THIS LEASE IS THE PROPERTY OF:
Woodbury County, Iowa
620 Douglas Street, Suite 104
Sioux City, Iowa 51101

AND THE PROPERTY OF:
Customer Support Manager, State of Iowa,
Motorola Solutions
1303 E. Algonquin Road
Schaumburg, IL 60196
ATTN: Dave Gordon
Phone: 319-377-6686

and

Law Department
Motorola Solutions, Inc.
500 W, Monroe St. 43rd Floor
Chicago, IL 60661
ATTN: Rich Heller
Phone: (847) 576-1817
Fax: (312) 559-5694

C/O Starcomm Public Safety Board
P.O. Box 447
Sioux City, Iowa 51102
ATTN: Glenn Sedivy
Phone: (712) 279-6959
Fax: (712) 279-6157

SITE LEASE AGREEMENT

THIS SITE LEASE AGREEMENT (hereinafter called "Lease"), is made and entered into as of this 7th day of March, 2017, by and between Woodbury County, Iowa, whose address is 620 Douglas Street, Suite 104, Sioux City, Iowa 51101 under the direction of the Starcomm Public Safety Board, whose address is P.O. Box 447 Sioux City, Iowa 51102, hereinafter called "Lessor", and Motorola Solutions, Inc. having an address of 500 W. Monroe St., Chicago, IL 60661, hereinafter called "Lessee".

In consideration of the covenants and agreements hereinafter set forth, the parties hereto agree as follows:

1. Leased Premises. Lessor is the owner of that certain real property described below (the "Property"). Lessor hereby Lease to the Lessee, for the period, at the rental, and upon the terms and conditions hereinafter set forth, certain portions of the Property, tower, and a portion of the interior space on the ground (the "Premises") located on the Property within the County of Woodbury, Iowa

2. Communications Equipment Upgrade and Installation. A detailed list of Communications Equipment to be installed and upgraded by the Lessee at the Property and a detailed Site Plan is hereby attached as **Exhibit A** and incorporated herein as if fully set forth in this Agreement. A Structural Analysis of the communications tower is hereby attached as **Exhibit B** and incorporated herein as if fully set forth in this Agreement.

"Communications Equipment" shall be defined as: a communications facility including (without limitation) antennae and radios (including microwave antennae and radios); equipment cabinets; backup

power sources (including batteries, generators and fuel storage tanks); and other associated equipment, fixtures, wiring, and cabling.

Lessee shall cause the Communications Equipment to be fully installed and upgraded on the Property by June 16, 2017. All costs associated with the installation of Communications Equipment and upgrading of the existing system shall be borne by the Lessee. The Communications Equipment shall service the Public Safety communication needs of the area.

The location of the above tower and equipment is:

Site Address: 2267 O'Brien Avenue, Anthon, Iowa 51104

Latitude: 42-22-30 N Longitude: 095-48-24W

3. Access. Lessor also grant to Lessee, the State of Iowa, and their respective employees, contractors, agents, representatives, and assigns, access to the Property and Premises described in paragraph one (1) above, seven days a week, 24 hours a day, throughout the term of this Lease, provided that, prior to Lessee or Lessee's contractors climbing the tower for antenna access, Lessee will give Lessor no less than 12 hours prior notice. To allow this access to climb the tower or Fenced Compound, Lessor will give Lessee a key to the lock on the Compound. Each time the Lessee's employee(s) access the location all the Lessee's employees will notify the Facility Manager, in writing, in person or if necessary over the phone by calling (712) 279-6960. These employees will be subject to criminal background checks, except in emergency situations and when otherwise agreed upon by Lessor in writing. Security access to the sites compound will be provided by the Starcomm Director or Facility Manager. Each employee of Lessee who climbs the tower will have in their possession a card showing that they have completed the Qualified Climber/Rescue course offered through Comtrain or similar program approved by Lessor. Each employee of Lessee will follow all OSHA regulations while climbing any portion of the tower including wearing all required safety harnesses and will use the safety climbing cable while on the tower. There will never be fewer than 2 certified climbers on the site during any type of climbing on the tower.

4. Initial Term and Commencement Date of Lease . The "Initial Term" of this Lease shall be for a period of Thirteen (13) years. The "Commencement Date" for the Initial Term of this Lease begins upon the start of installation of the Communications Equipment as described in Paragraph 1, in and about the Premises and expiring on the date which is thirteen (13) years thereafter. Lessee shall provide written notification to the Parties of the date when installation shall commence. In any event the commencement date shall be no later than April 1, 2017.

5. Renewal Terms. Lessor hereby grant to Lessee the right, privilege and option to extend this Lease for four (4) additional "Renewal Terms" of Five (5) years, each with the consent and written approval from Lessor, from the end of the Initial Term, under the same terms, covenants and conditions as herein contained, provided that Lessee is not in default of any of the terms, covenants or conditions of this Lease at the conclusion of the Initial Term or any prior Renewal Term, respectively. This Lease shall automatically terminate unless Lessee gives written notice of the desire to extend or renew the Lease at least one hundred eighty (180) days prior to the end of the applicable term and obtains Lessor' consent to each requested extension.

6. Termination.

a. Both Lessor and Lessee shall have the right to terminate this Lease for cause, in the event the other party defaults on any material provision of this Lease, and in the event that such default is not cured within thirty (30) days after written notice thereof is provided to the other party. Said curative period shall be extended another thirty (30) days provided defaulting party has shown a good faith effort to cure default. Notwithstanding the foregoing, the curative period for any monetary default is thirty (30) days from receipt of written notice and the curative period for lapse in insurance coverage is ten (10) days from the receipt of written notice

b. The parties agree that in the event that federal or state law requires the installation of back up power sources or supplies that the terms of this Lease will require an amendment to be negotiated between the parties. No additional equipment shall be placed upon the Premises by Lessee without the written consent of Lessor. Notwithstanding the foregoing, Lessee may install upgraded Communications Equipment to replace existing Communications Equipment without the written consent of Lessor. However, a detailed list of replaced items must be promptly provided to the Lessor.

c. This Lease may be terminated without further liability as set forth below:

1) by either party in the event the other party defaults on any material provision of this Lease, and in the event that such default is not cured within thirty (30) days after written notice thereof is provided to the other party. Said curative period shall be extended another thirty (30) days provided defaulting party has shown a good faith effort to cure default. Notwithstanding the foregoing, the curative period for any monetary default is thirty (30) days from receipt of written notice and the curative period for lapse in insurance coverage is ten (10) days from the receipt of written notice; or

2) by Lessee if it does not obtain or maintain any license, permit or other approval necessary for the construction and operation of Lessee's facilities; or

3) by Lessee if Lessee is unable to occupy and utilize the tower site due to an action of the FCC, including without limitation, a take-back of channels, a change in frequencies, or a change in licensed coverage area; or

4) by Lessee if Lessee determines that the tower site is not appropriate for its operations for economic or technological reasons, including, without limitation, signal interference; or

5) by Lessor if the Lessor determine the tower site is no longer suitable to be used by Lessor for their operation and the Lessor choose to remove the building; or

6) by Lessor after the expiration of the initial term of this Lease upon providing Lessee with written notice. Such notice, if given by Lessor, must be given not less than three hundred sixty-five (365) days prior to the date therein specified (this time is given for Lessee to find a new site, get zoning approval, construct a new site and move Lessee's shelter and antennas); or

7.) by Lessor at any time upon occurrence of a Separation Event, as that term is defined in 14(f), by giving at least thirty (30) days' notice in writing to the Lessee.

8) by the parties mutual agreement.

d. In the event of termination or expiration of this Lease, Lessee shall have a reasonable period of time (not exceeding ninety (90) days from the effective date of termination unless a longer time is allowed

elsewhere in this Lease) to remove all Communications Equipment from the Premises, however all improvements to the tower and/or ancillary structures shall be left in place and in good repair by the Lessee. Upon expiration of this Lease, Lessee shall restore the Premises to reasonably good condition and repair, subject to ordinary wear and tear on the Premises, which is specifically excepted. Failure of Lessee to remove its Communications Equipment at the expiration or termination of this Lease may result in Lessor removing the equipment and payment of all charges occasioned by such removal will be the responsibility of the Lessee.

7. Initial Term Rent .

a. Lessee shall pay Woodbury County, Iowa, administrator of funds of Starcomm Public Safety Board Ten Dollars ($10) and other good and valuable consideration as full consideration for the initial Term and all Renewal Terms of this Lease. Unless otherwise specified in this Lease, each party shall bear its own costs.

8. Use and Non-Interference of Premises. Lessee shall have the right to use the Property and Premises for the purpose of installing, removing, replacing, modifying, repairing, maintaining, and operating a communications facility including (without limitation) antennae and radios (including microwave antennae and radios); equipment cabinets; backup power sources (including batteries, generators and fuel storage tanks); and other associated equipment, fixtures, wiring, and cabling (collectively the "Communications Equipment"). The parties acknowledge that (a) the Communications Equipment will be owned by Lessee, the State of Iowa, or their respective assignee and (b) the Communications Equipment will be used for emergency services, public safety and other governmental purposes, including the Iowa State Patrol and other Iowa state agencies, and any federal, state, county, municipality or other governmental body, including any department or agency thereof. Lessee shall not do or permit any activities upon the Premises, which would cause interference to Lessor or with Lessor's principle use of the Premises as a Lattice Tower in Woodbury County, Iowa. 2267 O'Brien Avenue. The Lessee will be allowed to install its Communications Equipment inside and outside the communications tower house. This is not an exclusive lease of the premises. Lessor retains the right to lease additional space to other Tenants provided that the additional Tenants' equipment does not interfere with the activities and transmission signals of the Lessee. Additionally, Lessor will continue to use the premises for their own business or public safety purposes. Lessor affirmatively covenants that except for acts of God, neither Lessor nor its employees, agents, representatives, invitees, other tenants or licensees shall cause or allow others to cause interruption of electrical power or interruption of telephone service to the Communication Equipment.

9. Insurance and Indemnification.

Unless self-insured, at all times during the term of this Lease, Lessee shall at its expense carry and maintain for the mutual benefit of the Lessor:

a. Commercial General liability insurance against the claims for personal injury, death or property damage occurring in or about the Leased Premises or resulting from the installation, operation or maintenance of the Lessee's Communications Equipment on the Leased Premises, such insurance to be in the amount of $1,000,000.00 for personal injuries and deaths resulting from any one accident and for property damage in any one accident, and an aggregate coverage in the amount of $3,000,000.00 with Lessor included as additional insureds.

b. A Standard Workmen's Compensation and Employer's Liability Insurance Policy in the amount equal to the limit of liability and in a form prescribed by the laws of the state in which the Leased Premises is located.

c. Any contract workers contracted by Lessee shall also carry similar insurance as set forth in a. and b. above.

10. Damage or Destruction. If the Premises are damaged, destroyed by fire, winds, flood, or other natural or manmade cause, Lessor shall have the option to repair or replace the Premises at their sole expense, or to terminate this Lease effective on the date of such damage or destruction. Notwithstanding the foregoing, for purposes of implementing the ninety (90) day period specified in 6(d), the ninety (90) day period shall commence upon the later of (i) the Lessor having notified the Lessee of a decision not to repair or replace the Premises or (ii) sixty (60) days having passed without Lessor having notified Lessee of a decision to repair or replace the Premises (unless the Lessor have begun repair or replacement activities). In the event Lessor elect to terminate this Lease, Lessee shall have no further obligations hereunder. Lessor shall have up to sixty (60) days to decide on whether to repair or replace the Premises. Failure by Lessor to notify Lessee within sixty (60) days of Lessor' decision to repair or replace the Premises shall be deemed an election by Lessor to terminate this Lease, unless the Lessor have begun repair or replacement activities. If Lessor elect to repair or replace the Premises, Lessee shall have the option of either abating the rent due until such repair or replacement is completed and the Premises are restored to a condition that the Lessee can resume full operations at the Premises; or until Lessee begins operating a mobile telecommunication base station on the Premises. Lessee may immediately erect on an unused portion of the Property a temporary communications facility. In the event such repairs or restoration are not commenced within thirty (30) days or completed within ninety (90) days, Lessee may elect to terminate this Lease by so notifying Lessor in writing, The option to operate a mobile telecommunications base station on the Premises is subject to the Lessee obtaining all required State and local permits and obtaining verbal consent of the Starcomm Public Safety Board, said consent shall not be unreasonably withheld. Said verbal consent will be confirmed electronically or in writing by the Starcomm Public Safety Board within twenty-four (24) hours. If there is a condemnation of the Premises, then this Lease will terminate upon transfer of title to the condemning authority, without further liability to either party except for Lessor's obligation to reimburse Lessee for any prepaid fees. Lessee is entitled to pursue a separate condemnation award from the condemning authority. Lessor shall notify Lessee in writing within ten (10) days after it receives notice of any actual or contemplated condemnation proceedings.

11. Taxes. Lessor shall pay and be responsible for all taxes on the Premises, and Lessee shall pay and be responsible for all taxes due on Lessee's equipment and fixtures installed on the Premises.

12. Notices. Any notices required or permitted to be given hereunder shall be given in writing, and shall be deemed to have been given only upon receipt after mailing by certified or registered first class mail, postage prepaid, return receipt requested, or sending by reliable overnight courier and addressed to the parties as follows:

Lessor: Woodbury County, Iowa
Board of Supervisors
620 Douglas Street, Suite 104
Sioux City, Iowa 51101
Phone: 712-279-6525

Starcomm Public Safety Board
P.O. Box 447
Sioux City, Iowa 51102
ATTN: Glenn Sedivy
Phone: (712) 279-6959
Fax: (712 279-6157

Lessee: Customer Support Manager, State of Iowa,
Motorola Solutions
1303 E. Algonquin Road
Schaumburg, IL 60196
ATTN: Dave Gordon
Phone: 319-377-6686

Law Department
Motorola Solutions, Inc.
500 W. Monroe St., 43rd Floor
Chicago, IL 60661
ATTN: Rich Heller
Phone: (847) 576-1817

13. Hazardous Materials. At no time during the term hereof shall the Lessee store, place, leave or deposit at the Tower or the Premises any substance or material which, if known to be present on or at such property, would require cleanup, removal or some other remedial action under any federal, state or local law, including statutes, regulations, ordinances, codes, rules and other governmental restrictions and requirements relating to the discharge of air pollutants, water pollutants, processed waste water, solid wastes, or otherwise relating to environmental hazardous substances, including but not limited to the Federal Solid Waste Disposal Act, the Federal Clean Air Act, the Federal Clean Water Act, the Federal Resource Conservation and Recovery Act of 1976, the Federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980, and all acts amendatory thereto, regulations of the Environmental Protection Agency, regulations of the Nuclear Regulatory Agency, and regulation of any State Department of Natural Resources or State Environmental Protection Agency now or at any time hereinafter in effect. The Lessee agrees to and does hereby indemnify and save the Lessor and owners harmless from any and all claims, demands, suits, actions, recoveries, judgments, costs and expenses relating in any way to Lessee's violation of this Section, and this indemnification obligation shall survive the expiration or termination of this Lease. Lessor acknowledge and agree that Lessee shall have no liability or responsibility whatsoever for any environmental violations or issues, at the tower or premises, existing prior to the date of Lessee's occupancy or otherwise not caused by Lessee. Lessor represents and warrants that it has no knowledge of any pre-existing environmental contamination on or about the Property or any substance, or chemical, or waste on the Property that is identified in any applicable state, federal, or local law or regulation as being hazardous, toxic, or dangerous. Lessor shall not introduce or allow any other tenant or licensee to introduce any such substance or chemical or waste onto, near or adjacent to the Property in violation of applicable law.

