



CITY OF SAN DIEGO
MASTER USE AND OCCUPANCY AGREEMENT

between

THE CITY OF SAN DIEGO

and

NEW CINGULAR WIRELESS PCS, LLC,
a Delaware limited liability company

for

Small Cell Installations on Various Poles

**CITY OF SAN DIEGO
MASTER SMALL CELL USE AND OCCUPANCY AGREEMENT**

This CITY OF SAN DIEGO MASTER USE AND OCCUPANCY AGREEMENT ("Master Agreement") is entered into by and between THE CITY OF SAN DIEGO, a California municipal corporation ("CITY") and NEW CINGULAR WIRELESS PCS, LLC, a Delaware limited liability company ("PERMITTEE") hereinafter collectively referred to as the "Parties," to be effective on the first day of the first month following the date of execution by CITY ("Effective Date"), once the Master Agreement is signed by the San Diego City Attorney.

RECITALS

- A. CITY is the record owner of certain public rights-of-way within the City of San Diego.
- B. PERMITTEE desires to erect, maintain and operate small wireless facilities within the CITY's public rights-of-way further defined below as "Communications Equipment."
- C. PERMITTEE is a commercial mobile radio service provider offering intrastate wireless telecommunications services within California that is registered with the California Public Utilities Commission ("PUC"), with a Wireless Identity Number (WIN) U-3060-C, and pursuant to that registration, PERMITTEE is authorized to do business and provide telecommunications services that the Communications Equipment enables under the California Public Utilities Code.
- D. CITY is willing to enter into this Master Agreement with PERMITTEE governing the right to use portions of CITY's public rights-of way, specifically CITY Street Light Poles and Signalized Poles (defined below), for the construction, operation and maintenance of the Communications Equipment (defined below) in order for PERMITTEE to provide better service to its customers.
- E. CITY and PERMITTEE previously entered into that certain Master Use and Occupancy Permit as of July 1, 2018 ("2018 Master Permit") pursuant to which CITY granted approval to PERMITTEE to install Communications Equipment on one hundred forty-four (144) City Street Light Poles (each a "2018 Master Permit Approved Site"); and
- F. CITY and PERMITTEE desire to terminate the 2018 Master Permit as of June 30, 2019, for all Approved Sites under that agreement, and to then include all of the 2018 Master Permit Approved Sites under this Master Agreement as of July 1, 2019, through the process set forth in Section 7 of this Master Agreement at which time this Master Agreement will supersede and replace in its entirety the 2018 Master Permit as to those Approved Sites, and the terms and conditions of this Master Agreement and the Use and Occupancy Permit will apply;
- G. Notwithstanding anything to the contrary contained in this Master Agreement, no provision contained herein shall be construed to mean that PERMITTEE is paying a use fee for any ground space portion of the public right-of-way.

- H. CITY and PERMITTEE share an interest in the accelerated deployment of an advanced wireless communications network to serve residents, visitors and businesses in San Diego and are entering into this Master Agreement to further such interest
- I. The Parties wish to enter into this Master Agreement to accelerate the deployment of such infrastructure and technology to allow PERMITTEE to serve San Diego's residents, businesses and visitors.

FOR VALUABLE CONSIDERATION, the sufficiency of which is hereby acknowledged, the Parties hereby agree to be bound as follows:

1. DEFINITIONS.

As used in this Master Agreement, the terms listed below are defined as follows:

- 1.1. "Approved Site" – a Site (defined below) for which all approvals required for construction or installation to commence have been obtained.
- 1.2. "Communications Equipment" – may consist of, but are not limited to, PERMITTEE's antennas, radios, mounting brackets, aerially mounted equipment enclosures, AC disconnects, switches, conduits, grounding plates, grounding wires, grounding pipes, coils, NEMA boxes, power sources, fiber optic cables, conduits, and shrouds installed by PERMITTEE, and more particularly described and depicted in the Master Structural Plan ("MSP") attached as Exhibit A.
- 1.3. "Emergency" – imminent or current network outage or danger to the public health, safety or welfare or property.
- 1.4. "Hazardous Substances" – those hazardous substances listed by the Environmental Protection Agency ("EPA") in regularly released reports and any other substances incorporated into the State of California's list of hazardous substances, and all types of petroleum-related substances and their chemical constituents.
- 1.5. "Permit Areas" – Up to a maximum of 1,500 Approved Sites (defined below), more particularly described and depicted in Exhibit A as updated from time to time.
- 1.6. "PERMITTEE's Operations" – PERMITTEE's development, occupancy, use, and/or maintenance of the Permit Areas.
- 1.7. "Signalized Pole" - any pole equipped with either vehicle signal indications, pedestrian signal indications, pedestrian pushbuttons, emergency vehicle preemption equipment, or any other components that comprise any part of a traffic signal/traffic control device that serves to control and direct traffic, including pedestrian traffic, by display of steady or flashing lighted indications.
- 1.8. "Site" – a Street Light Pole (defined below) or Signalized Pole, where the Communications Equipment may be installed pursuant to this Master Agreement and subsequent Use and Occupancy Permits ("UOPs") (defined below).

- 1.9. "Street Light Pole" – any Caltrans Type 15 pole (rounded, metal street light pole that has a luminaire arm and luminaire for the purpose of providing roadway lighting), the ownership of which shall be retained by the CITY.
- 1.10. "Use and Occupancy Permit" – an additional agreement entered into for one or more Approved Sites, in substantially the form attached hereto as Exhibit B, to install Communications Equipment on one or more Approved Sites which is approved by the CITY in accordance with Section 7.

2. USE OF PERMIT AREAS.

PERMITTEE shall use the Permit Areas solely for the purposes, with proper permits and approvals obtained, of installing, constructing, operating, modifying, upgrading, maintaining, repairing, and removing, all at PERMITTEE's sole cost and expense, the Communications Equipment ("Permit Use") only as provided in this Master Agreement.

- 2.1. Primary Purpose of Sites. Any Street Light Pole is for the primary purpose of providing lighting and in some instances traffic control, and any Signalized Pole is for the primary purpose of controlling and directing traffic, including pedestrian traffic, but any Site may have the secondary purpose of accommodating PERMITTEE's Operations at the Permit Area during the UOP Term.
- 2.2. Other Uses. PERMITTEE shall not operate the Communications Equipment or use the Permit Areas for other related or incidental activities of any kind without CITY's prior written consent, which consent shall be in CITY's sole discretion consistent with applicable law. Communications Equipment shall not interfere with the operation of the Street Light, or cause a safety-related visual impairment, distraction, or confusion to motorists.
- 2.3. No Nuisance. PERMITTEE shall not use the Permit Area in any manner which creates a nuisance, as defined in California Civil Code Section 3479.
- 2.4. No Limitation. Nothing contained in this Master Agreement shall be construed as a limitation, restriction or prohibition against CITY entering into agreements with other parties regarding the use of the Permit Areas, Sites or other facilities or the CITY issuing permits for the use of its rights-of-way.

3. RIGHT TO ENTER AND OCCUPY.

- 3.1. Grant. Subject to the terms and conditions of this Master Agreement, and the UOPs subsequently entered into by the Parties, CITY will grant permission to PERMITTEE, its officers, employees, agents, and contractors to enter upon and occupy the Permit Areas solely for the purpose of the Permit Use seven (7) days a week, twenty-four (24) hours a day.

- 3.2. License Only. This Master Agreement is a license to use CITY-owned property. It is not a lease; however, this Master Agreement and each UOP are binding contracts between the Parties.

4. TERM.

- 4.1. Term of Master Agreement. The term of this Master Agreement ("Term") shall be ten (10) years, commencing on the Effective Date. The Parties may enter into a Use and Occupancy Permit ("UOP") only during the first four (4) years of the Term of this Master Agreement.
- 4.2. Term of Subsequent Use and Occupancy Permits. The term of each Use and Occupancy Permit ("UOP Term") will be ten (10) years, commencing on the effective date of the particular UOP ("UOP Effective Date"). PERMITTEE shall provide the date on which it desires a particular UOP to be effective at the time of requesting the UOP, and CITY will include that effective date in the UOP, provided that such date is prior to PERMITTEE commencing any construction on the Approved Site(s). "Permit Year" shall mean each twelve (12) month period during the UOP Term, starting on the UOP Effective Date and terminating on the same day minus one day the following year, for example if the UOP's Effective Date was February 15, 2019, the first Permit Year would end on February 14, 2020. In no event will any UOP Term exceed ten (10) years. The terms and conditions of the Master Agreement shall be incorporated by reference in to each UOP.
- 4.3. Holdover. Any holding over by PERMITTEE after expiration or termination shall not be considered as a renewal or extension of this Master Agreement. The occupancy of the Site after expiration or termination shall continue, and all other terms and conditions of this Master Agreement shall continue in full force and effect; provided, however, CITY shall have the right to apply a reasonable increase in the Annual Fee as permitted by applicable law at that time, and to terminate the holdover at will. Calculation of all prorated rents under this section shall be based on a 30-day month. Notice of any such increase in Annual Fee shall be given in writing at least thirty (30) days prior to becoming effective.

5. ANNUAL FEE.

- 5.1 PERMITTEE shall pay to CITY an annual fee in the amount of two hundred and seventy dollars (\$270.00) per Approved Site ("Annual Fee"). However, if CITY's 2019 cost study determines that the CITY'S reasonable costs that are reasonably related to these deployments are less than two hundred and seventy dollars (\$270.00) CITY shall notify PERMITTEE in writing within thirty (30) days of the conclusion of the 2019 cost study, and going forward the Annual Fee shall be reduced to the amount of the CITY's reasonable costs as determined by the 2019 cost study.

- 5.2. Time and Place of Payment. The total Annual Fee for each UOP is due in advance on or before the first day of each UOP Permit Year during the UOP Term, except for the first UOP Permit Year which shall be paid within thirty (30) days of the UOP Effective Date(referred to hereinafter as the "Annual Payment"). The Annual Payment check shall be made payable to "City Treasurer" and delivered to the Office of the City Treasurer, Civic Center Plaza Building, 1200 Third Avenue, First Floor, San Diego, California 92101, or mailed with an invoice to:

The City of San Diego
Office of the City Treasurer
P.O. Box 129030
San Diego, California 92112-9030

PERMITTEE shall include CITY's customer account number for PERMITTEE on each of the checks used for the Annual Payment so CITY can apply the Annual Payment to the appropriate account. The place of payment may be changed at any time by CITY upon thirty (30) calendar days' written notice to PERMITTEE. Mailed Annual Payments shall be deemed paid upon the date the payments are postmarked by the postal authorities. If a postmark is illegible, the payment shall be deemed paid upon actual receipt by the City Treasurer. PERMITTEE assumes all risk of loss and responsibility for late payment charges if payments are made by mail.

- 5.3. Delinquent Payments. If PERMITTEE fails to pay the Annual Payment when due, PERMITTEE shall pay, in addition to the unpaid Annual Payment, five percent (5%) of the delinquent Annual Payment. If any portion of the Annual Payment is still unpaid fifteen (15) calendar days after the first day of the Permit Year, PERMITTEE shall pay an additional five percent (5%), for a total of ten percent (10%) of the delinquent Annual Payment, which is agreed by the Parties to be appropriate to compensate CITY for loss resulting from fee delinquency, including lost interest, opportunities, legal costs, and the cost of servicing the delinquent account. In no event shall the charge for late payments of the Annual Fee be less than twenty-five dollars (\$25). Acceptance of late charges and any portion of the late payment by CITY shall neither constitute a waiver of PERMITTEE's default with respect to late payment nor prevent CITY from exercising any other rights and remedies available at law or in equity.
- 5.4. Yearly Accounting for UOPs. PERMITTEE shall make one payment for the total Annual Fee owed under each Use and Occupancy Permit entered into under this Master Agreement. PERMITTEE shall provide an annual accounting with that payment to CITY separately identifying the UOP included in the payment, the number of Sites covered by that UOP, and the amount of the payment. It is the Parties intention that the Use and Occupancy Permits will be numbered sequentially for ease of reference as they are entered into. Failure to provide the yearly accounting for each UOP may result in penalties for delinquent Annual Payment and shall constitute a breach of this Master Agreement.

5.5. Financial Records. PERMITTEE shall maintain, in accordance with generally accepted accounting practices, complete and accurate financial records showing all receipts from its use of the Site and/or Permit Area. PERMITTEE shall make any and all of its records and accounts relating to its use of the Site or Permit Area available to CITY for inspection at a reasonable time and location within the City of San Diego so that CITY can determine PERMITTEE's compliance with this Master Agreement. PERMITTEE's failure to keep and maintain records and make them available for CITY inspection shall be a default of this Master Agreement subject to Section 30.1(b)(ii). PERMITTEE shall maintain all such financial records for a minimum period of five (5) years past the expiration or earlier revocation or termination of this Master Agreement. This section shall survive the expiration or earlier revocation or termination of this Master Agreement.

6. INSURANCE.

PERMITTEE shall not begin any work on any portion of the Permit Areas until it has: (a) provided to CITY insurance certificates reflecting evidence of all insurance required below; however, CITY reserves the right to request, and PERMITTEE shall submit, copies of any policy upon reasonable request by CITY; (b) obtained CITY approval of each insurance company or companies; and (c) confirmed with CITY that all policies contain the specific provisions required below. PERMITTEE's liabilities, including, but not limited to, PERMITTEE's indemnity obligations, under this Master Agreement, shall not be deemed limited in any way to the insurance coverage required herein. Maintenance of specified insurance coverage is a material element of this Master Agreement and PERMITTEE's failure to maintain or renew coverage or to provide evidence of renewal during the Term may be treated as a material breach of contract by CITY. PERMITTEE shall not modify any policy or endorsement thereto which increases CITY's exposure to loss for the Term.

6.1. Types of Insurance: At all times during the term of this Master Agreement, the PERMITTEE shall maintain insurance coverage as follows:

- a. Commercial General Liability (CGL). Insurance written on an ISO Occurrence form CG 00 01 07 98 or an equivalent form providing coverage at least as broad which shall cover liability arising from any and all personal injury or property damage in the amount of \$2 million per occurrence and subject to an annual aggregate of \$4 million. There shall be no endorsement or modification of the CGL limiting the scope of coverage for either insured vs. insured claims or contractual liability. All defense costs shall be outside the limits of the policy.
- b. Commercial Automobile Liability. For all of PERMITTEE's automobiles including owned, hired and non-owned automobiles, PERMITTEE shall keep in full force and effect automobile insurance written on an ISO form CA 00 01 12 90 or a later version of this form or an equivalent form providing coverage at least as broad for bodily injury and property damage for a combined single limit of \$1 million per occurrence. The insurance certificate shall reflect coverage for any automobile (any auto).

