AND GENERAL TRADE SECTIONS.
 - ALL WORK REQUIRING AN OUTAGE OR INTERRUPTION OF SERVICE (POWER, TELEPHONE) SHALL BE SCHEDULED ONLY AT SUCH TIME PERMITTED BY OWNER.
 - THE CONTRACTOR SHALL BE RESPONSIBLE FOR FILING THE PROJECT WITH THE ADVISORY BOARD OF THE CITY OF NEW YORK (IF REQUIRED) THE CONTRACTOR SHALL BE RESPONSIBLE FOR PREPARATION OF NECESSARY DRAWINGS, FORMS AND ALL ASSOCIATED FEES.
 - LIGHTING FIXTURES AND LAMPS:
 - LIGHTING FIXTURES SHALL BE FURNISHED COMPLETE WITH NECESSARY HARDWARE AND LAMPS.
 - PANELBOARDS:
 - PANELS SHALL BE BOLTED- ON MOLDED CASE CIRCUIT BREAKER TYPE WITH DOORS AND LOCKS.
 - ALL CONDUCTOR TERMINALS SHALL BE U.L. LISTED FOR MINIMUM OF 75° C.
 - TRANSFORMERS:
 - TRANSFORMERS SHALL BE DRY TYPE WITH AVERAGE TEMPERATURE RISE NOT TO EXCEED 150° C (115° C) (80° C).
 - TRANSFORMERS SHALL BE AS MANUFACTURED BY SQUARE D, GENERAL ELECTRIC OR SIEMENS.

ELECTRICAL LEGEND	
LIGHTING FIXTURES	
	1" X 4' SURFACE MOUNTED FLOURESCENT FIXTURE WITH WRAP AROUND ACRYLIC PRISMATIC LENS. ULTRONIA PART NO. LB-332-120-SS813-NYC. LAMPS: (3) F32T8/65K
	50 WATT H.P.S. EXTERIOR WALL MOUNTED FIXTURE W/ PHOTOCCELL. MOUNT 8" A.F.F. TO BOTTOM. HUBBELL NO. NRG-301-120-PC
POWER	
	HOMERUN TO DESIGNATED PANEL. CROSS LINES INDICATE NUMBER OF CONDUCTORS WHEN MORE THAN TWO (GROUND NOT INCLUDED). NUMBER DENOTES CIRCUIT
	TRANSFORMER
WIRING DEVICES	
	DUPLEX RECEPTACLE, 20 AMP, 125 V, LEVITON NO. 5262-1 MOUNT 1" A.F.F. TO CENTER
	DOUBLE DUPLEX RECEPTACLE, (2) 20 AMP, 125 V, LEVITON NO. 5262-1 MOUNT 1" A.F.F. TO CENTER
	20 AMP, 125 V, DUPLEX RECEPTACLE W/ GROUND FAULT INTERRUPTER LEVITON NO. 6599 W/ LOCKING COVER 5977
	SINGLE POLE, 20 AMP TOGGLE SWITCH LEVITON NO. CSB 1-20. MOUNT 4'-0" A.F.F. TO TOP.
	TWO-POLE, 20 AMP TOGGLE SWITCH LEVITON NO. CSB 2-20. MOUNT 4'-0" A.F.F. TO TOP.
	3-WAY, 20 AMP TOGGLE SWITCH LEVITON NO. CSB 3-20. MOUNT 4'-0" A.F.F. TO TOP.
AUXILIARY SYSTEMS	
	CEILING-MOUNTED IONIZATION SMOKE DETECTOR
	CEILING MOUNTED PHOTOELECTRIC SMOKE DETECTOR
	SELF-CONTAINED COMBINATION EMERGENCY LED LIGHT W/ (2) LAMPHEADS. DUAL-LITE NO. LTRSW
	FIRE ALARM PULL STATION, MOUNT 48" A.F.F. TO TOP.
	FIRE ALARM HORN / STROBE. MOUNT 80" A.F.F. TO TOP.
EQUIPMENT	
	DISCONNECT SWITCH 30 = AMP RATING NF = NON-FUSED
	PULLBOX
	PANELBOARD
	MOTOR-OPERATED DAMPER
	MOTOR
GROUNDING	
	#2 SOLID TINNED COPPER UNLESS OTHERWISE NOTIFIED
	EXOTHERMIC WELD CONNECTION
	MECHANICAL CONNECTION, DOUBLE-CRIMP "C" TYPE
	MASTER GROUND BAR
	INSULATED GROUND BAR
	UNINSULATED GROUND BAR
	5/8" x 10' COPPER CLAD GROUND ROD

THE CONTRACTOR IS REQUIRED TO CONTACT AND MEET WITH THE UTILITY COMPANIES PRIOR TO STARTING CONSTRUCTION. THIS IS NECESSARY TO VERIFY THAT FOLLOWING UTILITY POINTS HAVE REMAINED CONSISTENT WITH THE CONTRACTOR DOCUMENTS.

- * TELEPHONE DEMARCATION POINT
- * ELECTRICAL SERVICE TAP POINT
- * NEW UTILITY METER LOCATION



					
					
					
					
					
					
					
					
	09-21-20	ISSUED AS FINAL	DBS	JES	

REV.	DATE	REVISION DESCRIPTION	DRAWN BY	CHKD. BY



KMB DESIGN GROUP
kmbdg.com

1800 ROUTE 34, SUITE 209
WALL, NJ 07719
(732) 280-5623

N.J. CERTIFICATE OF AUTHORIZATION: 24GA28150800



Stephen A. Bray
PROFESSIONAL ENGINEER

NJ LICENSE: 24GE04414400 9/21/20

PROJECT NUMBER:
300.5912.50J

SITE INFORMATION:
MAJOR ROAD AND ROUTE 1
SOUTH BRUNSWICK, NJ 08852
MIDDLESEX COUNTY
NJ08012E

DESIGN TYPE:
CO-LOCATION

SHEET TITLE:
GENERAL INFORMATION

SHEET NUMBER: **E01** REV.: **0**

K:\300_T-Mobile\300.5000_T-Mobile LTE\300.5912_NJ08012E_Major Road and Route 1\300.5912.50J_CAD\300.5912.50J_Construction\300.5912.50J_E01.dwg, 9/21/2020 2:58:03 PM, C0reu



**Tower
Structural Analysis Report**

For

**US 1 NORTH & MAJOR ROAD
SOUTH BRUNSWICK, NJ 08852
MIDDLESEX COUNTY**

Site ID: NJ08012E

KMB ID: 300.5912.50J

Prepared For:

**T-MOBILE NORTHEAST LLC
4 SYLVAN WAY
PARSIPPANY, NJ 07054**

October 16, 2020

Analyzed By:

A handwritten signature in blue ink, appearing to read 'SS'.

Silviu Sacuiu
Structural Engineer

Reviewed By:

A circular professional engineer seal for the State of New Jersey, with a handwritten signature in black ink over it. The seal contains the text 'STATE OF NEW JERSEY', 'STEPHEN A. BRAY, P.E.', '24GE04414400', and 'PROFESSIONAL ENGINEER'.

Stephen A. Bray, P.E.
NJ PE License No. 24GE04414400
NJ Certificate of Authorization: 24GA28150800



Contents

1. Introduction
 2. Information Utilized for the Report
 3. Existing and Proposed Tower Loading
 4. Analysis Method
 5. Assumptions
 6. Tower Analysis Results
 7. Conclusion
- Appendix A – tnx Tower Output for Proposed Loading
- Appendix B – Referenced Reports



1. Introduction

Pursuant to your request, KMB Design Group, LLC (KMB) has completed a structural analysis of the existing monopole tower to evaluate T-Mobile’s proposed antenna and equipment installation at an approximate centerline elevation of 181’ feet above grade.

This structural analysis was completed according to the recommendations of the “Structural Standard for Antenna Supporting Structures and Antennas”, ANSI TIA/EIA Standard and 2015 International Building Code NJ Edition. This tower has been analyzed in accordance with the following:

- TIA/EIA-222-H
- 115 mph ultimate wind speed – Middlesex County (Risk Category II, ASCE7-16)
- 1.00” ice in conjunction with 40 mph wind speed.
- 60 mph under service loads
- Structure Class II
- Exposure B

2. Information Utilized for the Report

The following documents were utilized in the preparation of this analysis.

- Latest signed and sealed drawings by KMB;
- RFDS, dated 09/10/2020;
- Tower Mapping Report by Tower Engineering Professionals, dated 02/08/2018;
- Previous Structural Analysis by French & Parrello Associates, P.A., dated 11/09/2011;
- Previous Structural Analysis by KMB Design Group, Inc., dated 07/14/2009;

Please refer to Appendix B for further details.



3. Existing and Proposed Tower Loading

The existing tower geometry and structural loading was obtained from the above referenced tower mapping report.

Our analysis was performed considering the loading listed below:

Status	Centerline Elevation	Qty.	Antenna Model/Appurtenance	Coax/Conduit
Existing	185'	1	10' Dipole	(1) 1-5/8"
Existing / Proposed <i>T-Mobile</i>	181'	3	AIR6449 B41	(6) Hybrid Fiber Trunk (1) 1 5/8" (3) 7/8" (1) 1/2"
		3	AIR32 B66A B2A	
		3	APXVAARR24_43-U-NA20	
		3	AIR21 B2A B4P	
		3	Radio 4449 B71	
		3	Radio 4415 B25	
		3	Smart Bias T	
		3	KRY 112 144/1	
Existing <i>AT&T</i>	162'	6	SBNHH-1D65A	(11) 1-5/8" (2) 2-1/2"
		6	P65-15-XLH-RR	
		3	RRH4x45	
		3	B25-RRH4x30	
		1	RRH 2x40-07D	
		1	DC6-48-60-18	
Existing	140'	1	UXA4-107BC	(2) E105J (12) 1-5/8"
		1	SU6-107B0	
Existing	99.5'	2	20' OMNI	(1) 7/8" (1) 1-3/8"
		1	TMA	

Ultimate user is responsible to verify that the tower loading, as represented above, is the actual as-built tower loading. In the event of discrepancies, ultimate user shall notify KMB and a revised structural review must be conducted prior to any tower, antenna and appurtenance placement or modifications on the existing structure.

4. Analysis Method

TNX Tower 8.0, a commercially available engineering software program, was used to create a theoretical mathematical model of the tower and calculate primary member stresses under various loading conditions. Selected output from the analysis is included in Appendix A.



5. Assumptions

This structural analysis is based on the theoretical capacity of the tower and is not a condition assessment of the existing pole structure. Specifically, we assumed that the pole and foundation were erected, inspected and have been maintained according to the manufacturer's plans and specifications.

We have considered the tower structure is accurate as per mapping report by Tower Engineering Professionals, dated 02/08/2018. We have assumed the information in the mapping report is correct and reflects the current tower state.

6. Tower Analysis Results

Tower:

The analysis of the existing tower in accordance with the above loading indicates that the tower will be stressed to 91.2% of its maximum allowable design capacity. The tower structure with the proposed loading **complies** with the code requirements and **has adequate** structural capacity to support the proposed antenna loading. Please refer to the attached calculations for further information.

Foundation:

It should be noted that the original soil investigation report was not available to KMB Design Group at this time. We have compared the design reactions used in the previous analysis with the reactions resulted from the proposed load case. As per the attached calculations, the reactions imparted by the existing and proposed loading configuration are lower than the design reactions, stated in the previous Structural Analysis by French & Parrello Associates, P.A., dated 11/09/2011. Hence, the existing foundation is deemed structurally adequate to support the proposed loadings.

7. Conclusion

Based on the structural analysis, KMB Design Group, LLC concludes the existing tower is adequate to support the proposed loading considering the limitations stated above.

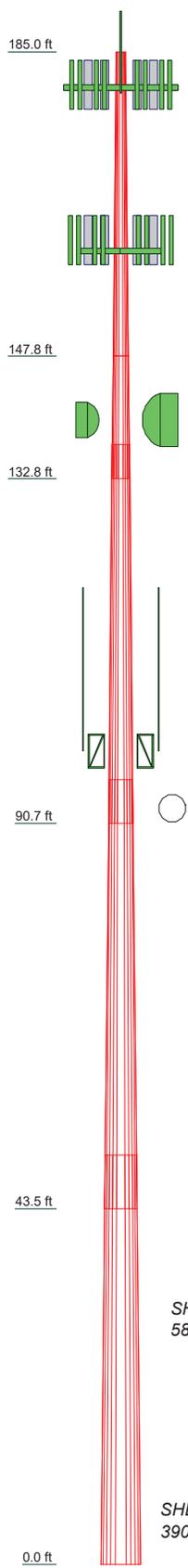
Should you have any questions or comments do not hesitate to contact us.



Appendix A

tnx Tower Output For
Proposed Loading

Section	1	2	3	4	5	
Length (ft)	37.170	15.000	46.330	52.500	50.080	31470.0
Number of Sides	12	12	12	12	12	
Thickness (in)	0.219	0.268	0.313	0.375	0.438	
Socket Length (ft)	13.563	4.170	5.330	6.580	45.363	
Top Dia (in)	22.850	22.850	25.021	34.640	57.875	
Bot Dia (in)	22.850	26.598	36.596	47.757	13515.7	
Grade	1763.2	1182.7	5321.6	9686.8	13515.7	
Weight (lb)						



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
10' x 2" Dipole	185	SBNHH-1D65A w/ Mount Pipe (ATI)	162
Platform Mount [LP 404-1] (TMO)	181	SBNHH-1D65A w/ Mount Pipe (ATI)	162
AIR 21 B2A/B4P w/ Mount Pipe (TMO)	181	SBNHH-1D65A w/ Mount Pipe (ATI)	162
AIR 21 B2A/B4P w/ Mount Pipe (TMO)	181	SBNHH-1D65A w/ Mount Pipe (ATI)	162
AIR 21 B2A/B4P w/ Mount Pipe (TMO)	181	SBNHH-1D65A w/ Mount Pipe (ATI)	162
AIR 6449 B41 w/ Mount Pipe (TMO)	181	P65-15-XLH-RR w/ Mount Pipe (ATI)	162
AIR 6449 B41 w/ Mount Pipe (TMO)	181	P65-15-XLH-RR w/ Mount Pipe (ATI)	162
AIR 6449 B41 w/ Mount Pipe (TMO)	181	P65-15-XLH-RR w/ Mount Pipe (ATI)	162
AIR 32 B2a/B66Aa w/ Mount Pipe (TMO)	181	P65-15-XLH-RR w/ Mount Pipe (ATI)	162
AIR 32 B2a/B66Aa w/ Mount Pipe (TMO)	181	P65-15-XLH-RR w/ Mount Pipe (ATI)	162
AIR 32 B2a/B66Aa w/ Mount Pipe (TMO)	181	P65-15-XLH-RR w/ Mount Pipe (ATI)	162
AIR 32 B2a/B66Aa w/ Mount Pipe (TMO)	181	PCS B25 RRH4x30 (ATI)	162
AIR 32 B2a/B66Aa w/ Mount Pipe (TMO)	181	PCS B25 RRH4x30 (ATI)	162
APXVAARR24 43-U-NA20 w/ Mounting Pipe (TMO)	181	PCS B25 RRH4x30 (ATI)	162
APXVAARR24 43-U-NA20 w/ Mounting Pipe (TMO)	181	RRH2X40-AWS (ATI)	162
APXVAARR24 43-U-NA20 w/ Mounting Pipe (TMO)	181	RRH2X40-AWS (ATI)	162
APXVAARR24 43-U-NA20 w/ Mounting Pipe (TMO)	181	RRH2X40-AWS (ATI)	162
KRY 112 144/2 (TMO)	181	RRH2x40-07L-DE (ATI)	162
KRY 112 144/2 (TMO)	181	DC6-48-60-18-8C (ATI)	162
KRY 112 144/2 (TMO)	181	T-Arm Mount [TA 601-1] (ATI)	161
KRY 112 144/2 (TMO)	181	T-Arm Mount [TA 601-1] (ATI)	161
KRY 112 144/2 (TMO)	181	T-Arm Mount [TA 601-1] (ATI)	161
RRU 4449 (TMO)	181	UXA4-107BC	140
RRU 4449 (TMO)	181	SUG-107B	140
RRU 4449 (TMO)	181	20' x 3" Omni	119.5 - 99.5
RRU 4415 (TMO)	181	20' x 3" Omni	119.5 - 99.5
RRU 4415 (TMO)	181	12" x 12" x 6" TMA	99.5
RRU 4415 (TMO)	181	5' horizontal 3"x3" sq. tube mount	99.5
SBNHH-1D65A w/ Mount Pipe (ATI)	162	5' horizontal 3"x3" sq. tube mount	99.5

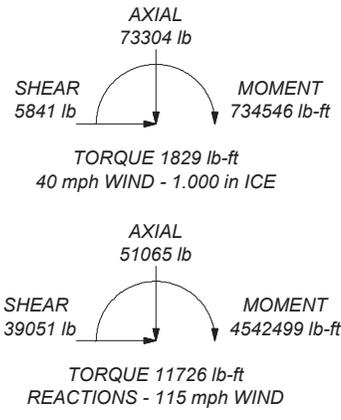
MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower designed for Exposure B to the TIA-222-H Standard.
2. Tower designed for a 115 mph basic wind in accordance with the TIA-222-H Standard.
3. Tower is also designed for a 40 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
4. Deflections are based upon a 60 mph wind.
5. Tower Risk Category II.
6. Topographic Category 1 with Crest Height of 0.000 ft
7. Weld together tower sections have flange connections.
8. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
9. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
10. Welds are fabricated with ER-70S-6 electrodes.
11. TOWER RATING: 91.2%

ALL REACTIONS ARE FACTORED



KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job: 300.5912.50J - NJ08012E - SAND HILL_1		
	Project: 185-ft Monopole		
	Client: T-MOBILE	Drawn by: Ekata A. Shah, P.E.	App'd:
	Code: TIA-222-H	Date: 10/16/20	Scale: NTS
	Path:	Dwg No. E-1	

<p>tnxTower</p> <p>KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980</p>	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 1 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-H standard.

The following design criteria apply:

Tower base elevation above sea level: 247.000 ft.

Basic wind speed of 115 mph.

Risk Category II.

Exposure Category B.

Simplified Topographic Factor Procedure for wind speed-up calculations is used.

Topographic Category: 1.

Crest Height: 0.000 ft.

Nominal ice thickness of 1.000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 40 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

Weld together tower sections have flange connections..

Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..

Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..

Welds are fabricated with ER-70S-6 electrodes..

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Options

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile √ Include Bolts In Member Capacity √ Leg Bolts Are At Top Of Section √ Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) √ SR Members Have Cut Ends SR Members Are Concentric | <ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area √ Use Clear Spans For KL/r Retension Guys To Initial Tension Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. √ Autocalc Torque Arm Areas Add IBC .6D+W Combination Sort Capacity Reports By Component √ Triangulate Diamond Inner Bracing Treat Feed Line Bundles As Cylinder Ignore KL/ry For 60 Deg. Angle Legs | <ul style="list-style-type: none"> Use ASCE 10 X-Brace Ly Rules √ Calculate Redundant Bracing Forces Ignore Redundant Members in FEA SR Leg Bolts Resist Compression √ All Leg Panels Have Same Allowable Offset Girt At Foundation √ Consider Feed Line Torque Include Angle Block Shear Check Use TIA-222-H Bracing Resist. Exemption Use TIA-222-H Tension Splice Exemption <li style="text-align: center;">Poles √ Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets Pole Without Linear Attachments Pole With Shroud Or No Appurtenances Outside and Inside Corner Radii Are Known |
|--|---|---|

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 2 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	185.000-147.830	37.170	0.000	12	13.563	22.850	0.219	0.875	A572-65 (65 ksi)
L2	147.830-132.830	15.000	4.170	12	22.850	26.598	0.268	1.070	A572-65 (65 ksi)
L3	132.830-90.670	46.330	5.330	12	25.021	36.596	0.313	1.250	A572-65 (65 ksi)
L4	90.670-43.500	52.500	6.580	12	34.640	47.757	0.375	1.500	A572-65 (65 ksi)
L5	43.500-0.000	50.080		12	45.363	57.875	0.438	1.750	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I ² /Q in ²	w in	w/t
L1	13.964	9.401	213.681	4.777	7.026	30.415	432.976	4.627	3.049	13.933
L2	23.579	15.944	1042.332	8.102	11.836	88.063	2112.048	7.847	5.537	25.308
	27.441	22.679	2006.888	9.426	13.778	145.664	4066.499	11.162	6.411	23.967
L3	26.872	24.863	1937.391	8.846	12.961	149.481	3925.679	12.237	5.868	18.778
	37.777	36.511	6135.220	12.990	18.957	323.641	12431.619	17.969	8.970	28.705
L4	37.108	41.375	6200.262	12.267	17.943	345.547	12563.411	20.363	8.278	22.076
	49.309	57.213	16394.758	16.963	24.738	662.737	33220.224	28.159	11.794	31.45
L5	48.511	63.288	16303.830	16.083	23.498	693.843	33035.980	31.149	10.985	25.108
	59.762	80.915	34072.871	20.563	29.979	1136.547	69040.875	39.824	14.338	32.773

Tower Elevation ft	Gusset Area (per face) ft ²	Gusset Thickness in	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontals in	Double Angle Stitch Bolt Spacing Redundants in
L1 185.000-147.830				1	1	1.1			
L2 147.830-132.830				1	1	1.1			
L3 132.830-90.670				1	1	1.1			
L4 90.670-43.500				1	1	1.1			
L5 43.500-0.000				1	1	1.1			

Feed Line/Linear Appurtenances - Entered As Round Or Flat

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 3 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Description	Sector	Exclude From Torque Calculation	Component Type	Placement ft	Total Number	Number Per Row	Start/End Position	Width or Diameter in	Perimeter in	Weight plf
LDF12-50A (2-1/4 FOAM)	C	No	Surface Ar (CaAa)	162.000 - 7.000	2	2	0.000 0.000	2.350		1.220
LDF7-50A (1-5/8 FOAM)	C	No	Surface Ar (CaAa)	185.000 - 7.000	1	1	0.000 0.000	1.980		0.820
LDF5-50A (7/8 FOAM)	C	No	Surface Ar (CaAa)	99.000 - 7.000	1	1	0.000 0.000	1.090		0.330
E105J(ELLIPTICAL)	C	No	Surface Ar (CaAa)	139.000 - 7.000	2	1	0.000 0.000	1.300		0.640
LDF1-50A (1/4 FOAM)	C	No	Surface Ar (CaAa)	147.000 - 7.000	3	1	0.000 0.000	0.350		0.060
Safety Line 3/8	C	No	Surface Ar (CaAa)	185.000 - 0.000	1	1	0.000 0.000	0.375		0.220
3/8" Fiber Cable	C	No	Surface Ar (CaAa)	180.000 - 7.000	12	6	0.000 0.000	0.375		0.150

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement ft	Total Number		C _A A _A ft ² /ft	Weight plf
LDF7-50A (1-5/8 FOAM)	C	No	No	Inside Pole	162.000 - 7.000	11	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.820 0.820 0.820
LDF7-50A (1-5/8 FOAM)	C	No	No	Inside Pole	180.000 - 7.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.820 0.820 0.820
LDF5-50A (7/8 FOAM)	C	No	No	Inside Pole	180.000 - 7.000	3	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.330 0.330 0.330
LDF4-50A (1/2 FOAM)	C	No	No	Inside Pole	180.000 - 7.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.150 0.150 0.150
LDF7-50A (1-5/8 FOAM)	C	No	No	Inside Pole	147.000 - 7.000	12	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.820 0.820 0.820
HFT1206-24S26(1-3/8")	C	No	No	Inside Pole	147.000 - 7.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	1.620 1.620 1.620
LDF1-50A (1/4 FOAM)	C	No	No	Inside Pole	147.000 - 7.000	3	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.060 0.060 0.060
927-2549-10020(9/16)	C	No	No	Inside Pole	97.000 - 7.000	1	No Ice 1/2" Ice 1" Ice	0.000 0.000 0.000	0.242 0.242 0.242

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight lb
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tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job	300.5912.50J - NJ08012E - SAND HILL_1	Page	4 of 22
	Project	185-ft Monopole	Date	12:13:51 10/16/20
	Client	T-MOBILE	Designed by	Ekata A. Shah, P.E.

Tower Section	Tower Elevation ft	Face	A_R ft ²	A_F ft ²	C_{AA} In Face ft ²	C_{AA} Out Face ft ²	Weight lb
L1	185.000-147.830	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	22.652	0.000	322.004
L2	147.830-132.830	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	15.256	0.000	419.287
L3	132.830-90.670	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	47.094	0.000	1242.098
L4	90.670-43.500	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	56.816	0.000	1411.892
L5	43.500-0.000	A	0.000	0.000	0.000	0.000	0.000
		B	0.000	0.000	0.000	0.000	0.000
		C	0.000	0.000	44.227	0.000	1094.058

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A_R ft ²	A_F ft ²	C_{AA} In Face ft ²	C_{AA} Out Face ft ²	Weight lb
L1	185.000-147.830	A	1.175	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	57.198	0.000	844.948
L2	147.830-132.830	A	1.156	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	38.163	0.000	838.743
L3	132.830-90.670	A	1.129	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	119.681	0.000	2634.419
L4	90.670-43.500	A	1.073	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	144.881	0.000	3034.363
L5	43.500-0.000	A	0.956	0.000	0.000	0.000	0.000	0.000
		B		0.000	0.000	0.000	0.000	0.000
		C		0.000	0.000	110.801	0.000	2275.220

Feed Line Center of Pressure

Section	Elevation ft	CP_x in	CP_z in	CP_x Ice in	CP_z Ice in
L1	185.000-147.830	0.000	3.049	0.000	3.789
L2	147.830-132.830	0.000	4.486	0.000	5.426
L3	132.830-90.670	0.000	5.093	0.000	6.571
L4	90.670-43.500	0.000	5.716	0.000	7.895
L5	43.500-0.000	0.000	5.141	0.000	7.670

Note: For pole sections, center of pressure calculations do not consider feed line shielding.

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 5 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
L1	1	LDF12-50A (2-1/4 FOAM)	147.83 - 162.00	1.0000	1.0000
L1	2	LDF7-50A (1-5/8 FOAM)	147.83 - 185.00	1.0000	1.0000
L1	14	Safety Line 3/8	147.83 - 185.00	1.0000	1.0000
L1	15	3/8" Fiber Cable	147.83 - 180.00	1.0000	1.0000
L2	1	LDF12-50A (2-1/4 FOAM)	132.83 - 147.83	1.0000	1.0000
L2	2	LDF7-50A (1-5/8 FOAM)	132.83 - 147.83	1.0000	1.0000
L2	4	E105J(ELLIPTICAL)	132.83 - 139.00	1.0000	1.0000
L2	5	LDF1-50A (1/4 FOAM)	132.83 - 147.00	1.0000	1.0000
L2	14	Safety Line 3/8	132.83 - 147.83	1.0000	1.0000
L2	15	3/8" Fiber Cable	132.83 - 147.83	1.0000	1.0000
L3	1	LDF12-50A (2-1/4 FOAM)	90.67 - 132.83	1.0000	1.0000
L3	2	LDF7-50A (1-5/8 FOAM)	90.67 - 132.83	1.0000	1.0000
L3	3	LDF5-50A (7/8 FOAM)	90.67 - 99.00	1.0000	1.0000
L3	4	E105J(ELLIPTICAL)	90.67 - 132.83	1.0000	1.0000
L3	5	LDF1-50A (1/4 FOAM)	90.67 - 132.83	1.0000	1.0000
L3	14	Safety Line 3/8	90.67 - 132.83	1.0000	1.0000
L3	15	3/8" Fiber Cable	90.67 - 132.83	1.0000	1.0000
L4	1	LDF12-50A (2-1/4 FOAM)	43.50 - 90.67	1.0000	1.0000
L4	2	LDF7-50A (1-5/8 FOAM)	43.50 - 90.67	1.0000	1.0000
L4	3	LDF5-50A (7/8 FOAM)	43.50 - 90.67	1.0000	1.0000
L4	4	E105J(ELLIPTICAL)	43.50 - 90.67	1.0000	1.0000
L4	5	LDF1-50A (1/4 FOAM)	43.50 - 90.67	1.0000	1.0000
L4	14	Safety Line 3/8	43.50 - 90.67	1.0000	1.0000
L4	15	3/8" Fiber Cable	43.50 - 90.67	1.0000	1.0000
L5	1	LDF12-50A (2-1/4 FOAM)	7.00 - 43.50	1.0000	1.0000
L5	2	LDF7-50A (1-5/8 FOAM)	7.00 - 43.50	1.0000	1.0000
L5	3	LDF5-50A (7/8 FOAM)	7.00 - 43.50	1.0000	1.0000
L5	4	E105J(ELLIPTICAL)	7.00 - 43.50	1.0000	1.0000
L5	5	LDF1-50A (1/4 FOAM)	7.00 - 43.50	1.0000	1.0000
L5	14	Safety Line 3/8	0.00 - 43.50	1.0000	1.0000
L5	15	3/8" Fiber Cable	7.00 - 43.50	1.0000	1.0000

Discrete Tower Loads

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job	300.5912.50J - NJ08012E - SAND HILL_1	Page	6 of 22
	Project	185-ft Monopole	Date	12:13:51 10/16/20
	Client	T-MOBILE	Designed by	Ekata A. Shah, P.E.

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz	Vert					
					°	ft	ft ²	ft ²	lb
10' x 2" Dipole	C	None			0.000	185.000	No Ice 2.000	2.000	35.000
							1/2" Ice 3.025	3.025	50.501
							1" Ice 4.067	4.067	72.466
Platform Mount [LP 404-1] (TMO)	C	None			0.000	181.000	No Ice 32.790	32.790	2043.000
							1/2" Ice 44.630	44.630	2475.480
							1" Ice 56.470	56.470	2907.960
AIR 21 B2A/B4P w/ Mount Pipe (TMO)	A	From Leg	4.000		0.000	181.000	No Ice 6.162	5.545	103.379
			4.000				1/2" Ice 6.600	6.303	159.182
			0.000				1" Ice 7.033	6.998	221.629
AIR 21 B2A/B4P w/ Mount Pipe (TMO)	B	From Leg	4.000		0.000	181.000	No Ice 6.162	5.545	103.379
			4.000				1/2" Ice 6.600	6.303	159.182
			0.000				1" Ice 7.033	6.998	221.629
AIR 21 B2A/B4P w/ Mount Pipe (TMO)	C	From Leg	4.000		0.000	181.000	No Ice 6.162	5.545	103.379
			4.000				1/2" Ice 6.600	6.303	159.182
			0.000				1" Ice 7.033	6.998	221.629
AIR 6449 B41 w/ Mount Pipe (TMO)	A	From Leg	4.000		0.000	181.000	No Ice 6.424	3.841	124.900
			2.000				1/2" Ice 6.996	4.566	179.233
			0.000				1" Ice 7.504	5.168	239.450
AIR 6449 B41 w/ Mount Pipe (TMO)	B	From Leg	4.000		0.000	181.000	No Ice 6.424	3.841	124.900
			2.000				1/2" Ice 6.996	4.566	179.233
			0.000				1" Ice 7.504	5.168	239.450
AIR 6449 B41 w/ Mount Pipe (TMO)	C	From Leg	4.000		0.000	181.000	No Ice 6.424	3.841	124.900
			2.000				1/2" Ice 6.996	4.566	179.233
			0.000				1" Ice 7.504	5.168	239.450
AIR 32 B2a/B66Aa w/ Mount Pipe (TMO)	A	From Leg	4.000		0.000	181.000	No Ice 6.747	6.070	153.066
			-2.000				1/2" Ice 7.202	6.867	214.038
			0.000				1" Ice 7.648	7.583	281.895
AIR 32 B2a/B66Aa w/ Mount Pipe (TMO)	B	From Leg	4.000		0.000	181.000	No Ice 6.747	6.070	153.066
			-2.000				1/2" Ice 7.202	6.867	214.038
			0.000				1" Ice 7.648	7.583	281.895
AIR 32 B2a/B66Aa w/ Mount Pipe (TMO)	C	From Leg	4.000		0.000	181.000	No Ice 6.747	6.070	153.066
			-2.000				1/2" Ice 7.202	6.867	214.038
			0.000				1" Ice 7.648	7.583	281.895
APXVAARR24_43-U-NA20 w/ Mounting Pipe (TMO)	A	From Leg	4.000		0.000	181.000	No Ice 20.842	11.775	207.900
			-4.000				1/2" Ice 21.696	13.406	351.611
			0.000				1" Ice 22.561	15.061	507.611
APXVAARR24_43-U-NA20 w/ Mounting Pipe (TMO)	B	From Leg	4.000		0.000	181.000	No Ice 20.842	11.775	207.900
			-4.000				1/2" Ice 21.696	13.406	351.611
			0.000				1" Ice 22.561	15.061	507.611
APXVAARR24_43-U-NA20 w/ Mounting Pipe (TMO)	C	From Leg	4.000		0.000	181.000	No Ice 20.842	11.775	207.900
			-4.000				1/2" Ice 21.696	13.406	351.611
			0.000				1" Ice 22.561	15.061	507.611
KRY 112 144/2 (TMO)	A	From Leg	4.000		0.000	181.000	No Ice 0.470	0.220	11.000
			2.000				1/2" Ice 0.560	0.290	14.000
			0.000				1" Ice 0.660	0.370	17.000
KRY 112 144/2 (TMO)	B	From Leg	4.000		0.000	181.000	No Ice 0.470	0.220	11.000
			2.000				1/2" Ice 0.560	0.290	14.000
			0.000				1" Ice 0.660	0.370	17.000
KRY 112 144/2 (TMO)	C	From Leg	4.000		0.000	181.000	No Ice 0.470	0.220	11.000
			2.000				1/2" Ice 0.560	0.290	14.000
			0.000				1" Ice 0.660	0.370	17.000
RRU 4449 (TMO)	A	From Leg	4.000		0.000	181.000	No Ice 1.639	1.291	74.000
			-4.000				1/2" Ice 1.799	1.436	91.125
			0.000				1" Ice 1.966	1.587	110.939
RRU 4449 (TMO)	B	From Leg	4.000		0.000	181.000	No Ice 1.639	1.291	74.000
			-4.000				1/2" Ice 1.799	1.436	91.125
			0.000				1" Ice 1.966	1.587	110.939

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job	300.5912.50J - NJ08012E - SAND HILL_1	Page	7 of 22
	Project	185-ft Monopole	Date	12:13:51 10/16/20
	Client	T-MOBILE	Designed by	Ekata A. Shah, P.E.

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight
			Horz	Vert					
			ft	ft	°	ft	ft ²	ft ²	lb
RRU 4449 (TMO)	C	From Leg	4.000	0.000	0.000	181.000	No Ice 1.639	1.291	74.000
			-4.000				1/2" Ice 1.799	1.436	91.125
			0.000				1" Ice 1.966	1.587	110.939
RRU 4415 (TMO)	A	From Leg	4.000	0.000	0.000	181.000	No Ice 1.639	0.677	46.300
			-4.000				1/2" Ice 1.799	0.789	58.709
			0.000				1" Ice 1.966	0.911	73.485
RRU 4415 (TMO)	B	From Leg	4.000	0.000	0.000	181.000	No Ice 1.639	0.677	46.300
			-4.000				1/2" Ice 1.799	0.789	58.709
			0.000				1" Ice 1.966	0.911	73.485
RRU 4415 (TMO)	C	From Leg	4.000	0.000	0.000	181.000	No Ice 1.639	0.677	46.300
			-4.000				1/2" Ice 1.799	0.789	58.709
			0.000				1" Ice 1.966	0.911	73.485
T-Arm Mount [TA 601-1] (AT&T)	A	From Leg	2.000	0.000	0.000	161.000	No Ice 6.670	3.020	242.000
			0.000				1/2" Ice 8.820	4.200	308.520
			0.000				1" Ice 10.970	5.380	375.040
T-Arm Mount [TA 601-1] (AT&T)	B	From Leg	2.000	0.000	0.000	161.000	No Ice 6.670	3.020	242.000
			0.000				1/2" Ice 8.820	4.200	308.520
			0.000				1" Ice 10.970	5.380	375.040
T-Arm Mount [TA 601-1] (AT&T)	C	From Leg	2.000	0.000	0.000	161.000	No Ice 6.670	3.020	242.000
			0.000				1/2" Ice 8.820	4.200	308.520
			0.000				1" Ice 10.970	5.380	375.040
SBNHH-1D65A w/ Mount Pipe (AT&T)	A	From Leg	4.000	0.000	0.000	162.000	No Ice 6.120	5.190	53.879
			4.000				1/2" Ice 6.558	5.961	107.715
			0.000				1" Ice 6.990	6.658	168.135
SBNHH-1D65A w/ Mount Pipe (AT&T)	B	From Leg	4.000	0.000	0.000	162.000	No Ice 6.120	5.190	53.879
			4.000				1/2" Ice 6.558	5.961	107.715
			0.000				1" Ice 6.990	6.658	168.135
SBNHH-1D65A w/ Mount Pipe (AT&T)	C	From Leg	4.000	0.000	0.000	162.000	No Ice 6.120	5.190	53.879
			4.000				1/2" Ice 6.558	5.961	107.715
			0.000				1" Ice 6.990	6.658	168.135
SBNHH-1D65A w/ Mount Pipe (AT&T)	A	From Leg	4.000	0.000	0.000	162.000	No Ice 6.120	5.190	53.879
			-2.000				1/2" Ice 6.558	5.961	107.715
			0.000				1" Ice 6.990	6.658	168.135
SBNHH-1D65A w/ Mount Pipe (AT&T)	B	From Leg	4.000	0.000	0.000	162.000	No Ice 6.120	5.190	53.879
			-2.000				1/2" Ice 6.558	5.961	107.715
			0.000				1" Ice 6.990	6.658	168.135
SBNHH-1D65A w/ Mount Pipe (AT&T)	C	From Leg	4.000	0.000	0.000	162.000	No Ice 6.120	5.190	53.879
			-2.000				1/2" Ice 6.558	5.961	107.715
			0.000				1" Ice 6.990	6.658	168.135
P65-15-XLH-RR w/ Mount Pipe (AT&T)	A	From Leg	4.000	0.000	0.000	162.000	No Ice 5.304	3.665	48.250
			2.000				1/2" Ice 5.692	4.278	92.059
			0.000				1" Ice 6.087	4.902	141.752
P65-15-XLH-RR w/ Mount Pipe (AT&T)	B	From Leg	4.000	0.000	0.000	162.000	No Ice 5.304	3.665	48.250
			2.000				1/2" Ice 5.692	4.278	92.059
			0.000				1" Ice 6.087	4.902	141.752
P65-15-XLH-RR w/ Mount Pipe (AT&T)	C	From Leg	4.000	0.000	0.000	162.000	No Ice 5.304	3.665	48.250
			2.000				1/2" Ice 5.692	4.278	92.059
			0.000				1" Ice 6.087	4.902	141.752
P65-15-XLH-RR w/ Mount Pipe (AT&T)	A	From Leg	4.000	0.000	0.000	162.000	No Ice 5.304	3.665	48.250
			-4.000				1/2" Ice 5.692	4.278	92.059
			0.000				1" Ice 6.087	4.902	141.752
P65-15-XLH-RR w/ Mount Pipe (AT&T)	B	From Leg	4.000	0.000	0.000	162.000	No Ice 5.304	3.665	48.250
			-4.000				1/2" Ice 5.692	4.278	92.059
			0.000				1" Ice 6.087	4.902	141.752
P65-15-XLH-RR w/ Mount Pipe (AT&T)	C	From Leg	4.000	0.000	0.000	162.000	No Ice 5.304	3.665	48.250
			-4.000				1/2" Ice 5.692	4.278	92.059
			0.000				1" Ice 6.087	4.902	141.752

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job	300.5912.50J - NJ08012E - SAND HILL_1	Page	8 of 22
	Project	185-ft Monopole	Date	12:13:51 10/16/20
	Client	T-MOBILE	Designed by	Ekata A. Shah, P.E.

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz Lateral	Vert						ft
PCS B25 RRH4x30 (AT&T)	A	From Leg	4.000	0.000	0.000	162.000	No Ice	2.200	1.742	55.000
			2.000				1/2" Ice	2.393	1.920	75.465
			0.000				1" Ice	2.593	2.106	98.944
PCS B25 RRH4x30 (AT&T)	B	From Leg	4.000	0.000	0.000	162.000	No Ice	2.200	1.742	55.000
			2.000				1/2" Ice	2.393	1.920	75.465
			0.000				1" Ice	2.593	2.106	98.944
PCS B25 RRH4x30 (AT&T)	C	From Leg	4.000	0.000	0.000	162.000	No Ice	2.200	1.742	55.000
			2.000				1/2" Ice	2.393	1.920	75.465
			0.000				1" Ice	2.593	2.106	98.944
RRH2X40-AWS (AT&T)	A	From Leg	4.000	0.000	0.000	162.000	No Ice	2.161	1.420	44.000
			-2.000				1/2" Ice	2.360	1.590	61.396
			0.000				1" Ice	2.565	1.768	81.692
RRH2X40-AWS (AT&T)	B	From Leg	4.000	0.000	0.000	162.000	No Ice	2.161	1.420	44.000
			-2.000				1/2" Ice	2.360	1.590	61.396
			0.000				1" Ice	2.565	1.768	81.692
RRH2X40-AWS (AT&T)	C	From Leg	4.000	0.000	0.000	162.000	No Ice	2.161	1.420	44.000
			-2.000				1/2" Ice	2.360	1.590	61.396
			0.000				1" Ice	2.565	1.768	81.692
RRH2x40-07L-DE (AT&T)	C	None		0.000	0.000	162.000	No Ice	3.431	2.250	74.100
							1/2" Ice	3.675	2.458	101.799
							1" Ice	3.927	2.674	133.083
DC6-48-60-18-8C (AT&T)	C	None		0.000	0.000	162.000	No Ice	2.737	2.737	26.200
							1/2" Ice	2.963	2.963	52.159
							1" Ice	3.196	3.196	81.676
20' x 3" Omni	B	From Leg	4.000	0.000	0.000	119.500 - 99.500	No Ice	6.000	6.000	70.000
			0.000				1/2" Ice	8.033	8.033	113.168
			0.000				1" Ice	10.083	10.083	169.011
20' x 3" Omni	C	From Leg	4.000	0.000	0.000	119.500 - 99.500	No Ice	6.000	6.000	70.000
			0.000				1/2" Ice	8.033	8.033	113.168
			0.000				1" Ice	10.083	10.083	169.011
5' horizontal 3"x3" sq. tube mount	B	From Leg	2.000	0.000	0.000	99.500	No Ice	1.500	0.075	80.000
			0.000				1/2" Ice	1.854	0.112	94.130
			0.000				1" Ice	2.215	0.156	112.731
5' horizontal 3"x3" sq. tube mount	C	From Leg	2.000	0.000	0.000	99.500	No Ice	1.500	0.075	80.000
			0.000				1/2" Ice	1.854	0.112	94.130
			0.000				1" Ice	2.215	0.156	112.731
12" x 12" x 6" TMA	C	From Leg	4.000	0.000	0.000	99.500	No Ice	1.200	0.600	22.000
			0.000				1/2" Ice	1.337	0.704	32.338
			0.000				1" Ice	1.481	0.815	44.815

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight	
				Horz Lateral	Vert							ft
UXA4-107BC	C	Paraboloid w/Shroud (HP)	From Leg	2.000	40.000	0.000	20.000	140.000	6.583	No Ice	14.580	88.000
				0.000						1/2" Ice	15.150	170.000
				0.000						1" Ice	15.720	240.000
SU6-107B	B	Paraboloid	From	2.000	20.000	0.000	20.000	140.000	6.583	No Ice	34.040	209.000

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 9 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight
				ft	°	°	ft	ft	ft ²	lb
	w/Shroud (HP)	Leg	0.000	0.000				1/2" Ice	34.910	390.000
				0.000				1" Ice	35.770	570.000

Tower Pressures - No Ice

$G_H = 1.100$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _{A A A} In Face	C _{A A A} Out Face
ft	ft		psf	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.000-147.830	164.973	1.14	36.32	58.145	A	0.000	58.145	58.145	100.00	0.000	0.000
			5		B	0.000	58.145		100.00	0.000	0.000
					C	0.000	58.145		100.00	22.652	0.000
L2 147.830-132.830	140.141	1.088	34.69	31.877	A	0.000	31.877	31.877	100.00	0.000	0.000
			0		B	0.000	31.877		100.00	0.000	0.000
					C	0.000	31.877		100.00	15.256	0.000
L3 132.830-90.670	110.848	1.018	32.38	113.566	A	0.000	113.566	113.566	100.00	0.000	0.000
			9		B	0.000	113.566		100.00	0.000	0.000
					C	0.000	113.566		100.00	47.094	0.000
L4 90.670-43.500	66.573	0.88	27.88	169.845	A	0.000	169.845	169.845	100.00	0.000	0.000
			2		B	0.000	169.845		100.00	0.000	0.000
					C	0.000	169.845		100.00	56.816	0.000
L5 43.500-0.000	21.122	0.7	22.56	196.245	A	0.000	196.245	196.245	100.00	0.000	0.000
			1		B	0.000	196.245		100.00	0.000	0.000
					C	0.000	196.245		100.00	44.227	0.000

Tower Pressure - With Ice

$G_H = 1.100$

Section Elevation	z	K _Z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _{A A A} In Face	C _{A A A} Out Face
ft	ft		psf	in	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.000-147.830	164.973	1.14	4.395	1.175	65.421	A	0.000	65.421	65.421	100.00	0.000	0.000
						B	0.000	65.421		100.00	0.000	0.000
						C	0.000	65.421		100.00	57.198	0.000
L2 147.830-132.830	140.141	1.088	4.197	1.156	34.766	A	0.000	34.766	34.766	100.00	0.000	0.000
						B	0.000	34.766		100.00	0.000	0.000
						C	0.000	34.766		100.00	38.163	0.000
L3 132.830-90.670	110.848	1.018	3.919	1.129	121.686	A	0.000	121.686	121.686	100.00	0.000	0.000
						B	0.000	121.686		100.00	0.000	0.000
						C	0.000	121.686		100.00	119.681	0.000
L4 90.670-43.500	66.573	0.88	3.373	1.073	178.720	A	0.000	178.720	178.720	100.00	0.000	0.000
						B	0.000	178.720		100.00	0.000	0.000
						C	0.000	178.720		100.00	144.881	0.000
L5 43.500-0.000	21.122	0.7	2.729	0.956	204.022	A	0.000	204.022	204.022	100.00	0.000	0.000
						B	0.000	204.022		100.00	0.000	0.000
						C	0.000	204.022		100.00	110.801	0.000

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 10 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Tower Pressure - Service

$G_H = 1.100$

Section Elevation ft	z ft	K_Z	q_z psf	A_G ft ²	F a c e	A_F ft ²	A_R ft ²	A_{leg} ft ²	Leg %	$C_A A_A$ In Face ft ²	$C_A A_A$ Out Face ft ²
185.000-147.830	164.973	1.14	8.847	58.145	A	0.000	58.145	58.145	100.00	0.000	0.000
					B	0.000	58.145		100.00	0.000	0.000
					C	0.000	58.145		100.00	22.652	0.000
147.830-132.830	140.141	1.088	8.449	31.877	A	0.000	31.877	31.877	100.00	0.000	0.000
					B	0.000	31.877		100.00	0.000	0.000
					C	0.000	31.877		100.00	15.256	0.000
132.830-90.670	110.848	1.018	7.889	113.566	A	0.000	113.566	113.566	100.00	0.000	0.000
					B	0.000	113.566		100.00	0.000	0.000
					C	0.000	113.566		100.00	47.094	0.000
90.670-43.500	66.573	0.88	6.791	169.845	A	0.000	169.845	169.845	100.00	0.000	0.000
					B	0.000	169.845		100.00	0.000	0.000
					C	0.000	169.845		100.00	56.816	0.000
43.500-0.000	21.122	0.7	5.495	196.245	A	0.000	196.245	196.245	100.00	0.000	0.000
					B	0.000	196.245		100.00	0.000	0.000
					C	0.000	196.245		100.00	44.227	0.000

Tower Forces - No Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C_F	q_z psf	D_F	D_R	A_E ft ²	F lb	w plf	Ctrl. Face
185.000-147.830	322.004	1763.187	A	1	0.95	36.32	1	1	58.145	2207.165	59.380	C
			B	1	0.95	5	1	1	58.145			
			C	1	0.95	58.145	1	1	58.145			
147.830-132.830	419.287	1182.739	A	1	0.95	34.69	1	1	31.877	1155.587	77.039	C
			B	1	0.95	0	1	1	31.877			
			C	1	0.95	31.877	1	1	31.877			
132.830-90.670	1242.098	5321.566	A	1	0.95	32.38	1	1	113.566	3843.853	91.173	C
			B	1	0.95	9	1	1	113.566			
			C	1	0.95	113.566	1	1	113.566			
90.670-43.500	1411.892	9686.816	A	1	0.95	27.88	1	1	169.845	4948.751	104.913	C
			B	1	0.95	2	1	1	169.845			
			C	1	0.95	169.845	1	1	169.845			
43.500-0.000	1094.058	13515.697	A	1	0.95	22.56	1	1	196.245	4626.637	106.359	C
			B	1	0.95	1	1	1	196.245			
			C	1	0.95	196.245	1	1	196.245			
Sum Weight:	4489.340	31470.004						OTM	1379323.5 78 lb-ft	16781.994		

Tower Forces - No Ice - Wind 60 To Face

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 11 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.000-147.8	322.004	1763.187	A	1	0.95	36.32	1	1	58.145	2207.165	59.380	C
30			B	1	0.95	5	1	1	58.145			
L2 147.830-132.8	419.287	1182.739	C	1	0.95		1	1	58.145			
30			A	1	0.95	34.69	1	1	31.877	1155.587	77.039	C
L3 132.830-90.67	1242.098	5321.566	B	1	0.95	0	1	1	31.877			
0			C	1	0.95		1	1	31.877			
L4 90.670-43.500	1411.892	9686.816	A	1	0.95	32.38	1	1	113.566	3843.853	91.173	C
			B	1	0.95	9	1	1	113.566			
			C	1	0.95		1	1	113.566			
L5 43.500-0.000	1094.058	13515.697	A	1	0.95	27.88	1	1	169.845	4948.751	104.913	C
			B	1	0.95	2	1	1	169.845			
			C	1	0.95		1	1	169.845			
Sum Weight:	4489.340	31470.004	A	1	0.95	22.56	1	1	196.245	4626.637	106.359	C
			B	1	0.95	1	1	1	196.245			
			C	1	0.95		1	1	196.245			
								OTM	1379323.5	16781.994		
									78 lb-ft			

Tower Forces - No Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.000-147.8	322.004	1763.187	A	1	0.95	36.32	1	1	58.145	3572.298	96.107	C
30			B	1	0.95	5	1	1	58.145			
L2 147.830-132.8	419.287	1182.739	C	1	1.2		1	1	58.145			
30			A	1	0.95	34.69	1	1	31.877	2109.882	140.659	C
L3 132.830-90.67	1242.098	5321.566	B	1	0.95	0	1	1	31.877			
0			C	1	1.2		1	1	31.877			
L4 90.670-43.500	1411.892	9686.816	A	1	0.95	32.38	1	1	113.566	7051.318	167.251	C
			B	1	0.95	9	1	1	113.566			
			C	1	1.2		1	1	113.566			
L5 43.500-0.000	1094.058	13515.697	A	1	0.95	27.88	1	1	169.845	8524.210	180.713	C
			B	1	0.95	2	1	1	169.845			
			C	1	1.2		1	1	169.845			
Sum Weight:	4489.340	31470.004	A	1	0.95	22.56	1	1	196.245	5844.173	134.349	C
			B	1	0.95	1	1	1	196.245			
			C	1	1.2		1	1	196.245			
								OTM	2357553.5	27101.882		
									23 lb-ft			

Tower Forces - With Ice - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1	844.948	2822.785	A	1	1.2	4.395	1	1	65.421	379.512	10.210	C

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 12 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
185.000-147.8			B	1	1.2		1	1	65.421			
30			C	1	1.2		1	1	65.421			
L2	838.743	1744.473	A	1	1.2	4.197	1	1	34.766	192.602	12.840	C
147.830-132.8			B	1	1.2		1	1	34.766			
30			C	1	1.2		1	1	34.766			
L3	2634.419	7255.887	A	1	1.2	3.919	1	1	121.498	628.447	14.906	C
132.830-90.67			B	1	1.2		1	1	121.498			
0			C	1	1.2		1	1	121.498			
L4	3034.363	12407.349	A	1	1.2	3.373	1	1	178.279	793.822	16.829	C
90.670-43.500			B	1	1.2		1	1	178.279			
			C	1	1.2		1	1	178.279			
L5	2275.220	16297.401	A	1	1.2	2.729	1	1	203.178	732.026	16.828	C
43.500-0.000			B	1	1.2		1	1	203.178			
			C	1	1.2		1	1	203.178			
Sum Weight:	9627.692	40527.896						OTM	227571.11 4 lb-ft	2726.410		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1	844.948	2822.785	A	1	1.2	4.395	1	1	65.421	379.512	10.210	C
185.000-147.8			B	1	1.2		1	1	65.421			
30			C	1	1.2		1	1	65.421			
L2	838.743	1744.473	A	1	1.2	4.197	1	1	34.766	192.602	12.840	C
147.830-132.8			B	1	1.2		1	1	34.766			
30			C	1	1.2		1	1	34.766			
L3	2634.419	7255.887	A	1	1.2	3.919	1	1	121.498	628.447	14.906	C
132.830-90.67			B	1	1.2		1	1	121.498			
0			C	1	1.2		1	1	121.498			
L4	3034.363	12407.349	A	1	1.2	3.373	1	1	178.279	793.822	16.829	C
90.670-43.500			B	1	1.2		1	1	178.279			
			C	1	1.2		1	1	178.279			
L5	2275.220	16297.401	A	1	1.2	2.729	1	1	203.178	732.026	16.828	C
43.500-0.000			B	1	1.2		1	1	203.178			
			C	1	1.2		1	1	203.178			
Sum Weight:	9627.692	40527.896						OTM	227571.11 4 lb-ft	2726.410		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1	844.948	2822.785	A	1	1.2	4.395	1	1	65.421	560.056	15.067	C
185.000-147.8			B	1	1.2		1	1	65.421			

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 13 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
30			C	1	1.2		1	1	65.421			
L2 147.830-132.8	838.743	1744.473	A	1	1.2	4.197	1	1	34.766	324.841	21.656	C
30			B	1	1.2		1	1	34.766			
L3 132.830-90.67	2634.419	7255.887	C	1	1.2		1	1	34.766			
30			A	1	1.2	3.919	1	1	121.498	1056.804	25.067	C
0			B	1	1.2		1	1	121.498			
L4 90.670-43.500	3034.363	12407.349	C	1	1.2		1	1	121.498			
30			A	1	1.2	3.373	1	1	178.279	1241.712	26.324	C
0			B	1	1.2		1	1	178.279			
L5 43.500-0.000	2275.220	16297.401	C	1	1.2		1	1	178.279			
30			A	1	1.2	2.729	1	1	203.178	732.026	16.828	C
0			B	1	1.2		1	1	203.178			
0			C	1	1.2		1	1	203.178			
Sum Weight:	9627.692	40527.896						OTM	353187.62 6 lb-ft	3915.440		

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.000-147.8	322.004	1763.187	A	1	0.95	8.847	1	1	58.145	537.572	14.463	C
30			B	1	0.95		1	1	58.145			
L2 147.830-132.8	419.287	1182.739	C	1	0.95		1	1	58.145			
30			A	1	0.95	8.449	1	1	31.877	281.452	18.763	C
0			B	1	0.95		1	1	31.877			
L3 132.830-90.67	1242.098	5321.566	C	1	0.95		1	1	31.877			
30			A	1	0.95	7.889	1	1	113.566	936.201	22.206	C
0			B	1	0.95		1	1	113.566			
L4 90.670-43.500	1411.892	9686.816	C	1	0.95		1	1	113.566			
30			A	1	0.95	6.791	1	1	169.845	1205.307	25.552	C
0			B	1	0.95		1	1	169.845			
L5 43.500-0.000	1094.058	13515.697	C	1	0.95		1	1	169.845			
30			A	1	0.95	5.495	1	1	196.245	1126.854	25.905	C
0			B	1	0.95		1	1	196.245			
0			C	1	0.95		1	1	196.245			
Sum Weight:	4489.340	31470.004						OTM	335945.09 2 lb-ft	4087.386		

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.000-147.8	322.004	1763.187	A	1	0.95	8.847	1	1	58.145	537.572	14.463	C
30			B	1	0.95		1	1	58.145			
0			C	1	0.95		1	1	58.145			

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 14 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L2 147.830-132.8	419.287	1182.739	A	1	0.95	8.449	1	1	31.877	281.452	18.763	C
30			B	1	0.95		1	1	31.877			
L3			C	1	0.95		1	1	31.877			
L3 132.830-90.67	1242.098	5321.566	A	1	0.95	7.889	1	1	113.566	936.201	22.206	C
0			B	1	0.95		1	1	113.566			
L4			C	1	0.95		1	1	113.566			
L4 90.670-43.500	1411.892	9686.816	A	1	0.95	6.791	1	1	169.845	1205.307	25.552	C
0			B	1	0.95		1	1	169.845			
L5			C	1	0.95		1	1	169.845			
L5 43.500-0.000	1094.058	13515.697	A	1	0.95	5.495	1	1	196.245	1126.854	25.905	C
0			B	1	0.95		1	1	196.245			
Sum Weight:			C	1	0.95		1	1	196.245			
Sum Weight:	4489.340	31470.004						OTM	335945.09 2 lb-ft	4087.386		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.000-147.8	322.004	1763.187	A	1	0.95	8.847	1	1	58.145	870.061	23.408	C
30			B	1	0.95		1	1	58.145			
L2			C	1	1.2		1	1	58.145			
L2 147.830-132.8	419.287	1182.739	A	1	0.95	8.449	1	1	31.877	513.878	34.259	C
30			B	1	0.95		1	1	31.877			
L3			C	1	1.2		1	1	31.877			
L3 132.830-90.67	1242.098	5321.566	A	1	0.95	7.889	1	1	113.566	1717.404	40.735	C
0			B	1	0.95		1	1	113.566			
L4			C	1	1.2		1	1	113.566			
L4 90.670-43.500	1411.892	9686.816	A	1	0.95	6.791	1	1	169.845	2076.138	44.014	C
0			B	1	0.95		1	1	169.845			
L5			C	1	1.2		1	1	169.845			
L5 43.500-0.000	1094.058	13515.697	A	1	0.95	5.495	1	1	196.245	1423.394	32.722	C
0			B	1	0.95		1	1	196.245			
Sum Weight:			C	1	1.2		1	1	196.245			
Sum Weight:	4489.340	31470.004						OTM	574200.67 9 lb-ft	6600.876		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M _x lb-ft	Sum of Overturning Moments, M _z lb-ft	Sum of Torques lb-ft
Leg Weight	31470.004					
Bracing Weight	0.000					
Total Member Self-Weight	31470.004			2965.581	-214.376	
Total Weight	42554.053			2965.581	-214.376	

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	<p>Project</p> <p style="text-align: center;">185-ft Monopole</p>	<p>Date</p> <p style="text-align: center;">12:13:51 10/16/20</p>
	<p>Client</p> <p style="text-align: center;">T-MOBILE</p>	<p>Designed by</p> <p style="text-align: center;">Ekata A. Shah, P.E.</p>

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Wind 0 deg - No Ice		-806.554	-28648.391	-3347086.574	113067.260	663.914
Wind 30 deg - No Ice		13815.290	-24563.499	-2863539.662	-1602469.669	3438.058
Wind 60 deg - No Ice		24898.746	-13660.704	-1578856.390	-2911560.730	4725.393
Wind 90 deg - No Ice		39009.035	653.412	94807.378	-4331784.885	11937.862
Wind 120 deg - No Ice		24971.166	14503.254	1703375.174	-2922063.612	2177.440
Wind 150 deg - No Ice		14772.123	24636.386	2880039.116	-1737056.835	279.072
Wind 180 deg - No Ice		634.589	28367.023	3313626.179	-89420.862	-1462.389
Wind 210 deg - No Ice		-13913.084	24519.813	2863354.723	1615732.116	-3809.215
Wind 240 deg - No Ice		-24693.761	13708.035	1591413.895	2882434.007	-3901.354
Wind 270 deg - No Ice		-39044.880	-859.655	-117750.244	4336374.362	-10124.350
Wind 300 deg - No Ice		-25080.593	-14714.558	-1727026.546	2936954.547	-1020.871
Wind 330 deg - No Ice		-14868.987	-24883.018	-2908636.458	1750189.057	-422.565
Member Ice	9057.892					
Total Weight Ice	63873.841			13180.222	-720.153	
Wind 0 deg - Ice		-103.740	-4638.102	-532473.947	13853.011	75.520
Wind 30 deg - Ice		2256.160	-3984.693	-454862.553	-264490.302	487.725
Wind 60 deg - Ice		4031.742	-2233.593	-247639.848	-474987.095	694.834
Wind 90 deg - Ice		5836.335	83.888	24974.027	-672860.604	1833.918
Wind 120 deg - Ice		4040.975	2342.062	289271.713	-476329.232	374.341
Wind 150 deg - Ice		2379.179	3994.248	482610.106	-281798.701	95.663
Wind 180 deg - Ice		81.573	4601.993	553779.250	-12189.865	-178.580
Wind 210 deg - Ice		-2268.429	3979.261	480462.449	264767.663	-533.610
Wind 240 deg - Ice		-4005.000	2239.631	274845.707	469802.926	-587.450
Wind 270 deg - Ice		-5840.370	-110.208	-2298.426	671985.284	-1600.050
Wind 300 deg - Ice		-4054.421	-2368.969	-266678.252	476771.437	-225.723
Wind 330 deg - Ice		-2391.109	-4025.772	-460663.112	282028.688	-114.287
Total Weight	42554.053			2965.581	-214.376	
Wind 0 deg - Service		-196.443	-6977.541	-814773.615	27376.256	161.701
Wind 30 deg - Service		3364.822	-5982.633	-697001.967	-390456.238	837.366
Wind 60 deg - Service		6064.285	-3327.172	-384107.265	-709295.649	1150.907
Wind 90 deg - Service		9500.957	159.144	23526.693	-1055202.398	2907.560
Wind 120 deg - Service		6081.924	3532.381	415306.015	-711853.709	530.333
Wind 150 deg - Service		3597.866	6000.385	701891.760	-423236.000	67.970
Wind 180 deg - Service		154.559	6909.011	807495.295	-21941.317	-356.176
Wind 210 deg - Service		-3388.641	5971.993	697828.145	393362.085	-927.764
Wind 240 deg - Service		-6014.359	3338.700	388036.965	701877.280	-950.205
Wind 270 deg - Service		-9509.687	-209.376	-28243.386	1055995.875	-2465.865
Wind 300 deg - Service		-6108.575	-3583.846	-420195.270	715156.186	-248.641
Wind 330 deg - Service		-3621.458	-6060.455	-707985.646	426110.129	-102.919

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice

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	<p>Project</p> <p style="text-align: center;">185-ft Monopole</p>	<p>Date</p> <p style="text-align: center;">12:13:51 10/16/20</p>
	<p>Client</p> <p style="text-align: center;">T-MOBILE</p>	<p>Designed by</p> <p style="text-align: center;">Ekata A. Shah, P.E.</p>

Comb. No.	Description
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice+1.0 Temp
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft	
L1	185 - 147.83	Pole	Max Tension	1	0.000	0.000	0.000	
			Max. Compression	26	-17444.956	-44.827	-875.941	
			Max. Mx	8	-7642.000	-345715.84	-930.932	
					3			
			Max. My	14	-8145.948	-675.158	-317958.18	
					2			
			Max. Vy	8	14478.216	-345715.84	-930.932	
					3			
L2	147.83 - 132.83	Pole	Max. Vx	2	-12946.706	747.635	317831.885	
			Max. Torque	21			668.562	
			Max Tension	1	0.000	0.000	0.000	
			Max. Compression	26	-20469.792	-1077.249	-2864.038	
			Max. Mx	8	-9158.747	-516253.05	-3605.009	
					0			

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	Project	185-ft Monopole	Date	12:13:51 10/16/20
	Client	T-MOBILE	Designed by	Ekata A. Shah, P.E.

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L3	132.83 - 90.67	Pole	Max. My	14	-9797.048	-3120.505	-467612.064
			Max. Vy	20	-17807.747	515521.417	2909.092
			Max. Vx	2	-15564.244	3237.439	467142.458
			Max. Torque	7			-3694.068
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-31952.898	-884.370	-7298.495
			Max. Mx	20	-17219.705	1387560.186	38931.951
L4	90.67 - 43.5	Pole	Max. My	2	-17931.067	38375.811	1184308.882
			Max. Vy	20	-25132.394	1387560.186	38931.951
			Max. Vx	2	-19728.345	38375.811	1184308.882
			Max. Torque	9			-7206.425
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-48885.014	-914.081	-11181.244
			Max. Mx	20	-30474.575	2725175.273	79537.245
L5	43.5 - 0	Pole	Max. My	2	-30967.818	77157.557	2192611.159
			Max. Vy	20	-33048.525	2725175.273	79537.245
			Max. Vx	2	-24169.568	77157.557	2192611.159
			Max. Torque	9			-11129.985
			Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-73304.154	-915.512	-15081.632
			Max. Mx	20	-51034.521	4540840.413	122744.838
			Max. My	2	-51047.694	118461.772	3516679.999
			Max. Vy	20	-39078.508	4540840.413	122744.838
			Max. Vx	2	-28676.056	118461.772	3516679.999
			Max. Torque	9			-11738.415

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	26	73304.154	0.056	0.429
	Max. H _x	21	38298.335	39041.369	859.539
	Max. H _z	3	38298.526	806.508	28646.746
	Max. M _x	2	3516679.995	806.482	28645.841
	Max. M _z	8	4536903.423	-39008.141	-653.408
	Max. Torsion	21	9983.041	39041.369	859.539
	Min. Vert	21	38298.335	39041.369	859.539
	Min. H _x	9	38298.598	-39008.477	-653.411
	Min. H _z	14	51064.759	-634.561	-28365.625
	Min. M _x	14	-3483269.992	-634.561	-28365.625
	Min. M _z	20	-4540840.354	39039.512	859.487
	Min. Torsion	9	-11726.026	-39008.477	-653.411

<p>tnxTower</p> <p>KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980</p>	<p>Job</p> <p>300.5912.50J - NJ08012E - SAND HILL_1</p>	<p>Page</p> <p>18 of 22</p>
	<p>Project</p> <p>185-ft Monopole</p>	<p>Date</p> <p>12:13:51 10/16/20</p>
	<p>Client</p> <p>T-MOBILE</p>	<p>Designed by</p> <p>Ekata A. Shah, P.E.</p>

Tower Mast Reaction Summary

Load Combination	Vertical	Shear _x	Shear _z	Overturing Moment, M _x	Overturing Moment, M _z	Torque
	lb	lb	lb	lb-ft	lb-ft	lb-ft
Dead Only	42554.053	-0.131	-0.673	2929.493	-207.286	0.021
1.2 Dead+1.0 Wind 0 deg - No Ice	51064.671	-806.482	-28645.841	-3516679.995	118461.884	661.813
0.9 Dead+1.0 Wind 0 deg - No Ice	38298.526	-806.508	-28646.746	-3471041.124	117058.846	661.858
1.2 Dead+1.0 Wind 30 deg - No Ice	51064.855	13815.236	-24563.394	-3009231.666	-1684474.313	3378.244
0.9 Dead+1.0 Wind 30 deg - No Ice	38298.638	13815.230	-24563.382	-2970139.571	-1661974.004	3381.800
1.2 Dead+1.0 Wind 60 deg - No Ice	51064.855	24898.641	-13660.650	-1659079.801	-3060057.054	4627.565
0.9 Dead+1.0 Wind 60 deg - No Ice	38298.638	24898.629	-13660.643	-1637878.247	-3019356.970	4633.609
1.2 Dead+1.0 Wind 90 deg - No Ice	51064.782	39008.141	653.408	99813.431	-4536903.423	11714.060
0.9 Dead+1.0 Wind 90 deg - No Ice	38298.598	39008.477	653.411	97670.507	-4479947.061	11726.026
1.2 Dead+1.0 Wind 120 deg - No Ice	51064.855	24971.061	14503.197	1790726.573	-3070859.613	2135.193
0.9 Dead+1.0 Wind 120 deg - No Ice	38298.638	24971.049	14503.191	1766023.187	-3030026.601	2138.710
1.2 Dead+1.0 Wind 150 deg - No Ice	51064.855	14772.064	24636.282	3027552.940	-1825433.710	281.622
0.9 Dead+1.0 Wind 150 deg - No Ice	38298.638	14772.058	24636.270	2986369.242	-1801173.036	282.369
1.2 Dead+1.0 Wind 180 deg - No Ice	51064.759	634.561	28365.625	3483269.992	-93776.059	-1424.972
0.9 Dead+1.0 Wind 180 deg - No Ice	38298.528	634.558	28365.389	3435978.600	-92536.176	-1426.766
1.2 Dead+1.0 Wind 210 deg - No Ice	51064.855	-13913.029	24519.708	3010299.727	1698330.075	-3734.965
0.9 Dead+1.0 Wind 210 deg - No Ice	38298.638	-13913.022	24519.697	2969326.949	1675784.842	-3739.281
1.2 Dead+1.0 Wind 240 deg - No Ice	51064.855	-24693.655	13707.982	1673516.285	3029530.772	-3835.372
0.9 Dead+1.0 Wind 240 deg - No Ice	38298.638	-24693.643	13707.976	1650274.533	2989342.785	-3839.932
1.2 Dead+1.0 Wind 270 deg - No Ice	51064.375	-39039.512	-859.487	-122747.019	4540840.354	-9974.598
0.9 Dead+1.0 Wind 270 deg - No Ice	38298.335	-39041.369	-859.539	-122140.503	4484231.473	-9983.041
1.2 Dead+1.0 Wind 300 deg - No Ice	51064.854	-25080.487	-14714.500	-1814151.604	3086240.772	-1004.302
0.9 Dead+1.0 Wind 300 deg - No Ice	38298.638	-25080.475	-14714.494	-1791037.227	3045369.486	-1006.639
1.2 Dead+1.0 Wind 330 deg - No Ice	51064.855	-14868.928	-24882.913	-3056077.225	1839010.318	-408.912
0.9 Dead+1.0 Wind 330 deg - No Ice	38298.638	-14868.921	-24882.902	-3016425.632	1814728.808	-410.485
1.2 Dead+1.0 Ice+1.0 Temp	73304.154	-0.056	-0.429	15081.632	-915.512	0.014
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	73304.142	-103.728	-4637.498	-582085.508	14919.992	75.168
1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp	73304.143	2255.857	-3984.178	-497152.207	-289743.021	485.648
1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp	73304.142	4031.200	-2233.312	-270346.752	-520097.895	691.560

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job	300.5912.50J - NJ08012E - SAND HILL_1	Page	19 of 22	
	Project	185-ft Monopole		Date	12:13:51 10/16/20
	Client	T-MOBILE		Designed by	Ekata A. Shah, P.E.