14. Miscellaneous Provisions.

a. Lessor warrant that (i) Lessor are the owners of the tower and owners and/or lessees of the tower site property; (ii) that Lessor have full right, power, and authority to execute this agreement and if necessary have obtained all necessary consents to sublease the Premises; (iii) that Lessor will not have unsupervised access to the Communication Equipment on the Premises; (iv) that the Property: (a) abuts a public right-of-way over which practical access is possible, or (b) is accessible over easements appurtenant to such site; and (v) that to the best of Lessor's knowledge making of this Lease and the performance thereof will not violate any zoning or other laws, ordinances, restrictive covenants or the provision of any mortgage, lease or other agreements under which Lessor is bound and which restricts itself in any way with respect to the use or disposition of the Property. Lessor covenant that Lessee, in paying Rent and performing the covenants by Lessee herein made, shall and may peacefully and quietly have, hold, and enjoy the Leased Premises.

b. Lessee may, at its expense, make such improvements to the Property and Premises as it deems necessary for the operation of the Communication Equipment with prior written approval of the Lessor. Lessee shall obtain all necessary governmental and regulatory approvals required for Lessee's occupation and use of the Premises, including but not limited to zoning changes, and shall be responsible for the cost of obtaining such approvals. Lessor shall cooperate with Lessee in obtaining such approvals.

c. The provisions of this Lease shall bind and inure to the benefit of the parties hereto and their heirs, legal representatives, successors and assigns. References to Lessee herein shall include Lessee's transferees, successors, and assigns. References to Lessor herein shall include Lessor's transferees, successors, and assigns.

d. This Lease and the attached exhibits contain the entire agreement of the parties with respect to its subject matter and supersede any prior oral or written agreements.

e. This Lease may be amended in writing only, signed by all the parties in interest at the time of such amendment.

f. Lessee may assign this Lease to the State of Iowa or any of its departments, agencies or designees, or to any of Lessee's affiliates without the prior consent of Lessor. In addition, in the event Lessee separates one or more of its businesses (each a "Separated Business"), whether by way of a sale, establishment of a joint venture, spin-off or otherwise (each a "Separation Event"), Lessee may, without the prior written consent of Lessor and at no additional cost to Lessee, assign this Lease such that it will continue to benefit the Separated Business and its affiliates following the Separation Event. In the event of such a permitted transfer, Lessee shall provide written notice to Lessor of the Separation Event within thirty days of the completion of the Separation Event. This Lease shall continue as a direct lease between Lessor and any permitted transferee, and the original Lessee shall be released from any and all future liability hereunder. Lessee shall notify Lessor in writing of the name and address of any assignee. This Lease may be assigned by Lessor without the consent of Lessee provided that the assignee shall occupy and use the Premises subject to this Lease. Lessor shall notify Lessees in writing of the name and address of any assignee.

g. No waiver by either party of any provision herein shall be deemed a waiver of any other provision or of any prior or subsequent breach of any provision herein.

h. If any term or provision of this Lease is held to be invalid or unenforceable, such invalidity or unenforceability shall not be construed to affect any other provision of this Lease and the remaining provisions shall be enforceable in accordance with their terms.

i. This agreement shall be governed by and construed in accordance with the laws of the State of IOWA, without regard to its conflicts of law principles.

j. If Lessee does not vacate the Premises in accordance with the Lease terms upon valid termination of this Lease, such holding over shall be treated as creating a month to month tenancy. This holdover will not be approved for more than ninety (90) days. Rent during the holdover will be 150% of the current rent. Further, if Lessee does not vacate the Premises as required, Lessee's Communications Equipment may be removed by Lessor at Lessee's expense. Any bill for removal of Lessee's equipment by Lessor shall be paid in full within thirty (30) days of mailing.

k. Lessee may make, with prior approval from Lessor, reasonable alterations, additions, or improvements to the Premises necessary for its antennas, communication shelter, power cables and telephone cables, so

long as the structural integrity of the Premises is not affected. Lessee will bear the total cost of such alterations, additions or improvements, including regular maintenance, and the cost of removal and returning the Premises to the condition it was at the time of entering into the Lease (subject to the terms of paragraph 6(d) of this Lease).

l. Lessee shall be solely responsible for maintenance of its Communications Equipment, and shall arrange for maintenance under separate contract for all such maintenance services. Lessee shall not expect or ask Lessor to do any special site maintenance for Lessee's antennas or shelter, unless Lessee enters into a separate maintenance contract with Lessor, which contract will be separate from the terms of this Lease (i.e.: in the event that some minor snow plowing is requested for Lessee's access to their shelter, Lessee will separately contract for that service under a separate document).

m. Lessee will bear any and all costs associated with temporary relocation of Lessee's equipment, if required, during repairs or painting of Lessor' building. Lessor will give Lessee at least thirty (30) days advance notice of scheduled repairs or painting of Lessor' building or tower which may affect Lessee's operation, so that Lessee can pre-plan for providing high-quality communications to Lessee's customers during any temporary relocation required by Lessor' repair or painting activities. Lessor are not required to provide notice of routine repairs, such as replacement of tower lights, which do not affect Lessee's operation. Lessor will provide Lessee notice of emergency repairs with at least twelve (12) hours prior notice unless it is impossible or impractical to do so and then the Lessee shall be provided with as much prior notice as possible under the emergency circumstances.

n. To the extent permitted by law, Lessee shall indemnify and hold Lessor harmless against all expenses, liabilities and claims of every kind, including reasonable attorney fees, to the extent arising from the negligent or wrongful acts or omissions of Lessee or anyone for whose acts Lessee may be liable and made necessary by or on behalf of any person or entity arising out of:

1) A failure by Lessee to perform any of the terms and conditions of this Lease; or

2) Any injury or damage happening on or about the Leased Premises which is caused in whole or in part by Lessee's use of the Premises, any act or omission of Lessee or anyone for whose acts Lessee may be liable; or

3) Any injury or damage to any employee, agent, or customer of Lessee or Lessor on or about the Leased Premises which is caused in whole or in part by Lessee's use of the Premises, any act or omission of Lessee or anyone for whose acts Lessee may be liable; or

4) Failure of Lessee to comply with any applicable laws or governmental authority; or

5) Any action brought by a third party for damages as a result of an injury caused by Lessee or action or inaction of the Lessee.

15. Approval. The parties agree that this Lease shall not be binding on either party unless and until it is fully executed by both parties. If this Lease is signed by only one party, it shall merely constitute an offer to lease.

16. Utilities. Lessee shall be entitled to install any utilities and services required for the Communication Equipment. Lessor shall provide Lessee with such reasonable assistance as is necessary to enable Lessee to arrange for such utilities and services, including signing any easement or other instrument reasonably required by the utility company. Lessor represents that utilities required for Lessee's use of the Premises are available, and Lessee shall not be required to pay any share of such utilities and services as are used

for the Communication Equipment. All electricity and any other utility services used by Lessee to operate the Communications Equipment will be paid by Lessor.

17. Compliance with Laws. The Parties shall comply with all applicable local, state, and federal government laws, codes and regulations, including without limitation FAA, FCC, NEPA, occupational health and safety, environmental, and electromagnetic (EME) requirements, and applicable requirements of the Americans with Disabilities Act.

18. Short Form Lease. The parties will, at any time upon the request of either one, promptly execute duplicate originals of an instrument, in recordable form, which will constitute a short form of this Lease setting forth a description of the premises, the term of this Lease and any portions hereof, excepting the rent and cost provisions.

19. Contingency for Due Diligence. Lessee shall have until the Commencement Date to conduct a due diligence examination of all factors affecting the Property and to satisfy itself in its sole discretion that the Property is suitable for Lessee's intended use. Lessor shall furnish Lessee with the legal description, coordinates, address or location and real estate tax numbers, if available, for the Property as well as copies of any title policies or searches, surveys or site drawings (including those dealing with utility or access easements), any Prime Lease or Ground Lease, including all amendments, current users of the Property and all broadcast frequencies and any studies dealing with structural, RF, engineering or environmental, NEPA or EME matters, as well as other documentation reasonably requested by Lessee. Lessor shall also allow Lessee's personnel or its contractors to visit and investigate the Property and perform structural, engineering and environmental evaluations and tests. Lessor shall use its best efforts to obtain from the holder of any mortgage or deed of trust ("Mortgagee") a non-disturbance agreement in a form provided by or otherwise acceptable to Lessee. In the event Lessee is not satisfied with the Property or Lessee does not receive non-disturbance agreements from all Mortgagees Lessee shall have the right to terminate this Lease by so notifying Lessor in writing on or before the Commencement Date, in which event all funds paid by Lessee shall be returned to Lessee.

23. Brokers. Lessor and Lessee each represents to the other that he, she, or it did not deal with any broker or other person who may be entitled to a commission as a result of the transaction contemplated by this Lease, and Lessor and Lessee hereby agree to indemnify and hold the other harmless from a breach of the foregoing representation.

24. Counterparts: Facsimile Signatures. This Lease may be executed in one or more counterparts, each of which shall be deemed an original and all of which together shall constitute one and the same instrument. In addition, a true and correct facsimile copy or computer image of this Agreement shall be treated as and shall have the same effect as an original signed copy of this document.

25. Waiver of Lessor's Lien Rights. Lessor agrees that it does not have any lien rights in Lessee's personal property or the Communications Equipment.

26. Mutual Waiver of Consequential Damages and Limitation of Liability. NOTWTHSTANDING ANYTHING TO THE CONTRARY IN THIS LEASE, ALTHOUGH THE PARTIES ACKNOWLEDGE THE POSSIBILITY OF SUCH LOSSES OR DAMAGES, EACH PARTY AGREES THAT THE OTHER PARTY WILL NOT BE LIABLE FOR ANY COMMERCIAL LOSS; INCONVENIENCE; LOSS OF USE, TIME, DATA, GOOD WILL, REVENUES, PROFITS OR SAVINGS; OR OTHER SPECIAL, INCIDENTAL, INDIRECT, OR CONSEQUENTIAL DAMAGES IN ANY WAY RELATED TO OR ARISING FROM THIS LEASE, AND EXCEPT FOR PERSONAL INJURY, DEATH, OR DAMAGE TO TANGIBLE PROPERTY, EACH PARTY'S TOTAL LIABILITY, WHETHER FOR BREACH OF CONTRACT, WARRANTY, NEGLIGENCE, STRICT

LIABILITY IN TORT, INDEMNIFICATION, OR OTHERWISE, WILL BE LIMITED TO THE DIRECT DAMAGES RECOVERABLE UNDER LAW, BUT NOT TO EXCEED $3,000,000.00. This limitation of liability provision survives the expiration or termination of this Lease and applies to the fullest extent permitted by law, notwithstanding any contrary provision.

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

WOODBURY COUNTY, IOWA

By _____
Matthew Ung
Chairperson

Certification of County Auditor:

I, Patrick Gill, certify that I am the County Auditor of the Woodbury County, Iowa and that Matthew Ung, who executed this Agreement for and on behalf of the County, was duly authorized and empowered to do so as of 3-17-17. 2017

_____
Patrick Gill
Woodbury County Auditor

STARCOMM, WOODBURY, IOWA

By _____
Douglas Young
Chairperson

Certification of Starcomm:

I, Carrie Anfinson-Haden, certify that I am the Administrative Secretary for Starcomm and that Chairperson Douglas Young, who executed this Lease for and on behalf of Starcomm, was duly authorized and empowered to do so as of March 2, 2017.

_____
Carie Anfinson-Haden,
Administrative Secretary for Starcomm

MOTOROLA SOLUTIONS, INC.

By: _____

James T. Mears
[Print Name]

Title: Senior Vice President

Date: February 28, 2017

STATE OF ILLINOIS)
: ss
COUNTY OF COOK)

On this 28th day of February, 20 17 before me, the undersigned a Notary Public in and for said County and State, personally appeared James T. Mears to me personally known, who being by me duly sworn, did state that he is the Senior Vice President of said corporation executing the within and foregoing instrument, that said instrument was signed on behalf of said corporation by authority of its Board of Directors ; and that the said James T. Mears as such officer acknowledged the execution of said instrument to be the voluntary act and deed of said corporation by it and by him voluntarily executed.

Tangy McGee
NOTARY PUBLIC in and for said COUNTY and STATE

OFFICIAL SEAL
TANGY MCGEE
NOTARY PUBLIC, STATE OF ILLINOIS
My Commission Expires May 11, 2020

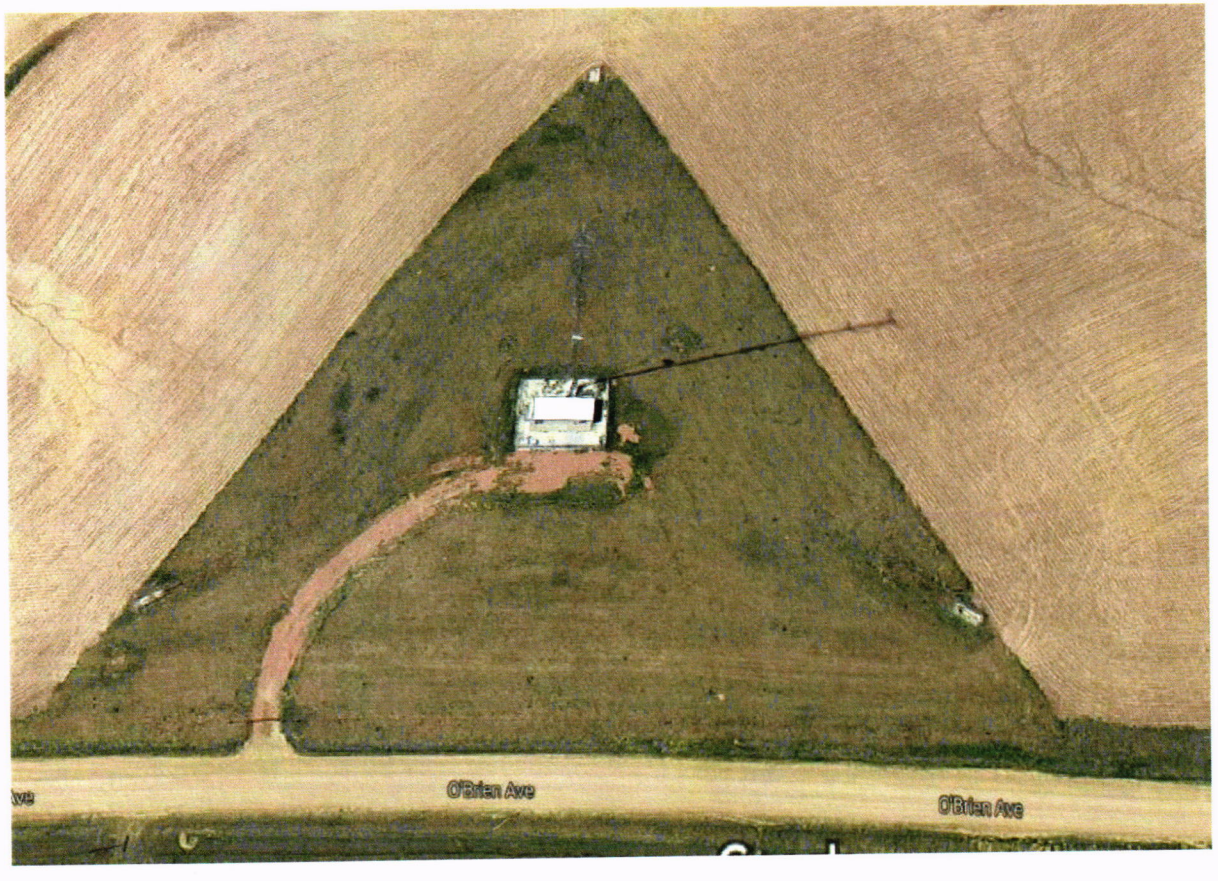
EXHIBIT A

DESCRIPTION OF PROPERTY AND EQUIPMENT TO BE INSTALLED

This exhibit provides the address, location, and general description of the property subject to the Lease.

Legal Description:

The site is known as "Obrien" consists of a guyed tower, communications shelter, and backup generator. Additional antennas are planned for this tower resulting in tower strengthening work as documented in the loading analysis report (PNS-ISICS-94 Woodbury tower SA). With the exception of the antennas to be mounted on the tower, all new equipment is to be installed inside the equipment shelter.