- c. Workers' Compensation. For all of PERMITTEE employees who are subject to this Master Agreement and to the extent required by the applicable state or federal law, PERMITTEE shall keep in full force and effect a Workers' Compensation policy. That policy shall provide a minimum of \$1 million of employers' liability coverage, and PERMITTEE shall provide an endorsement that the insurer waives the right of subrogation against CITY and its respective elected officials, officers, employees, agents and representatives.
- 6.2. Deductibles: All deductibles on any policy shall be the responsibility of PERMITTEE and shall be disclosed to CITY at the time the evidence of insurance is provided.
- 6.3 Acceptability of Insurers: Except for the State Compensation Insurance Fund, all insurance required by this Master Agreement shall only be carried by insurance companies with a rating of at least "A-, VI" by A.M. Best Company, that are authorized by the California Insurance Commissioner to do business in the State of California, and that have been approved by CITY. CITY will accept insurance provided by non-admitted, "surplus lines" carriers only if the carrier is authorized to do business in the State of California and is included on the List of Eligible Surplus Lines Insurers (LESLI list). All policies of insurance carried by non-admitted carriers are subject to all of the requirements for policies of insurance provided by admitted carriers described herein.
- 6.4 Modification: To assure protection from and against the kind and extent of risk existing with PERMITTEE's Operations, CITY, at its reasonable discretion, may require the revision of amounts and coverage at any time by giving PERMITTEE thirty (30) days prior written notice. PERMITTEE shall also obtain any additional insurance required by CITY for new improvements, changed circumstances, or CITY'S reasonable re-evaluation of risk levels related to the Site.
- 6.5 Accident Reports: PERMITTEE shall immediately report to CITY any accident causing property damage or injury to persons on the Permit Areas or otherwise related to PERMITTEE's Operations. Such report shall contain the names and addresses of the involved parties, a statement of the circumstances, the date and hour of the accident, the names and addresses of any witnesses, and other pertinent information.
- 6.6 Required Endorsements: The following endorsements to the policies of insurance are required to be provided to CITY before any work is initiated under this Master Agreement.
- 6.6.1. Commercial General Liability Insurance Endorsements:
- i. Additional Insured: To the fullest extent allowed by law, including, but not limited to, California Insurance Code Section 11580.04, the policy or policies must be endorsed to include as an Additional Insured the City of San Diego and its respective elected officials, officers, employees, agents and representatives with respect to liability arising out of (a) ongoing operations performed by PERMITTEE or on PERMITTEE's behalf, (b) PERMITTEE's

products, (c) PERMITTEE's work, including, but not limited to, PERMITTEE's completed operations performed by PERMITTEE or on PERMITTEE's behalf, or (d) premises owned, leased, controlled or used by PERMITTEE.

- ii. Primary and Non-Contributory Coverage: The policy or policies must be endorsed to provide that the insurance afforded by the Commercial General Liability policy or policies is primary to any insurance or self-insurance of the City of San Diego and its elected officials, officers, employees, agents and representatives with respect to the operations of the named insured. Any insurance maintained by the City of San Diego and its elected officials, officers, employees, agents and representatives shall be in excess of PERMITTEE's insurance and shall not contribute to it.
- iii. Severability of Interest. The policy or policies must be endorsed to provide that PERMITTEE's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.

6.6.2. Automobile Liability Insurance Endorsements:

- i. Additional Insured. To the fullest extent allowed by law, including, but not limited to, California Insurance Code Section 11580.04, the policy or policies must be endorsed to include as an Additional Insured the City of San Diego and its respective elected officials, officers, employees, agents and representatives with respect to liability arising out of automobiles owned, leased, hired or borrowed by or on behalf of PERMITTEE.
- ii. Severability of Interest. The policy or policies must be endorsed to provide that PERMITTEE's insurance shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer's liability and shall provide cross-liability coverage.

7. SUBSEQUENT USE AND OCCUPANCY PERMITS.

Upon obtaining any necessary regulatory permits from the Development Services Department ("DSD"), or any other required permits, PERMITTEE shall provide a list of Sites for which it requires a UOP in order to move forward with the installation of the Communications Equipment. The CITY will execute a UOP in substantially the form attached hereto as Exhibit B, for any Approved Sites that comply with the Master Structural Plan attached hereto as Exhibit A. If the Communications Equipment does not comply with the Master Structural Plan, CITY shall review the request for a UOP according to the standards and timelines set forth for Minor Modifications and Major Modifications in Sections 10.2.1 and 10.2.2 of this Master Agreement.

PERMITTEE shall include all Sites in a particular polygon in one UOP, but may include more than one polygon if it chooses to do so. If there is a change in law that is required to be incorporated in future UOPs in order for the CITY to comply with that law, other than those affecting the rate of the Annual Fee, the length of the Term of this Master Agreement, or the UOP Term, the Parties agree that CITY will be permitted to incorporate any mandatory language required by such change of law into any future UOPs executed after the effective date of such change in law; or if such change in law does not have mandatory language associated with it, the Parties will meet and confer to determine the appropriate language to be added to any future UOPs in order to implement such change in law.

8. PERMITTEE'S RISK.

PERMITTEE shall bear all risks and liability arising out of or in any manner directly or indirectly connected with PERMITTEE's Operations and any damages to the improvements on, under, or in the vicinity of the Permit Areas resulting directly or indirectly thereby.

9. ACCEPTANCE OF PERMIT AREAS.

PERMITTEE represents and warrants that PERMITTEE will independently inspect the Site and Permit Area and make all tests, investigations, and observations necessary to satisfy itself of the condition of the Site and Permit Area and the suitability for the Permit Use. PERMITTEE acknowledges and agrees that PERMITTEE is not relying on any representation by CITY as to the condition of the Site or its suitability for the Permit Use, and PERMITTEE agrees that PERMITTEE is relying solely on its independent inspections, tests, investigations, and observations in entering into any UOPs pursuant to this Master Agreement. PERMITTEE acknowledges that the Site and Permit Area will be in the condition called for herein, that CITY has performed or will perform all work with respect to the Site and Permit Area that is necessary and/or required by this Master Agreement, and that PERMITTEE shall not hold CITY responsible for any defects, whether apparent or latent, in the Site and/or Permit Area. PERMITTEE accepts and assumes all risk of harm to all persons and property, including without limitation, PERMITTEE'S employees, from and defects within the Site and Permit Area, and shall be solely responsible therefor. PERMITTEE acknowledges that it has been or will be given the opportunity to investigate the Site and Permit Area for the presence of any Hazardous Substances, including, without limitation, the opportunity to perform soil borings and other tests. PERMITTEE shall notify CITY if PERMITTEE'S investigations indicate the presence of any Hazardous Substances on the Site and Permit Area. PERMITTEE waives any claims against CITY which may result from the presence of Hazardous Substances on the Site and Permit Area.

10. DEVELOPMENT OF SITES AND MODIFICATION OF PERMIT AREA.

10.1 Approved Sites. Prior to the execution of this Master Agreement, and at any time during the first four (4) years of the Term that PERMITTEE desires to add Sites to the Permit Area, PERMITTEE shall provide to CITY's Real Estate Assets Department a list of Approved Sites for which PERMITTEE has received all required permits and on which PERMITTEE is ready to install their Communications Equipment as depicted and described in the MSP attached hereto as Exhibit A. CITY shall prepare a UOP

substantially in the form of the UOP attached hereto as Exhibit B for the Parties execution. PERMITTEE acknowledges and understands that any requests for amendments to the Master Agreement, including those related to adding sites with equipment that is not depicted and described on the MSP, will be subject to appropriate environmental review subject to the California Environmental Quality Act ("CEQA").

- 10.2 Master Structural Plan. In lieu of site plans for each individual Site, PERMITTEE has provided to CITY, prior to the execution of this Master Agreement, a master design plan which contains full and complete design plans that show all of the Communications Equipment that PERMITTEE proposes to install or construct in the Permit Area, which is attached as Exhibit A. If during the Term, PERMITTEE desires to modify the Communications Equipment that is being placed on an Approved Site from what is shown in the approved MSP, PERMITTEE shall do the following:

10.2.1 Minor Modifications. If the new equipment is the same size or smaller in all dimensions and weighs the same or less than the equipment previously approved through the MSP (a "Minor Modification"), PERMITTEE may submit a form factor drawing with sufficient information for READ to determine the actual size, weight, location, and aesthetics of the new equipment in the Permit Area. PERMITTEE acknowledges that this form factor drawing, which may be sufficient for the CITY as the property owner to approve the amendment may not be sufficient for DSD to review and approve construction permits, and this requirement does not relieve PERMITTEE of its obligations to provide DSD staff with all required information for review and issuance of regulatory permits (construction, right-of-way, or any other type of permit determined necessary by DSD). Subject to the foregoing, the CITY will either consent to or deny consent, in its reasonable discretion, to the requested Minor Modification in writing within thirty (30) days of receiving the form factor drawing, provided that any applicable review required by CEQA has been completed and any associated appeal periods have run without an appeal being filed.

10.2.2 Major Modifications. If the new equipment is larger in any dimension than the previously approved equipment, or if the new equipment weighs more than the previously approved equipment (a "Major Modification"), PERMITTEE shall prepare a new MSP and submit that plan at the time the request for amendment of this Master Agreement is submitted to READ. Subject to the foregoing, the CITY will either consent to or deny consent, in its sole discretion consistent with applicable law, to the requested Major Modification in writing within thirty (30) days of receiving the new MSP, provided that any applicable environmental review required by CEQA has been completed and any associated appeal periods have run without an appeal being filed.

- 10.3 Timing of Development. PERMITTEE shall not develop any requested Site in the Permit Area unless and until this Master Agreement and a UOP for the Approved Site has been executed (or if applicable, amended) by the Parties. PERMITTEE shall develop each Site in the Permit Areas in accordance with the Master Structural Plan and any modifications authorized for the specific Approved Site(s) as attached to the UOP for those Approved Sites. CITY may, in its reasonable discretion, authorize changes to the Master Structural Plan, or specific site plans, provided the principal components thereof are not modified.

11. IMPROVEMENTS AND ALTERATIONS.

Other than as approved by the MSP depicted in Exhibit A, PERMITTEE shall not construct any improvements, structures, or installations in the Permit Areas, or make any alterations to the Permit Areas (with the exception of necessary maintenance and/or repairs that does not include swapping out or replacing any of the Communications Equipment) without CITY's prior written consent, which consent shall be in CITY's sole discretion consistent with applicable law or, when associated with a Minor Modification, such consent shall be in the CITY's reasonable discretion. This includes modifications that are considered "eligible facilities" under Section 6409 of the Middle Class Tax Relief and Job Creation Act. PERMITTEE shall not make any structural or architectural design alterations to approved improvements, structures, or installations in the Permit Areas without CITY's prior written consent, which consent shall be in CITY's sole discretion consistent with applicable law or, when associated with a Minor Modification, such consent shall be in the CITY's reasonable discretion. CITY shall not be obligated by this Master Agreement to make, or assume any expense for, any improvements or alterations.

- 11.1 Alterations to Communications Equipment. PERMITTEE shall not make any alterations, additions or improvements to the Communications Equipment except for routine maintenance that does not include swapping out or replacing any of the Communications Equipment, unless: (1) PERMITTEE obtains CITY's prior written consent, which consent shall be in CITY's discretion as set forth above for Minor or Major Modifications; (2) the alterations, additions, or improvements do not: (a) damage or interfere with any adjacent improvements in the Permit Areas or (b) interfere with third party communications signals operated in compliance with applicable law; and (3) the alterations, additions, or improvements comply with the requirements set forth in Exhibit C. Nothing in this Section shall be construed to eliminate PERMITTEE's obligation to obtain development and construction related permits and approvals for any alterations to the Communications Equipment that may be required by CITY's Development Services Department or any other governmental agency. CITY, in its proprietary capacity, through READ, retains the right to deny any request for modification or alteration of a Site as a proprietary right, even if CITY's DSD is required by federal law to approve or permit such a request.

- 11.2 Information to Permitting Authorities. In obtaining any required permits for improvements, structures, installations, and/or alterations in the Permit Areas, PERMITTEE shall inform permitting authorities, in writing, that the Permit Areas are CITY-owned property.
- 11.3 Repair and Restoration. Nothing in this Section shall relieve PERMITTEE of any obligation under this Master Agreement to maintain the Permit Areas in a decent, safe, healthy and sanitary condition, as required in this Master Agreement.
- 11.4 Emergency. In the event of an Emergency, as soon as practicable thereafter and not later than three (3) business days after having taken such action, PERMITTEE shall advise CITY in writing of the emergency work performed or the action taken with respect to any emergency modification or alteration of PERMITTEE's Communications Equipment. PERMITTEE shall acquire any necessary permits, if any, to cover the emergency work performed.
- 11.5 Accidental Damage by CITY. In the event CITY should cut or damage PERMITTEE's communication line, PERMITTEE agrees to perform all repairs expeditiously after notice thereof from CITY. Simultaneously, CITY agrees to cease any and all work to the affected portion of the Permit Areas for a maximum of twenty-four (24) hours or until PERMITTEE completes all repairs, whichever is less.

12. COMPETENT MANAGEMENT.

Throughout the Term, PERMITTEE shall provide competent management of the Permit Areas for the Permit Use to the reasonable satisfaction of CITY. "Competent management" shall mean demonstrated ability in the management and operation of Communication Equipment and related activities in a responsible manner and in accordance with industry standards.

13. COMPLIANCE WITH LAWS AND POLICIES.

- 13.1. General. PERMITTEE's Operations shall, at all times, comply with all applicable laws, statutes, ordinances, and regulations of CITY, county, state, and federal governments, at PERMITTEE's sole cost and expense. Upon receipt of the same, PERMITTEE shall comply with any and all notices issued by CITY under the authority of all laws, statutes, ordinances, or regulations.
- 13.2. Nondiscrimination/Equal Opportunity. PERMITTEE shall not discriminate in any manner against any person or persons on account of race, color, religion, gender, gender identity, gender expression, sexual orientation, medical status, national origin, age, marital status, or disability in PERMITTEE's Operations.

14. WATER QUALITY ASSURANCES.

- 14.1. CITY and PERMITTEE are committed to the implementation of controls (best management practices, or BMPs) to manage activities on the Site and Permit Area in a manner which aids in the protection of the City of San Diego's precious water resources. It is PERMITTEE's responsibility to identify and implement an effective combination of BMPs so as not to cause pollutant discharges to the storm drain system in violation of San Diego Storm Water Management and Discharge Control Ordinance (San Diego Municipal Code Section 43.0301 to 43.0312). Therefore, PERMITTEE shall at a minimum implement and comply, as applicable, with the Minimum Industrial and Commercial BMPs adopted under the San Diego Municipal Code Section 43.0307(a). It is ultimately PERMITTEE's responsibility to prevent pollutant discharges to the storm drain system. Therefore, PERMITTEE will identify and implement any additional BMPs that may be required to avoid the discharge of pollutants to the storm drain system.