Load Combination	Vertical lb	Shear _x lb	Shear _z lb	Overturning Moment, M _x lb-ft	Overturning Moment, M _z lb-ft	Torque lb-ft
Ice+1.0 Temp						
1.2 Dead+1.0 Wind 90 deg+1.0	73304.142	5835.608	83.859	28096.755	-734008.045	1829.376
Ice+1.0 Temp						
1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp	73304.145	4040.431	2341.730	317512.899	-521574.785	371.820
1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp	73304.145	2378.858	3993.694	529221.619	-308580.809	94.608
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	73304.145	81.559	4601.357	607149.127	-13409.796	-177.942
1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp	73304.145	-2268.128	3978.709	526882.599	289755.404	-531.408
1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp	73304.145	-4004.465	2239.314	301817.479	514176.192	-584.408
1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp	73304.142	-5839.648	-110.210	-1569.078	732757.168	-1595.956
1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp	73304.145	-4053.880	-2368.669	-291063.549	521757.290	-223.310
1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp	73304.142	-2390.792	-4025.251	-503461.813	308524.319	-113.072
Dead+Wind 0 deg - Service	42554.023	-196.393	-6975.860	-848350.504	28484.462	161.733
Dead+Wind 30 deg - Service	42554.024	3364.014	-5981.194	-725474.287	-407515.781	835.653
Dead+Wind 60 deg - Service	42554.023	6062.821	-3326.377	-398985.303	-740184.637	1147.888
Dead+Wind 90 deg - Service	42554.008	9498.926	159.101	26404.351	-1098678.310	2902.121
Dead+Wind 120 deg - Service	42554.022	6080.453	3531.522	435301.156	-742847.898	528.300
Dead+Wind 150 deg - Service	42554.022	3596.997	5998.928	734404.166	-441638.536	67.291
Dead+Wind 180 deg - Service	42554.023	154.519	6907.332	844619.137	-22852.999	-355.484
Dead+Wind 210 deg - Service	42554.023	-3387.826	5970.544	730174.340	410516.729	-925.759
Dead+Wind 240 deg - Service	42554.023	-6012.908	3337.891	406914.836	732439.375	-947.825
Dead+Wind 270 deg - Service	42554.008	-9507.657	-209.326	-27482.070	1099476.940	-2461.821
Dead+Wind 300 deg - Service	42554.022	-6107.101	-3582.988	-436547.507	746257.044	-246.994
Dead+Wind 330 deg - Service	42554.022	-3620.586	-6058.997	-736902.921	444602.780	-101.870

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
1	0.000	-42554.053	0.000	0.131	42554.053	0.673	0.002%
2	-806.554	-51064.864	-28648.391	806.482	51064.671	28645.841	0.004%
3	-806.554	-38298.648	-28648.391	806.508	38298.526	28646.746	0.003%
4	13815.290	-51064.864	-24563.499	-13815.236	51064.855	24563.394	0.000%
5	13815.290	-38298.648	-24563.499	-13815.230	38298.638	24563.382	0.000%
6	24898.746	-51064.864	-13660.704	-24898.641	51064.855	13660.650	0.000%
7	24898.746	-38298.648	-13660.704	-24898.629	38298.638	13660.643	0.000%
8	39009.035	-51064.864	653.412	-39008.141	51064.782	-653.408	0.001%
9	39009.035	-38298.648	653.412	-39008.477	38298.598	-653.411	0.001%
10	24971.166	-51064.864	14503.254	-24971.061	51064.855	-14503.197	0.000%
11	24971.166	-38298.648	14503.254	-24971.049	38298.638	-14503.191	0.000%
12	14772.123	-51064.864	24636.386	-14772.064	51064.855	-24636.282	0.000%
13	14772.123	-38298.648	24636.386	-14772.058	38298.638	-24636.270	0.000%
14	634.589	-51064.864	28367.023	-634.561	51064.759	-28365.625	0.002%
15	634.589	-38298.648	28367.023	-634.558	38298.528	-28365.389	0.003%
16	-13913.084	-51064.864	24519.813	13913.029	51064.855	-24519.708	0.000%
17	-13913.084	-38298.648	24519.813	13913.022	38298.638	-24519.697	0.000%
18	-24693.761	-51064.864	13708.035	24693.655	51064.855	-13707.982	0.000%
19	-24693.761	-38298.648	13708.035	24693.643	38298.638	-13707.976	0.000%
20	-39044.880	-51064.864	-859.655	39039.512	51064.375	859.487	0.008%
21	-39044.880	-38298.648	-859.655	39041.369	38298.335	859.539	0.006%

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 20 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
22	-25080.593	-51064.864	-14714.558	25080.487	51064.854	14714.500	0.000%
23	-25080.593	-38298.648	-14714.558	25080.475	38298.638	14714.494	0.000%
24	-14868.987	-51064.864	-24883.018	14868.928	51064.855	24882.913	0.000%
25	-14868.987	-38298.648	-24883.018	14868.921	38298.638	24882.902	0.000%
26	0.000	-73304.155	0.000	0.056	73304.154	0.429	0.001%
27	-103.740	-73304.155	-4638.102	103.728	73304.142	4637.498	0.001%
28	2256.160	-73304.155	-3984.693	-2255.857	73304.143	3984.178	0.001%
29	4031.742	-73304.155	-2233.593	-4031.200	73304.142	2233.312	0.001%
30	5836.335	-73304.155	83.888	-5835.608	73304.142	-83.859	0.001%
31	4040.975	-73304.155	2342.062	-4040.431	73304.145	-2341.730	0.001%
32	2379.179	-73304.155	3994.248	-2378.858	73304.145	-3993.694	0.001%
33	81.573	-73304.155	4601.993	-81.559	73304.145	-4601.357	0.001%
34	-2268.429	-73304.155	3979.261	2268.128	73304.145	-3978.709	0.001%
35	-4005.000	-73304.155	2239.631	4004.465	73304.145	-2239.314	0.001%
36	-5840.370	-73304.155	-110.208	5839.648	73304.142	110.210	0.001%
37	-4054.421	-73304.155	-2368.969	4053.880	73304.145	2368.669	0.001%
38	-2391.109	-73304.155	-4025.772	2390.792	73304.142	4025.251	0.001%
39	-196.443	-42554.053	-6977.541	196.393	42554.023	6975.860	0.004%
40	3364.822	-42554.053	-5982.633	-3364.014	42554.024	5981.194	0.004%
41	6064.285	-42554.053	-3327.172	-6062.821	42554.023	3326.377	0.004%
42	9500.957	-42554.053	159.144	-9498.926	42554.008	-159.101	0.005%
43	6081.924	-42554.053	3532.381	-6080.453	42554.022	-3531.522	0.004%
44	3597.866	-42554.053	6000.385	-3596.997	42554.022	-5998.928	0.004%
45	154.559	-42554.053	6909.011	-154.519	42554.023	-6907.332	0.004%
46	-3388.641	-42554.053	5971.993	3387.826	42554.023	-5970.544	0.004%
47	-6014.359	-42554.053	3338.700	6012.908	42554.023	-3337.891	0.004%
48	-9509.687	-42554.053	-209.376	9507.657	42554.008	209.326	0.005%
49	-6108.575	-42554.053	-3583.846	6107.101	42554.022	3582.988	0.004%
50	-3621.458	-42554.053	-6060.455	3620.586	42554.022	6058.997	0.004%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000762
2	Yes	19	0.00005525	0.00012497
3	Yes	19	0.00003569	0.00009443
4	Yes	24	0.00000001	0.00009875
5	Yes	23	0.00000001	0.00012682
6	Yes	24	0.00000001	0.00009011
7	Yes	23	0.00000001	0.00011509
8	Yes	21	0.00001609	0.00013894
9	Yes	21	0.00000001	0.00010004
10	Yes	24	0.00000001	0.00010477
11	Yes	23	0.00000001	0.00013369
12	Yes	24	0.00000001	0.00010328
13	Yes	23	0.00000001	0.00013178
14	Yes	20	0.00003075	0.00010350
15	Yes	19	0.00003576	0.00013936
16	Yes	24	0.00000001	0.00009166
17	Yes	23	0.00000001	0.00011711
18	Yes	24	0.00000001	0.00009930
19	Yes	23	0.00000001	0.00012737
20	Yes	18	0.00009458	0.00011797
21	Yes	18	0.00006193	0.00009369
22	Yes	24	0.00000001	0.00010378

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job	300.5912.50J - NJ08012E - SAND HILL_1	Page	21 of 22
	Project	185-ft Monopole	Date	12:13:51 10/16/20
	Client	T-MOBILE	Designed by	Ekata A. Shah, P.E.

23	Yes	23	0.00000001	0.00013233
24	Yes	24	0.00000001	0.00010472
25	Yes	23	0.00000001	0.00013363
26	Yes	14	0.00000001	0.00000926
27	Yes	20	0.00009217	0.00002209
28	Yes	20	0.00009218	0.00003194
29	Yes	20	0.00009215	0.00003048
30	Yes	20	0.00009124	0.00002915
31	Yes	20	0.00009203	0.00003536
32	Yes	20	0.00009205	0.00003466
33	Yes	20	0.00009218	0.00002336
34	Yes	20	0.00009211	0.00003248
35	Yes	20	0.00009210	0.00003414
36	Yes	20	0.00009118	0.00002745
37	Yes	20	0.00009199	0.00003212
38	Yes	20	0.00009201	0.00003252
39	Yes	17	0.00014754	0.00004735
40	Yes	17	0.00014743	0.00010056
41	Yes	17	0.00014736	0.00006902
42	Yes	17	0.00014566	0.00009738
43	Yes	17	0.00014716	0.00010050
44	Yes	17	0.00014720	0.00009222
45	Yes	17	0.00014763	0.00005107
46	Yes	17	0.00014740	0.00007198
47	Yes	17	0.00014739	0.00010356
48	Yes	17	0.00014563	0.00007029
49	Yes	17	0.00014708	0.00008983
50	Yes	17	0.00014711	0.00009239

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 147.83	45.134	42	2.503	0.014
L2	147.83 - 132.83	26.983	48	2.009	0.012
L3	137 - 90.67	22.667	48	1.798	0.011
L4	96 - 43.5	10.177	48	1.086	0.006
L5	50.08 - 0	2.579	48	0.480	0.002

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.000	10' x 2" Dipole	42	45.134	2.503	0.014	17248
181.000	Platform Mount [LP 404-1]	42	43.054	2.459	0.014	17248
162.000	SBNHH-1D65A w/ Mount Pipe	42	33.446	2.232	0.013	3748
161.000	T-Arm Mount [TA 601-1]	42	32.964	2.218	0.013	3592
140.000	UXA4-107BC	48	23.812	1.858	0.011	2950
119.500	20' x 3" Omni	48	16.631	1.472	0.009	3475
114.500	20' x 3" Omni	48	15.103	1.385	0.008	3528
109.500	20' x 3" Omni	48	13.659	1.301	0.007	3582
104.500	20' x 3" Omni	48	12.300	1.220	0.007	3638
99.500	20' x 3" Omni	48	11.023	1.140	0.006	3696

tnxTower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ Phone: 732-280-5623 FAX: 732-280-3980	Job 300.5912.50J - NJ08012E - SAND HILL_1	Page 22 of 22
	Project 185-ft Monopole	Date 12:13:51 10/16/20
	Client T-MOBILE	Designed by Ekata A. Shah, P.E.

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 147.83	186.233	20	10.356	0.061
L2	147.83 - 132.83	111.472	20	8.309	0.050
L3	137 - 90.67	93.658	20	7.440	0.044
L4	96 - 43.5	42.065	20	4.495	0.023
L5	50.08 - 0	10.660	20	1.985	0.008

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.000	10' x 2" Dipole	20	186.233	10.356	0.061	4404
181.000	Platform Mount [LP 404-1]	20	177.668	10.175	0.060	4404
162.000	SBNHH-1D65A w/ Mount Pipe	20	138.107	9.233	0.055	952
161.000	T-Arm Mount [TA 601-1]	20	136.122	9.176	0.055	911
140.000	UXA4-107BC	20	98.386	7.685	0.046	738
119.500	20' x 3" Omni	20	68.732	6.091	0.034	859
114.500	20' x 3" Omni	20	62.419	5.732	0.032	870
109.500	20' x 3" Omni	20	56.456	5.384	0.029	882
104.500	20' x 3" Omni	20	50.838	5.046	0.027	893
99.500	20' x 3" Omni	20	45.560	4.718	0.024	905

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail	
L1	185 - 147.83	Pole	TP22.85x13.563x0.219	1	-7642.000	47975.602	85.4	Pass	
L2	147.83 - 132.83	Pole	TP26.598x22.85x0.268	2	-9158.750	81834.297	76.9	Pass	
L3	132.83 - 90.67	Pole	TP36.596x25.021x0.313	3	-17219.699	252421.000	91.2	Pass	
L4	90.67 - 43.5	Pole	TP47.757x34.64x0.375	4	-30474.600	678750.000	88.5	Pass	
L5	43.5 - 0	Pole	TP57.875x45.363x0.438	5	-51034.500	1568280.000	82.3	Pass	
							Summary		
							Pole (L3)	91.2	Pass
							RATING =	91.2	Pass

Monopole Base Plate Connection

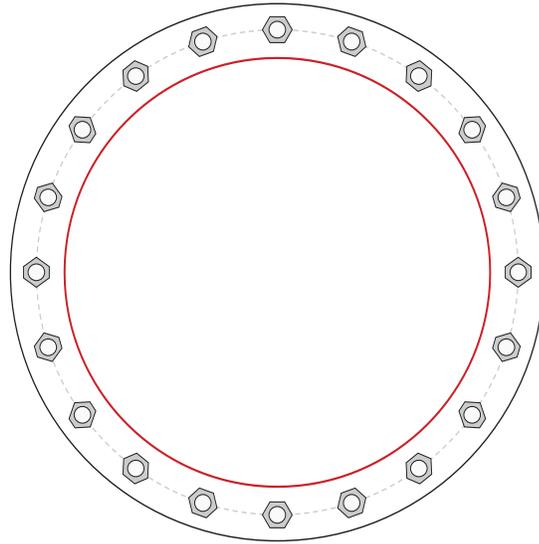


Site Info	
BU #	300.5912.50J
Site Name	SAND HILL_1
Order #	NJ08012E

Analysis Considerations	
TIA-222 Revision	H
Grout Considered:	No
I_{ar} (in)	0

Applied Loads	
Moment (kip-ft)	4542.5
Axial Force (kips)	51.07
Shear Force (kips)	39.05

*TIA-222-H Section 15.5 Applied



Connection Properties	Analysis Results
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Anchor Rod Data
(20) 2-1/4" ϕ bolts (A615-75 N; $F_y=75$ ksi, $F_u=100$ ksi) on 65.5" BC
Base Plate Data
72.55" OD x 2.25" Plate (A572-60; $F_y=60$ ksi, $F_u=75$ ksi)
Stiffener Data
N/A
Pole Data
57.8751" x 0.4375" 12-sided pole (A572-65; $F_y=65$ ksi, $F_u=80$ ksi)

Anchor Rod Summary	<i>(units of kips, kip-in)</i>	
$Pu_c = 168.58$	$\phi Pn_c = 243.75$	Stress Rating
$Vu = 1.95$	$\phi Vn = 73.13$	65.9%
$Mu = n/a$	$\phi Mn = n/a$	Pass
Base Plate Summary		
Max Stress (ksi):	34.82	(Flexural)
Allowable Stress (ksi):	54	
Stress Rating:	61.4%	Pass



Appendix B

Referenced Reports

RAN Template: 67D5A992DB Outdoor	A&L Template: 67D5992DB_3xAIR+1OP
--	---

Section 1 - Site Information

Site ID: NJ08012E
Status: Final
Version: 14
Project Type: Anchor
Approved: 6/2/2020 4:16:43 PM
Approved By: Wasif.Sharif1@t-mobile.com
Last Modified: 6/2/2020 4:16:43 PM
Last Modified By: Wasif.Sharif1@t-mobile.com

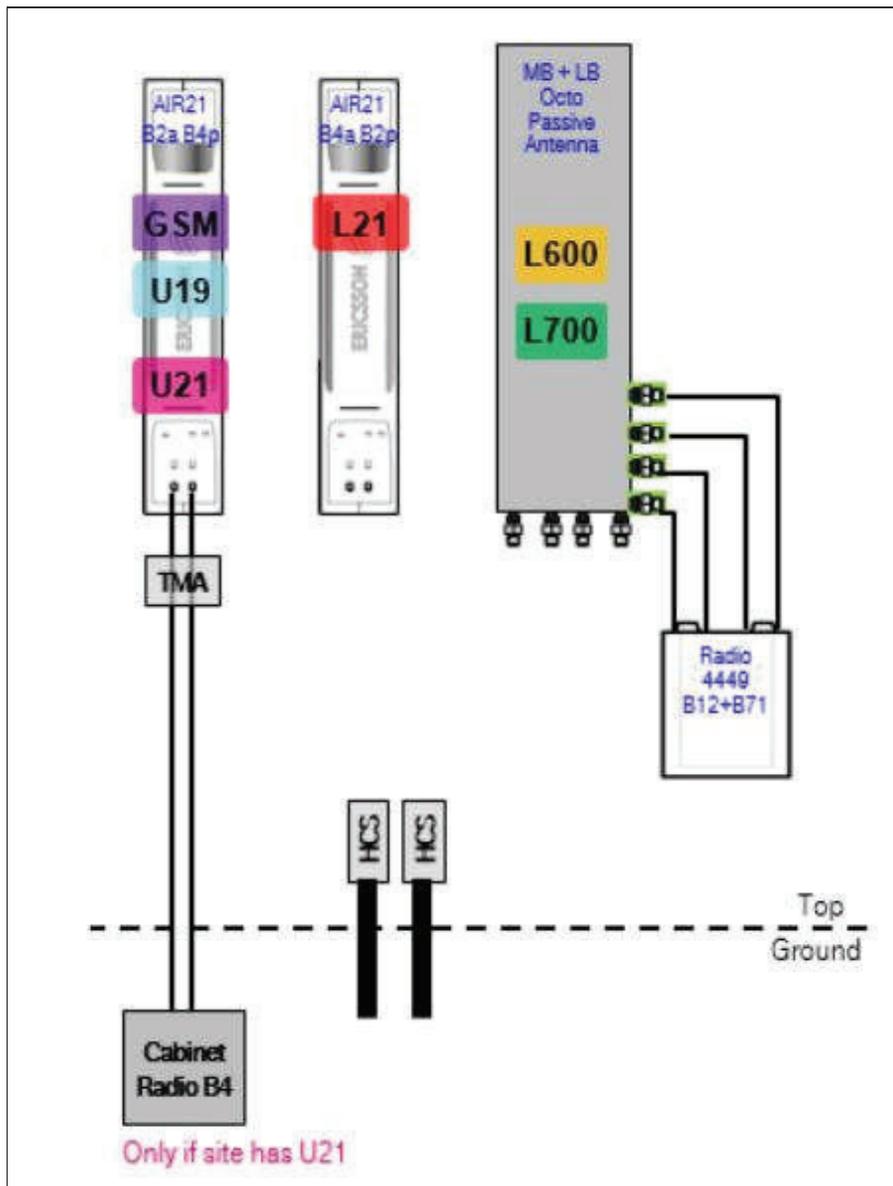
Site Name: Sand Hill_1
Site Class: Monopole
Site Type: Structure Non Building
Plan Year: 2020
Market: NEW JERSEY NJ
Vendor: Ericsson
Landlord: Township of South Brunswick

Latitude: 40.40507600
Longitude: -74.54753800
Address: Major Road and Route 1
City, State: South Brunswick Twp, NJ
Region: NORTHEAST

RAN Template: 67D5A992DB Outdoor		AL Template: 67D5992DB_3xAIR+1OP		
Sector Count: 3	Antenna Count: 12	Coax Line Count: 6	TMA Count: 3	RRU Count: 6

Section 2 - Existing Template Images

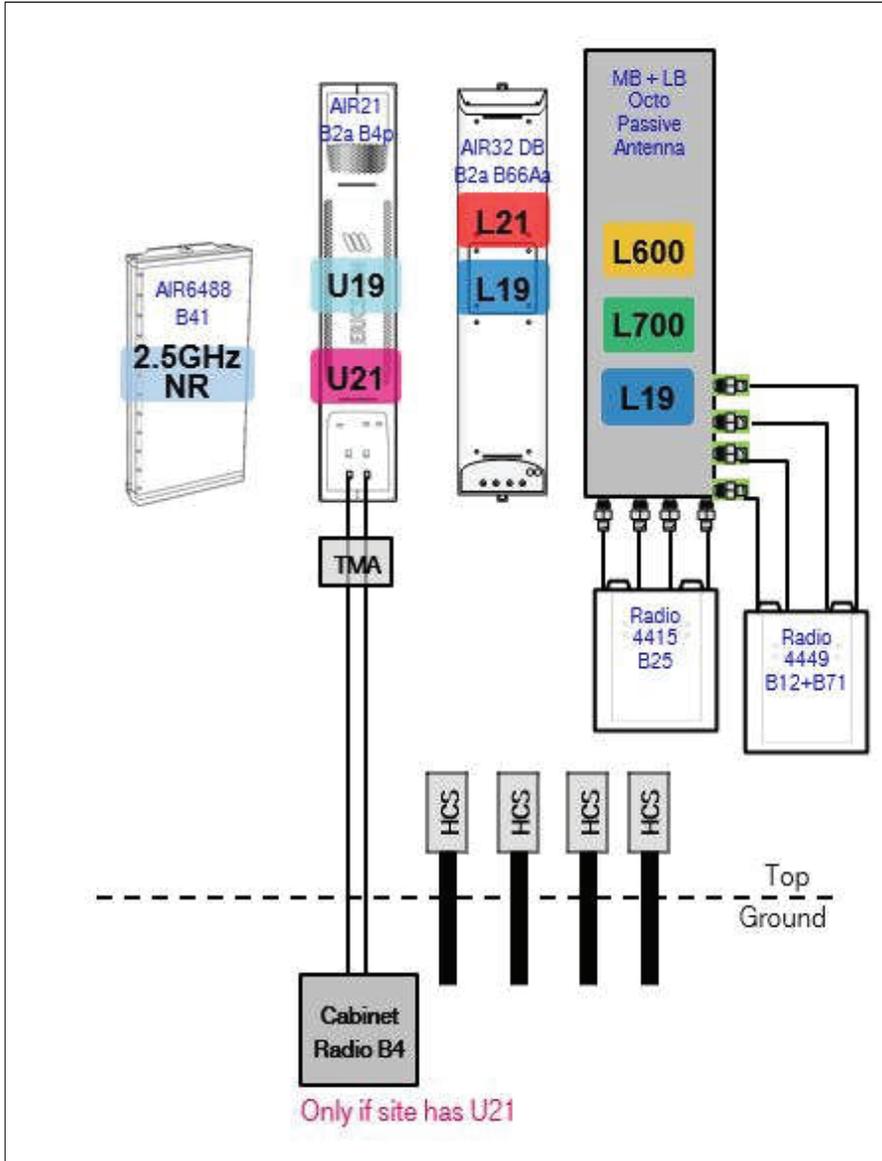
67D02C.JPG



Notes:

Section 3 - Proposed Template Images

67D5992DB_3xAIR+1OP.JPG



Notes:

Section 4 - Siteplan Images

----- This section is intentionally blank. -----

RAN Template: 67D5A992DB Outdoor	A&L Template: 67D5992DB_3xAIR+1OP
--	---

Section 5 - RAN Equipment

Existing RAN Equipment

Template: 67D02C Hybrid

Enclosure	1	2
Enclosure Type	RBS 6102	RBS 2106
Baseband	DUW30 U2100 DUG20 G1900 BB 5216 L1900 L2100 L700 L600 BB 6630 N600	
Hybrid Cable System	Ericsson 6x12 HCS *Select Length & AWG* (x 2)	
Multiplexer	XMU	
Radio	RUS01 B4 (x 3) U2100	

Proposed RAN Equipment

Template: 67D5A992DB Outdoor

Enclosure	1	2	3
Enclosure Type	RBS 6102	Enclosure 6160	B160
Baseband	DUW30 U2100 DUG20 G1900 BB 5216 L2100 L1900 L700 L600 BB 6630 N600	BB 6630 (x 3) L2500 BB 6648 N2500	
Hybrid Cable System	Ericsson 6x12 HCS *Select Length & AWG* (x 3)	PSU 4813	
Multiplexer	XMU		
Radio	RUS01 B4 (x 3) U2100		

RAN Scope of Work:

Start Config 67D02C. Final config. 67D5992DB.
 Swap one dark 2106 cabinet for 6160 and B160 for Anchor.
 Add IXRe router into 6160.
 2 6x12 existing during L600. We need to add 1 more 6x12 for Anchor.
 Add 4 more BB, 3 BB 6630 and 1 BB 6648 in 6160 (3 for L2500 and 1 for N2500).

RAN Template:
67D5A992DB Outdoor

A&L Template:
67D5992DB_3xAIR+1OP

Print Name: Standard
PORs: Anchor_Phase 3

Section 6 - A&L Equipment

Existing Template: 67D02C_2xAIR+1OP
Proposed Template: 67D5992DB_3xAIR+1OP

Sector 1 (Existing) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		Ericsson - AIR21 KRC118023-1_B2P_B4A (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)			
Azimuth	30		30		30			
M. Tilt	0		0		0			
Height	180		180		180			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L1900 G1900	U2100	L2100		L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	8	8	8		8	8		
Cables	Fiber Jumper - 15 ft. (x2)	Coax Jumper - 15 ft. (x2) 1-5/8" Coax - 200 ft. (x2)	Fiber Jumper - 15 ft. (x2)		Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)		
TMA's		Ericsson Twin Style 1BX - KRY 112 144/2 (AtAntenna)						
Diplexers / Combiners								
Radio					Radio 4449 B71+B8 5 (At Antenna)	SHARED Radio 4449 B71+B8 5 (At Antenna)		
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)						

Unconnected Equipment:

Scope of Work:

- *** Add AIR21 B4A for L2100 at pos2. Configure for L2100
- *** Add L600/L700 Octo port antenna at pos3. Add Radio 4449 to low band ports of Octo port antenna
- *** Remove AWS combiner

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template:
67D5A992DB Outdoor

A&L Template:
67D5992DB_3xAIR+1OP

Print Name: Standard
PORs: Anchor_Phase 3

Sector 1 (Proposed) view from behind

Coverage Type	A - Outdoor Macro											
Antenna	1			2			3			4		
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)			Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)			Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			RFS - APXVAARR24_43-U-NA20 (Octo)		
Azimuth	30			30			30			30		
M. Tilt	0			0			0			0		
Height	180			180			180			180		
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
Active Tech.	G1900	U2100	L2500 N2500	L2500 N2500	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600	L1900	L1900
Dark Tech.												
Restricted Tech.												
Decomm. Tech.												
E. Tilt	8	8	8	8	8	8	8	8	8	8	8	8
Cables	Fiber Jumper - 15 ft. (x2)	Coax Jumper - 15 ft. (x2) 1-5/8" Coax - 200 ft. (x2)	Fiber Jumper - 15 ft. (x4)	SHARED Fiber Jumper - 15 ft. (x4)	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)	Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)
TMA's		Ericsson Twin Style 1BX - KRY 112 144/2 (AtAntenna)										
Diplexers / Combiners												
Radio									Radio 4449 B71 +B85 (At Antenna)	SHARED Radio 4449 B71 +B85 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)										

Unconnected Equipment:

Scope of Work:

Swap L21 B4A/B2P antenna with AIR32 DB antenna for L21 and L19 1st carrier.
 Add Anchor Antenna 6449 on Pos2 on all sectors for L2500 and N2500.
 Add Radio 4415 B25 on mid-band ports of L600/L700 antenna and integrate L19 2nd carrier.

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template: 67D5A992DB Outdoor	A&L Template: 67D5992DB_3xAIR+1OP
--	---

Sector 2 (Existing) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		Ericsson - AIR21 KRC118023-1_B2P_B4A (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)			
Azimuth	165		165		165			
M. Tilt	0		0		0			
Height	180		180		180			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L1900 G1900	U2100	L2100		L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	8	8	8	0	8	8		
Cables	Fiber Jumper - 15 ft. (x2)	Coax Jumper - 15 ft. (x2) 1-5/8" Coax - 200 ft. (x2)	Fiber Jumper - 15 ft. (x2)		Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)		
TMA's		Ericsson Twin Style 1BX - KRY 112 144/2 (AtAntenna)						
Diplexers / Combiners								
Radio					Radio 4449 B71+B8 5 (At Antenna)	SHARED Radio 4449 B71+B8 5 (At Antenna)		
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)						

Unconnected Equipment:

Scope of Work:

*** Add AIR21 B4A for L2100 at pos2. Configure for L2100
 *** Add L600/L700 Octo port antenna at pos3. Add Radio 4449 to low band ports of Octo port antenna
 *** Remove AWS combiner

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template:
67D5A992DB Outdoor

A&L Template:
67D5992DB_3xAIR+1OP

Print Name: Standard
PORs: Anchor_Phase 3

Sector 2 (Proposed) view from behind

Coverage Type	A - Outdoor Macro											
Antenna	1			2			3			4		
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)			Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)			Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			RFS - APXVAARR24_43-U-NA20 (Octo)		
Azimuth	165			165			165			165		
M. Tilt	0			0			0			0		
Height	180			180			180			180		
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
Active Tech.	G1900	U2100	L2500 N2500	L2500 N2500	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600	L1900	L1900
Dark Tech.												
Restricted Tech.												
Decomm. Tech.												
E. Tilt	8	8	8	8	8	8	8	8	8	8	8	8
Cables	Fiber Jumper - 15 ft. (x2)	Coax Jumper - 15 ft. (x2) 1-5/8" Coax - 200 ft. (x2)	Fiber Jumper - 15 ft. (x4)	SHARED Fiber Jumper - 15 ft. (x4)	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)	Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)
TMA's		Ericsson Twin Style 1BX - KRY 112 144/2 (AtAntenna)										
Diplexers / Combiners												
Radio									Radio 4449 B71 +B85 (At Antenna)	SHARED Radio 4449 B71 +B85 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)										

Unconnected Equipment:

Scope of Work:

Swap L21 B4A/B2P antenna with AIR32 DB antenna for L21 and L19 1st carrier.
 Add Anchor Antenna 6449 on Pos2 on all sectors for L2500 and N2500.
 Add Radio 4415 B25 on mid-band ports of L600/L700 antenna and integrate L19 2nd carrier.

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template: 67D5A992DB Outdoor	A&L Template: 67D5992DB_3xAIR+1OP
--	---

Sector 3 (Existing) view from behind

Coverage Type	A - Outdoor Macro							
Antenna	1		2		3			
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)		Ericsson - AIR21 KRC118023-1_B2P_B4A (Quad)		RFS - APXVAARR24_43-U-NA20 (Octo)			
Azimuth	245		245		245			
M. Tilt	0		0		0			
Height	180		180		180			
Ports	P1	P2	P3	P4	P5	P6	P7	P8
Active Tech.	L1900 G1900	U2100	L2100		L700 L600 N600	L700 L600 N600		
Dark Tech.								
Restricted Tech.								
Decomm. Tech.								
E. Tilt	8	8	8	0	8	8		
Cables	Fiber Jumper - 15 ft. (x2)	Coax Jumper - 15 ft. (x2) 1-5/8" Coax - 200 ft. (x2)	Fiber Jumper - 15 ft. (x2)		Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)		
TMA's		Ericsson Twin Style 1BX - KRY 112 144/2 (AtAntenna)						
Diplexers / Combiners								
Radio					Radio 4449 B71+B8 5 (At Antenna)	SHARED Radio 4449 B71+B8 5 (At Antenna)		
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)						

Unconnected Equipment:

Scope of Work:

*** Add AIR21 B4A for L2100 at pos2. Configure for L2100
 *** Add L600/L700 Octo port antenna at pos3. Add Radio 4449 to low band ports of Octo port antenna
 *** Remove AWS combiner

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template: 67D5A992DB Outdoor	A&L Template: 67D5992DB_3xAIR+1OP
--	---

Sector 3 (Proposed) view from behind

Coverage Type	A - Outdoor Macro											
Antenna	1			2			3			4		
Antenna Model	Ericsson - AIR21 KRC118023-1_B2A_B4P (Quad)			Ericsson - AIR6449 B41 (Active Antenna - Massive MIMO)			Ericsson - AIR32 KRD901146-1_B66A_B2A (Octo)			RFS - APXVAARR24_43-U-NA20 (Octo)		
Azimuth	245			245			245			245		
M. Tilt	0			0			0			0		
Height	180			180			180			180		
Ports	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12
Active Tech.	G1900	U2100	L2500 N2500	L2500 N2500	L2100	L2100	L1900	L1900	L700 L600 N600	L700 L600 N600	L1900	L1900
Dark Tech.												
Restricted Tech.												
Decomm. Tech.												
E. Tilt	8	8	8	8	8	8	8	8	8	8	8	8
Cables	Fiber Jumper - 15 ft. (x2)	Coax Jumper - 15 ft. (x2) 1-5/8" Coax - 200 ft. (x2)	Fiber Jumper - 15 ft. (x4)	SHARED Fiber Jumper - 15 ft. (x4)	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Fiber Jumper - 15 ft.	Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)	Coax Jumper - 15 ft. (x4)	SHARED Coax Jumper - 15 ft. (x4)
TMA's		Ericsson Twin Style 1BX - KRY 112 144/2 (AtAntenna)										
Diplexers / Combiners												
Radio									Radio 4449 B71 +B85 (At Antenna)	SHARED Radio 4449 B71 +B85 (At Antenna)	Radio 4415 B25 (At Antenna)	SHARED Radio 4415 B25 (At Antenna)
Sector Equipment		Andrew Smart Bias T (Ericsson) (At Antenna)										

Unconnected Equipment:

Scope of Work:

Swap L21 B4A/B2P antenna with AIR32 DB antenna for L21 and L19 1st carrier.
Add Anchor Antenna 6449 on Pos2 on all sectors for L2500 and N2500.
Add Radio 4415 B25 on mid-band ports of L600/L700 antenna and integrate L19 2nd carrier.

*A dashed border indicates shared equipment. Any connected equipment is denoted with the SHARED keyword.

RAN Template: 67D5A992DB Outdoor	A&L Template: 67D5992DB_3xAIR+1OP
--	---

Section 7 - Power Systems Equipment

Existing Power Systems Equipment

----- This section is intentionally blank. -----

Proposed Power Systems Equipment

TOWER MAPPING REPORT

FEBRUARY 8, 2018

T-MOBILE SITE NAME: SAND HILL_1

T-MOBILE SITE NUMBER: NJ08012E

TEP#: 131623.155453

KMB#: 300.5912.501

US 1 NORTH & MAJOR ROAD
SOUTH BRUNSWICK, NJ 08852
(MIDDLESEX COUNTY)



PREPARED FOR:





TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 2 of 21

CHECKLIST

Page Title	Initials	Page # (s)	Revision	Notes
Checklist & Notes	TDV	2	0	
Tower Elevation	TDV	3	0	
Base Plate Details	TDV	4	0	
Collar Plate Details	TDV	5	0	
Modifications	TDV	6	0	
Transmission Cables	TDV	7	0	
Ladder Details	TDV	8	0	
Waveguide Details	TDV	9	0	
Hand Hole Rims	TDV	10	0	
Antenna and Mount Sketch	TDV	11-16	0	
Photos	TDV	17-21	0	

NOTES

Latitude:	N 40° 24' 18.23"	Longitude:	W 74° 32' 51.07"
Ground Elevation:	249-FT AMSL (GOOGLE EARTH)		
Site Address:	US 1 NORTH & MAJOR ROAD, SOUTH BRUNSWICK, NJ 08852 (MIDDLESEX COUNTY)		
FCC#:	1211853		
Tower ID Plate:	VALMONT 17720-98		
Telephone Company:	N/A		
Pedestal # and Location:	N/A		
Power Company:	PSE&G		
Meter # and Owner:	79 388 753 / MIDDLESEX CO., 626055745626331 / T-MOBILE, 96110243 / AT&T		
Existing Carriers/Site #:	MIDDLESEX COUNTY / N/A		
	T-MOBILE / NJ0812E		
	AT&T / FA# 10010531		
Gate Combo:	2008		
Special Access Issues:	CONTACT KEN KERSH AT 732-329-4000 EXT 7317 BEFORE ENTERING SITE		

Crew Leader: JASON CHESTNUTT, E.I.
Crew Member: GARRETT GRIFFITHS

Abbreviations:	AGL: Above Ground Level	L: Angle	S.B.: Stitch Bolts
	B.C.: Bolt Circle	LLH: Long Leg Horizontal	Schl: Schifflerized Angle
	BP: Bent Plate	LLV: Long Leg Vertical	SM: Smooth Heliax
	C-C: Center to Center	2L: Double Angle	SP: Spacing
	C: Channel	M.C.: Metal Conduit	SR: Solid Rod
	CNR: Could Not Record	M.E.: Minimum Edge	Th: Thickness
	EW: Elliptical Waveguide	MOD: Modification	T.R.: Threaded Rod
	FH: Foam Heliax	PL: Plate	TME: Tower Mounted Equip.
	HSS: Hollow Struct. Section	RC: Rigid Conduit	Tri: Triangular



TOWER MAPPING

Site Name SAND HILL_1

TEP # 131623.155453

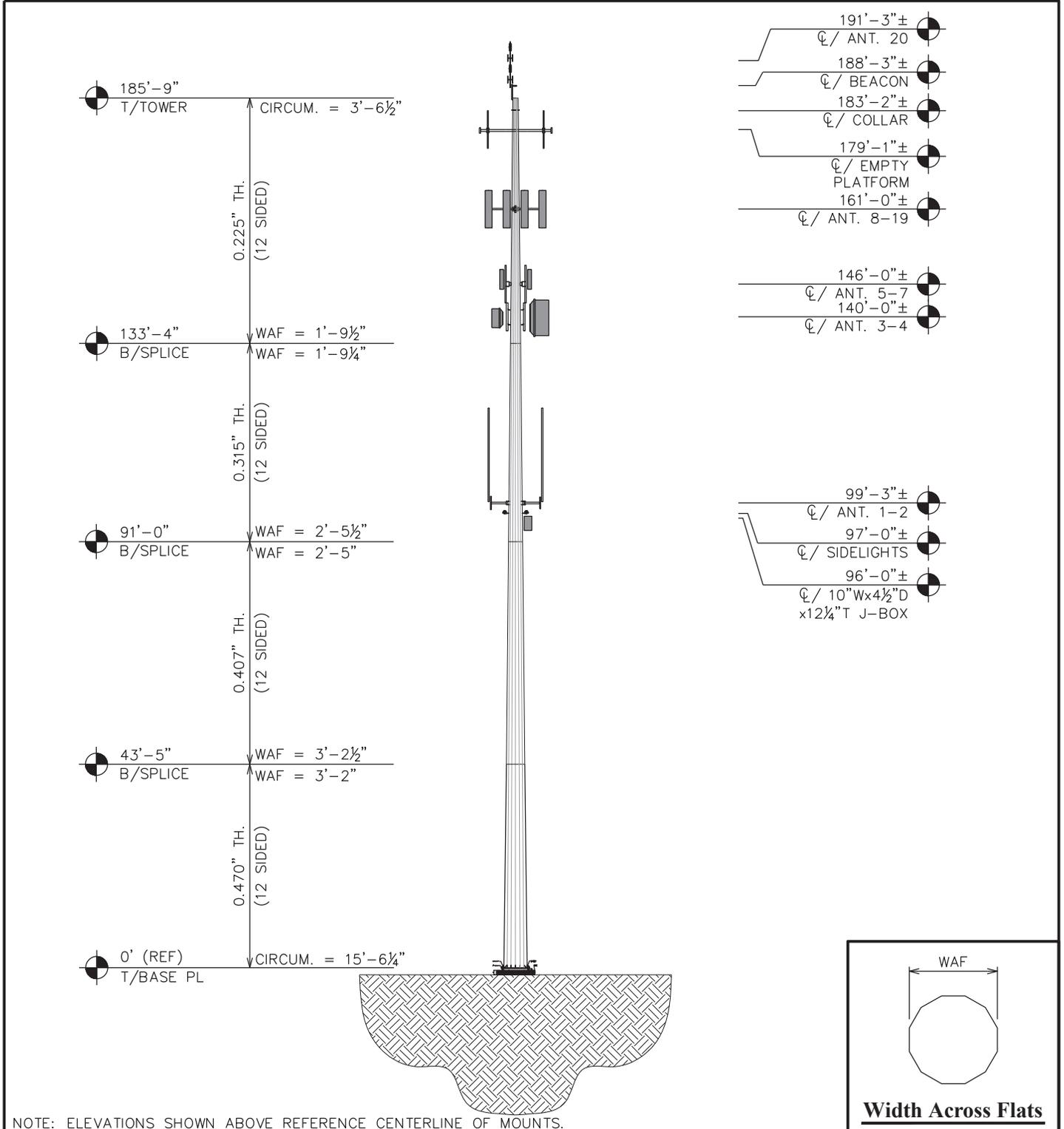
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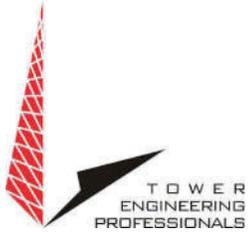
Field Work Date 2-2-2018

Report Date 2-8-2018

Page 3 of 21

TOWER ELEVATION

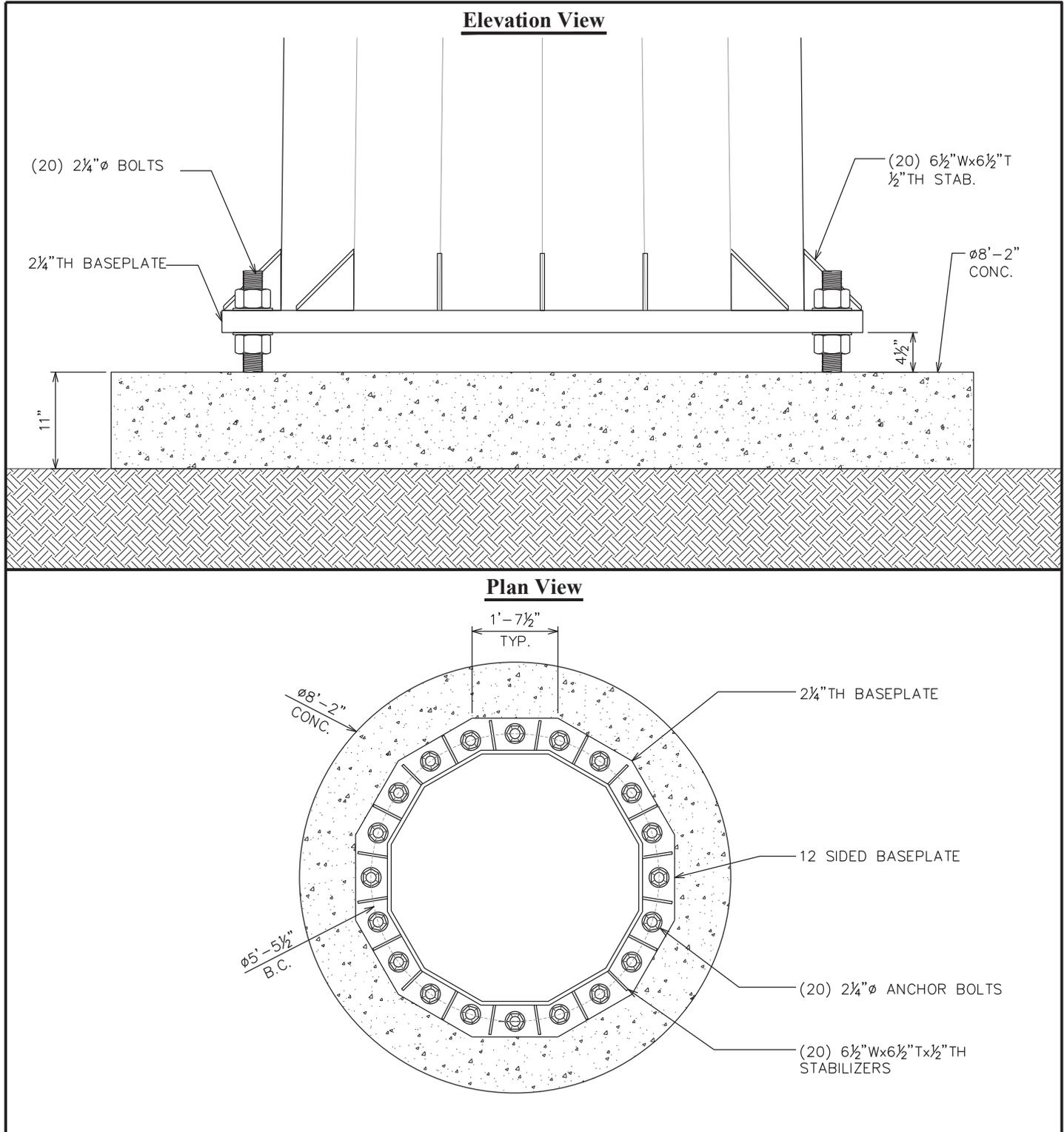




TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 4 of 21

BASE PLATE DETAILS

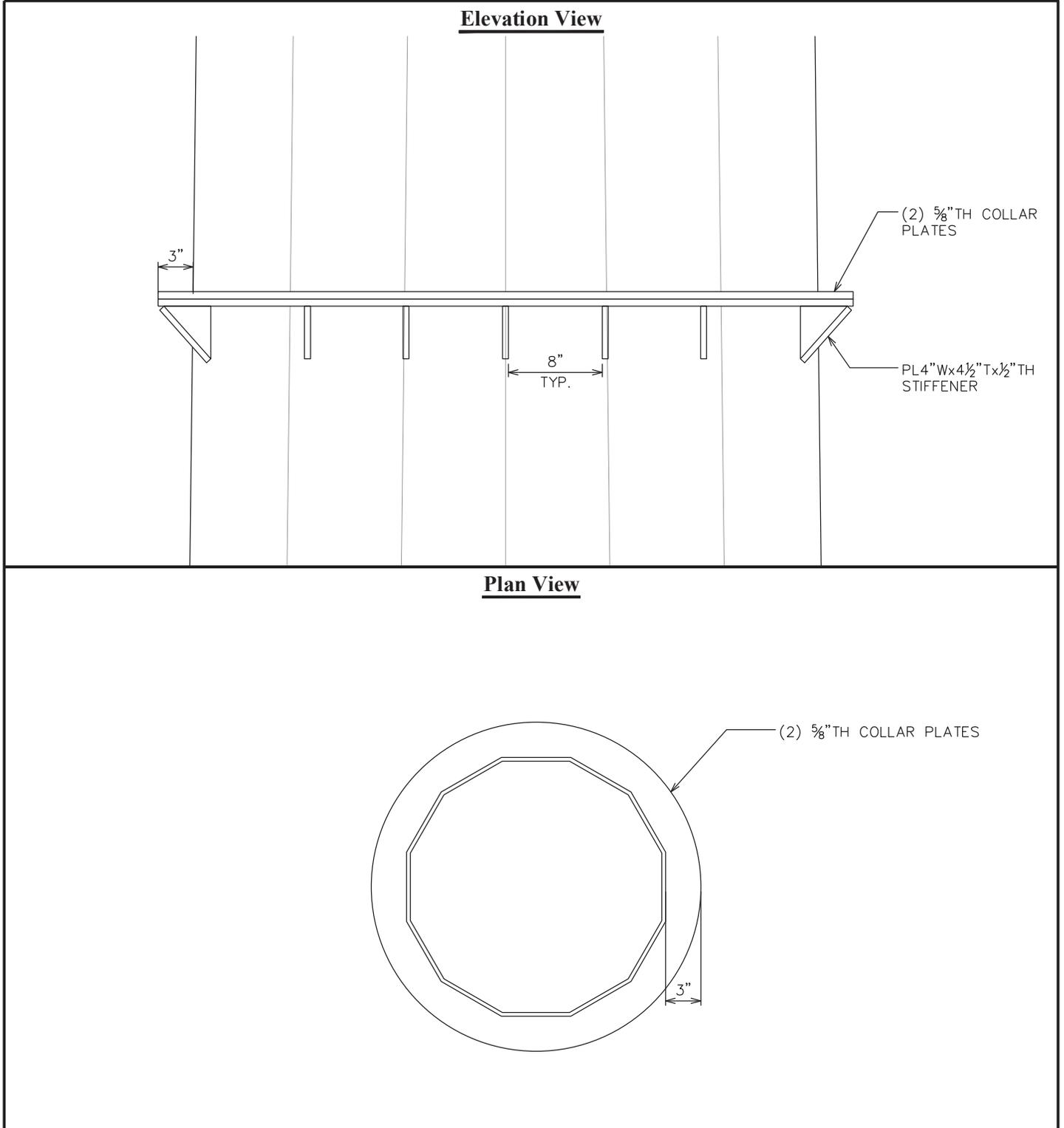




TOWER MAPPING

Site Name SAND HILL_1
TEP # 131623.155453
Client # 300.5912.501
Field Work Date 2-2-2018
Report Date 2-8-2018
Page 5 of 21

COLLAR PLATE DETAILS



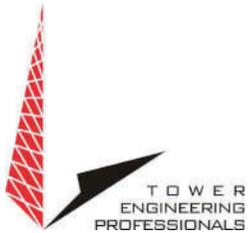


TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 6 of 21

MODIFICATIONS

Modification Sketch			Photo	
Mod #	Elevation	Flat #s	Member Size	Term. Weld Size & Spacing
1	134'-5 1/2" - 149'-7"	2, 6, 9, 12	PL4"Wx0.252"TH	2" STITCH WELD, 1 3/4" SPACING



TOWER MAPPING

Site Name SAND HILL_1

TEP # 131623.155453

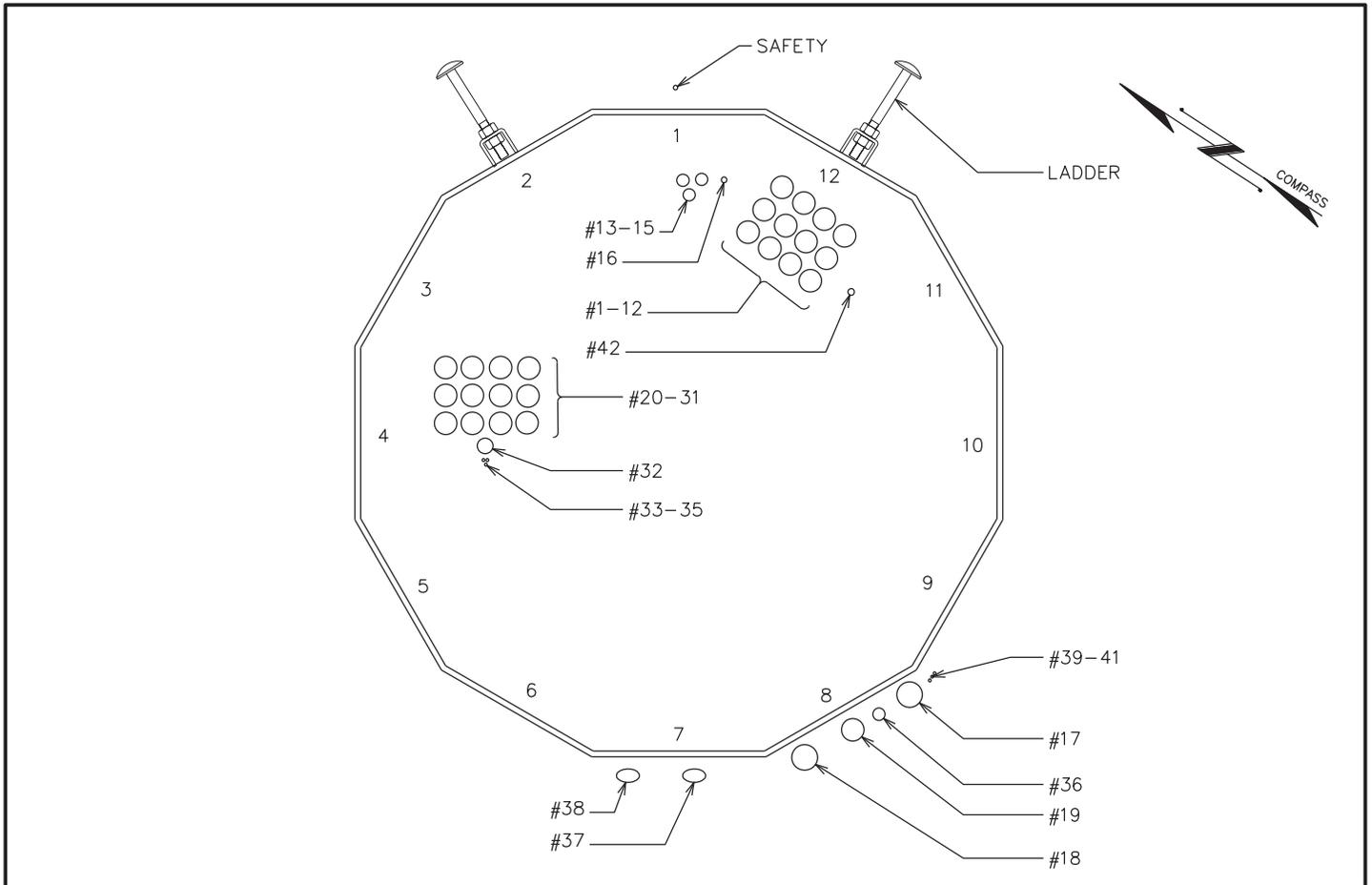
Client # 300.5912.501

Field Work Date 2-2-2018

Report Date 2-8-2018

Page 7 of 21

TRANSMISSION CABLES



Color Code: B = Blue, G = Green, O = Orange, R = Red, W = White, Y = Yellow

Coax #	Type/Style	Start Height	End Height	Antenna	Carrier	Notes
1-11	FH 1 $\frac{5}{8}$	7'-0"	162'-0"	8-19	AT&T	
12	FH 1 $\frac{5}{8}$	7'-0"	179'-1"	N/A	AT&T	ABANDONED
13-15	FH 7 $\frac{7}{8}$	7'-0"	179'-1"	N/A	AT&T	CUT
16	1/2"Ø SM	7'-0"	179'-1"	N/A	AT&T	ABANDONED
17-18	2/4"Ø F.C.	7'-0"	162'-0"	8-19	AT&T	
19	FH 1 $\frac{5}{8}$	7'-0"	191'-0"	20	MIDDLESEX CO.	
20-31	FH 1 $\frac{5}{8}$	7'-0"	147'-0"	5-7	T-MOBILE	
32	SM 1 $\frac{3}{8}$	7'-0"	147'-0"	5-7	T-MOBILE	
33-35	1/4"Ø SM	7'-0"	147'-0"	5-7	T-MOBILE	
36	FH 7 $\frac{7}{8}$	7'-0"	99'-3"	1-2	MIDDLESEX CO.	
37-38	E105J	7'-0"	139'-0"	3-4	MIDDLESEX CO.	
39-41	1/4"Ø SM	7'-0"	147'-0"	5-7	T-MOBILE	
42	9/16"Ø SM	7'-0"	97'-0"	N/A	N/A	LIGHTS



TOWER MAPPING

Site Name SAND HILL_1

TEP # 131623.155453

Client # 300.5912.501

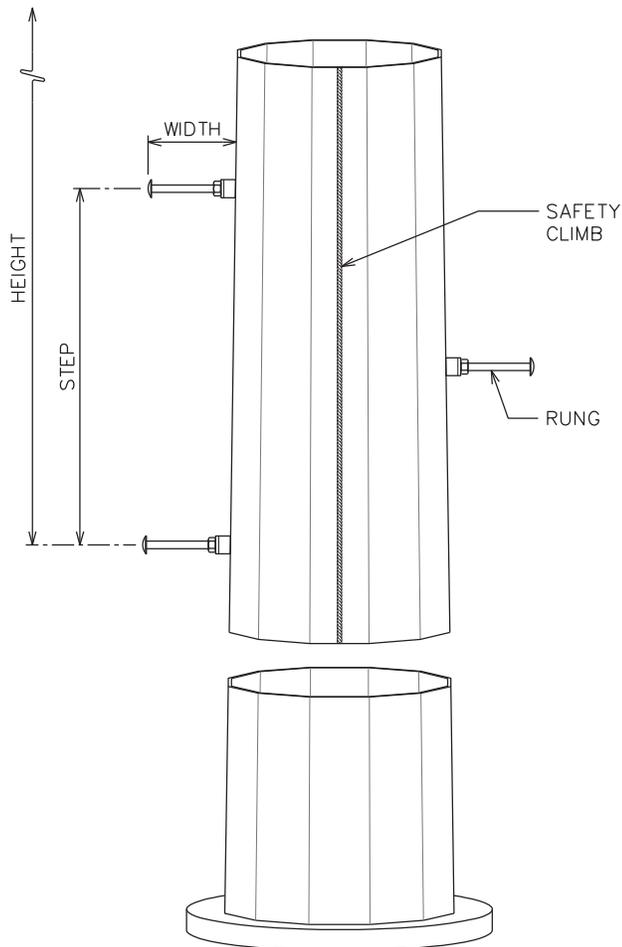
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Report Date 2-8-2018

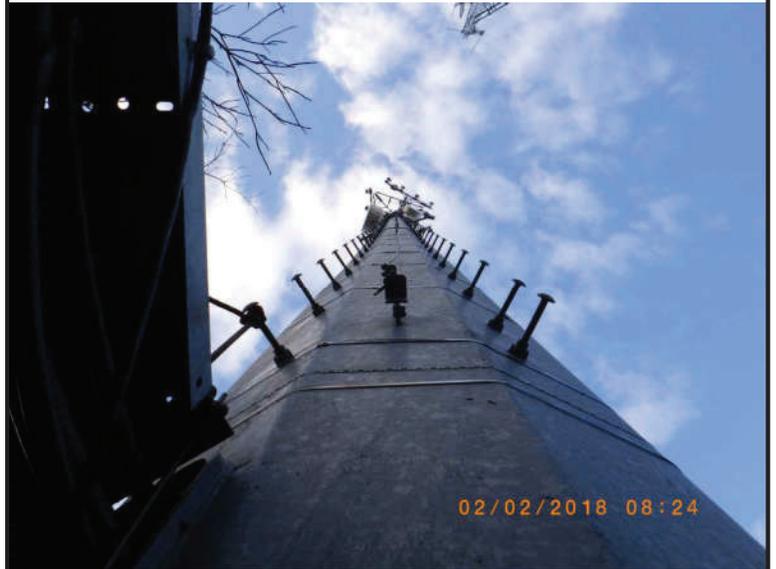
Page 8 of 21

LADDER DETAILS

Climbing Ladder #1 Sketch



Climbing Ladder #1 Photo



Climbing Ladder #1 Photo



Description	#	Height	Width	Step	Rail (type & size)	Rung (type & size)	Safety (type & size)
LADDER	1	111'-0"-188'-0"	7"	30"	N/A	3/4"Ø S.R.	3/8"Ø SAFETY

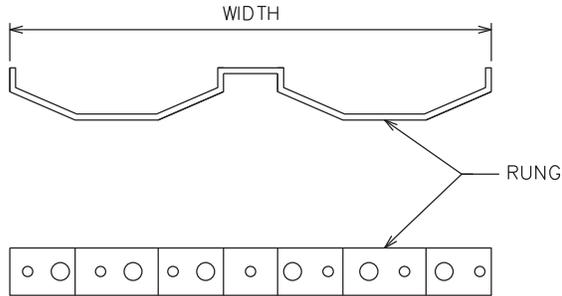


TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 9 of 21

WAVEGUIDE DETAILS

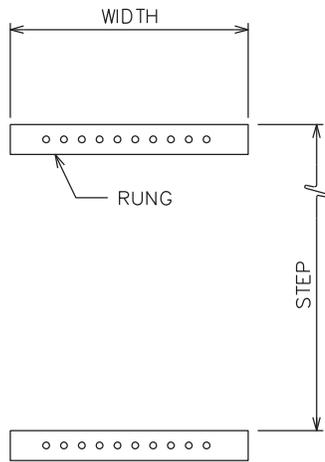
Waveguide Ladder #1 Sketch



Waveguide Ladder #1 Photo



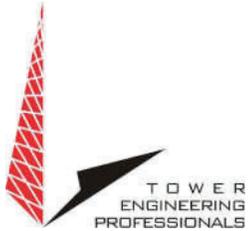
Waveguide Ladder #2 Sketch



Waveguide Ladder #2 Photo



Description	#	Height	Width	Step	Rail (type & size)	Rung (type & size)	Holes (size & spacing)
WAVEGUIDE	1	8'-0"-137'-0"	20"	4'	N/A	PL1 1/2"Wx 1/4"TH.	(6) 1/2"Ø, (8) 3/16"Ø
WAVEGUIDE	2	8'-0"-161'-0"	20"	4'	N/A	PL2 1/2"Wx 1/4"TH.	(10) 9/16"Ø



TOWER MAPPING

Site Name SAND HILL_1

TEP # 131623.155453

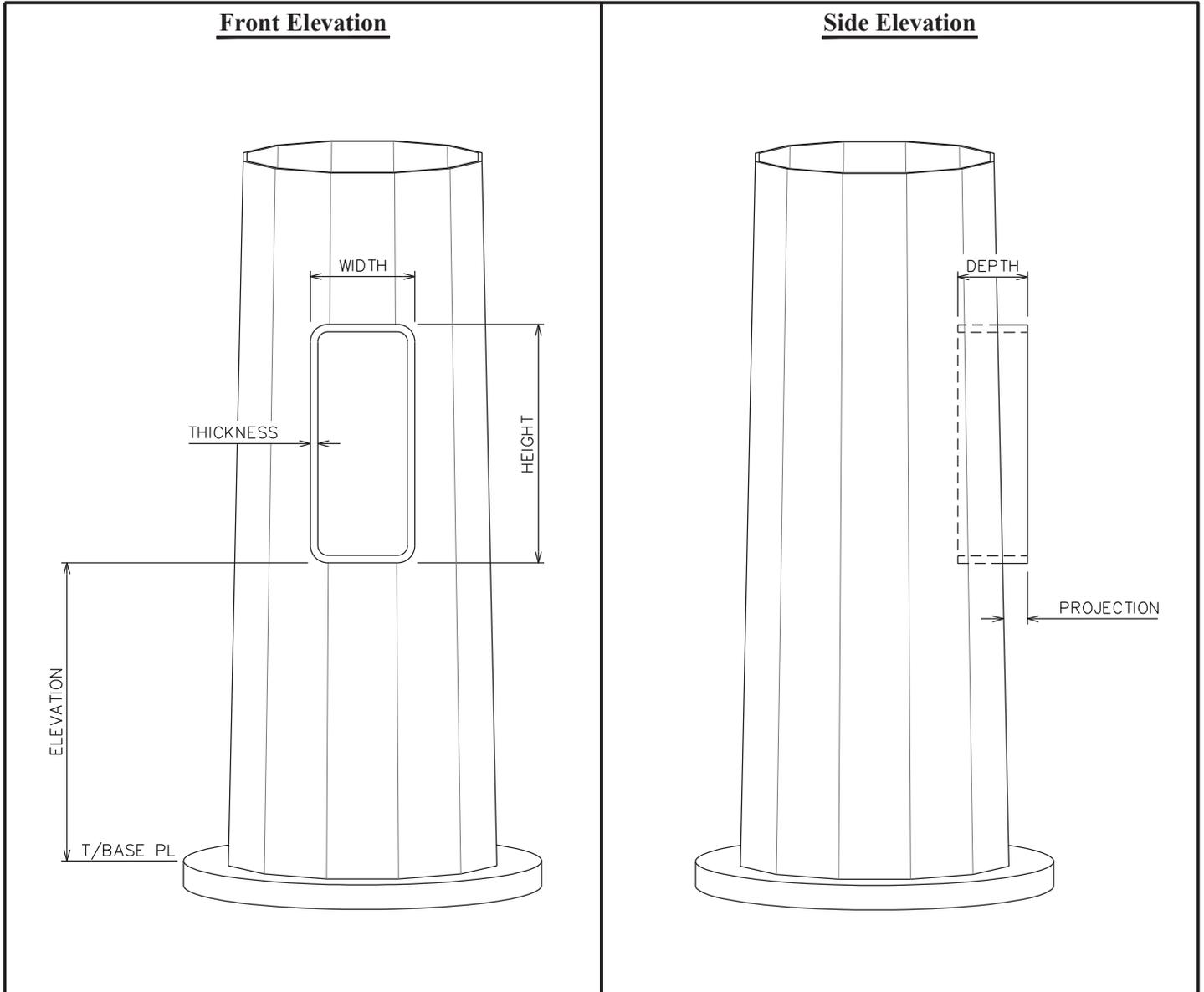
Client # 300.5912.501

Field Work Date 2-2-2018

Report Date 2-8-2018

Page 10 of 21

HAND HOLE RIMS



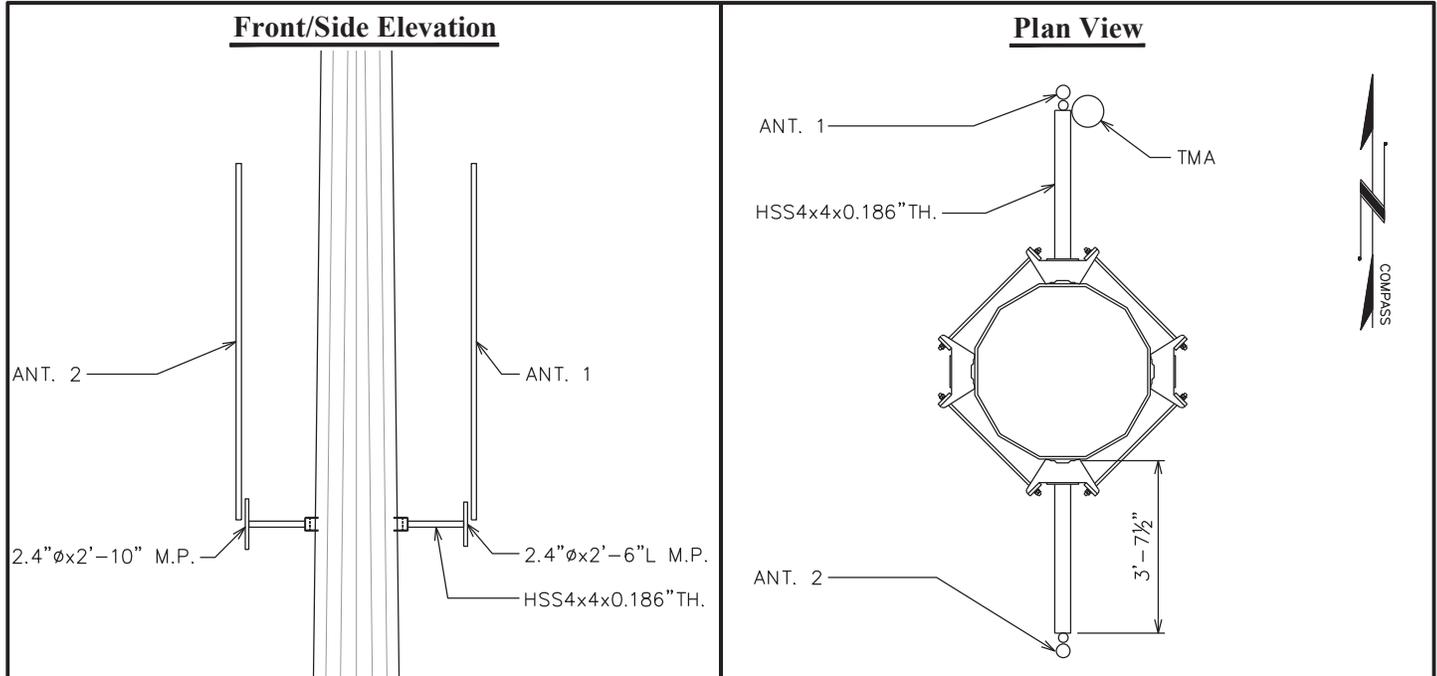
#	Elevation	Width	Height	Thickness	Depth	Projection	Flat #(s)	Description
1-3	6'-11 1/2"	10 1/2"	25 1/2"	3/4"	3 1/2"	1"	4, 8, 12	(1) T-MO ENTRY, (2) OPEN,(3) AT&T ENTRY
4	6'-9'-7"	6"	9 1/4"	1/2"	3	3/8"	1	OPEN
5	11'-4'-0"	6"	9 1/4"	1/2"	3	3/8"	1	OPEN
6-8	14'-2'-11"	6"	17"	1/2"	2 1/2"	1/2"	3, 7, 11	T-MOBILE EXIT
9-11	16'-3'-0"	6"	17"	1/2"	2 1/2"	1/2"	3, 7, 11	AT&T EXIT
12-14	18'-1'-0"	6"	18"	1/2"	2 3/4"	1/2"	3, 7, 11	OPEN



TOWER MAPPING

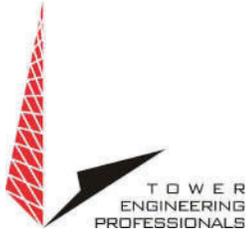
Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 11 of 21

ANTENNA AND MOUNT SKETCH



Antenna #	Mount Elevation	Antenna Elevation	Mount Type	Flat #	Azimuth
1-2	99'-3"	99'-6"	STANDOFF	3/4, 9/10	N/A
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	(Coax Quantity) Size		
UNKNOWN	3.5"Øx20'L OMNI	(1) 8"Øx21"L TMA	(1) FH 7/8		

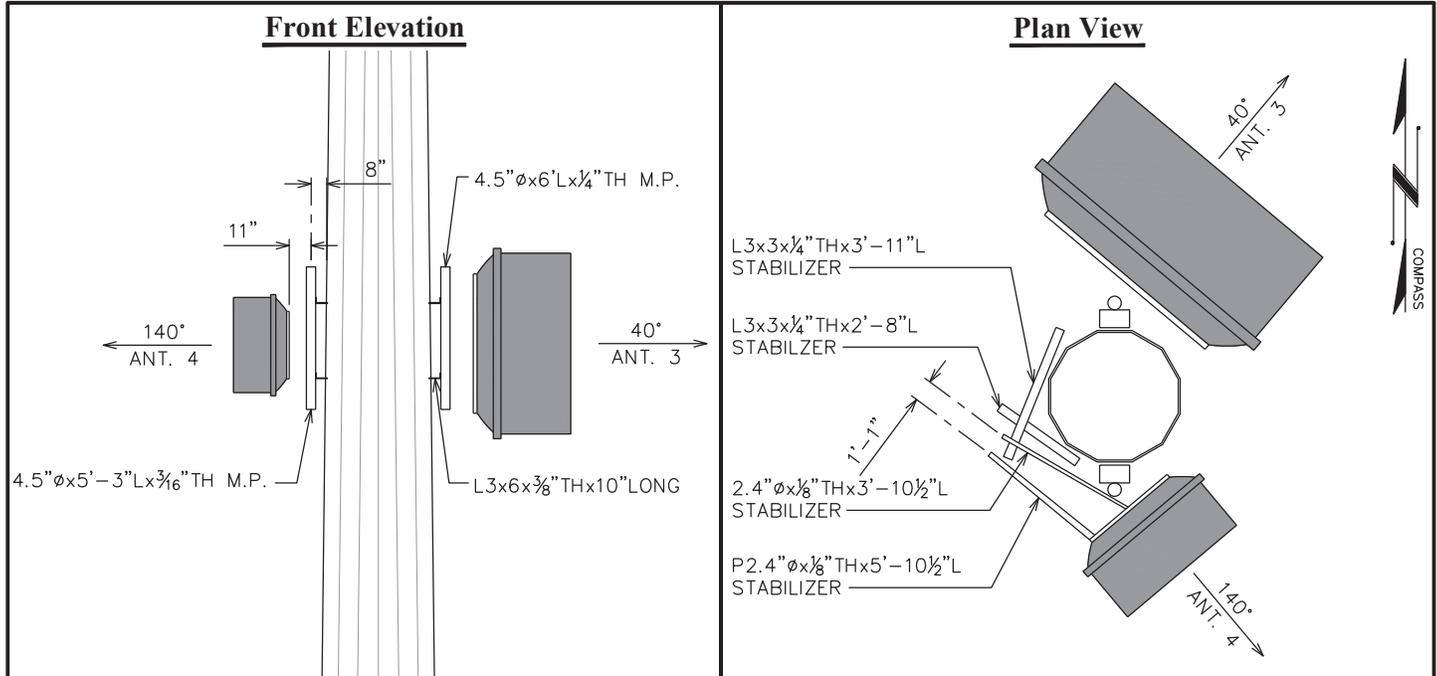




TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 12 of 21

ANTENNA AND MOUNT SKETCH



Antenna #	Mount Elevation	Antenna Elevation	Mount Type	Flat #	Azimuth
3-4	140'-0"	139'-0", 138'-10"	STANDOFF	3/4, 9/10	40°, 140°
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	(Coax Quantity) Size		
(#3) RFS	UXA4-107BC	N/A	(2) E105J		
(#4) RFS	SUG-107B0				