Address or Location:

East (O'Brien Ave) Iowa
2267 O'Brien Ave.
O'Brien Ave & 230th St
2.5 miles E of Anthon

Coordinates:

42-22-30N / 95-48-24W

Equipment to be installed on the tower:

- 21ft Omni directional antenna (SC412-HF2LDF) @ 345 feet
- 6ft parabolic dish (SB6-W60AC) @ 340 feet
- 4ft parabolic dish (SB4-W60AD) @ 310 feet
- 6ft parabolic dish (SB6-W60AC) @ 89 feet

Equipment to be installed inside the shelter:

- 3 Base Radios to existing Expansion Radio Rack
- Coriant MPLS router
- Additional DC rectifiers to existing Eltek chassis to increase output capacity
- Additional battery strings to increase runtime

ARMOR TOWER ENGINEERING

Structural Analysis of a 350 ft Guyed Tower

Site Number: 94

Site Name: Woodbury
County: Woodbury
Location: Anthon, IA

Checked By:

Derek Hartzell
Structural Design Engineer IV

LICENSED PROFESSIONAL ENGINEER
DMITRIY V. ALBUL
21016
IOWA

05/12/2016

Pyramid Network Services, LLC

6519 Towpath Rd.

East Syracuse, NY 13057

May 2016

9 North Main Street, 2nd Floor, Cortland, NY 13045
(607)591-5381 Fax: (866)870-0840 www.ArmorTower.com

ARMOR TOWER ENGINEERING

May 12, 2016

James Reek
Pyramid Network Services, LLC
6519 Towpath Road
East Syracuse, NY 13057

RE: ISICS – 94 – Woodbury CO
O'Brien Ave, Anthon, IA

James:

We have completed the structural analysis of the subject tower and **have found it to be overloaded within the scope of this analysis to support the proposed antenna loading**. The tower was analyzed according to the requirements of TIA 222-G-2 standard for Woodbury County for 90 mph (3-sec. gust) wind speed with no ice and 50 mph wind with 3/4"* ice per the 2009 IBC as referenced by the local building Code. Topographic Category 1, Exposure C, and Structure Class III were used in this analysis.

The subject tower is a 350' Sabre guyed tower consisting of all-welded sections with solid rod legs and solid rod bracing. Tower face dimension is 24" the full height above a 5' tapered base. The tower mast is laterally supported by six levels of guying attached to one set of three guy anchors. Foundation capacities were predicated on supplied as-built details.

The loading used in the analysis consisted of the existing antennas/lines as well as the following:

- (1) SC412-HF2LDF @ 345 tip height fed by one 1-1/4" coax
- (1) SB6-W60 dish @ 340'** (azimuth of 284.01°) fed by one CNT-400
- (1) SB4-W60 dish @ 310' (azimuth of 184.94°) fed by one CNT-400
- (1) SB6-W60 dish @ 89' (azimuth of 284.01°) fed by one CNT-400

The proposed feed lines were assumed to be located as shown on drawing E-7.
**Adjusted from 350' due to obstruction.

The results of the analysis showed multiple sections of bracing and legs, an elevation of guy cables, as well the foundation to be overloaded with a maximum stress rating of 178.1%*. Note that a reinforcement design of these elements is outside the scope of this analysis but can be completed under separate contract.

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The maximum displacement of the proposed microwave dishes at service wind speed is as follows:

Elevation ft	*Appurtenance*	*Tilt* °	*Twist* °
340.00	SB6-W60	2.355	12.020
310.00	SB4-W60	2.254	10.577
89.00	SB6-W60	1.894	3.775

*Note that the ice in this analysis was reduced to 0.6" out of the required 0.75" due to software limitations. It is assumed that the stresses and overloading are larger under the code required ice. During a reinforcement design 0.75" will need to be considered.

For a detailed listing of the tower's pre-reinforcement performance, please see pages 16 through 19 of the calculations.

We appreciate the opportunity to provide our services Pyramid Network Services, Motorola and Iowa State EMS, and if you have any questions concerning this analysis, please contact us. Please let us know if we can be of further assistance in providing a price quote to design the reinforcement for this tower.

Sincerely,

ARMOR TOWER, INC.

Patrick Propert

Patrick Propert
Structural Design Engineer II

LICENSED PROFESSIONAL ENGINEER
DMITRIY V. ALBUL
21016
IOWA

05/12/2016

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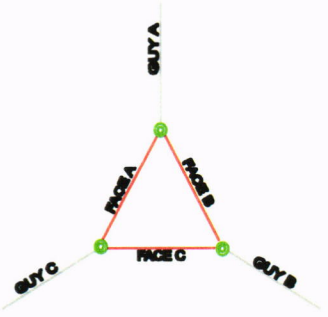
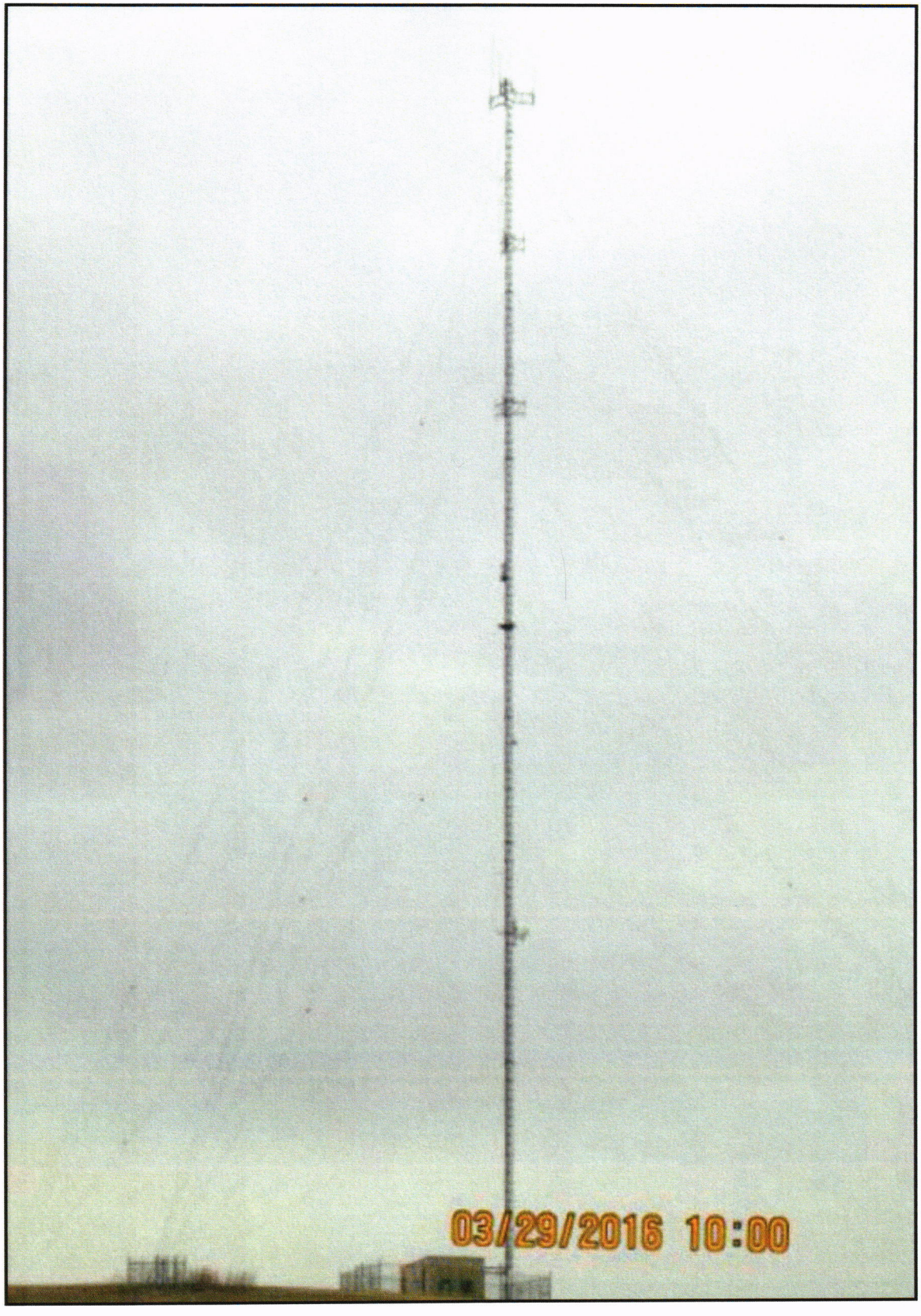
PRIMARY ASSUMPTIONS USED IN THE ANALYSIS



1. Leg A is assumed to be oriented Northeast.
2. Allowable steel stresses are defined by AISC-LRFD 13th Edition and all welds conform to AWS D1.1 specifications.
3. Armor Tower has been commissioned to analyze the tower according to the requirements of TIA 222-G-2 for Woodbury County, IA. Per this standard, a basic wind speed of 90 mph (3-sec. gust) without ice and 50 mph with 3/4" ice is recommended. This site is not within a special wind region according to the ASCE 7 wind map. It is the client's responsibility to check with local authorities or the tower owner if a greater wind or ice loading is required to be considered in the analysis.
4. The acceptability of the analyzed antenna loading is the responsibility of Motorola and its affiliates to confirm with the respective carriers or the tower owner.
5. Any deviation from the analyzed antenna loading will require a re-analysis of the tower for verification of structural integrity. The proposed feed lines were assumed to be located as shown on drawing E-7.
6. This analysis assumes all tower members are galvanized adequately to prevent corrosion of the steel and that all tower members are in "like new" condition with no physical deterioration. This analysis also assumes the tower has been maintained properly per TIA 222-G Annex J recommended inspection and maintenance procedures for tower owners and is in a plumb condition. Armor Tower has not completed a condition assessment of the tower. Site observations indicate an adequately painted tower.
7. No accounting for residual stresses due to incorrect tower erection can be made. This analysis assumes all bolts are appropriately tightened providing necessary connection continuity and that the installation of the tower was performed by a qualified tower erector.
8. Foundation capacities are based on soil parameters provided in the geotechnical report by Certified Testing Services, Inc in April 2004.
9. No conclusions, expressed or implied, shall indicate that Armor Tower has made an evaluation of the original design, materials, fabrication, or potential installation or erection deficiencies. Any information contrary to that assumed for the purpose of preparing this analysis could alter the findings and conclusions stated herein.
10. Tower member sizes and geometry are based on tower design drawings completed by Sabre in August 2004. Existing antenna loading is based on customer-supplied data. It is our assumption that this data is complete and accurately reflects the existing conditions of the tower and equipment. Armor Tower has not been commissioned to field-validate this data. Armor Tower reserves the right to add to or modify this report as more information becomes available. Proposed equipment was outlined in "State of Iowa Site List Book9f.xlx" and "State of Iowa Summary using Leased Towers for MW Repeaters.xlsx" files.
11. The investigation of the load carrying capacities of the antenna supporting frames/mounts is outside the scope of this analysis. Antenna mount certification can be completed under separate contract.



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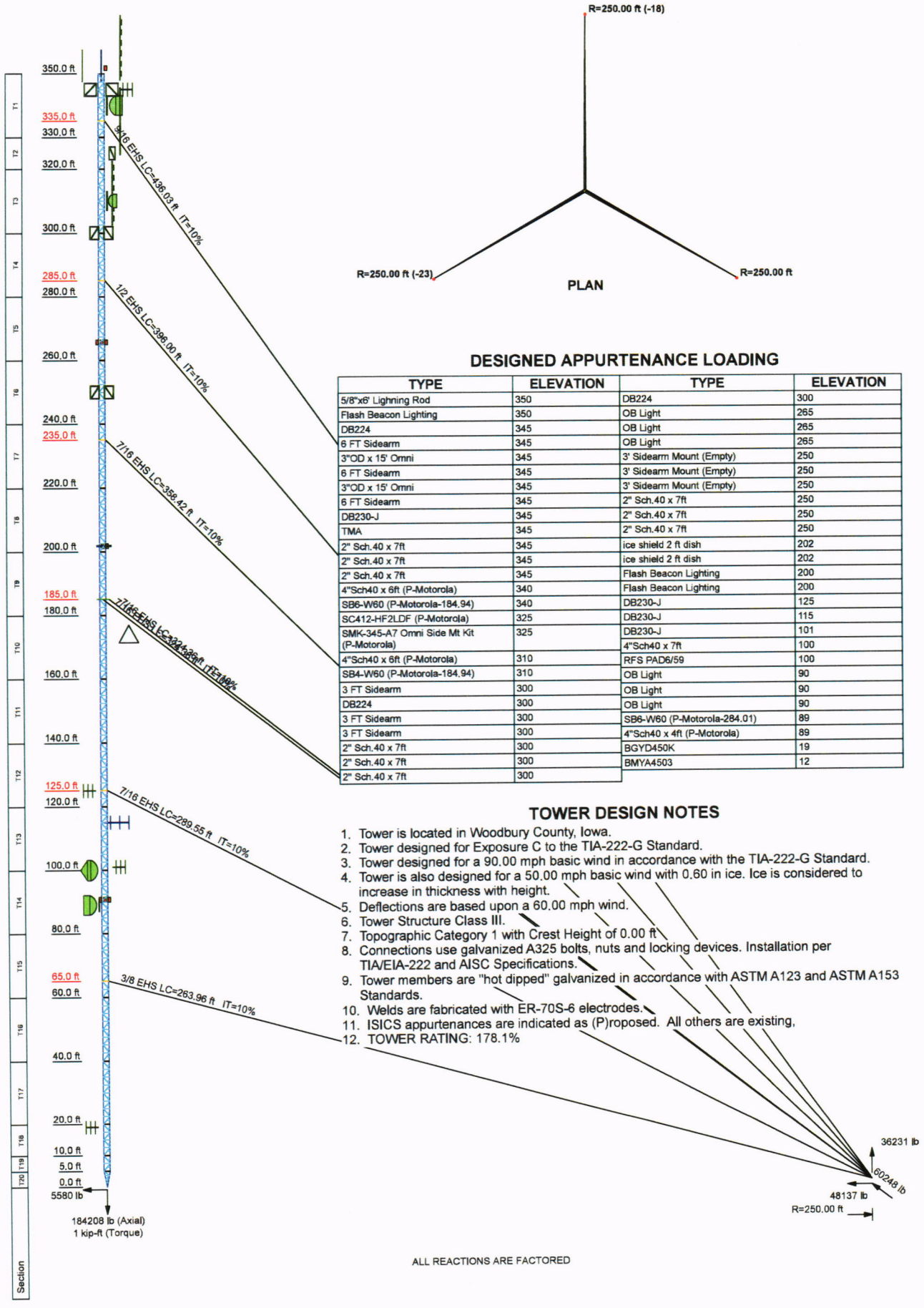

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
5/8"x6' Lighning Rod	350	DB224	300
Flash Beacon Lighting	350	OB Light	265
DB224	345	OB Light	265
6 FT Sidearm	345	OB Light	265
3"OD x 15' Omni	345	3' Sidearm Mount (Empty)	250
6 FT Sidearm	345	3' Sidearm Mount (Empty)	250
3"OD x 15' Omni	345	3' Sidearm Mount (Empty)	250
6 FT Sidearm	345	2" Sch.40 x 7ft	250
DB230-J	345	2" Sch.40 x 7ft	250
TMA	345	2" Sch.40 x 7ft	250
2" Sch.40 x 7ft	345	ice shield 2 ft dish	202
2" Sch.40 x 7ft	345	ice shield 2 ft dish	202
2" Sch.40 x 7ft	345	Flash Beacon Lighting	200
4"Sch40 x 6ft (P-Motorola)	340	Flash Beacon Lighting	200
SB6-W60 (P-Motorola-184.94)	340	DB230-J	125
SC412-HF2LDF (P-Motorola)	325	DB230-J	115
SMK-345-A7 Omni Side Mt Kit (P-Motorola)	325	DB230-J	101
		4"Sch40 x 7ft	100
4"Sch40 x 6ft (P-Motorola)	310	RFS PAD6/59	100
SB4-W60 (P-Motorola-184.94)	310	OB Light	90
3 FT Sidearm	300	OB Light	90
DB224	300	OB Light	90
3 FT Sidearm	300	SB6-W60 (P-Motorola-284.01)	89
3 FT Sidearm	300	4"Sch40 x 4ft (P-Motorola)	89
2" Sch.40 x 7ft	300	BGYD450K	19
2" Sch.40 x 7ft	300	BMYA4503	12
2" Sch.40 x 7ft	300		