15. TELECOMMUNICATIONS PROVISIONS.

- 15.1. Entire Installation. PERMITTEE warrants that the Communications Equipment listed in Exhibit A constitutes the entire installation at each Site within the Permit Areas. PERMITTEE shall update Exhibit A from time to time as any changes to the Communications Equipment are made, or within thirty (30) calendar days after CITY's demand for such an update. No changes to the Communications Equipment shall be made without first obtaining written approval by CITY as further provided under this Master Agreement.
- 15.2. Radio Frequency Radiation. PERMITTEE shall maintain any radio frequency ("RF") radiation associated with the Communications Equipment within the levels allowed by federal regulations set forth in Section 1.1310 of Title 47 of the Code of Federal Regulations and the Federal Communications Commission's ("FCC") OET Bulletin 65. Any portion of the Permit Areas casually accessible by the general public or by any worker at ground level shall be maintained below limits stated for General Population/Uncontrolled Exposure. PERMITTEE shall report to CITY any portion of the Permit Areas discovered by PERMITTEE to exceed these federally mandated limits. PERMITTEE shall defend and hold CITY harmless for any liabilities, fines or other penalties claimed or imposed against CITY that result from the existence of excessive levels of radiation that are caused by PERMITTEE's Operations; provided, however, that the duty to indemnify shall not extend to any liabilities, fines, or other penalties claimed or imposed against the CITY arising from CITY's established sole negligence or willful misconduct. Hazardous RF radiation levels may be encountered when climbing on antenna structures (refer to FCC OET Bulletin 65). Any Communications Equipment installed within the Permit Areas may, at times, require shutdown to allow scheduled maintenance on antenna structures. PERMITTEE shall allow shutdown periods when required for this scheduled maintenance (which shall not include Emergencies), provided CITY shall give prior notice to PERMITTEE of these shutdowns and ensure that these shutdowns do not occur during peak hours of operation. Protection of employees performing service on buildings, roofs, air-conditioning

equipment, water tanks, communications equipment, or any other maintenance work is a primary concern. Any areas in which these employees may be subjected to radiation levels that exceed the General Population/Uncontrolled Exposure limits must be clearly identified as required by CAL-OSHA. PERMITTEE shall provide CITY with written shutdown procedures, contact names, and telephone numbers. PERMITTEE shall notify CITY, in writing, of any changes to the shutdown procedures, contact names, or telephone numbers at least ten (10) calendar days prior to such a change. Once the installation is complete, the PERMITTEE shall perform an on-air test and provide documentation to demonstrate that the Communications Equipment is operating within federally mandated limits. After the initial test, the PERMITTEE shall perform an on-air test within fifteen days of CITY requesting such a test.

- 15.3. Radio Frequency Interference. PERMITTEE warrants that all Communications Equipment installations, modifications, operation, and maintenance will not result in degraded performance or RF interference to any existing uses of the Site, by fulfilling the requirements of Exhibit C, which may be updated from time to time by the Parties.
- 15.4. Industry Standards. PERMITTEE shall perform all Communications Equipment installations, modifications, operation, and maintenance in adherence to industry standards set by the "Standards and Guidelines for Communications Sites" Motorola R56© Manual, or any succeeding regulations or standards. In addition to the requirements of the Motorola R56© publication, installations on CITY property shall comply with the following supplemental requirements:
 - 15.4.1. PERMITTEE shall remove all of its trash and debris from the Permit Areas at the end of each workday and on completion of each project;
 - 15.4.2. Tower and structure climbing shall be done in compliance with all CAL-OSHA requirements and General Orders promulgated by the CPUC; and
 - 15.4.3. All transmitters shall have all necessary protection, such as cavity filtering and transmitter isolators, to eliminate any RF degradation of the receive signal to any other user within the Permit Areas.
- 15.5. Collocation. PERMITTEE shall not access any third party wireless communication facility or CITY-owned communications equipment (including any towers) within the Permit Areas without CITY's prior written consent, and if applicable a third-party owner's written consent.
- 15.6. Interference with CITY Operations or Public Use. PERMITTEE's Operations shall not unreasonably interfere with CITY operations or public use of CITY-owned property.

16. WASTE, DAMAGE, OR DESTRUCTION.

PERMITTEE shall immediately give notice to CITY of any fire or any other material damage that PERMITTEE has knowledge of that occurs on or within the Permit Areas that occurs either during or after the completion of construction of approved improvements. If PERMITTEE causes any damage to any portion of the Permit Areas that puts any portion of the Permit Area into a condition which is not decent, safe, healthy, and sanitary PERMITTEE shall make, or cause to be made, full repair of the damage and restore the Permit Areas to the condition which existed prior to the damage; or, at CITY's option, PERMITTEE shall clear and remove from the Permit Areas all debris resulting from the damage and restore the Permit Areas in accordance with plans and specifications previously submitted to and approved by CITY, in writing, in order to replace in kind and scope the operation which existed prior to the damage. PERMITTEE shall commence preliminary steps toward performing repairs and/or restoration of the Permit Areas as soon as practicable, but no later than ten (10) calendar days after the occurrence of the fire or damage, and shall complete the required repairs and/or restoration of the Permit Areas within sixty (60) calendar days after such occurrence. Failure to timely repair damage to the Site and/or Permit Areas will be considered a default under the Master Agreement.

17. HAZARDOUS MATERIALS.

PERMITTEE shall not allow the illegal installation, storage, utilization, generation, sale or release of any Hazardous Substance or otherwise regulated substances in, on, under or from the Permit Areas by any of PERMITTEE's officers, employees, agents, contractors, invitees and guests. PERMITTEE and PERMITTEE's officers, employees, agents, contractors, invitees and guests shall not install, store, utilize, generate or sell any Hazardous Substance on the Permit Areas without CITY's prior written consent. PERMITTEE shall, prior to initiating any operations, obtain all required permits from applicable regulatory agencies, including without limitation the San Diego County Department of Environmental Health, local fire agencies, the San Diego County Department of Weights and Measures, the San Diego County Air Pollution Control District, and the San Diego Regional Water Quality Control Board. Installing, utilizing, storing, or any other presence of a Hazardous Substance includes boxes, bags, bottles, drums, cylinders, above or below ground tanks, equipment with tanks, or any other type of container, equipment or device which holds or incorporates a Hazardous Substance or hazardous waste.

- 17.1. Release. For all purposes of this Master Agreement, a "release" shall include without limitation any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or otherwise disposing of a Hazardous Substance.
- 17.2. Remediation. If PERMITTEE's occupancy, use, development, maintenance, or restoration of the Permit Areas results in a release of a Hazardous Substance, PERMITTEE shall pay all costs of remediation and removal to CITY's satisfaction for unrestricted reuse of the Permit Areas, and in accordance with all applicable laws, rules, and regulations of governmental authorities.

- 17.3. Removal. If PERMITTEE or PERMITTEE's officers, employees, agents, contractors, invitees and guests have received approval and permits to store, utilize, generate or install, or otherwise bring Hazardous Substances to the Permit Areas, PERMITTEE shall remove all Hazardous Substances in any type of container, equipment or device from the Permit Areas immediately upon or prior to the expiration or earlier termination of this Master Agreement. CITY reserves the right to conduct inspections of the Permit Areas and/or request documentation demonstrating the legal removal and/or disposal of the hazardous materials, wastes or other containers, equipment or devices from the Permit Areas. PERMITTEE shall be responsible for any and all costs incurred by CITY to remove any container, equipment or device requiring disposal or removal as required by this provision.
- 17.4. Indemnity. PERMITTEE shall protect, defend, indemnify, and hold CITY harmless from any and all claims, costs, and expenses related to environmental liabilities resulting from PERMITTEE's occupancy, use, development, maintenance, or restoration of the Permit Areas, including without limitation: (i) costs of environmental assessments; (ii) costs of regulatory remediation oversight; (iii) costs of remediation and removal; (iv) any necessary CITY response costs; (v) all fines, penalties or fees assessed by any regulatory agency; (vi) damages for injury to natural resources, PERMITTEE's officers, employees, invitees, guests, agents or contractors, or the public; and (vii) all costs of any health assessments or health effect studies; provided, however, that PERMITTEE's duty to indemnify and hold harmless shall not include any established liability arising from the sole negligence or willful misconduct of CITY, its elected officials, officers, representatives, agents and employees.
- 17.5. Notice of Release. If PERMITTEE knows or has reasonable cause to believe that a Hazardous Substance has been released on, from or beneath any portion of the Permit Areas, PERMITTEE shall immediately notify CITY and any appropriate regulatory or reporting agency pursuant to California Code of Regulations Title 19 and any other applicable laws or regulations. PERMITTEE shall deliver a written report thereof to CITY within three (3) days after receipt of the knowledge or cause for belief and submit any required written reports to regulatory or reporting agencies as required by regulation or law. If PERMITTEE knows or has reasonable cause to believe that such substance is an imminent release or is an imminent substantial danger to public health and safety, PERMITTEE shall take all actions necessary to alleviate the danger. PERMITTEE shall immediately notify CITY in writing of any violation, notice to comply, or notice of violation received or the initiation of environmental actions or private suits related to the Permit Areas.
- 17.6. Environmental Assessment. Upon reasonable cause to believe that PERMITTEE's occupancy, use, development, maintenance, or restoration of the Permit Areas resulted in any Hazardous Substance being released on, from or beneath any portion of the Permit Areas, CITY may cause an environmental assessment under regulatory oversight of the suspect area to be performed by a professional environmental consultant registered with the State of California as a Professional Engineer, Certified Engineering Geologist or Registered Civil Engineer. The environmental assessment shall be obtained at PERMITTEE's sole cost and expense, and shall establish what, if any,

Hazardous Substances have more likely than not been caused by PERMITTEE's occupancy, use, development, maintenance, or restoration of any affected portion of the Permit Areas, and in what quantities. If any such Hazardous Substances exist in quantities greater than allowed by CITY, county, state or federal laws, statutes, ordinances or regulations, or require future restricted re-use of the Permit Areas, then the environmental assessment shall include a discussion of such substances with recommendations for remediation and removal necessary to effect unrestricted re-use and in compliance with those laws or statutes, and estimates of the cost of such remediation or removal. PERMITTEE shall cause, or if PERMITTEE fails to do so within a reasonable period of time, as determined by CITY in its sole discretion, then CITY may cause, the remediation and/or removal recommended in the environmental assessment such that unrestricted re-use of the Permit Areas and compliance with environmental laws and regulations are achieved, and PERMITTEE shall pay all costs and expenses therefor.

18. SIGNS.

PERMITTEE shall only post signs required by federal, state, or local regulations, including, without limitation, safety signs required by OSHA, FAA, CPUC and/or FCC. PERMITTEE shall not erect or display any banners, pennants, flags, posters, signs, decorations, marquees, awnings, or similar devices or advertising within the Permit Areas without CITY's prior written consent, which consent shall be in CITY's sole discretion. If any such unauthorized item is found within the Permit Areas, PERMITTEE shall remove the item, at PERMITTEE's sole cost and expense, upon forty-eight (48) hours' notice by CITY, or CITY may then enter the Permit Areas and remove the item at PERMITTEE's sole cost and expense. PERMITTEE shall post a clearly marked sign at each Site within the Permit Areas indicating PERMITTEE's name and emergency telephone number.

19. MAINTENANCE OF PERMIT AREAS.

PERMITTEE shall, at its sole cost and expense, continuously maintain the Permit Areas throughout the Term. In doing so, PERMITTEE shall, at its sole cost and expense, make all repairs, restoration, and replacements (including structural repairs and restoration of damaged or worn improvements) necessary to maintain and preserve the Permit Areas in a decent, safe, healthy, and sanitary condition, reasonable wear and tear excepted. All such maintenance, repairs, restoration, and replacements shall be completed to the satisfaction of CITY, in conformance with the Master Structural Plan set forth in Exhibit A, and in compliance with all applicable codes and standards of CITY, state, and federal agencies.

- 19.1. CITY Maintenance. CITY reserves the right to perform any needed routine maintenance within the Permit Areas at any time without providing notice to PERMITTEE, including, but not limited to, the replacement of light bulbs on a Site. However, should CITY perform non-routine maintenance, including, but not limited to, the replacement of a Site, CITY shall provide PERMITTEE with at least forty-eight (48) hours' notice prior to commencing the work (except in the event of an emergency, in which case, no prior notice shall be required, but CITY shall give PERMITTEE notice in compliance with Exhibit D), and PERMITTEE shall comply with all applicable safety requirements issued

by CITY to ensure the safety of CITY personnel performing such maintenance within the Permit Areas. In the event CITY's non-routine maintenance includes replacing a Site, CITY shall give thirty (30) days advance notice to PERMITTEE so that PERMITTEE may remove its Communications Equipment prior to the replacement of the Site.

- 19.2. Maintenance Procedures for Parties. The Parties shall comply with the emergency maintenance procedures set forth in Exhibit D, including the requirement to notify the other Party, in writing, of any changes to its emergency contacts and telephone numbers. PERMITTEE shall provide and install an emergency shut-off switch which will terminate electrical service to PERMITTEE's Communications Equipment, with the switch to be used only as set forth in Exhibit D.

20. ENTRY AND INSPECTION.

CITY may, at any time, enter the Permit Areas for the purpose of viewing and ascertaining the condition of the Permit Areas, or to protect CITY's interest in the Permit Areas, or to inspect the operations conducted within the Permit Areas. If CITY's entry or inspection discloses that any portion of the Permit Areas is not in a decent, safe, healthy, and sanitary condition, (reasonable wear and tear excepted), CITY may, after ten (10) days written notice to PERMITTEE, have any necessary maintenance work done in order to keep the Permit Areas in a decent, safe, healthy, and sanitary condition, all at PERMITTEE's sole cost and expense, and PERMITTEE shall promptly pay any and all costs incurred by CITY in having the necessary maintenance work done. If at any time CITY determines that any portion of the Permit Areas is not in a decent, safe, healthy, and sanitary condition, CITY may, in its reasonable discretion, without additional notice, require PERMITTEE to file with CITY a faithful performance bond to assure prompt correction of any condition which is not decent, safe, healthy, and sanitary. The bond shall be in an amount adequate, in CITY's opinion, to correct the unsatisfactory condition. PERMITTEE shall pay all costs associated with the bond. The rights reserved in this Section shall not create any obligation on CITY or increase CITY's obligations elsewhere in this Master Agreement. As part of its standard practice, PERMITTEE shall schedule a pre-construction and post-construction inspection for each Site within the Permit Area.

21. UTILITIES.

PERMITTEE shall order, obtain, and pay for all utilities, including installation and service charges, in connection with PERMITTEE's Operations. All electric utilities shall be installed underground unless such utilities are aerial on existing poles and shall only be used by PERMITTEE for PERMITTEE's Operations.

22. TAXES.

PERMITTEE shall pay, before delinquency, all taxes, assessments, and fees assessed or levied upon PERMITTEE or the Permit Areas, including the land, any buildings, structures, machinery, equipment, appliances, or other improvements or property of any nature whatsoever erected, installed or maintained by PERMITTEE, or levied by reason of PERMITTEE's Operations, including any licenses or permits. PERMITTEE acknowledges that this Master Agreement may create a possessory interest subject to property taxation, and that PERMITTEE may be subject to the payment of taxes levied on that interest. PERMITTEE shall pay all such possessory interest taxes. PERMITTEE's payment for such taxes, assessments, and/or fees shall not reduce any payment due CITY.

23. SUPERIOR INTERESTS.

This Master Agreement is subject to all liens, encumbrances, covenants, conditions, restrictions, reservations, contracts, permits, licenses, easements, and rights-of-way pertaining to the Permit Areas, whether or not of record. PERMITTEE shall obtain all licenses, permits, and agreements from such third parties as may be or become necessary or reasonably advisable to allow PERMITTEE's use of the Permit Areas, relative to any such superior interest. If PERMITTEE's use of the Permit Areas is or becomes inconsistent or incompatible with a preexisting superior interest, PERMITTEE shall take such actions and pay all costs and expenses necessary to remove such inconsistency or incompatibility to the satisfaction of the holder of the superior interest.

24. ENCUMBRANCES.

PERMITTEE shall not permit any encumbrance related to PERMITTEE's Operations. CITY may, in its reasonable discretion, consent to such an encumbrance if exclusively related to PERMITTEE's development of the Permit Areas. If an encumbrance is placed on any portion of the Permit Areas, PERMITTEE shall diligently seek and obtain, at its sole cost and expense, the removal of the encumbrance as soon as possible upon completion of the development, if the encumbrance was authorized by CITY, or, if unauthorized, immediately upon CITY's demand.