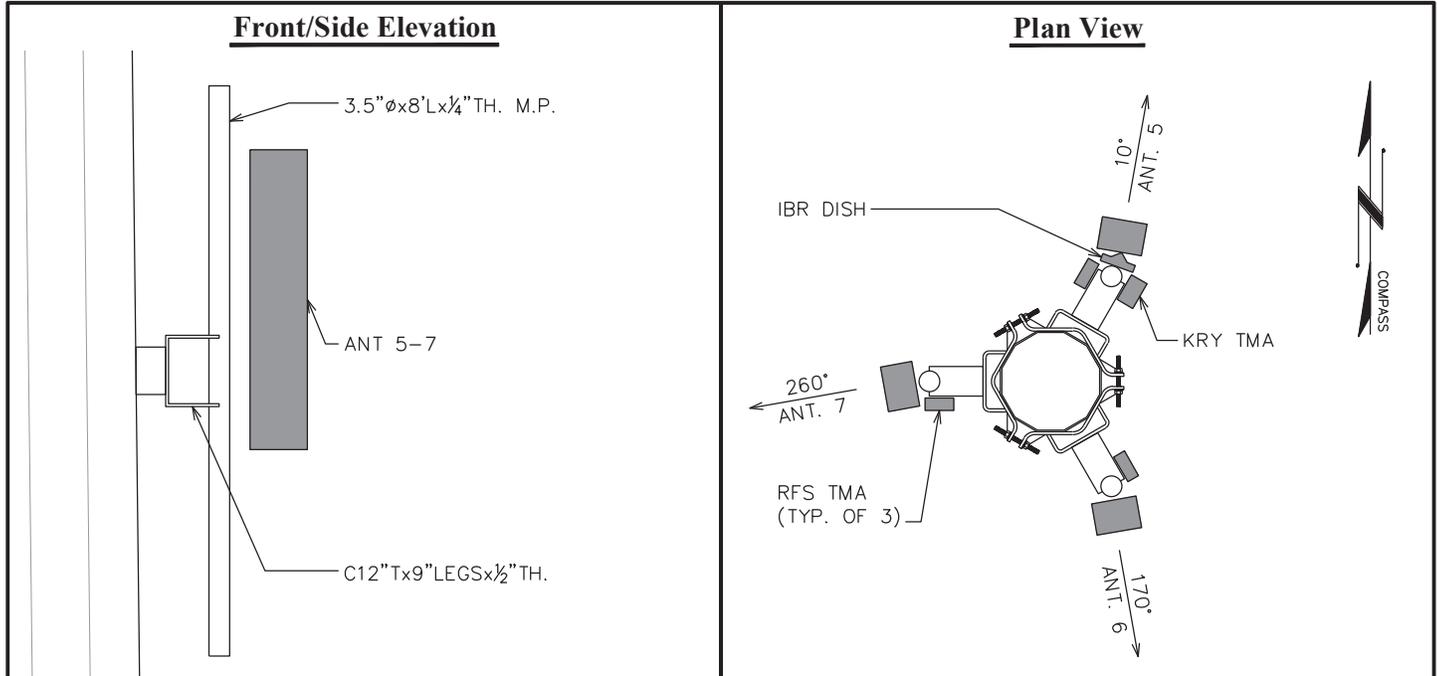




TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 13 of 21

ANTENNA AND MOUNT SKETCH



Antenna #	Mount Elevation	Antenna Elevation	Mount Type	Flat #	Azimuth
5-7	146'-0"	147'-0"	STANDOFF	2, 6, 10	10°, 170°, 260°
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	(Coax Quantity) Size		
KATHREIN	81010020R3A	(3) RFS 9"Wx10"Tx3 1/2"D (1) KRY112144/1 (1) IBR-1211-83-NA	(12) FH 1 5/8, (1) SM 1 3/8, (6) 1/4" Ø SM		

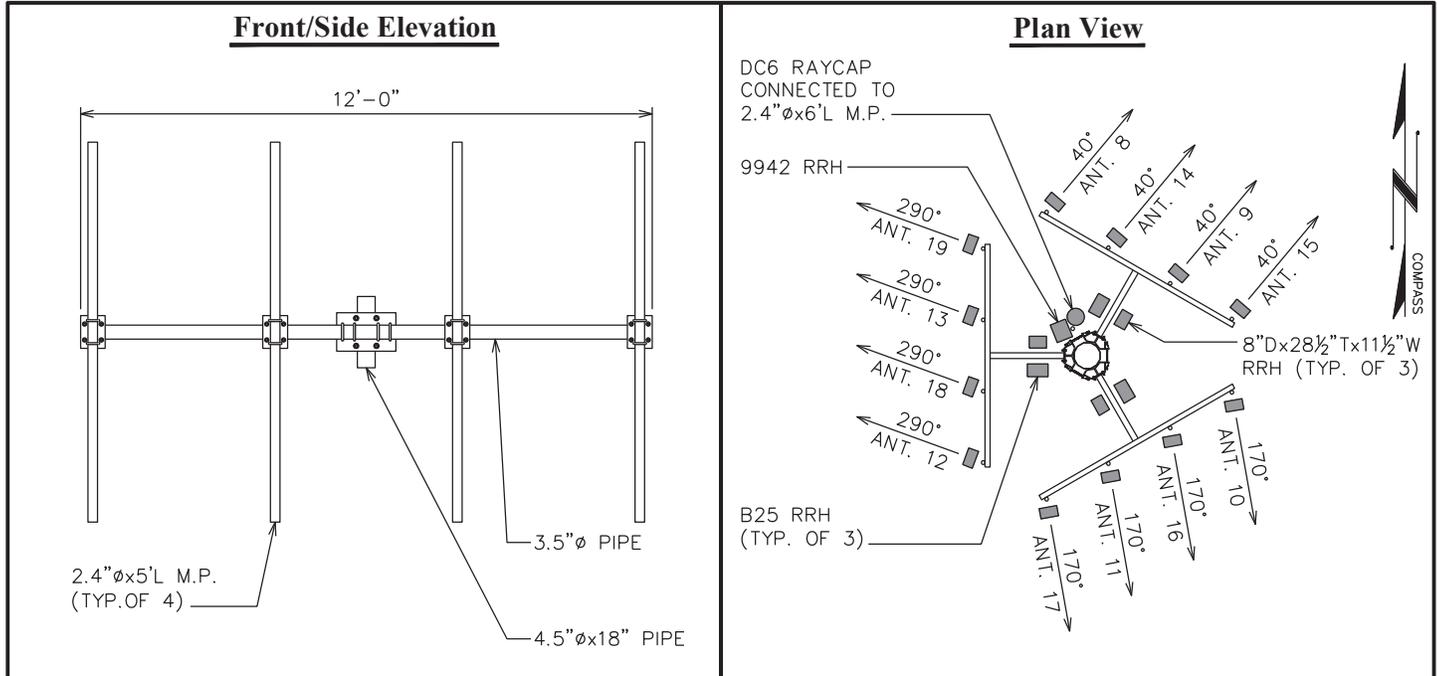




TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 14 of 21

ANTENNA AND MOUNT SKETCH



Antenna #	Mount Elevation	Antenna Elevation	Mount Type	Flat #	Azimuth
8-19	161'-0"	162'-0"	T-ARM	2, 6, 10	40°, 170°, 290°
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	(Coax Quantity) Size		
(#8-13) UNKNOWN	12"Wx7"DxT PANEL	(3) B25 RRH 4x30 (3) 8"Dx28 1/2"T x 1 1/2"W RRH (1) 9442 RRH 2x40-7D (1) DCG-48-60-18-8M	(1) FH 1 5/8, (2) 2 1/4" F.C.		
(#14-19) COMMSCOPE	SBNHH-1 D65A				

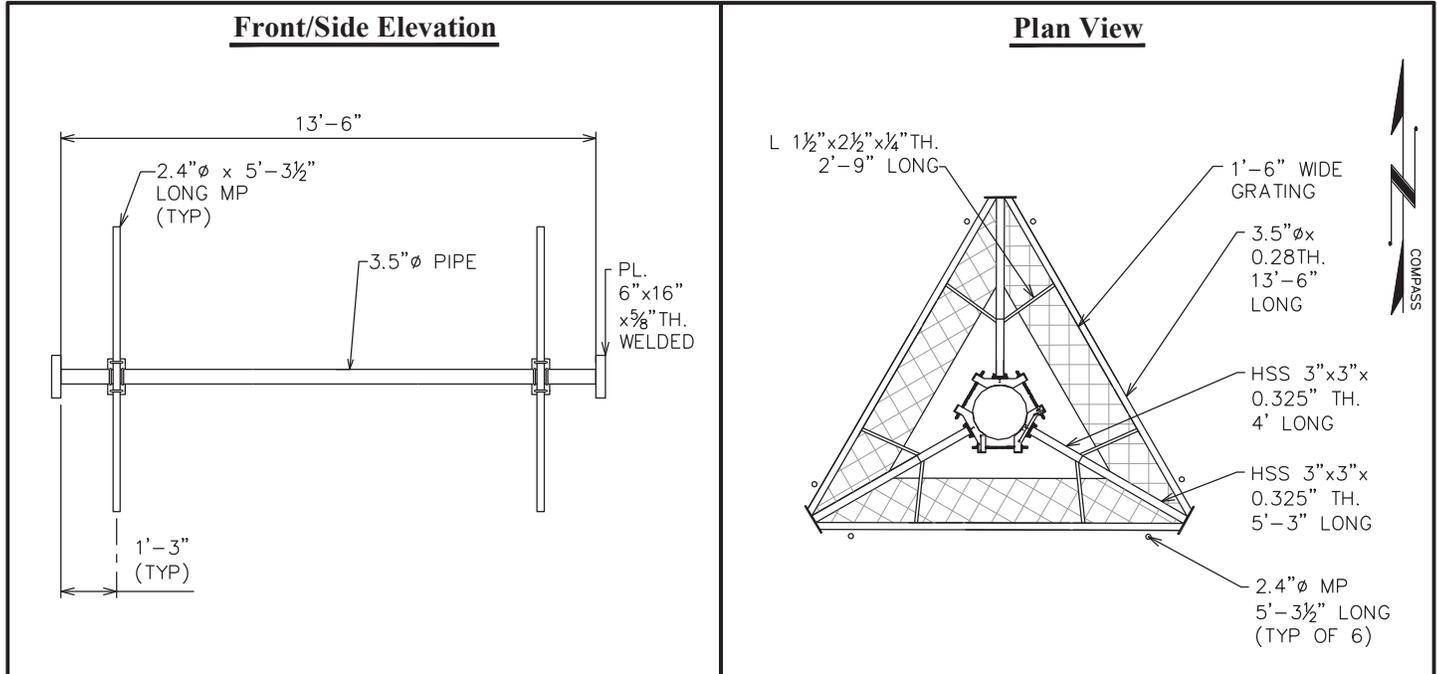




TOWER MAPPING

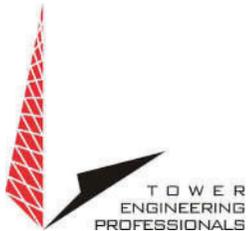
Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 15 of 21

ANTENNA AND MOUNT SKETCH



Antenna #	Mount Elevation	Antenna Elevation	Mount Type	Flat #	Azimuth
EMPTY	179'-1"	N/A	PLATFORM	N/A	N/A
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	(Coax Quantity) Size		
-	-	-	(1) FH 1 5/8, (3) FH 7/8, (1) 1/2"Ø SM		

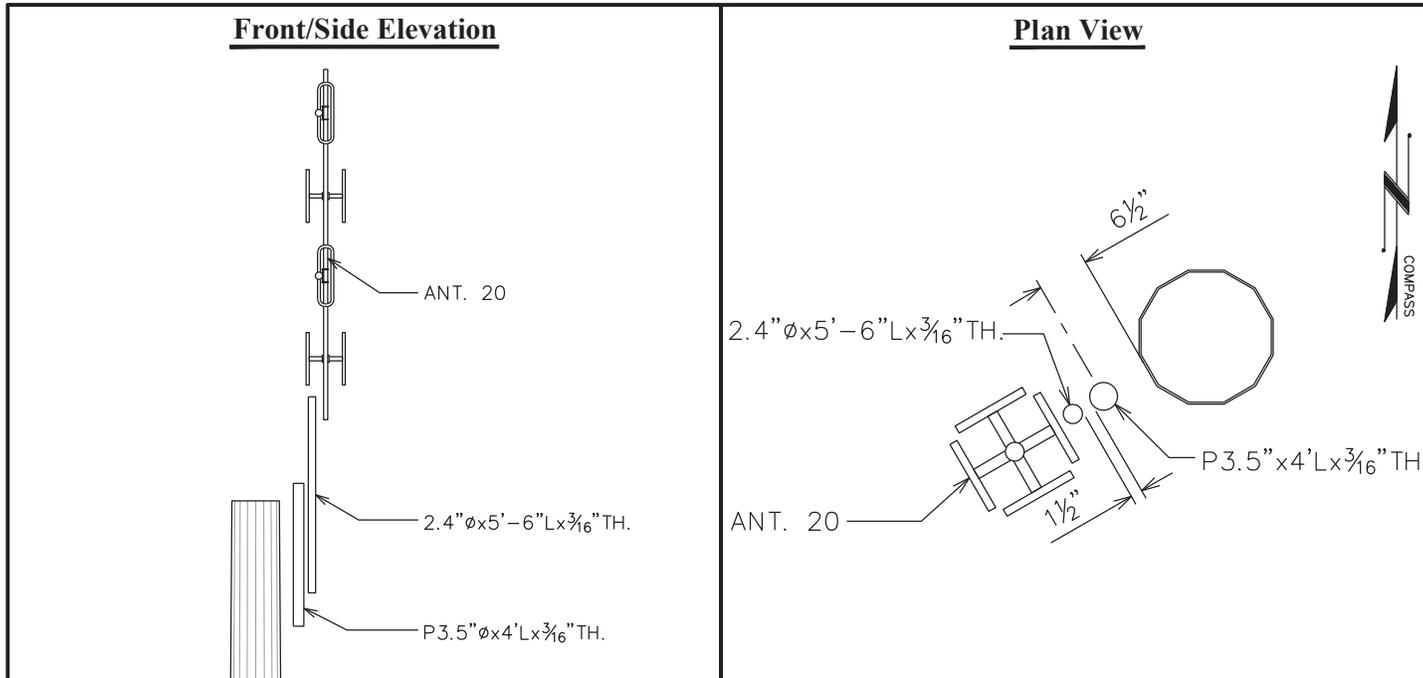




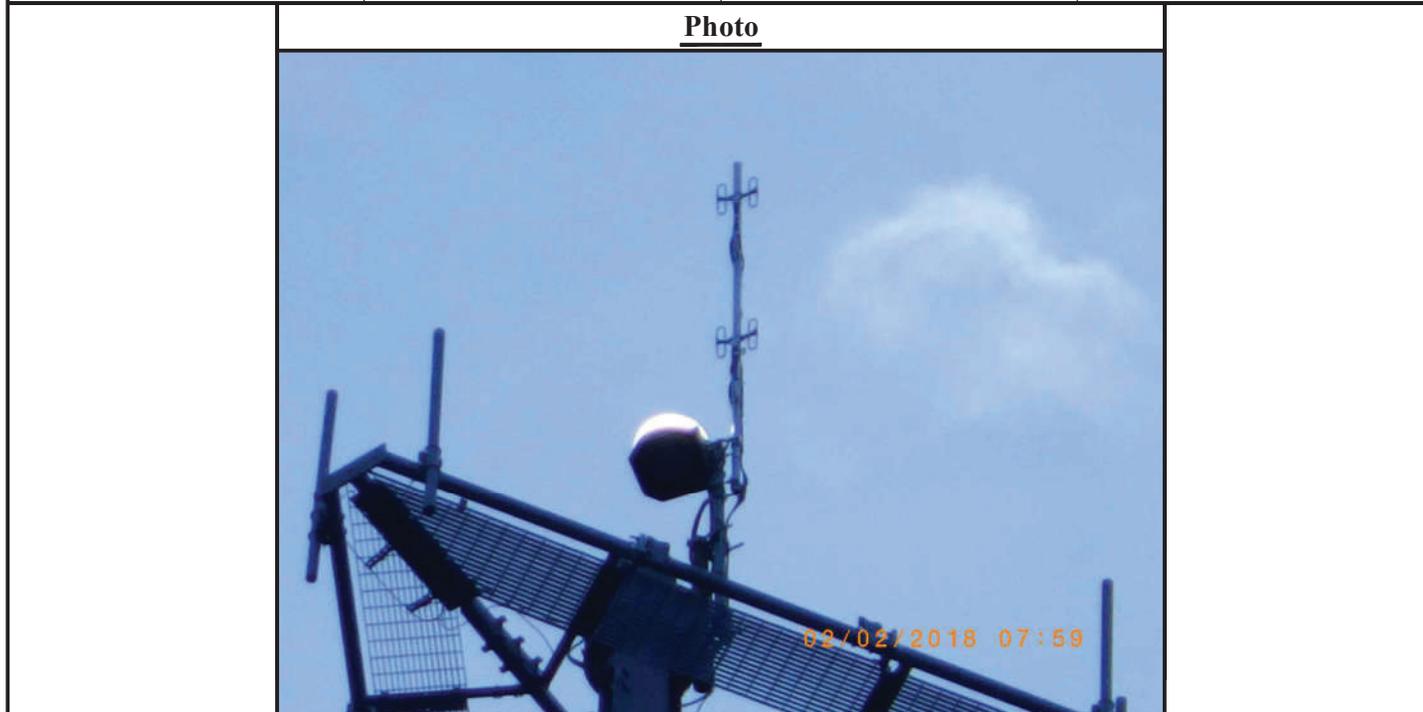
TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 16 of 21

ANTENNA AND MOUNT SKETCH



Antenna #	Mount Elevation	Antenna Elevation	Mount Type	Flat #	Azimuth
20	191'-3"	191'-3"	PIPE	7	N/A
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	(Coax Quantity) Size		
UNKNOWN	10' LONG DIPOLE	N/A	(1) FH 1 5/8		

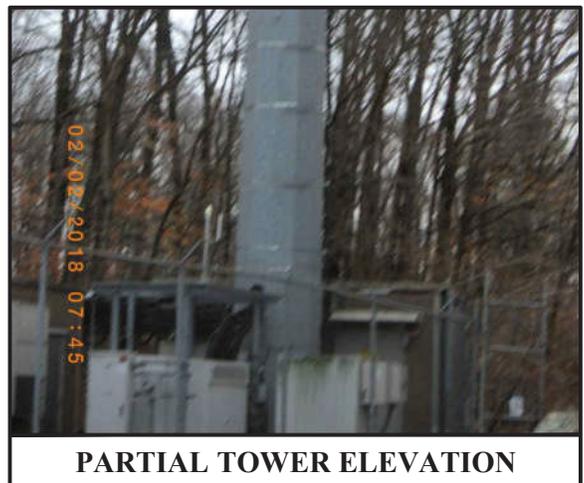


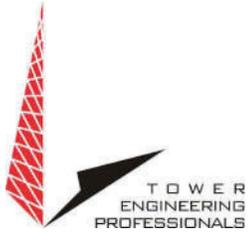


TOWER MAPPING

Site Name SAND HILL_1
TEP # 131623.155453
Client # 300.5912.501
Field Work Date 2-2-2018
Report Date 2-8-2018
Page 17 of 21

PHOTOS





TOWER MAPPING

Site Name SAND HILL_1
TEP # 131623.155453
Client # 300.5912.501
Field Work Date 2-2-2018
Report Date 2-8-2018
Page 18 of 21

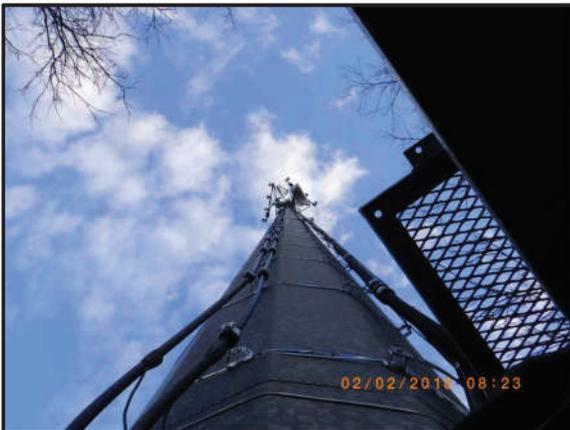
PHOTOS



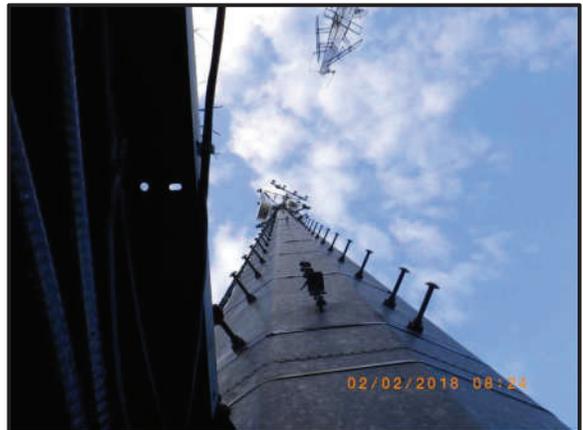
VIEW UP FLAT 3



VIEW UP FLAT 6



VIEW UP FLAT 9



VIEW UP FLAT 12



FRONT GATE



MIDDLESEX CO. POWER METER



TOWER MAPPING

Site Name SAND HILL_1
TEP # 131623.155453
Client # 300.5912.501
Field Work Date 2-2-2018
Report Date 2-8-2018
Page 19 of 21

PHOTOS



T-MOBILE POWER METER



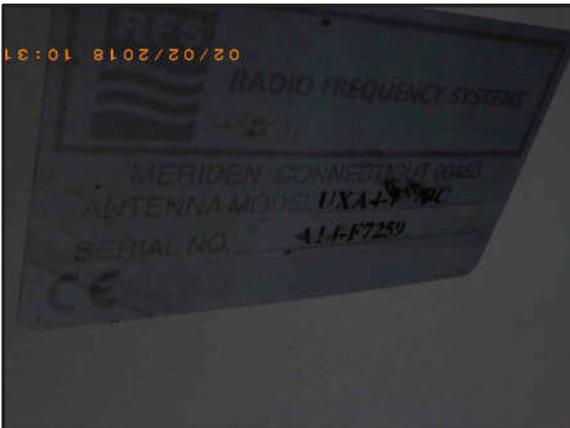
AT&T POWER METER



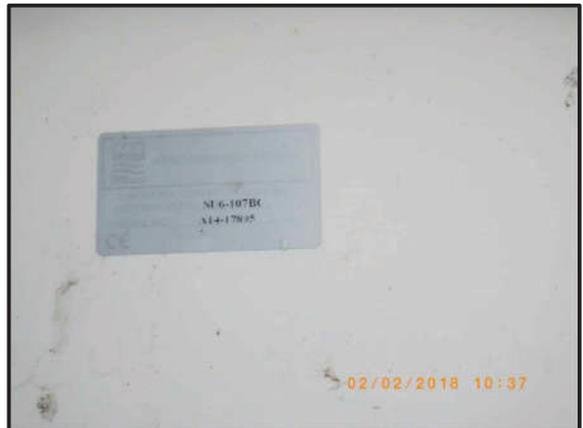
JUNCTION BOX



SIDE LIGHTS



ANTENNA #3 TAG



ANTENNA #4 TAG



TOWER MAPPING

Site Name SAND HILL_1
 TEP # 131623.155453
 Client # 300.5912.501
 Field Work Date 2-2-2018
 Report Date 2-8-2018
 Page 20 of 21

PHOTOS



ANTENNA #5-7 TMA TAG



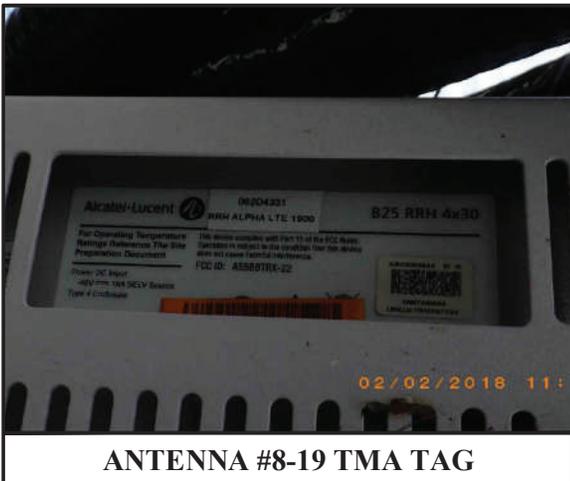
ANTENNA #5-7 TMA TAG



ANTENNA #8-13 TAG



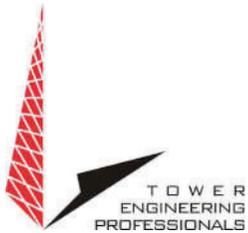
ANTENNA #14-19 TAG



ANTENNA #8-19 TMA TAG



ANTENNA #8-19 TMA TAG



TOWER MAPPING

Site Name SAND HILL_1
TEP # 131623.155453
Client # 300.5912.501
Field Work Date 2-2-2018
Report Date 2-8-2018
Page 21 of 21

PHOTOS



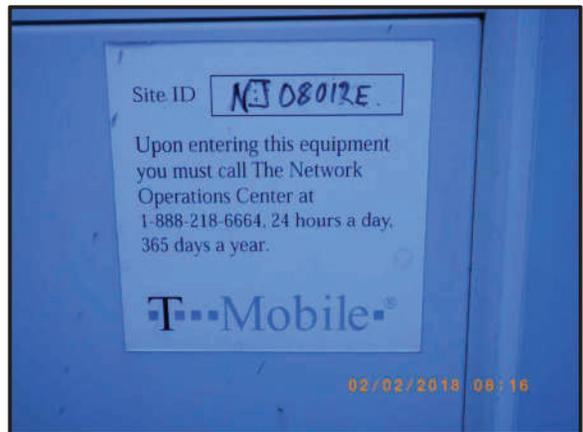
ANTENNA #8-19 RAYCAP TAG



BEACON



COLLAR



T-MOBILE SIGNAGE



AT&T SIGNAGE



August 17, 2011
Revised: November 9, 2011

Mr. Douglas Fetkowitz
OVERLAND CONTRACTING (BLACK & VEATCH)
45 Eisenhower Drive, Suite 240
Paramus, New Jersey 07652

Re: **Kendall Park – 062D4331**
3960 Route 1
South Brunswick, NJ 08901
FPA No. 1771.038R1

Dear Mr. Fetkowitz:

French & Parrello Associates, P.A. has analyzed the following 185' monopole in accordance with Electronics Industry Association Standard EIA/TIA-222G.

Tower:	Valmont Tower, Inc. 185' Monopole
Location:	South Brunswick, NJ
Site:	062U4331
County:	Middlesex
State:	New Jersey
Code:	EIA/TIA-222G
Design Windspeed:	95 mph
	50 mph w/ 1" radial ice
Exposure Category:	B

Discrete Attachments:

Existing 1	- Lightning Rod	@ 185'
Existing 1	- 4' whip w/ Mount	@ 185'
Existing 1	- 15' Low Profile Platform	@ 180'
Existing 3	- Kathrein 800 10504	@ 180'
Existing 3	- 10' Face T- Arm Mount	@ 165' (AT&T)
Existing 12	- 4' Panel Antenna	@ 165' (AT&T)
Remove 12	- 4' Panel Antenna	@ 165' (AT&T)
Proposed 12	- P65-15-XLH-RR LTE Antenna	@ 165' (AT&T)
Proposed 6	- RRH Units	@ 165' (AT&T)
Existing 3	- 4' Panel Antenna Flush Mount	@ 150' (T-Mobile)
Existing 3	- TMA	@ 150' (T-Mobile)
Existing 3	- 5' Face T- Arm Mount	@ 130' (ClearWire)
Existing 3	- 4' Panel Antenna	@ 130' (ClearWire)

Existing 4	- 1' Diameter Dish	@ 130' (ClearWire)
Existing 1	- RFS BMR10-A-B1 w/ Mount	@ 100'
Existing 1	- DB810KE-XT w/ Mount	@ 100'
Existing 1	- GPS	@ 50'

Linear Attachments:

Existing 1	- 1 $\frac{5}{8}$ " Cable	10' to 185'
Existing 6	- 1 $\frac{5}{8}$ " Cable	10' to 180'
Existing 12	- 1 $\frac{5}{8}$ " Cable	10' to 165'
Proposed 3	- 2" Innerduct	10' to 165'
Existing 12	- 1 $\frac{1}{4}$ " Cable	10' to 150'
Existing 3	- 1 $\frac{5}{8}$ " Cable	10' to 130'
Existing 1	- $\frac{7}{8}$ " Cable	10' to 100'
Existing 1	- 1 $\frac{5}{8}$ " Cable	10' to 100'
Existing 1	- $\frac{7}{8}$ " Cable	10' to 50'

The monopole dimensions were obtained from tower report by Valmont dated November 8, 1999, and a tower analysis and reinforcement design report by KMB dated March 10, 2010. The existing antenna types obtained from a KMB tower analysis and reinforcement design report dated March 10, 2010 and observed in the field on August 11, 2011 by French & Parrello Associates, P.A. The antenna types are as assumed and if different, FPA should be notified immediately. The monopole was assumed to be made of steel with a minimum yield stress of 65,000 psi. The 185' existing monopole consists of four 12 sided sections that are 57"φ at the base of the pole and tapered to a 13.6"φ at the top of the pole. The four monopole sections have thicknesses of 0.4375", 0.3750", 0.3125", and 0.2188" respectively from base to top of the pole. The monopole is reinforced with four 0.25" x 4" plates from elevation 132.8' to 147.8' above the base. The base of the monopole was observed to have a 2-1/4" thick round base plate with (16) 2-1/4" anchor bolts and (16) 1/2" x 7" stiffener plates. For additional information on the geometry of the monopole, refer to the attached analysis. No allowance has been assumed for damaged, rusted, or missing members. All members have been assumed to have no deficiencies. If the existing conditions differ, FPA should be immediately notified to reevaluate the structure.

The analysis was performed with the future arrangement of equipment (@±165') in place as shown above. The proposed configuration calls for (12) existing antennas (@±165') to be removed and replaced with (12) new LTE antennas and RRH units (@±165'). The new cables will be routed on the outside face of the monopole. The analysis was performed under the code requirements set by ANSI/TIA/EIA-222G. This analysis assumes the wind blowing from three different directions (i.e., normal, 60°, and 90° to the face). Based on our analysis, the tower was calculated to be at 83.3% of its allowable structural capacity, and is structurally adequate to support the proposed loads.

The foundation was observed in the field to be a 7'-0" diameter caisson foundation having an unknown depth. The maximum factored foundation loads at the base of the tower with the current configuration is 42.4 kips of compression, 29.7 kips of shear, and 3,296 kip-ft of moment. The original nominal design reactions with an applied factor of safety of 2 and corresponding reduction factors is 59.1 kips of compression, 60.6 kips of shear, and 6,619 kip-ft of moment. Based on our analysis, the foundation was calculated to be at 72% of its allowable structural capacity and the foundation is structurally adequate to support the proposed loads.

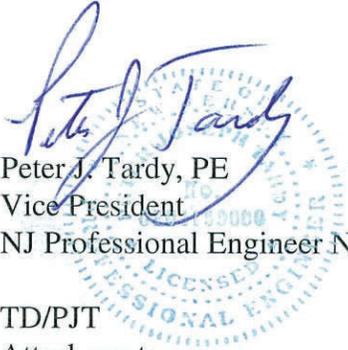
Should you have any questions or comments, please do not hesitate to contact us.

Very truly yours,

FRENCH & PARRELLO ASSOCIATES, P.A.



Timothy R. Donahue
Staff Engineer
Building Design Services



Peter J. Tardy, PE
Vice President
NJ Professional Engineer No. 41990

TD/PJT
Attachments

CHECK FOUNDATION:

ORIGINAL DESIGN REACTIONS (PER VALMONT REPORT DATED 11/12/99)

$$\begin{aligned} M &= 4413 \text{ k-ft} && \text{PER TIA-6 9.4} \\ V &= 40.4 \text{ kip} && \text{ASSUME FS} = 2 \\ P &= 39.4 \text{ kip} \end{aligned}$$

$$\begin{aligned} M_u &= 8826 \text{ k-ft} \times 0.75 = 6619 \text{ k-ft} \\ V_u &= 80.8 \text{ kip} \times 0.75 = 60.6 \text{ kip} \\ P_u &= 78.8 \text{ kip} \times 0.75 = 59.1 \text{ kip} \end{aligned}$$

FROM REVISED TOWER REPORT

$$\begin{aligned} M_u &= 3,296 \text{ k-ft} / 6619 \text{ k-ft} = 0.50 \\ V_u &= 29.7 \text{ kip} / 60.6 \text{ kip} = 0.49 \\ P_u &= 42.4 \text{ kip} / 59.1 = 0.72 \end{aligned}$$

∴ FOUNDATION IS AT 72% CAPACITY OK

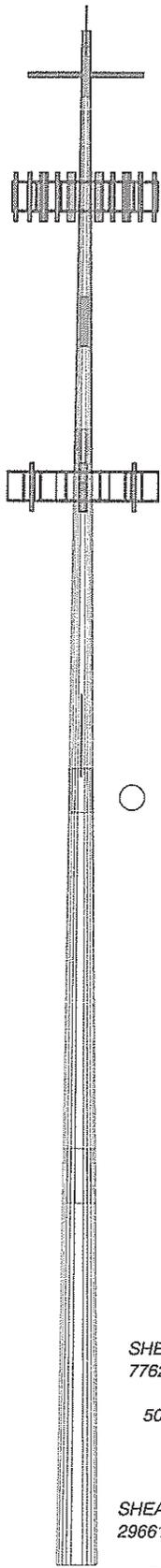
$$\begin{aligned} P_{\text{MAX}} &= \text{ICE} + \text{SERVICE} && P = 78.9 \text{ kip} \\ & && M = 989 \text{ k-ft} \\ & && V = 7.9 \text{ kip} \end{aligned}$$

⇒ FPA'S EXPERIENCE $P_u \gg$ DUE TO
REQUIRED MOMENT CAPACITY.

∴ 78.9 kip w/ SERVICE LOADS OK

Length (ft)	50.08	52.50	46.33	15.00	37.17
Number of Sides	12	12	12	12	12
Thickness (in)	0.4375	0.3750	0.3125	0.2675	0.2168
Socket Length (ft)	45.3627	6.58	5.33	4.17	13.5630
Top Dia (in)	57.8751	34.6396	25.0208	22.8499	22.8499
Bot Dia (in)	12287.0	47.7567	36.5963	26.5976	1602.9
Grade			A572-65		
Weight (lb)		8806.2	4837.8	1075.2	

185.0 ft
147.8 ft
132.8 ft
90.7 ft
43.5 ft
0.0 ft



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
Generic Lighting Rod 4' copper	185	(3) RRH AWS 2X40 (80W) (ATI)	165
4' Whip	185	(3) APXV18-206517-C (T-Mobile)	150
PiROD 15' Low Profile Platform (Monopole) (Metro)	180	(3) TMA (T-Mobile)	150
(3) 800 10504 (Metro)	180	(3) 2' Standoff T-Arm (5' face width) (ClearWire)	130
(3) 742 351 (Metro)	180	(3) Flat Panel 48"x8" (ClearWire)	130
(3) 2' Standoff T-Arm (10' face width) (ATI)	165	(4) 1' Dia Dish (ClearWire)	130
(12) P65-15-XLH-RR (ATI)	165	BMR10-A-B1	100
(3) RRH 700 MHz 2X40 (80W) (ATI)	165	DB810KE-XT	100
		(2) GPS (Metro)	50

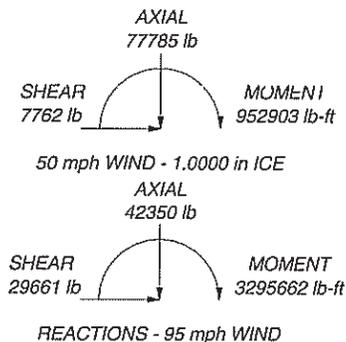
MATERIAL STRENGTH

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

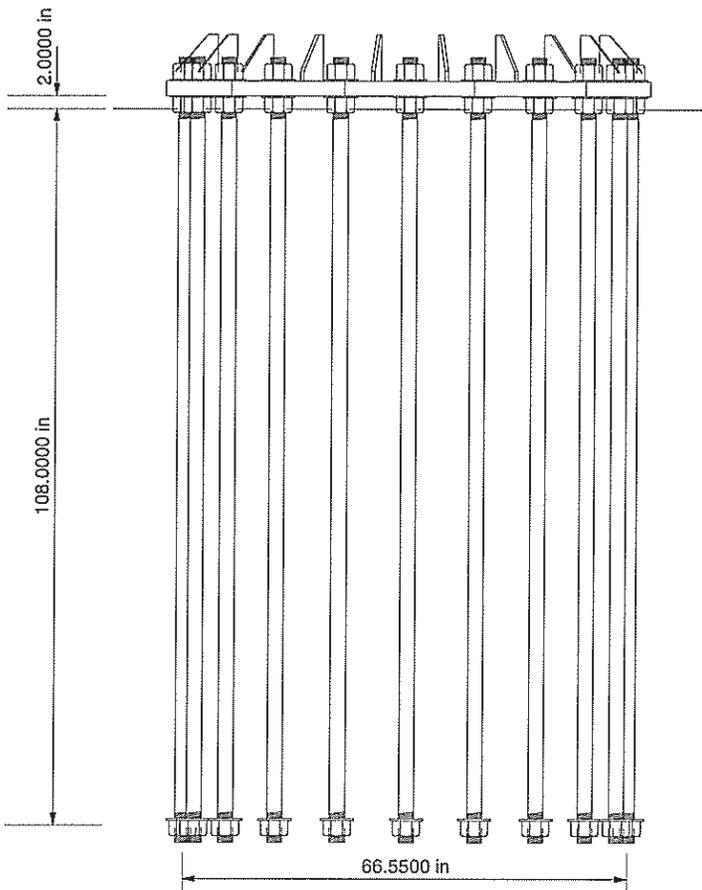
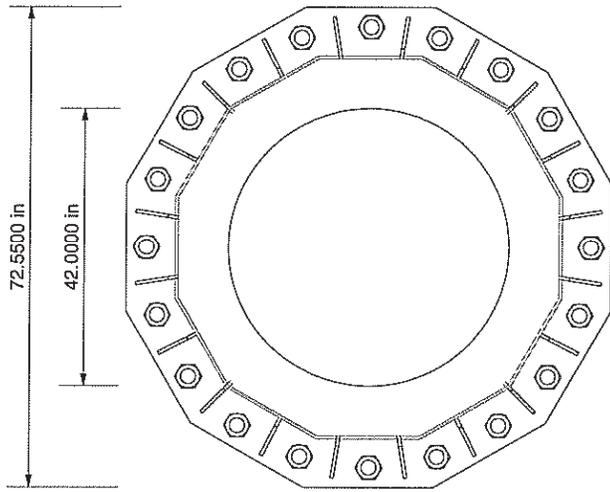
TOWER DESIGN NOTES

1. Tower is located in Middlesex County, New Jersey.
2. Tower designed for Exposure B to the TIA-222-G Standard.
3. Tower designed for a 95 mph wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Structure Class II.
7. Topographic Category 1 with Crest Height of 0.00 ft
8. TOWER RATING: 83.3%

ALL REACTIONS ARE FACTORED



French and Parrello		Job: 1771.038 - 062U4331 Route 1 Monmouth Junct	
1800 Route 34, Suite 101		Project: 185' Monopole	
Wall, NJ 07719		Client: AT&T (Black & Veatch)	Drawn by: Timothy.Donahue
Phone: 732.312.9688		Code: TIA-222-G	Date: 11/09/11
FAX: 732.312.9801		Path:	Scale: NT;
			Dwg No. E-



FOUNDATION NOTES

1. Plate thickness is 2.2500 in.
2. Plate grade is A633-60.
3. Anchor bolt grade is A615-75.
4. f_c is 4 ksi.

French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job: 1771.038 - 062U4331 Route 1 Monmouth Junction		
	Project: 185' Monopole		
	Client: AT&T (Black & Veatch)	Drawn by: Timothy Donahue	App'd:
	Code: TIA-222-G	Date: 11/09/11	Scale: NT
	Path:	Dwg No. 1	

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 1 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Tower Input Data

There is a pole section.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

- Tower is located in Middlesex County, New Jersey.
- Basic wind speed of 95 mph.
- Structure Class II.
- Exposure Category B.
- Topographic Category 1.
- Crest Height 0.00 ft.
- Nominal ice thickness of 1.0000 in.
- Ice thickness is considered to increase with height.
- Ice density of 56 pcf.
- A wind speed of 50 mph is used in combination with ice.
- Temperature drop of 50 °F.
- Deflections calculated using a wind speed of 60 mph.
- A non-linear (P-delta) analysis was used.
- Pressures are calculated at each section.
- Stress ratio used in pole design is 1.
- Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Options

- | | | |
|--|--|--|
| <ul style="list-style-type: none"> Consider Moments - Legs Consider Moments - Horizontals Consider Moments - Diagonals Use Moment Magnification √ Use Code Stress Ratios √ Use Code Safety Factors - Guys Escalate Ice Always Use Max Kz Use Special Wind Profile √ Include Bolts In Member Capacity √ Leg Bolts Are At Top Of Section √ Secondary Horizontal Braces Leg Use Diamond Inner Bracing (4 Sided) Add IBC .6D+W Combination | <ul style="list-style-type: none"> Distribute Leg Loads As Uniform Assume Legs Pinned √ Assume Rigid Index Plate √ Use Clear Spans For Wind Area √ Use Clear Spans For KL/r √ Retension Guys To Initial Tension Bypass Mast Stability Checks √ Use Azimuth Dish Coefficients √ Project Wind Area of Appurt. √ Autocalc Torque Arm Areas √ SR Members Have Cut Ends Sort Capacity Reports By Component √ Triangulate Diamond Inner Bracing | <ul style="list-style-type: none"> Treat Feedline Bundles As Cylinder Use ASCE 10 X-Brace Ly Rules √ Calculate Redundant Bracing Forces Ignore Redundant Members in FEA √ SR Leg Bolts Resist Compression √ All Leg Panels Have Same Allowable Offset Girt At Foundation Consider Feedline Torque Include Angle Block Shear Check <li style="text-align: center;">Poles Include Shear-Torsion Interaction Always Use Sub-Critical Flow Use Top Mounted Sockets |
|--|--|--|

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	185.00-147.83	37.17	0.00	12	13.5630	22.8499	0.2188	0.8752	A572-65 (65 ksi)
L2	147.83-132.83	15.00	4.17	12	22.8499	26.5976	0.2675	1.0700	A572-65 (65 ksi)
L3	132.83-90.67	46.33	5.33	12	25.0208	36.5963	0.3125	1.2500	A572-65

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 2 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade (65 ksi)
L4	90.67-43.50	52.50	6.58	12	34.6396	47.7567	0.3750	1.5000	A572-65 (65 ksi)
L5	43.50-0.00	50.08		12	45.3627	57.8751	0.4375	1.7500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
L1	14.0415	9.4015	213.6814	4.7772	7.0256	30.4145	432.9765	4.6271	3.0485	13.933
	23.6560	15.9444	1042.3321	8.1019	11.8362	88.0627	2112.0475	7.8474	5.5374	25.308
L2	23.6560	19.4514	1266.1230	8.0845	11.8362	106.9700	2565.5084	9.5734	5.4069	20.213
	27.5359	22.6795	2006.8971	9.4262	13.7776	145.6640	4066.5177	11.1621	6.4113	23.967
L3	26.9820	24.8627	1937.3976	8.8456	12.9608	149.4818	3925.6928	12.2367	5.8681	18.778
	37.8873	36.5106	6135.2139	12.9896	18.9569	323.6405	12431.6066	17.9694	8.9703	28.705
L4	37.2402	41.3745	6200.2578	12.2667	17.9433	345.5471	12563.4032	20.3633	8.2784	22.076
	49.4414	57.2134	16394.7391	16.9626	24.7380	662.7361	33220.1863	28.1587	11.7938	31.45
L5	48.6649	63.2883	16303.8118	16.0832	23.4979	693.8423	33035.9429	31.1486	10.9847	25.108
	59.9167	80.9153	34072.9212	20.5627	29.9793	1136.5476	69040.9760	39.8240	14.3380	32.773

Tower Elevation ft	Gusset Area ft ² (per face)	Gusset Thickness in	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals in	Double Angle Stitch Bolt Spacing Horizontal in
L1 185.00-147.83				1	1	1		
L2 147.83-132.83				1	1	1		
L3 132.83-90.67				1	1	1		
L4 90.67-43.50				1	1	1		
L5 43.50-0.00				1	1	1		

Monopole Base Plate Data

Base Plate Data

Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	20
Embedment length	108.0000 in
f _c	4.0 ksi
Grout space	2.0000 in
Base plate grade	A633-60
Base plate thickness	2.2500 in
Bolt circle diameter	66.5500 in
Outer diameter	72.5500 in
Inner diameter	42.0000 in
Base plate type	Stiffened Plate

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 3 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Base Plate Data	
Bolts per stiffener	1
Stiffener thickness	0.5000 in
Stiffener height	7.0000 in

Feed Line/Linear Appurtenances - Entered As Round Or Flat

Description	Sector	Component Type	Placement	Total Number	Number Per Row	Start/End Position	Width or Diameter	Perimeter	Weight
			<i>ft</i>				<i>in</i>	<i>in</i>	<i>plf</i>
LDF12-50A (2-1/4 FOAM) (AT&T)	C	Surface Ar (CaAa)	165.00 - 10.00	2	2	0.000 0.000	2.3500		1.22
LDF7-50A (1-5/8 FOAM) (Metro)	C	Surface Ar (CaAa)	180.00 - 10.00	2	2	0.000 0.000	1.9800		0.82

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	C _{AA}	Weight
				<i>ft</i>		<i>ft²/ft</i>	<i>plf</i>
LDF5-50A (7/8 FOAM)	C	No	Inside Pole	185.00 - 10.00	1	No Ice 1/2" Ice 1" Ice 0.00 0.00 0.00	0.33 0.33 0.33
LDF7-50A (1-5/8 FOAM) (AT&T)	C	No	Inside Pole	165.00 - 10.00	12	No Ice 1/2" Ice 1" Ice 0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM) (T-Mobile)	C	No	Inside Pole	150.00 - 10.00	6	No Ice 1/2" Ice 1" Ice 0.00 0.00 0.00	0.82 0.82 0.82
LDF7-50A (1-5/8 FOAM) (ClearWire)	C	No	Inside Pole	130.00 - 10.00	3	No Ice 1/2" Ice 1" Ice 0.00 0.00 0.00	0.82 0.82 0.82

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation	Face	A _R	A _F	C _{AA} In Face	C _{AA} Out Face	Weight
	<i>ft</i>		<i>ft²</i>	<i>ft²</i>	<i>ft²</i>	<i>ft²</i>	<i>lb</i>
L1	185.00-147.83	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	20.809	0.000	286.55
L2	147.83-132.83	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	12.990	0.000	287.55
L3	132.83-90.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	36.511	0.000	904.96
L4	90.67-43.50	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	40.849	0.000	1020.29
L5	43.50-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	29.011	0.000	724.61

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 4 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight lb
L1	185.00-147.83	A	2.349	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	54.989	0.000	1126.39
L2	147.83-132.83	A	2.311	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	33.571	0.000	795.30
L3	132.83-90.67	A	2.258	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	94.358	0.000	2332.07
L4	90.67-43.50	A	2.145	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	104.308	0.000	2566.92
L5	43.50-0.00	A	1.913	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	72.199	0.000	1750.02

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
L1	5	LDF12-50A (2-1/4 FOAM)	147.83 - 165.00	1.0000	1.0000
L1	6	LDF7-50A (1-5/8 FOAM)	147.83 - 180.00	1.0000	1.0000
L2	5	LDF12-50A (2-1/4 FOAM)	132.83 - 147.83	1.0000	1.0000
L2	6	LDF7-50A (1-5/8 FOAM)	132.83 - 147.83	1.0000	1.0000
L3	5	LDF12-50A (2-1/4 FOAM)	90.67 - 132.83	1.0000	1.0000
L3	6	LDF7-50A (1-5/8 FOAM)	90.67 - 132.83	1.0000	1.0000
L4	5	LDF12-50A (2-1/4 FOAM)	43.50 - 90.67	1.0000	1.0000
L4	6	LDF7-50A (1-5/8 FOAM)	43.50 - 90.67	1.0000	1.0000

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight lb
Generic Lightning Rod 4' copper	C	None		0.0000	185.00	No Ice	0.50	0.00
						1/2" Ice	1.00	0.00
						1" Ice	1.50	0.00
4' Whip	C	None		0.0000	185.00	No Ice	0.40	8.00

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 5 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft		C _{AA}	C _{AA}	Weight lb
							Front ft ²	Side ft ²	
						1/2" Ice	0.81	0.81	11.77
						1" Ice	1.06	1.06	18.23
PiROD 15' Low Profile Platform (Monopole) (Metro)	C	None		0.0000	180.00	No Ice	17.30	17.30	1500.00
(3) 800 10504 (Metro)	C	None		0.0000	180.00	1/2" Ice	22.10	22.10	2030.00
						1" Ice	26.90	26.90	2560.00
(3) 742 351 (Metro)	C	None		0.0000	180.00	No Ice	3.35	1.86	17.60
						1/2" Ice	3.70	2.19	35.63
						1" Ice	4.05	2.52	57.94
(3) 2' Standoff T-Arm (10' face width) (AT&T)	C	None		0.0000	165.00	No Ice	5.89	1.73	13.50
(12) P65-15-XLH-RR (AT&T)	C	None		0.0000	165.00	1/2" Ice	6.30	2.04	40.80
						1" Ice	6.72	2.36	72.57
(3) RRH 700 MHz 2X40 (80W) (AT&T)	C	None		0.0000	165.00	No Ice	5.50	5.50	129.00
(3) RRH AWS 2X40 (80W) (AT&T)	C	None		0.0000	165.00	1/2" Ice	6.90	6.90	170.00
						1" Ice	8.30	8.30	211.00
(3) APXV18-206517-C (T-Mobile)	C	None		0.0000	150.00	No Ice	5.95	3.08	41.00
(3) TMA (T-Mobile)	C	None		0.0000	150.00	1/2" Ice	6.36	3.41	75.35
						1" Ice	6.78	3.74	114.37
(3) 2' Standoff T-Arm (5' face width) (ClearWire)	C	None		0.0000	130.00	No Ice	2.49	2.21	51.00
(3) Flat Panel 48"x8" (ClearWire)	C	None		0.0000	130.00	1/2" Ice	2.71	2.42	72.38
						1" Ice	2.94	2.63	96.81
DB810KE-XT	C	None		0.0000	100.00	No Ice	2.92	2.19	43.00
						1/2" Ice	3.16	2.41	65.04
						1" Ice	3.41	2.65	90.25
BMR10-A-B1	C	None		0.0000	100.00	No Ice	5.05	3.07	26.40
						1/2" Ice	5.50	3.50	52.63
(2) GPS (Metro)	C	None		0.0000	50.00	1" Ice	5.96	3.94	84.37
						No Ice	0.97	0.29	8.00
						1/2" Ice	1.11	0.38	13.96
						1" Ice	1.25	0.48	21.61
						No Ice	3.50	3.50	91.00
						1/2" Ice	4.20	4.20	120.00
						1" Ice	4.90	4.90	149.00
						No Ice	3.73	1.31	24.00
						1/2" Ice	4.10	1.60	41.99
						1" Ice	4.48	1.90	63.93
						No Ice	3.63	3.63	35.00
						1/2" Ice	5.10	5.10	61.88
						1" Ice	6.60	6.60	98.03
						No Ice	8.38	8.38	83.00
						1/2" Ice	9.16	9.16	141.06
						1" Ice	9.95	9.95	207.89
						No Ice	0.67	0.67	25.00
						1/2" Ice	0.83	0.83	32.64
						1" Ice	1.01	1.01	42.16

Dishes

RISATower

French and Parrello
 1800 Route 34, Suite 101
 Wall, NJ 07719
 Phone: 732.312.9688
 FAX: 732.312.9801

Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 6 of 18
Project 185' Monopole	Date 15:50:28 11/09/11
Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight
				ft	°	°	ft	ft	ft ²	lb
(4) 1' Dia Dish (ClearWire)		Paraboloid w/o Radome	None		0.0000		130.00	1.00	No Ice 1/2" Ice 1" Ice	20.00 24.73 29.46

Tower Pressures - No Ice

$$G_H = 1.100$$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face	C _A A _A Out Face
ft	ft		psf	ft ²	e	ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.00-147.83	164.98	1.14	25.0	58.384	A	0.000	58.384	58.384	100.00	0.000	0.000
					B	0.000	58.384	100.00	0.000	0.000	
					C	0.000	58.384	100.00	20.809	0.000	
L2 147.83-132.83	140.14	1.088	23.9	31.995	A	0.000	31.995	31.995	100.00	0.000	0.000
					B	0.000	31.995	100.00	0.000	0.000	
					C	0.000	31.995	100.00	12.990	0.000	
L3 132.83-90.67	110.85	1.018	22.3	113.954	A	0.000	113.954	113.954	100.00	0.000	0.000
					B	0.000	113.954	100.00	0.000	0.000	
					C	0.000	113.954	100.00	36.511	0.000	
L4 90.67-43.50	66.58	0.88	19.2	170.365	A	0.000	170.365	170.365	100.00	0.000	0.000
					B	0.000	170.365	100.00	0.000	0.000	
					C	0.000	170.365	100.00	40.849	0.000	
L5 43.50-0.00	21.12	0.7	15.5	196.804	A	0.000	196.804	196.804	100.00	0.000	0.000
					B	0.000	196.804	100.00	0.000	0.000	
					C	0.000	196.804	100.00	29.011	0.000	

Tower Pressure - With Ice

$$G_H = 1.100$$

Section Elevation	z	K _Z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face	C _A A _A Out Face
ft	ft		psf	in	ft ²	e	ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.00-147.83	164.98	1.14	6.9	2.3492	72.937	A	0.000	72.937	72.937	100.00	0.000	0.000
						B	0.000	72.937	100.00	0.000	0.000	
						C	0.000	72.937	100.00	54.989	0.000	
L2 147.83-132.83	140.14	1.088	6.6	2.3112	37.773	A	0.000	37.773	37.773	100.00	0.000	0.000
						B	0.000	37.773	100.00	0.000	0.000	
						C	0.000	37.773	100.00	33.571	0.000	
L3 132.83-90.67	110.85	1.018	6.2	2.2576	130.194	A	0.000	130.194	130.194	100.00	0.000	0.000
						B	0.000	130.194	100.00	0.000	0.000	
						C	0.000	130.194	100.00	94.358	0.000	
L4 90.67-43.50	66.58	0.88	5.3	2.1454	188.114	A	0.000	188.114	188.114	100.00	0.000	0.000
						B	0.000	188.114	100.00	0.000	0.000	
						C	0.000	188.114	100.00	104.308	0.000	
L5 43.50-0.00	21.12	0.7	4.3	1.9127	212.358	A	0.000	212.358	212.358	100.00	0.000	0.000
						B	0.000	212.358	100.00	0.000	0.000	
						C	0.000	212.358	100.00	72.199	0.000	

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 7 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
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Tower Pressure - Service

$G_H = 1.100$

Section Elevation	z	K_z	q_z	A_G	F a c e	A_F	A_R	A_{leg}	Leg %	C_{AA} In Face	C_{AA} Out Face
ft	ft		psf	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.00-147.83	164.98	1.14	8.9	58.384	A	0.000	58.384	58.384	100.00	0.000	0.000
					B	0.000	58.384	100.00	0.000	0.000	
					C	0.000	58.384	100.00	20.809	0.000	
L2 147.83-132.83	140.14	1.088	8.5	31.995	A	0.000	31.995	31.995	100.00	0.000	0.000
					B	0.000	31.995	100.00	0.000	0.000	
					C	0.000	31.995	100.00	12.990	0.000	
L3 132.83-90.67	110.85	1.018	8.0	113.954	A	0.000	113.954	113.954	100.00	0.000	0.000
					B	0.000	113.954	100.00	0.000	0.000	
					C	0.000	113.954	100.00	36.511	0.000	
L4 90.67-43.50	66.58	0.88	6.9	170.365	A	0.000	170.365	170.365	100.00	0.000	0.000
					B	0.000	170.365	100.00	0.000	0.000	
					C	0.000	170.365	100.00	40.849	0.000	
L5 43.50-0.00	21.12	0.7	5.5	196.804	A	0.000	196.804	196.804	100.00	0.000	0.000
					B	0.000	196.804	100.00	0.000	0.000	
					C	0.000	196.804	100.00	29.011	0.000	

Tower Forces - No Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C_F	q_z	D_F	D_R	A_E	F	w	Ctrl. Face
ft	lb	lb				psf			ft ²	lb	plf	
L1 185.00-147.83	286.55	1602.90	A	1	1	25.0	1	1	58.384	1606.32	43.22	C
			B	1	1	1	1	58.384				
			C	1	1	1	1	58.384				
L2 147.83-132.83	287.55	1075.22	A	1	1	23.9	1	1	31.995	840.66	56.04	C
			B	1	1	1	1	31.995				
			C	1	1	1	1	31.995				
L3 132.83-90.67	904.96	4837.79	A	1	1	22.3	1	1	113.954	2795.51	66.31	C
			B	1	1	1	1	113.954				
			C	1	1	1	1	113.954				
L4 90.67-43.50	1020.29	8806.19	A	1	1	19.2	1	1	170.365	3597.83	76.27	C
			B	1	1	1	1	170.365				
			C	1	1	1	1	170.365				
L5 43.50-0.00	724.61	12287.00	A	1	1	15.5	1	1	196.804	3362.91	77.31	C
			B	1	1	1	1	196.804				
			C	1	1	1	1	196.804				
Sum Weight:	3223.95	28609.10						OTM	1003274.5 7 lb-ft	12203.23		

Tower Forces - No Ice - Wind 60 To Face

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 8 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z	D _F	D _R	A _E	F	w	Ctrl. Face
ft	lb	lb				psf			ft ²	lb	plf	
L1 185.00-147.83	286.55	1602.90	A	1	1	25.0	1	1	58.384	1606.32	43.22	C
			B	1	1		1	1	58.384			
			C	1	1		1	1	58.384			
L2 147.83-132.83	287.55	1075.22	A	1	1	23.9	1	1	31.995	840.66	56.04	C
			B	1	1		1	1	31.995			
			C	1	1		1	1	31.995			
L3 132.83-90.67	904.96	4837.79	A	1	1	22.3	1	1	113.954	2795.51	66.31	C
			B	1	1		1	1	113.954			
			C	1	1		1	1	113.954			
L4 90.67-43.50	1020.29	8806.19	A	1	1	19.2	1	1	170.365	3597.83	76.27	C
			B	1	1		1	1	170.365			
			C	1	1		1	1	170.365			
L5 43.50-0.00	724.61	12287.00	A	1	1	15.5	1	1	196.804	3362.91	77.31	C
			B	1	1		1	1	196.804			
			C	1	1		1	1	196.804			
Sum Weight:	3223.95	28609.10						OTM	1003274.5 7 lb-ft	12203.23		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z	D _F	D _R	A _E	F	w	Ctrl. Face
ft	lb	lb				psf			ft ²	lb	plf	
L1 185.00-147.83	286.55	1602.90	A	1	1	25.0	1	1	58.384	1840.08	49.50	C
			B	1	1		1	1	58.384			
			C	1	1.146		1	1	58.384			
L2 147.83-132.83	287.55	1075.22	A	1	1	23.9	1	1	31.995	1008.79	67.25	C
			B	1	1		1	1	31.995			
			C	1	1.2		1	1	31.995			
L3 132.83-90.67	904.96	4837.79	A	1	1	22.3	1	1	113.954	3076.45	72.97	C
			B	1	1		1	1	113.954			
			C	1	1.1		1	1	113.954			
L4 90.67-43.50	1020.29	8806.19	A	1	1	19.2	1	1	170.365	3597.83	76.27	C
			B	1	1		1	1	170.365			
			C	1	1		1	1	170.365			
L5 43.50-0.00	724.61	12287.00	A	1	1	15.5	1	1	196.804	3362.91	77.31	C
			B	1	1		1	1	196.804			
			C	1	1		1	1	196.804			
Sum Weight:	3223.95	28609.10						OTM	1096545.4 5 lb-ft	12886.06		

Tower Forces - With Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	q _z	D _F	D _R	A _E	F	w	Ctrl. Face
ft	lb	lb				psf			ft ²	lb	plf	
L1	1126.39	3850.54	A	1	1.2	6.9	1	1	72.937	667.06	17.95	C

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 9 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
185.00-147.83			B	1	1.2		1	1	72.937			
			C	1	1.2		1	1	72.937			
L2 147.83-132.83	795.30	2248.85	A	1	1.2	6.6	1	1	37.773	329.91	21.99	C
			B	1	1.2		1	1	37.773			
			C	1	1.2		1	1	37.773			
L3 132.83-90.67	2332.07	8840.99	A	1	1.2	6.2	1	1	130.194	1061.69	25.18	C
			B	1	1.2		1	1	130.194			
			C	1	1.2		1	1	130.194			
L4 90.67-43.50	2566.92	14383.22	A	1	1.2	5.3	1	1	188.114	1320.55	28.00	C
			B	1	1.2		1	1	188.114			
			C	1	1.2		1	1	188.114			
L5 43.50-0.00	1750.02	17950.11	A	1	1.2	4.3	1	1	212.358	1206.21	27.73	C
			B	1	1.2		1	1	212.358			
			C	1	1.2		1	1	212.358			
Sum Weight:	8570.71	47273.72						OTM	387370.94 lb-ft	4585.41		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.00-147.83	1126.39	3850.54	A	1	1.2	6.9	1	1	72.937	667.06	17.95	C
			B	1	1.2		1	1	72.937			
			C	1	1.2		1	1	72.937			
L2 147.83-132.83	795.30	2248.85	A	1	1.2	6.6	1	1	37.773	329.91	21.99	C
			B	1	1.2		1	1	37.773			
			C	1	1.2		1	1	37.773			
L3 132.83-90.67	2332.07	8840.99	A	1	1.2	6.2	1	1	130.194	1061.69	25.18	C
			B	1	1.2		1	1	130.194			
			C	1	1.2		1	1	130.194			
L4 90.67-43.50	2566.92	14383.22	A	1	1.2	5.3	1	1	188.114	1320.55	28.00	C
			B	1	1.2		1	1	188.114			
			C	1	1.2		1	1	188.114			
L5 43.50-0.00	1750.02	17950.11	A	1	1.2	4.3	1	1	212.358	1206.21	27.73	C
			B	1	1.2		1	1	212.358			
			C	1	1.2		1	1	212.358			
Sum Weight:	8570.71	47273.72						OTM	387370.94 lb-ft	4585.41		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.00-147.83	1126.39	3850.54	A	1	1.2	6.9	1	1	72.937	876.60	23.58	C
			B	1	1.2		1	1	72.937			

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 10 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L2 147.83-132.83	795.30	2248.85	C	1	1.2	6.6	1	1	72.937	452.08	30.14	C
			A	1	1.2		1	1	37.773			
			B	1	1.2		1	1	37.773			
L3 132.83-90.67	2332.07	8840.99	C	1	1.2	6.2	1	1	37.773	1382.29	32.79	C
			A	1	1.2		1	1	130.194			
			B	1	1.2		1	1	130.194			
L4 90.67-43.50	2566.92	14383.22	C	1	1.2	5.3	1	1	130.194	1320.55	28.00	C
			A	1	1.2		1	1	188.114			
			B	1	1.2		1	1	188.114			
L5 43.50-0.00	1750.02	17950.11	C	1	1.2	4.3	1	1	188.114	1206.21	27.73	C
			A	1	1.2		1	1	212.358			
			B	1	1.2		1	1	212.358			
Sum Weight:	8570.71	47273.72	C	1	1.2		1	1	212.358	5237.74		
								OTM	474602.85			
									lb-ft			

Tower Forces - Service - Wind Normal To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.00-147.83	286.55	1602.90	A	1	1	8.9	1	1	58.384	573.30	15.42	C
			B	1	1		1	1	58.384			
			C	1	1		1	1	58.384			
L2 147.83-132.83	287.55	1075.22	A	1	1	8.5	1	1	31.995	300.03	20.00	C
			B	1	1		1	1	31.995			
			C	1	1		1	1	31.995			
L3 132.83-90.67	904.96	4837.79	A	1	1	8.0	1	1	113.954	997.73	23.67	C
			B	1	1		1	1	113.954			
			C	1	1		1	1	113.954			
L4 90.67-43.50	1020.29	8806.19	A	1	1	6.9	1	1	170.365	1284.08	27.22	C
			B	1	1		1	1	170.365			
			C	1	1		1	1	170.365			
L5 43.50-0.00	724.61	12287.00	A	1	1	5.5	1	1	196.804	1200.23	27.59	C
			B	1	1		1	1	196.804			
			C	1	1		1	1	196.804			
Sum Weight:	3223.95	28609.10	C	1	1		1	1	196.804	4355.37		
								OTM	358072.04			
									lb-ft			

Tower Forces - Service - Wind 60 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.00-147.83	286.55	1602.90	A	1	1	8.9	1	1	58.384	573.30	15.42	C
			B	1	1		1	1	58.384			
			C	1	1		1	1	58.384			

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 11 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L2 147.83-132.83	287.55	1075.22	A	1	1	8.5	1	1	31.995	300.03	20.00	C
			B	1	1		1	1	31.995			
			C	1	1		1	1	31.995			
L3 132.83-90.67	904.96	4837.79	A	1	1	8.0	1	1	113.954	997.73	23.67	C
			B	1	1		1	1	113.954			
			C	1	1		1	1	113.954			
L4 90.67-43.50	1020.29	8806.19	A	1	1	6.9	1	1	170.365	1284.08	27.22	C
			B	1	1		1	1	170.365			
			C	1	1		1	1	170.365			
L5 43.50-0.00	724.61	12287.00	A	1	1	5.5	1	1	196.804	1200.23	27.59	C
			B	1	1		1	1	196.804			
			C	1	1		1	1	196.804			
Sum Weight:	3223.95	28609.10						OTM	358072.04 lb-ft	4355.37		

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight lb	Self Weight lb	F a c e	e	C _F	q _z psf	D _F	D _R	A _E ft ²	F lb	w plf	Ctrl. Face
L1 185.00-147.83	286.55	1602.90	A	1	1	8.9	1	1	58.384	656.73	17.67	C
			B	1	1		1	1	58.384			
			C	1	1.146		1	1	58.384			
L2 147.83-132.83	287.55	1075.22	A	1	1	8.5	1	1	31.995	360.04	24.00	C
			B	1	1		1	1	31.995			
			C	1	1.2		1	1	31.995			
L3 132.83-90.67	904.96	4837.79	A	1	1	8.0	1	1	113.954	1098.00	26.04	C
			B	1	1		1	1	113.954			
			C	1	1.1		1	1	113.954			
L4 90.67-43.50	1020.29	8806.19	A	1	1	6.9	1	1	170.365	1284.08	27.22	C
			B	1	1		1	1	170.365			
			C	1	1		1	1	170.365			
L5 43.50-0.00	724.61	12287.00	A	1	1	5.5	1	1	196.804	1200.23	27.59	C
			B	1	1		1	1	196.804			
			C	1	1		1	1	196.804			
Sum Weight:	3223.95	28609.10						OTM	391360.73 lb-ft	4599.08		

Force Totals

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M _x lb-ft	Sum of Overturning Moments, M _z lb-ft	Sum of Torques lb-ft
Leg Weight	28609.10					
Bracing Weight	0.00					
Total Member Self-Weight	28609.10			0.00	0.00	
Total Weight	35291.55			0.00	0.00	

RISATower

French and Parrello
 1800 Route 34, Suite 101
 Wall, NJ 07719
 Phone: 732.312.9688
 FAX: 732.312.9801

Job	1771.038 - 062U4331 Route 1 Monmouth Junction	Page	12 of 18
Project	185' Monopole	Date	15:50:28 11/09/11
Client	AT&T (Black & Veatch)	Designed by	Timothy.Donahue

Load Case	Vertical Forces lb	Sum of Forces X lb	Sum of Forces Z lb	Sum of Overturning Moments, M_x lb-ft	Sum of Overturning Moments, M_z lb-ft	Sum of Torques lb-ft
Wind 0 deg - No Ice		0.00	-17855.40	-1902304.11	0.00	0.00
Wind 90 deg - No Ice		18538.24	0.00	0.00	-1995575.00	0.00
Wind 180 deg - No Ice		0.00	17855.40	1902304.11	0.00	0.00
Member Ice	18664.62					
Total Weight Ice	68843.54			0.00	0.00	
Wind 0 deg - Ice		0.00	-7109.97	-788298.55	0.00	0.00
Wind 90 deg - Ice		7762.29	0.00	0.00	-875530.46	0.00
Wind 180 deg - Ice		0.00	7109.97	788298.55	0.00	0.00
Total Weight	35291.55			0.00	0.00	
Wind 0 deg - Service		0.00	-6372.65	-678938.69	0.00	0.00
Wind 90 deg - Service		6616.36	0.00	0.00	-712227.38	0.00
Wind 180 deg - Service		0.00	6372.65	678938.69	0.00	0.00

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 90 deg - No Ice
5	0.9 Dead+1.6 Wind 90 deg - No Ice
6	1.2 Dead+1.6 Wind 180 deg - No Ice
7	0.9 Dead+1.6 Wind 180 deg - No Ice
8	1.2 Dead+1.0 Ice+1.0 Temp
9	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
10	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
11	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
12	Dead+Wind 0 deg - Service
13	Dead+Wind 90 deg - Service
14	Dead+Wind 180 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft
L1	185 - 147.83	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-16855.14	0.00	0.00
			Max. Mx	4	-4626.04	-210423.07	0.00
			Max. My	2	-4712.77	0.00	203533.12
			Max. Vy	4	10902.63	-210423.07	0.00
			Max. Vx	2	-10508.75	0.00	203533.12
L2	147.83 - 132.83	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-19229.96	0.00	0.00
			Max. Mx	4	-5787.24	-334830.76	0.00
			Max. My	2	-5888.29	0.00	322648.69
			Max. Vy	4	12097.75	-334830.76	0.00
			Max. Vx	2	-11510.72	0.00	322648.69
L3	132.83 - 90.67	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-33324.37	0.00	0.00
			Max. Mx	4	-12932.82	-969635.08	0.00

RISATower

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Job	1771.038 - 062U4331 Route 1 Monmouth Junction	Page	13 of 18
Project	185' Monopole	Date	15:50:28 11/09/11
Client	AT&T (Black & Veatch)	Designed by	Timothy.Donahue

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial lb	Major Axis Moment lb-ft	Minor Axis Moment lb-ft	
L4	90.67 - 43.5	Pole	Max. My	2	-13040.61	0.00	923131.44	
			Max. Vy	4	18555.86	-969635.08	0.00	
			Max. Vx	2	-17491.54	0.00	923131.44	
			Max Tension	1	0.00	0.00	0.00	
			Max. Compression	8	-51798.76	0.00	0.00	
			Max. Mx	4	-24385.86	-1948912.2	0.00	
				2				
L5	43.5 - 0	Pole	Max. My	2	-24442.55	0.00	1850777.06	
			Max. Vy	4	24025.13	-1948912.2	0.00	
				2				
			Max. Vx	2	-22902.42	0.00	1850777.06	
			Max Tension	1	0.00	0.00	0.00	
			Max. Compression	8	-77784.61	0.00	0.00	
			Max. Mx	4	-42333.41	-3295662.2	0.00	
				7				
			Max. My	2	-42334.76	0.00	3141868.11	
			Max. Vy	4	29684.65	-3295662.2	0.00	
	7							
			Max. Vx	2	-28591.02	0.00	3141868.11	

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical lb	Horizontal, X lb	Horizontal, Z lb
Pole	Max. Vert	10	77784.61	-7762.40	0.00
	Max. H _x	14	35291.55	0.00	-6372.65
	Max. H _z	2	42349.86	0.00	28568.65
	Max. M _x	2	3141868.11	0.00	28568.65
	Max. M _z	4	3295662.27	-29661.18	0.00
	Max. Torsion	1	0.00	0.00	0.00
	Min. Vert	3	31762.39	0.00	28568.64
	Min. H _x	4	42349.86	-29661.18	0.00
	Min. H _z	6	42349.86	0.00	-28568.65
	Min. M _x	6	-3141868.11	0.00	-28568.65
	Min. M _z	1	0.00	0.00	0.00
	Min. Torsion	1	0.00	0.00	0.00

Tower Mast Reaction Summary

Load Combination	Vertical lb	Shear _x lb	Shear _z lb	Overturning Moment, M _x lb-ft	Overturning Moment, M _z lb-ft	Torque lb-ft
Dead Only	35291.55	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	42349.86	0.00	-28568.65	-3141868.11	0.00	0.00
0.9 Dead+1.6 Wind 0 deg - No Ice	31762.39	0.00	-28568.64	-3115612.14	0.00	0.00
1.2 Dead+1.6 Wind 90 deg - No Ice	42349.86	29661.18	0.00	0.00	-3295662.27	0.00
0.9 Dead+1.6 Wind 90 deg - No Ice	31762.39	29661.18	0.00	0.00	-3268092.36	0.00
1.2 Dead+1.6 Wind 180 deg -	42349.86	0.00	28568.65	3141868.11	0.00	0.00

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 14 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Load Combination	Vertical lb	Shear _x lb	Shear _z lb	Overturning Moment, M _x lb-ft	Overturning Moment, M _z lb-ft	Torque lb-ft
No Ice						
0.9 Dead+1.6 Wind 180 deg - No Ice	31762.39	0.00	28568.64	3115612.14	0.00	0.00
1.2 Dead+1.0 Ice+1.0 Temp	77784.61	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	77784.61	0.00	-7110.07	-858078.39	0.00	0.00
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	77784.61	7762.40	0.00	0.00	-952903.44	0.00
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	77784.61	0.00	7110.07	858078.39	0.00	0.00
Dead+Wind 0 deg - Service	35291.55	0.00	-6372.65	-697749.49	0.00	0.00
Dead+Wind 90 deg - Service	35291.55	6616.36	0.00	0.00	-731988.15	0.00
Dead+Wind 180 deg - Service	35291.55	0.00	6372.65	697749.49	0.00	0.00

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX lb	PY lb	PZ lb	PX lb	PY lb	PZ lb	
1	0.00	-35291.55	0.00	0.00	35291.55	0.00	0.000%
2	0.00	-42349.85	-28568.64	0.00	42349.86	28568.65	0.000%
3	0.00	-31762.39	-28568.64	0.00	31762.39	28568.64	0.000%
4	29661.18	-42349.85	0.00	-29661.18	42349.86	0.00	0.000%
5	29661.18	-31762.39	0.00	-29661.18	31762.39	0.00	0.000%
6	0.00	-42349.85	28568.64	0.00	42349.86	-28568.65	0.000%
7	0.00	-31762.39	28568.64	0.00	31762.39	-28568.64	0.000%
8	0.00	-77784.61	0.00	0.00	77784.61	0.00	0.000%
9	0.00	-77784.61	-7109.97	0.00	77784.61	7110.07	0.000%
10	7762.29	-77784.61	0.00	-7762.40	77784.61	0.00	0.000%
11	0.00	-77784.61	7109.97	0.00	77784.61	-7110.07	0.000%
12	0.00	-35291.55	-6372.65	0.00	35291.55	6372.65	0.000%
13	6616.36	-35291.55	0.00	-6616.36	35291.55	0.00	0.000%
14	0.00	-35291.55	6372.65	0.00	35291.55	-6372.65	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	4	0.00000001	0.00023508
3	Yes	4	0.00000001	0.00007202
4	Yes	4	0.00000001	0.00024530
5	Yes	4	0.00000001	0.00007328
6	Yes	4	0.00000001	0.00023508
7	Yes	4	0.00000001	0.00007202
8	Yes	4	0.00000001	0.00000001
9	Yes	5	0.00000001	0.00052422
10	Yes	5	0.00000001	0.00057811
11	Yes	5	0.00000001	0.00052422
12	Yes	4	0.00000001	0.00002243
13	Yes	4	0.00000001	0.00002371
14	Yes	4	0.00000001	0.00002243

RISATower

French and Parrello
 1800 Route 34, Suite 101
 Wall, NJ 07719
 Phone: 732.312.9688
 FAX: 732.312.9801

Job	1771.038 - 062U4331 Route 1 Monmouth Junction	Page	15 of 18
Project	185' Monopole	Date	15:50:28 11/09/11
Client	AT&T (Black & Veatch)	Designed by	Timothy.Donahue

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 147.83	28.709	13	1.4974	0.0000
L2	147.83 - 132.83	17.565	13	1.2772	0.0000
L3	137 - 90.67	14.804	13	1.1549	0.0000
L4	96 - 43.5	6.700	13	0.7116	0.0000
L5	50.08 - 0	1.706	13	0.3170	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	Generic Lightning Rod 4' copper	13	28.709	1.4974	0.0000	34975
180.00	PIROD 15' Low Profile Platform (Monopole)	13	27.132	1.4781	0.0000	34975
165.00	(3) 2' Standoff T-Arm (10' face width)	13	22.488	1.4088	0.0000	8743
150.00	(3) APXV18-206517-C	13	18.153	1.2984	0.0000	5026
130.00	(4) 1' Dia Dish	13	13.163	1.0737	0.0000	5445
100.00	DB810KE-XT	13	7.334	0.7513	0.0000	5793
50.00	(2) GPS	13	1.701	0.3164	0.0000	6616

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 147.83	129.251	4	6.7519	0.0000
L2	147.83 - 132.83	79.109	4	5.7571	0.0000
L3	137 - 90.67	66.682	4	5.2058	0.0000
L4	96 - 43.5	30.187	4	3.2074	0.0000
L5	50.08 - 0	7.687	4	1.4283	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	Generic Lightning Rod 4' copper	4	129.251	6.7519	0.0000	7945
180.00	PIROD 15' Low Profile Platform (Monopole)	4	122.158	6.6646	0.0000	7945
165.00	(3) 2' Standoff T-Arm (10' face width)	4	101.262	6.3514	0.0000	1983
150.00	(3) APXV18-206517-C	4	81.755	5.8528	0.0000	1136

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 16 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
130.00	(4) 1' Dia Dish	4	59.293	4.8399	0.0000	1225
100.00	DB810KE-XT	4	33.041	3.3863	0.0000	1294
50.00	(2) GPS	4	7.663	1.4257	0.0000	1469

Base Plate Design Data

Plate Thickness	Number of Anchor Bolts	Anchor Bolt Size	Actual Allowable Ratio Bolt Tension	Actual Allowable Ratio Bolt Compression	Actual Allowable Ratio Plate Stress	Actual Allowable Ratio Stiffener Stress	Controlling Condition	Ratio
in		in	lb	lb	ksi	ksi		
2.2500	20	2.2500	116735.16	120968.50	15.38	45.00	Stiff	0.83
			268385.28	445519.56	54.00	54.00		✓
			0.43	0.27	0.28	0.83		

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L _a	Kl/r	A	P _u	φP _n	Ratio
	ft		ft	ft		in ²	lb	lb	$\frac{P_u}{\phi P_n}$
L1	185 - 147.83 (1)	TP22.8499x13.563x0.2188	37.17	185.00	274.0	15.9444	-4626.04	47975.60	0.096
L2	147.83 - 132.83 (2)	TP26.5976x22.8499x0.2675	15.00	185.00	245.2	21.7820	-5787.24	81834.60	0.071
L3	132.83 - 90.67 (3)	TP36.5963x25.0208x0.3125	46.33	185.00	177.4	35.1705	-12932.80	252421.00	0.051
L4	90.67 - 43.5 (4)	TP47.7567x34.6396x0.375	52.50	185.00	139.0	53.8676	-23244.30	629809.00	0.037
L5	43.5 - 0 (5)	TP57.8751x45.3627x0.4375	50.08	185.00	108.0	80.9153	-42333.40	4520780.00	0.009

Pole Bending Design Data

Section No.	Elevation	Size	M _{ux}	φM _{ux}	Ratio	M _{uy}	φM _{uy}	Ratio
	ft		lb-ft	lb-ft	$\frac{M_{ux}}{\phi M_{ux}}$	lb-ft	lb-ft	$\frac{M_{uy}}{\phi M_{uy}}$
L1	185 - 147.83 (1)	TP22.8499x13.563x0.2188	210423.33	429305.83	0.490	0.00	429305.83	0.000
L2	147.83 - 132.83 (2)	TP26.5976x22.8499x0.2675	334830.83	654755.00	0.511	0.00	654755.00	0.000
L3	132.83 - 90.67 (3)	TP36.5963x25.0208x0.3125	969633.33	1463583.33	0.663	0.00	1463583.33	0.000
L4	90.67 - 43.5 (4)	TP47.7567x34.6396x0.375	1841841.67	2862616.67	0.643	0.00	2862616.67	0.000
L5	43.5 - 0 (5)	TP57.8751x45.3627x0.4375	3295658.33	5291625.00	0.623	0.00	5291625.00	0.000

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 17 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
	Client AT&T (Black & Veatch)	Designed by Timothy.Donahue

Section No.	Elevation ft	Size	M_{ux} lb-ft	ϕM_{rx} lb-ft	Ratio $\frac{M_{ux}}{\phi M_{rx}}$	M_{uy} lb-ft	ϕM_{ry} lb-ft	Ratio $\frac{M_{uy}}{\phi M_{ry}}$
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Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u lb	ϕV_n lb	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u lb-ft	ϕT_n lb-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	185 - 147.83 (1)	TP22.8499x13.563x0.2188	10902.60	466374.00	0.023	0.00	870500.00	0.000
L2	147.83 - 132.83 (2)	TP26.5976x22.8499x0.2675	12097.80	637125.00	0.019	0.00	1327641.67	0.000
L3	132.83 - 90.67 (3)	TP36.5963x25.0208x0.3125	18555.90	1028740.00	0.018	0.00	2967691.67	0.000
L4	90.67 - 43.5 (4)	TP47.7567x34.6396x0.375	23759.10	1593690.00	0.015	0.00	5804500.00	0.000
L5	43.5 - 0 (5)	TP57.8751x45.3627x0.4375	29684.70	2260390.00	0.013	0.00	10729750.00	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u ϕP_n	Ratio M_{ux} ϕM_{rx}	Ratio M_{uy} ϕM_{ry}	Ratio V_u ϕV_n	Ratio T_u ϕT_n	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	185 - 147.83 (1)	0.096	0.490	0.000	0.023	0.000	0.587	1.000	4.8.2 ✓
L2	147.83 - 132.83 (2)	0.071	0.511	0.000	0.019	0.000	0.582	1.000	4.8.2 ✓
L3	132.83 - 90.67 (3)	0.051	0.663	0.000	0.018	0.000	0.714	1.000	4.8.2 ✓
L4	90.67 - 43.5 (4)	0.037	0.643	0.000	0.015	0.000	0.681	1.000	4.8.2 ✓
L5	43.5 - 0 (5)	0.009	0.623	0.000	0.013	0.000	0.632	1.000	4.8.2 ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
L1	185 - 147.83	Pole	TP22.8499x13.563x0.2188	1	-4626.04	47975.60	58.7	Pass
L2	147.83 - 132.83	Pole	TP26.5976x22.8499x0.2675	2	-5787.24	81834.60	58.2	Pass
L3	132.83 - 90.67	Pole	TP36.5963x25.0208x0.3125	3	-12932.80	252421.00	71.4	Pass
L4	90.67 - 43.5	Pole	TP47.7567x34.6396x0.375	4	-23244.30	629809.00	68.1	Pass
L5	43.5 - 0	Pole	TP57.8751x45.3627x0.4375	5	-42333.40	4520780.00	63.2	Pass
Summary								
Pole (L3)							71.4	Pass

RISATower French and Parrello 1800 Route 34, Suite 101 Wall, NJ 07719 Phone: 732.312.9688 FAX: 732.312.9801	Job 1771.038 - 062U4331 Route 1 Monmouth Junction	Page 18 of 18
	Project 185' Monopole	Date 15:50:28 11/09/11
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Section No.	Elevation ft	Component Type	Size	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
						Base Plate	83.3	Pass
						RATING =	83.3	Pass

Element Map

Section No.	Section Elevation ft	Component Type	Element List
L1	185.00-147.83	Pole	1
L2	147.83-132.83	Pole	2
L3	132.83-90.67	Pole	3
L4	90.67-43.50	Pole	4
L5	43.50-0.00	Pole	5
			Total number of elements: 5



July 14, 2009

MetroPCS
 5 Skyline Drive
 Hawthorne, NY 10532

RE: Structural Analysis – Base Plate Reinforcement Design
 MPCS #: NY5672
 KMB #: 313.0087
 Site Address: 3960 Route 1 North, Monmouth Junction
 South Brunswick, Middlesex County, New Jersey
 Structure: Existing 185 FT Monopole
 Manufacturer: Valmont Microflect
 Governing Codes: ANSI TIA/EIA-222-F and IBC 2006
 Minimum basic design wind velocity 80 mph
 Reduced basic design wind velocity 69 mph with 1/2" radial ice

Introduction

Pursuant to your request KMB Design Group (KMB) has completed a structural analysis of the existing structure for the additional MetroPCS equipment loading.