TOWER DESIGN NOTES

1. Tower is located in Woodbury County, Iowa.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 90.00 mph basic wind in accordance with the TIA-222-G Standard.
4. Tower is also designed for a 50.00 mph basic wind with 0.60 in ice. Ice is considered to increase in thickness with height.
5. Deflections are based upon a 60.00 mph wind.
6. Tower Structure Class III.
7. Topographic Category 1 with Crest Height of 0.00 ft
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. ISICS appurtenances are indicated as (P)roposed. All others are existing.
12. TOWER RATING: 178.1%

ALL REACTIONS ARE FACTORED

ARMOR TOWER
Armor Tower, Inc.
9 N Main St
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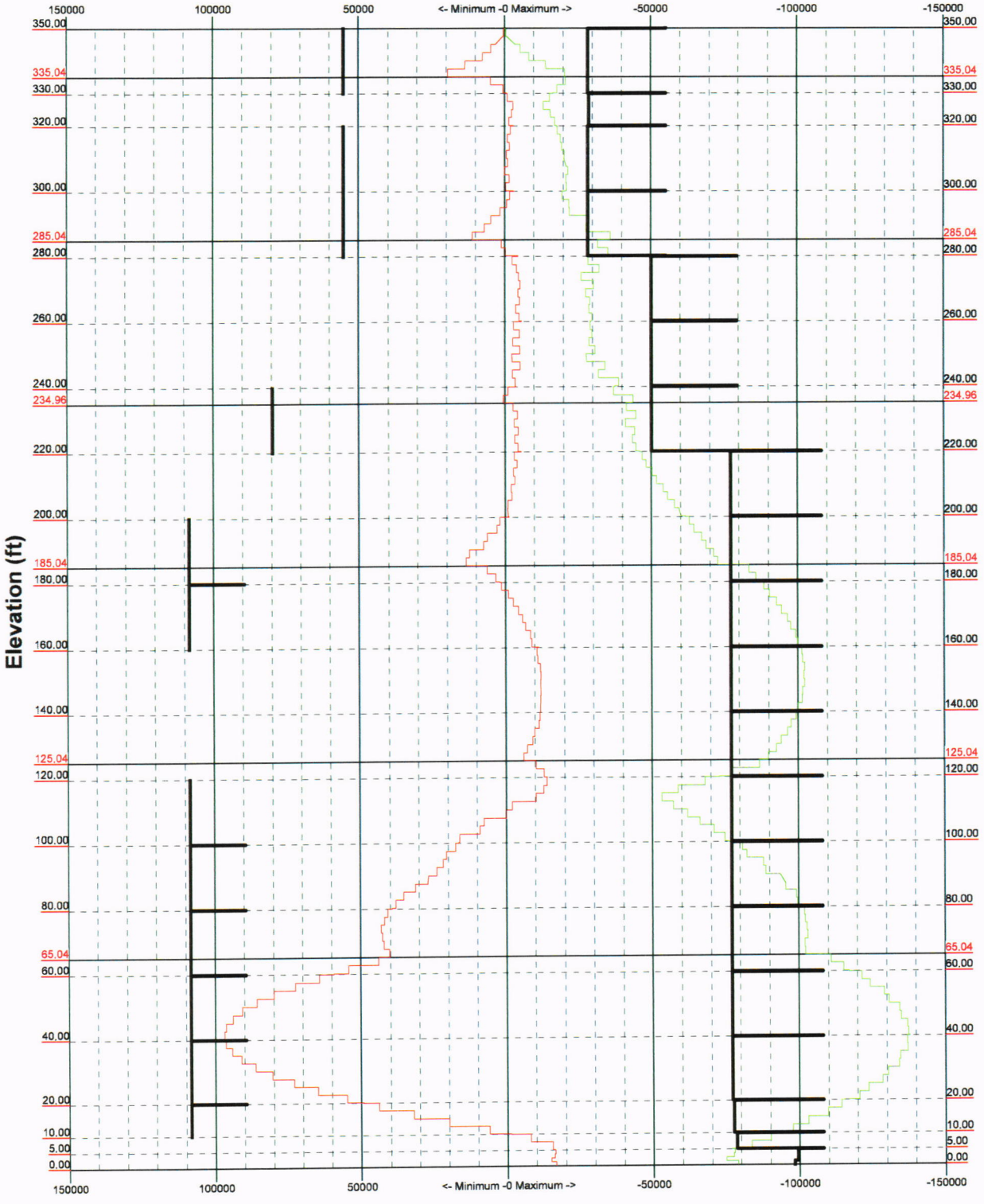
Phone: (607) 591-5381
FAX: (866) 870-0840

Job: ***350' GUYED TOWER ANALYSIS***			
Project: ***ISICS - 94-Woodbury***			
Client: Pyramid Network Services	Drawn by: PEP	App'd:	
Code: TIA-222-G	Date: 05/12/16	Scale: NTS	
Path: Z:\Pyramid Network Srvc\Iowa State EMS\94 Woodbury Co\2016-05 tower SA\tnx Files\350GT.eri		Dwg No. E-1	

TIA-222-G - 90.00 mph/50.00 mph 0.60 in Ice Exposure C

Leg Capacity ——— **Leg Compression (lb)**



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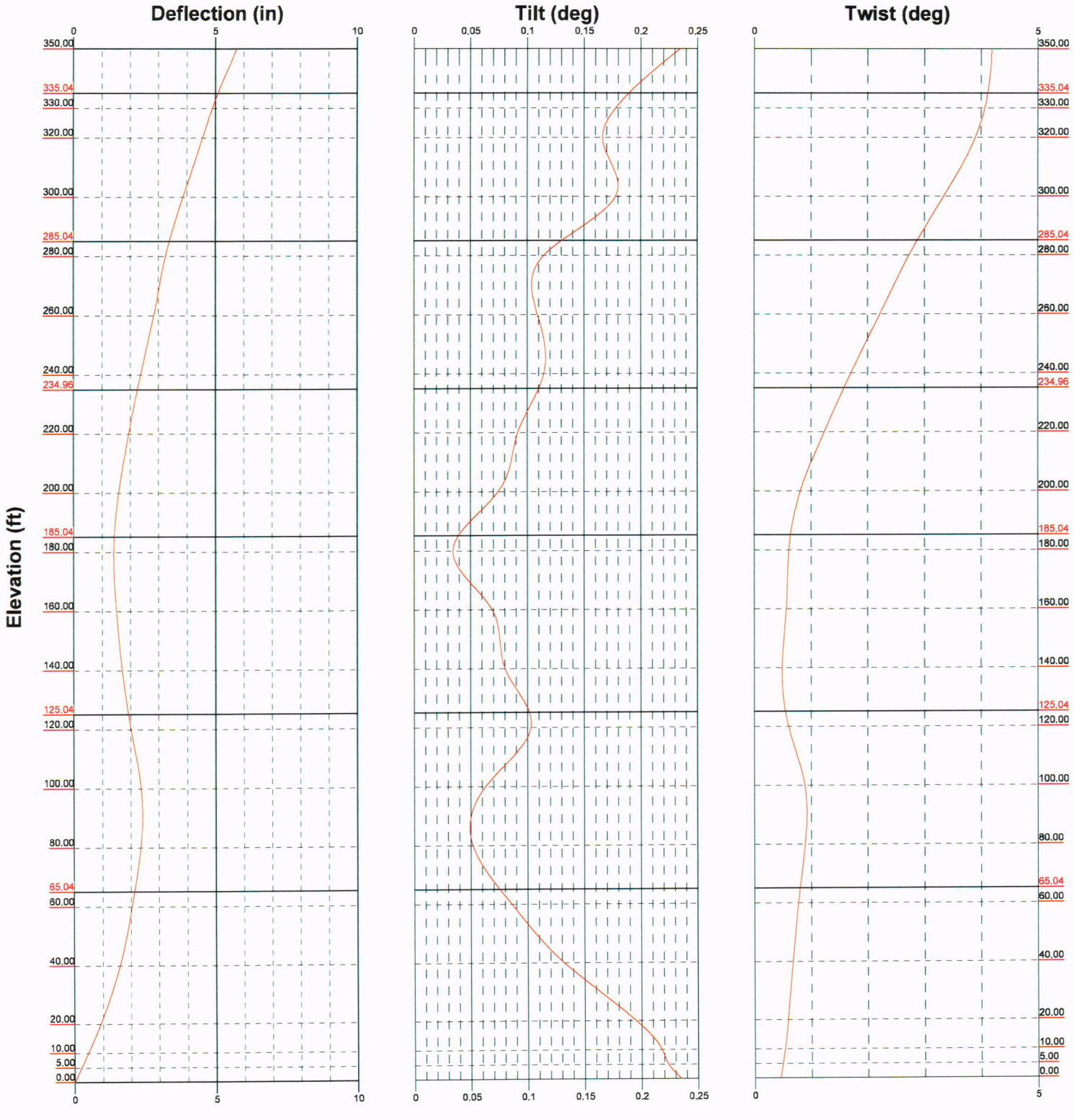
Path: Z:\Pyramid Network Srvc\Iowa State EMS\94 Woodbury Co\2016-05 tower SA\tnx Files\350GT.ar			Dwg No. E-3

TIA-222-G - Service - 60.00 mph

Maximum Values



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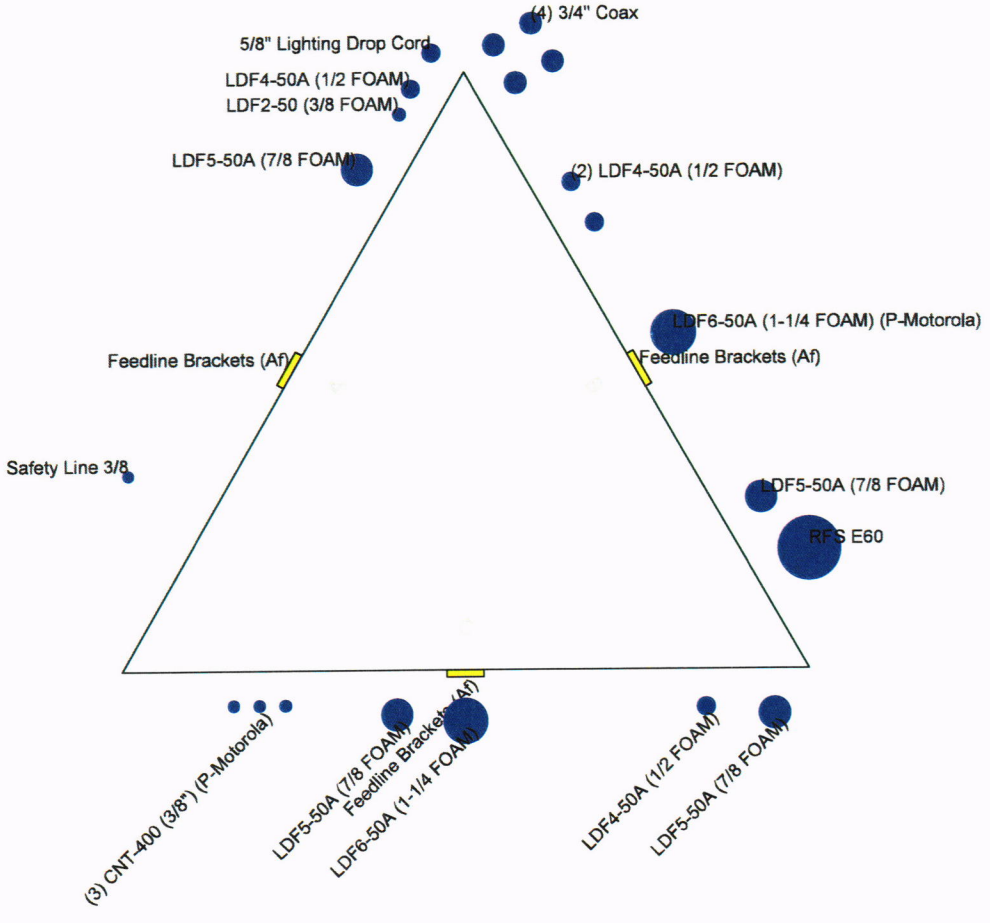
Code: TIA-222-G	Date: 05/12/16		Scale: NTS
Path: Z:\Pyramid Network Srvc\Iowa State EMS\94 Woodbury Co\2016-05 tower SA\tnx Files\350GT.eri			Dwg No. E-5

Feed Line Plan

Round Flat App In Face App Out Face



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Client: Pyramid Network Services	Drawn by: PEP		App'd:
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ARMOR TOWER ENGINEERING

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Job	Page
350' GUYED TOWER ANALYSIS	1 of 18
Project	**Date**
ISICS - 94-Woodbury	08:30:05 05/12/16
Client	**Designed by**
Pyramid Network Services	PEP

Load Combinations

Comb. No.	*Description*
1	Dead Only
2	1.2 Dead+1.6 Wind 0 deg - No Ice+1.0 Guy
3	1.2 Dead+1.6 Wind 30 deg - No Ice+1.0 Guy
4	1.2 Dead+1.6 Wind 60 deg - No Ice+1.0 Guy
5	1.2 Dead+1.6 Wind 90 deg - No Ice+1.0 Guy
6	1.2 Dead+1.6 Wind 120 deg - No Ice+1.0 Guy
7	1.2 Dead+1.6 Wind 150 deg - No Ice+1.0 Guy
8	1.2 Dead+1.6 Wind 180 deg - No Ice+1.0 Guy
9	1.2 Dead+1.6 Wind 210 deg - No Ice+1.0 Guy
10	1.2 Dead+1.6 Wind 240 deg - No Ice+1.0 Guy
11	1.2 Dead+1.6 Wind 270 deg - No Ice+1.0 Guy
12	1.2 Dead+1.6 Wind 300 deg - No Ice+1.0 Guy
13	1.2 Dead+1.6 Wind 330 deg - No Ice+1.0 Guy
14	1.2 Dead+1.0 Ice+1.0 Temp+Guy
15	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp+1.0 Guy
16	1.2 Dead+1.0 Wind 30 deg+1.0 Ice+1.0 Temp+1.0 Guy
17	1.2 Dead+1.0 Wind 60 deg+1.0 Ice+1.0 Temp+1.0 Guy
18	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp+1.0 Guy
19	1.2 Dead+1.0 Wind 120 deg+1.0 Ice+1.0 Temp+1.0 Guy
20	1.2 Dead+1.0 Wind 150 deg+1.0 Ice+1.0 Temp+1.0 Guy
21	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp+1.0 Guy
22	1.2 Dead+1.0 Wind 210 deg+1.0 Ice+1.0 Temp+1.0 Guy
23	1.2 Dead+1.0 Wind 240 deg+1.0 Ice+1.0 Temp+1.0 Guy
24	1.2 Dead+1.0 Wind 270 deg+1.0 Ice+1.0 Temp+1.0 Guy
25	1.2 Dead+1.0 Wind 300 deg+1.0 Ice+1.0 Temp+1.0 Guy
26	1.2 Dead+1.0 Wind 330 deg+1.0 Ice+1.0 Temp+1.0 Guy
27	Dead+Wind 0 deg - Service+Guy
28	Dead+Wind 30 deg - Service+Guy
29	Dead+Wind 60 deg - Service+Guy
30	Dead+Wind 90 deg - Service+Guy
31	Dead+Wind 120 deg - Service+Guy
32	Dead+Wind 150 deg - Service+Guy
33	Dead+Wind 180 deg - Service+Guy
34	Dead+Wind 210 deg - Service+Guy
35	Dead+Wind 240 deg - Service+Guy
36	Dead+Wind 270 deg - Service+Guy
37	Dead+Wind 300 deg - Service+Guy
38	Dead+Wind 330 deg - Service+Guy