24.1. Liens. PERMITTEE shall, at all times, protect, defend, indemnify, and hold CITY harmless from and against any and all claims for labor or materials in connection with PERMITTEE's Operations, and all costs of defending against such claims, including, without limitation, reasonable attorneys' fees. If PERMITTEE's Operations result in a lien or notice of lien being filed against any portion of the Permit Areas, PERMITTEE shall, within thirty (30) calendar days after such filing, either: (a) take all actions necessary to record a valid release of the lien; or (b) deliver to CITY a bond, cash, or other security acceptable to CITY in an amount sufficient to pay in full all claims of all persons seeking relief under the lien.

25. ASSIGNMENT AND SUBLICENSING.

- 25.1 **Assignment.** The rights and obligations assumed by each of the Parties under this Master Agreement shall not be assigned or otherwise transferred, in whole or in part, without the written prior consent of the other Party which consent will not be unreasonably withheld, delayed or conditioned.
- 25.2 **Sublicensing.** PERMITTEE shall not sublicense, in whole or in part, the Site, or any right or appurtenant privilege to the Site, or attempt to transfer any other interest or right to use the Permit Area, in whole or in part, the Site or any right or appurtenant privilege to the Site, without CITY'S prior written consent, which consent shall be in CITY'S sole discretion following disclosure of any information required by San Diego Charter section 225, and shall require additional compensation as required by San Diego Council Policy 700-10 at the time of the request. The provision of capacity, bandwidth or grant of use in the Communications Equipment, or any portion thereof, to another person shall not constitute a breach of this Section 25 or require consent, provided that PERMITTEE shall at all times retain control over the entire Communications Equipment, remains fully responsible for compliance with the terms of this Master Agreement, does not allow any entity to physically occupy the Site or Permit Area, and does not allow installation of additional equipment not included in the MSP.
- 25.3 **Provisions Binding on Successors.** Except as otherwise provided in this Master Agreement, all of the terms, covenants, and conditions of this Master Agreement shall apply to, benefit, and bind the successors and assigns of the respective parties, jointly and individually.

26. INDEMNIFICATION.

PERMITTEE shall protect, defend, indemnify, and hold CITY, its elected officials, officers, and employees harmless from and against any and all claims asserted or liability established for damages or injuries to any person or property, including injury to PERMITTEE's officers, employees, agents, contractors, invitees and guests, which arise out of or are in any manner directly or indirectly connected with this Master Agreement or PERMITTEE's occupancy, use, development, maintenance, or restoration of the Permit Areas, including damages arising out of release of hazardous materials, and all expenses of investigating and defending against same, including without limitation reasonable attorney fees and costs; provided, however, that PERMITTEE's duty to indemnify and hold harmless shall not include any established liability arising from the sole negligence or willful misconduct of CITY, its elected officials, officers, representatives, agents and employees. CITY may, at its election, conduct the defense or participate in the defense of any claim related in any way to this indemnification. If CITY chooses at its own election to conduct its own defense, participate in its own defense, or obtain independent legal counsel in defense of any claim related to this indemnification, PERMITTEE shall pay all reasonable costs related thereto, including without limitation reasonable attorney fees and costs.

27. OTHER GOVERNMENTAL ACTIONS.

By entering into this Master Agreement, neither CITY nor the City Council is obligating itself to PERMITTEE or to any other governmental agent, board, commission, or agency with regard to any other discretionary action relating to the development, occupancy, use, or maintenance of the Permit Areas. Discretionary action includes, but is not limited to, rezonings, variances, environmental clearances, or any other governmental agency approvals that may be required for PERMITTEE's Operations. PERMITTEE shall diligently seek, at its sole cost and expense, all entitlements and actions from both CITY and other governmental agencies with jurisdiction over the Permit Areas, as may be necessary for PERMITTEE's Operations.

28. CITY'S RESERVATION OF RIGHTS.

- 28.1. Resources. CITY reserves all rights, title, and interest in any and all subsurface natural gas, oil, minerals, and water on or within the Permit Areas.
- 28.2. Use. CITY may grant and use easements or establish and use rights-of-way over, under, along, and across the Permit Areas for utilities, thoroughfares, or access as CITY deems advisable, in its sole discretion for the public good.
- 28.3. Entry. CITY may enter the Permit Areas at any time to develop or make repairs to municipal resources and services.

29. REASSIGNMENT OF SPACE.

CITY may reassign PERMITTEE to an equivalent amount of space in a different location within the Permit Areas or different Site acceptable to PERMITTEE, if and when reasonably necessary due to: (i) construction, expansion, repair, relocation, or maintenance of a street or other public improvement project; or (ii) maintenance, upgrade, expansion, replacement, or relocation of CITY traffic light poles and/or traffic signal light system; or (iii) permanent closure of a street or sale of CITY property; or (iv) projects and programs undertaken to protect or preserve the public health or safety; or (v) activities undertaken to eliminate a public nuisance; or (vi) duty otherwise arising from applicable law. PERMITTEE will, at the direction of CITY, relocate its Communications Equipment at PERMITTEE's sole cost and expense not later than one hundred eighty (180) days after receiving written notice from CITY. This Section shall not apply to underground vault sites. PERMITTEE shall cooperate with CITY and its contractors during any such relocation or any renovation, repair, or other alteration of the Permit Areas. During physical relocation of the Communications Equipment to the relocation site, CITY will work with PERMITTEE to reasonably attempt to secure an alternative CITY-approved site for PERMITTEE to operate temporary installed communications equipment, which will be installed and maintained at PERMITTEE's sole cost and expense. CITY warrants that every effort will be made to ensure continuous, uninterrupted broadcast and/or receiving capability during any such activity. If any relocation is not satisfactory to PERMITTEE, then PERMITTEE may, in its sole discretion, terminate this Master Agreement or the specific Approved Site or Permit Area upon thirty (30) calendar days' written notice to CITY, without further obligation therefor.

30. REVOCATION AND TERMINATION.

30.1. Revocation by CITY.

- d. **Revocable License.** This Master Agreement and all subsequent Use and Occupancy Permits are not a lease; they are a license to use CITY-owned property. However, this Master Agreement and each subsequent Use and Occupancy Permit are binding contracts between the Parties. The Parties hereby acknowledge and agree that CITY, as the licensor, may revoke this Master Agreement and any or all UOPs associated with it, at will and at any time during the Term. However, CITY agrees that CITY will not exercise its right to revoke this Master Agreement and all of the UOPs associated with it at will unless CITY determines, that PERMITTEE is in default of this Master Agreement as set forth in Section 30.1(b)(i)-(ii), which default is pervasive and consistent, and has affected more than one-half of all of the UOPs then issued, or PERMITTEE is in default as set forth in Section 30.1(b)(iii)-(vi). CITY further agrees not to revoke a specific UOP except in the event of default as set forth in Section 30.1(b)(i)-(ii) provided that such default is related to the specific UOP, and such revocations shall not impact this Master Agreement or any other UOPs that have been issued under it. Upon default, CITY may thereafter, in its sole discretion, exercise its right to revoke this Master Agreement and such UOPs at will and at any time during the Term, as provided in this Section. If CITY exercises its right to revoke this Master Agreement and such UOPs, CITY will provide PERMITTEE written notice of the revocation, and upon PERMITTEE's receipt of the notice, PERMITTEE shall promptly cease PERMITTEE's Operations and remove PERMITTEE's improvements and personal property from the Permit Areas (pursuant to Section 30 of this Master Agreement).
- e. **Events of Default.** Each of the following shall constitute an event of default under this Master Agreement or a subsequent UOP:
 - i. PERMITTEE's failure to make any payment required under this Master Agreement or a subsequent UOP when due,, if the failure continues for twenty (20) calendar days following written notice of the failure by CITY;
 - ii. PERMITTEE's breach of any of its obligations under this Master Agreement or a subsequent UOP, other than those requiring payment to CITY, and PERMITTEE either:
 - a. fails to cure the breach within thirty (30) calendar days following written notice from CITY;
 - b. if such breach is not curable within thirty (30) calendar days following written notice from CITY, fails to promptly commence to cure the breach and to diligently pursue the cure to completion; or

- c. PERMITTEE uses any portion of the Permit Areas for any unauthorized purpose.
 - iii. PERMITTEE voluntarily files any petition under any bankruptcy or insolvency act or law;
 - iv. PERMITTEE has involuntarily filed against it any petition under any bankruptcy or insolvency act or law and the matter is not dismissed by a court of competent jurisdiction within ninety (90) calendar days of filing;
 - v. PERMITTEE is adjudicated a bankrupt; or
 - vi. PERMITTEE makes a general assignment for the benefit of creditors.
- 30.2 Termination by PERMITTEE. PERMITTEE may terminate this Master Agreement or a subsequent UOP, or remove any Communications Equipment thereby terminating PERMITTEE's right to use the corresponding Site(s) or Permit Area(s), for any reason upon thirty (30) days prior written notice to CITY. Upon PERMITTEE's termination, PERMITTEE shall promptly cease PERMITTEE's Operations and remove the Communications Equipment from the affected Permit Areas (pursuant to Section 30 of this Master Agreement).
- 30.3 No Obligation. CITY shall not be obligated for any loss, financial or otherwise, which may be incurred by PERMITTEE as a result of CITY's revocation or PERMITTEE's termination of this Master Agreement. PERMITTEE expressly waives any claim for expense or loss which PERMITTEE might incur as a result of CITY's revocation or PERMITTEE's termination of this Master Agreement.
- 30.4 Cumulative Remedies. CITY's rights and remedies under this Master Agreement are cumulative and shall not limit or otherwise waive or deny any of its respective rights or remedies at law or in equity.
- 30.5 Waiver. The property constituting the Permit Areas is publicly owned and held in trust for the benefit of CITY's citizens. The failure of either Party to insist upon the strict performance of any of the other Party's obligations under this Master Agreement, in one or more instances, shall not be construed as a waiver of any such obligation, and the same shall remain in full force and effect. The waiver of a default shall not be a waiver of any other default. Any waiver of a default must be in writing and executed by the non-defaulting Party to constitute a valid and binding waiver. A Party's delay or failure to exercise a right or seek a remedy shall not be deemed a waiver of that or any other right or remedy under this Master Agreement, at law or in equity. The exercise of any particular right or the use of any particular remedy for any default shall not waive the use of any other right or remedy for the same default or for another or later default. CITY's acceptance of any Annual Fee shall not be a waiver of any default preceding such payment. The failure to discover a default or take prompt action to require the cure of any default shall not result in an equitable estoppel, but the Parties may, at any and all

times, require the cure of the default.

- 30.6 Effect of Termination of Specific Approved Site or Permit Area. Following the early revocation or termination of a specific Approved Site or Permit Area by either CITY or PERMITTEE, no Annual Fee will be due to the CITY for that Approved Site or Permit Area.

31 REMOVAL OF IMPROVEMENTS AND PERSONAL PROPERTY.

- 31.2 Improvements. Upon the expiration or termination of this Master Agreement or upon the termination of a specific Site or Permit Area, PERMITTEE shall, at PERMITTEE's sole cost and expense, remove the Communications Equipment, its improvements, trade fixtures, structures, installations, and/or additions (except Street Light Poles that were installed by PERMITTEE) as soon as practicable, but in no event later than one hundred twenty (120) calendar days after the expiration or earlier termination of this Master Agreement or a subsequent Use and Occupancy Permit. If any removal of such improvements, trade fixtures, structures, installations, and/or additions by PERMITTEE results in damage to any portion of the Permit Areas, PERMITTEE shall repair all such damage at PERMITTEE's sole cost and expense. If PERMITTEE fails to remove any such improvements, trade fixtures, structures, installations, and/or additions identified by CITY, CITY may, at its option, remove them at PERMITTEE's sole cost and expense.
- 31.3 Personal Property. Upon expiration of this Mater Agreement (without the Parties execution of a new permit or agreement for the Permit Areas) or upon earlier revocation or termination of this Master Agreement or any specific Use and Occupancy Permit subsequently issued for Approved Sites, PERMITTEE shall remove machines, appliances, equipment (other than trade fixtures), and other items of personal property installed by the expiration or earlier revocation or termination of this Master Agreement. If any removal of such personal property by PERMITTEE results in damage to any portion of the Permit Areas, PERMITTEE shall repair all such damage at PERMITTEE's sole cost and expense. Any such items which PERMITTEE fails to remove shall be deemed abandoned and become CITY's property free of all claims and liens, or CITY may, at its option, remove such items at PERMITTEE's sole cost and expense.
- 31.4 Performance Bond. PERMITTEE shall obtain and provide CITY on a yearly basis proof of security in the form of a performance bond in the amount of one thousand dollars (\$1,000.00) per Site, in favor of CITY, to cover the cost to dismantle or remove PERMITTEE's Communications Equipment ("Removal Performance Bond") constructed, installed or erected by PERMITTEE or PERMITTEE's sublicensees, contractors, or subcontractors within the Permit Areas. The Removal Performance Bond shall be for a term of one (1) year and shall be continuously renewed, extended or replaced so that it remains in place for the entire Term of this Master Agreement or the expiration of all subsequent UOPs issued under this Master Agreement, whichever occurs later; or until PERMITTEE's secured removal obligations are performed to the satisfaction of CITY, if that occurs sooner than the expiration or termination of either the Master Agreement or all subsequent UOPs. In order to ensure continuous renewal of the

Removal Performance Bond with no lapse, each bond shall be extended or replaced at least one month in advance of its expiration date. Removal costs may, at CITY's reasonable discretion, be reevaluated at the conclusion of the fifth (5th) year of the Term of this Master Agreement to ensure sufficient funds for removal. PERMITTEE shall adjust the amount of the Removal Performance Bond at CITY's request. Failure to secure the Removal Performance Bond and all renewals and extensions thereof shall constitute breaches of the PERMITTEE under this Master Agreement.

32 NOTICES.

Any notice required or permitted to be given under this Master Agreement shall be in writing and may be served personally, sent by United States mail, postage prepaid, or sent by reliable overnight courier, addressed to the Parties as follows, or to any mortgagee, trustee, or beneficiary, as applicable, at the appropriate address designated, in writing, by the respective party:

If to PERMITTEE:

New Cingular Wireless PCS, LLC
Attn; Tower Asset Group – Lease Administration
AT&T Site Name: AT&T- City of San Diego Master Agreement For
Small Cells (CA)
1025 Lenox Park Blvd. NE, 3rd Floor
Atlanta, GA 30319

Tower Asset Group – Lease Administration Phone #: 1 - (877) 231-5447

Tenant Network Operations Center Phone #: 1 - (800) 832-6662
[For Maintenance & Emergencies]

with a copy to:

New Cingular Wireless PCS, LLC
Attn: AT&T Legal Department – Network Operations
AT&T Site Name: AT&T- City of San Diego Master Agreement For
Small Cells (CA)
208 S. Akard Street
Dallas, TX 75202

If to CITY:

City of San Diego
Real Estate Assets Department
Attn: Real Estate Assets Director
1200 Third Avenue, Suite 1700, MS 51A
San Diego, CA 92101-4155
Contact phone # 619-236-6020

If to CITY's Transportation Stormwater:

City of San Diego
Streets Division
Attn: Deputy Director
2781 Caminito Chollas
San Diego, CA 92105
Maintenance contact phone # (619) 527-7500 (Station 38)

- 32.2 Address Changes. Any Party entitled or required to receive notice under this Master Agreement may, by like notice, designate a different address to which notices shall be sent.
- 32.3 When Effective. Notice shall be effective upon personal service, or five (5) calendar days after deposit in the United States mail.