The project consists of installing six (6) panel antennas at a centreline elevation of 180 feet above grade and (2) GPS units at elevation of 50 feet above grade on the existing tower structure.

Existing and Reserved Antenna Loading

Elevation	Qty.	Status	Antenna Model/Appurtenance	Coax
185'AGL	1	Existing	5/8" Lightning Rod	Na
185'AGL	1	Existing	RFS 201-7N on Side Arm Mount	(1) 1 5/8" Existing Inside Pole
185'AGL		Existing		(4) 1 5/8" Existing Inside Pole
165'AGL CL	12	Existing	Panel antennas on T-Arm Mount	(12) 1 5/8" Existing Inside Pole
150'AGL CL	3	Existing	Panel antennas on Flush Mount	(3) 1 5/8" Existing Inside Pole
100'AGL	1	Existing	RFS BMR10-A-B1 on Bracket Mount	(1) 7/8" Existing Outside Pole
100'AGL	1	Existing	Decibel DB810KE-XT on Standoff Mount	(1) 1 5/8" Existing Outside Pole

The above tower inventory is based on the proposed antenna loading as described in a structural report prepared for the above structure by Innovative Engineering, Inc., dated October 24, 2007 and supplemented by limited field observations by KMB on 1/9/09. Ultimate user is responsible to verify that the existing loading as represented above is the actual tower loading. In the event of discrepancies, ultimate user shall notify KMB and a revised structural review must be conducted prior to any tower, antenna and appurtenance placement or modifications on the existing structure.



Proposed Antenna Loading

Elevation	Qty.	Status	Antenna Model/Appurtenance	Coax
180'AGL CL	3	Proposed	Kathrein 800 10504 on Low Profile Platform	(6) 1 5/8" Proposed Inside of Pole
180'AGL CL	3	Reserved	Kathrein 742 351 on Low Profile Platform	(6) 1 5/8" Reserved Inside of Pole
50'AGL	2	Proposed	PCTEL GPS-TMG-26N GPS Unit	(2) 1/2" Proposed Outside of Pole

Analysis Method

RISA Tower and STAAD Pro, a commercially available engineering software programs, were used to create a theoretical mathematical model of the tower members and calculate primary member stresses under various loading conditions. Selected output from the analysis is included in the Appendix A.

Assumptions

This structural analysis is based on the theoretical capacity of the members and is not a condition assessment of the existing tower structure. This analysis is based on information supplied to KMB and its results are based on and are an accurate representation of results based on supplied data. The antenna inventory and configuration is as supplied and/or assumed and is assumed to be complete and accurate. All appurtenances are assumed to be property installed and supported as per manufacturer requirements. All antenna cables to be routed on the inside of the tower structure and utilize existing portholes. If any of these assumptions or information is not valid, this analysis may be affected.

Structural Analysis and Design Criteria

This structural analysis was completed according to the recommendations of the "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", ANSI TIA/EIA Standard and IBC 2006.

Proposed Base Plate Reinforcing Design

As a result of the structural analysis it was determined that the base plate of the monopole has been found to be overstressed. We have prepared the base plate reinforcing design and are attaching it in the Appendix B of this report.

Analysis Results

The analysis of the existing tower in accordance with the above indicates that the pole is stressed to 99.5% of its maximum allowable design capacity. The base plate is stressed to 121% of its maximum



allowable design capacity. Hence, if the existing tower structure base plate is reinforced in accordance with the attached designs found in Appendix B, the tower superstructure will meet the minimum code requirements and will have adequate structural capacity to safely support the proposed loading. Please refer to the attached calculations for further information.

Foundation Results

The original foundation reactions, as shown on the structural report for the tower prepared by Innovative Engineering Inc., dated 10/24/07 provided by the township to KMB, as compiled with the new results are as follows;

Original Moment:	4413 kips-ft	New Base Moment:	3568 kips-ft
Original Shear:	40.4 kips	New Base Shear:	32 kips
Original Axial:	39.4 kips	New Axial Load:	36 kips

Based on the above comparison of the foundation loads, it is concluded that the foundation is adequate to support the proposed loading since the new base reactions are less than the original design base reactions. This conclusion is based on the assumption that the foundation has been installed in accordance with the referenced designs and analysis.

Conclusion

The existing tower is adequate to support the proposed loading only if the structure is reinforced in accordance with the base plate reinforcement design attached in the Appendix B of this report.

Should you have any questions or comments do not hesitate to contact us.

Sincerely,

Analyzed by

A handwritten signature in blue ink, appearing to be "Jiang J. Yu".

Jiang J. Yu, P.E.
NJ Professional Engineer #45616

Reviewed by

A handwritten signature in black ink, appearing to be "Stephen A. Bray".

Stephen A. Bray, P.E.
NJ Professional Engineer # 44144



APPENDIX A

Section	4	3	2	1
Length (ft)	50.00	52.58	46.33	52.17
Number of Sides	12	12	12	12
Thickness (in)	0.4375	0.3750	0.3125	0.2188
Lap Splice (ft)	6.58		5.33	4.17
Top Dia (in)	45.5044	34.7420	25.1194	13.5630
Bot Dia (in)	58.0000	47.9020	36.7000	26.5980
Grade			A572-65	
Weight (K)	28.5	12.3	4.9	2.5

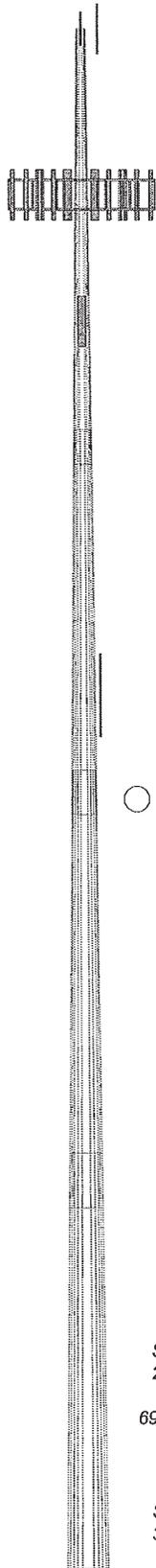
185.0 ft

132.8 ft

90.7 ft

43.4 ft

0.0 ft



DESIGNED APPURTENANCE LOADING

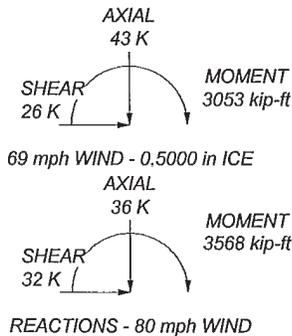
TYPE	ELEVATION	TYPE	ELEVATION
5/8" Lightning Rod	185	Flush Mount	150
201-7N	185	(3) Panel Antenna	150
3ft Side Arm	185	BMR10-A-B1	110 - 100
PIROD 13' Low Profile Platform	180	DB810KE-XT	110
(3) Kathrein 800 10504 w/Mount pipe	180	Bracket	100
(3) Kathrein 742 351 w/mount pipe	180	Bracket	100
(12) Panel Antenna	165	(2) GPS	50
(3) T-Frame	165		

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Middlesex County, New Jersey.
2. Tower designed for a 80 mph basic wind in accordance with the TIA/EIA-222-F Standard.
3. Tower is also designed for a 69 mph basic wind with 0.50 in ice.
4. Deflections are based upon a 50 mph wind.
5. Weld together tower sections have flange connections.
6. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
7. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
8. Welds are fabricated with ER-70S-6 electrodes.
9. TOWER RATING: 121%



KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job: 313.0087 (NY5672)
	Project: Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ
	Client: MetroPCS Drawn by: JYU App'd:
	Code: TIA/EIA-222-F Date: 07/14/09 Scale: NTS
	Path: Dwg No. E-1

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job 313.0087 (NY5672)	Page 1 of 14
	Project Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date 10:31:09 07/14/09
	Client MetroPCS	Designed by JYU

Tower Input Data

There is a pole section.

This tower is designed using the TIA/EIA-222-F standard.

The following design criteria apply:

Tower is located in Middlesex County, New Jersey.

Basic wind speed of 80 mph.

Nominal ice thickness of 0.5000 in.

Ice density of 56 pcf.

A wind speed of 69 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 50 mph.

Weld together tower sections have flange connections..

Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..

Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..

Welds are fabricated with ER-70S-6 electrodes..

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.333.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length in	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	185.00-132.83	52.17	50.00	12	13.5630	26.5980	0.2188	0.8750	A572-65 (65 ksi)
L2	132.83-90.67	46.33	64.00	12	25.1194	36.7000	0.3125	1.2500	A572-65 (65 ksi)
L3	90.67-43.42	52.58	79.00	12	34.7420	47.9020	0.3750	1.5000	A572-65 (65 ksi)
L4	43.42-0.00	50.00		12	45.5044	58.0000	0.4375	1.7500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
L1	14.0415	9.3994	213.6350	4.7772	7.0256	30.4079	432.8824	4.6261	3.0486	13.937
	27.5363	18.5809	1650.3544	9.4438	13.7778	119.7839	3344.0654	9.1449	6.5420	29.906
L2	27.0836	24.9619	1960.6837	8.8809	13.0118	150.6847	3972.8768	12.2855	5.8945	18.862
	37.9946	36.6149	6187.9743	13.0267	19.0106	325.5013	12538.5135	18.0208	8.9981	28.794
L3	37.3494	41.4981	6256.0050	12.3034	17.9963	347.6264	12676.3622	20.4241	8.3058	22.149
	49.5918	57.3889	16546.0486	17.0147	24.8132	666.8235	33526.7802	28.2450	11.8327	31.554
L4	48.8129	63.4880	16458.5908	16.1339	23.5713	698.2478	33349.5670	31.2469	11.0227	25.195
	60.0460	81.0912	34295.6329	20.6074	30.0440	1141.5135	69492.2503	39.9106	14.3715	32.849

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job 313.0087 (NY5672)	Page 2 of 14
	Project Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date 10:31:09 07/14/09
	Client MetroPCS	Designed by JYU

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft ²	in					in	in
L1 185.00-132.83				1	1	1		
L2 132.83-90.67				1	1	1		
L3 90.67-43.42				1	1	1		
L4 43.42-0.00				1	1	1		

Monopole Base Plate Data

Base Plate Data

Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	20
Embedment length	108.0000 in
f_c	4 ksi
Grout space	2.0000 in
Base plate grade	A633-60
Base plate thickness	2.2500 in
Bolt circle diameter	66.5500 in
Outer diameter	72.5500 in
Inner diameter	42.0000 in
Base plate type	Plain Plate

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number		C_{AA}	Weight
				ft			ft ² /ft	plf
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	185.00 - 0.00	4	No Ice	0.00	0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	165.00 - 0.00	12	1/2" Ice	0.00	0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	150.00 - 0.00	3	1/2" Ice	0.00	0.82
LDF5-50A (7/8 FOAM)	C	No	CaAa (Out Of Face)	100.00 - 0.00	1	No Ice	0.11	0.33
LDF7-50A (1-5/8 FOAM)	C	No	CaAa (Out Of Face)	100.00 - 0.00	1	1/2" Ice	0.21	1.30
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	180.00 - 0.00	6	No Ice	0.20	0.82
LDF7-50A (1-5/8 FOAM)	C	No	Inside Pole	180.00 - 0.00	6	1/2" Ice	0.30	2.33
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	50.00 - 0.00	2	No Ice	0.00	0.82
LDF4-50A (1/2 FOAM)	C	No	Inside Pole	50.00 - 0.00	2	1/2" Ice	0.00	0.15

Feed Line/Linear Appurtenances Section Areas

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job	313.0087 (NY5672)	Page	3 of 14
	Project	Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date	10:31:09 07/14/09
	Client	MetroPCS	Designed by	JYU

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L1	185.00-132.83	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	0.000	0.76
L2	132.83-90.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	2.865	0.88
L3	90.67-43.42	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	14.506	1.02
L4	43.42-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	13.329	0.95

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L1	185.00-132.83	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	0.000	0.76
L2	132.83-90.67	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	4.732	0.90
L3	90.67-43.42	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	23.956	1.14
L4	43.42-0.00	A	0.500	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	22.012	1.06

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
5/8" Lightning Rod	C	None		0.0000	185.00	No Ice 1/2" Ice	0.25 0.66	0.25 0.66	0.03 0.03
201-7N	C	None		0.0000	185.00	No Ice 1/2" Ice	1.38 2.23	1.38 2.23	0.01 0.02
3ft Side Arm	C	None		0.0000	185.00	No Ice 1/2" Ice	7.00 8.00	7.00 8.00	0.14 0.21
(12) Panel Antenna	C	None		0.0000	165.00	No Ice 1/2" Ice	6.53 6.94	4.20 4.57	0.04 0.08
(3) T-Frame	C	None		0.0000	165.00	No Ice 1/2" Ice	12.20 17.60	12.20 17.60	0.36 0.49
(3) Panel Antenna	C	None		0.0000	150.00	No Ice 1/2" Ice	6.53 6.94	4.20 4.57	0.04 0.08
Flush Mount	C	None		0.0000	150.00	No Ice 1/2" Ice	1.00 1.50	1.00 1.50	0.01 0.02

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job	313.0087 (NY5672)	Page	4 of 14
	Project	Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date	10:31:09 07/14/09
	Client	MetroPCS	Designed by	JYU

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert	Azimuth Adjustment	Placement	CAA Front	CAA Side	Weight	
			ft ft ft	°	ft	ft ²	ft ²	K	
BMR10-A-B1	C	None		0.0000	100.00 - 110.00	No Ice 1/2" Ice	8.38 9.16	8.38 9.16	0.06 0.11
Bracket	C	None		0.0000	100.00	No Ice 1/2" Ice	4.00 5.00	4.00 5.00	0.10 0.12
DB810KE-XT	C	None		0.0000	110.00	No Ice 1/2" Ice	4.35 5.83	4.35 5.83	0.04 0.07
Bracket	C	None		0.0000	100.00	No Ice 1/2" Ice	4.00 5.00	4.00 5.00	0.10 0.12
PiROD 13' Low Profile Platform	C	None		0.0000	180.00	No Ice 1/2" Ice	15.70 20.10	15.70 20.10	1.30 1.76
(3) Kathrein 800 10504 w/Mount pipe	C	None		0.0000	180.00	No Ice 1/2" Ice	11.13 12.54	2.88 4.08	0.05 0.10
(3) Kathrein 742 351 w/mount pipe	C	None		0.0000	180.00	No Ice 1/2" Ice	12.45 16.11	2.76 3.87	0.09 0.13
(2) GPS	C	None		0.0000	50.00	No Ice 1/2" Ice	1.00 1.12	1.00 1.12	0.06 0.10

Tower Pressures - No Ice

$G_H = 1.690$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	CAA In Face	CAA Out Face
ft	ft		psf	ft ²	e	ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.00-132.83	156.39	1.56	26	87.294	A	0.000	87.294	87.294	100.00	0.000	0.000
					B	0.000	87.294		100.00	0.000	0.000
					C	0.000	87.294		100.00	0.000	0.000
L2 132.83-90.67	110.85	1.414	23	110.443	A	0.000	110.443	110.443	100.00	0.000	0.000
					B	0.000	110.443		100.00	0.000	0.000
					C	0.000	110.443		100.00	0.000	2.865
L3 90.67-43.42	66.53	1.222	20	165.333	A	0.000	165.333	165.333	100.00	0.000	0.000
					B	0.000	165.333		100.00	0.000	0.000
					C	0.000	165.333		100.00	0.000	14.506
L4 43.42-0.00	20.96	1	16	190.219	A	0.000	190.219	190.219	100.00	0.000	0.000
					B	0.000	190.219		100.00	0.000	0.000
					C	0.000	190.219		100.00	0.000	13.329

Tower Pressure - With Ice

$G_H = 1.690$

Section Elevation	z	K _Z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	CAA In Face	CAA Out Face
ft	ft		psf	in	ft ²	e	ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.00-	156.39	1.56	19	0.5000	91.642	A	0.000	91.642	91.642	100.00	0.000	0.000

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job	313.0087 (NY5672)	Page	5 of 14	
	Project	Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ		Date	10:31:09 07/14/09
	Client	MetroPCS		Designed by	JYU

Section Elevation	z	K _Z	q _z	t _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face	C _A A _A Out Face
ft	ft		psf	in	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
132.83						B	0.000	91.642		100.00	0.000	0.000
						C	0.000	91.642		100.00	0.000	0.000
L2 132.83-90.67	110.85	1.414	17	0.5000	113.957	A	0.000	113.957	113.957	100.00	0.000	0.000
						B	0.000	113.957		100.00	0.000	0.000
						C	0.000	113.957		100.00	0.000	4.732
L3 90.67-43.42	66.53	1.222	15	0.5000	169.271	A	0.000	169.271	169.271	100.00	0.000	0.000
						B	0.000	169.271		100.00	0.000	0.000
						C	0.000	169.271		100.00	0.000	23.956
L4 43.42-0.00	20.96	1	12	0.5000	193.837	A	0.000	193.837	193.837	100.00	0.000	0.000
						B	0.000	193.837		100.00	0.000	0.000
						C	0.000	193.837		100.00	0.000	22.012

Tower Pressure - Service

$G_H = 1.690$

Section Elevation	z	K _Z	q _z	A _G	F a c e	A _F	A _R	A _{leg}	Leg %	C _A A _A In Face	C _A A _A Out Face
ft	ft		psf	ft ²		ft ²	ft ²	ft ²		ft ²	ft ²
L1 185.00-132.83	156.39	1.56	10	87.294	A	0.000	87.294	87.294	100.00	0.000	0.000
					B	0.000	87.294		100.00	0.000	0.000
					C	0.000	87.294		100.00	0.000	0.000
L2 132.83-90.67	110.85	1.414	9	110.443	A	0.000	110.443	110.443	100.00	0.000	0.000
					B	0.000	110.443		100.00	0.000	0.000
					C	0.000	110.443		100.00	0.000	2.865
L3 90.67-43.42	66.53	1.222	8	165.333	A	0.000	165.333	165.333	100.00	0.000	0.000
					B	0.000	165.333		100.00	0.000	0.000
					C	0.000	165.333		100.00	0.000	14.506
L4 43.42-0.00	20.96	1	6	190.219	A	0.000	190.219	190.219	100.00	0.000	0.000
					B	0.000	190.219		100.00	0.000	0.000
					C	0.000	190.219		100.00	0.000	13.329

Tower Forces - No Ice - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
L1 185.00-132.83	0.76	2.48	A	1	1.03	1	1	1	87.294	3.88	74.35	C
			B	1	1.03	1	1	1	87.294			
			C	1	1.03	1	1	1	87.294			
L2 132.83-90.67	0.88	4.85	A	1	1.03	1	1	1	110.443	4.56	108.08	C
			B	1	1.03	1	1	1	110.443			
			C	1	1.03	1	1	1	110.443			
L3 90.67-43.42	1.02	8.85	A	1	1.03	1	1	1	165.333	6.22	131.55	C
			B	1	1.03	1	1	1	165.333			
			C	1	1.03	1	1	1	165.333			
L4 43.42-0.00	0.95	12.30	A	1	1.03	1	1	1	190.219	5.79	133.45	C
			B	1	1.03	1	1	1	190.219			
			C	1	1.03	1	1	1	190.219			
Sum Weight:	3.62	28.48						OTM	1646.76	20.45		

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job 313.0087 (NY5672)	Page 6 of 14
	Project Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date 10:31:09 07/14/09
	Client MetroPCS	Designed by JYU

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
									kip-ft			

Tower Forces - No Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
L1 185.00-132.83	0.76	2.48	A	1	1.03	1	1	1	87.294	3.88	74.35	C
			B	1	1.03	1	1	1	87.294			
			C	1	1.03	1	1	1	87.294			
L2 132.83-90.67	0.88	4.85	A	1	1.03	1	1	1	110.443	4.56	108.08	C
			B	1	1.03	1	1	1	110.443			
			C	1	1.03	1	1	1	110.443			
L3 90.67-43.42	1.02	8.85	A	1	1.03	1	1	1	165.333	6.22	131.55	C
			B	1	1.03	1	1	1	165.333			
			C	1	1.03	1	1	1	165.333			
L4 43.42-0.00	0.95	12.30	A	1	1.03	1	1	1	190.219	5.79	133.45	C
			B	1	1.03	1	1	1	190.219			
			C	1	1.03	1	1	1	190.219			
Sum Weight:	3.62	28.48						OTM	1646.76 kip-ft	20.45		

Tower Forces - No Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
L1 185.00-132.83	0.76	2.48	A	1	1.03	1	1	1	87.294	3.88	74.35	C
			B	1	1.03	1	1	1	87.294			
			C	1	1.03	1	1	1	87.294			
L2 132.83-90.67	0.88	4.85	A	1	1.03	1	1	1	110.443	4.56	108.08	C
			B	1	1.03	1	1	1	110.443			
			C	1	1.03	1	1	1	110.443			
L3 90.67-43.42	1.02	8.85	A	1	1.03	1	1	1	165.333	6.22	131.55	C
			B	1	1.03	1	1	1	165.333			
			C	1	1.03	1	1	1	165.333			
L4 43.42-0.00	0.95	12.30	A	1	1.03	1	1	1	190.219	5.79	133.45	C
			B	1	1.03	1	1	1	190.219			
			C	1	1.03	1	1	1	190.219			
Sum Weight:	3.62	28.48						OTM	1646.76 kip-ft	20.45		

Tower Forces - With Ice - Wind Normal To Face

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job	313.0087 (NY5672)	Page	7 of 14
	Project	Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date	10:31:09 07/14/09
	Client	MetroPCS	Designed by	JYU

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
L1 185.00-132.83	0.76	3.16	A	1	1.03	1	1	1	91.642	3.05	58.54	C
			B	1	1.03	1	1	1	91.642			
			C	1	1.03	1	1	1	91.642			
L2 132.83-90.67	0.90	5.70	A	1	1.03	1	1	1	113.957	3.58	84.88	C
			B	1	1.03	1	1	1	113.957			
			C	1	1.03	1	1	1	113.957			
L3 90.67-43.42	1.14	10.10	A	1	1.03	1	1	1	169.271	5.00	105.87	C
			B	1	1.03	1	1	1	169.271			
			C	1	1.03	1	1	1	169.271			
L4 43.42-0.00	1.06	13.74	A	1	1.03	1	1	1	193.837	4.60	106.02	C
			B	1	1.03	1	1	1	193.837			
			C	1	1.03	1	1	1	193.837			
Sum Weight:	3.86	32.70						OTM	1303.62 kip-ft	16.24		

Tower Forces - With Ice - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
L1 185.00-132.83	0.76	3.16	A	1	1.03	1	1	1	91.642	3.05	58.54	C
			B	1	1.03	1	1	1	91.642			
			C	1	1.03	1	1	1	91.642			
L2 132.83-90.67	0.90	5.70	A	1	1.03	1	1	1	113.957	3.58	84.88	C
			B	1	1.03	1	1	1	113.957			
			C	1	1.03	1	1	1	113.957			
L3 90.67-43.42	1.14	10.10	A	1	1.03	1	1	1	169.271	5.00	105.87	C
			B	1	1.03	1	1	1	169.271			
			C	1	1.03	1	1	1	169.271			
L4 43.42-0.00	1.06	13.74	A	1	1.03	1	1	1	193.837	4.60	106.02	C
			B	1	1.03	1	1	1	193.837			
			C	1	1.03	1	1	1	193.837			
Sum Weight:	3.86	32.70						OTM	1303.62 kip-ft	16.24		

Tower Forces - With Ice - Wind 90 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K							ft ²	K	plf	
L1 185.00-132.83	0.76	3.16	A	1	1.03	1	1	1	91.642	3.05	58.54	C
			B	1	1.03	1	1	1	91.642			
			C	1	1.03	1	1	1	91.642			
L2 132.83-90.67	0.90	5.70	A	1	1.03	1	1	1	113.957	3.58	84.88	C
			B	1	1.03	1	1	1	113.957			
			C	1	1.03	1	1	1	113.957			
L3 90.67-43.42	1.14	10.10	A	1	1.03	1	1	1	169.271	5.00	105.87	C
			B	1	1.03	1	1	1	169.271			
			C	1	1.03	1	1	1	169.271			

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job	313.0087 (NY5672)	Page	8 of 14
	Project	Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date	10:31:09 07/14/09
	Client	MetroPCS	Designed by	JYU

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K	e						ft ²	K	plf	
L4 43.42-0.00	1.06	13.74	A	1	1.03	1	1	1	193.837	4.60	106.02	C
			B	1	1.03	1	1	1	193.837			
			C	1	1.03	1	1	1	193.837			
Sum Weight:	3.86	32.70						OTM	1303.62 kip-ft	16.24		

Tower Forces - Service - Wind Normal To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K	e						ft ²	K	plf	
L1 185.00-132.83	0.76	2.48	A	1	1.03	1	1	1	87.294	1.52	29.04	C
			B	1	1.03	1	1	1	87.294			
			C	1	1.03	1	1	1	87.294			
L2 132.83-90.67	0.88	4.85	A	1	1.03	1	1	1	110.443	1.78	42.22	C
			B	1	1.03	1	1	1	110.443			
			C	1	1.03	1	1	1	110.443			
L3 90.67-43.42	1.02	8.85	A	1	1.03	1	1	1	165.333	2.43	51.38	C
			B	1	1.03	1	1	1	165.333			
			C	1	1.03	1	1	1	165.333			
L4 43.42-0.00	0.95	12.30	A	1	1.03	1	1	1	190.219	2.26	52.13	C
			B	1	1.03	1	1	1	190.219			
			C	1	1.03	1	1	1	190.219			
Sum Weight:	3.62	28.48						OTM	643.27 kip-ft	7.99		

Tower Forces - Service - Wind 60 To Face

Section Elevation	Add Weight	Self Weight	F a c e	e	C _F	R _R	D _F	D _R	A _E	F	w	Ctrl. Face
ft	K	K	e						ft ²	K	plf	
L1 185.00-132.83	0.76	2.48	A	1	1.03	1	1	1	87.294	1.52	29.04	C
			B	1	1.03	1	1	1	87.294			
			C	1	1.03	1	1	1	87.294			
L2 132.83-90.67	0.88	4.85	A	1	1.03	1	1	1	110.443	1.78	42.22	C
			B	1	1.03	1	1	1	110.443			
			C	1	1.03	1	1	1	110.443			
L3 90.67-43.42	1.02	8.85	A	1	1.03	1	1	1	165.333	2.43	51.38	C
			B	1	1.03	1	1	1	165.333			
			C	1	1.03	1	1	1	165.333			
L4 43.42-0.00	0.95	12.30	A	1	1.03	1	1	1	190.219	2.26	52.13	C
			B	1	1.03	1	1	1	190.219			
			C	1	1.03	1	1	1	190.219			
Sum Weight:	3.62	28.48						OTM	643.27 kip-ft	7.99		

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job 313.0087 (NY5672)	Page 9 of 14
	Project Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date 10:31:09 07/14/09
	Client MetroPCS	Designed by JYU

Tower Forces - Service - Wind 90 To Face

Section Elevation ft	Add Weight K	Self Weight K	F a c e	e	C _F	R _R	D _F	D _R	A _E ft ²	F K	w plf	Ctrl. Face
L1 185.00-132.83	0.76	2.48	A	1	1.03	1	1	1	87.294	1.52	29.04	C
			B	1	1.03	1	1	1	87.294			
			C	1	1.03	1	1	1	87.294			
L2 132.83-90.67	0.88	4.85	A	1	1.03	1	1	1	110.443	1.78	42.22	C
			B	1	1.03	1	1	1	110.443			
			C	1	1.03	1	1	1	110.443			
L3 90.67-43.42	1.02	8.85	A	1	1.03	1	1	1	165.333	2.43	51.38	C
			B	1	1.03	1	1	1	165.333			
			C	1	1.03	1	1	1	165.333			
L4 43.42-0.00	0.95	12.30	A	1	1.03	1	1	1	190.219	2.26	52.13	C
			B	1	1.03	1	1	1	190.219			
			C	1	1.03	1	1	1	190.219			
Sum Weight:	3.62	28.48						OTM	643.27 kip-ft	7.99		

Force Totals

Load Case	Vertical Forces K	Sum of Forces X K	Sum of Forces Z K	Sum of Overturning Moments, M _x kip-ft	Sum of Overturning Moments, M _z kip-ft	Sum of Torques kip-ft
Leg Weight	28.48					
Bracing Weight	0.00					
Total Member Self-Weight	28.48			0.00	0.00	
Total Weight	36.11			0.00	0.00	
Wind 0 deg - No Ice		0.00	-31.50	-3468.73	0.00	0.00
Wind 90 deg - No Ice		31.50	0.00	0.00	-3468.73	0.00
Wind 180 deg - No Ice		0.00	31.50	3468.73	0.00	0.00
Member Ice	4.21					
Total Weight Ice	42.60			0.00	0.00	
Wind 0 deg - Ice		0.00	-26.15	-2939.11	0.00	0.00
Wind 90 deg - Ice		26.15	0.00	0.00	-2939.11	0.00
Wind 180 deg - Ice		0.00	26.15	2939.11	0.00	0.00
Total Weight	36.11			0.00	0.00	
Wind 0 deg - Service		0.00	-12.31	-1354.97	0.00	0.00
Wind 90 deg - Service		12.31	0.00	0.00	-1354.97	0.00
Wind 180 deg - Service		0.00	12.31	1354.97	0.00	0.00

Load Combinations

Comb. No.	Description
1	Dead Only
2	Dead+Wind 0 deg - No Ice
3	Dead+Wind 90 deg - No Ice
4	Dead+Wind 180 deg - No Ice
5	Dead+Ice+Temp
6	Dead+Wind 0 deg+Ice+Temp

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job	313.0087 (NY5672)	Page	10 of 14	
	Project	Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ		Date	10:31:09 07/14/09
	Client	MetroPCS		Designed by	JYU

Comb. No.	Description
7	Dead+Wind 90 deg+Ice+Temp
8	Dead+Wind 180 deg+Ice+Temp
9	Dead+Wind 0 deg - Service
10	Dead+Wind 90 deg - Service
11	Dead+Wind 180 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Force K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	185 - 132.833	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	5	-8.95	0.00	0.00
			Max. Mx	3	-5.04	-435.32	0.00
			Max. My	2	-5.04	0.00	435.32
			Max. Vy	3	14.29	-435.32	0.00
			Max. Vx	2	-14.29	0.00	435.32
L2	132.833 - 90.6667	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	5	-15.47	0.00	0.00
			Max. Mx	3	-10.90	-1115.65	0.00
			Max. My	2	-10.90	0.00	1115.65
			Max. Vy	3	19.51	-1115.65	0.00
			Max. Vx	2	-19.51	0.00	1115.65
L3	90.6667 - 43.4167	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	5	-25.98	0.00	0.00
			Max. Mx	3	-20.64	-2145.62	0.00
			Max. My	2	-20.64	0.00	2145.62
			Max. Vy	3	25.31	-2145.62	0.00
			Max. Vx	2	-25.31	0.00	2145.62
L4	43.4167 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	5	-42.60	0.00	0.00
			Max. Mx	3	-36.09	-3567.61	0.00
			Max. My	2	-36.09	0.00	3567.61
			Max. Vy	3	31.52	-3567.61	0.00
			Max. Vx	2	-31.52	0.00	3567.61

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	5	42.60	0.00	0.00
	Max. H _x	11	36.11	0.00	-12.30
	Max. H _z	2	36.11	0.00	31.50
	Max. M _x	2	3567.61	0.00	31.50
	Max. M _z	3	3567.61	-31.50	0.00
	Max. Torsion	1	0.00	0.00	0.00
	Min. Vert	2	36.11	0.00	31.50
	Min. H _x	3	36.11	-31.50	0.00
	Min. H _z	4	36.11	0.00	-31.50
	Min. M _x	4	-3567.61	0.00	-31.50
	Min. M _z	1	0.00	0.00	0.00
	Min. Torsion	1	0.00	0.00	0.00

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job 313.0087 (NY5672)	Page 11 of 14
	Project Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date 10:31:09 07/14/09
	Client MetroPCS	Designed by JYU

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
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Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	36.11	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg - No Ice	36.11	0.00	-31.50	-3567.61	0.00	0.00
Dead+Wind 90 deg - No Ice	36.11	31.50	0.00	0.00	-3567.61	0.00
Dead+Wind 180 deg - No Ice	36.11	0.00	31.50	3567.61	0.00	0.00
Dead+Ice+Temp	42.60	0.00	0.00	0.00	0.00	0.00
Dead+Wind 0 deg+Ice+Temp	42.60	0.00	-26.15	-3053.45	0.00	0.00
Dead+Wind 90 deg+Ice+Temp	42.60	26.15	0.00	0.00	-3053.45	0.00
Dead+Wind 180 deg+Ice+Temp	42.60	0.00	26.15	3053.45	0.00	0.00
Dead+Wind 0 deg - Service	36.11	0.00	-12.30	-1395.95	0.00	0.00
Dead+Wind 90 deg - Service	36.11	12.30	0.00	0.00	-1395.95	0.00
Dead+Wind 180 deg - Service	36.11	0.00	12.30	1395.95	0.00	0.00

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-36.11	0.00	0.00	36.11	0.00	0.000%
2	0.00	-36.11	-31.50	0.00	36.11	31.50	0.009%
3	31.50	-36.11	0.00	-31.50	36.11	0.00	0.009%
4	0.00	-36.11	31.50	0.00	36.11	-31.50	0.009%
5	0.00	-42.60	0.00	0.00	42.60	0.00	0.000%
6	0.00	-42.60	-26.15	0.00	42.60	26.15	0.004%
7	26.15	-42.60	0.00	-26.15	42.60	0.00	0.004%
8	0.00	-42.60	26.15	0.00	42.60	-26.15	0.004%
9	0.00	-36.11	-12.31	0.00	36.11	12.30	0.005%
10	12.31	-36.11	0.00	-12.30	36.11	0.00	0.005%
11	0.00	-36.11	12.31	0.00	36.11	-12.30	0.005%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	15	0.00009695	0.00012579
3	Yes	15	0.00009695	0.00012579
4	Yes	15	0.00009695	0.00012579
5	Yes	6	0.00000001	0.00000001
6	Yes	16	0.00007155	0.00014251
7	Yes	16	0.00007155	0.00014251
8	Yes	16	0.00007155	0.00014251
9	Yes	15	0.00010586	0.00007234
10	Yes	15	0.00010586	0.00007234

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job 313.0087 (NY5672)	Page 12 of 14
	Project Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date 10:31:09 07/14/09
	Client MetroPCS	Designed by JYU

11 Yes 15 0.00010586 0.00007234

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 132.833	58.465	10	3.2696	0.0000
L2	137 - 90.6667	28.843	10	2.3236	0.0000
L3	96 - 43.4167	12.855	10	1.3790	0.0000
L4	50 - 0	3.237	10	0.6036	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	5/8" Lightning Rod	10	58.465	3.2696	0.0000	16992
180.00	PiROD 13' Low Profile Platform	10	55.110	3.1765	0.0000	16992
165.00	(12) Panel Antenna	10	45.222	2.8938	0.0000	4247
150.00	(3) Panel Antenna	10	35.973	2.5980	0.0000	2425
110.00	BMR10-A-B1	10	17.355	1.7013	0.0000	2533
105.00	BMR10-A-B1	10	15.652	1.5847	0.0000	2755
100.00	BMR10-A-B1	10	14.058	1.4695	0.0000	3019
50.00	(2) GPS	10	3.237	0.6036	0.0000	3360

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 132.833	148.852	3	8.3280	0.0000
L2	137 - 90.6667	73.566	2	5.9249	0.0000
L3	96 - 43.4167	32.821	2	3.5199	0.0000
L4	50 - 0	8.269	2	1.5419	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	5/8" Lightning Rod	3	148.852	8.3280	0.0000	6894
180.00	PiROD 13' Low Profile Platform	3	140.329	8.0934	0.0000	6894
165.00	(12) Panel Antenna	3	115.207	7.3791	0.0000	1720
150.00	(3) Panel Antenna	3	91.699	6.6277	0.0000	978
110.00	BMR10-A-B1	2	44.301	4.3263	0.0000	1005
105.00	BMR10-A-B1	2	39.957	4.0315	0.0000	1091

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job	313.0087 (NY5672)	Page	13 of 14
	Project	Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date	10:31:09 07/14/09
	Client	MetroPCS	Designed by	JYU

Elevation	Appurtenance	Gov. Load Comb.	Deflection	Tilt	Twist	Radius of Curvature
ft			in	°	°	ft
100.00	BMR10-A-B1	2	35.891	3.7436	0.0000	1193
50.00	(2) GPS	2	8.269	1.5419	0.0000	1318

Base Plate Design Data

Plate Thickness	Number of Anchor Bolts	Anchor Bolt Size	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
in		in						
2.2500	20	2.2500	126.85	130.46	72.554		Plate	1.61 X
			131.21	217.81	45.000			
			0.97	0.60	1.61			

Compression Checks

Pole Design Data

Section No.	Elevation	Size	L	L _u	Kl/r	F _a	A	Actual P	Allow. P _a	Ratio P
	ft		ft	ft		ksi	in ²	K	K	P _a
L1	185 - 132.833 (1)	TP26.598x13.563x0.2188	52.17	185.00	244.7	2.493	17.8475	-5.04	44.50	0.113
L2	132.833 - 90.6667 (2)	TP36.7x25.1194x0.3125	46.33	185.00	176.9	4.772	35.2736	-10.90	168.32	0.065
L3	90.6667 - 43.4167 (3)	TP47.902x34.742x0.375	52.58	185.00	135.2	8.174	55.3994	-20.64	452.85	0.046
L4	43.4167 - 0 (4)	TP58x45.5044x0.4375	50.00	185.00	107.7	12.867	81.0912	-36.09	1043.43	0.035

Pole Bending Design Data

Section No.	Elevation	Size	Actual M _x	Actual f _{bx}	Allow. F _{bx}	Ratio f _{bx} /F _{bx}	Actual M _y	Actual f _{by}	Allow. F _{by}	Ratio f _{by} /F _{by}
	ft		kip-ft	ksi	ksi		kip-ft	ksi	ksi	
L1	185 - 132.833 (1)	TP26.598x13.563x0.2188	435.32	-47.284	39.000	1.212	0.00	0.000	39.000	0.000
L2	132.833 - 90.6667 (2)	TP36.7x25.1194x0.3125	1115.65	-44.332	39.000	1.137	0.00	0.000	39.000	0.000
L3	90.6667 - 43.4167 (3)	TP47.902x34.742x0.375	2145.62	-41.447	38.685	1.071	0.00	0.000	38.685	0.000
L4	43.4167 - 0 (4)	TP58x45.5044x0.4375	3567.61	-37.504	37.230	1.007	0.00	0.000	37.230	0.000

RISATower KMB design group, LLC Suite 209, 1800 Rt.34 WALL, NJ 07719 Phone: 732-280 5623 FAX: 732-280 3980	Job 313.0087 (NY5672)	Page 14 of 14
	Project Existing 185ft Monopole; 3960 Route 1, South Brunswick, NJ	Date 10:31:09 07/14/09
	Client MetroPCS	Designed by JYU

Pole Interaction Design Data

Section No.	Elevation ft	Size	Ratio	Ratio	Ratio	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
			$\frac{P}{P_a}$	$\frac{f_{bx}}{F_{bx}}$	$\frac{f_{by}}{F_{by}}$			
L1	185 - 132.833 (1)	TP26.598x13.563x0.2188	0.113	1.212	0.000	1.326 ✓	1.333	H1-3 ✓
L2	132.833 - 90.6667 (2)	TP36.7x25.1194x0.3125	0.065	1.137	0.000	1.201 ✓	1.333	H1-3 ✓
L3	90.6667 - 43.4167 (3)	TP47.902x34.742x0.375	0.046	1.071	0.000	1.117 ✓	1.333	H1-3 ✓
L4	43.4167 - 0 (4)	TP58x45.5044x0.4375	0.035	1.007	0.000	1.042 ✓	1.333	H1-3 ✓

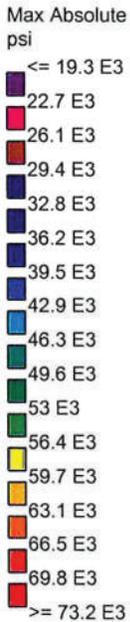
Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	SF*P _{allow} K	% Capacity	Pass Fail	
L1	185 - 132.833	Pole	TP26.598x13.563x0.2188	1	-5.04	59.32	99.5	Pass	
L2	132.833 - 90.6667	Pole	TP36.7x25.1194x0.3125	2	-10.90	224.38	90.1	Pass	
L3	90.6667 - 43.4167	Pole	TP47.902x34.742x0.375	3	-20.64	603.65	83.8	Pass	
L4	43.4167 - 0	Pole	TP58x45.5044x0.4375	4	-36.09	1390.89	78.2	Pass	
							Summary		
							Pole (L1)	99.5	Pass
							Base Plate	121.0	Fail ✗
							RATING =	121.0	Fail ✗



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Job No	Sheet No 1	Rev
Part		
Job Title 313.0087	Ref SOUTH BRUNSWICK	
By JY	Date 7-1-09	Chd
Client METRO	File bp_with pole_03_METRO	Date/Time 02-Jul-2009 13:06



$$M = 3565 \text{ k-ft}$$
$$V = 31 \text{ k}$$
$$W = 36 \text{ k}$$



Base Plate Stress contour
subject full loading, w/o Reinforcements

Stress Ratio : $\frac{73}{45} \div 1.33 = 1.219 \therefore \text{N.G.}$



APPENDIX B



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Job No

Sheet No

1

Rev

Part

Job Title 313.0087

Ref SOUTH BRUNSWICK

By JY

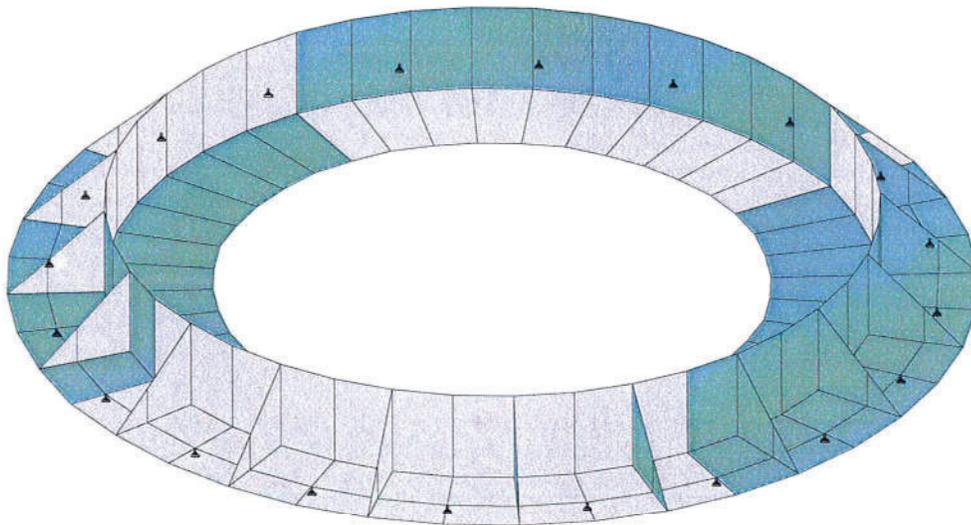
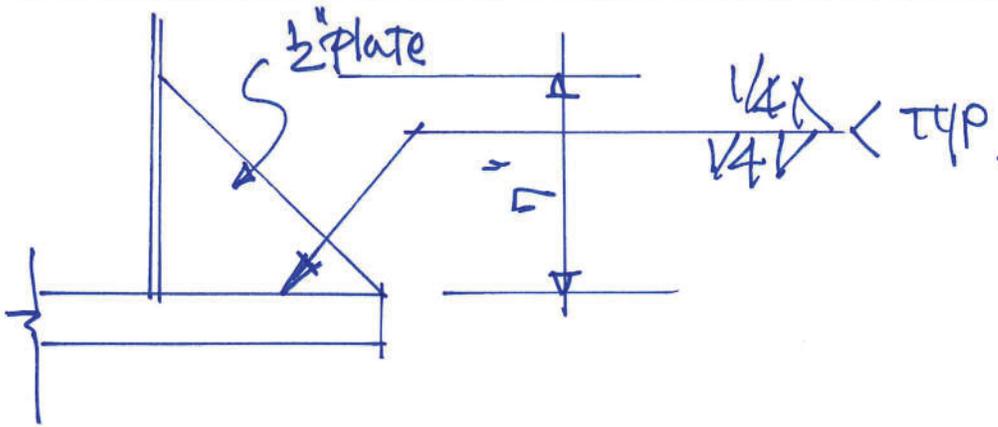
Date 7-1-09

Chd

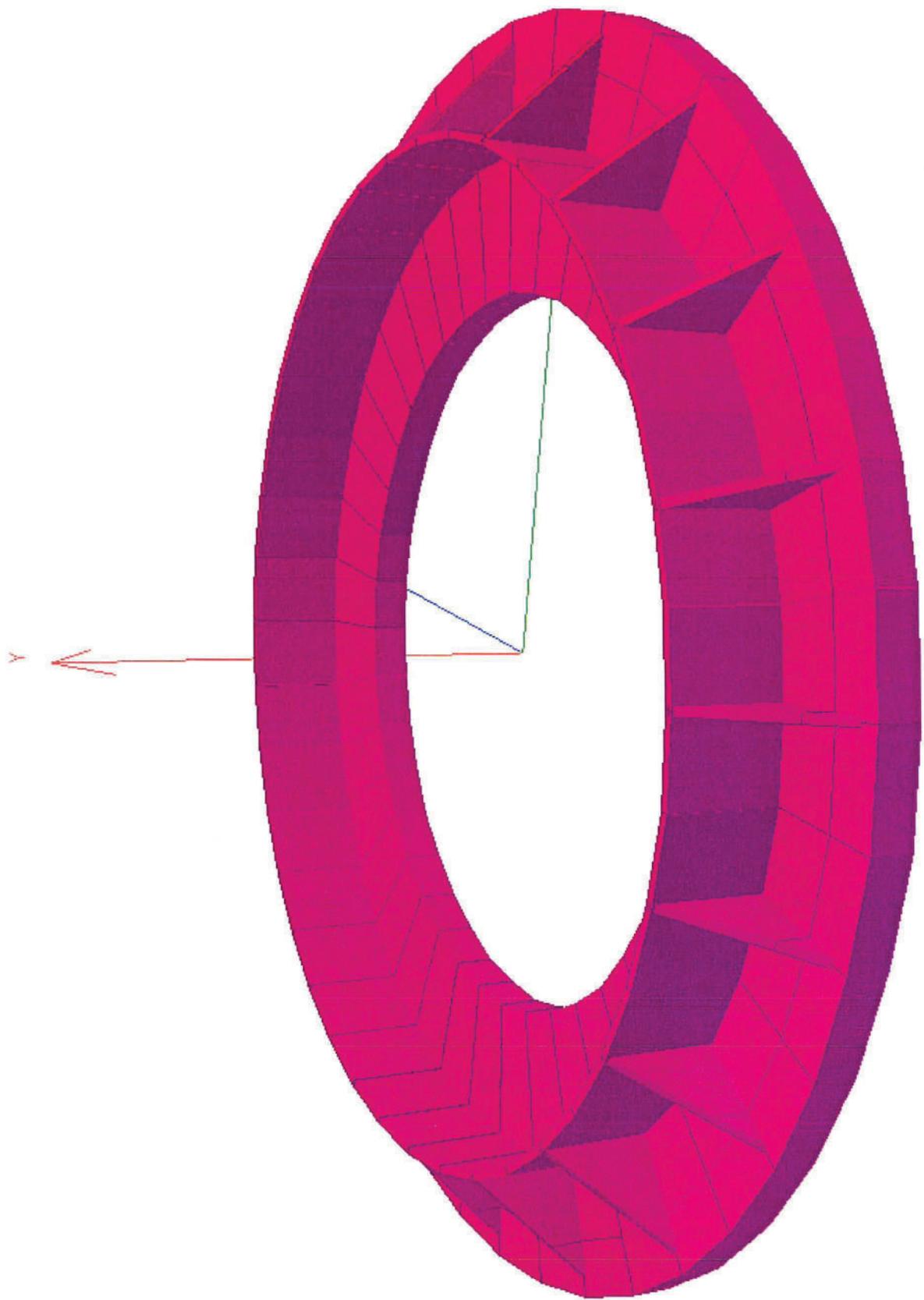
Client METRO

File bp_with pole_03_METRO

Date/Time 02-Jul-2009 10:28



Base Plate Structural Module
w/ Reinforcements





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Job No

Sheet No

1

Rev

Part

Job Title 313.0087

Ref SOUTH BRUNSWICK

By JY

Date 7-1-09

Chd

Client METRO

File bp_with pole_03_METRO

Date/Time 02-Jul-2009 13:13

Max Absolute
psi

- <= 5447
- 8845
- 12.2 E3
- 15.6 E3
- 19 E3
- 22.4 E3
- 25.8 E3
- 29.2 E3
- 32.6 E3
- 36 E3
- 39.4 E3
- 42.8 E3
- 46.2 E3
- 49.6 E3
- 53 E3
- 56.4 E3
- >= 59.8 E3

$$M = 3565 \text{ K-ft}$$

$$V = 31 \text{ K}$$

$$W = 36 \text{ K}$$



Base Plate Stress Contour
w/ stiffeners

$$\text{Stress Ratio} = \frac{49.6}{45} * \frac{1}{1.33} = 0.8287 \therefore \text{OK}$$



Mount Analysis Report

For

Anchor

T-Mobile ID: NJ08012E

KMB ID: 300.5912.50J

Address: Major Road and Route 1 South Brunswick Twp, NJ 08852

Prepared For:

**T-Mobile
4 Sylvan Way
Parsippany, NJ 07054**

September 11, 2020

Analyzed By:

A handwritten signature in blue ink that reads "Arindam Bose".

Arindam Bose

Reviewed By:



Stephen A. Bray, P.E
Professional Engineer
NJ PE License No. 24GE04414400
NJ Certificate of Authorization 24GA28150800



Contents

1. Introduction
2. Design Codes
3. Conclusion

Exhibit A – Structural Calculations



1.0 Introduction

KMB Design Group, LLC (KMB) was requested to conduct a structural review to evaluate T-Mobile's existing antenna with respect to the proposed reconfiguration of antennas on new sector mounts. This analysis is based on equipment configuration information changes provided by T-Mobile. The existing monopole structure has not been analyzed in this report and shall be provided under separate cover.

T-Mobile proposes to replace the existing configuration with the below proposed loading:

- P1 AIR21 KRC 118023-1_B2A_B4P
- P2 (Anchor) Ericsson AIR 6449
- P3 (L1900) Ericsson Air 32
- P4 APXVAARR 24_43-U-NA20
- Ancillary Equipment

2.0 Design Codes & Assumptions

As part of the design process, engineers licensed to practice in the State of New Jersey, have reviewed the proposed antenna and connections to which the proposed additional loads will be applied. The applicable design codes which govern the structural analysis of this project are as follows:

- *2018 International Building Code – NJ Edition*
- *AISC Steel Construction Manual – 15th Edition*
- *Building Code Requirements and Specification for Masonry Structures – TMS 402-2016*
- *Minimum Design Loads for Buildings and other Structures – ASCE 7-16*
- *Structural Standard for Antenna Supporting Structures and Antennas – TIA-222-H*

If there are substantial modifications to be made or the assumptions made in this analysis are not accurate, KMB should be notified immediately to perform a revised analysis. This report is not a condition assessment and assumes good workmanship practices and standards will be used and that all systems will be properly maintained.

All engineering services are performed on the basis that the information used is current and correct and should any discrepancy be found it should be brought to the attention of the engineer immediately. This report assumes that the telecommunication antenna and all ancillary support structures have been designed by a registered licensed professional engineer in accordance with all applicable codes and that the installation was inspected to ensure conformance with all final and approved plans and that the installation has been regularly inspected and maintained.



3.0 Conclusion

Alpha, Beta & Gamma Sectors: The existing T-arm mounts shall be replaced with a new low-profile platform to adequately support the proposed antenna loading. The proposed antenna systems are calculated to be within acceptable tolerances for pipe stress, deflection, and bending moment at the critical bending section. The existing connections to the monopole have adequate structural capacity to support the proposed loads.

This report and conclusion assume that the existing monopole surrounding the equipment installation is sound and that all previous installations have been installed correctly in accordance with all signed and sealed documents. Progress photos, prior, during and post upgrade installation shall be provided by the contractor for the engineer's review.

Please refer to the structural calculations in Exhibit A.