Maximum Tower Deflections - Service Wind

Section No.	*Elevation*	*Horz. Deflection*	*Gov. Load Comb.*	*Tilt*	*Twist*
	ft	*in*		°	°
T1	350 - 330	5.76	33	0.233	4.190
T2	330 - 320	4.88	33	0.178	4.061
T3	320 - 300	4.55	33	0.164	3.894
T4	300 - 280	3.85	33	0.175	3.341
T5	280 - 260	3.24	29	0.116	2.726
T6	260 - 240	2.84	29	0.110	2.217
T7	240 - 220	2.37	29	0.114	1.710
T8	220 - 200	1.95	29	0.091	1.236
T9	200 - 180	1.59	29	0.073	0.815
T10	180 - 160	1.41	29	0.032	0.615
T11	160 - 140	1.51	29	0.069	0.568
T12	140 - 120	1.71	29	0.080	0.490
T13	120 - 100	2.02	29	0.106	0.603

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Job	Page
350' GUYED TOWER ANALYSIS	2 of 18
Project ISICS - 94-Woodbury	**Date** 08:30:05 05/12/16
Client Pyramid Network Services	**Designed by** PEP

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T14	100 - 80	2.38	29	0.061	0.888
T15	80 - 60	2.36	29	0.050	0.893
T16	60 - 40	2.04	29	0.085	0.776
T17	40 - 20	1.61	29	0.133	0.678
T18	20 - 10	0.92	31	0.196	0.583
T19	10 - 5	0.48	31	0.219	0.535
T20	5 - 0	0.24	31	0.226	0.495

Critical Deflections and Radius of Curvature - Service Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
350.00	5/8"x6' Lighning Rod	33	5.76	0.233	4.190	40231
345.00	DB224	33	5.53	0.218	4.171	40231
340.00	SB6-W60	33	5.29	0.203	4.147	20115
335.04	Guy	33	5.08	0.190	4.112	13448
325.00	SC412-HF2LDF	33	4.71	0.168	3.989	22782
310.00	SB4-W60	33	4.21	0.172	3.643	28663
300.00	DB224	33	3.85	0.175	3.341	52086
285.04	Guy	29	3.37	0.131	2.873	18049
265.00	OB Light	29	2.94	0.107	2.341	55426
250.00	3' Sidearm Mount	29	2.61	0.116	1.962	114653
234.96	Guy	29	2.26	0.109	1.588	35022
202.00	ice shield 2 ft dish	29	1.62	0.078	0.849	30558
200.00	Flash Beacon Lighting	29	1.59	0.073	0.815	27624
185.04	Guy	29	1.43	0.028	0.644	15232
125.04	Guy	29	1.93	0.104	0.531	32139
125.00	DB230-J	29	1.93	0.104	0.532	32120
115.00	DB230-J	29	2.12	0.100	0.682	157936
101.00	DB230-J	29	2.37	0.063	0.879	10423
100.00	RFS PAD6/59	29	2.38	0.061	0.888	10066
90.00	OB Light	29	2.42	0.042	0.923	11210
89.00	SB6-W60	29	2.42	0.041	0.923	11433
65.04	Guy	29	2.14	0.075	0.806	43821
19.00	BGYD450K	31	0.88	0.199	0.579	19750
12.00	BMYA4503	31	0.57	0.216	0.548	27070

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T1	350 - 330	59.41	2	2.476	12.177
T2	330 - 320	49.32	2	2.257	11.782
T3	320 - 300	44.68	2	2.215	11.354
T4	300 - 280	35.33	2	2.243	9.574
T5	280 - 260	26.58	2	1.832	7.591
T6	260 - 240	19.49	2	1.587	6.152
T7	240 - 220	14.06	4	1.307	4.717
T8	220 - 200	11.49	4	0.844	3.453
T9	200 - 180	9.36	4	0.466	2.415
T10	180 - 160	8.17	4	0.327	1.908
T11	160 - 140	8.36	4	1.073	1.741
T12	140 - 120	10.45	5	1.895	1.583
T13	120 - 100	16.42	19	2.543	2.584

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
T14	100 - 80	27.27	19	2.347	3.683
T15	80 - 60	35.25	19	1.288	3.611
T16	60 - 40	37.87	19	0.570	3.050
T17	40 - 20	33.48	19	2.149	2.638
T18	20 - 10	19.94	19	4.137	2.241
T19	10 - 5	10.41	19	4.747	2.039
T20	5 - 0	5.25	19	4.908	1.888

Critical Deflections and Radius of Curvature - Design Wind

Elevation ft	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
350.00	5/8"x6' Lighning Rod	2	59.41	2.476	12.177	10606
345.00	DB224	2	56.82	2.414	12.104	10606
340.00	SB6-W60	2	54.25	2.355	12.020	5303
335.04	Guy	2	51.77	2.302	11.917	3545
325.00	SC412-HF2LDF	2	46.98	2.225	11.604	6307
310.00	SB4-W60	2	40.02	2.254	10.577	4864
300.00	DB224	2	35.33	2.243	9.574	5213
285.04	Guy	2	28.64	1.944	8.045	2628
265.00	OB Light	2	21.15	1.634	6.493	5753
250.00	3' Sidearm Mount	3	16.32	1.474	5.431	4132
234.96	Guy	4	13.37	1.196	4.383	1960
202.00	ice shield 2 ft dish	4	9.55	0.511	2.497	2454
200.00	Flash Beacon Lighting	4	9.36	0.466	2.415	1918
185.04	Guy	4	8.34	0.255	1.987	1191
125.04	Guy	19	13.83	2.438	2.302	1962
125.00	DB230-J	19	13.85	2.440	2.305	1969
115.00	DB230-J	19	19.13	2.581	2.895	4702
101.00	DB230-J	19	26.76	2.377	3.651	1520
100.00	RFS PAD6/59	19	27.27	2.347	3.683	1421
90.00	OB Light	19	31.83	1.946	3.784	1060
89.00	SB6-W60	19	32.22	1.893	3.776	1038
65.04	Guy	19	37.78	0.426	3.187	764
19.00	BGYD450K	19	19.05	4.212	2.223	736
12.00	BMYA4503	19	12.42	4.657	2.088	1101

Bolt Design Data

Section No.	Elevation ft	Component Type	Bolt Grade	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T1	350	Leg	A325N	1825.79	29820.60	0.061 ✓	1	Bolt Tension
T2	330	Leg	A325N	1954.40	29820.60	0.066 ✓	1	Bolt Tension
T3	320	Leg	A325N	2294.49	29820.60	0.077 ✓	1	Bolt Tension
T4	300	Leg	A325N	3541.61	29820.60	0.119 ✓	1	Bolt Tension
T5	280	Leg	A325N	3254.89	29820.60	0.109 ✓	1	Bolt Tension
T6	260	Leg	A325N	4164.77	29820.60	0.140 ✓	1	Bolt Tension
T7	240	Leg	A325N	5112.29	29820.60	0.171 ✓	1	Bolt Tension
T8	220	Leg	A325N	6848.94	29820.60	0.230 ✓	1	Bolt Tension

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Section No.	Elevation ft	Component Type	Bolt Grade	Maximum Load per Bolt lb	Allowable Load lb	Ratio Load / Allowable	Allowable Ratio	Criteria
T9	200	Leg	A325N	9714.58	29820.60	0.326 ✓	1	Bolt Tension
		Torque Arm Top@185.042	A325N	2173.38	17892.40	0.121 ✓	1	Bolt Shear
T10	180	Leg	A325N	11233.20	29820.60	0.377 ✓	1	Bolt Tension
T11	160	Leg	A325N	11128.30	29820.60	0.373 ✓	1	Bolt Tension
T12	140	Leg	A325N	8119.74	29820.60	0.272 ✓	1	Bolt Tension
T13	120	Leg	A325N	8431.30	29820.60	0.283 ✓	1	Bolt Tension
T14	100	Leg	A325N	13065.40	29820.60	0.438 ✓	1	Bolt Tension
T15	80	Leg	A325N	19710.20	29820.60	0.661 ✓	1	Bolt Tension
T16	60	Leg	A325N	32220.20	29820.60	1.080 ✗	1	Bolt Tension
T17	40	Leg	A325N	16421.50	29820.60	0.551 ✓	1	Bolt Tension
T18	20	Leg	A325N	10115.70	29820.60	0.339 ✓	1	Bolt Tension
T19	10	Leg	A325N	8533.64	29820.60	0.286 ✓	1	Bolt Tension

Guy Design Data

Section No.	Elevation ft	Initial Tension lb	Breaking Load lb	Actual T_u lb	Allowable ϕT_n lb	Required S.F.	Actual S.F.
T1	335.04 (A) (1110)	3500.00	35000.04	16959.80	21000.00	1.000	1.238 ✓
	335.04 (B) (1109)	3500.00	35000.04	17128.90	21000.00	1.000	1.226 ✓
	335.04 (C) (1105)	3500.00	35000.04	17070.40	21000.00	1.000	1.230 ✓
T4	285.04 (A) (1116)	2690.00	26900.04	11993.20	16140.00	1.000	1.346 ✓
	285.04 (B) (1115)	2690.00	26900.04	11733.60	16140.00	1.000	1.376 ✓
	285.04 (C) (1111)	2690.00	26900.04	12079.50	16140.00	1.000	1.336 ✓
T7	234.96 (A) (1122)	2080.00	20800.02	9098.50	12480.00	1.000	1.372 ✓
	234.96 (B) (1121)	2080.00	20800.02	8896.63	12480.00	1.000	1.403 ✓
	234.96 (C) (1117)	2080.00	20800.02	9188.38	12480.00	1.000	1.358 ✓
T9	185.04 (A) (1131)	2080.00	20800.02	7827.47	12480.00	1.000	1.594 ✓
	185.04 (A) (1132)	2080.00	20800.02	7746.30	12480.00	1.000	1.611 ✓
	185.04 (B) (1127)	2080.00	20800.02	7541.88	12480.00	1.000	1.655 ✓
	185.04 (B) (1128)	2080.00	20800.02	7561.36	12480.00	1.000	1.650 ✓
	185.04 (C) (1123)	2080.00	20800.02	7777.21	12480.00	1.000	1.605 ✓
	185.04 (C) (1124)	2080.00	20800.02	7850.15	12480.00	1.000	1.590 ✓
T12	125.04 (A) (1140)	2080.00	20800.02	8549.59	12480.00	1.000	1.460 ✓
	125.04 (B) (1139)	2080.00	20800.02	7998.78	12480.00	1.000	1.560 ✓
	125.04 (C) (1135)	2080.00	20800.02	8752.04	12480.00	1.000	1.426 ✓
T15	65.04 (A) (1146)	1540.00	15399.96	11574.00	9240.00	1.000	0.798 ✗
	65.04 (B) (1145)	1540.00	15399.96	9518.95	9240.00	1.000	0.971 ✗
	65.04 (C) (1141)	1540.00	15399.96	11885.40	9240.00	1.000	0.777 ✗

ARMOR TOWER ENGINEERING

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Compression Checks

Leg Design Data (Compression)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	*ft*	*ft*		in^2	*lb*	*lb*	
T1	350 - 330	20.00	2.48	95.2 K=1.00	1.23	-20682.80	28466.30	0.727 [1] ✓
T2	330 - 320	10.00	2.46	94.4 K=1.00	1.23	-17078.10	28783.70	0.593 [1] ✓
T3	320 - 300	20.00	2.48	95.2 K=1.00	1.23	-21532.30	28466.30	0.756 [1] ✓
T4	300 - 280	20.00	2.48	95.2 K=1.00	1.23	-36004.10	28466.30	1.265 [1] ✗
T5	280 - 260	20.00	2.48	79.3 K=1.00	1.77	-32236.30	50191.40	0.642 [1] ✓
T6	260 - 240	20.00	2.48	79.3 K=1.00	1.77	-38734.00	50191.40	0.772 [1] ✓
T7	240 - 220	20.00	2.48	79.3 K=1.00	1.77	-44763.00	50191.40	0.892 [1] ✓
T8	220 - 200	20.00	2.48	68.0 K=1.00	2.41	-60002.10	77187.30	0.777 [1] ✓
T9	200 - 180	20.00	2.48	68.0 K=1.00	2.41	-85572.40	77187.30	1.109 [1] ✗
T10	180 - 160	20.00	2.48	68.0 K=1.00	2.41	-99998.60	77187.30	1.296 [1] ✗
T11	160 - 140	20.00	2.48	68.0 K=1.00	2.41	-102262.00	77187.30	1.325 [1] ✗
T12	140 - 120	20.00	2.48	68.0 K=1.00	2.41	-99303.10	77187.30	1.287 [1] ✗
T13	120 - 100	20.00	2.48	68.0 K=1.00	2.41	-74787.60	77187.30	0.969 [1] ✓
T14	100 - 80	20.00	2.48	68.0 K=1.00	2.41	-99591.30	77187.30	1.290 [1] ✗
T15	80 - 60	20.00	2.48	68.0 K=1.00	2.41	-115290.00	77187.30	1.494 [1] ✗
T16	60 - 40	20.00	2.48	68.0 K=1.00	2.41	-137473.00	77187.30	1.781 [1] ✗
T17	40 - 20	20.00	2.48	68.0 K=1.00	2.41	-137190.00	77187.30	1.777 [1] ✗
T18	20 - 10	10.00	2.46	67.4 K=1.00	2.41	-114321.00	77625.30	1.473 [1] ✗
T19	10 - 5	5.00	2.42	66.3 K=1.00	2.41	-90069.90	78497.50	1.147 [1] ✗
T20	5 - 0	5.13	1.33	36.4 K=1.00	2.41	-78840.50	98264.20	0.802 [1] ✓

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Diagonal Design Data (Compression)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	*ft*	*ft*		in^2	*lb*	*lb*	
T1	350 - 330	3.19	3.02	135.3 K=0.70	0.44	-7047.23	5454.43	1.292 [1] ✗
T2	330 - 320	3.17	3.00	134.6 K=0.70	0.44	-5067.52	5510.30	0.920 [1] ✓
T3	320 - 300	3.19	3.02	135.3 K=0.70	0.44	-6209.96	5454.43	1.139 [1] ✗
T4	300 - 280	3.19	3.02	135.3 K=0.70	0.44	-7478.21	5454.43	1.371 [1] ✗
T5	280 - 260	3.19	2.99	133.8 K=0.70	0.44	-5077.17	5576.32	0.910 [1] ✓
T6	260 - 240	3.19	2.99	133.8 K=0.70	0.44	-5526.82	5576.32	0.991 [1] ✓
T7	240 - 220	3.19	2.99	133.8 K=0.70	0.44	-5489.71	5576.32	0.984 [1] ✓
T8	220 - 200	3.19	2.95	132.3 K=0.70	0.44	-4826.69	5696.32	0.847 [1] ✓
T9	200 - 180	3.19	2.95	99.2 K=0.70	0.79	-5598.01	15154.60	0.369 [1] ✓
T10	180 - 160	3.19	2.95	99.2 K=0.70	0.79	-4247.81	15154.60	0.280 [1] ✓
T11	160 - 140	3.19	2.95	132.3 K=0.70	0.44	-3841.01	5696.32	0.674 [1] ✓
T12	140 - 120	3.19	2.95	132.3 K=0.70	0.44	-7062.43	5696.32	1.240 [1] ✗
T13	120 - 100	3.19	2.95	132.3 K=0.70	0.44	-6821.71	5696.32	1.198 [1] ✗
T14	100 - 80	3.19	2.95	132.3 K=0.70	0.44	-5470.41	5696.32	0.960 [1] ✓
T15	80 - 60	3.19	2.95	132.3 K=0.70	0.44	-7571.46	5696.32	1.329 [1] ✗
T16	60 - 40	3.19	2.95	132.3 K=0.70	0.44	-6675.20	5696.32	1.172 [1] ✗
T17	40 - 20	3.19	2.95	132.3 K=0.70	0.44	-7076.28	5696.32	1.242 [1] ✗
T18	20 - 10	3.17	2.94	131.6 K=0.70	0.44	-9521.88	5749.78	1.656 [1] ✗
T19	10 - 5	3.14	2.91	130.3 K=0.70	0.44	-10135.20	5856.83	1.730 [1] ✗
T20	5 - 0	1.43	1.16	55.8 K=1.00	0.79	-5880.32	21601.00	0.272 [1] ✓