33 MISCELLANEOUS PROVISIONS.

- 33.2 Governing Law. This Master Agreement shall be governed, construed, and enforced in accordance with the laws of the State of California, and the United States, without regard to the conflict of law provisions thereof. Venue for any action under this Master Agreement shall be the state and federal courts located in San Diego County.
- 33.3 Entire Understanding. This Master Agreement, including all Exhibits attached hereto, contains the entire understanding of the Parties. CITY and PERMITTEE agree that there is no other written or oral understanding between them with respect to PERMITTEE's Operations. Each Party has relied on its own examination of the Permit Areas, advice from its own attorneys, and the warranties, representations, and covenants within the Master Agreement itself. Each party agrees that no other party, agent, or attorney of any other party has made any promise, representation, or warranty whatsoever which is not contained in this Master Agreement. The failure or refusal of any party to read this Master Agreement or other documents, inspect the Permit Areas, and obtain legal or other advice relevant to this transaction shall constitute a waiver of any objection, contention, or claim that might have been based on such actions.
- 33.4 No Affiliation. Nothing contained in this Master Agreement shall be deemed or construed to create a partnership, joint venture, or other affiliation between the Parties, or between CITY and any other entity or party, or cause CITY to be responsible in any way for the debts or obligations of PERMITTEE or any other party or entity.
- 33.5 Standard of Conduct. PERMITTEE and its employees shall, at all times, conduct themselves and PERMITTEE's Operations in a creditable manner and in accordance with industry standards.
- 33.6 Joint and Several Liability. If PERMITTEE is comprised of more than one person or legal entity, such persons and entities, and each of them, shall be jointly and severally liable for

the performance of each and every obligation of PERMITTEE under this Master Agreement.

- 33.7 Unavoidable Delay. If the performance of any act required of CITY or PERMITTEE under this Master Agreement is directly prevented or delayed by reason of strikes, lockouts, labor disputes, unusual governmental delays, acts of God, fire, floods, epidemics, freight embargoes, or other causes beyond the reasonable control of the Party required to perform an act, that Party shall be excused from performing that act for a period equal to the period of the prevention or delay. If CITY or PERMITTEE claims the existence of such a delay, the Party claiming the delay shall notify the other party, in writing, of that fact within ten (10) calendar days after the beginning of any such claimed delay and the Parties shall prepare and sign an appropriate document acknowledging any extension of time under this Section.
- 33.8 CITY's Consent or Approval. Whenever required under this Master Agreement, CITY's consent or approval shall mean the written consent or approval of CITY's Mayor or his designee, unless otherwise expressly provided. CITY's discretionary acts hereunder shall be made at the Mayor's discretion, unless otherwise expressly provided.
- 33.9 Agreement Modifications. This Master Agreement shall not be modified, altered, or amended unless the modification, alteration, or amendment is in writing and signed by the Parties.
- 33.10 Cost Recovery. CITY collects various fees to offset the administrative costs incurred for CITY staff services. CITY shall process each of PERMITTEE's service requests upon receipt of PERMITTEE's payment of the applicable fee. The fee schedule, which is on file with the Office of the City Clerk, may be updated from time to time in CITY's sole discretion.
- 33.11 Survival. Any obligation under this Master Agreement that requires a party's performance of that obligation after the expiration or earlier revocation or termination of this Master Agreement shall survive such expiration, revocation, or termination.
- 33.12 Number and Gender. In this Master Agreement, words in the singular number shall include the plural, and *vice versa*, as appropriate to the context. Words of either gender shall include the other gender.

- 33.13 Publicity. Marketing, advertising, promotional materials (e.g., marketing collateral), press releases or other public announcements regarding this Master Agreement, the activities hereunder, any Exhibit, any specific agreement or any agreement or amendment executed hereunder attached hereto, shall be made only after receiving the prior written consent of the other Party, except as required by law, in which case the other Party shall be consulted to the extent reasonably practicable as to the content and timing of such release, announcement or statement. Notwithstanding the foregoing, each Party may generally describe the collaborative nature of the relationship with the other Party in presentations, and proposals.
- 33.14 Attorneys' Fees. Other than as provided in Section 26 (Indemnification) in any suit or proceeding relating to this Master Agreement each Party shall be responsible for its own costs and fees incurred in connection with the suit or proceeding unless otherwise required by law.
- 33.15 Severability. This Master Agreement will be enforced to the fullest extent permitted by applicable law. If any provision of this Master Agreement is held to be illegal, invalid or unenforceable to any extent, then such provision shall be excluded to the extent of such illegality, invalidity or unenforceability; all other provisions hereof shall remain in full force and effect; and, to the extent permitted and possible, the excluded provision shall be deemed replaced by a provision that is valid and enforceable and that comes closest to expressing the intention of such excluded provision. If application of this Severability provision should materially and adversely affect the economic substance of the transactions contemplated hereby, the Party adversely impacted, in its sole discretion, shall be entitled to either (i) compensation for such adverse impact or (ii) shall have the right to terminate the Master Agreement upon thirty (30) days advance written notice, provided such notice is given within sixty (60) days of the determination of illegality, invalidity or unenforceability. The foregoing remedies are only available to the adversely impacted Party if the reason for the illegality, invalidity or unenforceability of a term is not due to misconduct of the Party seeking compensation or termination.
- 33.16 Counterparts. The Parties may sign this Master Agreement in counterparts, each of which will be considered an original, but all of which will constitute the same agreement. Facsimile and portable document format (PDF) signatures shall be binding as if original.
- 33.17 No Third-Party Beneficiaries. This Master Agreement and any separate agreements created pursuant to this Agreement are solely for the benefit of the CITY and PERMITTEE. They are not intended to benefit any other third parties.
- 33.18 Construction of Document. The parties acknowledge that this document shall not be construed in favor of or against the drafter by virtue of said Party being the drafter and that this Master Agreement shall not be construed as a binding offer until signed by both Parties.
- 33.19 Captions. The captions preceding the Sections of this Master Agreement are intended only for convenience of reference and in no way define, limit, or describe the scope of this Agreement or the intent of any provision hereof.

33.20 Authority to Execute and Deliver Agreement. Each individual executing this Master Agreement on behalf of another person or legal entity represents and warrants that he or she is authorized to execute and deliver this Master Agreement on behalf of such person or entity in accordance with duly adopted resolutions or other authorizing actions which are necessary and proper and under such legal entity's articles, charter, bylaws, or other written rules of conduct or governing agreement, and that this Master Agreement is binding upon such person or entity in accordance with its terms. Each person executing this Master Agreement on behalf of another person or legal entity shall provide CITY with evidence, satisfactory to CITY, that such authority is valid and that such entity is a valid, qualified corporation, limited liability company, partnership, or other unincorporated association, in good standing in its home state, and that such entity is qualified to do business in the State of California.

33.21 Exhibits Incorporated. All Exhibits referenced in this Master Agreement are incorporated into this Master Agreement by this reference.

33.22 Order of Precedence. The order of precedence between and among this Master Agreement and its Exhibits, which are or will be attached hereto and incorporated herein by reference, with respect to a conflict between the same subject matter, shall be as follows, but provided that the prevailing term shall apply only to (i) the conflicting terms and (ii) the extent necessary to resolve the conflict:

1. This Master Agreement;
2. Exhibits to this Master Agreement

IN WITNESS WHEREOF, this Master Agreement is executed by CITY and PERMITTEE, to be effective as of the Effective Date.

Date: 6/11/19

THE CITY OF SAN DIEGO, a California municipal corporation

By [Signature]
Cybele L. Thompson
Director, Real Estate Assets

Date: 6/18/19

NEW CINGULAR WIRELESS PCS, LLC,
a Delaware limited liability company

By: AT&T Mobility Corporation
Its: Manager

By [Signature]
(Print Name) Steve E. Casey
(Title) Area Vice President Construction and Engineering

ENVIRONMENTAL ANALYSIS SECTION:

CEQA Exemption 15301 (Existing Facilities) and 15303 (New Construction)

Date: 6/19/2019

By Jeff Szymanski

Name: JEFF SZYMANSKI

Title: Senior Planner

APPROVED AS TO FORM:

Date: 6/27/18

MARA W. ELLIOTT, City Attorney

By Melissa Ables
Melissa Ables, Deputy City Attorney

Exhibit A: Master Structural Plan



Approval

8/15/18 7:50 am

Page 1 of 1

L64A-005

THE CITY OF SAN DIEGO
Development Services Department
1222 First Avenue, San Diego, CA 92101-4154

Project Information

Project Nbr: **593784** Title: AT&T Master Plan 2016 CBC
Project Mgr: Doringo, Berric (619)446-5115 Bdoringo@sandiego.gov



Approval Information

Approval Nbr: **20 87690** Type: Master Plan, Establish Status: Issued
Issued: 05/17/2018 7:35 am Issued By: Bourachi, Saad Permit Holder: AT&T, - AT&T Wireless
Completed: Completed By: Owner Occupied: ☐ Overridden: ☐
Extension Qty: 0 Extended By: Cancel Reason:
Scope: For Master Plan Establishment under 2016 CBC for 2 types of AT&T Micro-Cellular Antennas and associated equipment to be mounted to new light poles and existing type 15, type 15D, type 21 and type 15 TS street light poles within the public right of way. Precancel Status:
Land Doc Type:
Recorded Map No.:
Recorded Date:



Job Location (1222 01ST AV [Pending])

Address	Assessor Parcel
1222 01ST AV [Pending]	533-433-2800

Fee Worksheet

Fee	Quantity	Unit	Category
Records-Com/MDU(Calcs&Std)	1.00	Each	Issuance Fees



2018 CALIFORNIA BUILDING CODE
2018 CALIFORNIA TITLE 24
2018 CALIFORNIA FIRE CODE
2018 CALIFORNIA ENERGY CODE
2018 CALIFORNIA MECHANICAL CODE
2018 CALIFORNIA ELECTRICAL CODE
2018 CALTRANS STANDARD PLANS
2015 ASHMO STANDARDS
TA-272-G CODE

IN THE EVENT OF CONFLICT, THE MOST RESTRICTIVE CODE SHALL PREVAIL.

ENGINEER: BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD, SUITE 150
SAN DIEGO, CA 92131

CONTACT: ROBERT WESTHOFF
(714) 705-5023

POWER COMPANY:	SOGBE
TELEPHONE COMPANY:	AC&T
POLE OWNER:	CITY OF SAN DIEGO
RF ENGINEER:	CHRISTIAN SOTO (608) 361-8970
ZONING AGENT:	TIM GROVES (619) 274-3576
CONSTRUCTION MANAGER:	ALBERT PUGADO (619) 227-8253
ENGINEER OF RECORD:	NOEL HERRERA (612) 458-8372

INSTALL (2-4) RADIOS AND ASSOCIATED HARDWARE
INSTALL (1) GANTRY ANTENNA AND ASSOCIATED HARDWARE
INSTALL (1) CUTOFF
REMOVE AND REPLACE CONCRETE POLE WITH STEEL POLE WHEN APPLICABLE

APPROVED
RAFAEL LARIOS
MAY 16 2018

593784

~~MASTER PLAN (MSP)~~

5.16.2018

677-5484



at&t

KEVIN MCGEE (858) 232-3996

**AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN
CITY OF SAN DIEGO**

PTS# 593784

BUILDING DEVELOPMENT REVIEW DIVISION/STRUCTURAL

STEPHEN LEPPER Dec 5-16-19

→ MASTER PLAN FOR 10 TYPES
OF ANTENNAS MOUNTED TO LIGHT POLES
→ 2016 CBL

[illegible]

at&t

5738 PACIFIC CENTER BLVD
SAN DIEGO, CA 92121



BLACK & VEATCH

BLACK & VEATCH CORPORATION
10069 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

593784

3	06/14/18	REVISED PER COMMENTS	
3	06/14/18	REVISED PER COMMENTS	
1	04/30/18	REVISED PER COMMENTS	
8	01/26/18	READY FOR APPROVAL	
REV	DATE	DESCRIPTION	



5/16/2018

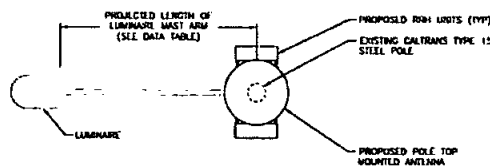
IT IS A VIOLATION OF LAW FOR ANY PERSON,
UNLESS THEY ARE ACTING UNDER THE DIRECTION
OF A LICENSED PROFESSIONAL ENGINEER,
TO ALTER THIS DOCUMENT

AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

TITLE SHEET

SHEET NUMBER

COVER



LUMINAIRE MAST ARM DATA PER CALTRANS

PROJECTED LENGTH	N RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
8'-0"	3'-0"	3-1/4"	0.1196"	31'-6"
9'-0"	3'-0"	3-1/2"		32'-0"
10'-0"	3'-3"	3-7/8"		32'-6"
12'-0"	4'-3"	4-1/4"		33'-6"
15'-0"	4'-9"	4-1/4"		34'-3"

STEEL POLE PLAN VIEW

NO SCALE

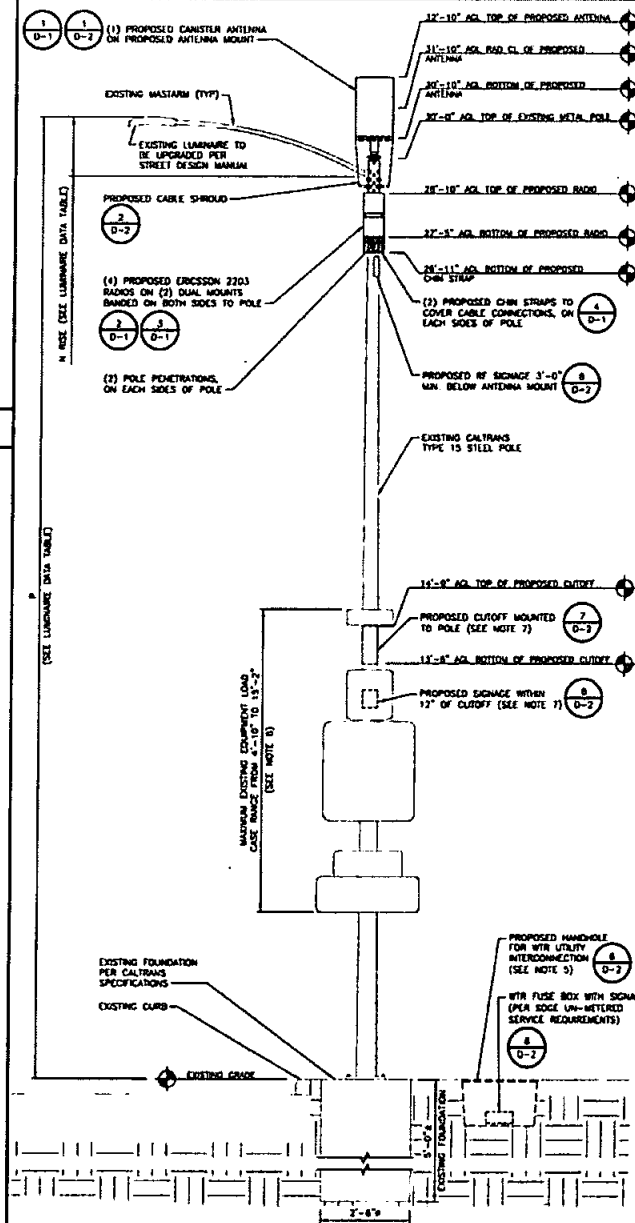
PROJECT DESCRIPTION

- AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:
- INSTALL (1) CANTENNA ANTENNA & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (4) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACON-27150-12P OR EQUAL ANTENNA	35.3	35.3
4	ERICSSON ARIUS-2203 RADIO	14.4	57.6
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	8	8
2	CHIN STRAP	5	10
1	PHOTECOSOL PPS80122 CUTOFF	12	12
TOTAL			149.9