Mount Analysis Report

KMB ID: 300.5912.50J

Date: 09.11.2020

Exhibit A

Structural Calculations



Structural Calculations

Project ID: NJ08012E
 Site Name: Sand Hill 1
 Site Address: Major Road and Route 1 South Brunswick Twp, NJ 08852

KMB ID: 300.5912.50J Checked By: EAS
 By: AB Date: 09-011-2020
 Date: 09-011-2020 Revision: 0

Antenna Mount Calculations

Antenna Sector All sectors

Codes used

2018 International Building Code, NJ Edition

AISC Steel Construction Manual – 15th Edition

Building Code Requirements for Masonry Structures - TMS 402-2016

Minimum Design Loads for Buildings and other Structures – ASCE 7-16

Structural Standard for Antenna Supporting Structures and Antennas – TIA-222-H

Design Wind Load

Code : TIA-222-H

Item	Description	Value	Code Reference
V_{ult}	Design Wind Speed (mph)	113.00	ASCE 7 Hazard Tool
V_i	Design Ice Wind Speed (mph)	40.00	TIA, Annex B
$V_{service}$	Service Wind Load (mph)	60.00	TIA, Section 2.8.3
K_d	Wind Direction Probability Factor	0.95	TIA, Section 16.5
$K_{d(service)}$	Wind Direction Probability Factor	0.85	TIA, Table 2-2
Class	Risk Category	II	TIA, Table 2-1
I	Importance Factor (Without Ice)	1.00	TIA, Table 2-3
I_{ice}	Importance Factor (for Ice)	1.00	TIA, Table 2-3
$z = h$	ft. (AGL)	181	Centerline of antenna
Exp. Cat.	Exposure Category	C	TIA, Sect. 2.6.5.1
z_g	Exposure Category Coeff.	900.00	TIA, Table 2-4
α	Exposure Category Coeff.	9.50	TIA, Table 2-4
$K_{z(min)}$	Exposure Category Coeff.	0.85	TIA, Table 2-4
K_e	Exposure Category Coeff.	1.00	TIA, Table 2-4
K_z	$= 2.01(z/z_g)^{2/9}$	1.43	TIA, Sect. 2.6.5.2
Topographic Category =	Topographic Category (1-5)	1.00	TIA, Sect. 2.6.6.2.1
e	Natural Logarithmic base	2.72	
K_{zt}	$[1 + ((K_e * K_z) / K_z)]^2$	1.00	TIA, Sect. 2.6.6.2.1
K_{ze}	$(z/33)^{0.10} \leq 1.4$ (Height escalation factor)	1.19	TIA, Sect. 2.6.10
G_s	Gust Effect Factor	1.00	TIA, Sect. 16.6
t_i	Design Ice Thickness (in)	0.75	TIA, Annex B
t_{ice}	$2t_i(I_{ice} t_{ice}) K_d (K_{zt})^{0.35}$	1.79	TIA, Sect. 2.6.10
$q_{z, design}$	$0.00256(K_z)(K_{zt})(K_d)(V_{max}^2)(I)$ (psf)	44.60	TIA, Sect. 2.6.11.6
$q_{z, ice}$	$0.00256(K_z)(K_{zt})(K_d)(V_i^2)$ (psf)	5.60	TIA, Sect. 2.6.11.6
$q_{z, service}$	$0.00256(K_z)(K_{zt})(K_d)(V_{service}^2)(I)$ (psf)	11.30	TIA, Sect. 2.6.11.6



Structural Calculations

Project ID: NJ08012E
 Site Name: Sand Hill 1
 Site Address: Major Road and Route 1 South Brunswick Twp, NJ 08852

KMB ID: 300.5912.50J
 By: AB
 Date: 09-011-2020
 Checked By: EAS
 Date: 09-011-2020
 Revision: 0

Wind Load Calculations

Design Wind Load without ice (W)

Item	Dimensions (in.)			Area (A _n) (normal) (sf)	Area (A _s) (side) (sf)	Aspect Ratio (normal)	Aspect Ratio (side)	C _{e(n)} (normal) Table 2-8	C _{e(s)} (side) Table 2-8
	Width in	Depth in	Height in						
P1 (3) AIR21 KRC 118023-1_B2A_B4P	12.00	7.90	56.00	4.67	3.07	4.67	7.09	1.30	1.40
P2 (3) (Anchor) Ericsson AIR 6449	20.50	8.30	33.10	4.71	1.91	1.61	3.99	1.20	1.27
P3 (3) (L1900) Ericsson Air 32	12.90	8.70	56.60	5.07	3.42	4.39	6.51	1.28	1.38
P4 (3) APXVAARR 24_43-U-NA20	24.00	8.70	96.00	16.00	5.80	4.00	11.03	1.27	1.53
(3) TMA	5.90	5.70	7.90	0.32	0.31	1.34	1.39	1.20	1.20
(3) 4449 RRU	13.20	9.30	14.90	1.37	0.96	1.13	1.60	1.20	1.20
(3) 4415 RRU	13.20	5.40	14.90	1.37	0.56	1.13	2.76	0.70	0.71

Item	EPA _(a) (0°) (sf)	EPA _(a) (30°) (sf)	EPA _(a) (60°) (sf)	EPA _(a) (90°) (sf)	F _(a) (0°) (lbs)	F _(a) (30°) (lbs)	F _(a) (60°) (lbs)	F _(a) (90°) (lbs)	Weight (Appurt.) (lbs)
P1 (3) AIR21 KRC 118023-1_B2A_B4P	6.07	5.63	4.74	4.30	270.57	250.89	211.52	191.83	91.00
P2 (3) (Anchor) Ericsson AIR 6449	5.65	4.85	3.23	2.42	252.19	216.16	144.10	108.06	103.00
P3 (3) (L1900) Ericsson Air 32	6.49	6.05	5.16	4.72	289.46	269.71	230.22	210.47	132.20
P4 (3) APXVAARR 24_43-U-NA20	20.32	17.46	11.74	8.87	906.27	778.65	523.40	395.78	118.00
(3) TMA	0.39	0.39	0.38	0.38	17.32	17.18	16.88	16.74	13.90
(3) 4449 RRU	1.64	1.52	1.28	1.15	73.10	67.70	56.90	51.50	75.00
(3) 4415 RRU	0.96	0.82	0.54	0.40	42.64	36.40	23.93	17.69	46.30

Design Wind Load w/ ice (W_i)

Item	Dimensions (in.)			Area (A _n) (normal) (sf)	Area (A _s) (side) (sf)	Aspect Ratio (normal)	Aspect Ratio (side)	C _{e(n)} (normal) Table 2-8	C _{e(s)} (side) Table 2-8
	Width in	Depth in	Height in						
P1 (3) AIR21 KRC 118023-1_B2A_B4P	15.58	11.48	59.58	6.45	4.75	3.82	5.19	1.26	1.32
P2 (3) (Anchor) Ericsson AIR 6449	24.08	11.88	36.68	6.13	3.03	1.52	3.09	1.20	1.23
P3 (3) (L1900) Ericsson Air 32	16.48	12.28	60.18	6.89	5.13	3.65	4.90	1.25	1.31
P4 (3) APXVAARR 24_43-U-NA20	27.58	12.28	99.58	19.07	8.49	3.61	8.11	1.25	1.44
(3) TMA	9.48	9.28	11.48	0.76	0.74	1.21	1.24	1.20	1.20
(3) 4449 RRU	16.78	12.88	18.48	2.15	1.65	1.10	1.43	1.20	1.20
(3) 4415 RRU	16.78	8.98	18.48	2.15	1.15	1.10	2.06	0.70	0.70

Item	EPA _(ai) (0°) (sf)	EPA _(ai) (30°) (sf)	EPA _(ai) (60°) (sf)	EPA _(ai) (90°) (sf)	F _(ai) (0°) (lbs)	F _(ai) (30°) (lbs)	F _(ai) (60°) (lbs)	F _(ai) (90°) (lbs)	Weight (Appurt.) (lbs)
P1 (3) AIR21 KRC 118023-1_B2A_B4P	8.12	7.66	6.73	6.27	45.48	42.89	37.70	35.11	177.63
P2 (3) (Anchor) Ericsson AIR 6449	7.36	6.45	4.63	3.72	41.22	36.12	25.94	20.84	161.47
P3 (3) (L1900) Ericsson Air 32	8.61	8.14	7.19	6.72	48.21	45.57	40.29	37.65	193.55
P4 (3) APXVAARR 24_43-U-NA20	23.84	20.94	15.13	12.23	133.51	117.25	84.74	68.48	454.46
(3) TMA	0.91	0.90	0.89	0.89	5.08	5.05	5.00	4.97	24.72
(3) 4449 RRU	2.58	2.43	2.13	1.98	14.47	13.63	11.95	11.11	71.91
(3) 4415 RRU	1.51	1.33	0.98	0.81	8.44	7.46	5.50	4.52	57.22

Service Wind Load (W_s)

Item	Dimensions (in.)			Area (A _n) (normal) (sf)	Area (A _s) (side) (sf)	Aspect Ratio (normal)	Aspect Ratio (side)	C _{e(n)} (normal) Table 2-8	C _{e(s)} (side) Table 2-8
	Width in	Depth in	Height in						
P1 (3) AIR21 KRC 118023-1_B2A_B4P	12.00	7.90	56.00	4.67	3.07	4.67	7.09	1.30	1.40
P2 (3) (Anchor) Ericsson AIR 6449	20.50	8.30	33.10	4.71	1.91	1.61	3.99	1.20	1.27
P3 (3) (L1900) Ericsson Air 32	12.90	8.70	56.60	5.07	3.42	4.39	6.51	1.28	1.38
P4 (3) APXVAARR 24_43-U-NA20	24.00	8.70	96.00	16.00	5.80	4.00	11.03	1.27	1.53
(3) TMA	5.90	5.70	7.90	0.32	0.31	1.34	1.39	1.20	1.20
(3) 4449 RRU	13.20	9.30	14.90	1.37	0.96	1.13	1.60	1.20	1.20
(3) 4415 RRU	13.20	5.40	14.90	1.37	0.56	1.13	2.76	0.70	0.71

Item	EPA _{(a)service} (0°) (sf)	EPA _{(a)service} (30°) (sf)	EPA _{(a)service} (60°) (sf)	EPA _{(a)service} (90°) (sf)	F _{(a) service} (0°) (lbs)	F _{(a) service} (30°) (lbs)	F _{(a) service} (60°) (lbs)	F _{(a) service} (90°) (lbs)	Weight (Appurt.) (lbs)
P1 (3) AIR21 KRC 118023-1_B2A_B4P	6.07	5.63	4.74	4.30	68.55	63.57	53.59	48.60	91.00
P2 (3) (Anchor) Ericsson AIR 6449	5.65	4.85	3.23	2.42	63.90	54.77	36.51	27.38	103.00
P3 (3) (L1900) Ericsson Air 32	6.49	6.05	5.16	4.72	73.34	68.34	58.33	53.32	132.20
P4 (3) APXVAARR 24_43-U-NA20	20.32	17.46	11.74	8.87	229.62	197.28	132.61	100.28	118.00
(3) TMA	0.39	0.39	0.38	0.38	4.39	4.35	4.28	4.24	13.90
(3) 4449 RRU	1.64	1.52	1.28	1.15	18.52	17.15	14.42	13.05	75.00
(3) 4415 RRU	0.96	0.82	0.54	0.40	10.80	9.22	6.06	4.48	46.30



Structural Calculations

Project ID: NJ08012E
Site Name: Sand Hill_1
Site Address: Major Road and Route 1 South Brunswick Twp, NJ 08852

KMB ID: 300.5912.50J
By: AB
Date: 09-011-2020

Checked By: EAS
Date: 09-011-2020
Revision: 0

Load Combinations

Load Combination (Section 2.3)

- 1) $1.2 D + 1.0 W$
- 2) $0.9 D + 1.0 W$
- 3) $1.2 D + 1.0 D_i + 1.0 W_i$
- 4) $1.0 D + 1.0 W_o$

D = Dead Load of appurtenance/structure
W = Wind Load without ice
D_i = Dead Load of Ice
W_i = Wind Load with ice
W_o = Service Wind Load

Deflection Check (LC # 7 & 8 only)

Length of member:	5.00	ft
Deflection from RISA 3D:	0.771	in
Allowable Deflection (1.5% <i>L</i>):	0.90	in OK

Maximum Stress ratio

Maximum Stress Ratio from RISA 3D:	0.858
Allowable Stress Ratio:	1.00 OK

Hot Rolled Steel Properties

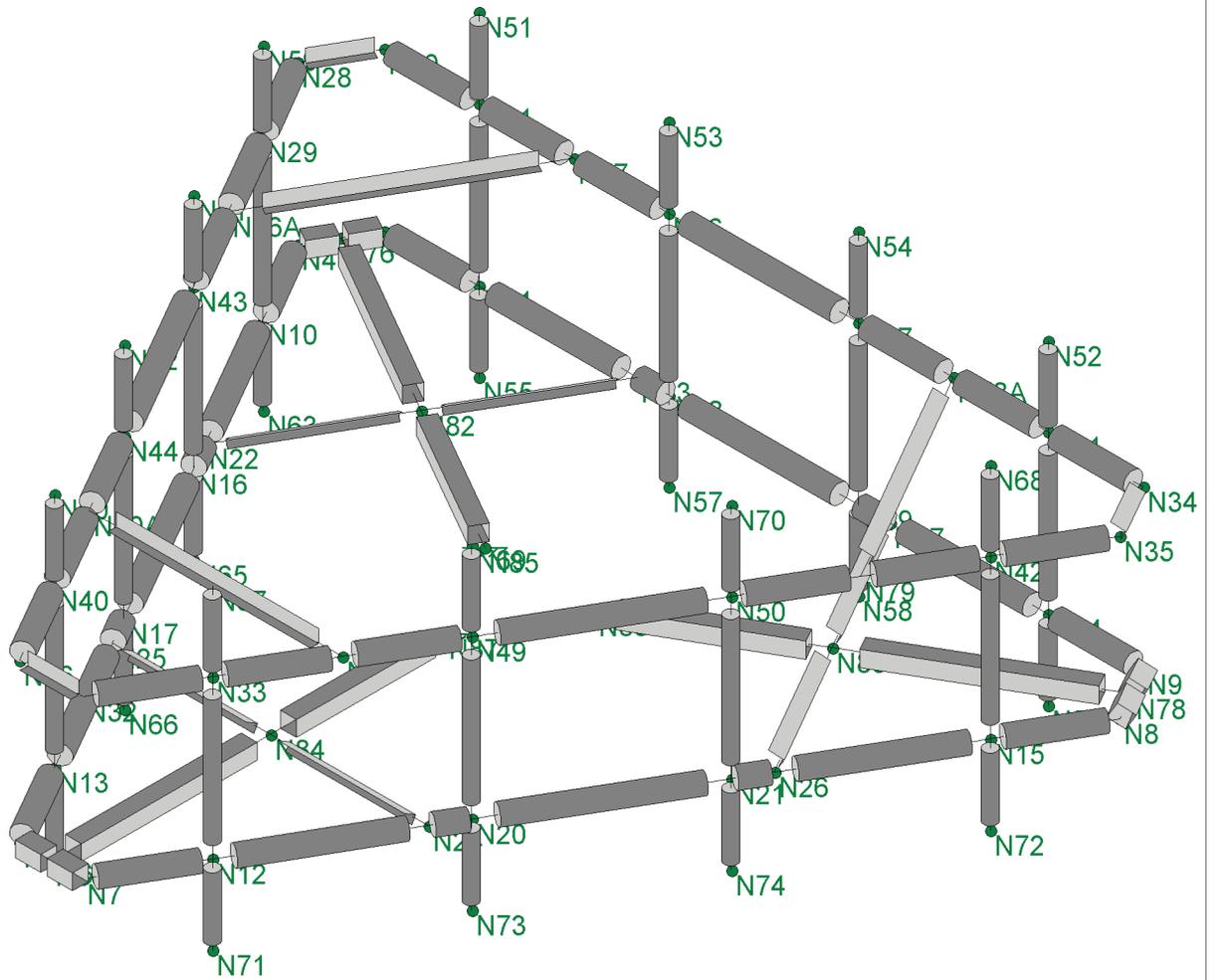
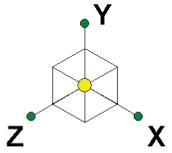
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1	A992	29000	11154	.3	.65	.49	50	1.1	65	1.1
2	A36 Gr.36	29000	11154	.3	.65	.49	36	1.5	58	1.2
3	A572 Gr.50	29000	11154	.3	.65	.49	50	1.1	65	1.1
4	A500 Gr.B RND	29000	11154	.3	.65	.527	42	1.4	58	1.3
5	A500 Gr.B Rect	29000	11154	.3	.65	.527	46	1.4	58	1.3
6	A53 Gr.B	29000	11154	.3	.65	.49	35	1.6	60	1.2
7	A1085	29000	11154	.3	.65	.49	50	1.25	65	1.15
8	A913 Gr.65	29000	11154	.3	.65	.49	65	1.1	80	1.1

Basic Load Cases

	BLC Description	Category	X Gravity	Y Gravity	Z Gravity	Joint	Point	Distribut...	Area(Me...	Surface(...
1	Dead Load	DL		-1		12	9			
2	Wind Load (+Z)	WL					21	20		
3	Dead ICE Load (Di)	DL				12	9			
4	Wind Load ICE(+Z) Wi	WL					21	20		
5	Service Wind Load (+Z) Wo	WL					21	20		
6	Wind Load (+X)	WL					21	34		
7	Wind Load ICE(+X) Wi	WL					21	34		
8	Service Wind Load (+X) Wo	WL					21	34		

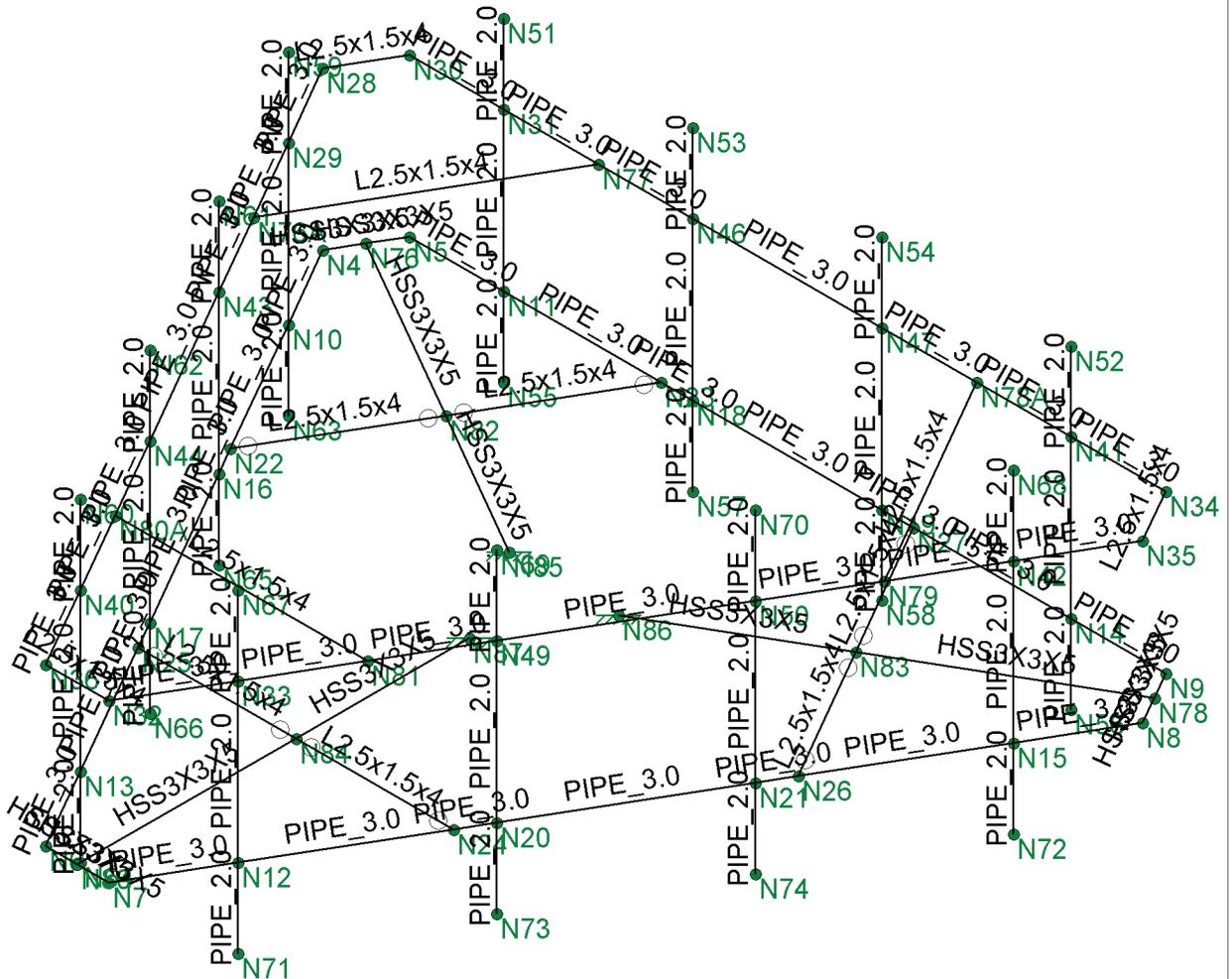
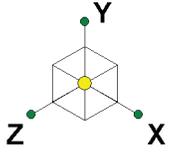
Load Combinations

	Description	Solve PD...	S...	BLC Fac...	B...	Fac...	B...	F...										
1	1.2 D + 1.0 W(+Z)	Yes	Y	1	1.2	2	1											
2	1.2 D + 1.0 W(+X)	Yes	Y	1	1.2	6	1											
3	0.9 D + 1.0 W(+Z)	Yes	Y	1	.9	2	1											
4	0.9 D + 1.0 W(+X)	Yes	Y	1	.9	6	1											
5	1.2 D + 1.0 Di + 1.0 Wi(+Z)	Yes	Y	1	1.2	3	1	4	1									
6	1.2 D + 1.0 Di + 1.0 Wi(+X)	Yes	Y	1	1.2	3	1	7	1									
7	1.0 D + 1.0 Wo(+Z)	Yes	Y	1	1	5	1											
8	1.0 D + 1.0 Wo(+X)	Yes	Y	1	1	8	1											



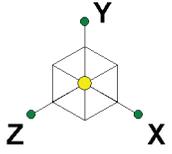
Envelope Only Solution

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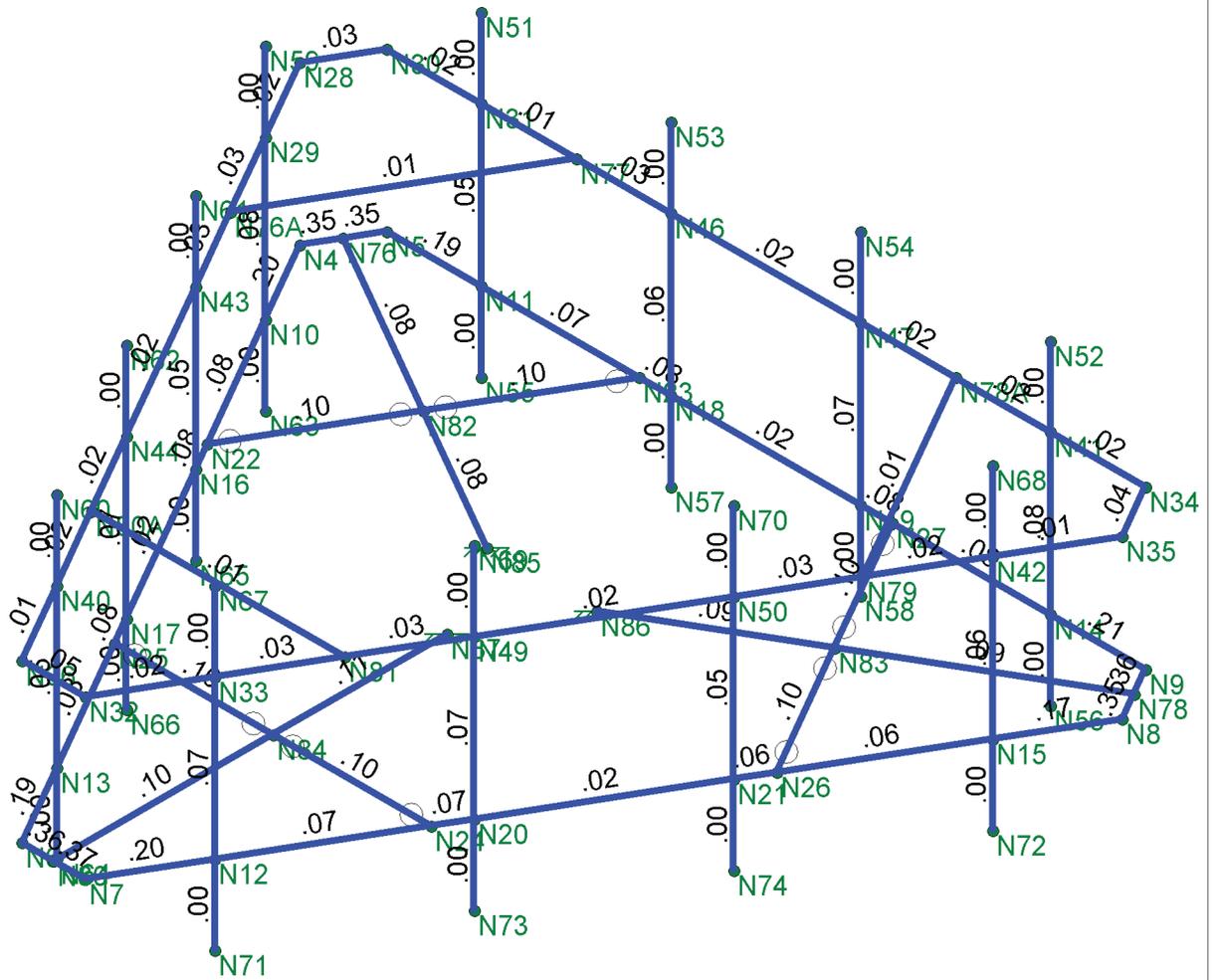
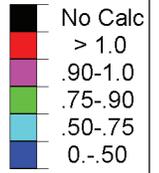


Envelope Only Solution

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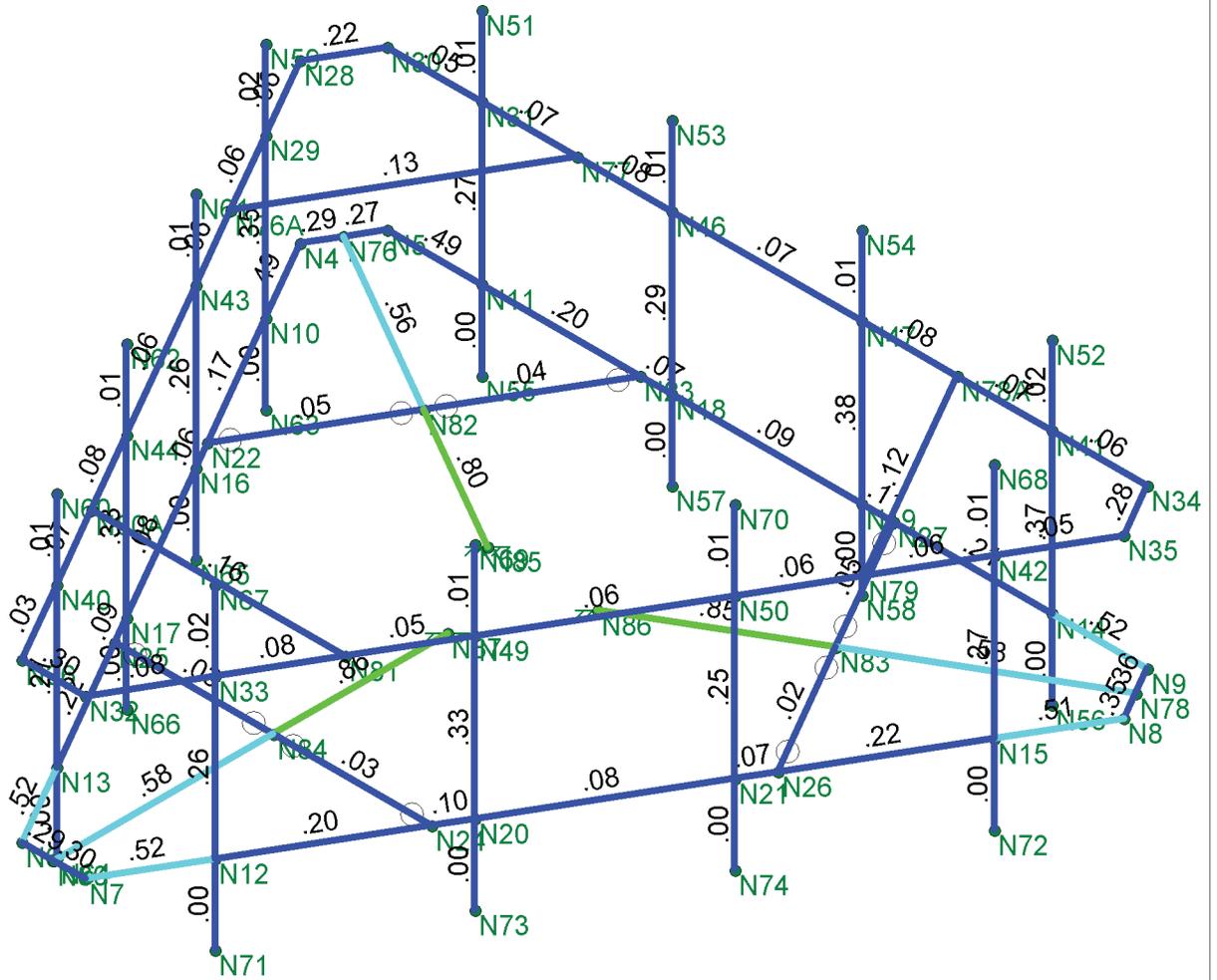
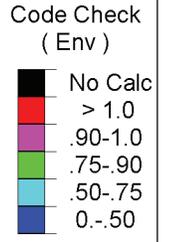
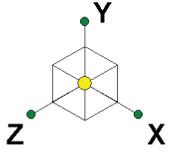


Shear Check
(Env)



Member Shear Checks Displayed (Enveloped)
Envelope Only Solution

T MOBILE	All Sectors SHEAR CHECK VIEW	SK - 4
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300.5912.50J		300.5912.50J_All Sectors.r3d



Member Code Checks Displayed (Enveloped)
Envelope Only Solution

T MOBILE

AB

300.5912.50J

All Sectors
CODE CHECK VIEW

SK - 5

Sept 11, 2020 at 10:29 AM

300.5912.50J_All Sectors.r3d

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	N85	max	-.163	5	2.176	5	-.229	6	3.799	6	.724	4	.048	4
2		min	-2.617	4	.227	4	-1.239	3	.23	3	-1.034	3	-6.799	5
3	N86	max	1.062	3	2.36	6	1.132	2	4.229	6	1.225	3	7.372	6
4		min	-2.432	2	.477	3	-1.43	3	.215	3	.009	6	1.403	3
5	N87	max	-.014	5	2.363	5	-.023	6	-2.888	4	-.027	5	.616	4
6		min	-.825	4	.822	4	-3.095	1	-8.512	5	-1.45	4	.008	7
7	Totals:	max	0	7	6.715	6	0	8						
8		min	-5.871	2	2.505	3	-5.76	1						

Max. Reaction

Envelope Joint Displacements

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...]	LC	Y Rotation [...]	LC	Z Rotation [...]	LC
1	N4	max	0	8	-.398	8	.01	8	7.002e-4	7	6.912e-4	8	3.457e-3	7
2		min	-.005	7	-.502	7	.005	7	-1.438e-3	8	-3.642e-4	7	6.23e-4	8
3	N5	max	0	7	-.413	8	.008	7	1.283e-4	7	4.829e-4	8	3.007e-3	7
4		min	-.006	8	-.478	7	.007	8	-2.013e-3	8	-4.594e-4	7	4.116e-4	8
5	N6	max	.023	8	-.57	8	0	7	6.805e-3	7	-5.745e-5	7	3.883e-4	7
6		min	0	7	-.77	7	-.002	8	3.947e-3	8	-3.708e-4	8	-2.085e-3	8
7	N7	max	.023	8	-.599	8	.002	8	6.835e-3	7	-1.114e-4	7	-6.202e-4	7
8		min	0	7	-.771	7	.002	7	4.114e-3	8	-3.476e-4	8	-2.91e-3	8
9	N8	max	.006	7	-.5	7	.005	7	6.415e-4	7	4.365e-4	8	-3.414e-3	7
10		min	-.002	8	-.764	8	-.011	8	-1.94e-3	8	4.297e-4	7	-6.552e-3	8
11	N9	max	0	7	-.477	7	.009	7	1.227e-4	7	6.047e-4	7	2.924e-3	7
12		min	-.006	8	-.751	8	-.009	8	-1.227e-4	7	6.047e-4	7	2.924e-3	8
13	N10	max	.009	8	-.395	8	.009	8	7.368e-5	8	-2.012e-4	7	-1.627e-3	7
14		min	-.01	7	-.508	7	.005	8	7.368e-5	8	-2.012e-4	7	-1.627e-3	8
15	N11	max	0	7	-.43	8	.014	7	1.335e-3	7	3.847e-4	8	4.472e-4	7
16		min	-.006	8	-.451	7	-.001	8	-1.29e-3	8	-1.933e-4	7	-1.995e-3	8
17	N12	max	.026	8	-.59	8	.004	8	3.838e-3	7	1.827e-5	7	-1.368e-3	7
18		min	.001	7	-.702	7	.002	7	1.518e-3	8	-5.566e-5	8	-3.895e-3	8
19	N13	max	.027	8	-.518	8	0	7	3.681e-3	7	-6.886e-5	8	1.154e-3	7
20		min	.003	7	-.7	7	-.005	8	9.331e-4	8	-9.884e-5	7	-1.847e-3	8
21	N14	max	0	7	-.451	7	.018	7	1.484e-3	7	3.856e-4	8	-3.898e-4	7
22		min	-.006	8	-.674	8	0	8	-1.664e-3	8	2.843e-4	7	-3.07e-3	8
23	N15	max	.011	7	-.505	7	.008	7	2.587e-3	7	2.531e-4	8	-1.637e-3	7
24		min	.003	8	-.707	8	-.008	8	3.663e-4	8	2.182e-4	7	-4.415e-3	8
25	N16	max	.015	8	-.449	8	.007	7	3.022e-3	7	2.387e-4	7	9.179e-4	7
26		min	-.009	7	-.582	7	.002	8	2.548e-4	8	1.993e-4	8	-2.637e-3	8
27	N17	max	.021	8	-.489	8	.002	7	2.401e-3	7	2.744e-4	7	1.256e-3	7
28		min	0	7	-.644	7	-.001	8	-3.848e-4	8	2.037e-4	8	-2.231e-3	8
29	N18	max	0	7	-.463	7	.014	7	2.284e-3	7	-4.996e-5	7	-3.924e-4	7
30		min	-.006	8	-.523	8	-.007	8	-8.337e-4	8	-1.704e-4	8	-2.687e-3	8
31	N19	max	0	7	-.463	7	.016	7	2.344e-3	7	-5.477e-5	7	3.781e-4	7
32		min	-.006	8	-.602	8	.003	8	-9.251e-4	8	-2.091e-4	8	-1.927e-3	8
33	N20	max	.021	8	-.637	8	.004	7	2.55e-3	7	2.626e-4	8	-1.424e-3	7
34		min	.003	7	-.645	7	.001	8	6.241e-4	8	-2.319e-4	7	-3.979e-3	8
35	N21	max	.011	7	-.58	7	.009	7	3.143e-3	7	3.163e-4	8	-9.772e-4	7
36		min	.011	8	-.675	8	-.004	8	1.179e-3	8	-1.868e-4	7	-3.551e-3	8
37	N22	max	.014	8	-.439	8	.008	7	3.124e-3	7	1.66e-4	7	9.489e-4	7
38		min	-.01	7	-.569	7	.003	8	4.144e-4	8	1.45e-4	8	-2.575e-3	8
39	N23	max	0	7	-.46	7	.014	7	2.122e-3	7	-6.922e-6	7	-5.397e-4	7
40		min	-.006	8	-.506	8	-.008	8	-9.126e-4	8	-4.489e-5	8	-2.759e-3	8
41	N24	max	.022	8	-.628	8	.003	7	2.437e-3	7	2.541e-4	8	-1.607e-3	7
42		min	.002	7	-.653	7	.002	8	5.804e-4	8	-1.657e-4	7	-4.079e-3	8
43	N25	max	.022	8	-.493	8	0	7	2.291e-3	7	2.258e-4	8	1.429e-3	7
44		min	.002	7	-.652	7	-.002	8	-4.57e-4	8	2.089e-4	7	-1.995e-3	8
45	N26	max	.012	7	-.567	7	.009	7	3.232e-3	7	2.889e-4	8	-9.852e-4	7
46		min	.01	8	-.679	8	-.005	8	1.344e-3	8	-1.153e-4	7	-3.525e-3	8
47	N27	max	0	7	-.461	7	.017	7	2.198e-3	7	-9.405e-5	7	5.244e-4	7
48		min	-.006	8	-.613	8	.004	8	-1.051e-3	8	-1.105e-4	8	-1.72e-3	8
49	N28	max	.09	8	-.365	8	.087	7	2.387e-3	7	5.418e-4	8	-3.28e-4	7
50		min	-.007	7	-.468	7	.011	8	2.201e-4	8	-4.905e-4	7	-3.017e-3	8
51	N29	max	.097	8	-.395	8	.091	7	2.31e-3	7	4.411e-4	8	-3.975e-4	7

Allowable deflection = L x 12 x 15% =
 5.0 X 12 x 0.015 = 0.9 in > 0.771 in

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...]	LC	Y Rotation [...]	LC	Z Rotation [...]	LC
52		min	-.014	7	-.508	7	.007	8	1.061e-4	8	-2.801e-4	7	-3.063e-3	8
53	N30	max	.081	8	-.38	8	.09	7	2.84e-3	7	6.659e-4	8	-4.653e-4	7
54		min	0	7	-.443	7	.006	8	3.369e-4	8	-2.888e-4	7	-2.753e-3	8
55	N31	max	.081	8	-.43	8	.095	7	2.956e-3	7	4.667e-4	8	-4.031e-4	7
56		min	0	7	-.451	7	-.005	8	3.902e-4	8	-2.596e-4	7	-2.771e-3	8
57	N32	max	.115	8	-.564	8	.085	7	1.735e-3	7	-1.888e-4	7	2.3e-5	7
58		min	.002	7	-.73	7	.006	8	-2.262e-4	8	-5.225e-4	8	-2.519e-3	8
59	N33	max	.121	8	-.59	8	.086	7	1.732e-3	7	-6.536e-5	7	9.064e-5	7
60		min	.004	7	-.702	7	.01	8	-2.541e-4	8	-2.045e-4	8	-2.456e-3	8
61	N34	max	.081	8	-.442	7	.093	7	2.877e-3	7	5.335e-4	7	5.024e-4	7
62		min	0	7	-.709	8	-.008	8	4.786e-4	8	3.788e-4	8	-1.925e-3	8
63	N35	max	.086	8	-.465	7	.088	7	2.421e-3	7	6.237e-4	7	2.117e-4	7
64		min	.008	7	-.724	8	-.011	8	1.435e-4	8	3.991e-4	8	-2.121e-3	8
65	N36	max	.115	8	-.533	8	.081	7	1.747e-3	7	-1.375e-4	7	-1.846e-4	7
66		min	.002	7	-.729	7	-.003	8	-7.725e-4	8	-2.922e-4	8	-2.887e-3	8
67	N40	max	.119	8	-.518	8	.08	7	1.726e-3	7	-1.205e-4	7	-2.267e-4	7
68		min	.004	7	-.7	7	-.005	8	-7.693e-4	8	-2.174e-4	8	-3.002e-3	8
69	N41	max	.081	8	-.451	7	.102	7	2.941e-3	7	3.816e-4	7	4.41e-4	7
70		min	0	7	-.674	8	-.001	8	5.312e-4	8	3.577e-4	8	-1.968e-3	8
71	N42	max	.092	8	-.505	7	.093	7	2.454e-3	7	3.768e-4	7	2.436e-4	7
72		min	.017	7	-.707	8	-.007	8	1.595e-4	8	3.007e-4	8	-2.091e-3	8
73	N43	max	.11	8	-.449	8	.09	7	2.074e-3	7	3.685e-4	8	-2.13e-4	7
74		min	-.013	7	-.582	7	0	8	-2.824e-4	8	2.798e-4	7	-3.092e-3	8
75	N44	max	.12	8	-.489	8	.083	7	1.87e-3	7	4.287e-4	7	-1.686e-4	7
76		min	0	7	-.644	7	-.006	8	-5.998e-4	8	2.089e-4	8	-3.072e-3	8
77	N46	max	.081	8	-.463	7	.104	7	3.032e-3	7	-1.705e-4	8	-1.502e-4	7
78		min	0	7	-.523	8	-.01	8	3.753e-4	8	-1.886e-4	7	-2.414e-3	8
79	N47	max	.081	8	-.464	7	.108	7	3.064e-3	7	-1.126e-5	7	1.379e-4	7
80		min	0	7	-.603	8	.001	8	4.082e-4	8	-2.804e-4	8	-2.197e-3	8
81	N49	max	.119	8	-.638	8	.089	7	2.036e-3	7	2.822e-4	8	2.011e-5	7
82		min	.01	7	-.645	7	.008	8	4.68e-5	8	-3.636e-4	7	-2.446e-3	8
83	N50	max	.105	8	-.581	7	.095	7	2.232e-3	7	5.548e-4	8	4.07e-5	7
84		min	.02	7	-.675	8	0	8	1.487e-4	8	-1.494e-4	7	-2.294e-3	8
85	N51	max	.123	8	-.43	8	.139	7	2.96e-3	7	4.667e-4	8	-4.036e-4	7
86		min	.005	7	-.451	7	.001	8	3.906e-4	8	-2.596e-4	7	-2.774e-3	8
87	N52	max	.111	8	-.451	7	.146	7	2.946e-3	7	3.816e-4	7	4.417e-4	7
88		min	-.007	7	-.674	8	.007	8	5.32e-4	8	3.577e-4	8	-1.971e-3	8
89	N53	max	.117	8	-.463	7	.149	7	3.036e-3	7	-1.705e-4	8	-1.504e-4	7
90		min	.001	7	-.523	8	-.004	8	3.758e-4	8	-1.886e-4	7	-2.417e-3	8
91	N54	max	.114	8	-.464	7	.154	7	3.07e-3	7	-1.126e-5	7	1.382e-4	7
92		min	-.003	7	-.603	8	.007	8	4.089e-4	8	-2.804e-4	8	-2.201e-3	8
93	N55	max	.006	7	-.43	8	.018	8	1.335e-3	7	3.847e-4	8	4.472e-4	7
94		min	-.036	8	-.451	7	-.006	7	-1.29e-3	8	-1.933e-4	7	-1.995e-3	8
95	N56	max	-.006	7	-.451	7	.025	8	1.484e-3	7	3.856e-4	8	-3.898e-4	7
96		min	-.052	8	-.674	8	-.005	7	-1.664e-3	8	2.843e-4	7	-3.07e-3	8
97	N57	max	-.006	7	-.463	7	.005	8	2.284e-3	7	-4.996e-5	7	-3.924e-4	7
98		min	-.046	8	-.523	8	-.02	7	-8.337e-4	8	-1.704e-4	8	-2.687e-3	8
99	N58	max	.006	7	-.463	7	.017	8	2.344e-3	7	-5.477e-5	7	3.781e-4	7
100		min	-.035	8	-.602	8	-.019	7	-9.25e-4	8	-2.091e-4	8	-1.927e-3	8
101	N59	max	.143	8	-.395	8	.125	7	2.313e-3	7	4.411e-4	8	-3.981e-4	7
102		min	-.008	7	-.508	7	.008	8	1.062e-4	8	-2.801e-4	7	-3.068e-3	8
103	N60	max	.164	8	-.518	8	.106	7	1.728e-3	7	-1.205e-4	7	-2.269e-4	7

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [...]	LC	Y Rotation [...]	LC	Z Rotation [...]	LC
104		min	.008	7	-.7	7	-.017	8	-7.702e-4	8	-2.174e-4	8	-3.006e-3	8
105	N61	max	.156	8	-.449	8	.121	7	2.077e-3	7	3.685e-4	8	-2.134e-4	7
106		min	-.01	7	-.582	7	-.005	8	-2.829e-4	8	2.798e-4	7	-3.097e-3	8
107	N62	max	.166	8	-.489	8	.111	7	1.872e-3	7	4.287e-4	7	-1.689e-4	7
108		min	.002	7	-.644	7	-.015	8	-6.006e-4	8	2.089e-4	8	-3.076e-3	8
109	N63	max	.015	7	-.395	8	.004	8	2.657e-3	7	4.066e-4	8	1.646e-3	7
110		min	-.015	8	-.508	7	-.032	7	7.368e-5	8	-2.012e-4	7	-1.627e-3	8
111	N64	max	.02	7	-.518	8	-.019	8	3.681e-3	7	-6.886e-5	8	1.154e-3	7
112		min	0	8	-.7	7	-.055	7	9.331e-4	8	-9.884e-5	7	-1.847e-3	8
113	N65	max	.005	7	-.449	8	-.002	8	3.022e-3	7	2.387e-4	7	9.179e-4	7
114		min	-.025	8	-.582	7	-.038	7	2.548e-4	8	1.993e-4	8	-2.637e-3	8
115	N66	max	.019	7	-.489	8	.004	8	2.401e-3	7	2.744e-4	7	1.256e-3	7
116		min	-.012	8	-.644	7	-.034	7	-3.848e-4	8	2.037e-4	8	-2.231e-3	8
117	N67	max	.158	8	-.59	8	.112	7	1.734e-3	7	-6.536e-5	7	9.077e-5	7
118		min	.003	7	-.702	7	.006	8	-2.545e-4	8	-2.045e-4	8	-2.46e-3	8
119	N68	max	.123	8	-.505	7	.13	7	2.457e-3	7	3.768e-4	7	2.439e-4	7
120		min	.013	7	-.707	8	-.005	8	1.597e-4	8	3.007e-4	8	-2.094e-3	8
121	N69	max	.156	8	-.638	8	.12	7	2.04e-3	7	2.822e-4	8	2.015e-5	7
122		min	.01	7	-.645	7	.009	8	4.687e-5	8	-3.636e-4	7	-2.45e-3	8
123	N70	max	.139	8	-.581	7	.128	7	2.234e-3	7	5.548e-4	8	4.075e-5	7
124		min	.019	7	-.675	8	.002	8	1.489e-4	8	-1.494e-4	7	-2.297e-3	8
125	N71	max	-.019	7	-.59	8	-.018	8	3.838e-3	7	1.827e-5	7	-1.368e-3	7
126		min	-.032	8	-.702	7	-.055	7	1.518e-3	8	-5.566e-5	8	-3.895e-3	8
127	N72	max	-.014	7	-.505	7	-.014	8	2.587e-3	7	2.531e-4	8	-1.637e-3	7
128		min	-.063	8	-.707	8	-.031	7	3.663e-4	8	2.182e-4	7	-4.415e-3	8
129	N73	max	-.018	7	-.637	8	-.008	8	2.55e-3	7	2.626e-4	8	-1.423e-3	7
130		min	-.039	8	-.645	7	-.035	7	6.24e-4	8	-2.319e-4	7	-3.979e-3	8
131	N74	max	-.003	7	-.58	7	-.021	8	3.143e-3	7	3.163e-4	8	-9.771e-4	7
132		min	-.042	8	-.675	8	-.039	7	1.179e-3	8	-1.868e-4	7	-3.551e-3	8
133	N76	max	-.003	7	-.404	8	.008	8	-2.181e-4	7	5.823e-4	8	4.195e-3	7
134		min	-.004	8	-.489	7	.006	7	-2.231e-3	8	-4.176e-4	7	1.478e-3	8
135	N78	max	.003	7	-.487	7	.007	7	-2.497e-4	7	5.208e-4	7	-4.131e-3	7
136		min	-.004	8	-.756	8	-.009	8	-3.067e-3	8	4.212e-4	8	-7.438e-3	8
137	N80	max	.023	8	-.583	8	0	7	8.191e-3	7	-8.331e-5	7	-1.14e-4	7
138		min	0	7	-.769	7	0	8	5.253e-3	8	-3.717e-4	8	-2.412e-3	8
139	N82	max	.002	8	-.149	8	.011	7	-3.524e-3	7	3.103e-4	7	7.794e-3	7
140		min	-.006	7	-.173	7	-.003	8	-4.082e-3	8	-2.227e-5	8	6.014e-3	8
141	N83	max	.007	7	-.173	7	.012	7	-3.537e-3	7	6.702e-5	8	-7.765e-3	7
142		min	0	8	-.25	8	0	8	-5.861e-3	8	-3.58e-4	7	-1.109e-2	8
143	N84	max	.022	8	-.2	8	0	7	1.273e-2	7	6.443e-4	8	-5.049e-5	7
144		min	.002	7	-.254	7	0	8	9.933e-3	8	5.061e-5	7	-1.068e-3	8
145	N85	max	0	8	0	8	0	8	0	8	0	8	0	8
146		min	0	7	0	7	0	7	0	7	0	7	0	7
147	N86	max	0	8	0	8	0	8	0	8	0	8	0	8
148		min	0	7	0	7	0	7	0	7	0	7	0	7
149	N87	max	0	8	0	8	0	8	0	8	0	8	0	8
150		min	0	7	0	7	0	7	0	7	0	7	0	7
151	N76A	max	.104	8	-.424	8	.092	7	2.176e-3	7	4.085e-4	8	-3.419e-4	7
152		min	-.016	7	-.547	7	.003	8	-2.085e-5	8	2.248e-5	7	-3.058e-3	8
153	N77	max	.081	8	-.458	7	.1	7	2.929e-3	7	1.428e-4	8	-3.813e-4	7
154		min	0	7	-.478	8	-.01	8	4.089e-4	8	-2.728e-4	7	-2.576e-3	8
155	N78A	max	.081	8	-.459	7	.107	7	2.976e-3	7	1.653e-4	7	3.77e-4	7

Envelope Joint Displacements (Continued)

	Joint		X [in]	LC	Y [in]	LC	Z [in]	LC	X Rotation [... LC	Y Rotation [... LC	Z Rotation [... LC			
156		min	0	7	-.64	8	.004	8	4.575e-4	8	6.726e-5	8	-1.948e-3	8
157	N79	max	.097	8	-.544	7	.095	7	2.33e-3	7	4.013e-4	8	1.524e-4	7
158		min	.02	7	-.692	8	-.005	8	2.362e-4	8	1.015e-4	7	-2.111e-3	8
159	N80A	max	.121	8	-.504	8	.08	7	1.666e-3	7	1.295e-4	7	-1.305e-4	7
160		min	.005	7	-.673	7	-.007	8	-7.899e-4	8	-2.676e-5	8	-2.904e-3	8
161	N81	max	.122	8	-.615	8	.087	7	1.788e-3	7	9.749e-5	8	1.724e-6	7
162		min	.005	7	-.675	7	.01	8	-1.353e-4	8	-1.664e-4	7	-2.424e-3	8



Company : T MOBILE
 Designer : AB
 Job Number : 300.5912.50J
 Model Name : All Sectors

Sept 11, 2020
 10:30 AM
 Checked By: EAS

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	M4	1	max	0	5	1.065	5	.254	2	-3.675	4	20.752	5	.829	4	.783	5
2			min	-.908	4	.103	4	-.205	3	-20.752	5	3.675	4	-.783	5	-.829	4
3		2	max	0	5	1.053	5	.248	2	-2.546	4	8.634	5	3.608	2	2.473	3
4			min	-.906	4	.094	4	-.205	3	-8.634	5	2.546	4	-2.473	3	-3.608	2
5	M5	1	max	-.065	6	.952	5	.059	4	-2.829	4	20.602	5	.731	6	1.579	3
6			min	-.604	3	.027	4	-.141	5	-20.602	5	2.829	4	-1.579	3	-.731	6
7		2	max	-.065	6	.94	5	.059	4	-2.322	3	9.797	6	1.145	4	2.603	1
8			min	-.604	3	.018	4	-.134	5	-9.797	6	2.322	3	-2.603	1	-1.145	4
9	M7	1	max	.929	1	1.159	5	.149	5	-7.207	4	21.842	5	-.529	8	1.363	1
10			min	.089	6	.257	4	-.265	4	-21.842	5	7.207	4	-1.363	1	.529	8
11		2	max	.929	1	1.147	5	.149	5	-3.708	3	8.747	6	.754	5	3.731	4
12			min	.09	6	.248	4	-.258	4	-8.747	6	3.708	3	-3.731	4	-.754	5
13	M10	1	max	.032	5	-.095	4	1.414	4	1.088	4	4.442	5	.555	5	.587	4
14			min	-.246	4	-.891	5	.044	5	-4.442	5	-1.088	4	-.587	4	-.555	5
15		2	max	.032	5	-.099	4	1.414	4	.775	4	7.328	5	4.041	2	-.401	7
16			min	-.246	4	-.896	5	.044	5	-7.328	5	-.775	4	.401	7	-4.041	2
17	M11	1	max	.308	2	.8	3	.897	5	.25	3	1.663	6	4.132	6	1.266	3
18			min	-.124	3	-1.156	2	.062	4	-1.663	6	-.25	3	-1.266	3	-4.132	6
19		2	max	.308	2	.798	3	.902	5	2.832	3	4.372	2	6.617	6	-1.208	3
20			min	-.124	3	-1.159	2	.065	4	-4.372	2	-2.832	3	1.208	3	-6.617	6
21	M12	1	max	.334	1	-.358	8	1.158	1	.102	4	4.823	5	1.093	4	.75	1
22			min	-.046	4	-.858	5	-.396	4	-4.823	5	-.102	4	-.75	1	-1.093	4
23		2	max	.334	1	-.363	8	1.158	1	-1.154	4	7.604	5	3.047	3	.465	6
24			min	-.046	4	-.864	5	-.396	4	-7.604	5	1.154	4	-.465	6	-3.047	3
25	M13	1	max	.119	1	.442	6	.06	3	.771	3	7.026	6	3.668	2	2.513	3
26			min	-.728	4	-.066	3	-.293	2	-7.026	6	-.771	3	-2.513	3	-3.668	2
27		2	max	.119	1	.422	6	.06	3	1.207	6	.627	3	-.544	7	2.018	2
28			min	-.725	4	-.081	3	-.303	2	-.627	3	-1.207	6	-2.018	2	.544	7
29	M14	1	max	.009	6	.517	5	.206	1	.927	4	8.522	5	1.225	4	2.671	1
30			min	-.625	3	-.071	4	.045	8	-8.522	5	-.927	4	-2.671	1	-1.225	4
31		2	max	.009	6	.496	5	.219	1	1.132	5	.563	4	2.428	2	-.511	7
32			min	-.625	3	-.086	4	.045	8	-.563	4	-1.132	5	.511	7	-2.428	2
33	M15	1	max	.625	1	.521	1	.195	4	-1.158	4	8.195	5	.719	5	3.818	4
34			min	.15	6	.05	4	-.033	5	-8.195	5	1.158	4	-3.818	4	-.719	5
35		2	max	.625	1	.501	1	.205	4	1.563	1	.342	4	2.188	3	.192	6
36			min	.153	6	.035	4	-.033	5	-.342	4	-1.563	1	-.192	6	-2.188	3
37	M16	1	max	.837	1	-.419	8	-.067	8	-2.69	4	10.071	5	3.008	2	-.328	3
38			min	-.24	4	-1.012	5	-.143	5	-10.071	5	2.69	4	.328	3	-3.008	2
39		2	max	.837	1	-.429	8	-.074	8	-7.952	4	21.718	5	1.544	4	1.059	1
40			min	-.238	4	-1.024	5	-.143	5	-21.718	5	7.952	4	-1.059	1	-1.544	4
41	M17	1	max	.699	2	-.302	3	.346	1	-2.047	3	8.561	6	-.643	8	4.495	1
42			min	-.645	3	-1.158	6	.102	8	-8.561	6	2.047	3	-4.495	1	.643	8
43		2	max	.699	2	-.312	3	.353	1	-5.558	3	21.878	6	1.08	2	.588	3
44			min	-.645	3	-1.17	6	.102	8	-21.878	6	5.558	3	-.588	3	-1.08	2
45	M18	1	max	.863	2	-.068	3	.047	3	-3.628	3	10.135	6	.379	6	1.963	3
46			min	-.174	3	-.998	6	-.125	6	-10.135	6	3.628	3	-1.963	3	-.379	6
47		2	max	.865	2	-.077	3	.047	3	-4.458	3	21.62	6	-.628	7	1.792	2
48			min	-.174	3	-1.01	6	-.119	6	-21.62	6	4.458	3	-1.792	2	.628	7
49	M19	1	max	.331	1	-.023	8	.116	3	2.831	1	-1.187	8	-.05	6	1.363	1
50			min	-.42	4	-.167	3	.004	6	1.187	8	-2.831	1	-1.363	1	.05	6
51		2	max	.331	1	-.043	8	.116	3	1.273	6	1.442	3	1.301	3	.109	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	
52		min	-.417	4		-.189	1	-.009	6	-1.442	3	-1.273	6	-.109	6	-1.301	3
53	M20	1	max	.603	1	-.231	8	.191	3	3.201	1	-1.659	8	1.421	3	.066	6
54		min	-.243	4		-.522	5	-.252	2	1.659	8	-3.201	1	-.066	6	-1.421	3
55		2	max	.603	1	-.234	8	.191	3	1.479	2	-.734	7	2.151	3	.633	6
56		min	-.242	4		-.526	5	-.254	2	.734	7	-1.479	2	-.633	6	-2.151	3
57	M21	1	max	.063	6	.036	5	-.006	3	3.308	2	-.781	3	1.797	2	-.004	3
58		min	-.505	3		-.189	4	-.15	2	.781	3	-3.308	2	.004	3	-1.797	2
59		2	max	.063	6	.012	5	.008	3	2.072	5	1.466	4	.035	5	1.655	4
60		min	-.505	3		-.211	2	-.15	2	-1.466	4	-2.072	5	-1.655	4	-.035	5
61	M22	1	max	.283	2	-.146	3	.328	1	3.909	2	-1.338	7	.073	1	1.734	4
62		min	-.483	3		-.536	2	-.114	4	1.338	7	-3.909	2	-1.734	4	-.073	1
63		2	max	.283	2	-.149	3	.331	1	1.858	2	-.628	7	1.33	1	2.17	4
64		min	-.483	3		-.54	2	-.114	4	.628	7	-1.858	2	-2.17	4	-1.33	1
65	M23	1	max	.511	2	.181	1	.049	4	2.254	6	1.219	3	1.253	3	.669	2
66		min	.085	7		-.095	4	-.116	1	-1.219	3	-2.254	6	-.669	2	-1.253	3
67		2	max	.514	2	.16	3	.062	4	2.875	1	.642	4	.611	4	1.406	1
68		min	.085	7		-.117	2	-.116	1	-.642	4	-2.875	1	-1.406	1	-.611	4
69	M24	1	max	.679	2	.039	3	.245	4	2.945	6	.794	3	.777	4	1.375	1
70		min	.012	3		-.509	6	-.085	5	-.794	3	-2.945	6	-1.375	1	-.777	4
71		2	max	.68	2	.036	3	.247	4	.998	6	.652	3	1.716	4	1.352	1
72		min	.012	3		-.513	6	-.085	5	-.652	3	-.998	6	-1.352	1	-1.716	4
73	M25	1	max	.114	5	.409	6	.337	2	1.107	6	.653	3	-.544	7	2.018	2
74		min	-.544	4		-.084	3	-.007	3	-.653	3	-1.107	6	-2.018	2	.544	7
75		2	max	.114	5	.405	6	.335	2	2.659	6	.978	3	-.105	6	1.405	1
76		min	-.544	4		-.087	3	-.007	3	-.978	3	-2.659	6	-1.405	1	.105	6
77	M26	1	max	.069	6	.483	5	-.083	8	1.03	5	.588	4	2.428	2	-.511	7
78		min	-.475	3		-.091	4	-.318	1	-.588	4	-1.03	5	.511	7	-2.428	2
79		2	max	.069	6	.479	5	-.083	8	2.865	5	.94	4	1.834	2	-.074	7
80		min	-.475	3		-.094	4	-.316	1	-.94	4	-2.865	5	.074	7	-1.834	2
81	M27	1	max	.515	1	.506	1	.038	5	1.508	1	.371	4	2.188	3	.192	6
82		min	.137	8		.039	4	-.216	3	-.371	4	-1.508	1	-.192	6	-2.188	3
83		2	max	.515	1	.502	1	.038	5	3.43	1	.228	4	1.363	3	.672	2
84		min	.137	8		.036	4	-.216	3	-.228	4	-3.43	1	-.672	2	-1.363	3
85	M28	1	max	.683	1	-.24	8	.192	2	1.535	2	-.778	7	2.151	3	.633	6
86		min	-.366	4		-.533	5	-.093	3	.778	7	-1.535	2	-.633	6	-2.151	3
87		2	max	.683	1	-.257	8	.181	2	-3.932	8	9.159	5	3.129	2	-.339	7
88		min	-.363	4		-.553	5	-.093	3	-9.159	5	3.932	8	.339	7	-3.129	2
89	M29	1	max	.809	2	.005	6	-.01	4	0	8	0	8	0	8	0	8
90		min	-.084	3		.003	3	-.013	1	0	1	0	1	0	1	0	1
91		2	max	.809	2	-.003	4	.013	6	0	8	0	8	0	8	0	8
92		min	-.084	3		-.005	1	.01	3	0	1	0	1	0	1	0	1
93	M30	1	max	.563	2	.005	6	-.01	4	0	8	0	8	0	8	0	8
94		min	-.362	3		-.007	3	-.023	1	0	1	0	1	0	1	0	1
95		2	max	.563	2	.007	3	.023	5	0	8	0	8	0	8	0	8
96		min	-.362	3		-.005	2	.01	4	0	1	0	1	0	1	0	1
97	M31	1	max	.793	2	.033	3	.05	5	1.1	6	.626	3	1.716	4	1.352	1
98		min	.029	3		-.519	6	-.152	4	-.626	3	-1.1	6	-1.352	1	-1.716	4
99		2	max	.796	2	.018	3	.05	5	-.142	3	8.995	6	.369	6	2.101	3
100		min	.029	3		-.54	6	-.141	4	-8.995	6	.142	3	-2.101	3	-.369	6
101	M32	1	max	.329	2	-.154	3	.052	4	1.916	2	-.67	7	1.33	1	2.17	4
102		min	-.665	3		-.541	2	-.317	1	.67	7	-1.916	2	-2.17	4	-1.33	1
103		2	max	.329	2	-.169	3	.052	4	-2.259	3	8.594	2	-.634	8	4.595	1

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	-.665	3		-.561	2	-.305	1	-8.594	2	2.259	3	-4.595	1	.634	8
105	M33	1	max	.818	1	.014	6	-.001	4	0	8	0	8	0	8	0	8
106		min	-.213	4		.003	3	-.013	1	0	1	0	1	0	1	0	1
107		2	max	.818	1	-.003	3	.013	5	0	8	0	8	0	8	0	8
108		min	-.206	4		-.014	2	.001	4	0	1	0	1	0	1	0	1
109	M34	1	max	.024	3	.052	6	.074	4	.348	6	-.119	8	.736	2	.284	3
110		min	-.082	2		-.034	3	-.186	1	.119	8	-.348	6	-.284	3	-.736	2
111		2	max	.024	3	.04	6	.068	4	.873	6	.247	3	1.526	4	2.399	1
112		min	-.08	2		-.044	1	-.186	1	-.247	3	-.873	6	-2.399	1	-1.526	4
113	M35	1	max	.072	4	.031	3	.11	2	.318	1	0	4	.61	4	.721	1
114		min	-.091	1		-.056	6	.032	7	0	4	-.318	1	-.721	1	-.61	4
115		2	max	.072	4	.022	3	.11	2	.598	3	.562	6	1.845	2	.113	3
116		min	-.091	1		-.068	6	.04	7	-.562	6	-.598	3	-.113	3	-1.845	2
117	M36	1	max	.07	4	.046	5	-.027	7	.299	6	-.037	3	-.124	7	.902	2
118		min	-.004	5		-.039	4	-.211	2	.037	3	-.299	6	-.902	2	.124	7
119		2	max	.072	4	.034	5	-.027	7	.745	5	.381	4	-.436	7	3.28	2
120		min	-.004	5		-.049	2	-.205	2	-.381	4	-.745	5	-3.28	2	.436	7
121	M37	1	max	-.016	4	.07	3	.576	4	3.023	6	-.577	7	5.354	1	6.29	4
122		min	-.153	1		-.104	6	-.43	1	.871	7	-2.003	6	-8.021	4	-4.199	1
123		2	max	-.016	4	.064	3	.576	4	3.478	1	.567	4	7.793	4	4.897	1
124		min	-.153	1		-.111	6	-.43	1	-.855	4	-2.304	1	-6.245	1	-6.111	4
125	M38	1	max	.041	3	.368	3	.522	1	1.854	6	1.247	3	-1.404	8	8.529	1
126		min	-.062	5		-.035	6	.062	8	-1.883	3	-1.228	6	-10.876	1	1.101	8
127		2	max	.041	3	.366	3	.533	1	1.994	1	-.223	4	11.196	3	-.726	6
128		min	-.062	5		-.039	6	.071	8	.336	4	-1.321	1	.926	6	-8.78	3
129	M39	1	max	.002	3	.099	5	-.079	7	.964	6	.081	3	12.776	2	-.902	5
130		min	-.125	2		-.075	4	-.742	2	-.122	3	-.639	6	1.151	5	-10.019	2
131		2	max	.002	3	.091	5	-.079	7	2.663	6	-.492	7	.321	5	8.225	4
132		min	-.125	2		-.08	4	-.742	2	.743	7	-1.765	6	-10.488	4	-.251	5
133	M40	1	max	.071	3	.033	7	.113	5	.781	6	-.152	7	1.464	4	2.355	1
134		min	-.05	6		-.034	4	-.184	4	.152	7	-.781	6	-2.355	1	-1.464	4
135		2	max	.071	3	.022	7	.113	5	.942	5	-.154	4	.384	6	2.206	3
136		min	-.048	6		-.043	4	-.19	4	.154	4	-.942	5	-2.206	3	-.384	6
137	M41	1	max	-.008	4	.072	5	.099	4	1.61	4	.392	5	1.763	2	.045	3
138		min	-.078	5		-.048	4	-.104	5	-.392	5	-1.61	4	-.045	3	-1.763	2
139		2	max	-.008	4	.06	5	.099	4	1.096	2	.039	3	2.811	4	.653	5
140		min	-.078	5		-.057	4	-.097	5	-.039	3	-1.096	2	-.653	5	-2.811	4
141	M42	1	max	.08	4	.106	1	.269	1	.695	6	.853	1	-.412	7	3.19	2
142		min	-.045	1		.022	4	.069	8	-.853	1	-.695	6	-3.19	2	.412	7
143		2	max	.082	4	.094	1	.269	1	.894	6	-.192	3	2.184	1	1.658	4
144		min	-.045	1		.011	6	.075	8	.192	3	-.894	6	-1.658	4	-2.184	1
145	M43	1	max	-.015	7	.062	5	.048	6	.609	4	.525	5	1	4	.448	5
146		min	-.127	2		-.028	4	-.046	3	-.525	5	-.609	4	-.448	5	-.1	4
147		2	max	-.015	7	.05	5	.041	6	.25	2	-.037	3	.81	4	-.012	5
148		min	-.126	2		-.038	4	-.046	3	.037	3	-.25	2	.012	5	-.81	4
149	M44	1	max	-.011	8	0	8	.144	3	.791	5	-.113	8	.583	6	2.591	3
150		min	-.096	1		-.041	5	-.04	6	.113	8	-.791	5	-2.591	3	-.583	6
151		2	max	-.011	8	-.01	8	.152	3	.257	5	-.033	4	.121	6	.899	3
152		min	-.096	1		-.053	5	-.04	6	.033	4	-.257	5	-.899	3	-.121	6
153	M45	1	max	.113	3	.069	5	.094	1	-.177	8	.658	1	-.108	4	2.021	1
154		min	-.011	6		.023	8	-.014	4	-.658	1	.177	8	-2.021	1	.108	4
155		2	max	.113	3	.057	5	.094	1	.06	6	.077	3	-.135	8	.942	1



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	-.009	6	.013	8	-.008	4	-.077	3	-.06	6	-.942	1	.135	8	
157	M46	1	max	.015	3	-.022	8	.12	1	2.096	1	-.645	8	.258	4	1.735	1
158		min	-.071	6	-.16	3	.018	8	.645	8	-2.096	1	-1.735	1	-.258	4	
159		2	max	.015	3	-.042	8	.12	1	-.086	8	1.843	3	1.138	4	-.067	5
160		min	-.067	6	-.182	1	.006	8	-1.843	3	.086	8	.067	5	-1.138	4	
161	M47	1	max	-.061	7	-.043	8	.212	1	1.57	2	-.722	7	1.194	4	0	5
162		min	-.143	6	-.124	1	.044	8	.722	7	-1.57	2	0	5	-1.194	4	
163		2	max	-.061	7	-.053	8	.212	1	.429	6	.3	3	3.309	1	-.756	8
164		min	-.141	6	-.137	1	.038	8	-.3	3	-.429	6	.756	8	-3.309	1	
165	M48	1	max	-.019	7	.039	5	-.007	5	2.414	2	-.098	5	1.71	2	.439	3
166		min	-.071	6	-.183	4	-.127	2	.098	5	-2.414	2	-.439	3	-1.71	2	
167		2	max	-.019	7	.015	5	.008	5	.719	5	2.026	4	.052	5	1.225	4
168		min	-.071	6	-.203	2	-.127	2	-2.026	4	-.719	5	-1.225	4	-.052	5	
169	M49	1	max	-.041	7	-.009	5	-.011	3	1.528	2	-.661	7	.031	5	1.146	4
170		min	-.195	2	-.103	2	-.174	2	.661	7	-1.528	2	-1.146	4	-.031	5	
171		2	max	-.041	7	-.022	5	-.004	3	.968	5	-.184	4	-.52	7	3.111	2
172		min	-.195	2	-.115	2	-.174	2	.184	4	-.968	5	-3.111	2	.52	7	
173	M50	1	max	0	4	.173	1	.074	2	1.174	2	1.833	3	.43	3	1.608	2
174		min	-.068	5	-.091	4	-.093	1	-1.833	3	-1.174	2	-1.608	2	-.43	3	
175		2	max	.004	4	.152	3	.086	2	1.912	1	1.18	4	.243	4	1.716	1
176		min	-.068	5	-.113	2	-.093	1	-1.18	4	-1.912	1	-1.716	1	-.243	4	
177	M51	1	max	.062	3	.105	3	.185	2	1.033	6	.579	3	.077	4	1.748	1
178		min	-.135	6	-.07	2	-.067	3	-.579	3	-1.033	6	-1.748	1	-.077	4	
179		2	max	.062	3	.096	3	.191	2	.656	1	.212	4	2.199	2	2.483	3
180		min	-.133	6	-.082	2	-.067	3	-.212	4	-.656	1	-2.483	3	-2.199	2	
181	M52	1	max	0	8	0	5	0	1	0	8	0	8	0	8	0	8
182		min	0	1	0	2	0	6	0	1	0	1	0	1	0	1	1
183		2	max	-.004	4	0	5	0	1	0	5	0	2	0	1	0	6
184		min	-.005	1	0	2	0	6	0	2	0	5	0	6	0	1	1
185	M53	1	max	.428	6	.868	2	0	4	.684	3	11.217	2	10.411	5	-.904	4
186		min	.069	3	-.086	3	-.614	1	-11.217	2	-.684	3	.904	4	-10.411	5	
187		2	max	.418	6	.339	2	0	4	6.34	4	1.898	1	.876	4	1.989	1
188		min	.062	3	-.086	3	-.372	5	-1.898	1	-6.34	4	-1.989	1	-.876	4	
189	M54	1	max	.284	6	.002	2	0	4	-.001	7	.029	2	.031	1	0	4
190		min	.084	3	0	7	-.002	1	-.029	2	.001	7	0	4	-.031	1	
191		2	max	.279	6	.002	2	0	4	0	8	0	8	0	8	0	8
192		min	.08	3	0	7	-.002	1	0	1	0	1	0	1	0	1	1
193	M55	1	max	0	8	0	3	0	1	0	8	0	8	0	8	0	8
194		min	0	1	0	2	0	6	0	1	0	1	0	1	0	1	1
195		2	max	-.004	4	0	3	0	1	0	3	0	2	0	1	0	6
196		min	-.005	1	0	2	0	6	0	2	0	3	0	6	0	1	1
197	M56	1	max	.444	5	1.087	4	.009	4	4.149	5	12.374	4	5.921	5	-.817	4
198		min	.098	4	-.247	5	-.631	1	-12.374	4	-4.149	5	.817	4	-5.921	5	
199		2	max	.276	5	.45	4	.027	3	8.656	4	3.012	5	1.123	2	2.168	3
200		min	.024	4	-.247	5	-.168	5	-3.012	5	-8.656	4	-2.168	3	-1.123	2	
201	M57	1	max	.282	6	.002	2	0	4	0	7	.03	2	.036	1	0	4
202		min	.095	3	0	7	-.003	1	-.03	2	0	7	0	4	-.036	1	
203		2	max	.277	6	.002	2	0	4	0	8	0	8	0	8	0	8
204		min	.091	3	0	7	-.003	1	0	1	0	1	0	1	0	1	1
205	M58	1	max	0	8	0	5	0	1	0	8	0	8	0	8	0	8
206		min	0	1	0	2	0	6	0	1	0	1	0	1	0	1	1
207		2	max	-.004	4	0	5	0	1	0	5	0	2	0	1	0	6

Envelope Member Section Stresses (Continued)

Member	Sec		Axial[ksj]	LC	y	Shear[... LC	z	Shear[... LC	y-Top[ksj]	LC	y-Bot[ksj]	LC	z-Top[ksj]	LC	z-Bot[ksj]	LC	
208		min	-.005	1	0	2	0	6	0	2	0	5	0	6	0	1	
209	M59	1	max	.464	6	1.267	2	-.069	8	-1.453	3	15.843	2	6.127	1	-2.227	8
210		min	.14	3	.086	7	-.654	1	-15.843	2	1.453	3	2.227	8	-6.127	1	
211		2	max	.344	6	.616	2	.018	3	10.698	2	-1.032	7	.311	6	2.697	3
212		min	.091	3	.086	7	-.173	6	1.032	7	-10.698	2	-2.697	3	-.311	6	
213	M60	1	max	.348	6	.003	2	0	4	.001	1	.037	2	.047	1	-.001	4
214		min	.12	3	0	1	-.003	1	-.037	2	-.001	1	.001	4	-.047	1	
215		2	max	.343	6	.003	2	0	4	0	8	0	8	0	8	0	8
216		min	.117	3	0	1	-.003	1	0	1	0	1	0	1	0	1	
217	M61	1	max	0	8	0	3	0	1	0	8	0	8	0	8	0	8
218		min	0	1	0	2	0	6	0	1	0	1	0	1	0	1	
219		2	max	-.004	4	0	3	0	1	0	3	0	2	0	1	0	6
220		min	-.005	1	0	2	0	6	0	2	0	3	0	6	0	1	
221	M62	1	max	.643	6	1.512	4	-.198	8	3.091	5	13.664	4	12.866	1	-4.889	8
222		min	.13	3	-.081	5	-1.328	1	-13.664	4	-3.091	5	4.889	8	-12.866	1	
223		2	max	.593	6	.081	3	.531	3	3.816	2	-.742	7	1.069	3	1.991	6
224		min	.11	3	-.301	2	-.449	6	.742	7	-3.816	2	-1.991	6	-1.069	3	
225	M63	1	max	.584	6	.002	2	0	8	.014	5	.032	2	.044	5	-.002	8
226		min	.108	3	0	5	-.003	5	-.032	2	-.014	5	.002	8	-.044	5	
227		2	max	.579	6	.002	2	0	8	0	8	0	8	0	8	0	8
228		min	.104	3	0	5	-.003	5	0	1	0	1	0	1	0	1	
229	M64	1	max	0	8	0	5	0	1	0	8	0	8	0	8	0	8
230		min	0	1	0	2	0	2	0	1	0	1	0	1	0	1	
231		2	max	-.004	4	0	5	0	1	0	5	0	2	0	1	0	2
232		min	-.005	1	0	2	0	2	0	2	0	5	0	2	0	1	
233	M65	1	max	.631	5	1.323	2	.101	6	-4.453	7	12.454	2	13.649	3	1.775	6
234		min	.069	4	.178	7	-1.464	3	-12.454	2	4.453	7	-1.775	6	-13.649	3	
235		2	max	.581	5	.435	5	.363	1	1.678	1	.686	4	1.166	6	2.258	3
236		min	.049	4	-.531	4	-.101	4	-.686	4	-1.678	1	-2.258	3	-1.166	6	
237	M66	1	max	.584	6	.003	6	0	8	0	3	.047	6	.034	1	0	8
238		min	.108	3	0	3	-.002	1	-.047	6	0	3	0	8	-.034	1	
239		2	max	.579	6	.003	6	0	8	0	8	0	8	0	8	0	8
240		min	.104	3	0	3	-.002	1	0	1	0	1	0	1	0	1	
241	M67	1	max	0	8	0	1	0	1	0	8	0	8	0	8	0	8
242		min	0	1	0	2	0	2	0	1	0	1	0	1	0	1	
243		2	max	-.004	4	0	1	0	1	0	1	0	2	0	1	0	2
244		min	-.005	1	0	2	0	2	0	2	0	1	0	2	0	1	
245	M68	1	max	.44	6	.725	2	.145	6	-2.213	7	7.027	2	9.662	3	3.782	6
246		min	.08	3	.081	7	-.939	3	-7.027	2	2.213	7	-3.782	6	-9.662	3	
247		2	max	.32	6	.26	1	.145	6	3.979	4	.311	5	.407	6	7.383	3
248		min	.032	3	.043	8	-.288	3	-.311	5	-3.979	4	-7.383	3	-.407	6	
249	M69	1	max	.348	6	.003	2	0	6	0	3	.046	2	.037	1	.005	6
250		min	.12	3	0	3	-.003	1	-.046	2	0	3	-.005	6	-.037	1	
251		2	max	.343	6	.003	2	0	6	0	8	0	8	0	8	0	8
252		min	.117	3	0	3	-.003	1	0	1	0	1	0	1	0	1	
253	M70	1	max	0	8	0	5	0	1	0	8	0	8	0	8	0	8
254		min	0	1	0	2	0	2	0	1	0	1	0	1	0	1	
255		2	max	-.004	4	0	5	0	1	0	5	0	2	0	1	0	2
256		min	-.005	1	0	2	0	2	0	2	0	5	0	2	0	1	
257	M71	1	max	.455	5	.897	2	-.126	8	-4.081	7	9.942	2	10.815	1	-1.632	8
258		min	.177	4	.191	7	-1.027	1	-9.942	2	4.081	7	1.632	8	-10.815	1	
259		2	max	.287	5	.439	1	-.126	8	5.561	2	-1.46	7	-2.025	8	8.475	1



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	.103	4	.164	8	-.39	1	1.46	7	-5.561	2	-8.475	1	2.025	8	
261	M72	1	max	.282	6	.002	2	0	6	0	3	.036	2	.028	1	.008	6
262		min	.095	3	0	3	-.002	1	-.036	2	0	3	-.008	6	-.028	1	
263		2	max	.277	6	.002	2	0	6	0	8	0	8	0	8	0	8
264		min	.091	3	0	3	-.002	1	0	1	0	1	0	1	0	1	
265	M73	1	max	0	8	0	5	0	1	0	8	0	8	0	8	0	8
266		min	0	1	0	2	0	4	0	1	0	1	0	1	0	1	
267		2	max	-.004	4	0	5	0	1	0	5	0	2	0	1	0	4
268		min	-.005	1	0	2	0	4	0	2	0	5	0	4	0	1	
269	M74	1	max	.462	5	.802	2	.275	6	-3.985	7	10.813	2	3.525	3	7.823	6
270		min	.139	4	.187	7	-.535	3	-10.813	2	3.985	7	-7.823	6	-3.525	3	
271		2	max	.452	5	.388	1	.3	5	4.759	2	-1.441	7	.143	6	4.282	1
272		min	.132	4	.169	8	-.137	4	1.441	7	-4.759	2	-4.282	1	-.143	6	
273	M75	1	max	.284	6	.002	2	0	6	0	7	.032	2	.025	1	.011	6
274		min	.084	3	0	7	-.002	1	-.032	2	0	7	-.011	6	-.025	1	
275		2	max	.279	6	.002	2	0	6	0	8	0	8	0	8	0	8
276		min	.08	3	0	7	-.002	1	0	1	0	1	0	1	0	1	
277	M76	1	max	0	8	0	7	0	1	0	8	0	8	0	8	0	8
278		min	0	1	0	2	0	8	0	1	0	1	0	1	0	1	
279		2	max	-.004	4	0	7	0	1	0	7	0	2	0	1	0	8
280		min	-.005	1	0	2	0	8	0	2	0	7	0	8	0	1	
281	M77	1	max	.64	5	1.234	4	.342	6	8.233	5	9.128	4	8.282	3	8.796	6
282		min	.199	8	-.394	1	-1.234	3	-9.128	4	-8.233	5	-8.796	6	-8.282	3	
283		2	max	.589	5	-.195	7	.606	1	.18	4	3.414	1	2.544	2	.978	1
284		min	.177	8	-.61	2	.166	8	-3.414	1	-.18	4	-.978	1	-2.544	2	
285	M78	1	max	.584	6	.003	2	.001	6	.005	5	.036	2	.032	1	.016	6
286		min	.108	3	0	5	-.002	1	-.036	2	-.005	5	-.016	6	-.032	1	
287		2	max	.579	6	.003	2	.001	6	0	8	0	8	0	8	0	8
288		min	.104	3	0	5	-.002	1	0	1	0	1	0	1	0	1	
289	M79	1	max	0	8	0	7	0	1	0	8	0	8	0	8	0	8
290		min	0	1	0	2	0	8	0	1	0	1	0	1	0	1	
291		2	max	-.004	4	0	7	0	1	0	7	0	2	0	1	0	8
292		min	-.005	1	0	2	0	8	0	2	0	7	0	8	0	1	
293	M80	1	max	.465	5	.658	4	.234	4	7.768	1	4.428	4	11.225	1	4.426	4
294		min	.13	4	-.381	1	-1.032	1	-4.428	4	-7.768	1	-4.426	4	-11.225	1	
295		2	max	.346	5	.007	4	.234	4	4.47	4	3.278	1	2.363	4	8.518	1
296		min	.081	4	-.381	1	-.381	1	-3.278	1	-4.47	4	-8.518	1	-2.363	4	
297	M81	1	max	.348	6	.003	2	0	6	.005	5	.042	2	.038	1	.002	6
298		min	.12	3	0	5	-.003	1	-.042	2	-.005	5	-.002	6	-.038	1	
299		2	max	.343	6	.003	2	0	6	0	8	0	8	0	8	0	8
300		min	.117	3	0	5	-.003	1	0	1	0	1	0	1	0	1	
301	M82	1	max	0	8	0	7	0	1	0	8	0	8	0	8	0	8
302		min	0	1	0	2	0	8	0	1	0	1	0	1	0	1	
303		2	max	-.004	4	0	7	0	1	0	7	0	2	0	1	0	8
304		min	-.005	1	0	2	0	8	0	2	0	7	0	8	0	1	
305	M83	1	max	.452	6	.647	4	.405	2	4.846	1	4.3	4	9.621	3	7.491	2
306		min	.122	3	-.241	1	-.946	3	-4.3	4	-4.846	1	-7.491	2	-9.621	3	
307		2	max	.284	6	.01	4	.405	2	4.181	2	2.334	3	4.237	2	7.319	3
308		min	.048	3	-.241	1	-.309	3	-2.334	3	-4.181	2	-7.319	3	-4.237	2	
309	M84	1	max	.282	6	.002	2	0	6	.006	5	.032	2	.031	1	0	6
310		min	.095	3	0	5	-.002	1	-.032	2	-.006	5	0	6	-.031	1	
311		2	max	.277	6	.002	2	0	6	0	8	0	8	0	8	0	8