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Horizontal Design Data (Compression)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	*ft*	*ft*		in^2	*lb*	*lb*	
T1	350 - 330	2.00	1.90	84.9 K=0.70	0.44	-1360.16	9791.06	0.139 [1] ✓
T2	330 - 320	2.00	1.90	84.9 K=0.70	0.44	-1128.15	9791.06	0.115 [1] ✓
T3	320 - 300	2.00	1.90	84.9 K=0.70	0.44	-567.09	9791.06	0.058 [1] ✓
T4	300 - 280	2.00	1.90	84.9 K=0.70	0.44	-623.61	9791.06	0.064 [1] ✓
T5	280 - 260	2.00	1.88	84.0 K=0.70	0.44	-558.35	9872.67	0.057 [1] ✓
T6	260 - 240	2.00	1.88	84.0 K=0.70	0.44	-670.89	9872.67	0.068 [1] ✓
T7	240 - 220	2.00	1.88	84.0 K=0.70	0.44	-775.32	9872.67	0.079 [1] ✓
T8	220 - 200	2.00	1.85	83.1 K=0.70	0.44	-1039.27	9954.05	0.104 [1] ✓
T9	200 - 180	2.00	1.85	83.1 K=0.70	0.44	-3218.63	9954.05	0.323 [1] ✓
T10	180 - 160	2.00	1.85	83.1 K=0.70	0.44	-1732.03	9954.05	0.174 [1] ✓
T11	160 - 140	2.00	1.85	83.1 K=0.70	0.44	-1771.24	9954.05	0.178 [1] ✓
T12	140 - 120	2.00	1.85	83.1 K=0.70	0.44	-1719.98	9954.05	0.173 [1] ✓
T13	120 - 100	2.00	1.85	83.1 K=0.70	0.44	-1295.36	9954.05	0.130 [1] ✓
T14	100 - 80	2.00	1.85	83.1 K=0.70	0.44	-1724.97	9954.05	0.173 [1] ✓
T15	80 - 60	2.00	1.85	83.1 K=0.70	0.44	-1996.88	9954.05	0.201 [1] ✓
T16	60 - 40	2.00	1.85	83.1 K=0.70	0.44	-2381.10	9954.05	0.239 [1] ✓
T17	40 - 20	2.00	1.85	83.1 K=0.70	0.44	-2376.21	9954.05	0.239 [1] ✓
T18	20 - 10	2.00	1.85	83.1 K=0.70	0.44	-1980.10	9954.05	0.199 [1] ✓
T19	10 - 5	2.00	1.85	83.1 K=0.70	0.44	-1560.06	9954.05	0.157 [1] ✓
T20	5 - 0	1.48	1.34	64.2 K=1.00	0.79	-1392.25	20483.40	0.068 [1] ✓

Secondary Horizontal Design Data (Compression)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	*ft*	*ft*		in^2	*lb*	*lb*	
T1	350 - 330	1.00	0.95	60.7 K=1.00	0.44	-0.03	11791.10	0.000 [1] ✓
T2	330 - 320	1.00	0.95	60.7 K=1.00	0.44	-0.03	11791.10	0.000 [1] ✓
T3	320 - 300	1.00	0.95	60.7 K=1.00	0.44	-0.03	11791.10	0.000 [1] ✓
T4	300 - 280	1.00	0.95	60.7 K=1.00	0.44	-0.04	11791.10	0.000 [1] ✓

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Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T5	280 - 260	1.00	0.94	60.0 K=1.00	0.44	-0.04	11841.20	0.000 [1] ✓
T6	260 - 240	1.00	0.94	60.0 K=1.00	0.44	-0.05	11841.20	0.000 [1] ✓
T7	240 - 220	1.00	0.94	60.0 K=1.00	0.44	-0.05	11841.20	0.000 [1] ✓
T8	220 - 200	1.00	0.93	59.4 K=1.00	0.44	-0.04	11890.90	0.000 [1] ✓
T9	200 - 180	1.00	0.93	59.4 K=1.00	0.44	-0.03	11890.90	0.000 [1] ✓
T10	180 - 160	1.00	0.93	59.4 K=1.00	0.44	-0.07	11890.90	0.000 [1] ✓
T11	160 - 140	1.00	0.93	59.4 K=1.00	0.44	-0.12	11890.90	0.000 [1] ✓
T12	140 - 120	1.00	0.93	59.4 K=1.00	0.44	-0.17	11890.90	0.000 [1] ✓
T13	120 - 100	1.00	0.93	59.4 K=1.00	0.44	-0.18	11890.90	0.000 [1] ✓
T14	100 - 80	1.00	0.93	59.4 K=1.00	0.44	-0.15	11890.90	0.000 [1] ✓
T15	80 - 60	1.00	0.93	59.4 K=1.00	0.44	-0.08	11890.90	0.000 [1] ✓
T16	60 - 40	1.00	0.93	59.4 K=1.00	0.44	-0.08	11890.90	0.000 [1] ✓
T17	40 - 20	1.00	0.93	59.4 K=1.00	0.44	-0.15	11890.90	0.000 [1] ✓
T18	20 - 10	1.00	0.93	59.4 K=1.00	0.44	-0.17	11890.90	0.000 [1] ✓
T19	10 - 5	1.00	0.93	59.4 K=1.00	0.44	-0.16	11890.90	0.000 [1] ✓

Top Girt Design Data (Compression)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	2.00	1.90	84.9 K=0.70	0.44	-118.20	9791.06	0.012 [1] ✓
T2	330 - 320	2.00	1.90	84.9 K=0.70	0.44	-652.98	9791.06	0.067 [1] ✓
T3	320 - 300	2.00	1.90	84.9 K=0.70	0.44	-1210.85	9791.06	0.124 [1] ✓
T4	300 - 280	2.00	1.90	84.9 K=0.70	0.44	-1817.13	9791.06	0.186 [1] ✓
T5	280 - 260	2.00	1.88	84.0 K=0.70	0.44	-1169.80	9872.67	0.118 [1] ✓
T6	260 - 240	2.00	1.88	84.0 K=0.70	0.44	-849.31	9872.67	0.086 [1] ✓
T7	240 - 220	2.00	1.88	84.0 K=0.70	0.44	-1124.91	9872.67	0.114 [1] ✓
T8	220 - 200	2.00	1.85	83.1 K=0.70	0.44	-623.34	9954.05	0.063 [1] ✓
T9	200 - 180	2.00	1.85	83.1 K=0.70	0.44	-749.50	9954.05	0.075 [1] ✓
T10	180 - 160	2.00	1.85	83.1 K=0.70	0.44	-506.08	9954.05	0.051 [1] ✓
T11	160 - 140	2.00	1.85	83.1 K=0.70	0.44	-356.83	9954.05	0.036 [1] ✓

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T12	140 - 120	2.00	1.85	83.1 K=0.70	0.44	-390.12	9954.05	0.039 [1] ✓
T13	120 - 100	2.00	1.85	83.1 K=0.70	0.44	-721.03	9954.05	0.072 [1] ✓
T14	100 - 80	2.00	1.85	83.1 K=0.70	0.44	-165.06	9954.05	0.017 [1] ✓
T15	80 - 60	2.00	1.85	83.1 K=0.70	0.44	-355.64	9954.05	0.036 [1] ✓
T16	60 - 40	2.00	1.85	83.1 K=0.70	0.44	-395.94	9954.05	0.040 [1] ✓
T17	40 - 20	2.00	1.85	83.1 K=0.70	0.44	-379.90	9954.05	0.038 [1] ✓
T18	20 - 10	2.00	1.85	83.1 K=0.70	0.44	-1020.65	9954.05	0.103 [1] ✓
T19	10 - 5	2.00	1.85	83.1 K=0.70	0.44	-1293.38	9954.05	0.130 [1] ✓

Bottom Girt Design Data (Compression)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	2.00	1.90	84.9 K=0.70	0.44	-674.55	9791.06	0.069 [1] ✓
T2	330 - 320	2.00	1.90	84.9 K=0.70	0.44	-1090.07	9791.06	0.111 [1] ✓
T3	320 - 300	2.00	1.90	84.9 K=0.70	0.44	-1325.90	9791.06	0.135 [1] ✓
T4	300 - 280	2.00	1.90	84.9 K=0.70	0.44	-994.11	9791.06	0.102 [1] ✓
T5	280 - 260	2.00	1.88	84.0 K=0.70	0.44	-729.34	9872.67	0.074 [1] ✓
T6	260 - 240	2.00	1.88	84.0 K=0.70	0.44	-944.29	9872.67	0.096 [1] ✓
T7	240 - 220	2.00	1.88	84.0 K=0.70	0.44	-469.71	9872.67	0.048 [1] ✓
T8	220 - 200	2.00	1.85	83.1 K=0.70	0.44	-488.05	9954.05	0.049 [1] ✓
T9	200 - 180	2.00	1.85	83.1 K=0.70	0.44	-573.80	9954.05	0.058 [1] ✓
T10	180 - 160	2.00	1.85	83.1 K=0.70	0.44	-476.67	9954.05	0.048 [1] ✓
T11	160 - 140	2.00	1.85	83.1 K=0.70	0.44	-383.37	9954.05	0.039 [1] ✓
T12	140 - 120	2.00	1.85	83.1 K=0.70	0.44	-831.43	9954.05	0.084 [1] ✓
T13	120 - 100	2.00	1.85	83.1 K=0.70	0.44	-871.77	9954.05	0.088 [1] ✓
T14	100 - 80	2.00	1.85	83.1 K=0.70	0.44	-310.45	9954.05	0.031 [1] ✓
T15	80 - 60	2.00	1.85	83.1 K=0.70	0.44	-1029.17	9954.05	0.103 [1] ✓
T16	60 - 40	2.00	1.85	83.1 K=0.70	0.44	-357.04	9954.05	0.036 [1] ✓
T17	40 - 20	2.00	1.85	83.1 K=0.70	0.44	-453.65	9954.05	0.046 [1] ✓
T18	20 - 10	2.00	1.85	83.1 K=0.70	0.44	-518.51	9954.05	0.052 [1] ✓

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

Torque-Arm Top Design Data

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T9	200 - 180 (1125)	2.00	1.93	28.9 K=1.00	6.09	-143.87	188804.00	0.001
T9	200 - 180 (1126)	2.00	1.93	28.9 K=1.00	6.09	-343.42	188804.00	0.002
T9	200 - 180 (1129)	2.00	1.93	28.9 K=1.00	6.09	-909.35	188804.00	0.005
T9	200 - 180 (1130)	2.00	1.93	28.9 K=1.00	6.09	-530.32	188804.00	0.003
T9	200 - 180 (1133)	2.00	1.93	28.9 K=1.00	6.09	-376.01	188804.00	0.002
T9	200 - 180 (1134)	2.00	1.93	28.9 K=1.00	6.09	-654.30	188804.00	0.003

Torque-Arm Top Bending Design Data

Section No.	Elevation	M_{ux}	ϕM_{nx}	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy}	ϕM_{ny}	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	ft	kip-ft	kip-ft		kip-ft	kip-ft	
T9	200 - 180 (1125)	-8	58	0.137	0	9	0.000
T9	200 - 180 (1126)	-8	58	0.135	0	9	0.000
T9	200 - 180 (1129)	-8	58	0.137	0	9	0.000
T9	200 - 180 (1130)	-7	58	0.123	0	9	0.000
T9	200 - 180 (1133)	-7	58	0.122	0	9	0.000
T9	200 - 180 (1134)	-8	58	0.132	0	9	0.000

Torque-Arm Top Interaction Design Data

Section No.	Elevation	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft						
T9	200 - 180 (1125)	0.001	0.137	0.000	0.137 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1126)	0.002	0.135	0.000	0.136 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1129)	0.005	0.137	0.000	0.139 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1130)	0.003	0.123	0.000	0.124 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1133)	0.002	0.122	0.000	0.123 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1134)	0.003	0.132	0.000	0.134 ✓	1.000	4.8.1 ✓

ARMOR TOWER ENGINEERING

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Tension Checks

Leg Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	20.00	2.48	95.2	1.23	19473.80	55223.30	0.353 [1] ✓
T3	320 - 300	20.00	2.48	95.2	1.23	58.99	55223.30	0.001 [1] ✓
T4	300 - 280	20.00	2.48	95.2	1.23	11090.40	55223.30	0.201 [1] ✓
T7	240 - 220	20.00	2.48	79.3	1.77	505.86	79521.60	0.006 [1] ✓
T9	200 - 180	20.00	2.48	68.0	2.41	13403.40	108238.00	0.124 [1] ✓
T10	180 - 160	20.00	0.08	2.3	2.41	1907.68	108238.00	0.018 [1] ✓
T13	120 - 100	20.00	0.08	2.3	2.41	16255.20	108238.00	0.150 [1] ✓
T14	100 - 80	20.00	0.08	2.3	2.41	39196.30	108238.00	0.362 [1] ✓
T15	80 - 60	20.00	0.08	2.3	2.41	59130.70	108238.00	0.546 [1] ✓
T16	60 - 40	20.00	2.48	68.0	2.41	96798.70	108238.00	0.894 [1] ✓
T17	40 - 20	20.00	0.08	2.3	2.41	96659.20	108238.00	0.893 [1] ✓
T18	20 - 10	10.00	0.08	2.3	2.41	49263.70	108238.00	0.455 [1] ✓

Diagonal Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	3.19	3.02	193.2	0.44	7166.06	14313.90	0.501 [1] ✓
T2	330 - 320	3.17	3.00	192.3	0.44	4836.98	14313.90	0.338 [1] ✓
T3	320 - 300	3.19	3.02	193.2	0.44	5707.90	14313.90	0.399 [1] ✓
T4	300 - 280	3.19	3.02	193.2	0.44	7327.65	14313.90	0.512 [1] ✓
T5	280 - 260	3.19	2.99	191.1	0.44	5374.82	14313.90	0.375 [1] ✓
T6	260 - 240	3.19	2.99	191.1	0.44	4835.75	14313.90	0.338 [1] ✓
T7	240 - 220	3.19	2.99	191.1	0.44	5427.42	14313.90	0.379 [1] ✓

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T8	220 - 200	3.19	2.95	189.0	0.44	3807.09	14313.90	0.266 [1] ✓
T9	200 - 180	3.19	2.95	141.7	0.79	5315.42	25446.90	0.209 [1] ✓
T10	180 - 160	3.19	2.95	141.7	0.79	3748.03	25446.90	0.147 [1] ✓
T11	160 - 140	3.19	2.95	189.0	0.44	2955.01	14313.90	0.206 [1] ✓
T12	140 - 120	3.19	2.95	189.0	0.44	5788.52	14313.90	0.404 [1] ✓
T13	120 - 100	3.19	2.95	189.0	0.44	5940.31	14313.90	0.415 [1] ✓
T14	100 - 80	3.19	2.95	189.0	0.44	4557.03	14313.90	0.318 [1] ✓
T15	80 - 60	3.19	2.95	189.0	0.44	6506.71	14313.90	0.455 [1] ✓
T16	60 - 40	3.19	2.95	189.0	0.44	5497.67	14313.90	0.384 [1] ✓
T17	40 - 20	3.19	2.95	189.0	0.44	6386.98	14313.90	0.446 [1] ✓
T18	20 - 10	3.17	2.94	188.0	0.44	8653.56	14313.90	0.605 [1] ✓
T19	10 - 5	3.14	2.91	186.1	0.44	8863.35	14313.90	0.619 [1] ✓
T20	5 - 0	1.43	1.16	55.8	0.79	2366.85	25446.90	0.093 [1] ✓