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE AASHTO 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR WOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDING ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF I-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



3738 PACIFIC CENTER BLVD
SAN DIEGO, CA 92131



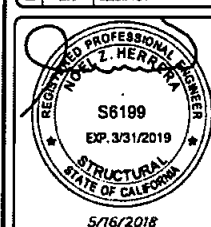
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE 8300
SAN DIEGO, CA 92131

PIS NUMBER

593784

REV	DATE	DESCRIPTION
1	01/16/18	ISSUED FOR COMMENTS
2	02/16/18	ISSUED FOR COMMENTS
3	03/16/18	ISSUED FOR COMMENTS
4	03/16/18	ISSUED FOR APPROVAL



5/16/2018
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE REVIEWED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MS15-1

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 30' Generic Existing Steel Light Pole
Type 15
Loading Scenario: Pico-1

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 82.4 % Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 103.3 % Pass
Existing Concrete Pier Foundation: 57.3 % Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

1. This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
2. Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
3. Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
4. This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
5. This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
6. Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4
8. At the time of this structural analysis, exact details were not available for the following items:
 - luminaire (type & model, weight & dimensions)
 - foundation rebar dia and quantity, soil parameters
 - signages on poles were assumed

POLE DATA
Type of Material: Steel - SS L90 (N/A)
Bottom Pole Diameter: 8 in
Top Pole Diameter: 3.6875 in
Pole Thickness: 0.119 in
Height of Pole: 30 ft
From Equation: $P_1 = 0.00316(n)(K)(G)(V)(K_1)$
Gust Effect Factor: $G = 1.14$
Basic Wind Speed: $V = 120$ mph
Service Wind Speed: $V_{S100} = 76$ mph
Exposure Category: C

ARM AND ARM DATA
Type of Material: Steel A500 Gr. B (N/A)
Arm Diameter: 3.875 in
Arm Thickness: 0.120 in
Weight of Arm: 72.5 lbs
Horizontal Length of Arm: 12.00 ft
Total Length of Arm: 12.5 ft

*Alterations made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the addition of (1) cutout unit above the vehicle impact zone on the pole. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appurtenances	Existing or Proposed	Dimensions (in.)			Weight (lbs)	Effective Projected Area (ft ²)	Elevation (ft)
		W	H	D			
Camera Head	Existing	-	-	-	45	1.90	15.75
ACL ALZOM 2130-119 with camera plate	Proposed	15	44	15	60.94	4.58	11.83
2130 antenna BLAS 2703	Proposed	4.13	17.1	7.87	28.8	0.49	9.93
2130 antenna BLAS 2703	Proposed	4.13	17.1	7.87	28.8	0.49	9.93
Ball Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00
Ball Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00
Ball Board Arm 2	Existing	12	3	12	10	0.25	0.25
Ball Board Arm 2	Existing	12	3	12	10	0.25	0.25
Postmount Signage	Existing	24	14	5	5	1.18	0.29
Postmount Signage	Existing	24	14	5	5	1.18	0.29
Signage Sign	Existing	28	4	0.1	2	1.17	0.00
Signage Sign	Existing	48	16	0.1	7	5.33	0.01
Clear Sign	Proposed	3	6	3	5	0.13	0.13

Total Dead Load = 0.51 kips
Total Moment Due to Dead Load (eccentrics) = 1.00 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.28 kips
Total Moment due to Wind in Z Dir = 20.99 kip-ft
Total Wind Force in X Direction = 0.73 kips
Total Moment due to Wind in X Dir = 16.92 kip-ft
Total Torque = 1.38 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.51 kips
Total Moment due to Wind in Z Dir = 8.42 kip-ft
Total Wind Force in X Direction = 0.29 kips
Total Moment due to Wind in X Dir = 6.79 kip-ft
Total Torque = 0.56 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components: Lattice Pole Compressive Strength Check

Maximum Factored Axial Load: $P_u = 0.84$ kips
Factored Compressive Strength: $\phi_c P_n = 1.83$ kips
Stress Ratio: $P_u / \phi_c P_n = 0.46$ (Less than 0.2)

6.2.2 Tension Check

Maximum Factored Bending Moment: $M_u = 21.0$ kip-ft
Factored Tension of Strength: $M_u = 21.0$ kip-ft
Moment Magnitude Factor (2nd Order Effect): $B_2 = 1.02$
Stress Ratio: $M_u / \phi_b M_n = 0.74$

Shear and Tension Strength Check

Maximum Factored Shear: $V_u = 1.47$ kips
Factored Shear of Strength: $V_u = 1.47$ kips
Stress Ratio: $V_u / \phi_v V_n = 0.04$

Maximum Factored Torque: $T_u = 1.38$ kips
Factored Torsional Strength: $T_u = 1.38$ kips
Stress Ratio: $T_u / \phi_t T_n = 0.013$
 T_u / T_n - Less than 0.2, torsional and shear effects can be ignored

Combined Forces Interaction

$$\left(\frac{P_u}{\phi_c P_n} \right)^2 + \left(\frac{M_u}{\phi_b M_n} \right)^2 + \left(\frac{V_u}{\phi_v V_n} \right)^2 + \left(\frac{T_u}{\phi_t T_n} \right)^2 \leq 1.0$$

Combined Forces Interaction = 0.824 Pass
Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Components: Lattice Arm

Flexural Strength Check

Maximum Factored Bending Moment: $M_u = 7.44$ kip-ft
Factored Flexural Strength: $M_u = 7.44$ kip-ft
Stress Ratio: $M_u / \phi_b M_n = 0.385$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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SAN DIEGO, CA 92121



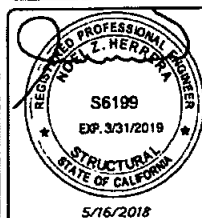
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE 8350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	05/14/18	REVISED PER COMMENTS
2	05/14/18	REVISED PER COMMENTS
3	04/26/18	REVISED PER COMMENTS
4	03/28/18	REVISED FOR APPROVAL



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

AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET LIGHT POLE WITH POLE TOP ANTENNA MOUNT AND PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15-2

6.6 Base Plate & Anchorage

6.6.3 Base Plate

ASCE Design Grade 1

Design Data			
Maximum Factored Bending Moment (per moment magnifier)	$M_u = 27.41$	kip-ft	(ref. Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	$P_u = 6.64$	kip	(ref. Analysis & Design Section 6.2.1)
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$A_p = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.65$		See 3.3.2
Base Plate Thickness	$t_p = 1.5$	in	
Anchor Rod Edge Distance	$e_{ap} = 1.25$	in	

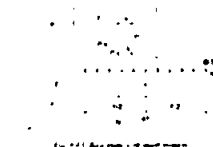


Fig. 6.6.3 Base plate - full moment transfer

Design Section 6.6.3.1 at Large Moment Base Plates

See 3.2

Equivalent Eccentricity	$e = \frac{M_u}{P_u}$	in	Eq. 3.3.6
Maximum Bearing Stress	$f_{max} = 1.33 \frac{P_u}{A_p} \left(1 + \frac{6e}{B} \right)$	ksi	See 4.6
Maximum Bearing Pressure	$f_{max} = 1.33 \frac{P_u}{A_p} \left(1 + \frac{6e}{B} \right)$	ksi	Eq. 3.3.6
Critical Eccentricity	$e_{crit} = \frac{B}{6}$	in	Eq. 3.3.7

Base Plate Design Method
 Actual Moment = $\phi_c M_u$
 Design Method = Large Moment Base Plate
 See 3.3.3

Base Plate Size Check	$F_y = 36$	ksi	Eq. 3.4.4
	$\left(\frac{P_u}{A_p} \right)^2 + \left(\frac{M_u}{S_p} \right)^2 \leq F_y^2$		
	$\left(\frac{6.64}{144} \right)^2 + \left(\frac{27.41}{144} \right)^2 \leq 36^2$		
	Check = Plate Size OK		

Bearing Length	$L_p = 12$	in	Eq. 3.4.3
Factored Anchor Rod Tension	$T_u = 6.64$	kip	Eq. 3.4.2

Base Plate Thickness Check
 Base Plate Yielding Limit at Bearing Interface
 $T_u \leq \phi_c F_y A_p$
 Check = OK, Use Eq. 3.3.15a-2

$$t_p = \sqrt{\frac{4.44 \sqrt{f'_c} \left(\frac{M_u}{S_p} + \frac{P_u}{A_p} \right)}{F_y}} \quad (3.3.15a-2)$$

$$t_p = \sqrt{\frac{4.44 \sqrt{3} \left(\frac{27.41}{144} + \frac{6.64}{144} \right)}{36}} \quad (3.3.15a-2)$$

Required Base Plate Thickness

Base Plate Yielding Limit at Tension Interface
 Contender Length (if not parallel to Plate Thickness Center)
 Required Base Plate Thickness

$$t_{pmin} = 2.11 \sqrt{\frac{F_y}{f'_c}} \quad (3.3.15b)$$

Maximum Required Base Plate Thickness

Base Plate Thickness

Stress Ratio

6.6.4 Anchor Rods

ASCE Design Grade 1

Design Data			
Maximum Factored Tension	$T_u = 1.6$	kip	(ref. Section 6.2.1)
Maximum Factored Shear	$V_u = 1.47$	kip	(ref. Section 6.2.1)
Number of Bolts in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{ur} = 0.4$	kip	
Factored Shear per Anchor Rod	$V_{ur} = 0.37$	kip	
Anchor Rod Diameter	$D = 1$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Bearing-Type Connections			See 3.3.1.2
Nominal Unstressed Area of Anchor Rod	$A_n = 0.79$	in ²	
Nominal Tensile Stress of Anchor Rod	$f_{tu} = 43.50$	ksi	Table 3.2
Nominal Shear Stress of Anchor Rod	$f_{tu} = 26.10$	ksi	Table 3.2
Required Shear Stress of Anchor Rod	$f_{tu} = 0.47$	ksi	See 3.3.1.2
Resistance Factor for Shear and Tension	$\phi = 0.75$		See 3.3.1.2
Nominal Tensile Stress Modified to Include Shear Stress	$f'_{tu} = 43.50$	ksi	See 3.3.1.2

Nominal Tensile Strength of Anchor Rod	$R_n = F_y A_n$	kip	Eq. 3.2
Factored Tensile Strength of Anchor Rod	$\phi R_n = 25.4$	kip	Eq. 3.2-2
Stress Ratio	$S_R = 0.016$	Plate	

Prior with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 0.93$	kip	
Vertical Force	$V = 0.61$	kip	
Height above grade of Lateral Force	$H = 14.33$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf/ft	: Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	: Table 1806.2
Transmit Load factor	$F = 2.00$		: Section 1806.3.4
Trill Depth	$D_{req} = 4.93$	ft	

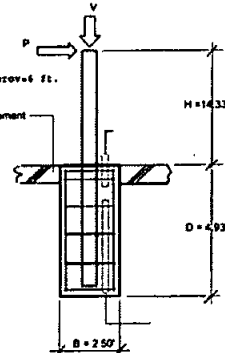
Allowable Equation

$$D_{req} = (4.25 P H / S, B)^{1/3} \quad (IBC 2012 Eq. 18-2)$$

Lateral Soil Bearing Capacity	$F \times S = 0.20$	ksf/ft	
Allowable lateral pressure at "D"	$S_2 = F \times S \times D = 0.99$	ksf	
Required Calculated Depth	$D_{req} = 4.93$	ft	$D_{req} < D_{prev} = 6$ ft.

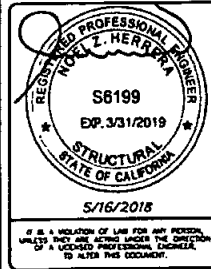
Vertical Soil bearing Check, (Section 1807.3.2.3)
 $Q_{ult} = (0.61 + 4.91 \times 0.10 \times 0.15) / 4.91$
 $Q_{ult} = 0.06$ ksf

	0.06 ksf	1.50 ksf	
	57.1%	OK	



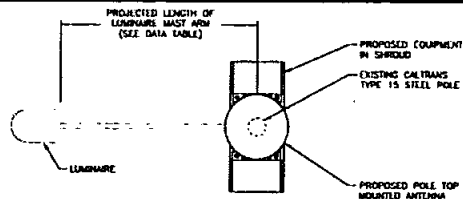
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AT&T SMALL CELL
 (CRAN) PROJECT
 MASTER STRUCTURAL PLAN
 EXISTING TYPE 15 STREET
 LIGHT POLE WITH POLE
 TOP ANTENNA MOUNT AND
 PICO RADIO EQUIPMENT
 STRUCTURAL CALCULATIONS

SHEET NUMBER
 MS15-3



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	N RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
6'-0"	2'-0"	3-1/4"	0.1196"	TYPE 15
8'-0"	2'-0"	3-1/2"		31'-6"
10'-0"	2'-0"	3-1/2"		32'-0"
12'-0"	2'-0"	3-7/8"		33'-0"
15'-0"	2'-0"	4-1/4"		34'-0"

STEEL POLE PLAN VIEW

NO SCALE

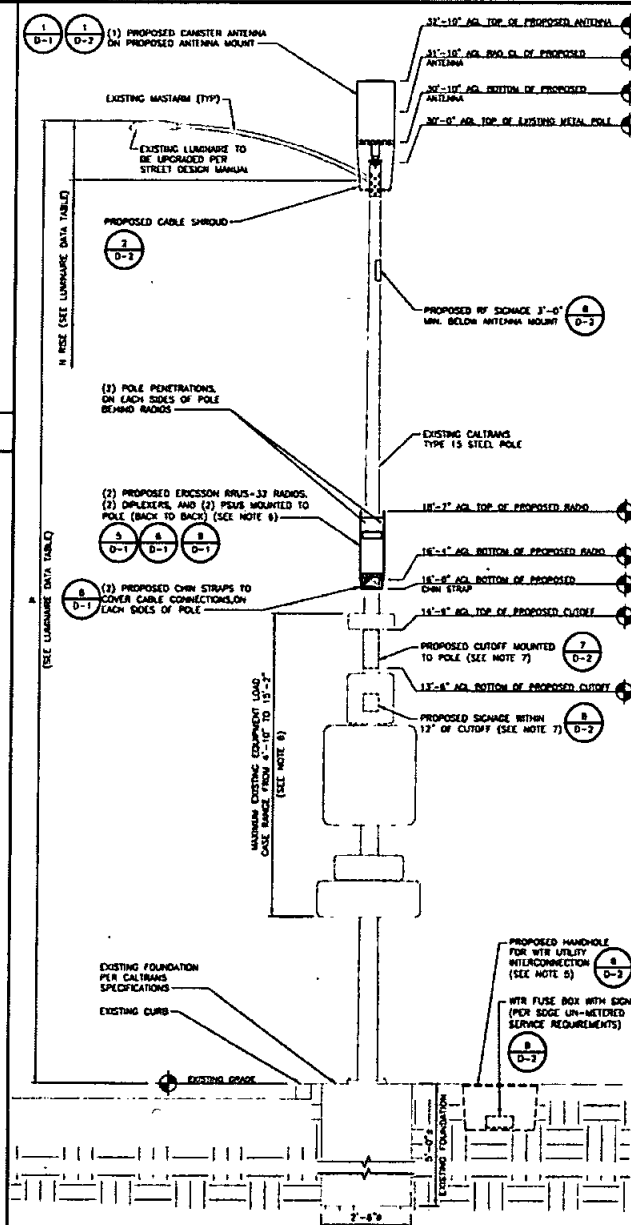
PROJECT DESCRIPTION

- AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:
- INSTALL (1) CONESTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACDM-27150-12P OR EQUAL ANTENNA	35.3	35.3
2	ERICSSON RRU-32 RADIO & PSU AC DB UNIT	62.21	124.42
2	RFS FOP4020A4-HC DIPLEXER	3.1	6.2
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHIN STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	FACTECRSL PYS90122 CUTOFF	12	12
	TOTAL		225.92

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

- A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
- THE GENERAL CONTRACTOR SHOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
- A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS ON ANTENNA.
- ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

- ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
- WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF I-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
- EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
- NO CHIPPING OF FOUNDATION.
- WIND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY. ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
- ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
- POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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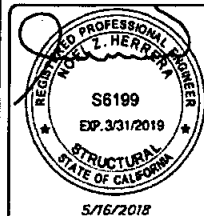
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MS15-4

Site Information: Address: San Diego, CA
Description: 30' Generic Existing Steel Light Pole
Type 15
Loading Scenario: Micro-2

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 85.5% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 103.3% Pass
Existing Concrete Pier Foundation: 57.3% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

- This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
- Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
- Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
- This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
- This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
- Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
- At the time of this structural analysis, exact details were not available for the following items:
 - luminaire, (type & model, weight & dimensions)
 - foundation rebar size and quantity, soil parameters
 - signages on poles were assumed.