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	.091	3	0	5	-.002	1	0	1	0	1	0	1	0	1	
313	M85	1	max	0	8	0	3	0	1	0	8	0	8	0	8	0	8
314		min	0	1	0	2	0	8	0	1	0	1	0	1	0	1	
315		2	max	-.004	4	0	3	0	1	0	3	0	2	0	1	0	8
316		min	-.005	1	0	2	0	8	0	2	0	3	0	8	0	1	
317	M86	1	max	.462	6	.286	4	.181	2	10.653	5	-.404	4	9.695	3	2.946	2
318		min	.086	3	-.42	5	-.804	3	.404	4	-10.653	5	-2.946	2	-9.695	3	
319		2	max	.452	6	-.178	8	.181	2	1.012	4	2.738	1	2.291	2	5.899	3
320		min	.078	3	-.42	5	-.272	3	-2.738	1	-1.012	4	-5.899	3	-2.291	2	
321	M87	1	max	.284	6	.002	2	0	6	.009	5	.028	2	.029	1	0	6
322		min	.084	3	0	5	-.002	1	-.028	2	-.009	5	0	6	-.029	1	
323		2	max	.279	6	.002	2	0	6	0	8	0	8	0	8	0	8
324		min	.08	3	0	5	-.002	1	0	1	0	1	0	1	0	1	
325	M89	1	max	.019	5	.8	5	-.137	6	-.064	3	6.843	6	2.986	2	-.648	7
326		min	-.219	4	.032	4	-.91	3	-6.843	6	.064	3	.648	7	-2.986	2	
327		2	max	.019	5	.795	5	-.137	6	.671	3	4.385	6	.517	6	1.118	3
328		min	-.219	4	.028	4	-.91	3	-4.385	6	-.671	3	-1.118	3	-.517	6	
329	M90	1	max	.934	4	-.124	4	.065	4	28.856	5	-5.467	4	1.055	2	.946	3
330		min	.084	5	-1.701	5	-.105	1	5.467	4	-28.856	5	-.946	3	-1.055	2	
331		2	max	.939	4	-.151	4	.058	4	2.383	4	9.606	5	2.44	4	3.151	3
332		min	.087	5	-1.737	5	-.093	1	-9.606	5	-2.383	4	-3.151	3	-2.44	4	
333	M92	1	max	.327	2	1.36	2	.177	4	.336	3	5.523	2	6.615	6	-2.768	7
334		min	-.076	3	-.167	3	-.678	5	-5.523	2	-.336	3	2.768	7	-6.615	6	
335		2	max	.327	2	1.358	2	.18	4	-.205	3	1.867	6	4.671	6	-1.917	7
336		min	-.076	3	-.169	3	-.674	5	-1.867	6	.205	3	1.917	7	-4.671	6	
337	M93	1	max	.551	3	-.336	3	.115	3	30.144	6	-7.649	3	1.299	1	-.203	8
338		min	-.905	2	-1.826	6	.002	6	7.649	3	-30.144	6	.203	8	-1.299	1	
339		2	max	.554	3	-.363	3	.103	3	-.179	3	11.121	6	3.736	3	-.289	6
340		min	-.905	2	-1.862	6	.002	6	-11.121	6	.179	3	.289	6	-3.736	3	
341	M95	1	max	.339	1	.977	5	-.087	6	-3.423	8	7.76	5	3.39	3	.394	6
342		min	.012	4	.218	4	-1.33	1	-7.76	5	3.423	8	-.394	6	-3.39	3	
343		2	max	.339	1	.971	5	-.087	6	-2.256	7	4.697	6	-.375	8	.965	1
344		min	.012	4	.214	4	-1.33	1	-4.697	6	2.256	7	-.965	1	.375	8	
345	M96	1	max	-.008	6	-.607	4	-.003	7	30.166	5	-10.304	4	.032	5	1.251	4
346		min	-1.048	1	-1.829	5	-.139	2	10.304	4	-30.166	5	-1.251	4	-.032	5	
347		2	max	-.008	6	-.634	4	-.003	7	-3.582	4	11.151	5	-.065	5	4.193	4
348		min	-1.048	1	-1.865	5	-.125	2	-11.151	5	3.582	4	-4.193	4	.065	5	
349	M100	1	max	.678	1	.005	6	-.01	4	0	8	0	8	0	8	0	8
350		min	.161	8	.003	3	-.013	1	0	1	0	1	0	1	0	1	
351		2	max	.678	1	-.003	4	.013	6	0	8	0	8	0	8	0	8
352		min	.161	8	-.005	1	.01	3	0	1	0	1	0	1	0	1	
353	M101	1	max	.938	4	-.16	4	.476	3	2.431	4	9.443	5	2.44	4	3.151	3
354		min	.087	5	-1.733	5	-.347	4	-9.443	5	-2.431	4	-3.151	3	-2.44	4	
355		2	max	.942	4	-.182	4	.485	3	-.607	4	40.507	5	5.393	3	3.777	4
356		min	.09	5	-1.761	5	-.352	4	-40.507	5	.607	4	-3.777	4	-5.393	3	
357	M102	1	max	.169	5	.014	6	-.001	4	0	8	0	8	0	8	0	8
358		min	-.513	4	.003	3	-.013	1	0	1	0	1	0	1	0	1	
359		2	max	.169	5	-.003	3	.013	5	0	8	0	8	0	8	0	8
360		min	-.506	4	-.014	2	.001	4	0	1	0	1	0	1	0	1	
361	M103	1	max	.553	3	-.37	3	-.019	6	-.126	3	10.955	6	3.736	3	-.289	6
362		min	-.908	2	-1.87	6	-.565	3	-10.955	6	.126	3	.289	6	-3.736	3	
363		2	max	.556	3	-.391	3	-.019	6	-6.894	3	44.456	6	-.047	6	6.392	3

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	-.908	2	-1.898	6	-.574	3	-44.456	6	6.894	3	-6.392	3	.047	6	
365	M104	1	max	.085	5	.005	6	-.01	4	0	8	0	8	0	8	0	8
366		min	-.494	3	-.007	3	-.023	1	0	1	0	1	0	1	0	1	1
367		2	max	.085	5	.007	3	.023	5	0	8	0	8	0	8	0	8
368		min	-.494	3	-.005	2	.01	4	0	1	0	1	0	1	0	1	1
369	M105	1	max	-.008	6	-.646	4	.656	4	-3.524	4	10.984	5	-.065	5	4.193	4
370		min	-1.052	1	-1.872	5	.012	5	-10.984	5	3.524	4	-4.193	4	.065	5	5
371		2	max	-.008	6	-.668	4	.667	4	-15.204	4	44.525	5	7.572	4	-.143	5
372		min	-1.052	1	-1.901	5	.012	5	-44.525	5	15.204	4	.143	5	-7.572	4	4
373	M94	1	max	.108	3	.011	8	.081	3	1.031	6	-.351	3	.53	6	2.588	3
374		min	-.091	6	-.062	3	-.057	5	.351	3	-1.031	6	-2.588	3	-.53	6	6
375		2	max	.108	3	0	8	.081	3	1.03	6	.409	3	.379	4	1.692	1
376		min	-.089	6	-.071	3	-.061	6	-.409	3	-1.03	6	-1.692	1	-.379	4	4
377	M95A	1	max	.071	4	.057	5	.068	5	.855	2	-.354	7	3.148	4	.778	5
378		min	-.128	5	-.102	4	-.132	4	.354	7	-.855	2	-.778	5	-3.148	4	4
379		2	max	.071	4	.045	5	.076	5	1.098	1	.452	4	1.673	2	.597	3
380		min	-.128	5	-.111	4	-.132	4	-.452	4	-1.098	1	-.597	3	-1.673	2	2
381	M96A	1	max	-.032	8	-.016	5	.21	2	.809	5	-.111	4	-.532	7	3.107	2
382		min	-.089	2	-.099	2	-.125	3	.111	4	-.809	5	-3.107	2	.532	7	7
383		2	max	-.032	8	-.029	5	.21	2	.553	5	1.003	2	.559	6	2.491	3
384		min	-.089	2	-.112	2	-.118	3	-1.003	2	-.553	5	-2.491	3	-.559	6	6
385	M97	1	max	.031	4	.07	3	.045	3	.791	1	-.056	4	1.908	2	2.3	3
386		min	-.052	5	-.11	2	-.184	2	.056	4	-.791	1	-2.3	3	-1.908	2	2
387		2	max	.033	4	.061	3	.045	3	1.453	3	1.192	2	-.071	4	1.88	1
388		min	-.052	5	-.123	2	-.178	2	-1.192	2	-1.453	3	-1.88	1	.071	4	4
389	M98	1	max	.005	3	-.043	8	-.061	8	.358	5	.25	4	3.145	1	-.788	8
390		min	-.074	2	-.144	1	-.213	1	-.25	4	-.358	5	.788	8	-3.145	1	1
391		2	max	.005	3	-.053	8	-.067	8	-.433	8	1.841	1	.879	4	.45	5
392		min	-.072	2	-.156	1	-.213	1	-1.841	1	.433	8	-.45	5	-.879	4	4
393	M99	1	max	.049	4	.089	1	.011	4	.95	6	-.118	3	2.156	1	1.734	4
394		min	-.166	1	-.042	4	-.163	1	.118	3	-.95	6	-1.734	4	-2.156	1	1
395		2	max	.051	4	.077	1	.017	4	1.172	1	.288	4	.32	3	1.605	2
396		min	-.166	1	-.051	4	-.163	1	-.288	4	-1.172	1	-1.605	2	-.32	3	3
397	M100A	1	max	.306	4	.132	1	.077	2	3.223	2	2.257	3	1.438	3	1.234	2
398		min	-.212	5	-.066	4	-.087	1	-3.406	3	-2.135	2	-1.574	2	-1.128	3	3
399		2	max	.306	4	.106	3	.077	2	4.525	1	1.536	4	2.088	4	.541	1
400		min	-.212	5	-.093	2	-.087	1	-2.319	4	-2.998	1	-.69	1	-1.637	4	4
401	M101A	1	max	.148	3	.003	1	.056	3	1.432	5	-.138	8	-.433	8	3.125	3
402		min	-.479	2	-.033	4	-.002	8	.209	8	-.949	5	-3.985	3	.34	8	8
403		2	max	.148	3	-.009	3	.095	1	-.033	7	1.611	4	4.435	1	-.54	6
404		min	-.479	2	-.047	2	.034	8	-2.431	4	.022	7	.688	6	-3.478	1	1
405	M102A	1	max	-.125	8	.034	5	0	8	3.492	2	.618	3	3.516	4	-.138	5
406		min	-.541	1	-.089	4	-.021	1	-.933	3	-2.314	2	.177	5	-2.757	4	4
407		2	max	-.125	8	.004	5	0	8	1.111	5	1.565	4	-.135	5	3.119	2
408		min	-.541	1	-.115	2	-.021	1	-2.362	4	-.736	5	-3.977	2	.106	5	5

Max. Stress

Envelope AISC 15th(360-16): LRFD Steel Code Checks

Member	Shape	Code Check	Loc[ft]	LC	Shear C...	Loc[ft]	Dir	LC	phi*Pnc [k]	phi*Pnt	...phi*M...	phi*M.....	Eqn
1	M4 PIPE 3.0	.490	0	5	.204	0		6	64.424	65.205	5.749	5.749	H1-1b
2	M5 PIPE 3.0	.488	0	5	.187	0		5	64.424	65.205	5.749	5.749	H1-1b



Company : T MOBILE
 Designer : AB
 Job Number : 300.5912.50J
 Model Name : All Sectors

Sept 11, 2020
 10:30 AM
 Checked By: EAS

Envelope AISC 15th(360-16): LRFD Steel Code Checks (Continued)

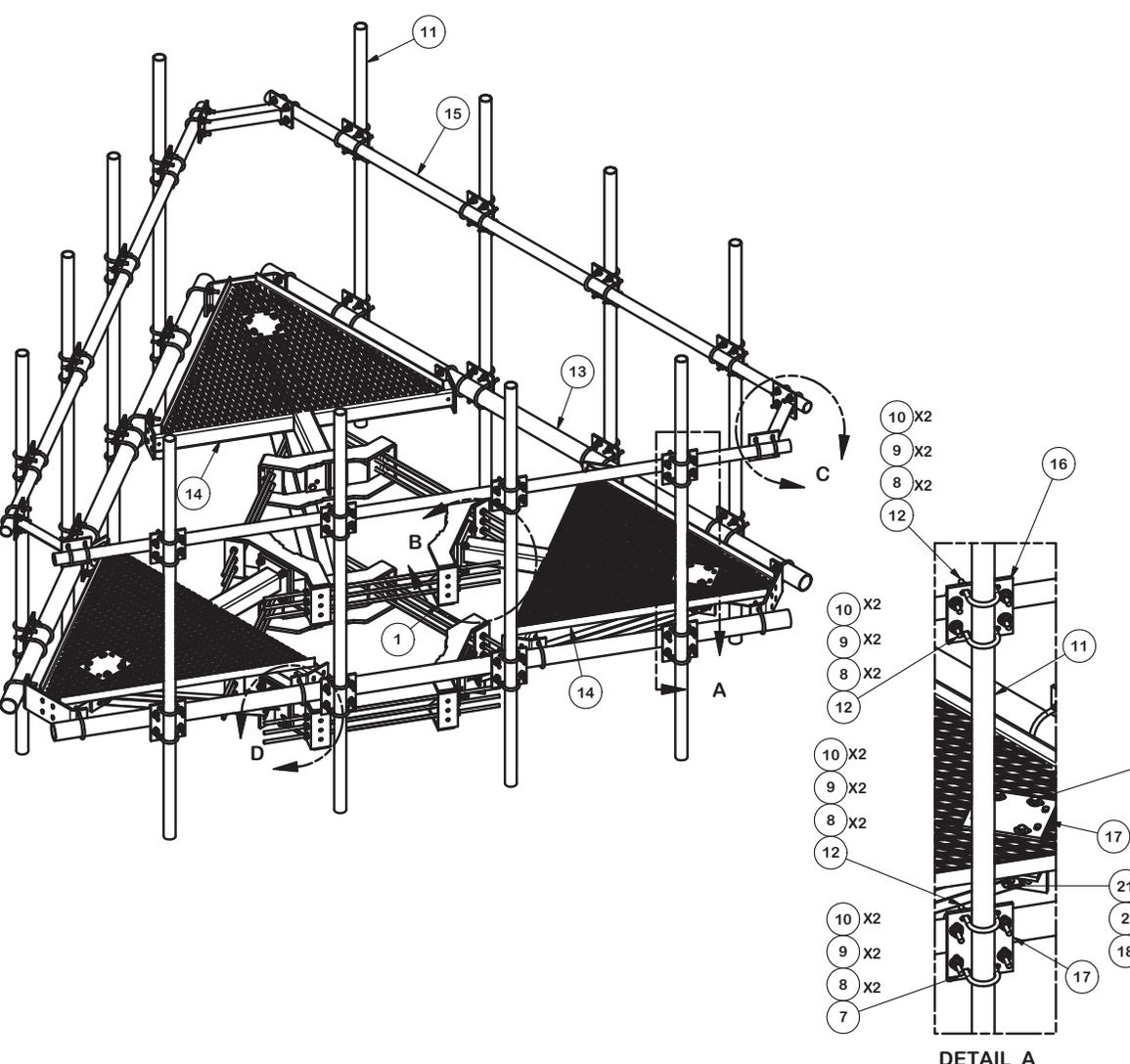
Member	Shape	Code Check	Loc[ft]	LC	Shear C...	Loc[ft]	Dir	LC	phi*Pnc [k]	phi*Pnt	...phi*M...	phi*M.....	Eqn	
3	M7	PIPE 3.0	.519	0	5	.197	0	5	64.424	65.205	5.749	5.749	H1-1b	
4	M10	HSS3X3X5	.289	.5	6	.351	.5	y	6	121.465	121.716	10.005	10.005	H3-6
5	M11	HSS3X3X5	.358	.5	6	.364	.5	z	6	121.465	121.716	10.005	10.005	H3-6
6	M12	HSS3X3X5	.291	.5	5	.359	.5	y	5	121.465	121.716	10.005	10.005	H3-6
7	M13	PIPE 3.0	.171	0	6	.075	0		6	63.06	65.205	5.749	5.749	H1-1b
8	M14	PIPE 3.0	.204	0	5	.075	0		5	63.06	65.205	5.749	5.749	H1-1b
9	M15	PIPE 3.0	.205	0	1	.073	0		5	63.06	65.205	5.749	5.749	H1-1b
10	M16	PIPE 3.0	.516	1.5	5	.193	1.5		6	64.424	65.205	5.749	5.749	H1-1b
11	M17	PIPE 3.0	.520	1.5	6	.213	1.5		5	64.424	65.205	5.749	5.749	H1-1b
12	M18	PIPE 3.0	.514	1.5	6	.169	1.5		6	64.424	65.205	5.749	5.749	H1-1b
13	M19	PIPE 3.0	.080	0	1	.015	3		4	62.138	65.205	5.749	5.749	H1-1b
14	M20	PIPE 3.0	.092	0	1	.084	.5		2	65.118	65.205	5.749	5.749	H1-1b
15	M21	PIPE 3.0	.089	0	2	.021	3		2	62.138	65.205	5.749	5.749	H1-1b
16	M22	PIPE 3.0	.105	0	2	.078	.5		5	65.118	65.205	5.749	5.749	H1-1b
17	M23	PIPE 3.0	.080	3	1	.022	0		3	62.138	65.205	5.749	5.749	H1-1b
18	M24	PIPE 3.0	.074	0	6	.064	.5		6	65.118	65.205	5.749	5.749	H1-1b
19	M25	PIPE 3.0	.063	.5	6	.076	0		6	65.118	65.205	5.749	5.749	H1-1b
20	M26	PIPE 3.0	.068	.5	5	.078	0		1	65.118	65.205	5.749	5.749	H1-1b
21	M27	PIPE 3.0	.095	.5	1	.073	0		5	65.118	65.205	5.749	5.749	H1-1b
22	M28	PIPE 3.0	.220	2.5	5	.082	2.5		2	63.06	65.205	5.749	5.749	H1-1b
23	M29	L2.5x1.5x4	.045	1.237	2	.096	0	z	6	19.373	30.683	.461	1.489	H2-1
24	M30	L2.5x1.5x4	.033	1.237	2	.100	2.5	z	5	19.373	30.683	.461	1.489	H2-1
25	M31	PIPE 3.0	.216	2.5	6	.064	2.5		6	63.06	65.205	5.749	5.749	H1-1b
26	M32	PIPE 3.0	.210	2.5	2	.078	2.5		5	63.06	65.205	5.749	5.749	H1-1b
27	M33	L2.5x1.5x4	.046	1.263	1	.099	0	y	6	19.373	30.683	.461	1.489	H2-1
28	M34	PIPE 3.0	.057	1.5	1	.022	0		5	64.424	65.205	5.749	5.749	H1-1b
29	M35	PIPE 3.0	.046	1.5	2	.019	1.5		1	64.424	65.205	5.749	5.749	H1-1b
30	M36	PIPE 3.0	.079	1.5	2	.019	0		6	64.424	65.205	5.749	5.749	H1-1b
31	M37	L2.5x1.5x4	.220	0	2	.030	0	z	1	28.506	30.683	.461	1.597	H2-1
32	M38	L2.5x1.5x4	.283	1	1	.038	1	z	1	28.506	30.683	.461	1.597	H2-1
33	M39	L2.5x1.5x4	.300	0	2	.048	0	z	2	28.506	30.683	.461	1.597	H2-1
34	M40	PIPE 3.0	.059	0	1	.025	1.5		4	64.424	65.205	5.749	5.749	H1-1b
35	M41	PIPE 3.0	.071	1.5	4	.013	1.5		4	64.424	65.205	5.749	5.749	H1-1b
36	M42	PIPE 3.0	.077	0	2	.033	0		1	64.424	65.205	5.749	5.749	H1-1b
37	M43	PIPE 3.0	.030	0	4	.015	1.5		2	64.424	65.205	5.749	5.749	H1-1b
38	M44	PIPE 3.0	.064	0	3	.015	1.5		5	64.424	65.205	5.749	5.749	H1-1b
39	M45	PIPE 3.0	.052	0	1	.010	0		3	64.424	65.205	5.749	5.749	H1-1b
40	M46	PIPE 3.0	.064	0	1	.016	3		1	62.138	65.205	5.749	5.749	H1-1b
41	M47	PIPE 3.0	.080	1.5	1	.023	1.5		1	64.424	65.205	5.749	5.749	H1-1b
42	M48	PIPE 3.0	.071	0	2	.018	3		2	62.138	65.205	5.749	5.749	H1-1b
43	M49	PIPE 3.0	.077	1.5	2	.023	1.5		1	64.424	65.205	5.749	5.749	H1-1b
44	M50	PIPE 3.0	.061	3	1	.019	0		3	62.138	65.205	5.749	5.749	H1-1b
45	M51	PIPE 3.0	.061	1.5	3	.028	1.5		2	64.424	65.205	5.749	5.749	H1-1b
46	M52	PIPE 2.0	.000	1.25	1	.000	0		1	31.534	32.13	1.872	1.872	H1-1b
47	M53	PIPE 2.0	.271	0	2	.053	0		2	29.81	32.13	1.872	1.872	H1-1b
48	M54	PIPE 2.0	.009	0	6	.000	0		1	31.534	32.13	1.872	1.872	H1-1b
49	M55	PIPE 2.0	.000	1.25	1	.000	0		1	31.534	32.13	1.872	1.872	H1-1b
50	M56	PIPE 2.0	.293	0	4	.061	0		4	29.81	32.13	1.872	1.872	H1-1b
51	M57	PIPE 2.0	.009	0	6	.000	0		1	31.534	32.13	1.872	1.872	H1-1b
52	M58	PIPE 2.0	.000	1.25	1	.000	0		1	31.534	32.13	1.872	1.872	H1-1b
53	M59	PIPE 2.0	.385	0	2	.074	0		2	29.81	32.13	1.872	1.872	H1-1b
54	M60	PIPE 2.0	.011	0	6	.000	0		1	31.534	32.13	1.872	1.872	H1-1b



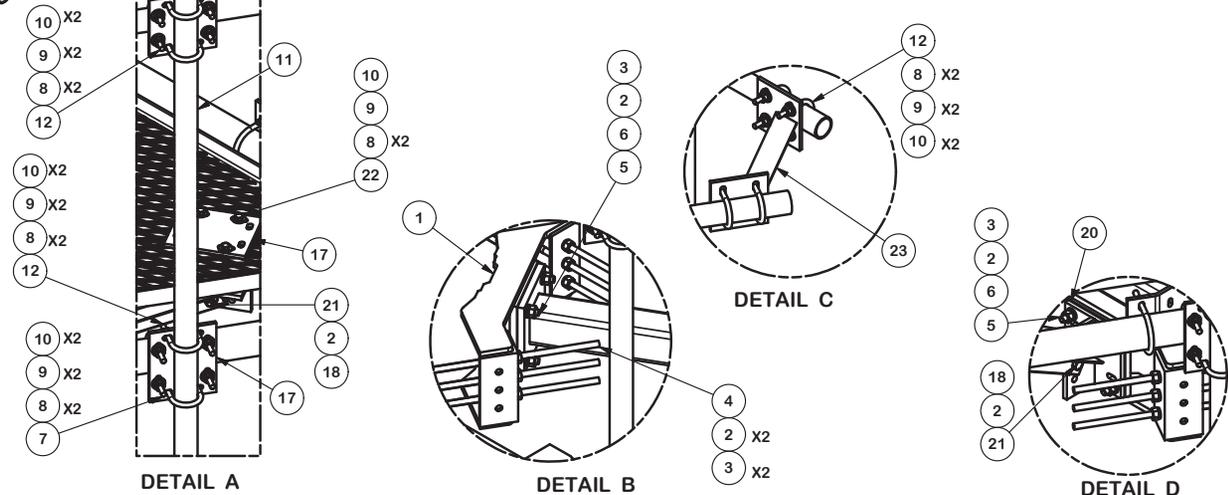
Envelope AISC 15th(360-16): LRFD Steel Code Checks (Continued)

Member	Shape	Code Check	Loc[ft]	LC	Shear C...	Loc[ft]	Dir	LC	phi*Pnc [k]	phi*Pnt	...phi*M...	phi*M.....	Eqn	
55	M61	PIPE 2.0	.000	1.25	2	.000	0	2	31.534	32.13	1.872	1.872	H1-1b	
56	M62	PIPE 2.0	.367	0	2	.082	0	2	29.81	32.13	1.872	1.872	H1-1b	
57	M63	PIPE 2.0	.019	0	6	.000	0	5	31.534	32.13	1.872	1.872	H1-1...	
58	M64	PIPE 2.0	.000	1.25	2	.000	0	2	31.534	32.13	1.872	1.872	H1-1b	
59	M65	PIPE 2.0	.350	0	1	.082	0	3	29.81	32.13	1.872	1.872	H1-1b	
60	M66	PIPE 2.0	.019	0	6	.000	0	6	31.534	32.13	1.872	1.872	H1-1...	
61	M67	PIPE 2.0	.000	1.25	2	.000	0	2	31.534	32.13	1.872	1.872	H1-1b	
62	M68	PIPE 2.0	.259	0	3	.055	0	3	29.81	32.13	1.872	1.872	H1-1b	
63	M69	PIPE 2.0	.011	0	6	.000	0	2	31.534	32.13	1.872	1.872	H1-1...	
64	M70	PIPE 2.0	.000	1.25	2	.000	0	2	31.534	32.13	1.872	1.872	H1-1b	
65	M71	PIPE 2.0	.329	0	1	.069	0	1	29.81	32.13	1.872	1.872	H1-1b	
66	M72	PIPE 2.0	.009	0	6	.000	0	2	31.534	32.13	1.872	1.872	H1-1...	
67	M73	PIPE 2.0	.000	1.25	1	.000	0	1	31.534	32.13	1.872	1.872	1 H1-1b	
68	M74	PIPE 2.0	.268	0	6	.053	0	2	29.81	32.13	1.872	1.872	H1-1b	
69	M75	PIPE 2.0	.009	0	6	.000	0	2	31.534	32.13	1.872	1.872	H1-1...	
70	M76	PIPE 2.0	.000	1.25	2	.000	0	2	31.534	32.13	1.872	1.872	H1-1b	
71	M77	PIPE 2.0	.261	0	1	.074	0	4	29.81	32.13	1.872	1.872	H1-1b	
72	M78	PIPE 2.0	.019	0	6	.000	0	2	31.534	32.13	1.872	1.872	H1-1...	
73	M79	PIPE 2.0	.000	1.25	2	.000	0	2	31.534	32.13	1.872	1.872	H1-1b	
74	M80	PIPE 2.0	.326	0	1	.067	0	1	29.81	32.13	1.872	1.872	H1-1b	
75	M81	PIPE 2.0	.011	0	6	.000	0	2	31.534	32.13	1.872	1.872	H1-1...	
76	M82	PIPE 2.0	.000	1.25	2	.000	0	2	31.534	32.13	1.872	1.872	H1-1b	
77	M83	PIPE 2.0	.252	0	3	.054	0	2	29.81	32.13	1.872	1.872	H1-1b	
78	M84	PIPE 2.0	.009	0	6	.000	0	2	31.534	32.13	1.872	1.872	H1-1...	
79	M85	PIPE 2.0	.000	1.25	2	.000	0	2	31.534	32.13	1.872	1.872	H1-1b	
80	M86	PIPE 2.0	.265	0	1	.056	0	1	29.81	32.13	1.872	1.872	H1-1b	
81	M87	PIPE 2.0	.009	0	6	.000	0	1	31.534	32.13	1.872	1.872	H1-1...	
82	M89	HSS3X3X5	.273	0	5	.346	0	y	5	121.465	121.716	10.005	10.005	H3-6
83	M90	HSS3X3X5	.556	0	5	.083	3.464	y	5	110.237	121.716	10.005	10.005	H1-1b
84	M92	HSS3X3X5	.349	0	6	.347	0	y	6	121.465	121.716	10.005	10.005	H3-6
85	M93	HSS3X3X5	.584	0	6	.085	3.464	y	2	110.237	121.716	10.005	10.005	H1-1b
86	M95	HSS3X3X5	.301	0	5	.369	0	y	5	121.465	121.716	10.005	10.005	H3-6
87	M96	HSS3X3X5	.581	0	5	.104	3.464	y	2	110.237	121.716	10.005	10.005	H1-1b
88	M100	L2.5x1.5x4	.039	1.263	1	.099	0	z	5	19.373	30.683	.461	1.489	H2-1
89	M101	HSS3X3X5	.799	2.753	5	.084	2.753	y	5	114.334	121.716	10.005	10.005	H1-1b
90	M102	L2.5x1.5x4	.021	1.237	4	.099	2.5	y	6	19.373	30.683	.461	1.489	H2-1
91	M103	HSS3X3X5	.855	2.753	6	.088	2.753	y	2	114.334	121.716	10.005	10.005	H1-1b
92	M104	L2.5x1.5x4	.025	1.237	3	.098	0	z	5	19.373	30.683	.461	1.597	H2-1
93	M105	HSS3X3X5	.858	2.753	5	.106	2.753	y	2	114.335	121.716	10.005	10.005	H1-1b
94	M94	PIPE 3.0	.063	0	3	.034	0	4	64.424	65.205	5.749	5.749	H1-1b	
95	M95A	PIPE 3.0	.078	0	4	.026	0	3	64.424	65.205	5.749	5.749	H1-1b	
96	M96A	PIPE 3.0	.075	0	2	.024	1.5	2	64.424	65.205	5.749	5.749	H1-1b	
97	M97	PIPE 3.0	.057	0	6			6	64.424	65.205	5.749	5.749	H1-1b	
98	M98	PIPE 3.0	.074	0	1	.020	1.5	1	64.424	65.205	5.749	5.749	H1-1b	
99	M99	PIPE 3.0	.054	0	1	.031	0	1	64.424	65.205	5.749	5.749	H1-1b	
100	M100A	L2.5x1.5x4	.132	0	4	.009	0	y	1	9.568	30.683	.461	1.555	H2-1
101	M101A	L2.5x1.5x4	.117	4	3	.009	4	z	1	9.568	30.683	.461	1.597	H2-1
102	M102A	L2.5x1.5x4	.157	0	2	.010	4	y	2	9.568	30.683	.461	1.552	H2-1

Max. Stress Ratio



PARTS LIST						
ITEM	QTY	PART NO.	PART DESCRIPTION	LENGTH	UNIT WT.	NET WT.
1	6	X-LWRM	RING MOUNT WELDMNT		68.16	408.95
2	66	G58LW	5/8" HDG LOCKWASHER		0.03	1.72
3	60	A58NUT	5/8" HDG A325 HEX NUT		0.13	7.78
4	18	G58R-24	5/8" x 24" THREADED ROD (HDG.)		0.55	9.88
4	18	G58R-48	5/8" x 48" THREADED ROD (HDG.)		0.55	9.88
5	24	A58234	5/8" x 2-3/4" HDG A325 HEX BOLT	2 3/4 in	0.36	8.53
6	24	A58FW	5/8" HDG A325 FLATWASHER		0.03	0.82
7	36	X-UB1306	1/2" X 3-5/8" X 6" X 3" U-BOLT (HDG.)		0.73	26.34
8	264	G12FW	1/2" HDG USS FLATWASHER		0.03	8.99
9	252	G12LW	1/2" HDG LOCKWASHER		0.01	3.50
10	252	G12NUT	1/2" HDG HEAVY 2H HEX NUT		0.07	18.03
11	12	P296	2-3/8" X 96" SCH. 40 GALVANIZED PIPE	96 in	30.76	369.08
12	84	X-UB1212	1/2" X 2-1/2" X 4-1/2" X 2" U-BOLT (HDG.)		0.73	61.46
13	3	P3150	3-1/2" X 150" SCH 40 GALVANIZED PIPE	150 in	94.80	284.40
14	3	X-SV196	LOW PROFILE PLATFORM CORNER		212.10	636.31
15	3	P2150	2-3/8" OD X 150" SCH 40 GALVANIZED PIPE	150 in	48.06	144.17
16	12	SCX2	CROSSOVER PLATE	7 in	4.80	57.56
17	15	SCX4	CROSSOVER PLATE	8 1/2 in	6.02	90.32
18	6	G58NUT	5/8" HDG HEAVY 2H HEX NUT		0.13	0.78
19	6	X-253993	PLATFORM REINFORCEMENT KIT ANGLE	52 25/32 in	14.33	85.99
20	6	X-253992	T-BRACKET FOR REINFORCEMENT KIT		13.55	81.27
21	6	G5802	5/8" x 2" HDG HEX BOLT GR5		0.27	1.62
22	12	G12065	1/2" x 6-1/2" HDG HEX BOLT GR5 FULL THREAD	6 1/2 in	0.41	4.91
23	3	X-AHCP	ANGLE HANDRAIL CORNER PLATE		12.92	38.76
					TOTAL WT. #	2448.72



TOLERANCE NOTES
 TOLERANCES ON DIMENSIONS, UNLESS OTHERWISE NOTED ARE:
 SAWED, SHEARED AND GAS CUT EDGES ($\pm 0.030"$)
 DRILLED AND GAS CUT HOLES ($\pm 0.030"$) - NO CONING OF HOLES
 LASER CUT EDGES AND HOLES ($\pm 0.010"$) - NO CONING OF HOLES
 BENDS ARE $\pm 1/2$ DEGREE
 ALL OTHER MACHINING ($\pm 0.030"$)
 ALL OTHER ASSEMBLY ($\pm 0.060"$)

PROPRIETARY NOTE:
 THE DATA AND TECHNIQUES CONTAINED IN THIS DRAWING ARE PROPRIETARY INFORMATION OF VALMONT INDUSTRIES AND CONSIDERED A TRADE SECRET. ANY USE OR DISCLOSURE WITHOUT THE CONSENT OF VALMONT INDUSTRIES IS STRICTLY PROHIBITED.

DESCRIPTION
 12' 6" LOW PROFILE PLATFORM
 WITH TWELVE 2-3/8" ANTENNA MOUNTING
 PIPES, AND HANDRAIL

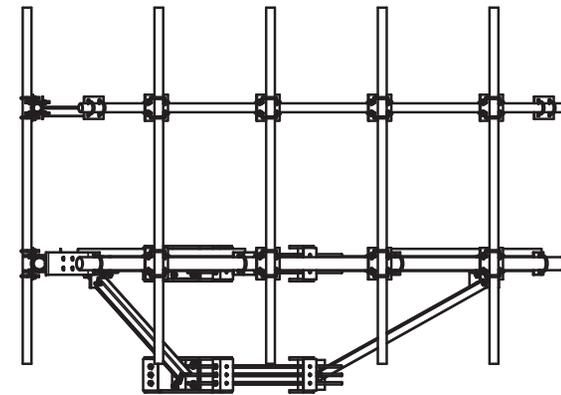
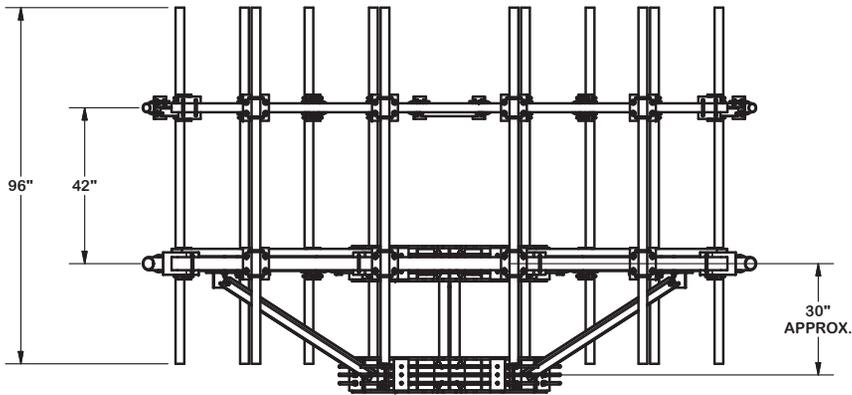
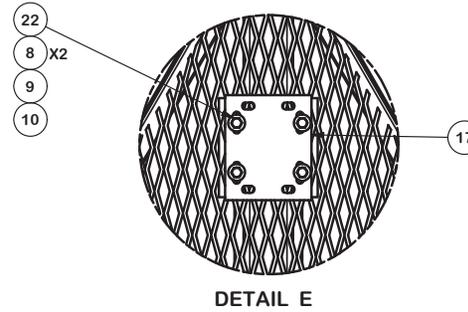
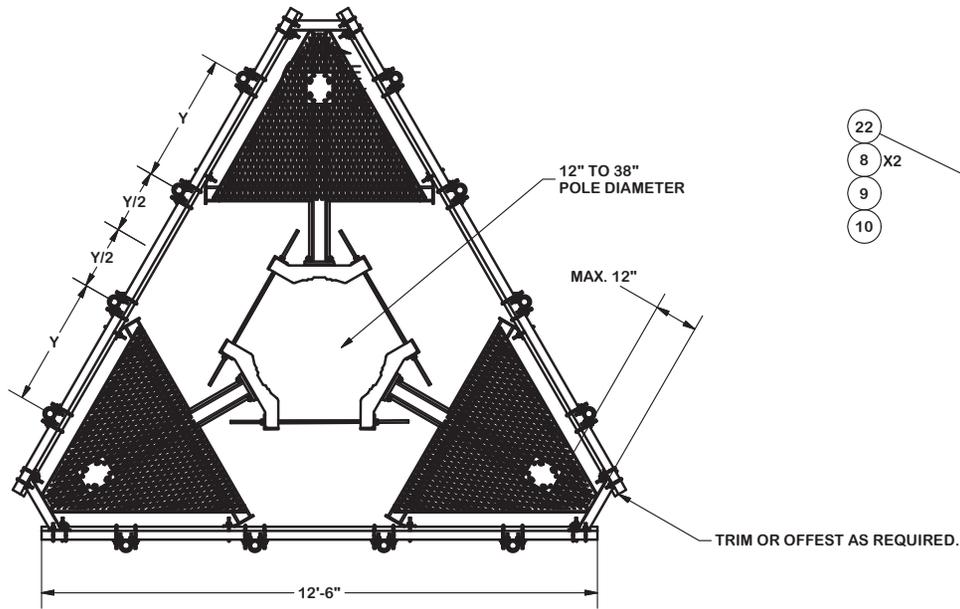
CPD NO. 4488 DRAWN BY CEK 7/14/2014 ENG. APPROVAL
 CLASS 81 SUB 02 DRAWING USAGE CUSTOMER CHECKED BY BMC 7/14/2014

SITE PRO 1
 Engineering Support Team:
 1-888-753-7446

Locations:
 New York, NY
 Atlanta, GA
 Los Angeles, CA
 Plymouth, IN
 Salem, OR
 Dallas, TX

PART NO. **RMQP-496-HK**
 DWG. NO. **RMQP-496-HK**

PAGE 1 OF 3



TOLERANCE NOTES

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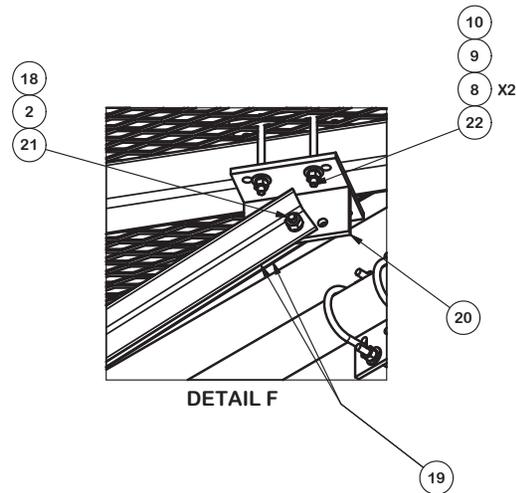
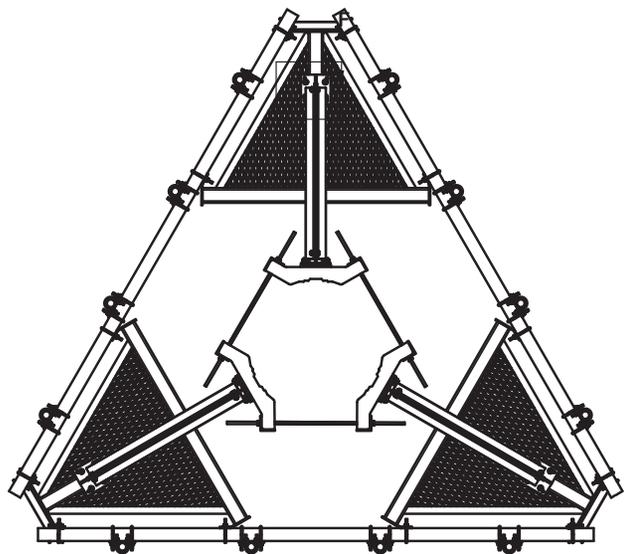
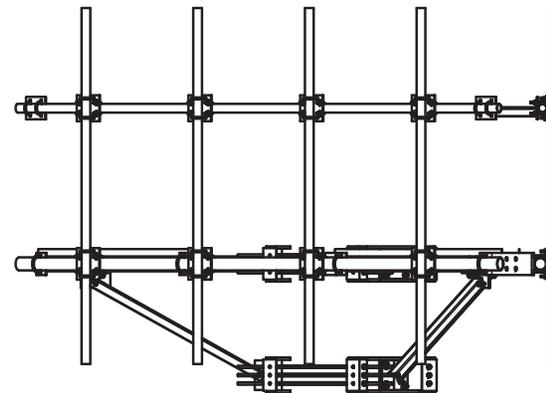
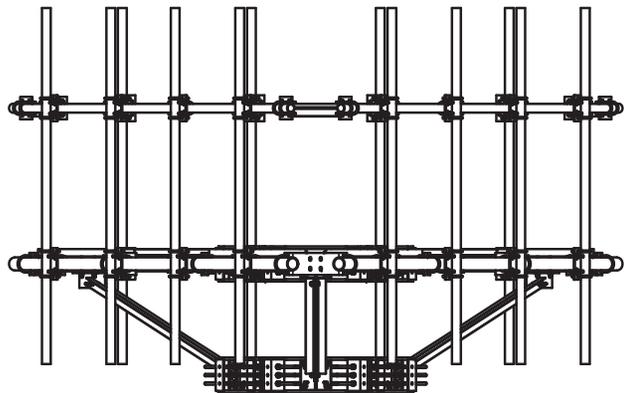
CPD NO. 4488	DRAWN BY CEK 7/14/2014	ENG. APPROVAL
CLASS 81	SUB 02	DRAWING USAGE CUSTOMER
	CHECKED BY BMC 7/14/2014	



Engineering Support Team:
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PART NO. RMQP-496-HK
DWG. NO. RMQP-496-HK



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DESCRIPTION
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CPD NO. 4488	DRAWN BY CEK 7/14/2014	ENG. APPROVAL
CLASS 81	SUB 02	DRAWING USAGE CUSTOMER
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PART NO. RMQP-496-HK	PAGE 3 OF 3
DWG. NO. RMQP-496-HK	

June 23, 2020



T-Mobile
Richard Mohr
4 Sylvan Way
Parsippany, NJ 07054

Project: Anchor Equipment Platform Structural Evaluation

Site Address: Major Road and Route 1, South Brunswick Twp, NJ
Site Number: NJ08012E
KMB Number: 300.5912.50J

To whom it may concern;

KMB Design Group, LLC (KMB) was requested to conduct a structural review to evaluate the proposed additional equipment being deployed by T-Mobile on an existing concrete pad at grade level at the above project location.

As part of the design process, engineers licensed to practice in the State of New Jersey, have reviewed the proposed additional loads to be applied to the existing steel equipment platform. The applicable design codes which govern the structural analysis of this project are as follows:

- *2018 International Building Code – NJ Edition*
- *AISC Steel Construction Manual – 15th Edition*
- *Building Code Requirements and Specification for Masonry Structures – TMS 402-2016*
- *Minimum Design Loads for Buildings and other Structures – ASCE 7-16*
- *Structural Standard for Antenna Supporting Structures and Antennas – TIA-222-H*

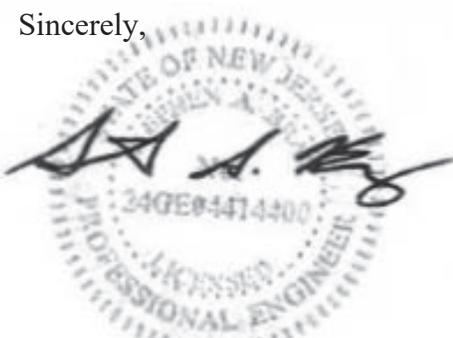
T-Mobile proposed to install RBS 6160 cabinet weighing 2500lbs and B160 cabinet weighing 605 lbs on the existing concrete pad, for a total increase in loading of 3105 lbs.

KMB has reviewed the increase in loading and hereby concludes that the existing equipment pad and attachments can support the proposed loading. Hence, the equipment pad is deemed structurally sufficient as depicted on the latest signed and sealed construction drawings issued by KMB.

KMB's assessment was based on a visual non-intrusive review and assumes that all existing elements are structurally sound.

Should you have any questions or comments do not hesitate to contact us.

Sincerely,



Stephen A. Bray, P.E.
Professional Engineer
NJ PE License No. 24GE04414400
NJ Certificate of Authorization 24GA28150800



Com-Ex Consultants • 115 Route 46 Ste. E39, Mountain Lakes, NJ 07043

November 7, 2018

Smartlink
14 Walsh Drive, Suite 302
Parsippany, NJ 07054

**SUBJECT: Site ID: NJ08012E (Sand Hill 1)
Structural Evaluation of Monopole
Major Road and Route 1, South Brunswick, NJ 08852
Com-Ex Project Number 18067-SMA**

To whom it may concern:

In accordance with your request, Com-Ex Consultants, LLC (Com-Ex) evaluated the structural impact of adding one (1) AIR21_KRC118023-1_B2A/B4P antenna, one (1) per APXVAARR24 43-U-NA20 antenna, and one (1) 449 B71+B12 RRH per sector.

This analysis is based on Com-Ex construction drawings dated 11/7/18 for L600 equipment upgrades.

The monopole appeared to be capable of supporting proposed antenna equipment changes. Our analysis indicated that the monopole is at 100.7% of its overall capacity. Value below 105% are considered passing.

The assessment specifically assumes: The mounts and monopole are in good repair and will be properly maintained. The original design and any previous upgrades were completed as per engineering documentation and manufacturer's requirements and were constructed accordingly. Information regarding base plate and anchor bolts was not available and could not be analyzed. Should base plate and anchor bolt information become available forward to COMEX for review and analysis.

Should you have any question or require additional information, please call me at 862-209-4300.

Sincerely,



Com-Ex Consultants, LLC
Nicholas Barile, P.E.
NJ License #49091



Com-Ex Consultants • 115 Route 46 Ste. E39, Mountain Lakes, NJ 07043

Attachment A

Proposed Equipment Configuration

Final Alpha Sector Antenna Configuration

Rad Center for Antennas is 180'-0"

- (1) (E) AIR21_KRC118023-1_B2A/B4P Antenna
- (1) (N) AIR21_KRC118023-B2P/B4A Antenna
- (1) (N) APXVAARR24_43-U-NA20 Antenna
- (1) (N) 4449 B71+B12 RRH
- (1) (E) 1BX-KRY TMA

Final Beta Sector Antenna Configuration

Rad Center for Antennas is 180'-0"

- (1) (E) AIR21_KRC118023-1_B2A/B4P Antenna
- (1) (N) AIR21_KRC118023-B2P/B4A Antenna
- (1) (N) APXVAARR24_43-U-NA20 Antenna
- (1) (N) 4449 B71+B12 RRH
- (1) (E) 1BX-KRY TMA

Final Gamma Sector Antenna Configuration

Rad Center for Antennas is 180'-0"

- (1) (E) AIR21_KRC118023-1_B2A/B4P Antenna
- (1) (N) AIR21_KRC118023-B2P/B4A Antenna
- (1) (N) APXVAARR24_43-U-NA20 Antenna
- (1) (N) 4449 B71+B12 RRH
- (1) (E) 1BX-KRY TMA

Foundation Analysis

	ORIGINAL DESIGN REACTION	FACTORED DESIGN REACTIONS	PROPOSED FACTORED REACTION	CAPACITY
AXIAL	39.4 K	53.2 K	29 K	
SHEAR	40.4 K	54.5 K	41 K	
MOMENT	4,413 FT-K	5,958 FT-K	3,516 FT-K	59.0%

185.8 ft

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
3.5" Dia. X 5FT Pipe	185.75	(4) SBNHH-1D65A w/ Pipe Mount	162
2.4" Dia. x 6ft Pipe	185.75	(4) SBNHH-1D65A w/ Pipe Mount	162
10ft 8 Element Dipole	185.75	(4) SBNHH-1D65A w/ Pipe Mount	162
12"x24" Beacon	185.75	B25 RRH4X30	162
AIR21_KRC118023-1_B2A/B4P	180	B25 RRH4X30	162
AIR21_KRC118023-1_B2P/B4A	180	B25 RRH4X30	162
APXVAARR24_43-U-NA20	180	9442 RRH2x40-07	162
4449 B71+B12 RRH	180	DC6-48-60-18-8F w/ Mount	162
1BX-KRY TMA	180	RRH8x20-25	162
AIR21_KRC118023-1_B2A/B4P	180	T-Arm Mount	161
AIR21_KRC118023-1_B2P/B4A	180	2.4" Dia. x 6ft Pipe	140
APXVAARR24_43-U-NA20	180	(2) L3X3x1/4 BY 5FT	140
4449 B71+B12 RRH	180	4.5" Dia x 72" Mount Pipe	140
1BX-KRY TMA	180	4.5" Dia x 72" Mount Pipe	140
AIR21_KRC118023-1_B2A/B4P	180	UXA4-107BC	139
AIR21_KRC118023-1_B2P/B4A	180	SU6-107BC	138.83
APXVAARR24_43-U-NA20	180	Side Arm Mount	99.25
4449 B71+B12 RRH	180	20ft x 3.5in Omni	99.25
1BX-KRY TMA	180	20ft x 3.5in Omni	99.25
Platform	179.08	8" Dia. x 21" TMA	99.25
(2) 2.4" Dia. x 6ft Pipe	179.08	Side Arm Mount	99.25
(2) 2.4" Dia. x 6ft Pipe	179.08	L3x3x1/4 by 4ft	97
(2) 2.4" Dia. x 6ft Pipe	179.08	5" Dia x 8" Side Light	97
RRH8x20-25	162	5" Dia x 8" Side Light	97
RRH8x20-25	162	Junction Box (12"x10"x4.25")	96

MATERIAL STRENGTH

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

TOWER DESIGN NOTES

1. Tower is located in Middlesex County, New Jersey.
2. Tower designed for Exposure B to the TIA-222-G Standard.
3. Tower designed for a 120 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 0.75 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Tower Risk Category III and IV.
7. Topographic Category 1 with Crest Height of 0.000 ft
8. TOWER RATING: 100.7%

Section	Length (ft)	Number of Sides	Thickness (in)	Socket Length (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	52.420	12	0.219	2.630	13.528	21.500		2.2
2	44.970	12	0.313	3.610	20.662	29.500	A572-65	3.9
3	51.190	12	0.375	4.720	28.166	38.500	A572-65	7.0
4	48.180	12	0.438	36.797	59.285			11.1
								24.2

133.4 ft

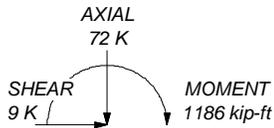
91.0 ft

43.5 ft

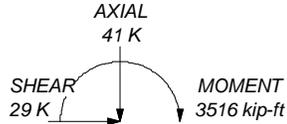
0.0 ft



ALL REACTIONS ARE FACTORED



TORQUE 2 kip-ft
50 mph WIND - 0.750 in ICE



TORQUE 7 kip-ft
REACTIONS - 120 mph WIND

Job:	18067-SMA		
Project:	Monopole		
Client:	Comex	Drawn by:	App'd:
Code:	TIA-222-G	Date:	11/06/18
Phone:		Scale:	NTS
FAX:		Path:	Dwg No. E-1

tnxTower Phone: FAX:	Job 18067-SMA	Page 1 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Tower is located in Middlesex County, New Jersey.

ASCE 7-10 Wind Data is used.

Basic wind speed of 120 mph.

Risk Category III and IV.

Exposure Category B.

Topographic Category 1.

Crest Height 0.000 ft.

Nominal ice thickness of 0.750 in.

Ice thickness is considered to increase with height.

Ice density of 57 pcf.

A wind speed of 50 mph is used in combination with ice.

Deflections calculated using a wind speed of 60 mph.

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	185.800-133.380	52.420	2.630	12	13.528	21.500	0.219	0.875	A572-65 (65 ksi)
L2	133.380-91.040	44.970	3.610	12	20.662	29.500	0.313	1.250	A572-65 (65 ksi)
L3	91.040-43.460	51.190	4.720	12	28.166	38.500	0.375	1.500	A572-65 (65 ksi)
L4	43.460-0.000	48.180		12	36.797	59.285	0.438	1.750	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
L1	13.928	9.377	212.004	4.765	7.008	30.254	429.579	4.615	3.039	13.89
	22.181	14.993	866.717	7.619	11.137	77.823	1756.204	7.379	5.176	23.655
L2	21.816	20.477	1082.382	7.285	10.703	101.128	2193.200	10.078	4.700	15.04
	30.430	29.370	3193.615	10.449	15.281	208.993	6471.129	14.455	7.069	22.619
L3	29.781	33.557	3307.995	9.949	14.590	226.734	6702.895	16.516	6.543	17.449
	39.726	46.036	8540.881	13.649	19.943	428.265	17306.139	22.657	9.313	24.835
L4	40.222	51.222	8643.257	13.017	19.061	453.455	17513.582	25.210	8.689	19.861
	61.222	82.901	36644.089	21.067	30.710	1193.244	74250.859	40.802	14.716	33.636

tnxTower Phone: FAX:	Job 18067-SMA	Page 2 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
L1 185.800-133.3				0	1.03	1.01			
80 L2 133.380-91.04				0	1.03	1.01			
0 L3 91.040-43.460				0	1.03	1.01			
L4 43.460-0.000				0	1.03	1.01			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	$C_A A_A$	Weight	
				ft		ft ² /ft	klf	
Safety Line 3/8	B	No	CaAa (Out Of Face)	185.800 - 11.000	1	No Ice	0.040	0.000
						1/2" Ice	0.140	0.001
						1" Ice	0.240	0.001
Step Pegs (3/4" SR) 7-in w/ Step	B	No	CaAa (Out Of Face)	185.800 - 11.000	1	No Ice	0.030	0.000
						1/2" Ice	0.140	0.001
						1" Ice	0.250	0.002
LDF7-50A (1-5/8")	C	No	Inside Pole	162.000 - 7.000	11	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
LDF7-50A (1-5/8")	C	No	Inside Pole	179.080 - 7.000	6	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
1/2" dia. coax	C	No	Inside Pole	179.080 - 7.000	1	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
LDF7-50A (1-5/8")	C	No	CaAa (Out Of Face)	162.000 - 7.000	1	No Ice	0.000	0.001
						1/2" Ice	0.000	0.002
						1" Ice	0.000	0.004
LDF7-50A (1-5/8")	A	No	Inside Pole	185.750 - 7.000	7	No Ice	0.000	0.001
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
LDF4P-50A (1/2 FOAM)	A	No	Inside Pole	185.750 - 7.000	1	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
LDF5-50A (7/8 FOAM)	A	No	Inside Pole	185.750 - 7.000	3	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000
LDF5-50A (7/8")	C	No	CaAa (Out Of Face)	99.250 - 7.000	1	No Ice	0.000	0.000
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.002
1/4 COAX	C	No	CaAa (Out Of Face)	147.000 - 7.000	3	No Ice	0.000	0.000
						1/2" Ice	0.000	0.001
						1" Ice	0.000	0.001
9/16" LIGHTING CABLE	A	No	Inside Pole	185.750 - 7.000	1	No Ice	0.000	0.000
						1/2" Ice	0.000	0.000
						1" Ice	0.000	0.000

tnxTower Phone: FAX:	Job 18067-SMA	Page 3 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	185.800-133.380	A	0.000	0.000	0.000	0.000	0.381
		B	0.000	0.000	0.000	3.669	0.020
		C	0.000	0.000	0.000	0.000	0.517
L2	133.380-91.040	A	0.000	0.000	0.000	0.000	0.308
		B	0.000	0.000	0.000	2.964	0.017
		C	0.000	0.000	0.000	0.000	0.647
L3	91.040-43.460	A	0.000	0.000	0.000	0.000	0.346
		B	0.000	0.000	0.000	3.331	0.019
		C	0.000	0.000	0.000	0.000	0.739
L4	43.460-0.000	A	0.000	0.000	0.000	0.000	0.265
		B	0.000	0.000	0.000	2.272	0.013
		C	0.000	0.000	0.000	0.000	0.567

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _A A _A In Face ft ²	C _A A _A Out Face ft ²	Weight K
L1	185.800-133.380	A	2.193	0.000	0.000	0.000	0.000	0.381
		B		0.000	0.000	0.000	51.946	0.299
		C		0.000	0.000	0.000	0.000	0.789
L2	133.380-91.040	A	2.117	0.000	0.000	0.000	0.000	0.308
		B		0.000	0.000	0.000	41.957	0.241
		C		0.000	0.000	0.000	0.000	1.217
L3	91.040-43.460	A	2.012	0.000	0.000	0.000	0.000	0.346
		B		0.000	0.000	0.000	45.645	0.262
		C		0.000	0.000	0.000	0.000	1.509
L4	43.460-0.000	A	1.786	0.000	0.000	0.000	0.000	0.265
		B		0.000	0.000	0.000	29.699	0.171
		C		0.000	0.000	0.000	0.000	1.127

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _A A _A Front ft ²	C _A A _A Side ft ²	Weight K	
Side Arm Mount	A	From Leg	2.000	0.000	99.250	No Ice	0.850	1.670	0.065
			0.000			1/2" Ice	1.140	2.340	0.079

tnxTower Phone: FAX:	Job 18067-SMA						Page 4 of 19		
	Project Monopole						Date 12:37:55 11/06/18		
	Client Comex						Designed by		

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	CAAA Front	CAAA Side	Weight	
			Horz	Vert						
			ft	ft	°	ft	ft ²	ft ²	K	
Side Arm Mount	C	From Face	0.000		0.000	99.250	1" Ice	1.430	3.010	0.093
			2.000				No Ice	0.850	1.670	0.065
			0.000				1/2" Ice	1.140	2.340	0.079
20ft x 3.5in Omni	A	From Leg	0.000		0.000	99.250	1" Ice	1.430	3.010	0.093
			4.000				No Ice	6.440	6.440	0.020
			0.000				1/2" Ice	9.040	9.040	0.069
20ft x 3.5in Omni	C	From Face	10.250		0.000	99.250	1" Ice	11.640	11.640	0.119
			4.000				No Ice	6.440	6.440	0.020
			0.000				1/2" Ice	9.040	9.040	0.069
8" Dia. x 21" TMA	A	From Leg	10.250		0.000	99.250	1" Ice	11.640	11.640	0.119
			4.000				No Ice	0.590	0.590	0.025
			0.000				1/2" Ice	0.960	0.960	0.036
4.5" Dia x 72" Mount Pipe	A	From Leg	0.000		0.000	140.000	1" Ice	1.330	1.330	0.047
			1.000				No Ice	1.690	1.690	0.065
			0.000				1/2" Ice	2.620	2.620	0.084
4.5" Dia x 72" Mount Pipe	C	From Face	0.000		0.000	140.000	1" Ice	3.550	3.550	0.103
			1.000				No Ice	1.690	1.690	0.065
			0.000				1/2" Ice	2.620	2.620	0.084
(2) L3X3X1/4 BY 5FT	A	From Face	0.000		0.000	140.000	1" Ice	3.550	3.550	0.103
			1.000				No Ice	1.500	0.070	0.025
			0.000				1/2" Ice	1.850	0.110	0.039
2.4" Dia. x 6ft Pipe	C	From Face	0.000		0.000	140.000	1" Ice	2.200	0.150	0.053
			1.000				No Ice	1.430	1.430	0.022
			0.000				1/2" Ice	1.930	2.300	0.033
T-Arm Mount	C	None	0.000		0.000	161.000	1" Ice	2.430	3.170	0.044
							No Ice	11.590	11.590	0.774
							1/2" Ice	15.440	15.440	0.990
(4) SBNHH-1D65A w/ Pipe Mount	A	From Leg	3.000		40.000	162.000	1" Ice	19.290	19.290	1.206
			0.000				No Ice	6.120	5.100	0.054
			0.000				1/2" Ice	6.560	5.960	0.108
(4) SBNHH-1D65A w/ Pipe Mount	B	From Leg	0.000		50.000	162.000	1" Ice	7.000	6.820	0.162
			3.000				No Ice	6.120	5.100	0.054
			0.000				1/2" Ice	6.560	5.960	0.108
(4) SBNHH-1D65A w/ Pipe Mount	C	From Leg	0.000		50.000	162.000	1" Ice	7.000	6.820	0.162
			3.000				No Ice	6.120	5.100	0.054
			0.000				1/2" Ice	6.560	5.960	0.108
B25 RRH4X30	A	From Leg	0.000		40.000	162.000	1" Ice	7.000	6.820	0.162
			1.500				No Ice	2.200	1.840	0.055
			0.000				1/2" Ice	2.390	1.920	0.075
B25 RRH4X30	B	From Leg	0.000		50.000	162.000	1" Ice	2.580	2.000	0.096
			1.500				No Ice	2.200	1.840	0.055
			0.000				1/2" Ice	2.390	1.920	0.075
B25 RRH4X30	C	From Leg	0.000		50.000	162.000	1" Ice	2.580	2.000	0.096
			1.500				No Ice	2.200	1.840	0.055
			0.000				1/2" Ice	2.390	1.920	0.075
9442 RRH2x40-07	A	From Face	0.000		0.000	162.000	1" Ice	2.580	2.000	0.096
			1.500				No Ice	2.130	1.890	0.051
			0.000				1/2" Ice	2.320	2.070	0.072
DC6-48-60-18-8F w/ Mount	A	From Face	0.000		0.000	162.000	1" Ice	2.510	2.250	0.094
			1.500				No Ice	1.760	1.760	0.043
			0.000				1/2" Ice	2.490	2.490	0.071
RRH8x20-25	A	From Leg	0.000		0.000	162.000	1" Ice	3.220	3.220	0.099
			1.500				No Ice	4.050	1.710	0.070
			0.000				1/2" Ice	4.300	1.900	0.097
RRH8x20-25	B	From Leg	0.000		0.000	162.000	1" Ice	4.550	2.090	0.124
			1.500				No Ice	4.050	1.710	0.070
			0.000				1/2" Ice	4.300	1.900	0.097

tnxTower Phone: FAX:	Job 18067-SMA						Page 5 of 19		
	Project Monopole						Date 12:37:55 11/06/18		
	Client Comex						Designed by		

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	CAAA Front	CAAA Side	Weight
			Horz	Vert					
RRH8x20-25	C	From Leg	0.000		0.000	162.000	4.550	2.090	0.124
			1.500				No Ice	4.050	1.710
			0.000				1/2" Ice	4.300	1.900
			0.000				1" Ice	4.550	2.090
Platform	C	None			0.000	179.080	No Ice	23.100	23.100
							1/2" Ice	26.800	26.800
							1" Ice	30.500	30.500
(2) 2.4" Dia. x 6ft Pipe	A	From Face	1.000		0.000	179.080	No Ice	1.430	1.430
			0.000				1/2" Ice	1.930	2.300
			0.000				1" Ice	2.430	3.170
(2) 2.4" Dia. x 6ft Pipe	B	From Face	1.000		0.000	179.080	No Ice	1.430	1.430
			0.000				1/2" Ice	1.930	2.300
			0.000				1" Ice	2.430	3.170
(2) 2.4" Dia. x 6ft Pipe	C	From Face	1.000		0.000	179.080	No Ice	1.430	1.430
			0.000				1/2" Ice	1.930	2.300
			0.000				1" Ice	2.430	3.170
AIR21_KRC118023-1_B2A/B4P	A	From Leg	3.000		30.000	180.000	No Ice	5.920	4.220
			6.000				1/2" Ice	6.530	4.840
			0.000				1" Ice	7.140	5.460
AIR21_KRC118023-1_B2P/B4A	A	From Leg	3.000		30.000	180.000	No Ice	5.920	4.220
			0.000				1/2" Ice	6.530	4.840
			0.000				1" Ice	7.140	5.460
APXVAARR24_43-U-NA20	A	From Leg	3.000		30.000	180.000	No Ice	17.140	8.740
			-6.000				1/2" Ice	18.200	9.870
			0.000				1" Ice	19.260	11.000
4449 B71+B12 RRH	A	From Leg	3.000		30.000	180.000	No Ice	1.680	1.290
			-6.000				1/2" Ice	1.920	1.510
			0.000				1" Ice	2.160	1.730
1BX-KRY TMA	A	From Leg	3.000		0.000	180.000	No Ice	0.350	0.160
			6.000				1/2" Ice	0.430	0.220
			0.000				1" Ice	0.510	0.280
AIR21_KRC118023-1_B2A/B4P	B	From Leg	3.000		30.000	180.000	No Ice	5.920	4.220
			6.000				1/2" Ice	6.530	4.840
			0.000				1" Ice	7.140	5.460
AIR21_KRC118023-1_B2P/B4A	B	From Leg	3.000		30.000	180.000	No Ice	5.920	4.220
			0.000				1/2" Ice	6.530	4.840
			0.000				1" Ice	7.140	5.460
APXVAARR24_43-U-NA20	B	From Leg	3.000		30.000	180.000	No Ice	17.140	8.740
			-6.000				1/2" Ice	18.200	9.870
			0.000				1" Ice	19.260	11.000
4449 B71+B12 RRH	B	From Leg	3.000		30.000	180.000	No Ice	1.680	1.290
			-6.000				1/2" Ice	1.920	1.510
			0.000				1" Ice	2.160	1.730
1BX-KRY TMA	B	From Leg	3.000		0.000	180.000	No Ice	0.350	0.160
			6.000				1/2" Ice	0.430	0.220
			0.000				1" Ice	0.510	0.280
AIR21_KRC118023-1_B2A/B4P	C	From Leg	3.000		30.000	180.000	No Ice	5.920	4.220
			6.000				1/2" Ice	6.530	4.840
			0.000				1" Ice	7.140	5.460
AIR21_KRC118023-1_B2P/B4A	C	From Leg	3.000		30.000	180.000	No Ice	5.920	4.220
			0.000				1/2" Ice	6.530	4.840
			0.000				1" Ice	7.140	5.460
APXVAARR24_43-U-NA20	C	From Leg	3.000		30.000	180.000	No Ice	17.140	8.740
			-6.000				1/2" Ice	18.200	9.870
			0.000				1" Ice	19.260	11.000
4449 B71+B12 RRH	C	From Leg	3.000		30.000	180.000	No Ice	1.680	1.290
			-6.000				1/2" Ice	1.920	1.510

tnxTower Phone: FAX:	Job 18067-SMA	Page 6 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	CAA Front	CAA Side	Weight					
			Horz	Lateral						Vert	°	ft	ft ²	ft ²
1BX-KRY TMA	C	From Leg	0.000		0.000	180.000	1" Ice	2.160	1.730	0.109				
			3.000								No Ice	0.350	0.160	0.011
			6.000								1/2" Ice	0.430	0.220	0.014
3.5" Dia. X 5FT Pipe	C	From Leg	0.000		0.000	185.750	1" Ice	0.510	0.280	0.017				
			0.500								No Ice	1.480	1.480	0.056
			0.000								1/2" Ice	2.040	2.040	0.074
2.4" Dia. x 6ft Pipe	C	From Leg	0.000		0.000	185.750	1" Ice	2.600	2.600	0.092				
			1.000								No Ice	1.430	1.430	0.022
			0.000								1/2" Ice	1.930	2.300	0.033
10ft 8 Element Dipole	C	From Leg	3.000		0.000	185.750	1" Ice	2.430	3.170	0.044				
			0.500								No Ice	2.500	2.500	0.030
			0.000								1/2" Ice	3.530	3.530	0.049
12"x24" Beacon	C	From Leg	5.500		0.000	185.750	1" Ice	4.560	4.560	0.067				
			0.300								No Ice	1.000	1.000	0.030
			0.000								1/2" Ice	1.580	1.580	0.050
5" Dia x 8" Side Light	A	From Leg	3.000		0.000	97.000	1" Ice	2.160	2.160	0.069				
			2.000								No Ice	0.160	0.160	0.010
			0.000								1/2" Ice	0.260	0.260	0.013
5" Dia x 8" Side Light	C	From Leg	0.000		0.000	97.000	1" Ice	0.360	0.360	0.016				
			2.000								No Ice	0.160	0.160	0.010
			0.000								1/2" Ice	0.260	0.260	0.013
L3x3x1/4 by 4ft	C	None	0.000		0.000	97.000	1" Ice	0.360	0.360	0.016				
											No Ice	1.700	1.700	0.020
											1/2" Ice	1.990	1.990	0.031
Junction Box (12"x10"x4.25")	C	None			0.000	96.000	1" Ice	2.280	2.280	0.042				
											No Ice	1.130	0.520	0.010
											1/2" Ice	1.260	0.620	0.018
						1" Ice	1.390	0.720	0.026					

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight				
				Horz	Lateral							Vert	°	°	ft
UXA4-107BC	C	Paraboloid w/Shroud (HP)	From Face	2.500		Worst		139.000	4.000	No Ice	12.570	0.088			
				0.000									1/2" Ice	13.100	0.155
				0.000									1" Ice	13.630	0.222
SU6-107BC	C	Paraboloid w/Shroud (HP)	From Face	2.500		Worst		138.830	6.000	No Ice	28.270	0.209			
				0.000									1/2" Ice	29.070	0.358
				0.000									1" Ice	29.870	0.507

Tower Pressures - No Ice

$$G_H = 1.100$$

tnxTower Phone: FAX:	Job	18067-SMA	Page	7 of 19
	Project	Monopole	Date	12:37:55 11/06/18
	Client	Comex	Designed by	

Section Elevation ft	z ft	K _Z	q _z ksf	A _G ft ²	F a c e ft ²	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _{AA} In Face ft ²	C _{AA} Out Face ft ²
185.800-133.380	157.896	1.126	0.039	78.869	A	0.000	81.235	81.235	100.00	0.000	0.000
					B	0.000	81.235	100.00	0.000	3.669	
					C	0.000	81.235	100.00	0.000	0.000	
133.380-91.040	111.331	1.019	0.036	92.172	A	0.000	94.937	94.937	100.00	0.000	0.000
					B	0.000	94.937	100.00	0.000	2.964	
					C	0.000	94.937	100.00	0.000	0.000	
91.040-43.460	66.722	0.88	0.031	137.798	A	0.000	141.932	141.932	100.00	0.000	0.000
					B	0.000	141.932	100.00	0.000	3.331	
					C	0.000	141.932	100.00	0.000	0.000	
43.460-0.000	20.342	0.7	0.025	183.697	A	0.000	189.208	189.208	100.00	0.000	0.000
					B	0.000	189.208	100.00	0.000	2.272	
					C	0.000	189.208	100.00	0.000	0.000	