Horizontal Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	2.00	1.90	121.3	0.44	2043.44	14313.90	0.143 [1] ✓
T2	330 - 320	2.00	1.90	121.3	0.44	1508.98	14313.90	0.105 [1] ✓
T3	320 - 300	2.00	1.90	121.3	0.44	698.68	14313.90	0.049 [1] ✓
T4	300 - 280	2.00	1.90	121.3	0.44	1368.20	14313.90	0.096 [1] ✓
T5	280 - 260	2.00	1.88	120.0	0.44	558.35	14313.90	0.039 [1] ✓
T6	260 - 240	2.00	1.88	120.0	0.44	670.89	14313.90	0.047 [1] ✓
T7	240 - 220	2.00	1.88	120.0	0.44	1018.26	14313.90	0.071 [1] ✓
T8	220 - 200	2.00	1.85	118.7	0.44	1039.27	14313.90	0.073 [1] ✓
T9	200 - 180	2.00	1.85	118.7	0.44	3700.31	14313.90	0.259 [1] ✓
T10	180 - 160	2.00	1.85	118.7	0.44	1732.03	14313.90	0.121 [1] ✓
T11	160 - 140	2.00	1.85	118.7	0.44	1771.24	14313.90	0.124 [1] ✓
T12	140 - 120	2.00	1.85	118.7	0.44	1719.98	14313.90	0.120 [1] ✓
T13	120 - 100	2.00	1.85	118.7	0.44	1295.36	14313.90	0.090 [1] ✓
T14	100 - 80	2.00	1.85	118.7	0.44	1724.97	14313.90	0.121 [1] ✓
T15	80 - 60	2.00	1.85	118.7	0.44	1996.88	14313.90	0.140 [1] ✓
T16	60 - 40	2.00	1.85	118.7	0.44	2381.10	14313.90	0.166 [1] ✓
T17	40 - 20	2.00	1.85	118.7	0.44	2376.21	14313.90	0.166 [1] ✓
T18	20 - 10	2.00	1.85	118.7	0.44	1980.10	14313.90	0.138 [1] ✓

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Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T19	10 - 5	2.00	1.85	118.7	0.44	1560.06	14313.90	0.109 [1] ✓
T20	5 - 0	0.52	0.37	17.8	0.79	2047.60	25446.90	0.080 [1] ✓

Secondary Horizontal Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	1.00	0.95	60.7	0.44	0.04	14313.90	0.000 [1] ✓
T2	330 - 320	1.00	0.95	60.7	0.44	0.04	14313.90	0.000 [1] ✓
T3	320 - 300	1.00	0.95	60.7	0.44	0.05	14313.90	0.000 [1] ✓
T4	300 - 280	1.00	0.95	60.7	0.44	0.05	14313.90	0.000 [1] ✓
T5	280 - 260	1.00	0.94	60.0	0.44	0.06	14313.90	0.000 [1] ✓
T6	260 - 240	1.00	0.94	60.0	0.44	0.06	14313.90	0.000 [1] ✓
T7	240 - 220	1.00	0.94	60.0	0.44	0.06	14313.90	0.000 [1] ✓
T8	220 - 200	1.00	0.93	59.4	0.44	0.05	14313.90	0.000 [1] ✓
T9	200 - 180	1.00	0.93	59.4	0.44	0.03	14313.90	0.000 [1] ✓
T10	180 - 160	1.00	0.93	59.4	0.44	0.06	14313.90	0.000 [1] ✓
T11	160 - 140	1.00	0.93	59.4	0.44	0.10	14313.90	0.000 [1] ✓
T12	140 - 120	1.00	0.93	59.4	0.44	0.13	14313.90	0.000 [1] ✓
T13	120 - 100	1.00	0.93	59.4	0.44	0.13	14313.90	0.000 [1] ✓
T14	100 - 80	1.00	0.93	59.4	0.44	0.10	14313.90	0.000 [1] ✓
T15	80 - 60	1.00	0.93	59.4	0.44	0.05	14313.90	0.000 [1] ✓
T16	60 - 40	1.00	0.93	59.4	0.44	0.12	14313.90	0.000 [1] ✓
T17	40 - 20	1.00	0.93	59.4	0.44	0.23	14313.90	0.000 [1] ✓
T18	20 - 10	1.00	0.93	59.4	0.44	0.25	14313.90	0.000 [1] ✓
T19	10 - 5	1.00	0.93	59.4	0.44	0.24	14313.90	0.000 [1] ✓

Top Girt Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	2.00	1.90	121.3	0.44	137.25	14313.90	0.010 [1] ✓
T2	330 - 320	2.00	1.90	121.3	0.44	665.85	14313.90	0.047 [1] ✓
T3	320 - 300	2.00	1.90	121.3	0.44	1067.70	14313.90	0.075 [1] ✓
T4	300 - 280	2.00	1.90	121.3	0.44	1762.34	14313.90	0.123 [1] ✓
T5	280 - 260	2.00	1.88	120.0	0.44	1040.31	14313.90	0.073 [1] ✓
T6	260 - 240	2.00	1.88	120.0	0.44	797.39	14313.90	0.056 [1] ✓
T7	240 - 220	2.00	1.88	120.0	0.44	1059.21	14313.90	0.074 [1] ✓

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Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T8	220 - 200	2.00	1.85	118.7	0.44	618.27	14313.90	0.043 [1] ✓
T9	200 - 180	2.00	1.85	118.7	0.44	804.29	14313.90	0.056 [1] ✓
T10	180 - 160	2.00	1.85	118.7	0.44	754.26	14313.90	0.053 [1] ✓
T11	160 - 140	2.00	1.85	118.7	0.44	636.09	14313.90	0.044 [1] ✓
T12	140 - 120	2.00	1.85	118.7	0.44	626.33	14313.90	0.044 [1] ✓
T13	120 - 100	2.00	1.85	118.7	0.44	1202.01	14313.90	0.084 [1] ✓
T14	100 - 80	2.00	1.85	118.7	0.44	773.28	14313.90	0.054 [1] ✓
T15	80 - 60	2.00	1.85	118.7	0.44	593.08	14313.90	0.041 [1] ✓
T16	60 - 40	2.00	1.85	118.7	0.44	644.21	14313.90	0.045 [1] ✓
T17	40 - 20	2.00	1.85	118.7	0.44	363.64	14313.90	0.025 [1] ✓
T18	20 - 10	2.00	1.85	118.7	0.44	855.09	14313.90	0.060 [1] ✓
T19	10 - 5	2.00	1.85	118.7	0.44	996.52	14313.90	0.070 [1] ✓
T20	5 - 0	1.97	1.82	116.5	0.44	5898.53	14313.90	0.412 [1] ✓

Bottom Girt Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	2.00	1.90	121.3	0.44	733.01	14313.90	0.051 [1] ✓
T2	330 - 320	2.00	1.90	121.3	0.44	1284.05	14313.90	0.090 [1] ✓
T3	320 - 300	2.00	1.90	121.3	0.44	1508.29	14313.90	0.105 [1] ✓
T4	300 - 280	2.00	1.90	121.3	0.44	1235.27	14313.90	0.086 [1] ✓
T5	280 - 260	2.00	1.88	120.0	0.44	917.67	14313.90	0.064 [1] ✓
T6	260 - 240	2.00	1.88	120.0	0.44	1162.32	14313.90	0.081 [1] ✓
T7	240 - 220	2.00	1.88	120.0	0.44	698.93	14313.90	0.049 [1] ✓
T8	220 - 200	2.00	1.85	118.7	0.44	736.78	14313.90	0.051 [1] ✓
T9	200 - 180	2.00	1.85	118.7	0.44	751.04	14313.90	0.052 [1] ✓
T10	180 - 160	2.00	1.85	118.7	0.44	613.61	14313.90	0.043 [1] ✓
T11	160 - 140	2.00	1.85	118.7	0.44	560.54	14313.90	0.039 [1] ✓
T12	140 - 120	2.00	1.85	118.7	0.44	986.05	14313.90	0.069 [1] ✓
T13	120 - 100	2.00	1.85	118.7	0.44	1036.77	14313.90	0.072 [1] ✓
T14	100 - 80	2.00	1.85	118.7	0.44	474.49	14313.90	0.033 [1] ✓
T15	80 - 60	2.00	1.85	118.7	0.44	776.10	14313.90	0.054 [1] ✓
T16	60 - 40	2.00	1.85	118.7	0.44	391.10	14313.90	0.027 [1] ✓
T17	40 - 20	2.00	1.85	118.7	0.44	712.16	14313.90	0.050 [1] ✓
T18	20 - 10	2.00	1.85	118.7	0.44	1305.51	14313.90	0.091 [1] ✓
T19	10 - 5	2.00	1.85	118.7	0.44	5834.85	14313.90	0.408 [1] ✓

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Top Guy Pull-Off Design Data (Tension)

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T1	350 - 330	2.00	1.90	210.2	1.13	5203.57	36450.00	0.143 [1] ✓
T4	300 - 280	2.00	1.90	210.2	1.13	3484.09	36450.00	0.096 [1] ✓
T7	240 - 220	2.00	1.88	207.8	1.13	2592.97	36450.00	0.071 [1] ✓
T12	140 - 120	2.00	1.85	205.5	1.13	3287.46	36450.00	0.090 [1] ✓
T15	80 - 60	2.00	1.85	205.5	1.13	4970.81	36450.00	0.136 [1] ✓

Torque-Arm Top Design Data

Section No.	Elevation	L	L_u	Kl/r	A	P_u	ϕP_n	Ratio $\frac{P_u}{\phi P_n}$
	ft	ft	ft		in^2	lb	lb	
T9	200 - 180 (1125)	2.00	1.93	28.9	4.38	1568.12	190636.00	0.008
T9	200 - 180 (1126)	2.00	1.93	28.9	4.38	1566.06	190636.00	0.008
T9	200 - 180 (1129)	2.00	1.93	28.9	4.38	1752.37	190636.00	0.009
T9	200 - 180 (1130)	2.00	1.93	28.9	4.38	1570.33	190636.00	0.008
T9	200 - 180 (1133)	2.00	1.93	28.9	4.38	1595.06	190636.00	0.008
T9	200 - 180 (1134)	2.00	1.93	28.9	4.38	1680.60	190636.00	0.009

Torque-Arm Top Bending Design Data

Section No.	Elevation	M_{ux}	ϕM_{nx}	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	M_{uy}	ϕM_{ny}	Ratio $\frac{M_{uy}}{\phi M_{ny}}$
	ft	kip-ft	kip-ft		kip-ft	kip-ft	
T9	200 - 180 (1125)	-11	58	0.192	0	9	0.000
T9	200 - 180 (1126)	-11	58	0.191	0	9	0.000
T9	200 - 180 (1129)	-11	58	0.193	0	9	0.000
T9	200 - 180 (1130)	-10	58	0.176	0	9	0.000
T9	200 - 180 (1133)	-10	58	0.176	0	9	0.000
T9	200 - 180 (1134)	-11	58	0.189	0	9	0.000

Torque-Arm Top Interaction Design Data

Section No.	Elevation	Ratio $\frac{P_u}{\phi P_n}$	Ratio $\frac{M_{ux}}{\phi M_{nx}}$	Ratio $\frac{M_{uy}}{\phi M_{ny}}$	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
	ft						
T9	200 - 180 (1125)	0.008	0.192	0.000	0.196 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1126)	0.008	0.191	0.000	0.195 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1129)	0.009	0.193	0.000	0.198 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1130)	0.008	0.176	0.000	0.180 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1133)	0.008	0.176	0.000	0.181 ✓	1.000	4.8.1 ✓
T9	200 - 180 (1134)	0.009	0.189	0.000	0.193 ✓	1.000	4.8.1 ✓

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Section Capacity Table

Section No.	Elevation ft	Component Type	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T1	350 - 330	Leg	2	-20682.80	28466.30	72.7	Pass
T2	330 - 320	Leg	64	-17078.10	28783.70	59.3	Pass
T3	320 - 300	Leg	98	-21532.30	28466.30	75.6	Pass
T4	300 - 280	Leg	161	-36004.10	28466.30	126.5	Fail
T5	280 - 260	Leg	223	-32236.30	50191.40	64.2	Pass
T6	260 - 240	Leg	285	-38734.00	50191.40	77.2	Pass
T7	240 - 220	Leg	346	-44763.00	50191.40	89.2	Pass
T8	220 - 200	Leg	408	-60002.10	77187.30	77.7	Pass
T9	200 - 180	Leg	470	-85572.40	77187.30	110.9	Fail
T10	180 - 160	Leg	532	-99998.60	77187.30	129.6	Fail
T11	160 - 140	Leg	594	-102262.00	77187.30	132.5	Fail
T12	140 - 120	Leg	656	-99303.10	77187.30	128.7	Fail
T13	120 - 100	Leg	719	-74787.60	77187.30	96.9	Pass
T14	100 - 80	Leg	779	-99591.30	77187.30	129.0	Fail
T15	80 - 60	Leg	843	-115290.00	77187.30	149.4	Fail
T16	60 - 40	Leg	903	-137473.00	77187.30	178.1	Fail
T17	40 - 20	Leg	965	-137190.00	77187.30	177.7	Fail
T18	20 - 10	Leg	1029	-114321.00	77625.30	147.3	Fail
T19	10 - 5	Leg	1063	-90069.90	78497.50	114.7	Fail
T20	5 - 0	Leg	1081	-78840.50	98264.20	80.2	Pass
T1	350 - 330	Diagonal	32	-7047.23	5454.43	129.2	Fail
T2	330 - 320	Diagonal	74	-5067.52	5510.30	92.0	Pass
T3	320 - 300	Diagonal	107	-6209.96	5454.43	113.9	Fail
T4	300 - 280	Diagonal	183	-7478.21	5454.43	137.1	Fail
T5	280 - 260	Diagonal	274	-5077.17	5576.32	91.0	Pass
T6	260 - 240	Diagonal	293	-5526.82	5576.32	99.1	Pass
T7	240 - 220	Diagonal	397	-5489.71	5576.32	98.4	Pass
T8	220 - 200	Diagonal	417	-4826.69	5696.32	84.7	Pass
T9	200 - 180	Diagonal	493	-5598.01	15154.60	36.9	Pass
T10	180 - 160	Diagonal	591	-4247.81	15154.60	28.0	Pass
T11	160 - 140	Diagonal	653	-3841.01	5696.32	67.4	Pass
T12	140 - 120	Diagonal	664	-7062.43	5696.32	124.0	Fail
T13	120 - 100	Diagonal	768	-6821.71	5696.32	119.8	Fail
T14	100 - 80	Diagonal	838	-5470.41	5696.32	96.0	Pass
T15	80 - 60	Diagonal	858	-7571.46	5696.32	132.9	Fail
T16	60 - 40	Diagonal	962	-6675.20	5696.32	117.2	Fail
T17	40 - 20	Diagonal	975	-7076.28	5696.32	124.2	Fail
T18	20 - 10	Diagonal	1037	-9521.88	5749.78	165.6	Fail
T19	10 - 5	Diagonal	1077	-10135.20	5856.83	173.0	Fail
T20	5 - 0	Diagonal	1092	-5880.32	21601.00	27.2	Pass
T1	350 - 330	Horizontal	22	2043.44	14313.90	14.3	Pass
T2	330 - 320	Horizontal	83	-1128.15	9791.06	11.5	Pass
T3	320 - 300	Horizontal	131	-567.09	9791.06	5.8	Pass
T4	300 - 280	Horizontal	180	1368.20	14313.90	9.6	Pass
T5	280 - 260	Horizontal	242	-558.35	9872.67	5.7	Pass
T6	260 - 240	Horizontal	304	-670.89	9872.67	6.8	Pass
T7	240 - 220	Horizontal	358	-775.32	9872.67	7.9	Pass
T8	220 - 200	Horizontal	421	-1039.27	9954.05	10.4	Pass
T9	200 - 180	Horizontal	489	-3218.63	9954.05	32.3	Pass
T10	180 - 160	Horizontal	551	-1732.03	9954.05	17.4	Pass
T11	160 - 140	Horizontal	607	-1771.24	9954.05	17.8	Pass
T12	140 - 120	Horizontal	669	-1719.98	9954.05	17.3	Pass
T13	120 - 100	Horizontal	731	-1295.36	9954.05	13.0	Pass

ARMOR TOWER ENGINEERING

Armor Tower, Inc.
9 N Main St
Cortland, NY 13045
Phone: (607) 591-5381
FAX: (866) 870-0840