POLE DATA
Type of Material: Steel - S5 ksi (A/A)
Bottom Pole Diameter: 8 in
Top Pole Diameter: 1.6875 in
Pole Thickness: 0.1196 in
Height of Pole: 30 ft

WIND PRESSURE
From Equation: $P_s = 0.00256 K_z K_{zt} G V^2$
Gust Effect Factor: $G = 0.84$
Basic Wind Speed: $V = 120$ mph
Service Wind Speed: $V_s = 76$ mph
Exposure Category: C

EQUIPMENT DATA
Type of Material: Steel A500 Gr B (A/A)
Arm Diameter: 1.875 in
Arm Thickness: 0.120 in
Weight of Arm: 72.5 lbs
Horizontal Length of Arm: 12.00 ft
Total Length of Arm: 12.5 ft

*Alterations made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the addition of (1) conduit and cable tray support on the pole, and the addition of (1) containment system for shielding the sides of the room units. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appendices	Existing or Proposed	Dimensions (in)			Weight (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		Z Dir	X Dir	
Cable Head	Existing	-	-	-	45	1.50	1.50	11.75
ACE ACDA-20 150 120 with connector	Proposed	15	44	15	69.54	4.58	4.58	11.81
2) BRUS 22 x (2) PM AC DB	Proposed	12.05	27.17	9.73	124.42	7.77	1.84	17.45
Cable Head	Proposed	17.05	6	8.75	10	0.50	0.36	16.08
Ball Mount Arm 1	Existing	60	0.5	0.5	5	0.11	0.00	71.00
Ball Mount Arm 2	Existing	60	0.5	0.5	5	0.11	0.00	72.00
Solar Panel	Existing	12	1	12	10	0.75	0.75	15.00
Sign	Existing	14	14	3	5	1.54	0.29	17.00
Proximity Signage	Existing	33	33	0.1	8	7.56	0.02	10.00
Traffic Sign	Existing	28	6	0.1	3	1.17	0.00	7.00
Street Sign	Existing	48	14	0.1	7	5.11	0.01	6.00

Total Dead Load = 0.58 kips
Total Moment Due to Dead Load Eccentricities = 0.98 kip-ft

Strength Design Wind Loads
Total Wind Force in Z Direction = 1.34 kips
Total Moment due to Wind in Z Dir = 21.52 kip-ft
Total Wind Force in X Direction = 0.79 kips
Total Moment due to Wind in X Dir = 15.97 kip-ft
Total Torison = 1.37 kip-ft

Service Design Wind Loads
Total Wind Force in Z Direction = 0.54 kips
Total Moment due to Wind in Z Dir = 8.83 kip-ft
Total Wind Force in X Direction = 0.29 kips
Total Moment due to Wind in X Dir = 6.41 kip-ft
Total Torison = 0.55 kip-ft

6.2 Structural Component Capacity Checks

6.2.1 Structural Component: Light Pole Compressive Strength Check

AASHTO
Sec. 9.12

Maximum Factored Axial Load: $P_u = 8.71$ kips
Factored Compressive Strength: $\phi_c P_n = 1.63$ kips
Stress Ratio: $P_u / \phi_c P_n = 0.193$ Less than 0.2

Flexural Strength Check

Maximum Factored Bending Moment: $M_u = 21.5$ kip-ft
Factored Flexural Strength: $\phi_b M_n = 16.9$ kip-ft
Moment Magnifier Factor (2nd Order Effects): $\delta = 1.02$
Stress Ratio: $M_u / \phi_b M_n = 0.760$

Shear and Torsion Strength Check

Maximum Factored Shear: $V_u = 1.53$ kips
Factored Shear Strength: $\phi_v V_n = 21.94$ kips
Stress Ratio: $V_u / \phi_v V_n = 0.008$
Maximum Factored Torison: $T_u = 1.37$ kips
Factored Torsional Strength: $\phi_t T_n = 24.47$ kips
Stress Ratio: $T_u / \phi_t T_n = 0.010$
 $T_u / \phi_t T_n < 0.2$, torsional and shear effects can be ignored

Combined Forces Interaction

Sec. 9.12

$$\left(\frac{P_u}{\phi_c P_n} \right)^2 + \left(\frac{M_u}{\phi_b M_n} \right)^2 + \left(\frac{V_u}{\phi_v V_n} \right)^2 + \left(\frac{T_u}{\phi_t T_n} \right)^2 \leq 1.0$$

Combined Forces Interaction = 0.955 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Component: Light Pole Flexural Strength Check

Maximum Factored Bending Moment: $M_u = 1.44$ kip-ft
Factored Flexural Strength: $\phi_b M_n = 6.13$ kip-ft
Stress Ratio: $M_u / \phi_b M_n = 0.185$

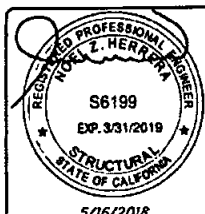
Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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It is a violation of law for any person, unless they are acting under the direction of a licensed professional engineer, to alter this document.

AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET LIGHT POLE WITH POLE TOP ANTENNA MOUNT AND MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15-5

6.6 Base Plate & Anchorage

6.6.1 Base Plate

MSK Design Guide 3

Design Data

Maximum Factored Bending Moment (at column face), $M_u = 21.35$ k-ft
Maximum Factored Axial Load, $P_u = 6.73$ kips

Concrete Compressive Strength	$f'_c = 3$ ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$ ksi	
Base Plate Length	$B = 12$ in	
Base Plate Width	$B = 12$ in	
Resistance Factor in Compression	$\phi_c = 0.65$	Sec. 5.3.3.7
Base Plate Thickness	$t_p = 1.5$ in	
Anchor Rod Edge Distance	$e = 1.25$ in	

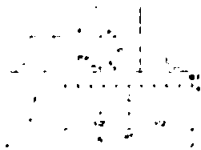


Fig. 6.6.1 Base plate with four rods

Design Method: Small or Large Moment Base Plates

Sec. 5.4

Equivalent Eccentricity	$e = \frac{M_u}{P_u}$	$e = 3.17$ in	Eq. 5.3.1.6
Maximum Bearing Stress	$f_{pmax} = \frac{P_u}{B t_p} \left(1 + \frac{6e}{B} \right)$	$f_{pmax} = 1.88$ ksi	Sec. 5.6
Maximum Bearing Pressure	$f_{pmax} = f_{pmax} = 1.88$ ksi	$f_{pmax} = 1.88$ ksi	Eq. 5.3.1.6
Critical Eccentricity	$e_c = \frac{B}{6}$	$e_c = 0.9$ in	Eq. 5.3.1.7

Base Plate Design Method: Small Moment = $\phi_c F_y A_g$
Large Moment = $\phi_c F_y A_g$

Sec. 5.3.1.4

Base Plate Size Check

Eq. 5.3.1.4

$$\left(\frac{P_u}{\phi_c F_y A_g} \right) + \left(\frac{M_u}{\phi_c F_y S_x} \right) \leq 1.0$$

$$Bearing Length: \left(\frac{P_u}{\phi_c F_y A_g} \right) + \left(\frac{M_u}{\phi_c F_y S_x} \right) \leq 1.0$$

$$Factored Anchor Rod Tension: \left(\frac{P_u}{\phi_c F_y A_g} \right) + \left(\frac{M_u}{\phi_c F_y S_x} \right) \leq 1.0$$

Base Plate Thickness Check

Eq. 5.3.1.4

Base Plate Yielding Limit at Bearing Interface: $V = 0$ or $V = 0.5$

Sec. 5.3.1.4

$$t_p = \sqrt{\frac{P_u}{\phi_c F_y A_g}}$$

$$t_p = \sqrt{\frac{P_u}{\phi_c F_y A_g}}$$

$$t_p = \sqrt{\frac{P_u}{\phi_c F_y A_g}}$$

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$$t_p = \sqrt{\frac{P_u}{\phi_c F_y A_g}}$$

$$t_p = \sqrt{\frac{P_u}{\phi_c F_y A_g}}$$

6.6.2 Anchorage Check

MSK Design Guide 3

Design Data

Maximum Factored Tension	$T_u = 1.7$ kips	(ref Section 6.5.1)
Maximum Factored Shear	$V_u = 1.53$ kips	(ref Section 6.2.1)
Number of Rods in Both Tension & Shear	$n = 4$	
Factored Tension per Anchor Rod	$T_{u,rod} = 0.4$ kips	
Factored Shear per Anchor Rod	$V_{u,rod} = 0.38$ kips	

Anchor Rod Diameter	$D = 1$ in	(minimum)
Yield Strength of Anchor Rod	$F_y = 36$ ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$ ksi	(A36 assumed)

Combined Tension and Shear in Bearing-Type Connections

Sec. 13.10.1-125

Normal Unstressed Area of Anchor Rod	$A_n = 0.79$ in ²	Table J3.2
Normal Tensile Stress of Anchor Rod	$f_t = 43.50$ ksi	Table J3.2
Normal Shear Stress of Anchor Rod	$f_v = 26.10$ ksi	Sec. 13.10.1-125
Required Shear Stress of Anchor Rod	$f_v = 0.65$ ksi	Sec. 13.10.1-125
Resistance Factor for Shear and Tension	$\phi = 0.75$	Sec. 13.10.1-125
Normal Tensile Stress Modified to Include Shear Stress	$F_t = 43.50$ ksi	Sec. 13.10.1-125

Normal Tensile Strength of Anchor Rod	$R_n = F_u A_n$	Eq. J3-2
Factored Tensile Strength of Anchor Rod	$\phi R_n = 29.4$ kips	Eq. J3-2
Stress Ratio	$SR = 0.016$	Pass

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 0.50$ k
Vertical Force	$V = 0.61$ k
Height above grade of Lateral Force	$H = 14.33$ ft
Diameter of Pier	$B = 2.50$ ft
Lateral Soil Bearing Capacity	$S = 0.10$ ksf
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$ ksf
Transient Load factor	$F = 2.00$
Total Depth	$D_{req} = 4.93$ ft

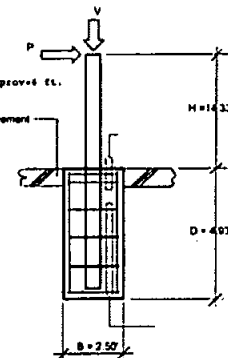
Applicable Equation

$$D_{req} = (4.25 P H / S) / B \quad (IBC 2012 Eq. 18-2)$$

Lateral Soil Bearing Capacity	$F \times S = 0.20$ ksf
Allowable lateral pressure of "D"	$S_1 = F \times S \times D = 0.99$ ksf
Required Calculated Depth	$D_{req} = 4.93$ ft < Depth = 6 ft.

Vertical Soil bearing Check	(Section 1807.3.2.3)
$Q_{ult} = (0.51 \times 4.91 \times 4.83 \times 0.15) / (4.91)$	
$Q_{ult} = 0.05$ ksf	

OK



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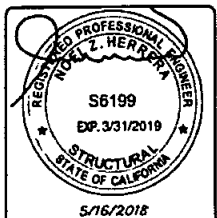
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BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE #300
SAN DIEGO, CA 92131

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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15-6

MS15-7

Site Information: Address: San Diego, CA
Description: 30' Generic Existing Steel Light Pole
Type 15
Loading Scenario: Pico-3

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 84.4% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 57.3% Pass
Existing Concrete Pier Foundation: 57.3% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

1. This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If the information is not current and correct, this report should be considered obsolete and further analysis will be required.
2. Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
3. Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
4. The analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
5. This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
6. Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4
 B. At the time of this structural analysis, exact details were not available for the following items:
 - luminaire (type & model, weight & dimensions)
 - foundation rebar size and quantity, soil parameters
 - signages on poles were assumed

POLE DATA		WIND PROBABILITIES	
Type of Material	Steel - SS 15	(N/A)	From Equation: $P_f = 0.00256(1 + 0.64G)(V^2/IC_d)$
Bottom Pole Diameter	8 in		G = 1.14
Top Pole Diameter	5.6875 in		V = 120 mph
Pole Thickness	0.1196 in		V ₅₀ = 76 mph
Height of Pole	30 ft		Exposure Category C

LAMP ARM DATA	
Type of Material	Steel A500 Gr B
Arm Diameter	1.875 in
Arm Thickness	0.120 in
Weight of Arm	72.5 lbs
Horizontal Length of Arm	12.00 ft
Total Length of Arm	12.5 ft

*Alterations made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the location of (1) cut-off unit above the vehicle impact zone on the pole. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Apparatus	Existing or Proposed	Dimensions (in.)			Weight (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		7' br	4' br	
Cable Head	Existing	-	-	-	65	1.30	1.30	33.75
ALC ACIM 37 15D 179 with connector	Proposed	15	31.5	15	37.8	3.28	3.28	28.69
Side Arm Mount	Proposed	34.5	14.5	9	25	1.24	0.60	26.77
Chain Mount	Proposed	3	6	3	5	0.11	0.11	23.67
22' Ericsson WRH 2200	Proposed	4.13	17.1	7.87	78.8	0.43	0.91	25.62
22' Ericsson WRH 2201	Proposed	4.13	17.1	7.87	28.8	0.43	0.91	25.62
Ball Mount Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	23.00
Ball Mount Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	22.00
Radio Panel	Existing	12	8	12	10	0.25	0.25	15.00
Bus	Existing	16	16	3	5	1.36	0.29	12.00
Proteum Signage	Existing	33	33	0.1	8	7.56	0.02	10.00
Trailer Sign	Existing	28	8	0.1	2	1.17	0.00	7.00
Street Sign	Existing	48	16	0.1	7	5.33	0.01	6.00