Tower Pressure - With Ice

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _z ksf	t _z in	A _G ft ²	F a c e ft ²	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _{AA} In Face ft ²	C _{AA} Out Face ft ²
185.800-133.380	157.896	1.126	0.007	2.193	98.026	A	0.000	100.967	100.967	100.00	0.000	0.000
						B	0.000	100.967	100.00	0.000	51.946	
						C	0.000	100.967	100.00	0.000	0.000	
133.380-91.040	111.331	1.019	0.006	2.117	107.645	A	0.000	110.874	110.874	100.00	0.000	0.000
						B	0.000	110.874	100.00	0.000	41.957	
						C	0.000	110.874	100.00	0.000	0.000	
91.040-43.460	66.722	0.88	0.005	2.012	154.589	A	0.000	159.227	159.227	100.00	0.000	0.000
						B	0.000	159.227	100.00	0.000	45.645	
						C	0.000	159.227	100.00	0.000	0.000	
L4 43.460-0.000	20.342	0.7	0.004	1.786	198.269	A	0.000	204.217	204.217	100.00	0.000	0.000
						B	0.000	204.217	100.00	0.000	29.699	
						C	0.000	204.217	100.00	0.000	0.000	

Tower Pressure - Service

$G_H = 1.100$

Section Elevation ft	z ft	K _Z	q _z ksf	A _G ft ²	F a c e ft ²	A _F ft ²	A _R ft ²	A _{leg} ft ²	Leg %	C _{AA} In Face ft ²	C _{AA} Out Face ft ²
185.800-133.380	157.896	1.126	0.009	78.869	A	0.000	81.235	81.235	100.00	0.000	0.000
					B	0.000	81.235	100.00	0.000	3.669	
					C	0.000	81.235	100.00	0.000	0.000	
133.380-91.040	111.331	1.019	0.008	92.172	A	0.000	94.937	94.937	100.00	0.000	0.000
					B	0.000	94.937	100.00	0.000	2.964	
					C	0.000	94.937	100.00	0.000	0.000	
91.040-43.460	66.722	0.88	0.007	137.798	A	0.000	141.932	141.932	100.00	0.000	0.000
					B	0.000	141.932	100.00	0.000	3.331	
					C	0.000	141.932	100.00	0.000	0.000	
L4	20.342	0.7	0.006	183.697	A	0.000	189.208	189.208	100.00	0.000	0.000

tnxTower Phone: FAX:	Job 18067-SMA	Page 9 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Description	Aiming Azimuth °	Weight K	Offset _x ft	Offset _z ft	z ft	K _z	q _z ksf	C _{AAc} Front ft ²	C _{AAc} Side ft ²
AIR21_KRC118023-1_B 2P/B4A	270.000	0.083	-3.118	1.800	180.000	1.169	0.041	5.920	4.220
APXVAARR24_43-U-N A20	270.000	0.115	-0.118	6.996	180.000	1.169	0.041	17.140	8.740
4449 B71+B12 RRH	270.000	0.074	-0.118	6.996	180.000	1.169	0.041	1.680	1.290
1BX-KRY TMA	240.000	0.011	-6.118	-3.396	180.000	1.169	0.041	0.350	0.160
3.5" Dia. X 5FT Pipe	240.000	0.056	-0.921	0.532	185.750	1.179	0.041	1.480	1.480
2.4" Dia. x 6ft Pipe	240.000	0.022	-1.354	0.782	188.750	1.185	0.041	1.430	1.430
10ft 8 Element Dipole	240.000	0.030	-0.921	0.532	191.250	1.189	0.042	2.500	2.500
12"x24" Beacon	240.000	0.030	-0.748	0.432	188.750	1.185	0.041	1.000	1.000
5" Dia x 8" Side Light	0.000	0.010	0.000	-3.180	97.000	0.980	0.034	0.160	0.160
5" Dia x 8" Side Light	240.000	0.010	-2.754	1.590	97.000	0.980	0.034	0.160	0.160
L3x3x1/4 by 4ft	0.000	0.020	0.000	0.000	97.000	0.980	0.034	1.700	1.700
Junction Box (12"x10"x4.25")	0.000	0.010	0.000	0.000	96.000	0.977	0.034	1.130	0.520
Sum Weight:		5.802							

Discrete Appurtenance Pressures - With Ice G_H = 1.100

Description	Aiming Azimuth °	Weight K	Offset _x ft	Offset _z ft	z ft	K _z	q _z ksf	C _{AAc} Front ft ²	C _{AAc} Side ft ²	t _z in
Side Arm Mount	0.000	0.124	0.000	-3.162	99.250	0.986	0.006	2.064	4.475	2.093
Side Arm Mount	180.000	0.124	0.000	3.162	99.250	0.986	0.006	2.064	4.475	2.093
20ft x 3.5in Omni	0.000	0.229	0.000	-5.162	109.500	1.014	0.006	17.432	17.432	2.114
20ft x 3.5in Omni	180.000	0.229	0.000	5.162	109.500	1.014	0.006	17.432	17.432	2.114
8" Dia. x 21" TMA	0.000	0.072	0.000	-5.162	99.250	0.986	0.006	2.139	2.139	2.093
4.5" Dia x 72" Mount Pipe	0.000	0.148	0.000	-1.854	140.000	1.088	0.007	5.720	5.720	2.167
4.5" Dia x 72" Mount Pipe	180.000	0.148	0.000	1.854	140.000	1.088	0.007	5.720	5.720	2.167
L3X3X1/4 BY 5FT	300.000	0.171	-1.606	-0.927	140.000	1.088	0.007	6.033	0.487	2.167
2.4" Dia. x 6ft Pipe	180.000	0.069	0.000	1.854	140.000	1.088	0.007	3.597	5.200	2.167
T-Arm Mount	0.000	1.724	0.000	0.000	161.000	1.132	0.007	28.507	28.507	2.197
SBNHH-1D65A w/ Pipe Mount	40.000	1.162	0.000	-3.714	162.000	1.134	0.007	32.218	35.525	2.198
SBNHH-1D65A w/ Pipe Mount	170.000	1.162	3.217	1.857	162.000	1.134	0.007	32.218	35.525	2.198
SBNHH-1D65A w/ Pipe Mount	290.000	1.162	-3.217	1.857	162.000	1.134	0.007	32.218	35.525	2.198
B25 RRH4X30	40.000	0.145	0.000	-2.214	162.000	1.134	0.007	3.035	2.192	2.198
B25 RRH4X30	170.000	0.145	1.918	1.107	162.000	1.134	0.007	3.035	2.192	2.198
B25 RRH4X30	290.000	0.145	-1.918	1.107	162.000	1.134	0.007	3.035	2.192	2.198
9442 RRH2x40-07	300.000	0.145	-1.918	-1.107	162.000	1.134	0.007	2.965	2.681	2.198
DC6-48-60-18-8F w/ Mount	300.000	0.165	-1.918	-1.107	162.000	1.134	0.007	4.970	4.970	2.198
RRH8x20-25	0.000	0.189	0.000	-2.214	162.000	1.134	0.007	5.149	2.545	2.198
RRH8x20-25	120.000	0.189	1.918	1.107	162.000	1.134	0.007	5.149	2.545	2.198
RRH8x20-25	240.000	0.189	-1.918	1.107	162.000	1.134	0.007	5.149	2.545	2.198
Platform	0.000	3.876	0.000	0.000	179.080	1.167	0.007	39.532	39.532	2.221
2.4" Dia. x 6ft Pipe	300.000	0.140	-1.391	-0.803	179.080	1.167	0.007	7.301	10.587	2.221
2.4" Dia. x 6ft Pipe	60.000	0.140	1.391	-0.803	179.080	1.167	0.007	7.301	10.587	2.221
2.4" Dia. x 6ft Pipe	180.000	0.140	0.000	1.606	179.080	1.167	0.007	7.301	10.587	2.221
AIR21_KRC118023-1_B 2A/B4P	30.000	0.265	6.000	-3.600	180.000	1.169	0.007	8.630	6.975	2.222
AIR21_KRC118023-1_B 2P/B4A	30.000	0.265	0.000	-3.600	180.000	1.169	0.007	8.630	6.975	2.222

tnxTower Phone: FAX:	Job	18067-SMA	Page	10 of 19
	Project	Monopole	Date	12:37:55 11/06/18
	Client	Comex	Designed by	

Description	Aiming Azimuth °	Weight K	Offset _x ft	Offset _z ft	z ft	K _z	q _z ksf	C _{AAC} Front ft ²	C _{AAC} Side ft ²	t _z in
APXVAARR24_43-U-N A20	30.000	0.547	-6.000	-3.600	180.000	1.169	0.007	21.850	13.761	2.222
4449 B71+B12 RRH	30.000	0.151	-6.000	-3.600	180.000	1.169	0.007	2.746	2.268	2.222
1BX-KRY TMA	0.000	0.025	6.000	-3.600	180.000	1.169	0.007	0.705	0.427	2.222
AIR21_KRC118023-1_B 2A/B4P	150.000	0.265	0.118	6.996	180.000	1.169	0.007	8.630	6.975	2.222
AIR21_KRC118023-1_B 2P/B4A	150.000	0.265	3.118	1.800	180.000	1.169	0.007	8.630	6.975	2.222
APXVAARR24_43-U-N A20	150.000	0.547	6.118	-3.396	180.000	1.169	0.007	21.850	13.761	2.222
4449 B71+B12 RRH	150.000	0.151	6.118	-3.396	180.000	1.169	0.007	2.746	2.268	2.222
1BX-KRY TMA	120.000	0.025	0.118	6.996	180.000	1.169	0.007	0.705	0.427	2.222
AIR21_KRC118023-1_B 2A/B4P	270.000	0.265	-6.118	-3.396	180.000	1.169	0.007	8.630	6.975	2.222
AIR21_KRC118023-1_B 2P/B4A	270.000	0.265	-3.118	1.800	180.000	1.169	0.007	8.630	6.975	2.222
APXVAARR24_43-U-N A20	270.000	0.547	-0.118	6.996	180.000	1.169	0.007	21.850	13.761	2.222
4449 B71+B12 RRH	270.000	0.151	-0.118	6.996	180.000	1.169	0.007	2.746	2.268	2.222
1BX-KRY TMA	240.000	0.025	-6.118	-3.396	180.000	1.169	0.007	0.705	0.427	2.222
3.5" Dia. X 5FT Pipe	240.000	0.136	-0.921	0.532	185.750	1.179	0.007	3.976	3.976	2.229
2.4" Dia. x 6ft Pipe	240.000	0.070	-1.354	0.782	188.750	1.185	0.007	3.662	5.314	2.232
10ft 8 Element Dipole	240.000	0.113	-0.921	0.532	191.250	1.189	0.007	7.104	7.104	2.235
12"x24" Beacon	240.000	0.117	-0.748	0.432	188.750	1.185	0.007	3.589	3.589	2.232
5" Dia x 8" Side Light	0.000	0.023	0.000	-3.180	97.000	0.980	0.006	0.578	0.578	2.088
5" Dia x 8" Side Light	240.000	0.023	-2.754	1.590	97.000	0.980	0.006	0.578	0.578	2.088
L3x3x1/4 by 4ft	0.000	0.067	0.000	0.000	97.000	0.980	0.006	2.911	2.911	2.088
Junction Box (12"x10"x4.25")	0.000	0.043	0.000	0.000	96.000	0.977	0.006	1.672	0.937	2.086
Sum Weight:		16.483								

Discrete Appurtenance Pressures - Service G_H = 1.100

Description	Aiming Azimuth °	Weight K	Offset _x ft	Offset _z ft	z ft	K _z	q _z ksf	C _{AAC} Front ft ²	C _{AAC} Side ft ²
Side Arm Mount	0.000	0.065	0.000	-3.162	99.250	0.986	0.008	0.850	1.670
Side Arm Mount	180.000	0.065	0.000	3.162	99.250	0.986	0.008	0.850	1.670
20ft x 3.5in Omni	0.000	0.020	0.000	-5.162	109.500	1.014	0.008	6.440	6.440
20ft x 3.5in Omni	180.000	0.020	0.000	5.162	109.500	1.014	0.008	6.440	6.440
8" Dia. x 21" TMA	0.000	0.025	0.000	-5.162	99.250	0.986	0.008	0.590	0.590
4.5" Dia x 72" Mount Pipe	0.000	0.065	0.000	-1.854	140.000	1.088	0.009	1.690	1.690
4.5" Dia x 72" Mount Pipe	180.000	0.065	0.000	1.854	140.000	1.088	0.009	1.690	1.690
L3X3X1/4 BY 5FT	300.000	0.049	-1.606	-0.927	140.000	1.088	0.009	3.000	0.140
2.4" Dia. x 6ft Pipe	180.000	0.022	0.000	1.854	140.000	1.088	0.009	1.430	1.430
T-Arm Mount	0.000	0.774	0.000	0.000	161.000	1.132	0.009	11.590	11.590
SBNHH-1D65A w/ Pipe Mount	40.000	0.216	0.000	-3.714	162.000	1.134	0.009	24.480	20.400
SBNHH-1D65A w/ Pipe Mount	170.000	0.216	3.217	1.857	162.000	1.134	0.009	24.480	20.400
SBNHH-1D65A w/ Pipe Mount	290.000	0.216	-3.217	1.857	162.000	1.134	0.009	24.480	20.400
B25 RRH4X30	40.000	0.055	0.000	-2.214	162.000	1.134	0.009	2.200	1.840
B25 RRH4X30	170.000	0.055	1.918	1.107	162.000	1.134	0.009	2.200	1.840
B25 RRH4X30	290.000	0.055	-1.918	1.107	162.000	1.134	0.009	2.200	1.840

tnxTower Phone: FAX:	Job 18067-SMA	Page 11 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Description	Aiming	Weight	Offset _x	Offset _z	z	K _z	q _z	C _{AAc} Front	C _{AAc} Side
	Azimuth °	K	ft	ft	ft		ksf	ft ²	ft ²
9442 RRH2x40-07	300.000	0.051	-1.918	-1.107	162.000	1.134	0.009	2.130	1.890
DC6-48-60-18-8F w/ Mount	300.000	0.043	-1.918	-1.107	162.000	1.134	0.009	1.760	1.760
RRH8x20-25	0.000	0.070	0.000	-2.214	162.000	1.134	0.009	4.050	1.710
RRH8x20-25	120.000	0.070	1.918	1.107	162.000	1.134	0.009	4.050	1.710
RRH8x20-25	240.000	0.070	-1.918	1.107	162.000	1.134	0.009	4.050	1.710
Platform	0.000	2.100	0.000	0.000	179.080	1.167	0.009	23.100	23.100
2.4" Dia. x 6ft Pipe	300.000	0.044	-1.391	-0.803	179.080	1.167	0.009	2.860	2.860
2.4" Dia. x 6ft Pipe	60.000	0.044	1.391	-0.803	179.080	1.167	0.009	2.860	2.860
2.4" Dia. x 6ft Pipe	180.000	0.044	0.000	1.606	179.080	1.167	0.009	2.860	2.860
AIR21_KRC118023-1_B 2A/B4P	30.000	0.083	6.000	-3.600	180.000	1.169	0.009	5.920	4.220
AIR21_KRC118023-1_B 2P/B4A	30.000	0.083	0.000	-3.600	180.000	1.169	0.009	5.920	4.220
APXVAARR24_43-U-N A20	30.000	0.115	-6.000	-3.600	180.000	1.169	0.009	17.140	8.740
4449 B71+B12 RRH	30.000	0.074	-6.000	-3.600	180.000	1.169	0.009	1.680	1.290
1BX-KRY TMA	0.000	0.011	6.000	-3.600	180.000	1.169	0.009	0.350	0.160
AIR21_KRC118023-1_B 2A/B4P	150.000	0.083	0.118	6.996	180.000	1.169	0.009	5.920	4.220
AIR21_KRC118023-1_B 2P/B4A	150.000	0.083	3.118	1.800	180.000	1.169	0.009	5.920	4.220
APXVAARR24_43-U-N A20	150.000	0.115	6.118	-3.396	180.000	1.169	0.009	17.140	8.740
4449 B71+B12 RRH	150.000	0.074	6.118	-3.396	180.000	1.169	0.009	1.680	1.290
1BX-KRY TMA	120.000	0.011	0.118	6.996	180.000	1.169	0.009	0.350	0.160
AIR21_KRC118023-1_B 2A/B4P	270.000	0.083	-6.118	-3.396	180.000	1.169	0.009	5.920	4.220
AIR21_KRC118023-1_B 2P/B4A	270.000	0.083	-3.118	1.800	180.000	1.169	0.009	5.920	4.220
APXVAARR24_43-U-N A20	270.000	0.115	-0.118	6.996	180.000	1.169	0.009	17.140	8.740
4449 B71+B12 RRH	270.000	0.074	-0.118	6.996	180.000	1.169	0.009	1.680	1.290
1BX-KRY TMA	240.000	0.011	-6.118	-3.396	180.000	1.169	0.009	0.350	0.160
3.5" Dia. X 5FT Pipe	240.000	0.056	-0.921	0.532	185.750	1.179	0.009	1.480	1.480
2.4" Dia. x 6ft Pipe	240.000	0.022	-1.354	0.782	188.750	1.185	0.009	1.430	1.430
10ft 8 Element Dipole	240.000	0.030	-0.921	0.532	191.250	1.189	0.009	2.500	2.500
12"x24" Beacon	240.000	0.030	-0.748	0.432	188.750	1.185	0.009	1.000	1.000
5" Dia x 8" Side Light	0.000	0.010	0.000	-3.180	97.000	0.980	0.008	0.160	0.160
5" Dia x 8" Side Light	240.000	0.010	-2.754	1.590	97.000	0.980	0.008	0.160	0.160
L3x3x1/4 by 4ft	0.000	0.020	0.000	0.000	97.000	0.980	0.008	1.700	1.700
Junction Box (12"x10"x4.25")	0.000	0.010	0.000	0.000	96.000	0.977	0.008	1.130	0.520
Sum Weight:		5.802							

Dish Pressures - No Ice

Elevation ft	Dish Description	Aiming Azimuth °	Weight K	Offset _x ft	Offset _z ft	K _z	A _A ft ²	q _z ksf
139.000	UXA4-107BC	220.000	0.088	0.000	3.360	1.086	12.570	0.038
138.830	SU6-107BC	140.000	0.209	0.000	3.361	1.085	28.270	0.038
	Sum Weight:		0.297					

tnxTower Phone: FAX:	Job 18067-SMA	Page 12 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Dish Pressures - With Ice

Elevation ft	Dish Description	Aiming Azimuth °	Weight K	Offset _x ft	Offset _z ft	K _z	A _A ft ²	q _z ksf	t _z in
139.000	UXA4-107BC	220.000	0.320	0.000	3.360	1.086	14.406	0.007	1.732
138.830	SU6-107BC	140.000	0.726	0.000	3.361	1.085	31.041	0.007	1.732
	Sum		1.046						
	Weight:								

Dish Pressures - Service

Elevation ft	Dish Description	Aiming Azimuth °	Weight K	Offset _x ft	Offset _z ft	K _z	A _A ft ²	q _z ksf
139.000	UXA4-107BC	220.000	0.088	0.000	3.360	1.086	12.570	0.009
138.830	SU6-107BC	140.000	0.209	0.000	3.361	1.085	28.270	0.009
	Sum		0.297					
	Weight:							

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 30 deg - No Ice
5	0.9 Dead+1.0 Wind 30 deg - No Ice
6	1.2 Dead+1.0 Wind 60 deg - No Ice
7	0.9 Dead+1.0 Wind 60 deg - No Ice
8	1.2 Dead+1.0 Wind 90 deg - No Ice
9	0.9 Dead+1.0 Wind 90 deg - No Ice
10	1.2 Dead+1.0 Wind 120 deg - No Ice
11	0.9 Dead+1.0 Wind 120 deg - No Ice
12	1.2 Dead+1.0 Wind 150 deg - No Ice
13	0.9 Dead+1.0 Wind 150 deg - No Ice
14	1.2 Dead+1.0 Wind 180 deg - No Ice
15	0.9 Dead+1.0 Wind 180 deg - No Ice
16	1.2 Dead+1.0 Wind 210 deg - No Ice
17	0.9 Dead+1.0 Wind 210 deg - No Ice
18	1.2 Dead+1.0 Wind 240 deg - No Ice
19	0.9 Dead+1.0 Wind 240 deg - No Ice
20	1.2 Dead+1.0 Wind 270 deg - No Ice
21	0.9 Dead+1.0 Wind 270 deg - No Ice
22	1.2 Dead+1.0 Wind 300 deg - No Ice
23	0.9 Dead+1.0 Wind 300 deg - No Ice
24	1.2 Dead+1.0 Wind 330 deg - No Ice
25	0.9 Dead+1.0 Wind 330 deg - No Ice
26	1.2 Dead+1.0 Ice
27	1.2 Dead+1.0 Wind 0 deg+1.0 Ice
28	1.2 Dead+1.0 Wind 30 deg+1.0 Ice
29	1.2 Dead+1.0 Wind 60 deg+1.0 Ice
30	1.2 Dead+1.0 Wind 90 deg+1.0 Ice
31	1.2 Dead+1.0 Wind 120 deg+1.0 Ice
32	1.2 Dead+1.0 Wind 150 deg+1.0 Ice
33	1.2 Dead+1.0 Wind 180 deg+1.0 Ice

tnxTower Phone: FAX:	Job 18067-SMA	Page 13 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Comb. No.	Description
34	1.2 Dead+1.0 Wind 210 deg+1.0 Ice
35	1.2 Dead+1.0 Wind 240 deg+1.0 Ice
36	1.2 Dead+1.0 Wind 270 deg+1.0 Ice
37	1.2 Dead+1.0 Wind 300 deg+1.0 Ice
38	1.2 Dead+1.0 Wind 330 deg+1.0 Ice
39	Dead+Wind 0 deg - Service
40	Dead+Wind 30 deg - Service
41	Dead+Wind 60 deg - Service
42	Dead+Wind 90 deg - Service
43	Dead+Wind 120 deg - Service
44	Dead+Wind 150 deg - Service
45	Dead+Wind 180 deg - Service
46	Dead+Wind 210 deg - Service
47	Dead+Wind 240 deg - Service
48	Dead+Wind 270 deg - Service
49	Dead+Wind 300 deg - Service
50	Dead+Wind 330 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov.	Axial	Major Axis	Minor Axis
				Load Comb.	K	Moment kip-ft	Moment kip-ft
L1	185.8 - 133.38	Pole	Max Tension	36	0.002	-0.000	0.006
			Max. Compression	26	-24.552	1.751	-4.216
			Max. Mx	20	-7.503	457.117	0.143
			Max. My	14	-7.499	-0.032	-459.210
			Max. Vy	20	-16.315	457.117	0.143
			Max. Vx	14	16.318	-0.032	-459.210
			Max. Torque	20			7.392
L2	133.38 - 91.04	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-34.971	2.071	-4.331
			Max. Mx	20	-14.137	1213.141	2.326
			Max. My	14	-14.144	-2.446	-1214.862
			Max. Vy	20	-20.666	1213.141	2.326
			Max. Vx	14	20.607	-2.446	-1214.862
			Max. Torque	20			7.365
L3	91.04 - 43.46	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-49.716	2.186	-4.573
			Max. Mx	20	-24.659	2268.260	4.955
			Max. My	14	-24.662	-5.202	-2267.164
			Max. Vy	20	-24.672	2268.260	4.955
			Max. Vx	14	24.611	-5.202	-2267.164
			Max. Torque	20			7.088
L4	43.46 - 0	Pole	Max Tension	1	0.000	0.000	0.000
			Max. Compression	26	-71.910	2.186	-4.573
			Max. Mx	20	-40.893	3564.631	7.739
			Max. My	14	-40.893	-7.975	-3560.617
			Max. Vy	20	-29.494	3564.631	7.739
			Max. Vx	14	29.434	-7.975	-3560.617
			Max. Torque	20			7.021

Maximum Reactions

tnxTower Phone: FAX:	Job 18067-SMA	Page 14 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	36	71.910	8.643	0.024
	Max. H _x	21	30.682	29.471	0.056
	Max. H _z	2	40.909	0.056	29.411
	Max. M _x	2	3558.396	0.056	29.411
	Max. M _z	8	3563.491	-29.471	-0.056
	Max. Torsion	20	7.013	29.471	0.056
	Min. Vert	13	30.682	-14.784	-25.499
	Min. H _x	9	30.682	-29.471	-0.056
	Min. H _z	14	40.909	-0.056	-29.411
	Min. M _x	14	-3560.617	-0.056	-29.411
	Min. M _z	20	-3564.631	29.471	0.056
	Min. Torsion	8	-7.007	-29.471	-0.056

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
Dead Only	34.091	-0.000	0.000	0.897	0.464	-0.000
1.2 Dead+1.0 Wind 0 deg - No Ice	40.909	-0.056	-29.411	-3558.396	9.081	-0.627
0.9 Dead+1.0 Wind 0 deg - No Ice	30.682	-0.056	-29.411	-3493.334	8.773	-0.615
1.2 Dead+1.0 Wind 30 deg - No Ice	40.909	14.687	-25.442	-3077.423	-1773.982	2.960
0.9 Dead+1.0 Wind 30 deg - No Ice	30.682	14.687	-25.442	-3021.152	-1741.618	2.970
1.2 Dead+1.0 Wind 60 deg - No Ice	40.909	25.494	-14.656	-1771.558	-3081.672	5.754
0.9 Dead+1.0 Wind 60 deg - No Ice	30.682	25.494	-14.656	-1739.230	-3025.319	5.760
1.2 Dead+1.0 Wind 90 deg - No Ice	40.909	29.471	0.056	9.317	-3563.491	7.007
0.9 Dead+1.0 Wind 90 deg - No Ice	30.682	29.471	0.056	8.951	-3498.267	7.007
1.2 Dead+1.0 Wind 120 deg - No Ice	40.909	25.551	14.754	1787.974	-3090.318	6.384
0.9 Dead+1.0 Wind 120 deg - No Ice	30.682	25.551	14.754	1754.916	-3033.746	6.377
1.2 Dead+1.0 Wind 150 deg - No Ice	40.909	14.784	25.499	3087.850	-1788.939	4.052
0.9 Dead+1.0 Wind 150 deg - No Ice	30.682	14.784	25.499	3030.870	-1756.239	4.041
1.2 Dead+1.0 Wind 180 deg - No Ice	40.909	0.056	29.411	3560.617	-7.975	0.633
0.9 Dead+1.0 Wind 180 deg - No Ice	30.682	0.056	29.411	3494.934	-7.980	0.621
1.2 Dead+1.0 Wind 210 deg - No Ice	40.909	-14.687	25.442	3079.499	1775.376	-2.959
0.9 Dead+1.0 Wind 210 deg - No Ice	30.682	-14.687	25.442	3022.650	1742.614	-2.969
1.2 Dead+1.0 Wind 240 deg - No Ice	40.909	-25.494	14.656	1773.312	3083.083	-5.759
0.9 Dead+1.0 Wind 240 deg - No Ice	30.682	-25.494	14.656	1740.503	3026.326	-5.764
1.2 Dead+1.0 Wind 270 deg - No Ice	40.909	-29.471	-0.056	-7.740	3564.631	-7.013

tnxTower Phone: FAX:	Job 18067-SMA	Page 15 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Load Combination	Vertical K	Shear _x K	Shear _z K	Overturning Moment, M _x kip-ft	Overturning Moment, M _z kip-ft	Torque kip-ft
0.9 Dead+1.0 Wind 270 deg - No Ice	30.682	-29.471	-0.056	-7.802	3499.085	-7.012
1.2 Dead+1.0 Wind 300 deg - No Ice	40.909	-25.551	-14.754	-1786.252	3091.170	-6.384
0.9 Dead+1.0 Wind 300 deg - No Ice	30.682	-25.551	-14.754	-1753.667	3034.362	-6.378
1.2 Dead+1.0 Wind 330 deg - No Ice	40.909	-14.784	-25.499	-3085.806	1789.774	-4.047
0.9 Dead+1.0 Wind 330 deg - No Ice	30.682	-14.784	-25.499	-3029.395	1756.843	-4.036
1.2 Dead+1.0 Ice	71.910	-0.000	0.000	4.573	2.186	-0.000
1.2 Dead+1.0 Wind 0 deg+1.0 Ice	71.910	-0.024	-8.578	-1193.631	6.654	-0.348
1.2 Dead+1.0 Wind 30 deg+1.0 Ice	71.910	4.301	-7.417	-1031.058	-597.488	0.459
1.2 Dead+1.0 Wind 60 deg+1.0 Ice	71.910	7.473	-4.268	-590.781	-1040.950	1.144
1.2 Dead+1.0 Wind 90 deg+1.0 Ice	71.910	8.643	0.024	9.036	-1204.707	1.523
1.2 Dead+1.0 Wind 120 deg+1.0 Ice	71.910	7.497	4.310	607.684	-1045.425	1.492
1.2 Dead+1.0 Wind 150 deg+1.0 Ice	71.910	4.342	7.441	1044.757	-605.223	1.061
1.2 Dead+1.0 Wind 180 deg+1.0 Ice	71.910	0.024	8.578	1202.930	-2.231	0.345
1.2 Dead+1.0 Wind 210 deg+1.0 Ice	71.910	-4.301	7.417	1040.340	601.965	-0.462
1.2 Dead+1.0 Wind 240 deg+1.0 Ice	71.910	-7.473	4.268	600.006	1045.435	-1.145
1.2 Dead+1.0 Wind 270 deg+1.0 Ice	71.910	-8.643	-0.024	0.150	1209.146	-1.520
1.2 Dead+1.0 Wind 300 deg+1.0 Ice	71.910	-7.497	-4.310	-598.476	1049.812	-1.489
1.2 Dead+1.0 Wind 330 deg+1.0 Ice	71.910	-4.342	-7.441	-1035.492	609.602	-1.061
Dead+Wind 0 deg - Service	34.091	-0.013	-6.579	-790.503	2.381	-0.149
Dead+Wind 30 deg - Service	34.091	3.285	-5.691	-683.526	-394.092	0.699
Dead+Wind 60 deg - Service	34.091	5.703	-3.278	-393.150	-684.842	1.360
Dead+Wind 90 deg - Service	34.091	6.592	0.013	2.823	-791.963	1.657
Dead+Wind 120 deg - Service	34.091	5.715	3.300	398.295	-686.747	1.509
Dead+Wind 150 deg - Service	34.091	3.307	5.704	687.297	-397.385	0.958
Dead+Wind 180 deg - Service	34.091	0.013	6.579	792.387	-1.410	0.150
Dead+Wind 210 deg - Service	34.091	-3.285	5.691	685.404	395.076	-0.699
Dead+Wind 240 deg - Service	34.091	-5.703	3.278	395.014	685.827	-1.360
Dead+Wind 270 deg - Service	34.091	-6.592	-0.013	-0.967	792.936	-1.657
Dead+Wind 300 deg - Service	34.091	-5.715	-3.300	-396.432	687.708	-1.510
Dead+Wind 330 deg - Service	34.091	-3.307	-5.704	-685.420	398.345	-0.958

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.000	-34.091	0.000	0.000	34.091	-0.000	0.000%
2	-0.056	-40.909	-29.411	0.056	40.909	29.411	0.000%
3	-0.056	-30.682	-29.411	0.056	30.682	29.411	0.000%
4	14.687	-40.909	-25.442	-14.687	40.909	25.442	0.000%
5	14.687	-30.682	-25.442	-14.687	30.682	25.442	0.000%

tnxTower Phone: FAX:	Job 18067-SMA	Page 16 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
6	25.494	-40.909	-14.656	-25.494	40.909	14.656	0.000%
7	25.494	-30.682	-14.656	-25.494	30.682	14.656	0.000%
8	29.471	-40.909	0.056	-29.471	40.909	-0.056	0.000%
9	29.471	-30.682	0.056	-29.471	30.682	-0.056	0.000%
10	25.551	-40.909	14.754	-25.551	40.909	-14.754	0.000%
11	25.551	-30.682	14.754	-25.551	30.682	-14.754	0.000%
12	14.784	-40.909	25.499	-14.784	40.909	-25.499	0.000%
13	14.784	-30.682	25.499	-14.784	30.682	-25.499	0.000%
14	0.056	-40.909	29.411	-0.056	40.909	-29.411	0.000%
15	0.056	-30.682	29.411	-0.056	30.682	-29.411	0.000%
16	-14.687	-40.909	25.442	14.687	40.909	-25.442	0.000%
17	-14.687	-30.682	25.442	14.687	30.682	-25.442	0.000%
18	-25.494	-40.909	14.656	25.494	40.909	-14.656	0.000%
19	-25.494	-30.682	14.656	25.494	30.682	-14.656	0.000%
20	-29.471	-40.909	-0.056	29.471	40.909	0.056	0.000%
21	-29.471	-30.682	-0.056	29.471	30.682	0.056	0.000%
22	-25.551	-40.909	-14.754	25.551	40.909	14.754	0.000%
23	-25.551	-30.682	-14.754	25.551	30.682	14.754	0.000%
24	-14.784	-40.909	-25.499	14.784	40.909	25.499	0.000%
25	-14.784	-30.682	-25.499	14.784	30.682	25.499	0.000%
26	0.000	-71.910	0.000	0.000	71.910	-0.000	0.000%
27	-0.024	-71.910	-8.578	0.024	71.910	8.578	0.000%
28	4.301	-71.910	-7.417	-4.301	71.910	7.417	0.000%
29	7.473	-71.910	-4.268	-7.473	71.910	4.268	0.000%
30	8.643	-71.910	0.024	-8.643	71.910	-0.024	0.000%
31	7.497	-71.910	4.310	-7.497	71.910	-4.310	0.000%
32	4.342	-71.910	7.441	-4.342	71.910	-7.441	0.000%
33	0.024	-71.910	8.578	-0.024	71.910	-8.578	0.000%
34	-4.301	-71.910	7.417	4.301	71.910	-7.417	0.000%
35	-7.473	-71.910	4.268	7.473	71.910	-4.268	0.000%
36	-8.643	-71.910	-0.024	8.643	71.910	0.024	0.000%
37	-7.497	-71.910	-4.310	7.497	71.910	4.310	0.000%
38	-4.342	-71.910	-7.441	4.342	71.910	7.441	0.000%
39	-0.013	-34.091	-6.579	0.013	34.091	6.579	0.000%
40	3.285	-34.091	-5.691	-3.285	34.091	5.691	0.000%
41	5.703	-34.091	-3.278	-5.703	34.091	3.278	0.000%
42	6.592	-34.091	0.013	-6.592	34.091	-0.013	0.000%
43	5.715	-34.091	3.300	-5.715	34.091	-3.300	0.000%
44	3.307	-34.091	5.704	-3.307	34.091	-5.704	0.000%
45	0.013	-34.091	6.579	-0.013	34.091	-6.579	0.000%
46	-3.285	-34.091	5.691	3.285	34.091	-5.691	0.000%
47	-5.703	-34.091	3.278	5.703	34.091	-3.278	0.000%
48	-6.592	-34.091	-0.013	6.592	34.091	0.013	0.000%
49	-5.715	-34.091	-3.300	5.715	34.091	3.300	0.000%
50	-3.307	-34.091	-5.704	3.307	34.091	5.704	0.000%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	4	0.00000001	0.00000001
2	Yes	5	0.00000001	0.00040465
3	Yes	5	0.00000001	0.00014638
4	Yes	7	0.00000001	0.00014120
5	Yes	6	0.00000001	0.00040820
6	Yes	7	0.00000001	0.00012040

tnxTower Phone: FAX:	Job 18067-SMA	Page 17 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

7	Yes	6	0.00000001	0.00034027
8	Yes	6	0.00000001	0.00020251
9	Yes	5	0.00000001	0.00090838
10	Yes	7	0.00000001	0.00015046
11	Yes	6	0.00000001	0.00043804
12	Yes	7	0.00000001	0.00012401
13	Yes	6	0.00000001	0.00035166
14	Yes	5	0.00000001	0.00019220
15	Yes	5	0.00000001	0.00004783
16	Yes	7	0.00000001	0.00012727
17	Yes	6	0.00000001	0.00036262
18	Yes	7	0.00000001	0.00014848
19	Yes	6	0.00000001	0.00043189
20	Yes	6	0.00000001	0.00017822
21	Yes	5	0.00000001	0.00080573
22	Yes	7	0.00000001	0.00011860
23	Yes	6	0.00000001	0.00033411
24	Yes	7	0.00000001	0.00014466
25	Yes	6	0.00000001	0.00041919
26	Yes	5	0.00000001	0.00001281
27	Yes	6	0.00028508	0.00040743
28	Yes	7	0.00007567	0.00083478
29	Yes	7	0.00007564	0.00077838
30	Yes	6	0.00028467	0.00063316
31	Yes	7	0.00007535	0.00093678
32	Yes	7	0.00007543	0.00082908
33	Yes	6	0.00028496	0.00039933
34	Yes	7	0.00007550	0.00085245
35	Yes	7	0.00007546	0.00091638
36	Yes	6	0.00028473	0.00059501
37	Yes	7	0.00007546	0.00080120
38	Yes	7	0.00007545	0.00090177
39	Yes	5	0.00000001	0.00002718
40	Yes	5	0.00000001	0.00045140
41	Yes	5	0.00000001	0.00036237
42	Yes	5	0.00000001	0.00017903
43	Yes	5	0.00000001	0.00052152
44	Yes	5	0.00000001	0.00038150
45	Yes	5	0.00000001	0.00002368
46	Yes	5	0.00000001	0.00039029
47	Yes	5	0.00000001	0.00050683
48	Yes	5	0.00000001	0.00017501
49	Yes	5	0.00000001	0.00036751
50	Yes	5	0.00000001	0.00048054

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio P _u / φP _n
L1	185.8 - 133.38 (1)	TP21.5x13.528x0.219	52.420	0.000	0.0	14.712	-7.499	1051.950	0.007
		4.8.2 (1.04 CR) - 1							
L2	133.38 - 91.04 (2)	TP29.5x20.662x0.313	44.970	0.000	0.0	28.656	-14.133	2081.510	0.007

tnxTower Phone: FAX:	Job 18067-SMA	Page 18 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
L3	91.04 - 43.46 (3)	4.8.2 (1.02 CR) - 2 TP38.5x28.166x0.375	51.190	0.000	0.0	44.885	-24.656	3165.960	0.008
L4	43.46 - 0 (4)	TP59.285x36.797x0.438	48.180	0.000	0.0	54.325	-26.832	3988.740	0.007

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{ux} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M _{uy} kip-ft	φM _{uy} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	185.8 - 133.38 (1)	TP21.5x13.528x0.219	459.210	446.377	1.029	0.000	446.377	0.000
L2	133.38 - 91.04 (2)	TP29.5x20.662x0.313	1216.642	1203.992	1.011	0.000	1203.992	0.000
L3	91.04 - 43.46 (3)	TP38.5x28.166x0.375	2272.242	2392.425	0.950	0.000	2392.425	0.000
L4	43.46 - 0 (4)	TP59.285x36.797x0.438	2389.858	3123.050	0.765	0.000	3123.050	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V _u K	φV _n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T _u kip-ft	φT _n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	185.8 - 133.38 (1)	TP21.5x13.528x0.219	16.319	525.977	0.031	0.634	908.325	0.001
L2	133.38 - 91.04 (2)	TP29.5x20.662x0.313	20.673	1040.760	0.020	4.102	2450.392	0.002
L3	91.04 - 43.46 (3)	TP38.5x28.166x0.375	24.708	1582.980	0.016	6.394	4867.658	0.001
L4	43.46 - 0 (4)	TP59.285x36.797x0.438	25.378	2031.670	0.012	6.391	6356.867	0.001

Pole Interaction Design Data

Section No.	Elevation ft	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	Ratio $\frac{M_{uy}}{\phi M_{uy}}$	Ratio $\frac{V_u}{\phi V_n}$	Ratio $\frac{T_u}{\phi T_n}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	185.8 - 133.38 (1)	0.007	1.029	0.000	0.031	0.001	1.037 X	1.000	4.8.2 X
L2	133.38 - 91.04 (2)	0.007	1.011	0.000	0.020	0.002	1.018 X	1.000	4.8.2 X
L3	91.04 - 43.46 (3)	0.008	0.950	0.000	0.016	0.001	0.958 ✓	1.000	4.8.2 ✓
L4	43.46 - 0 (4)	0.007	0.765	0.000	0.012	0.001	0.772 ✓	1.000	4.8.2 ✓

tnxTower Phone: FAX:	Job 18067-SMA	Page 19 of 19
	Project Monopole	Date 12:37:55 11/06/18
	Client Comex	Designed by

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail	
L1	185.8 - 133.38	Pole	TP21.5x13.528x0.219	1	-7.499	1051.950	103.7	Fail X	
L2	133.38 - 91.04	Pole	TP29.5x20.662x0.313	2	-14.133	2081.510	101.8	Fail X	
L3	91.04 - 43.46	Pole	TP38.5x28.166x0.375	3	-24.656	3165.960	95.8	Pass	
L4	43.46 - 0	Pole	TP59.285x36.797x0.438	4	-26.832	3988.740	77.2	Pass	
							Summary		
							Pole (L1)	103.7	Fail X
							RATING =	103.7	Fail X



[ASCE 7 Windspeed](#) [ASCE 7 Ground Snow Load](#) [Related Resources](#) [Sponsors](#) [About ATC](#) [Contact](#)

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Search Results

Query Date: Tue Nov 06 2018
Latitude: 40.4051
Longitude: -74.5475

**ASCE 7-10 Windspeeds
(3-sec peak gust in mph*):**

Risk Category I: 105
Risk Category II: 115
Risk Category III-IV: 120
MRI 10-Year:** 76
MRI 25-Year:** 84
MRI 50-Year:** 90
MRI 100-Year:** 96

ASCE 7-05 Windspeed:
95 (3-sec peak gust in mph)
ASCE 7-93 Windspeed:
78 (fastest mile in mph)



*Miles per hour
**Mean Recurrence Interval

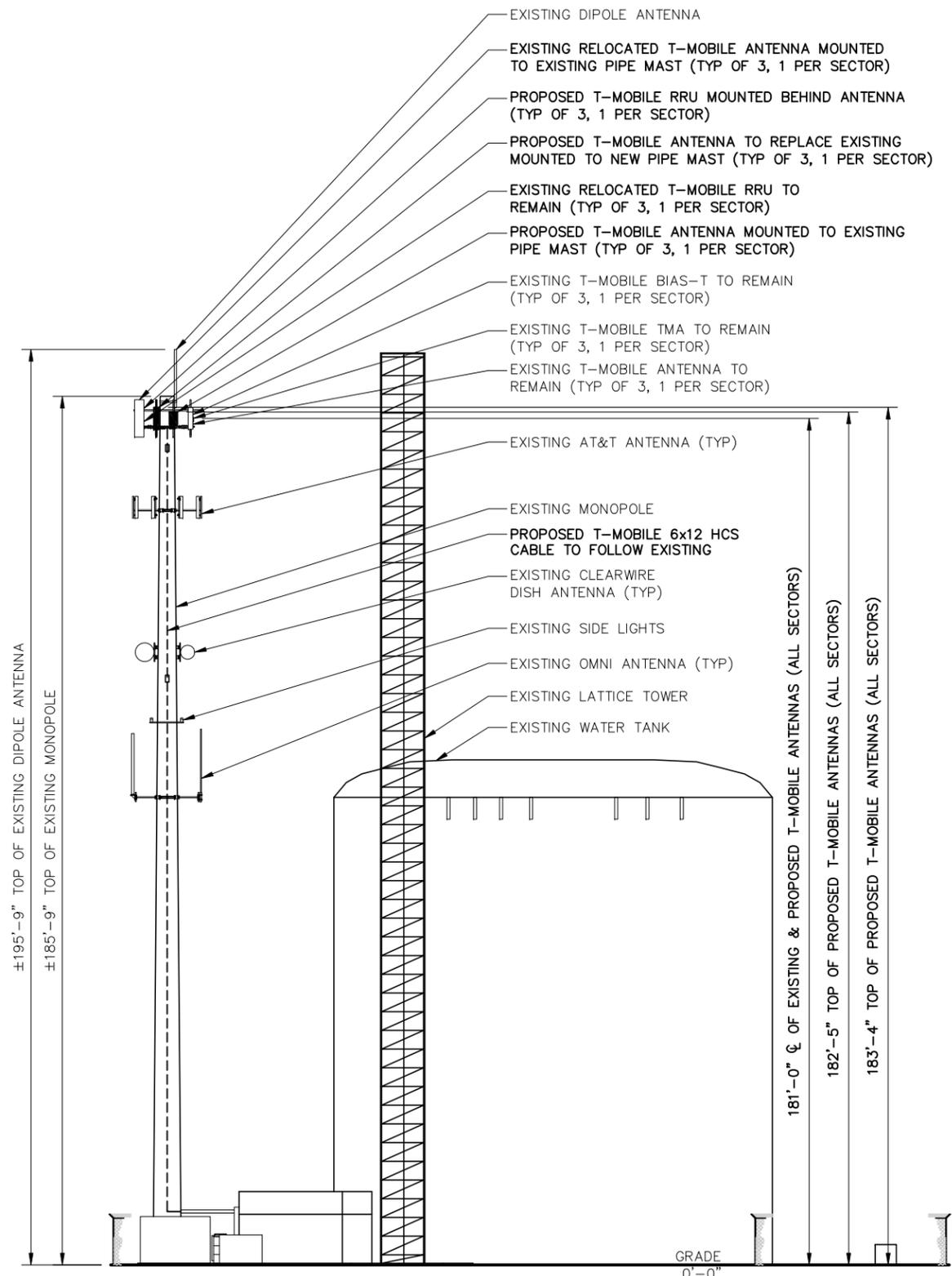
Users should consult with local building officials to determine if there are community-specific wind speed requirements that govern.

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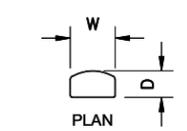
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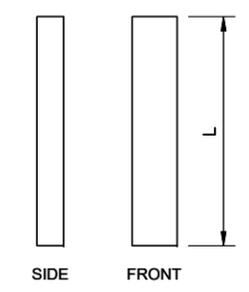
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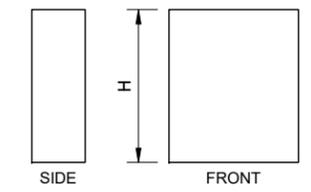
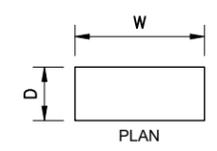
MANUF.: ERICSSON
 MODEL: AIR 32 B2/B66A (DUAL)
 LENGTH: 56.6"
 WIDTH: 12.9"
 DEPTH: 8.7"
 WEIGHT: 132.2 lbs



MANUF.: ERICSSON
 MODEL: AIR 6449 B41
 LENGTH: 33.1"
 WIDTH: 20.5"
 DEPTH: 8.3"
 WEIGHT: 103 lbs



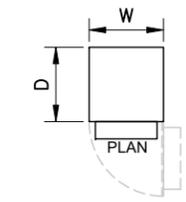
MANUF.: ERICSSON
 MODEL: Radio 4415 B25
 LENGTH: 14.9"
 WIDTH: 13.2"
 DEPTH: 5.4"
 WEIGHT: 46.3 lbs



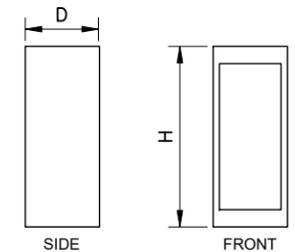
2 PANEL ANTENNA

SCALE: NTS

MANUFACTURER: ERICSSON
 MODEL #: B160
 HEIGHT: 63.0"
 WIDTH: 26.0"
 DEPTH: 26.0"
 WEIGHT: 1,891.0 lbs
 AREA: 4.7 SF



NOTES:
 1. WEIGHT INCLUDES CUSTOMER EQUIPMENT OR BATTERIES.
 2. INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
 3. VERIFY BOLT LOCATIONS WITH CABINET MANUFACTURER.



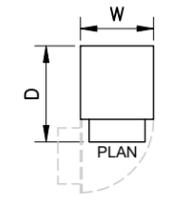
4 BATTERY CABINET

SCALE: NTS

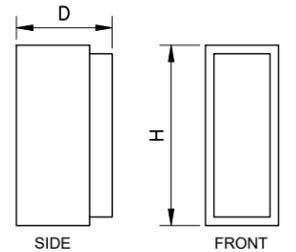
3 REMOTE RADIO UNIT (RRU)

SCALE: NTS

MANUFACTURER: ERICSSON
 MODEL #: 6160
 HEIGHT: 63.0"
 WIDTH: 25.6"
 DEPTH: 33.5"
 WEIGHT: 605.0 lbs
 AREA: 4.6 SF



NOTES:
 1. WEIGHT INCLUDES CUSTOMER EQUIPMENT OR BATTERIES.
 2. INSTALLED PER MANUFACTURER'S SPECIFICATIONS.
 3. VERIFY BOLT LOCATIONS WITH CABINET MANUFACTURER.



5 EQUIPMENT CABINET

SCALE: NTS

1 SOUTHEAST ELEVATION

11 x 17 SCALE: 1/32" = 1'-0" 24 x 36 SCALE: 1/16" = 1'-0"



△				
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0	09-21-20	ISSUED AS FINAL	DBS	JES
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REV.	DATE	REVISION DESCRIPTION	DRAWN BY	CHKD. BY
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1800 ROUTE 34, SUITE 209
 WALL, NJ 07719
 (732) 280-5623

N.J. CERTIFICATE OF AUTHORIZATION: 24GA28150800

Stephen A. Bray
 PROFESSIONAL ENGINEER
 NJ LICENSE: 24GE04414400 9/21/20

PROJECT NUMBER:
300.5912.50J

SITE INFORMATION:
 MAJOR ROAD AND ROUTE 1
 SOUTH BRUNSWICK, NJ 08852
 MIDDLESEX COUNTY

NJ08012E

DESIGN TYPE:
 CO-LOCATION

SHEET TITLE:
 ELEVATION & DETAILS

SHEET NUMBER: REV.:

C02 0

K:\300_T-Mobile\300.5000_T-Mobile LTE\300.5912_NJ08012E_Major Road and Route 1\300.5912.50J_Anchor\300.5912.50J_CAD\300.5912.50J_Construction\300.5912.50J_C02.dwg, 9/21/2020 2:57:26 PM, C_Creut



Structural Analysis Report

For

T-Mobile North East, LLC

**Site ID#: NJ08012E
Addition of Ericsson Air 21
Antennas & Associated Equipment**

KMB ID: 300.5912

Prepared For:

T-Mobile

Robert Ciaglia
Senior Development Manager
4 Sylvan Way
Parsippany, NJ 07054

Date: 7/17/2012

Analyzed By:

A handwritten signature in black ink, appearing to read "Jiang J Yu".

Jiang J Yu, P.E.

Reviewed By:

A handwritten signature in black ink, appearing to read "Stephen A. Bray".

Stephen A. Bray, P.E.
NJ PE License No. GE44144



Contents

1. Introduction
2. Information Provided
3. Existing Tower Loading
4. Analysis Method
5. Assumptions
6. Tower Analysis Results
7. Conclusion

Appendix A – RISA Tower Output

Appendix B – RF Data Sheet (RFDS)

Appendix C – Tower Inventory Information

Appendix D – Proposed Antenna Manufacturer Specification Sheet



1. Introduction

Pursuant to your request, KMB Design Group, LLC (KMB) has completed a structural analysis of the existing monopole structure to evaluate T-Mobile’s existing antenna and equipment infrastructure with respect to the deployment of the Ericsson Air antenna system and ancillary equipment at this installation. The project consists of removing the existing three (3) antennas and replacing them with new three (3) Ericsson AIR 21 antennas mounted on the existing mount at a centreline elevation of 147 feet above grade on the existing monopole structure.

This structural analysis was completed according to the recommendations of the “Structural Standards for Steel Antenna Towers and Antenna Supporting Structures”, ANSI TIA/EIA Standard and IBC 2009 NJ Edition. Specifically this tower has been analyzed in accordance with the following:

- TIA/EIA-222-G
- 105 mph basic wind
- 1.00” ice
- 60 mph under service loads

2. Information Provided

A monopole climb was performed to obtain all necessary information required to perform this analysis, however some parameters needed to be assumed. In addition, we were provided with the following reports to aid in the preparation of this analysis:

1. Structural Analysis and Tower Reinforcement Design prepared by KMB Design Group dated March 30, 2010 (Revision #2).
2. Structural Analysis prepared by French and Parrello Associates, P. A., revised on November 9, 2011

3. Existing and Proposed Tower Loading

The existing antenna information was obtained from the monopole climb performed on July 5, 2012 and the above referenced reports. The proposed antenna information was obtained from the RF Data Sheet provided to us by T-Mobile dated June 28, 2012. Our analysis was performed using the following existing and proposed loading:

Status	Elevation	Qty.	Antenna Model/Appurtenance	Coax/Conduit
Existing	185 ft	1	5/8” Lightning Rod	
Existing	181 ft*	3	Kathrein 800 10504 on Low Profile Platform	(6) 1-5/8” and (1) 1/4”(outside)



Structural Analysis Report

KMB No: 300.5912

Date: 7/17/2012

Existing	162 ft*	12	Powerwave P65-15-XLH-RR on T-Frame Mounts	(14) 1 5/8", (2) 7/8" and (1) 1/4" (inside)
Existing	162 ft*	3	TMA	N/A
To be removed	147 ft*	3	RFS APX16PV-16PVL	
Proposed	147 ft*	3	Ericsson AIR21 on existing Mount	(12) 1-1/4" and (1) 1/4" (inside)
Existing	131 ft*	3	Argus LLPX31OR-V1 on T-Arm	(3) 2" (outside)
Existing	131 ft*	3	TMA	N/A
Existing	131 ft*	3	Andrew VHLP2 (2ft Dish)	(3) 1/2" (outside)
Existing	131 ft*	1	2ft diameter Dish	
Existing	100 ft*	2	Omni Antennas on Side arm Mount	(1) 7/8" and (1) 1-5/8"
Existing	50 ft*	1	GPS	

* Centerline

Ultimate user is responsible to verify that the tower loading, as represented above, is the actual as-built tower loading. In the event of discrepancies, ultimate user shall notify KMB and a revised structural review must be conducted prior to any tower, antenna and appurtenance placement or modifications on the existing structure.

4. Analysis Method

RISA Tower, a commercially available engineering software programs, was used to create a theoretical mathematical model of the tower members and calculate primary member stresses under various loading conditions. Selected output from the analysis is included in Appendix A.

5. Assumptions

This structural analysis is based on the theoretical capacity of the members and is not a condition assessment of the existing tower structure.

6. Tower Analysis Results

Monopole and Base Plate

The analysis of the existing tower in accordance with the above indicates that the tower is stressed to 67.6% of its maximum allowable design capacity. The base plate is stressed to 88% of its allowable design capacity. Hence, the monopole structure does meet the minimum code requirements and has adequate structural capacity to support the proposed loading. Please refer to the attached calculations for further information.



Foundation Results

The foundation reactions, as shown on the above referenced structural reports for the tower are compared with the new results as follows:

Original Moment: 4413 kip-ft
Original Shear: 40.4 kips
Original Axial: 39.4 kips

Original Moment with applied factor: 6619 kip-ft
Original Shear with applied factor: 60.6 kips
Original Axial with applied factor: 59.1 kips

New Base Moment: 3530 kip-ft
New Base Shear: 43 kips
New Axial Load: 48 kips

Based on the above comparison of the foundation loads, it is concluded that the foundation is adequate to support the proposed loading since the new base reactions are less than the original reactions with applied factor. This conclusion is based on the assumption that the foundation has been installed and maintained in accordance with the original tower drawings.

7. Conclusion

Based on the structural analysis with proposed loading, KMB Design Group, LLC concludes the existing tower and foundation are structurally adequate to support the proposed loading and tower does not require structural reinforcements.

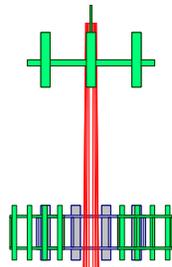
Should you have any questions or comments do not hesitate to contact us.



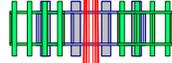
Appendix A

RISA Tower Output

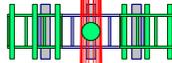
185.0 ft



147.8 ft



132.8 ft



90.7 ft



43.4 ft

0.0 ft

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
5/8" Lightning Rod	185	(3) TMA (Clearwire)	131
PIROD 13' Low Profile Platform (MetroPCS)	181	(3) T-Arm (Clearwire)	131
(3) 800-10504 (MetroPCS)	181	(4) VHLP2 (Clearwire)	131
(3) T-Frame (ATI)	162	2ft Dish	131
(12) P65-15-XLH-RR (ATI)	162	12ft Omni	110 - 100
(3) RRH (ATI)	162	12ft Omni	110 - 100
(3) Ericsson AIR 21 (T-Mobile)	147	Side Arm Mount	100
(3) Flush Mount (T-Mobile)	147	Side Arm Mount	100
(3) Argus LLPX31OR-V1 (Clearwire)	131	(2) GPS (MetroPCS)	50

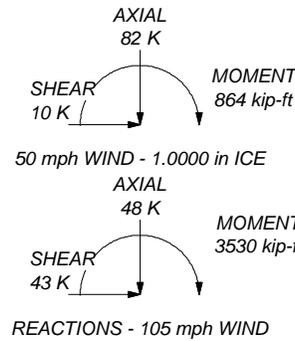
MATERIAL STRENGTH

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

TOWER DESIGN NOTES

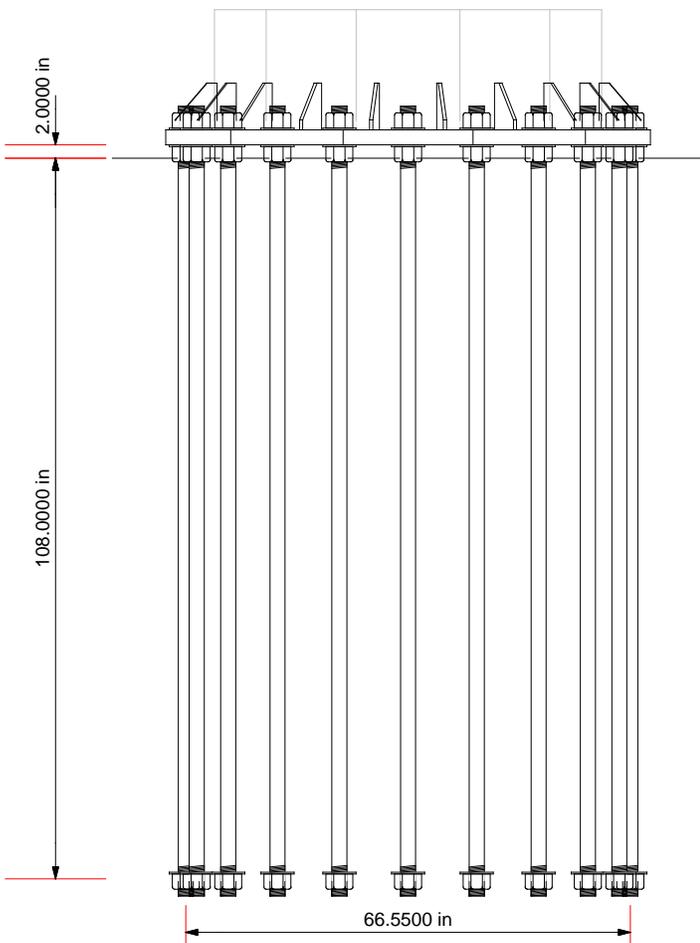
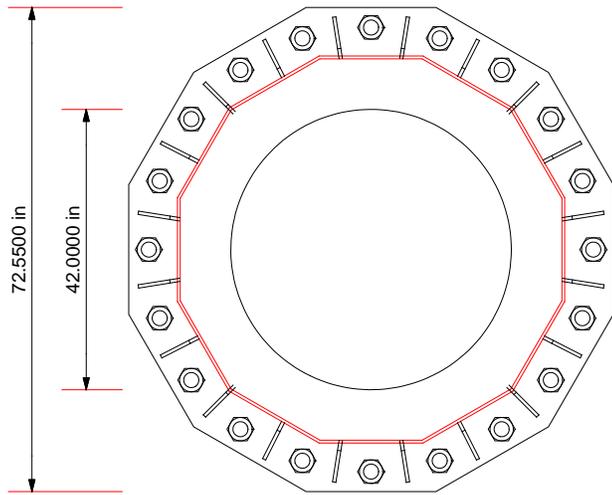
1. Tower is located in Middlesex County, New Jersey.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 105 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50 mph basic wind with 1.00 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60 mph wind.
6. Weld together tower sections have flange connections.
7. Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications.
8. Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards.
9. Welds are fabricated with ER-70S-6 electrodes.
10. TOWER RATING: 88%

Section	Length (ft)	Number of Sides	Thickness (in)	Lap Splice (ft)	Top Dia (in)	Bot Dia (in)	Grade	Weight (K)
1	37.17	12	0.2188					1.6
2	15.00	12	0.2790	4.17				1.1
3	46.33	12	0.3125	5.33	24.9989	36.7000	A572-65	4.8
4	52.58	12	0.3750	6.58	34.7282	47.9020		8.8
5	50.00	12	0.4375	45.5027	58.0000			12.3
								28.7



KMB Design Group, LLC
 1800 Route 34, Suite 209
 Wall, NJ 07719
 Phone: (732) 280-5623
 FAX: (732) 280-3980

Job: **300.5912 - NJ08012E**
 Project: **185ft Monopole; Major Road Route 1, South Brunswick, NJ**
 Client: T-Mobile
 Code: TIA-222-G
 Path:
 Drawn by: Ekata A. Shah
 Date: 07/17/12
 App'd:
 Scale: NTS
 Dwg No. E-1



FOUNDATION NOTES

1. Plate thickness is 2.2500 in.
2. Plate grade is A633-60.
3. Anchor bolt grade is A615-75.
4. f_c is 4 ksi.

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Client: T-Mobile	Drawn by: Ekata A. Shah	App'd:
Code: TIA-222-G	Date: 07/17/12	Scale: NTS
Path:		Dwg No. F-1

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job 300.5912 - NJ08012E	Page 1 of 11
	Project 185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date 15:38:07 07/17/12
	Client T-Mobile	Designed by Ekata A. Shah

Tower Input Data

There is a pole section.

This tower is designed using the TIA-222-G standard.

The following design criteria apply:

Tower is located in Middlesex County, New Jersey.

Basic wind speed of 105 mph.

Structure Class II.

Exposure Category C.

Topographic Category 1.

Crest Height 0.00 ft.

Nominal ice thickness of 1.0000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 50 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

Weld together tower sections have flange connections..

Connections use galvanized A325 bolts, nuts and locking devices. Installation per TIA/EIA-222 and AISC Specifications..

Tower members are "hot dipped" galvanized in accordance with ASTM A123 and ASTM A153 Standards..

Welds are fabricated with ER-70S-6 electrodes..

A non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feedline supports, and appurtenance mounts are not considered.