Job	Page
350' GUYED TOWER ANALYSIS	17 of 18
Project	**Date**
ISICS - 94-Woodbury	08:30:05 05/12/16
Client	**Designed by**
Pyramid Network Services	PEP

Section No.	Elevation ft	Component Type	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T14	100 - 80	Horizontal	799	-1724.97	9954.05	17.3	Pass
T15	80 - 60	Horizontal	862	-1996.88	9954.05	20.1	Pass
T16	60 - 40	Horizontal	918	-2381.10	9954.05	23.9	Pass
T17	40 - 20	Horizontal	985	-2376.21	9954.05	23.9	Pass
T18	20 - 10	Horizontal	1048	-1980.10	9954.05	19.9	Pass
T19	10 - 5	Horizontal	1075	-1560.06	9954.05	15.7	Pass
T20	5 - 0	Horizontal	1087	2047.60	25446.90	8.0	Pass
T1	350 - 330	Secondary Horizontal	34	0.04	14313.90	0.1	Pass
T2	330 - 320	Secondary Horizontal	75	0.04	14313.90	0.1	Pass
T3	320 - 300	Secondary Horizontal	123	0.05	14313.90	0.1	Pass
T4	300 - 280	Secondary Horizontal	213	0.05	14313.90	0.1	Pass
T5	280 - 260	Secondary Horizontal	233	0.06	14313.90	0.1	Pass
T6	260 - 240	Secondary Horizontal	323	0.06	14313.90	0.1	Pass
T7	240 - 220	Secondary Horizontal	399	0.06	14313.90	0.1	Pass
T8	220 - 200	Secondary Horizontal	419	0.03	14313.90	0.1	Pass
T9	200 - 180	Secondary Horizontal	481	0.02	14313.90	0.1	Pass
T10	180 - 160	Secondary Horizontal	571	-0.04	11890.90	0.1	Pass
T11	160 - 140	Secondary Horizontal	647	-0.08	11890.90	0.1	Pass
T12	140 - 120	Secondary Horizontal	667	-0.16	11890.90	0.1	Pass
T13	120 - 100	Secondary Horizontal	771	-0.17	11890.90	0.1	Pass
T14	100 - 80	Secondary Horizontal	791	-0.08	11890.90	0.0	Pass
T15	80 - 60	Secondary Horizontal	853	0.01	14313.90	0.0	Pass
T16	60 - 40	Secondary Horizontal	915	0.12	14313.90	0.1	Pass
T17	40 - 20	Secondary Horizontal	977	0.23	14313.90	0.1	Pass
T18	20 - 10	Secondary Horizontal	1039	0.25	14313.90	0.1	Pass
T19	10 - 5	Secondary Horizontal	1073	0.24	14313.90	0.1	Pass
T1	350 - 330	Top Girt	4	-118.20	9791.06	1.2	Pass
T2	330 - 320	Top Girt	68	-652.98	9791.06	6.7	Pass
T3	320 - 300	Top Girt	102	-1210.85	9791.06	12.4	Pass
T4	300 - 280	Top Girt	162	-1817.13	9791.06	18.6	Pass
T5	280 - 260	Top Girt	226	-1169.80	9872.67	11.8	Pass
T6	260 - 240	Top Girt	286	-849.31	9872.67	8.6	Pass
T7	240 - 220	Top Girt	348	-1124.91	9872.67	11.4	Pass
T8	220 - 200	Top Girt	410	-623.34	9954.05	6.3	Pass
T9	200 - 180	Top Girt	472	-749.50	9954.05	7.5	Pass
T10	180 - 160	Top Girt	536	754.26	14313.90	5.3	Pass
T11	160 - 140	Top Girt	598	636.09	14313.90	4.4	Pass
T12	140 - 120	Top Girt	659	626.33	14313.90	4.4	Pass
T13	120 - 100	Top Girt	721	1202.01	14313.90	8.4	Pass
T14	100 - 80	Top Girt	783	773.28	14313.90	5.4	Pass
T15	80 - 60	Top Girt	846	593.08	14313.90	4.1	Pass
T16	60 - 40	Top Girt	907	644.21	14313.90	4.5	Pass
T17	40 - 20	Top Girt	969	-379.90	9954.05	3.8	Pass
T18	20 - 10	Top Girt	1031	-1020.65	9954.05	10.3	Pass
T19	10 - 5	Top Girt	1065	-1293.38	9954.05	13.0	Pass
T20	5 - 0	Top Girt	1086	5898.53	14313.90	41.2	Pass
T1	350 - 330	Bottom Girt	7	-674.55	9791.06	6.9	Pass
T2	330 - 320	Bottom Girt	70	-1090.07	9791.06	11.1	Pass
T3	320 - 300	Bottom Girt	103	-1325.90	9791.06	13.5	Pass
T4	300 - 280	Bottom Girt	167	-994.11	9791.06	10.2	Pass
T5	280 - 260	Bottom Girt	228	-729.34	9872.67	7.4	Pass
T6	260 - 240	Bottom Girt	289	-944.29	9872.67	9.6	Pass
T7	240 - 220	Bottom Girt	351	698.93	14313.90	4.9	Pass
T8	220 - 200	Bottom Girt	413	736.78	14313.90	5.1	Pass
T9	200 - 180	Bottom Girt	477	-573.80	9954.05	5.8	Pass
T10	180 - 160	Bottom Girt	539	-476.67	9954.05	4.8	Pass
T11	160 - 140	Bottom Girt	599	560.54	14313.90	3.9	Pass
T12	140 - 120	Bottom Girt	663	-831.43	9954.05	8.4	Pass
T13	120 - 100	Bottom Girt	725	-871.77	9954.05	8.8	Pass
T14	100 - 80	Bottom Girt	785	474.49	14313.90	3.3	Pass
T15	80 - 60	Bottom Girt	848	-1029.17	9954.05	10.3	Pass

ARMOR TOWER ENGINEERING	Job: 350' GUYED TOWER ANALYSIS	Page: 18 of 18
Armor Tower, Inc. 9 N Main St Cortland, NY 13045 Phone: (607) 591-5381 FAX: (866) 870-0840	Project: ISICS - 94-Woodbury	Date: 08:30:05 05/12/16
	Client: Pyramid Network Services	Designed by: PEP

Section No.	Elevation ft	Component Type	Critical Element	P lb	ϕP_{allow} lb	% Capacity	Pass Fail
T16	60 - 40	Bottom Girt	910	-357.04	9954.05	3.6	Pass
T17	40 - 20	Bottom Girt	972	712.16	14313.90	5.0	Pass
T18	20 - 10	Bottom Girt	1034	1305.51	14313.90	9.1	Pass
T19	10 - 5	Bottom Girt	1068	5834.85	14313.90	40.8	Pass
T1	350 - 330	Guy A@335.042	1110	16959.80	21000.00	80.8	Pass
T4	300 - 280	Guy A@285.042	1116	11993.20	16140.00	74.3	Pass
T7	240 - 220	Guy A@234.958	1122	9098.50	12480.00	72.9	Pass
T9	200 - 180	Guy A@185.042	1131	7827.47	12480.00	62.7	Pass
T12	140 - 120	Guy A@125.042	1140	8549.59	12480.00	68.5	Pass
T15	80 - 60	Guy A@65.0417	1146	11574.00	9240.00	125.3	Fail ✗
T1	350 - 330	Guy B@335.042	1109	17128.90	21000.00	81.6	Pass
T4	300 - 280	Guy B@285.042	1115	11733.60	16140.00	72.7	Pass
T7	240 - 220	Guy B@234.958	1121	8896.63	12480.00	71.3	Pass
T9	200 - 180	Guy B@185.042	1128	7561.36	12480.00	60.6	Pass
T12	140 - 120	Guy B@125.042	1139	7998.78	12480.00	64.1	Pass
T15	80 - 60	Guy B@65.0417	1145	9518.95	9240.00	103.0	Fail ✗
T1	350 - 330	Guy C@335.042	1105	17070.40	21000.00	81.3	Pass
T4	300 - 280	Guy C@285.042	1111	12079.50	16140.00	74.8	Pass
T7	240 - 220	Guy C@234.958	1117	9188.38	12480.00	73.6	Pass
T9	200 - 180	Guy C@185.042	1124	7850.15	12480.00	62.9	Pass
T12	140 - 120	Guy C@125.042	1135	8752.04	12480.00	70.1	Pass
T15	80 - 60	Guy C@65.0417	1141	11885.40	9240.00	128.6	Fail ✗
T1	350 - 330	Top Guy Pull-Off@335.042	1107	5203.57	36450.00	14.3	Pass
T4	300 - 280	Top Guy Pull-Off@285.042	1113	3484.09	36450.00	9.6	Pass
T7	240 - 220	Top Guy Pull-Off@234.958	1119	2592.97	36450.00	7.1	Pass
T12	140 - 120	Top Guy Pull-Off@125.042	1137	3287.46	36450.00	9.0	Pass
T15	80 - 60	Top Guy Pull-Off@65.0417	1144	4970.81	36450.00	13.6	Pass
T9	200 - 180	Torque Arm Top@185.042	1129	1752.37	190636.00	19.8	Pass
						Summary	
					Leg (T16)	178.1	Fail ✗
					Diagonal (T19)	173.0	Fail ✗
					Horizontal (T9)	32.3	Pass
					Secondary Horizontal (T18)	0.1	Pass
					Top Girt (T20)	41.2	Pass
					Bottom Girt (T19)	40.8	Pass
					Guy A (T15)	125.3	Fail ✗
					Guy B (T15)	103.0	Fail ✗
					Guy C (T15)	128.6	Fail ✗
					Top Guy Pull-Off (T1)	14.3	Pass
					Torque Arm Top (T9)	19.8	Pass
					Bolt Checks	108.0	Fail ✗
					RATING =	**178.1**	**Fail ✗**

Existing GUY ANCHOR ANALYSIS

Customer: Pyramid Network Services
Project: ISICS-94 Woodbury
5/11/2016 1:34 PM

FACTORED REACTIONS:

Vertical:	36.2 kips
Horizontal:	48.1 kips
Resultant:	60.2 kips
Hor. Angle:	37.0 °
Submerged?	No
Depth to Water:	3 ft

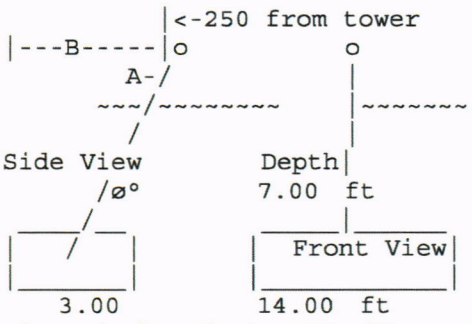
Soil Unit Wt	110 lb/ft^3
Soil Gs:	2.65
Sub.Soil Wt:	68.5 lb/ft^3
Conc. Wt:	150 lb/ft^3
Rebar Fy:	60000 psi
Conc f`c:	3000 psi

CONCRETE WEIGHT:

Block Volume	4.7 cu yds
Block Wt	18.9 kips
3-block Volume:	14.0 cu yds

SOIL FRUSTUM WEIGHT:

Frustum:	30 °
Block:	32.3 kips
Edges:	52.9 kips
Corners:	16.8 kips
Total Wt:	102.0 kips
Excavatn:	420 cuft



HORIZONTAL CAPACITY:
Based on Normal Soils

Load @	8.5 ft
Stress:	6800 psf
Load:	285.6 kip

Check anchor shaft embedment? OK

	Uplift	Horizontal	
Design Loads:	36.2	48.1	kips
TIA 9.4.1 - ϕRn:	90.7	214.2	kips
% Loaded:	40%	22%	OK

GUY ANCHOR SHAFT:

Hole QTY	9	holes
Bar Qty:	(1)	2-1/4" Rod
Fy/Fu:	50/65	ksi
Shaft Ag:	3.98	in²
Capacity	159.0	kips TIA 4.6.3
% Loaded	37.9%	OK

ANCHOR ROD LENGTH:

Minimum:	16.1 ft
Maximum:	20.0 ft
Recommend:	18.0 ft
Actual:	16.6 ft

BLOCK REINFORCEMENT:
ACI 9.3.2.1 ϕ: 0.9 Cage Bar: #7 Cover: 3 in

	Top Face	Front Face		
Factored Loads:	36.2	48.1	kips	
Factored Moment:	760.2	1010.1	kip-inch	
ACI 10.5.3 As:	0.571	0.760	in²	OK
ACI 10.5.4 As:	2.138	2.138	in²	OK
Bar Qty:	(4)	(3)		
Actual As:	2.405	1.804	in²	

ANCHOR DIMENSIONS:
Length - 14'- 0"
Width - 3'- 0"
Height - 3'- 0"
Depth - 7'- 0"
OADepth- 10'- 0"
Dim. A: 12'- 1"
Dim. B: 15'- 1"
ø: 36°

REBAR DIMENSIONS:

RBL:	168"	
RBH:	30"	
RBW:	30"	
Bent OAL:	60"	
QTY Long:	8	Bars ea
QTY Bent:	17	Bars ea
Rebar Wt.	442	lb ea

MASTER CHECK: OK

Codes: ACI 318, TIA 222-G

SQUARE FOOTING AND PIER ANALYSIS

Customer: Pyramid Network Services
Project: ISICS-94 Woodbury
5/11/2016 1:34 PM

Factored Axial Load: 184.2 kips
Base Shear: 5.6 kips

DIMENSIONS:
Width 9.00 ft
Thickness 1.50 ft
Ht.above Grade: 6 inches

Round Pier OD 2.50 ft
Depth to Pad 2.00 ft
Bearing Depth: 3.50 ft

Pier Area: 707 inch²

SOIL PROPERTIES:
Dry Unit Wt: 100 pcf
Saturated Unit Wt: 120 pcf
Depth to GWT: 6 ft

CONCRETE PROPERTIES:
f'c: 3000 psi
Fy: 60000 psi

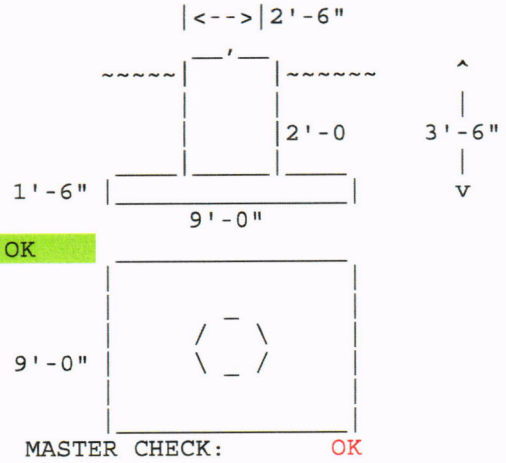
CALCULATIONS
EIA-F Normal soil: TIA 15.5.1
Qu: 1.80 ksf
Qnet: 1.56 ksf
TIA 9.4.1 $\phi_s R_s$: 145.80 kip phi=1.0
Ultimate Stress: 2355 psf Bearing: 126.3% No Good

CHECK PAD SHEAR ACI 9.3.2.3 ϕ: 0.75
Two Way Action: ßc=1 (L=W) Beam Action Load Area: 18.656 ft²
Vu: 173121 lbs Vu: 43938 lbs
ϕVc: 364639 lbs ϕVc: 142044 lbs
47.48% <= OK => 30.93%

MINIMUM PIER REINFORCING
ACI 15.8.2.1 0.005Ag: 3.534 inch² Steel Area:
(6) Bars of #7 3.608 inch² 98.0% OK
Bar Lngth: 37.5 inch
Pier Tie bar: #3 14 " tie bar spacing ACI 7.10.5

PAD BENDING MOMENT REINFORCEMENT
ACI 9.3.2.1 ϕ: 0.9
Mu: 111942 ft-lbs
As(Strength): 1.786 inch²
As(minimum): 2.746 inch²
Cover: 3 inches
(10) Bars of #7 Each Way
Actual As: 6.013 inch² 45.7% OK

Effective d 14.125 inches



Mat Bars: Concrete:
20 @ 11.33" spacing 4.9 cuyd
365 lb 19697.6 lb

MASTER CHECK: OK

Codes: ACI 318, TIA 222-G