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length in	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	185.00-147.83	37.17	0.00	12	13.5630	22.8499	0.2188	0.8750	A572-65 (65 ksi)
L2	147.83-132.83	15.00	50.00	12	22.8499	26.5980	0.2790	1.1160	A572-65 (65 ksi)
L3	132.83-90.67	46.33	64.00	12	24.9989	36.7000	0.3125	1.2500	A572-65 (65 ksi)
L4	90.67-43.42	52.58	79.00	12	34.7282	47.9020	0.3750	1.5000	A572-65 (65 ksi)
L5	43.42-0.00	50.00		12	45.5027	58.0000	0.4375	1.7500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	I/Q in ²	w in	w/t
---------	----------------	-------------------------	----------------------	---------	---------	------------------------	----------------------	------------------------	---------	-----

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	2 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	It/Q in ²	w in	w/t
L1	14.0415	9.3994	213.6350	4.7772	7.0256	30.4079	432.8824	4.6261	3.0486	13.937
	23.6560	15.9408	1042.1009	8.1020	11.8362	88.0432	2111.5789	7.8456	5.5375	25.314
L2	23.6560	20.2772	1318.5380	8.0804	11.8362	111.3983	2671.7155	9.9798	5.3761	19.269
	27.5363	23.6445	2090.5193	9.4222	13.7778	151.7314	4235.9588	11.6371	6.3805	22.869
L3	26.9701	24.8406	1932.2470	8.8377	12.9494	149.2151	3915.2562	12.2258	5.8622	18.759
	37.9946	36.6149	6187.9743	13.0267	19.0106	325.5013	12538.5135	18.0208	8.9981	28.794
L4	37.3365	41.4815	6248.4733	12.2984	17.9892	347.3459	12661.1010	20.4159	8.3022	22.139
	49.5918	57.3889	16546.0486	17.0147	24.8132	666.8235	33526.7802	28.2450	11.8327	31.554
L5	48.8114	63.4856	16456.7075	16.1333	23.5704	698.1943	33345.7510	31.2457	11.0222	25.194
	60.0460	81.0912	34295.6329	20.6074	30.0440	1141.5135	69492.2503	39.9106	14.3715	32.849

Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A _f	Adjust. Factor A _r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals
ft	ft ²	in					in	in
L1				1	1	1		
185.00-147.83								
L2				1	1	1		
147.83-132.83								
L3				1	1	1		
132.83-90.67								
L4				1	1	1		
90.67-43.42								
L5				1	1	1		
43.42-0.00								

Monopole Base Plate Data

Base Plate Data

Base plate is square	
Base plate is grouted	
Anchor bolt grade	A615-75
Anchor bolt size	2.2500 in
Number of bolts	20
Embedment length	108.0000 in
f _c	4 ksi
Grout space	2.0000 in
Base plate grade	A633-60
Base plate thickness	2.2500 in
Bolt circle diameter	66.5500 in
Outer diameter	72.5500 in
Inner diameter	42.0000 in
Base plate type	Stiffened Plate
Bolts per stiffener	1
Stiffener thickness	0.5000 in
Stiffener height	7.0000 in

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Component Type	Placement	Total Number	C _{AA}	Weight
				ft		ft ² /ft	plf
LDf1-50A (1/4 FOAM) (AT&T)	C	No	Inside Pole	162.00 - 0.00	1	No Ice	0.06
						1/2" Ice	0.06
						1" Ice	0.06

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	3 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Description	Face or Leg	Allow Shield	Component Type	Placement ft	Total Number	C _{AA}		Weight plf
						In Face	Out Face	
LDF7-50A (1-5/8 FOAM) (AT&T)	C	No	Inside Pole	162.00 - 0.00	14	No Ice	0.00	0.82
						1/2" Ice	0.00	0.82
						1" Ice	0.00	0.82
LDF5-50A (7/8 FOAM) (AT&T)	C	No	Inside Pole	162.00 - 0.00	2	No Ice	0.00	0.33
						1/2" Ice	0.00	0.33
						1" Ice	0.00	0.33
LDF6-50A (1-1/4 FOAM) (T-Mobile)	C	No	Inside Pole	147.00 - 0.00	12	No Ice	0.00	0.66
						1/2" Ice	0.00	0.66
						1" Ice	0.00	0.66
LDF1-50A (1/4 FOAM) (T-Mobile)	C	No	Inside Pole	147.00 - 0.00	1	No Ice	0.00	0.06
						1/2" Ice	0.00	0.06
						1" Ice	0.00	0.06
LDF4-50A (1/2 FOAM) (Clearwire)	C	No	CaAa (Out Of Face)	131.00 - 0.00	3	No Ice	0.06	0.15
						1/2" Ice	0.16	0.84
						1" Ice	0.26	2.14
LDF5-50A (7/8 FOAM)	C	No	CaAa (Out Of Face)	100.00 - 0.00	1	No Ice	0.11	0.33
						1/2" Ice	0.21	1.30
						1" Ice	0.31	2.88
VXL7-50 (1-5/8 FOAM)	C	No	CaAa (Out Of Face)	100.00 - 0.00	1	No Ice	0.20	0.75
						1/2" Ice	0.30	2.26
						1" Ice	0.40	4.39
LDF12-50A (2-1/4 FOAM) (MetroPCS)	C	No	CaAa (Out Of Face)	100.00 - 0.00	1	No Ice	0.23	1.22
						1/2" Ice	0.34	2.96
						1" Ice	0.43	5.31
LDF7-50A (1-5/8 FOAM) (MetroPCS)	C	No	CaAa (Out Of Face)	180.00 - 0.00	1	No Ice	0.20	0.82
						1/2" Ice	0.30	2.33
						1" Ice	0.40	4.46

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation ft	Face	A _R	A _F	C _{AA} In Face	C _{AA} Out Face	Weight K
			ft ²	ft ²	ft ²	ft ²	
L1	185.00-147.83	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	6.369	0.20
L2	147.83-132.83	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	2.970	0.31
L3	132.83-90.67	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	21.030	0.93
L4	90.67-43.42	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	43.895	1.12
L5	43.42-0.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	40.334	1.03

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness	A _R	A _F	C _{AA} In Face	C _{AA} Out Face	Weight K
			in	ft ²	ft ²	ft ²	ft ²	
L1	185.00-147.83	A	2.349	0.000	0.000	0.000	0.000	0.00

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	4 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L2	147.83-132.83	B	2.311	0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	21.482	0.62
		A		0.000	0.000	0.000	0.000	0.00
L3	132.83-90.67	B	2.257	0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	9.904	0.50
		A		0.000	0.000	0.000	0.000	0.00
L4	90.67-43.42	B	2.145	0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	109.393	2.89
		A		0.000	0.000	0.000	0.000	0.00
L5	43.42-0.00	B	1.919	0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	193.227	4.57
		A		0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	170.699	3.90

Shielding Factor Ka

Tower Section	Feed Line Record No.	Description	Feed Line Segment Elev.	K _a No Ice	K _a Ice
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Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
5/8" Lightning Rod	C	None		0.0000	185.00	No Ice	0.25	0.25	0.03
						1/2" Ice	0.66	0.66	0.03
						1" Ice	0.97	0.97	0.04
(12) P65-15-XLH-RR (AT&T)	C	None		0.0000	162.00	No Ice	5.95	3.08	0.04
						1/2" Ice	6.36	3.41	0.08
						1" Ice	6.78	3.74	0.11
(3) RRH (AT&T)	C	None		0.0000	162.00	No Ice	2.92	2.19	0.04
						1/2" Ice	3.16	2.41	0.07
						1" Ice	3.41	2.65	0.09
(3) T-Frame (AT&T)	C	None		0.0000	162.00	No Ice	12.20	12.20	0.36
						1/2" Ice	17.60	17.60	0.49
						1" Ice	23.00	23.00	0.62
(3) Ericsson AIR 21 (T-Mobile)	C	None		0.0000	147.00	No Ice	6.53	4.36	0.11
						1/2" Ice	6.98	4.77	0.15
						1" Ice	7.43	5.20	0.19
(3) Flush Mount (T-Mobile)	C	None		0.0000	147.00	No Ice	1.00	1.00	0.01
						1/2" Ice	1.50	1.50	0.02
						1" Ice	2.00	2.00	0.03
12ft Omni	C	None		0.0000	100.00 - 110.00	No Ice	8.38	8.38	0.06
						1/2" Ice	9.16	9.16	0.11
						1" Ice	9.95	9.95	0.18
Side Arm Mount	C	None		0.0000	100.00	No Ice	4.00	4.00	0.10
						1/2" Ice	5.00	5.00	0.12
						1" Ice	6.00	6.00	0.14
12ft Omni	C	None		0.0000	100.00 - 110.00	No Ice	4.35	4.35	0.04

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	5 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Description	Face or Leg	Offset Type	Offsets:		Azimuth Adjustment	Placement	C _{AA} Front	C _{AA} Side	Weight	
			Horz Lateral	Vert						ft
						1/2" Ice	5.83	5.83	0.07	
						1" Ice	7.33	7.33	0.11	
Side Arm Mount	C	None			0.0000	100.00	No Ice	4.00	4.00	0.10
							1/2" Ice	5.00	5.00	0.12
							1" Ice	6.00	6.00	0.14
(3) Argus LLPX31OR-V1 (Clearwire)	C	None			0.0000	131.00	No Ice	4.86	1.97	0.03
							1/2" Ice	5.22	2.24	0.05
							1" Ice	5.58	2.52	0.08
(3) TMA (Clearwire)	C	None			0.0000	131.00	No Ice	0.58	0.19	0.02
							1/2" Ice	0.69	0.28	0.02
							1" Ice	0.81	0.37	0.02
(3) T-Arm (Clearwire)	C	None			0.0000	131.00	No Ice	22.00	22.00	1.13
							1/2" Ice	30.00	30.00	1.47
							1" Ice	38.00	38.00	1.81
PiROD 13' Low Profile Platform (MetroPCS)	C	None			0.0000	181.00	No Ice	15.70	15.70	1.30
							1/2" Ice	20.10	20.10	1.76
							1" Ice	24.50	24.50	2.23
(3) 800-10504 (MetroPCS)	C	None			0.0000	181.00	No Ice	3.39	1.88	0.02
							1/2" Ice	3.74	2.21	0.04
							1" Ice	4.09	2.55	0.06
(2) GPS (MetroPCS)	C	None			0.0000	50.00	No Ice	1.00	1.00	0.06
							1/2" Ice	1.12	1.12	0.10
							1" Ice	1.24	0.62	0.07

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets:		Azimuth Adjustment	3 dB Beam Width	Elevation	Outside Diameter	Aperture Area	Weight	
				Horz Lateral	Vert							ft
(4) VHLP2 (Clearwire)		Paraboloid w/o Radome	None			0.0000		131.00	2.00	No Ice	3.14	0.03
										1/2" Ice	3.41	0.04
										1" Ice	3.67	0.06
2ft Dish		Paraboloid w/Radome	None			0.0000		131.00	2.00	No Ice	3.14	0.07
										1/2" Ice	3.41	0.28
										1" Ice	3.68	0.49

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice
3	0.9 Dead+1.6 Wind 0 deg - No Ice
4	1.2 Dead+1.6 Wind 90 deg - No Ice
5	0.9 Dead+1.6 Wind 90 deg - No Ice
6	1.2 Dead+1.6 Wind 180 deg - No Ice

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	6 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Comb. No.	Description
7	0.9 Dead+1.6 Wind 180 deg - No Ice
8	1.2 Dead+1.0 Ice+1.0 Temp
9	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
10	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
11	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
12	Dead+Wind 0 deg - Service
13	Dead+Wind 90 deg - Service
14	Dead+Wind 180 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	185 - 147.833	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-14.58	0.00	0.00
			Max. Mx	4	-5.53	-82.24	0.00
			Max. My	2	-5.53	0.00	82.24
			Max. Vy	4	4.70	-82.24	0.00
			Max. Vx	2	-4.70	0.00	82.24
L2	147.833 - 132.833	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-17.54	0.00	0.00
			Max. Mx	4	-7.09	-142.13	0.00
			Max. My	2	-7.09	0.00	142.13
			Max. Vy	4	6.37	-142.13	0.00
			Max. Vx	2	-6.37	0.00	142.13
L3	132.833 - 90.667	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-39.70	0.00	0.00
			Max. Mx	4	-18.01	-636.25	0.00
			Max. My	2	-18.01	0.00	636.25
			Max. Vy	4	16.95	-636.25	0.00
			Max. Vx	2	-16.95	0.00	636.25
L4	90.667 - 43.4167	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-57.04	0.00	0.00
			Max. Mx	4	-29.41	-1701.58	0.00
			Max. My	2	-29.41	0.00	1701.58
			Max. Vy	4	29.69	-1701.58	0.00
			Max. Vx	2	-29.69	0.00	1701.58
L5	43.4167 - 0	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-81.80	0.00	0.00
			Max. Mx	4	-47.81	-3529.55	0.00
			Max. My	2	-47.81	0.00	3529.55
			Max. Vy	4	43.03	-3529.55	0.00
			Max. Vx	2	-43.03	0.00	3529.55

Maximum Reactions

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
Pole	Max. Vert	8	81.80	0.00	0.00
	Max. H _x	14	39.86	0.00	-7.85

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	7 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Location	Condition	Gov. Load Comb.	Vertical K	Horizontal, X K	Horizontal, Z K
	Max. H _z	2	47.84	0.00	43.00
	Max. M _x	2	3529.55	0.00	43.00
	Max. M _z	4	3529.55	-43.00	0.00
	Max. Torsion	1	0.00	0.00	0.00
	Min. Vert	3	35.88	0.00	43.00
	Min. H _x	4	47.84	-43.00	0.00
	Min. H _z	6	47.84	0.00	-43.00
	Min. M _x	6	-3529.55	0.00	-43.00
	Min. M _z	1	0.00	0.00	0.00
	Min. Torsion	1	0.00	0.00	0.00

Tower Mast Reaction Summary

Load Combination	Vertical K	Shear _x K	Shear _z K	Overtuning Moment, M _x kip-ft	Overtuning Moment, M _z kip-ft	Torque kip-ft
Dead Only	39.86	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.6 Wind 0 deg - No Ice	47.84	0.00	-43.00	-3529.55	0.00	0.00
0.9 Dead+1.6 Wind 0 deg - No Ice	35.88	0.00	-43.00	-3500.24	0.00	0.00
1.2 Dead+1.6 Wind 90 deg - No Ice	47.84	43.00	0.00	0.00	-3529.55	0.00
0.9 Dead+1.6 Wind 90 deg - No Ice	35.88	43.00	0.00	0.00	-3500.24	0.00
1.2 Dead+1.6 Wind 180 deg - No Ice	47.84	0.00	43.00	3529.55	0.00	0.00
0.9 Dead+1.6 Wind 180 deg - No Ice	35.88	0.00	43.00	3500.24	0.00	0.00
1.2 Dead+1.0 Ice+1.0 Temp	81.80	0.00	0.00	0.00	0.00	0.00
1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp	81.80	0.00	-9.98	-863.71	0.00	0.00
1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp	81.80	9.98	0.00	0.00	-863.71	0.00
1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp	81.80	0.00	9.98	863.71	0.00	0.00
Dead+Wind 0 deg - Service	39.86	0.00	-7.85	-641.31	0.00	0.00
Dead+Wind 90 deg - Service	39.86	7.85	0.00	0.00	-641.31	0.00
Dead+Wind 180 deg - Service	39.86	0.00	7.85	641.31	0.00	0.00

Solution Summary

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
1	0.00	-39.86	0.00	0.00	39.86	0.00	0.000%
2	0.00	-47.84	-43.00	0.00	47.84	43.00	0.006%
3	0.00	-35.88	-43.00	0.00	35.88	43.00	0.009%
4	43.00	-47.84	0.00	-43.00	47.84	0.00	0.006%
5	43.00	-35.88	0.00	-43.00	35.88	0.00	0.009%
6	0.00	-47.84	43.00	0.00	47.84	-43.00	0.006%
7	0.00	-35.88	43.00	0.00	35.88	-43.00	0.009%
8	0.00	-81.80	0.00	0.00	81.80	0.00	0.000%
9	0.00	-81.80	-9.98	0.00	81.80	9.98	0.001%

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	8 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Load Comb.	Sum of Applied Forces			Sum of Reactions			% Error
	PX K	PY K	PZ K	PX K	PY K	PZ K	
10	9.98	-81.80	0.00	-9.98	81.80	0.00	0.001%
11	0.00	-81.80	9.98	0.00	81.80	-9.98	0.001%
12	0.00	-39.86	-7.85	0.00	39.86	7.85	0.001%
13	7.85	-39.86	0.00	-7.85	39.86	0.00	0.001%
14	0.00	-39.86	7.85	0.00	39.86	-7.85	0.001%

Non-Linear Convergence Results

Load Combination	Converged?	Number of Cycles	Displacement Tolerance	Force Tolerance
1	Yes	6	0.00000001	0.00000001
2	Yes	17	0.00012117	0.00007854
3	Yes	16	0.00014941	0.00011342
4	Yes	17	0.00012117	0.00007854
5	Yes	16	0.00014941	0.00011342
6	Yes	17	0.00012117	0.00007854
7	Yes	16	0.00014941	0.00011342
8	Yes	6	0.00000001	0.00000001
9	Yes	19	0.00014084	0.00003096
10	Yes	19	0.00014084	0.00003096
11	Yes	19	0.00014084	0.00003096
12	Yes	17	0.00000001	0.00001853
13	Yes	17	0.00000001	0.00001853
14	Yes	17	0.00000001	0.00001853

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 147.833	17.980	13	0.8019	0.0000
L2	147.833 - 132.833	11.905	13	0.7318	0.0000
L3	137 - 90.667	10.287	13	0.6931	0.0000
L4	96 - 43.4167	5.079	13	0.4972	0.0000
L5	50 - 0	1.392	13	0.2514	0.0000

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	5/8" Lightning Rod	13	17.980	0.8019	0.0000	112570
181.00	PiROD 13' Low Profile Platform	13	17.307	0.7969	0.0000	112570
162.00	(12) P65-15-XLH-RR	13	14.151	0.7674	0.0000	24471
147.00	(3) Ericsson AIR 21	13	11.777	0.7291	0.0000	15349
131.00	(4) VHLP2	13	9.431	0.6691	0.0000	14463
110.00	12ft Omni	13	6.680	0.5733	0.0000	12363
105.00	12ft Omni	13	6.085	0.5473	0.0000	11950

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job 300.5912 - NJ08012E	Page 9 of 11
	Project 185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date 15:38:07 07/17/12
	Client T-Mobile	Designed by Ekata A. Shah

Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
100.00	12ft Omni	13	5.516	0.5200	0.0000	11564
50.00	(2) GPS	13	1.392	0.2514	0.0000	8884

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	185 - 147.833	99.288	2	4.4388	0.0000
L2	147.833 - 132.833	65.701	2	4.0473	0.0000
L3	137 - 90.667	56.761	2	3.8319	0.0000
L4	96 - 43.4167	28.007	2	2.7449	0.0000
L5	50 - 0	7.670	2	1.3858	0.0000

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
185.00	5/8" Lightning Rod	2	99.288	4.4388	0.0000	20412
181.00	PIROD 13' Low Profile Platform	2	95.565	4.4102	0.0000	20412
162.00	(12) P65-15-XLH-RR	2	78.116	4.2450	0.0000	4435
147.00	(3) Ericsson AIR 21	2	64.995	4.0326	0.0000	2780
131.00	(4) VHL P2	2	52.033	3.6954	0.0000	2625
110.00	12ft Omni	2	36.839	3.1507	0.0000	2242
105.00	12ft Omni	2	33.559	3.0088	0.0000	2167
100.00	12ft Omni	2	30.417	2.8634	0.0000	2096
50.00	(2) GPS	2	7.670	1.3858	0.0000	1612

Base Plate Design Data

Plate Thickness	Number of Anchor Bolts	Anchor Bolt Size	Actual Allowable Ratio Bolt Tension K	Actual Allowable Ratio Bolt Compression K	Actual Allowable Ratio Plate Stress ksi	Actual Allowable Ratio Stiffener Stress ksi	Controlling Condition	Ratio
in		in						
2.2500	20	2.2500	124.90	129.68	16.472	47.536	Stiff	0.88
			223.65	371.27	54.000	54.000		✓
			0.56	0.35	0.31	0.88		

Compression Checks

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	10 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	Kl/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
L1	185 - 147.833 (1)	TP22.8499x13.563x0.2188	37.17	185.00	320.0	13.6513	-13.33	30.12	0.442
L2	147.833 - 132.833 (2)	TP26.598x22.8499x0.279	15.00	185.00	271.5	20.5204	-16.06	62.90	0.255
L3	132.833 - 90.667 (3)	TP36.7x24.9989x0.3125	46.33	185.00	177.0	35.2597	-18.01	254.35	0.071
L4	90.667 - 43.4167 (4)	TP47.902x34.7282x0.375	52.58	185.00	138.6	54.0303	-28.40	635.53	0.045
L5	43.4167 - 0 (5)	TP58x45.5027x0.4375	50.00	185.00	107.7	81.0912	-47.81	4525.13	0.011

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{ux} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M _{uy} kip-ft	φM _{uy} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	185 - 147.833 (1)	TP22.8499x13.563x0.2188	9.34	314.27	0.030	0.00	314.27	0.000
L2	147.833 - 132.833 (2)	TP26.598x22.8499x0.279	24.73	556.25	0.044	0.00	556.25	0.000
L3	132.833 - 90.667 (3)	TP36.7x24.9989x0.3125	636.25	1471.04	0.433	0.00	1471.04	0.000
L4	90.667 - 43.4167 (4)	TP47.902x34.7282x0.375	1570.53	2880.02	0.545	0.00	2880.02	0.000
L5	43.4167 - 0 (5)	TP58x45.5027x0.4375	3529.55	5308.32	0.665	0.00	5308.32	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V _u K	φV _n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T _u kip-ft	φT _n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	185 - 147.833 (1)	TP22.8499x13.563x0.2188	0.93	241.48	0.004	0.00	667.16	0.000
L2	147.833 - 132.833 (2)	TP26.598x22.8499x0.279	1.39	358.69	0.004	0.00	1181.96	0.000
L3	132.833 - 90.667 (3)	TP36.7x24.9989x0.3125	16.95	609.12	0.028	0.00	3115.58	0.000
L4	90.667 - 43.4167 (4)	TP47.902x34.7282x0.375	29.02	945.19	0.031	0.00	6096.44	0.000
L5	43.4167 - 0 (5)	TP58x45.5027x0.4375	43.03	1400.86	0.031	0.00	11228.00	0.000

Pole Interaction Design Data

RISATower KMB Design Group, LLC 1800 Route 34, Suite 209 Wall, NJ 07719 Phone: (732) 280-5623 FAX: (732) 280-3980	Job	300.5912 - NJ08012E	Page	11 of 11
	Project	185ft Monopole; Major Road Route 1, South Brunswick, NJ	Date	15:38:07 07/17/12
	Client	T-Mobile	Designed by	Ekata A. Shah

Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
		ϕP_n	ϕM_{nx}	ϕM_{ny}	ϕV_n	ϕT_n			
L1	185 - 147.833 (1)	0.442	0.030	0.000	0.004	0.000	0.472	1.000	4.10-1a ✓
L2	147.833 - 132.833 (2)	0.255	0.044	0.000	0.004	0.000	0.300	1.000	4.10-1a ✓
L3	132.833 - 90.667 (3)	0.071	0.433	0.000	0.028	0.000	0.504	1.000	4.10-1a ✓
L4	90.667 - 43.4167 (4)	0.045	0.545	0.000	0.031	0.000	0.591	1.000	4.10-1a ✓
L5	43.4167 - 0 (5)	0.011	0.665	0.000	0.031	0.000	0.676	1.000	4.10-1a ✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	185 - 147.833	Pole	TP22.8499x13.563x0.2188	1	-13.33	30.12	47.2	Pass
L2	147.833 - 132.833	Pole	TP26.598x22.8499x0.279	2	-16.06	62.90	30.0	Pass
L3	132.833 - 90.667	Pole	TP36.7x24.9989x0.3125	3	-18.01	254.35	50.4	Pass
L4	90.667 - 43.4167	Pole	TP47.902x34.7282x0.375	4	-28.40	635.53	59.1	Pass
L5	43.4167 - 0	Pole	TP58x45.5027x0.4375	5	-47.81	4525.13	67.6	Pass
Summary								
Pole (L5)							67.6	Pass
Base Plate							88.0	Pass
RATING =							88.0	Pass



Appendix B

RF Data Sheet

Network Modernization RFDS v3.0



Site ID NJ08012E	Latitude 40.40507
Site Name Sand Hill_1	Longitude -74.54754
Address Major Road and Route 1, South Brunswick Twp, 8852	Site Type Structure (Non-Building)
Market New Jersey	Site Class Monopole
	Landlord Township of South Brunswick

Configuration

1C

Approvals	
Market RF	Wave
Market Development	Per
RFDS Revision	2
RFDS Final	x
Work Order #	
Date	06/28/2012
NO#	(888) 412-6664

Site Information

Existing Configuration				Cabinet #	Proposed Configuration			
1	2	3	4	Technology	1	2	3	4
UMTS 3106	GSM 2106			GSM/UMTS/LTE 6102		GSM 2106		
1				Cabinet type CBU	2			
				DUW30	1			
				DUL20	1			
				DUG20				
				DUS41				
				RBS6601	2			
				dTRU/TRX				
6	6			RU22 B4				
				RUS01 B2				
				RUS01 B4	12			

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

Scope of Work

Replace existing 3106 UMTS cabinet with 6102 cabinet equipped with DUW30 and 12 RUS01 B4 radios (6 for UMTS and 6 for LTE). Turn off and keep in place existing 2106 GSM cabinet. Add another DUW30, DUL20, DUG20 and 2 RBS6601 main units to the 6102 cabinet, install DUW30 in one RBS6601 and DUG20 in the other. Verify existing UMTS tilts and Azimuth. Keep same Azimuth/tilts if different from RFDS. Use one (1) HCS 9X18MLE 10 AWG(6MM) 1" cable per site

ALPHA - Scope of Work

- | | |
|---|--|
| <ul style="list-style-type: none"> <input type="checkbox"/> Add new mount <input type="checkbox"/> Relocate antenna <input type="checkbox"/> Add antenna <input checked="" type="checkbox"/> Swap antenna <input type="checkbox"/> Remove antenna <input type="checkbox"/> Add TMA <input type="checkbox"/> Swap TMA <input checked="" type="checkbox"/> Remove TMA | <ul style="list-style-type: none"> <input type="checkbox"/> Add RRU <input type="checkbox"/> Swap existing RRU <input type="checkbox"/> Remove RRU <input type="checkbox"/> Consolidate coax cables <input type="checkbox"/> Add coax cables <input checked="" type="checkbox"/> Add fiber cables <input type="checkbox"/> Add hybrid combiner <input checked="" type="checkbox"/> Add filter combiner |
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GAMMA - Scope of Work

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| <ul style="list-style-type: none"> <input type="checkbox"/> Add new mount <input type="checkbox"/> Relocate antenna <input type="checkbox"/> Add antenna <input checked="" type="checkbox"/> Swap antenna <input type="checkbox"/> Remove antenna <input type="checkbox"/> Add TMA <input type="checkbox"/> Swap TMA <input checked="" type="checkbox"/> Remove TMA | <ul style="list-style-type: none"> <input type="checkbox"/> Add RRU <input type="checkbox"/> Swap existing RRU <input type="checkbox"/> Remove RRU <input type="checkbox"/> Consolidate coax cables <input type="checkbox"/> Add coax cables <input checked="" type="checkbox"/> Add fiber cables <input type="checkbox"/> Add hybrid combiner <input checked="" type="checkbox"/> Add filter combiner |
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DELTA - Scope of Work

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| <ul style="list-style-type: none"> <input type="checkbox"/> Add new mount <input type="checkbox"/> Relocate antenna <input type="checkbox"/> Add antenna <input type="checkbox"/> Swap antenna <input type="checkbox"/> Remove antenna <input type="checkbox"/> Add TMA <input type="checkbox"/> Swap TMA <input type="checkbox"/> Remove TMA | <ul style="list-style-type: none"> <input type="checkbox"/> Add RRU <input type="checkbox"/> Swap existing RRU <input type="checkbox"/> Remove RRU <input type="checkbox"/> Consolidate coax cables <input type="checkbox"/> Add coax cables <input type="checkbox"/> Add fiber cables <input type="checkbox"/> Add hybrid combiner <input type="checkbox"/> Add filter combiner |
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| <ul style="list-style-type: none"> <input type="checkbox"/> Add new mount <input type="checkbox"/> Relocate antenna <input type="checkbox"/> Add antenna <input checked="" type="checkbox"/> Swap antenna <input type="checkbox"/> Remove antenna <input type="checkbox"/> Add TMA <input type="checkbox"/> Swap TMA <input checked="" type="checkbox"/> Remove TMA | <ul style="list-style-type: none"> <input type="checkbox"/> Add RRU <input type="checkbox"/> Swap existing RRU <input type="checkbox"/> Remove RRU <input type="checkbox"/> Consolidate coax cables <input type="checkbox"/> Add coax cables <input checked="" type="checkbox"/> Add fiber cables <input type="checkbox"/> Add hybrid combiner <input checked="" type="checkbox"/> Add filter combiner |
|---|--|

Scope of work
 Swap existing passive antenna at position 1 with AIR21 B2A/B4P. Keep existing UMTS dd B4 TMA at position 1/right and remove/disconnect obsolete GSM TMAs. Keep existing coax lines at position 1/left for LMU. Keep existing coax lines at position 1/right for AWS UMTS and LTE. Add AWS filter combiners (LLC) to diplex AWS UMTS and LTE lines. Connect DATA (CPRI) active ports of AIR21 B2A/B4P antenna to DUG20 and PCS UMTS DUW30 via fiber lines. Connect RF passive port of AIR21 B2A/B4P antenna to AWS UMTS and LTE in cabinet radio/filter units via diplexed coax lines.

DELTA (view from behind)

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

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| <ul style="list-style-type: none"> <input type="checkbox"/> Add new mount <input type="checkbox"/> Relocate antenna <input type="checkbox"/> Add antenna <input type="checkbox"/> Swap antenna <input type="checkbox"/> Remove antenna <input type="checkbox"/> Add TMA <input type="checkbox"/> Swap TMA <input type="checkbox"/> Remove TMA | <ul style="list-style-type: none"> <input type="checkbox"/> Add RRU <input type="checkbox"/> Swap existing RRU <input type="checkbox"/> Remove RRU <input type="checkbox"/> Consolidate coax cables <input type="checkbox"/> Add coax cables <input type="checkbox"/> Add fiber cables <input type="checkbox"/> Add hybrid combiner <input type="checkbox"/> Add filter combiner |
|---|--|

Scope of work



Appendix C

Tower Inventory Information

TOWER MAPPING

Site Name South Brunswick

Client # NJ08012F

Date July 5, 2012

Page 1 of 13

Page Title	Initials	Page # (s)	Notes
Checklist & Notes	TWP	1	
Ladder	TWP	2	
Waveguide	TWP	3	
Hand Hole Rims	TWP	4	
Tower Elevation	TWP	5	
Transmission Cables	TWP	6-7	
Antenna and Mount Sketch	TWP	8-12	
Photo Log	TWP	13	

Latitude:	N 40° - 24' - 18.86"	Longitude:	W 74° - 32' - 51.40"
Ground Elevation:	265-ft		
Site Address:	Major Road & Route 1, South Brunswick, New Jersey		
Special Access Issues (Key Entry, Hidden/Unmarked Access, FM/TV on tower):	None		
FCC#:	1211853		
Tower ID Plate:	Valmont - 17720-98		
Telephone Company:	Verizon New Jersey, INC.		
Pedestal # and Location:	228458 (Inside AT&T compound)		
Power Company:	PSE&G		
Meter # and Owner:	703 732 00 (Nextel) & 626 055 745 (T-Mobile)		
Existing Carriers/Site #:	T-Mobile (NJ08012)		
	AT&T		
	Clearwire		
	Metro PCS (NY5672)		
	Unknown Carrier		
Gate Combo:	6678		

Signature of Crew Leader *Ryan Seifert*

Print Name: Ryan Seifert

Signature of Crew Member *Kevin Arnett*

Print Name: Kevin Arnett, E.I.

Abbreviations:	AGL: Above Ground Level	L: Angle	S.B.: Stitch Bolts
	BP: Bent Plate	2L: Double Angle	Schl: Schifflerized Angle
	B-B: Bolt to Bolt	MC: Metal Conduit	SM: Smooth Heliax
	C-C: Center to Center	ME: Minimum Edge	SP: Spacing
	C: Channel	MOD: Modification	SR: Solid Rod
	CNR: Could Not Record	PL: Plate	Th: Thickness
	EW: Elliptical Waveguide	RC: Rigid Conduit	Tri: Triangular
	FH: Foam Heliax	RHSS: Round Hollow Struct. Section	

TOWER MAPPING

Site Name South Brunswick

Client # NJ08012F

Date July 5, 2012

Page 2 of 13

LADDER

<p style="text-align: center;"><u>Climbing Ladder #1 Sketch</u></p>	<p style="text-align: center;"><u>Climbing Ladder #1 Photo</u></p>
--	---

Description	#	Height	Width	Step	Rail (type & size)	Rung (type & size)	Safety (type & size)
Ladder	1	11'-3"-185'	7"	30"	N/A	3/4"Ø SOLID ROD	3/8"Øx7 STRAND
Ladder							
Ladder							
Ladder							

TOWER MAPPING

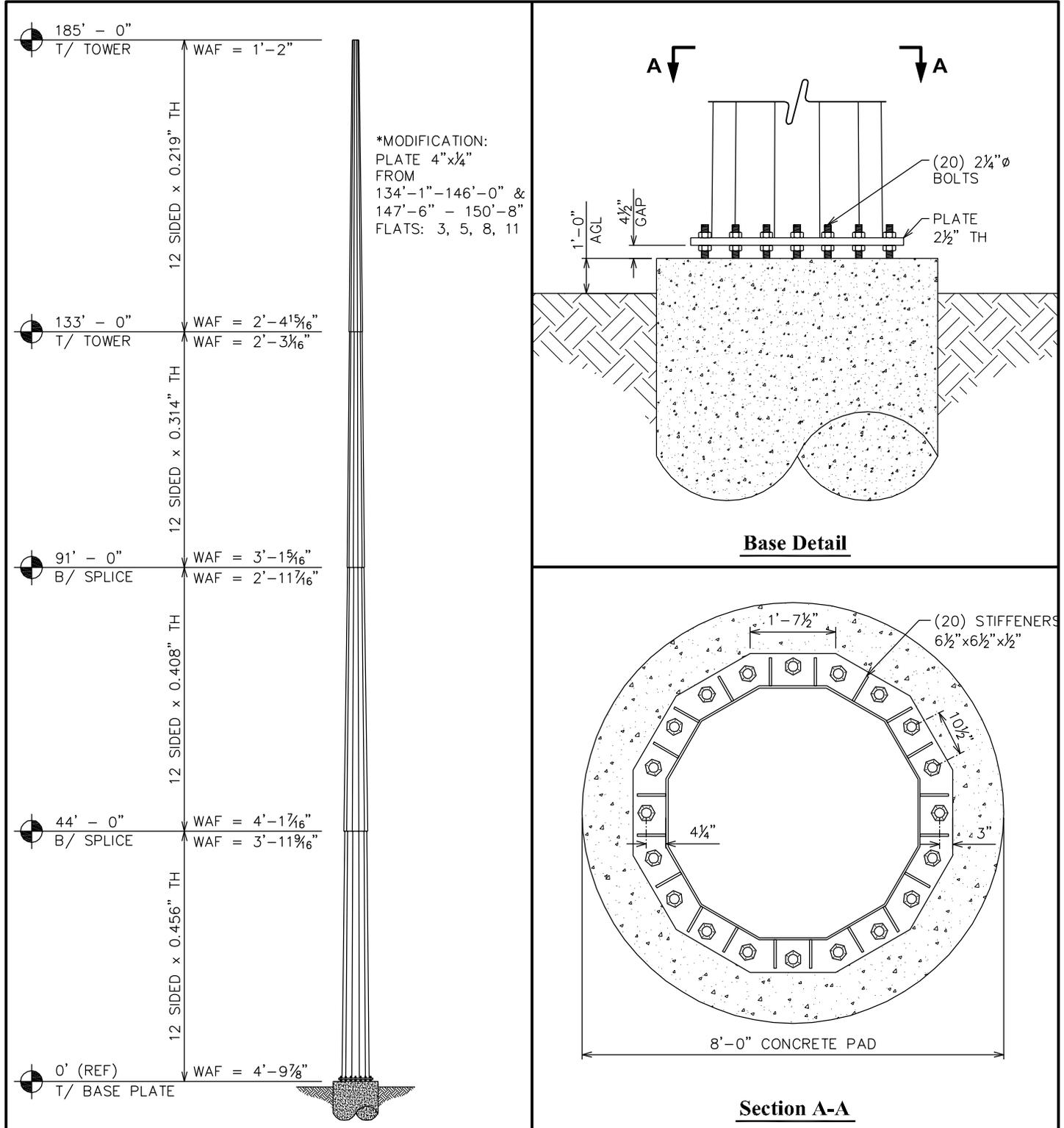
Site Name South Brunswick

Client # NJ08012F

Date July 5, 2012

Page 5 of 13

TOWER ELEVATION



TOWER MAPPING

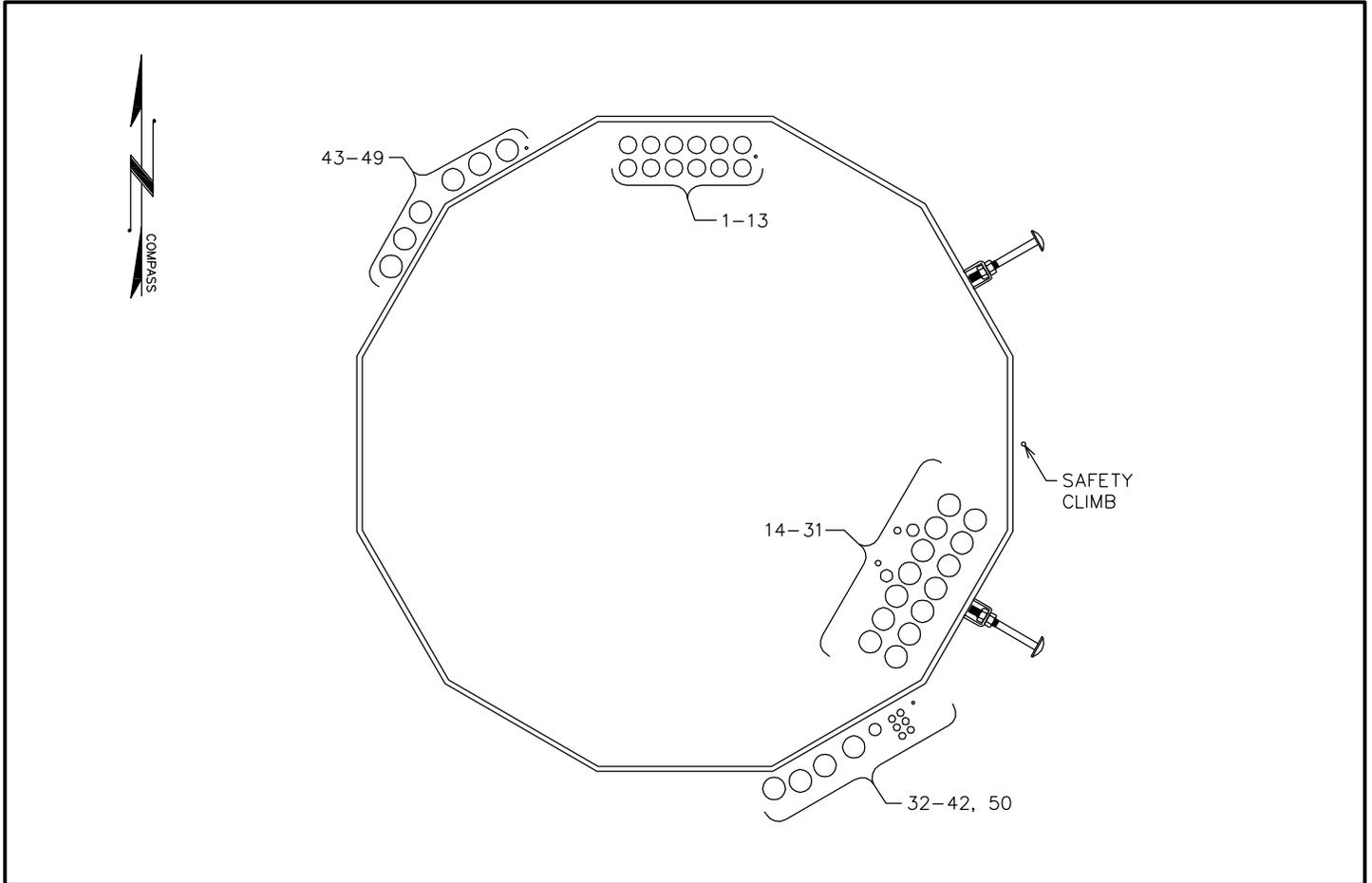
Site Name South Brunswick

Client # NJ08012F

Date July 5, 2012

Page 6 of 13

TRANSMISSION CABLES



Coax #	Type	Size	Height	Antenna	Carrier	Notes
1	FH	1/4"	13'-147'	11-13	T-MOBILE	
2	FH	1/4"	13'-147'	11-13	T-MOBILE	
3	FH	1/4"	13'-147'	11-13	T-MOBILE	
4	FH	1/4"	13'-147'	11-13	T-MOBILE	
5	FH	1/4"	13'-147'	11-13	T-MOBILE	
6	FH	1/4"	13'-147'	11-13	T-MOBILE	
7	FH	1/4"	13'-147'	11-13	T-MOBILE	
8	FH	1/4"	13'-147'	11-13	T-MOBILE	
9	FH	1/4"	13'-147'	11-13	T-MOBILE	
10	FH	1/4"	13'-147'	11-13	T-MOBILE	
11	FH	1/4"	13'-147'	11-13	T-MOBILE	
12	FH	1/4"	13'-147'	11-13	T-MOBILE	
13	SM	1/4"Ø	13'-147'	11-13	T-MOBILE	
14	FH	1 5/8"	13'-162'	14-25	AT&T	
15	FH	1 5/8"	13'-162'	14-25	AT&T	

TOWER MAPPINGSite Name South BrunswickClient # NJ08012FDate July 5, 2012Page 7 of 13**TRANSMISSION CABLES (CONTINUED)**

Coax #	Type	Size	Height	Antenna	Carrier	Notes
16	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
17	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
18	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
19	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
20	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
21	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
22	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
23	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
24	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
25	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
26	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
27	FH	1 ⁵ / ₈ "	13'-162'	14-25	AT&T	
28	FH	7/8"	13'-162'	14-25	AT&T	
29	FH	7/8"	13'-162'	14-25	AT&T	
30	SM	1/2"Ø	13'-116'	N/A	OWNER	SIDE LIGHTS
31	SM	5/8"Ø	13'-185'	N/A	OWNER	BEACON
32	FH	1/2"	13'-131'	3-10	CLEARWIRE	
33	FH	1/2"	13'-131'	3-10	CLEARWIRE	
34	FH	1/2"	13'-131'	3-10	CLEARWIRE	
35	FH	1/2"	13'-131'	3-10	CLEARWIRE	
36	FH	1/2"	13'-131'	3-10	CLEARWIRE	
37	FH	1/2"	13'-131'	3-10	CLEARWIRE	
38	FH	7/8"	13'-100'	1	UNKNOWN	
39	FH	1 ⁵ / ₈ "	13'-100'	2	UNKNOWN	
40	FLEX	2"Ø	13'-131'	3-10	CLEARWIRE	
41	FLEX	2"Ø	13'-131'	3-10	CLEARWIRE	
42	FLEX	2"Ø	13'-131'	3-10	CLEARWIRE	
43	FH	1 ⁵ / ₈ "	13'-181'	26-28	METRO PCS	
44	FH	1 ⁵ / ₈ "	13'-181'	26-28	METRO PCS	
45	FH	1 ⁵ / ₈ "	13'-181'	26-28	METRO PCS	
46	FH	1 ⁵ / ₈ "	13'-181'	26-28	METRO PCS	
47	FH	1 ⁵ / ₈ "	13'-181'	26-28	METRO PCS	
48	FH	1 ⁵ / ₈ "	13'-181'	26-28	METRO PCS	
49	SM	1/4"Ø	13'-181'	26-28	METRO PCS	
50	SM	1/4"Ø	13'-162'	14-25	AT&T	

TOWER MAPPING

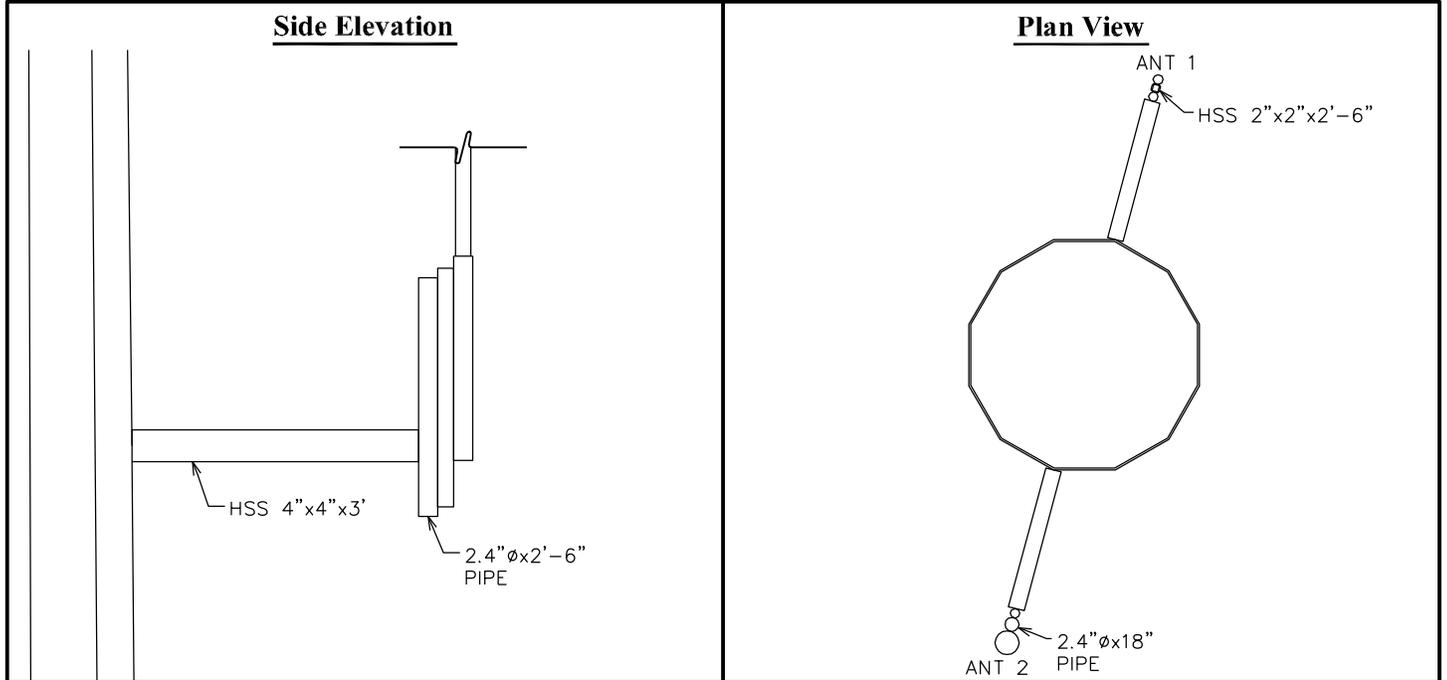
Site Name South Brunswick

Client # NJ08012F

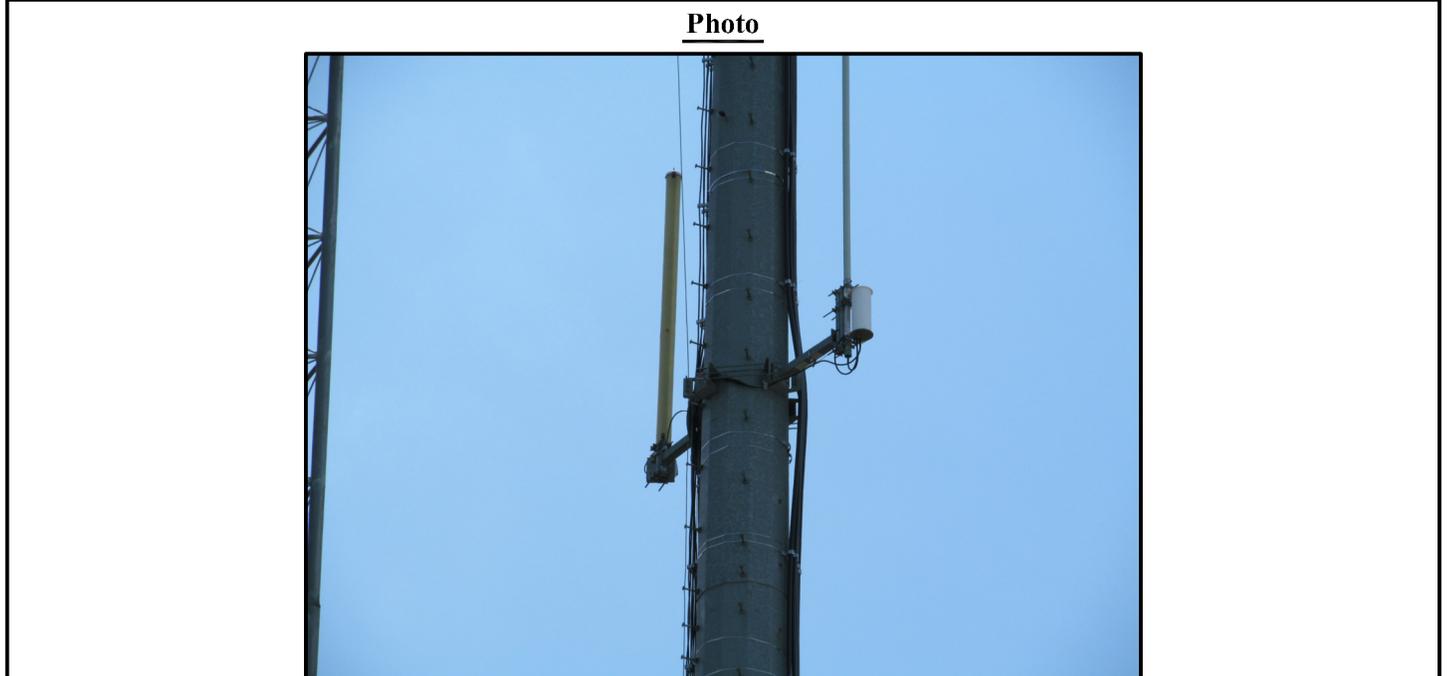
Date July 5, 2012

Page 8 of 13

ANTENNA AND MOUNT SKETCH



Ant #	Elevation	Flat	Mount Type	Azimuth
1-2	100' (MOUNT)	1/2 & 7/8	SIDEARM	15° & 195°
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	Coax # / Size	
CNR (ANT 1)	2 1/2" ϕ x 12' OMNI	(1) 6" ϕ x 15"	38 (7/8")	
CNR (ANT 2)	6" ϕ x 12' OMNI	N/A	39 (1 5/8")	



TOWER MAPPING

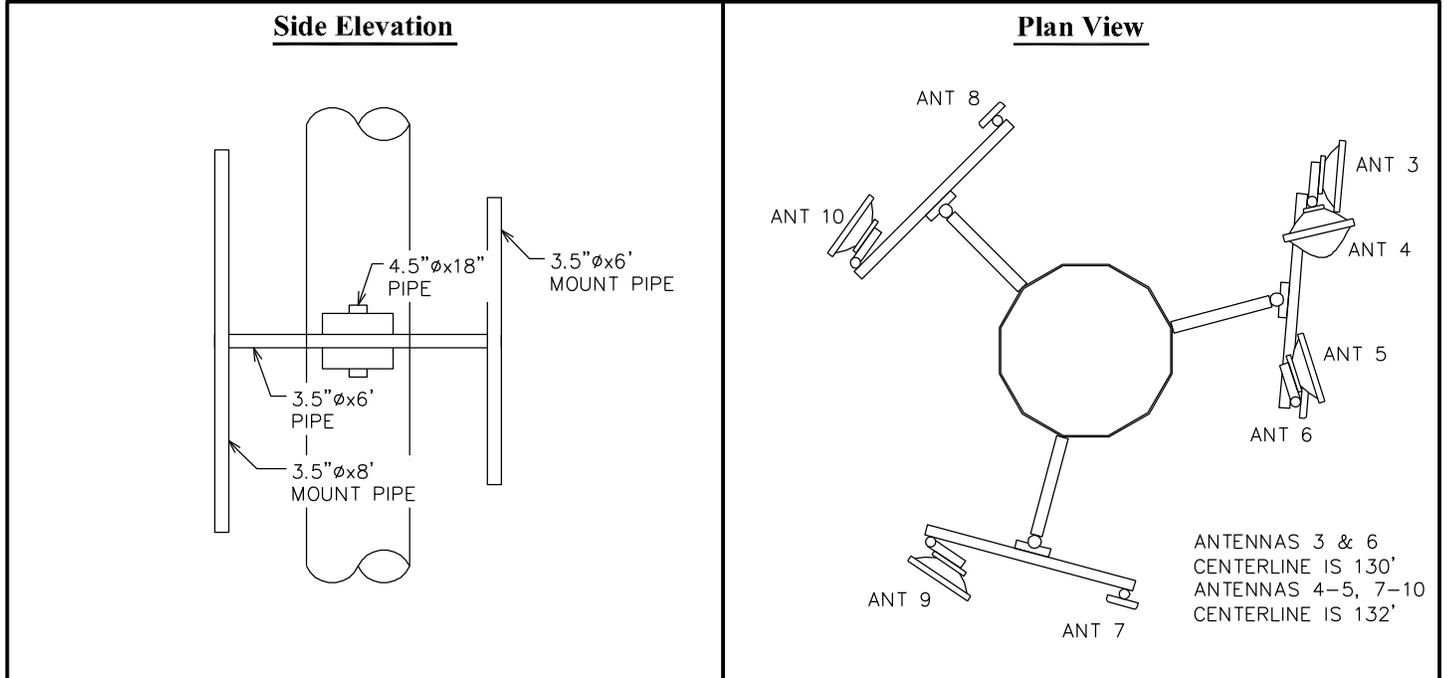
Site Name South Brunswick

Client # NJ08012F

Date July 5, 2012

Page 9 of 13

ANTENNA AND MOUNT SKETCH



Ant #	Elevation	Flat	Mount Type	Azimuth
3-10	VARIES (SEE ABOVE)	3/4, 7/8, 1 1/2	SECTOR	75°, 195°, 315°
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	Coax # / Size	
ANDREW (ANT 3)	VHLP2-23-DW1	(3) 24"x8"x3"	32-37	
ANDREW (ANT 4)	2'Ø DISH		32-37	
ANDREW (ANT 5)	VHLP2-11-DW1		32-37	
ARGUS (ANT 6-8)	LLPX31OR-V1		40-42	
ANDREW (9-10)	VHLP2-18-CR4		32-37	

Photo



TOWER MAPPING

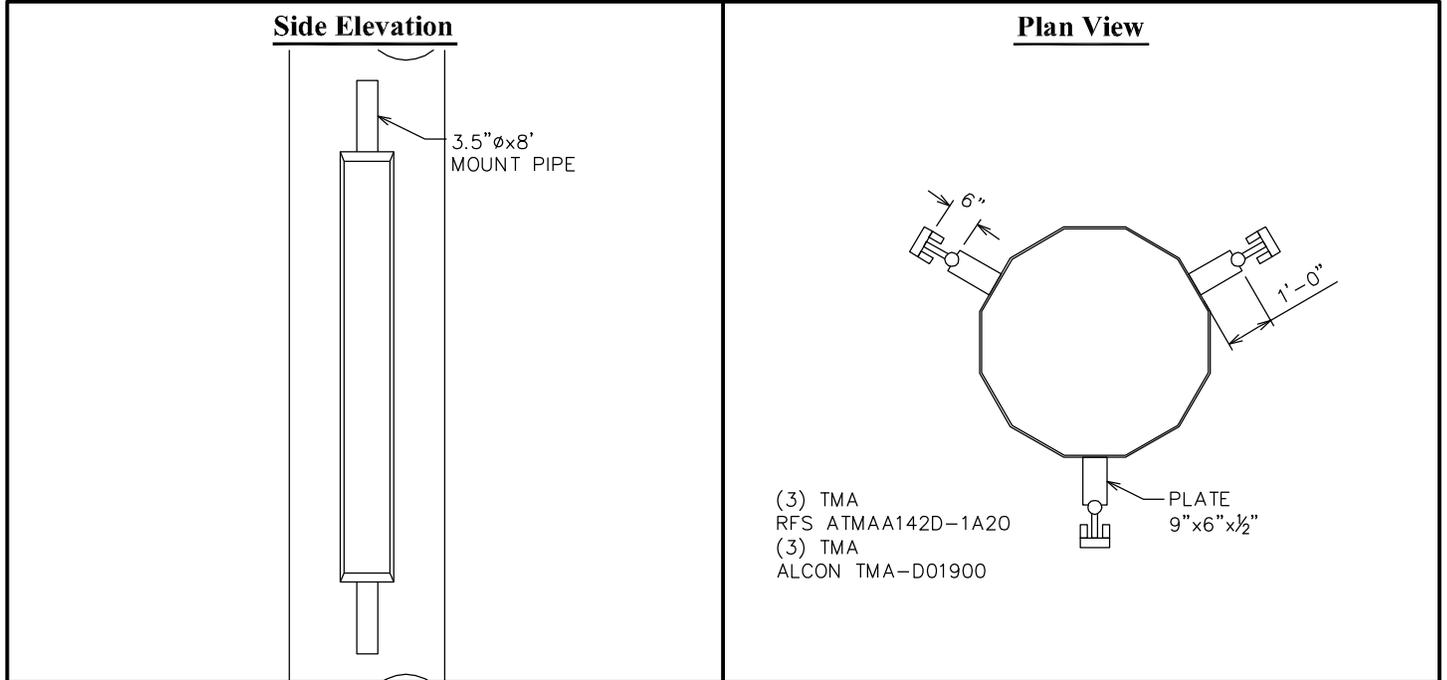
Site Name South Brunswick

Client # NJ08012F

Date July 5, 2012

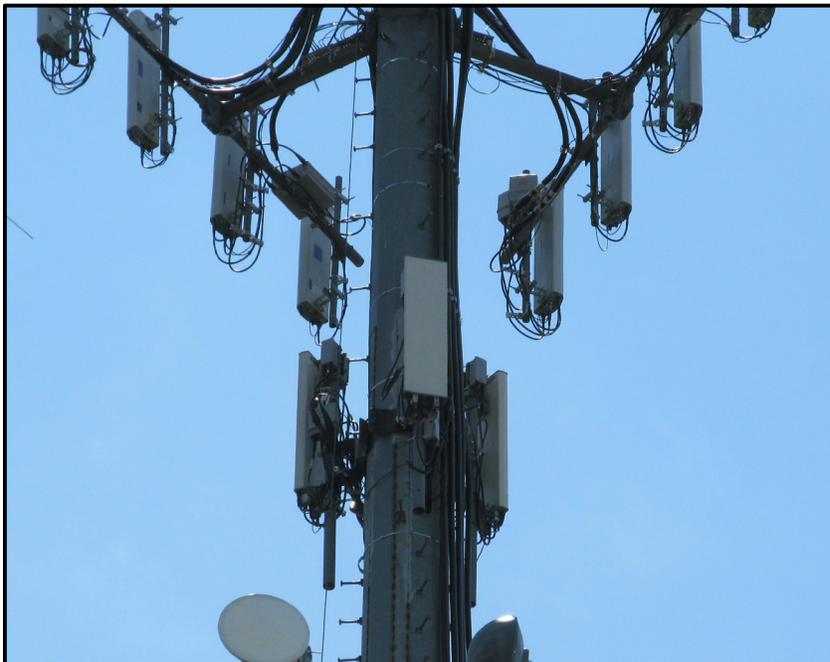
Page 10 of 13

ANTENNA AND MOUNT SKETCH



Ant #	Elevation	Flat	Mount Type	Azimuth
11-13	147' (MOUNT)	3, 7, 11	SIDEARM	60°, 180°, 300°
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	Coax # / Size	
CNR (NO TAG)	4'-6"x1"x3"	SEE ABOVE	1-12 (1¼")	

Photo



TOWER MAPPING

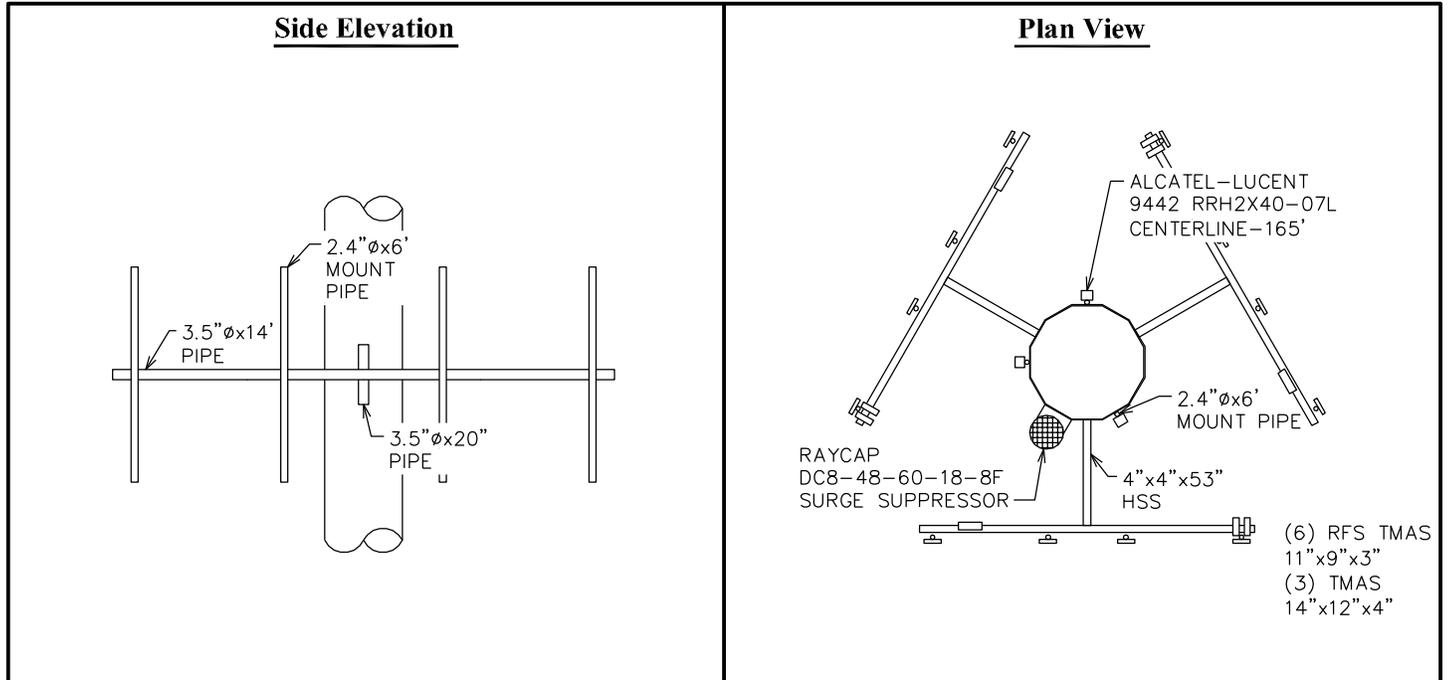
Site Name South Brunswick

Client # NJ08012F

Date July 5, 2012

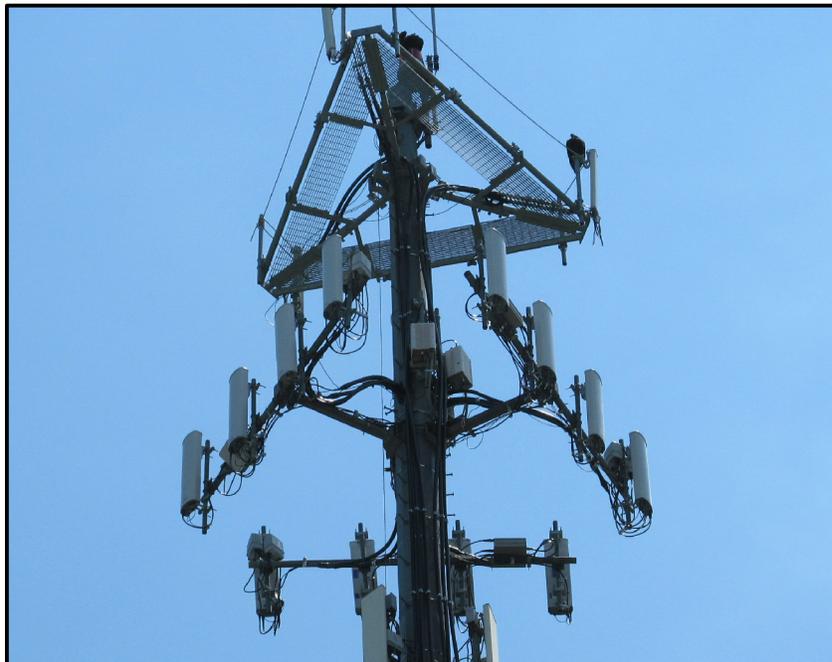
Page 11 of 13

ANTENNA AND MOUNT SKETCH



Ant #	Elevation	Flat	Mount Type	Azimuth
14-25	162' (MOUNT)	3, 7, 11	SECTOR	60°, 180°, 300°
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	Coax # / Size	
POWERWAVE	PG5-15-XLH-RR J	SEE ABOVE	14-25 (1 5/8")	

Photo



TOWER MAPPING

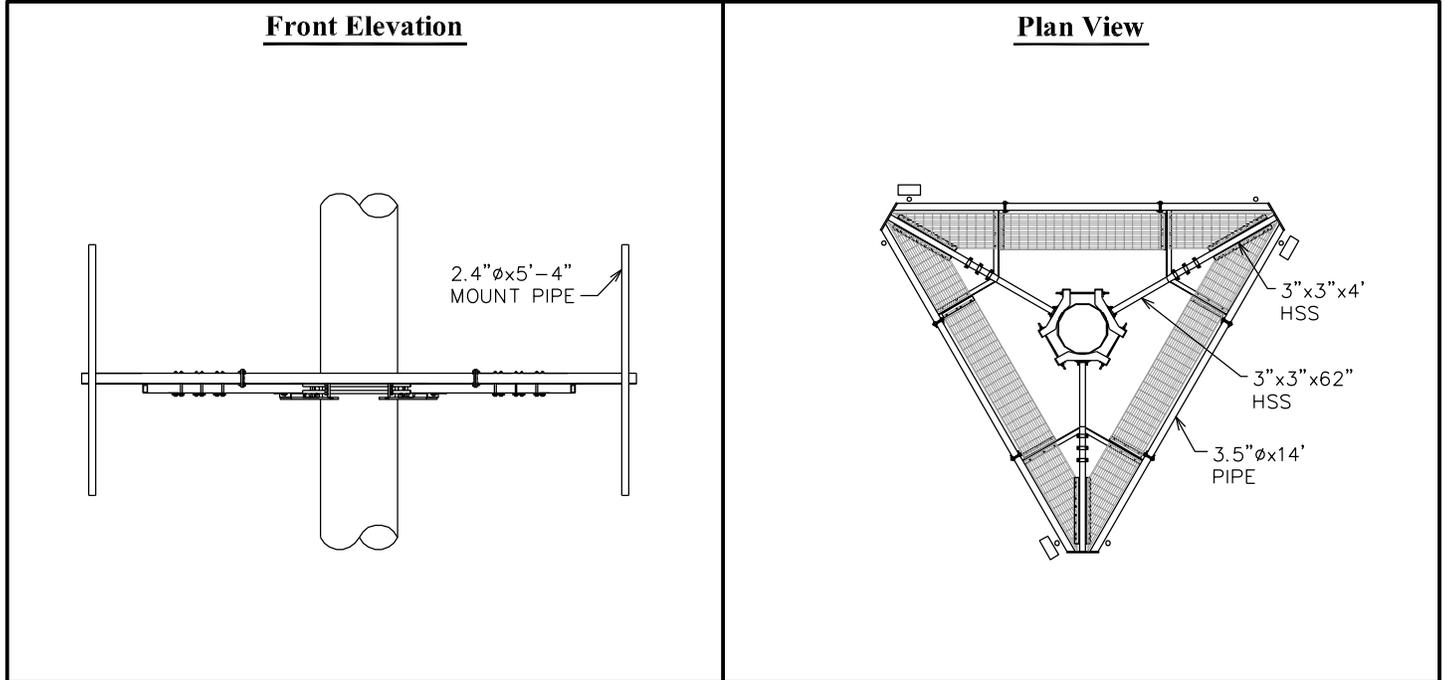
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Date July 5, 2012

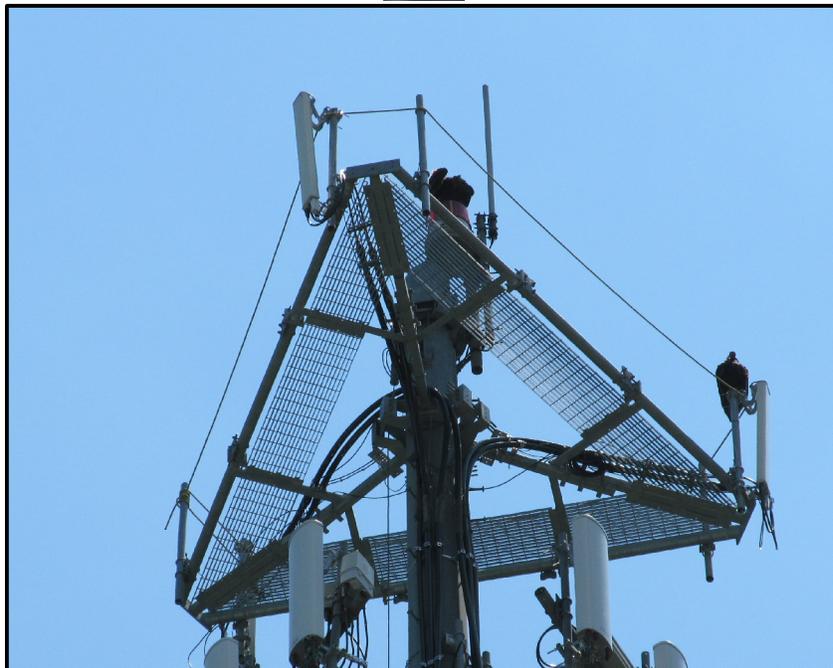
Page 12 of 13

ANTENNA AND MOUNT SKETCH



Ant #	Elevation	Flat	Mount Type	Azimuth
26-28	181' (MOUNT)	3, 7, 11	PLATFORM	60°, 180°, 300°
Antenna Manufacturer	Antenna Model #	TMA (#) / Model #	Coax # / Size	
KATHREIN	80010504	N/A	43-49 (1 5/8" & 1/4" Ø)	

Photo



TOWER MAPPINGSite Name South BrunswickClient # NJ08012FDate July 5, 2012Page 13 of 13**PHOTO LOG**

Photo #	Description of Photograph
1-2	Front gate
3-7	Power meters
8-15	Tower elevation
16-22	Carrier equipment
23	Front gate
24-28	Tower elevation
29	Tower ID plate
30-47	Tower base
48-55	Coax
56	Waveguide
57-58	Coax
59-60	Ladder
61-63	Hand hole rns
64-69	Coax
70-73	Tower compound from tower
74-76	Tower splice
77-78	Antennas 1-2
79	Piecemark
80	Tower splice
81-90	Antennas 1-2
91-93	Side Lights
94-112	Antennas 3-10
113	Tower splice
114	Piecemark
115-122	Plate modification
123-150	Antennas 11-28
151-152	Tower elevation

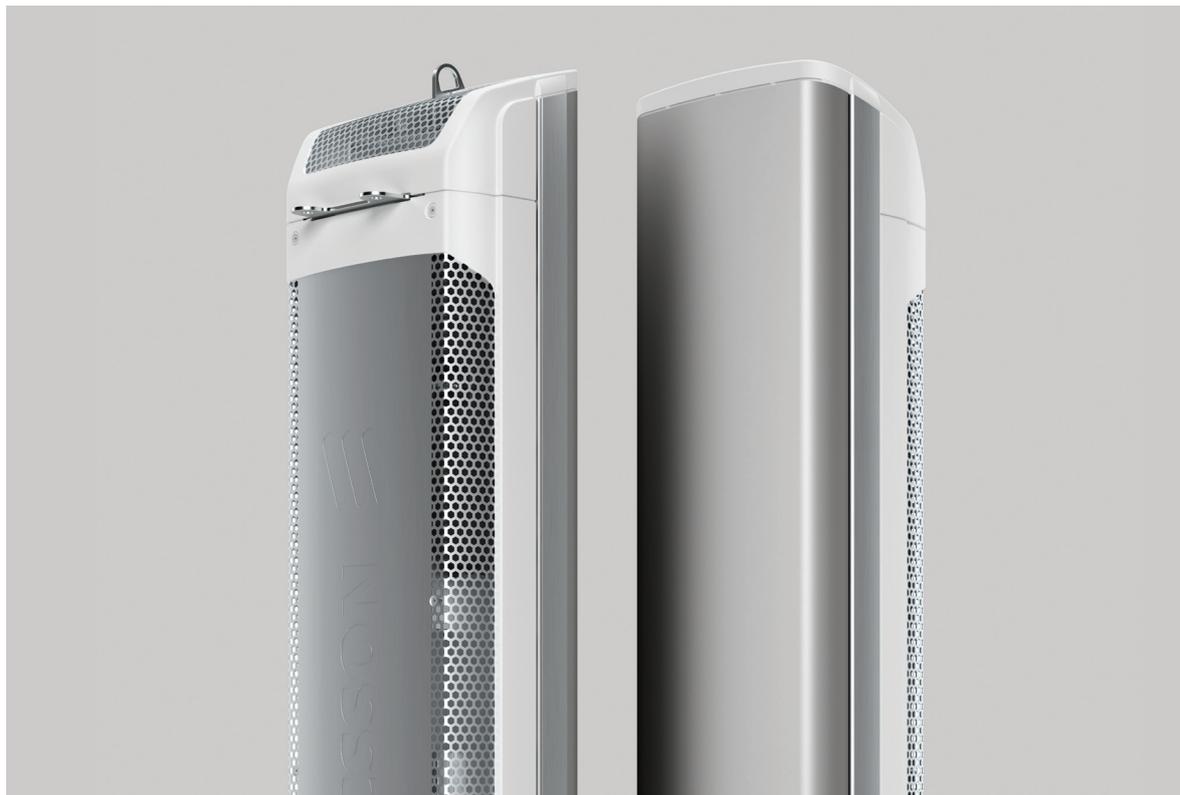


Appendix D

Proposed Antenna Manufacturer Specification Sheet

DATA-SHEET FOR

AIR 21, 1.3 M, B2A B4P



The Antenna-Integrated Radio (AIR) is a single tower-mounted unit that can replace the antenna/s and radio for one sector. Additional electronics such as **ASC?** and a RET Actuator and control are also included. A passive antenna function for an extra band is optional.

ANTENNA- INTEGRATED RADIO



Figure 2 →
Three-sector tower site
with three AIR units.e

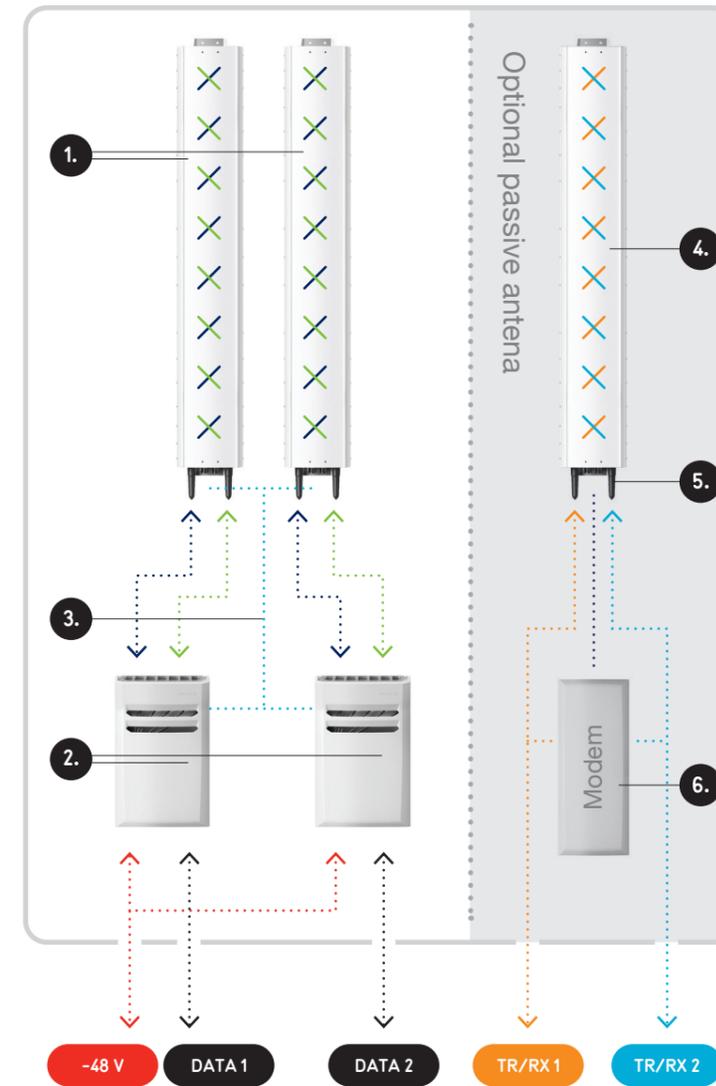
The Antenna-Integrated Radio (AIR) is a single tower-mounted unit that can replace the antenna/s and radio for one sector. Additional electronics such as **ASC?** and a RET Actuator and control are also included. A passive antenna function for an extra band is optional. (The option has to be specified when ordering, retrofit is not possible).

The height and width are the same as for a passive antenna with similar characteristics. The depth is increased to house the radios' electronics. Digital Units (DUs) from Ericsson's RBS 6000 family provide the baseband function and support GSM, WCDMA and LTE.

Digital Units (DUs) from Ericsson's RBS 6000 family provide the baseband function and support GSM, WCDMA and LTE.

One or two DUs, depending on capacity and the standards to be supported, are needed for a three-sector site with AIR units.

The AIR is especially suited for state of the art mobile broadband basestations utilizing advanced MIMO techniques. Less tower-mounted equipment is required and the unit's attractive appearance enables it to blend in well with other existing equipment. The same applies to sites with multiple access technologies on different frequency bands. With Air, it is only necessary to swap antennas in order to add new 3G/4G technology on-site or at a new site. The AIR also saves power compared to traditional macro RBSs that use long feeders for antenna connections.



← Figure 2
Example of hardware that a single AIR unit can replace

Functionality for the AIR unit

Figure 2 shows an example of the hardware that a single AIR unit can replace. The function of the AIR unit is the same, but the implementation is different. The AIR unit's active band has two radios (2) connected to a pair of cross-polarized antenna arrays (1). Remote electrical tilt (3) is included. Air supports 2 TX for the down-link and 4 RX for the up-link. The passive antenna function on the frequency band not used by the AIR unit's active part is optional. The passive function includes an antenna array (4) and a RET motor (5) with a modem to control it (6). The tilts for the active part and the passive part are controlled independently, but each band has the same tilt for both arrays and for both polarizations.

Configuration Example

Figure 3 shows a typical configuration with WCDMA with 2 × 2 MIMO for Band 1. One AIR unit is deployed in each sector. A common base band unit with a DUW inside provides base band processing and back-haul. The AIR units can be specified with passive antennas for Band 4.

Figure 3 →
Three sector configuration example: RBS 6601 with three AIR units.

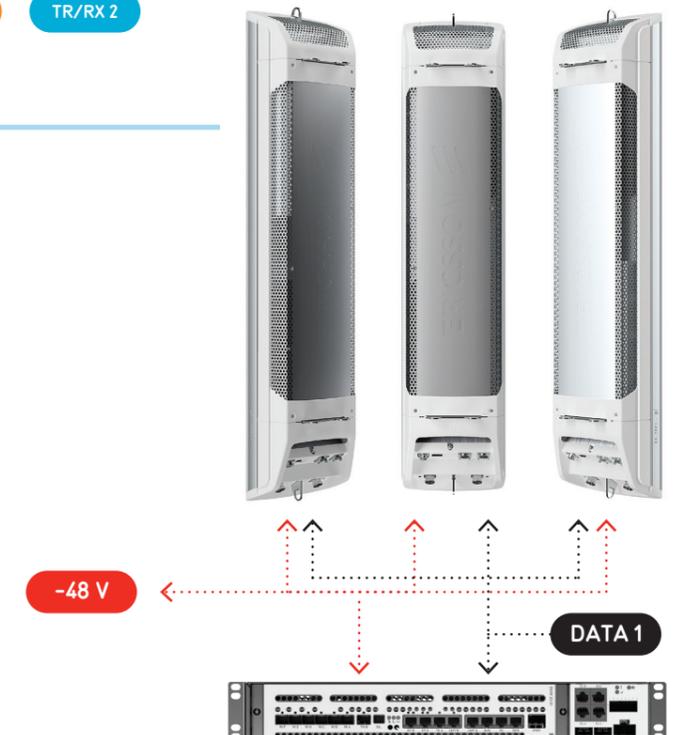
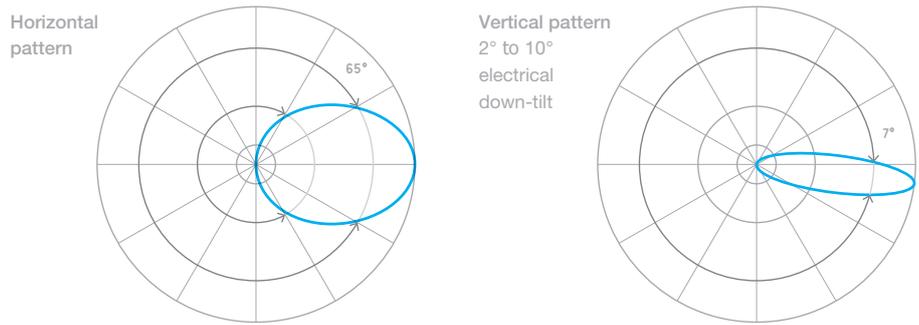


Figure 4
Antenna
Characteristics



Technical Specification

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 63 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
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 Figure 3
MECHANICAL	
Weight	32 kg (70 lb) for active only 38 kg (83 lb) for active and passive
Size (H x W x D)	56" x 12" x 8" (1422 mm x 300 mm x 200 mm)
Wind load (frontal/lateral/rear-side) @ 150 km/h wind speed	580 N / 300 N / 720 N
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)
SUPPORTING BASE-BAND	
RBS 6601	One or two units depending on configuration.

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

** Other base-band configurations are available