Total Dead Load = 0.50 kips
Total Moment Due to Dead Load (Excenter) = 1.11 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.12 kips
Total Moment due to Wind in Z Dir = 21.78 kip-ft
Total Wind Force in X Direction = 0.72 kips
Total Moment due to Wind in X Dir = 26.79 kip-ft
Total Torque = 1.56 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.51 kips
Total Moment due to Wind in Z Dir = 8.74 kip-ft
Total Wind Force in X Direction = 0.29 kips
Total Moment due to Wind in X Dir = 9.54 kip-ft
Total Torque = 0.63 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components: Light Pole Compressive Strength Check

AASHTO Sec. 5.12

Maximum Factored Axial Load $P_u = 0.61$ kips
Factored Compressive Strength $\phi_c P_n = 2.83$ kips
Stress Ratio $P_u/P_n = 0.161$ Less than 0.2

Flexure Strength Check

Maximum Factored Bending Moment $M_u = 21.8$ kip-ft
Factored Flexural Strength $\phi_b M_n = 25.9$ kip-ft
Moment Magnifier Factor (2nd Order Effects) $\delta = 1.01$
Stress Ratio $M_u/M_n = 0.782$

Shear and Torsion Strength Checks

Maximum Factored Shear $V_u = 1.51$ kips
Factored Shear Strength $\phi_v V_n = 21.94$ kips
Stress Ratio $V_u/V_n = 0.067$
Maximum Factored Torque $T_u = 1.56$ kips
Factored Torsional Strength $\phi_t T_n = 14.57$ kips
Stress Ratio $T_u/T_n = 0.107$
 $T_u/T_n < 0.2$, torsional and shear effects can be ignored

Combined Forces Interactions

Sec. 5.12

$$\frac{P_u}{\phi_c P_n} + \frac{M_u}{\phi_b M_n} + \frac{T_u}{\phi_t T_n} = 0.161 + 0.782 + 0.107 = 1.05$$

Combined Forces Interaction = 0.844 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Components: Lamp Arm

General Strength Checks

Maximum Factored Bending Moment $M_u = 2.44$ kip-ft
Factored Flexural Strength $\phi_b M_n = 6.35$ kip-ft
Stress Ratio $M_u/M_n = 0.385$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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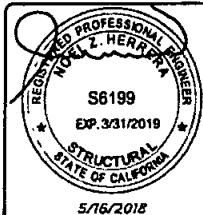
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE #300
SAN DIEGO, CA 92131

PDS NUMBER

593784

REV	DATE	DESCRIPTION
1	02/16/18	REVISED PER COMMENTS
2	05/11/18	REVISED PER COMMENTS
3	04/30/19	REVISED PER COMMENTS
4	05/16/19	REVISED FOR APPROVAL



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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET LIGHT POLE WITH SIDE ARM ANTENNA MOUNT AND PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15-8

6.5 Base Plate & Anchorage

6.5.1 Base Plate

ASCE DESIGN GUIDE 1

Design Data			
Maximum Factored Bending Moment for column height	$M_u = 21.06$	kip-ft	ref Analysis & Design Section 6.2.1
Maximum Factored Axial Load	$P_u = 0.63$	kip	ref Analysis & Design Section 6.2.1
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$N = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.90$		Sec. 3.5.2.2
Base Plate Thickness	$t_p = 1.5$	in	
Anchor Rod Edge Distance	$l_{ar} = 1.75$	in	

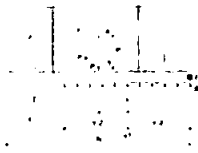


Fig. 6.5.1 Base plate with anchor rods

Design Method: Lateral or Large Moment Base Plates

Sec. 3.4

Equivalent Eccentricity	$e = \frac{M_u}{P_u}$	$e = 33$	in	Eq. 3.3.6
Maximum Bearing Stress	$f_{max} = \frac{P_u}{A_g} \left(1 + \frac{6e}{N} \right)$	$f_{max} = 1.60$	ksi	Sec. 1.8
Maximum Bearing Pressure	$q_{max} = f_{max} \times H$	$q_{max} = 10.9$	kip/in	Eq. 3.3.4
Critical Eccentricity	$e_c = \frac{N}{6} \left(\frac{f_{max}}{f_{min}} - 1 \right)$	$e_c = 6.0$	in	Eq. 3.3.7
Base Plate Design Method	Small Moment: $e \leq e_c$ Large Moment: $e > e_c$			Sec. 3.3.2.1

Base Plate Size Check

Eq. 3.4.4

$$\left(\frac{P_u}{\phi_c F_y A_g} \right) \leq 1.0$$

$$\left(\frac{P_u}{\phi_c F_y A_g} \right) = 0.25$$

Check = Plate Size OK

Bearing Length

Eq. 3.4.2

Factored Anchor Rod Tension $T_u = q_{max} e - P_u$

Eq. 3.4.2

Base Plate Thickness Check

Base Plate Yielding Limit at Bearing Interface

Sec. 3.4.2

$T_u \leq \phi_t F_y A_{ar}$

Check = Y = OK, Use Eq. 3.3.15a-3

$$T_u = 1.10 \text{ kip/in} \times 1.1 \times 12 = 14.52 \text{ kip}$$

$$T_u = 1.10 \text{ kip/in} \times 1.1 \times 12 = 14.52 \text{ kip}$$

Required Base Plate Thickness

Eq. 3.3.15a-2

Base Plate Yielding Limit at Tension Interface

Eq. 3.4.6

Centerline Length (Dist. Between 1st Pipe Thickness Center)

Eq. 3.4.7a

Required Base Plate Thickness

Eq. 3.4.7a

$$t_{p,min} = 2.11 \sqrt{\frac{T_u}{\phi_t F_y}}$$

Minimum Required Base Plate Thickness

Eq. 3.4.7a

Base Plate Thickness

Eq. 3.4.7a

Shear Ratio

Eq. 3.4.7a

6.5.2 Anchorage Check

ASCE 318, 22.2

Design Data

Maximum Factored Tension	$T_u = 1.7$	kip	ref Section 6.5.1
Maximum Factored Shear	$V_u = 1.51$	kip	ref Section 6.5.1
Number of Bolts in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{ar} = 0.4$	kip	
Factored Shear per Anchor Rod	$V_{ar} = 0.38$	kip	
Anchor Rod Diameter	$D = 1$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Reinforcing Steel Connections

Sec. 23.18.1.125

Nominal Unstressed Area of Anchor Rod	$A_n = 0.79$	in ²	Table J3.2
Nominal Tensile Stress of Anchor Rod	$F_n = 43.50$	ksi	Table J3.2
Nominal Shear Stress of Anchor Rod	$F_v = 26.10$	ksi	Table J3.2
Required Shear Stress of Anchor Rod	$F_{vr} = 0.48$	ksi	Sec. 23.18.1.125
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 23.18.1.125
Nominal Tensile Stress Modified to Include Shear Stress	$F_n' = 43.50$	ksi	Sec. 23.18.1.125
Nominal Tensile Strength of Anchor Rod $R_n = F_n' A_n$	$R_n = 34.2$	kip	Eq. 23.2
Factored Tensile Strength of Anchor Rod $\phi R_n = F_n' A_n$	$\phi R_n = 25.8$	kip	Eq. 23.2
Shear Ratio	$SR = 0.017$	Pass	

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 0.93$	kip	
Vertical Force	$V = 0.51$	kip	
Height above grade of Lateral Force	$H = 14.33$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	kip/ft	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	kip/ft	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
Test Depth	$D_{test} = 4.93$	ft	

Acceptable Equation

(IBC 2012 Eq. 18-2)

Lateral Soil Bearing Capacity	$F = S = 0.20$	kip/ft
Allowable lateral pressure at "D"	$S_y = F \times S \times D = 0.99$	kip
Required Calculated Depth	$D_{req} = 4.93$	ft

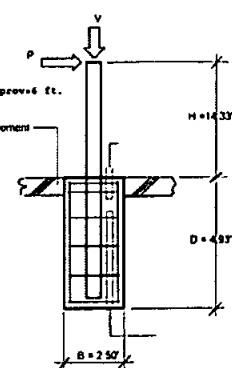
Vertical Soil bearing Check, (Section 1807.3.2.3)

$$Q_{ult} = (0.61 \times 4.91 \times 4.93 \times 0.15) / 4.91$$

$$Q_{ult} = 0.86 \text{ kip/ft}$$

1.50 kip/ft

OK



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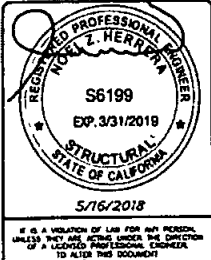


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10003 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

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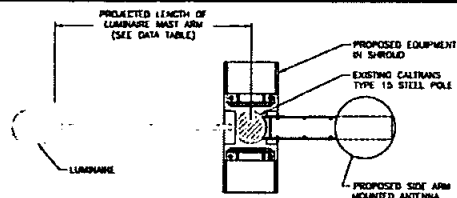


AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15-9



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	N RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
6'-0"	2'-0"	3-1/2"	0.1196"	TYPE 15
8'-0"	2'-0"	3-1/2"		31'-8"
10'-0"	2'-0"	3-1/2"		32'-0"
12'-0"	2'-0"	3-1/2"		32'-8"
15'-0"	2'-0"	3-1/2"		34'-3"

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

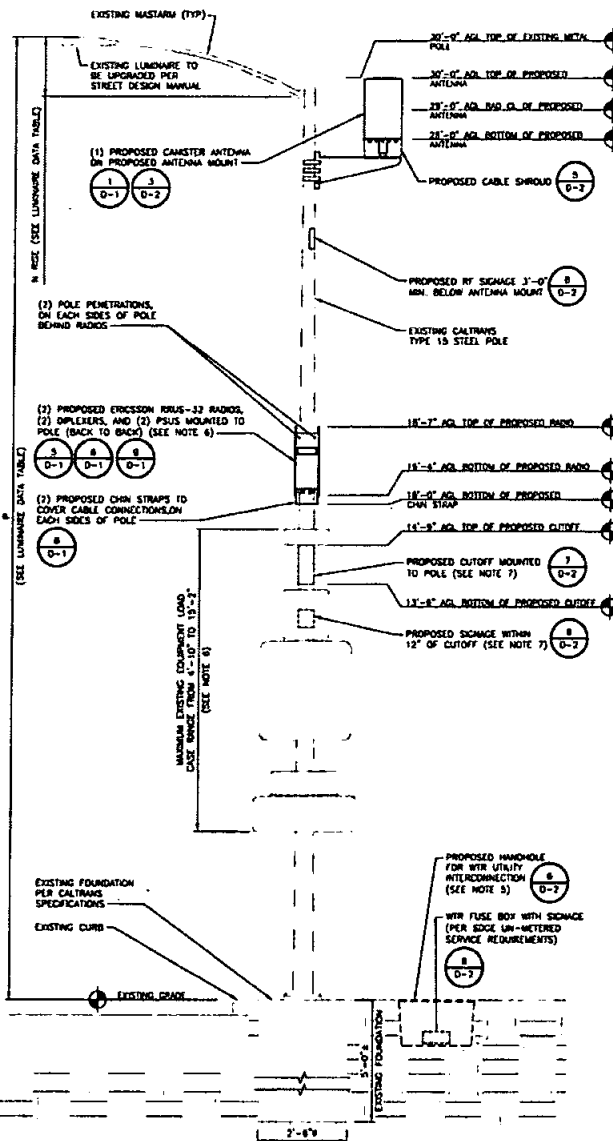
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANTENNA ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-27150-12P OR EQUAL ANTENNA	33.3	33.3
2	ERICSSON RRUS-32 RADIO & PSU AC DB UNIT	62.21	124.42
2	RRS PDP4020A4-NC DUPLER	3.1	6.2
1	SIDE ARM ANTENNA MOUNT BRACKET	25	25
1	ANTENNA SLAVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHIN STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	PACTED-GOL PYS80123 CUTOFF	12	12
	TOTAL		228.93

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE AASHTO 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR SHOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS ON ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 4-S PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. WIND POLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY. ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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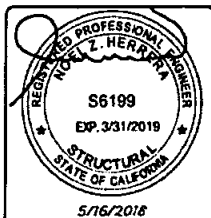
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BLACK & VEATCH CORPORATION
10088 WILLOW CREEK RD
SUITE 4350
SAN DIEGO, CA 92131

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18	05/16/18	REVISED PER COMMENTS
19	05/16/18	REVISED PER COMMENTS
20	05/16/18	REVISED PER COMMENTS



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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET LIGHT POLE WITH SIDE ARM ANTENNA MOUNT AND MICRO RADIO EQUIPMENT SCHEMATIC

SHEET NUMBER
MS15-10

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 30' Generic Existing Steel Light Pole
Type 15
Loading Scenario: Micro-4

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 88.0% **Pass**
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: **Pass**
Existing Concrete Pier Foundation: 57.3% **Pass**

ASSUMPTIONS, DISCLAIMERS, AND NOTES

- This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
- Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
- Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
- This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
- This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
- Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
- At the time of this structural analysis, exact details were not available for the following items:
 - Luminaire: (Type & Model, weight & dimensions)
 - Foundation reinforcement and quantity, soil parameters.
 - Regulators on poles were assumed.

POLE DATA
Type of Material: Steel - SS 101 (N/A)
Bottom Pole Diameter: 6 in
Top Pole Diameter: 3.6875 in
Pole Thickness: 0.1196 in
Height of Pole: 30 ft
Wind Pressure: From Equation $P_s = 0.00256K_z K_{zt} K_{dts} V^2$
Gust Effect Factor: $G = 1.14$
Basic Wind Speed: $V = 120$ mph
Service Wind Speed: $V_{ss} = 76$ mph
Exposure Category: C

LAMP ARM DATA
Type of Material: Steel A500 Gr B (N/A)
Arm Diameter: 3.875 in
Arm Thickness: 0.120 in
Weight of Arm: 73.5 lbs
Horizontal Length of Arm: 12.00 ft
Total Length of Arm: 12.5 ft

*Alterations made to the following load cases, as shown on the previous sheet within the submitted, do not significantly impact the structural results. These alterations include: the addition of (1) cutoff will above the reference impact zone on the pole, and the addition of (1) concentrator system for spreading the loads of the radio units. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appendices	Existing or Proposed	Dimensions (in)			Weight (lb)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		Z-Dir	X-Dir	
Cable Head	Existing	-	-	-	45	1.80	1.80	13.75
ACE ACORN 21 (50 L2P with concrete)	Proposed	15	31.5	15	17.8	9.28	9.28	28.69
Indy Arm Mount	Proposed	34.5	14.5	6	25	1.76	0.60	26.77
123 MPUS 12 + (2) PLU AC 08	Proposed	12.05	22.12	9.75	324.43	2.77	4.84	17.45
Omni 30 up	Proposed	12.05	6	8.75	30	0.50	0.36	16.08
Full Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	23.00
Full Board Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	22.00
Solar Panel	Existing	12	3	17	10	0.25	0.25	15.00
Blow	Existing	14	14	6	5	0.36	0.29	12.00
Provisional Signage	Existing	22	24	0.1	0	0.56	0.02	10.00
TruLife Sign	Existing	28	4	0.1	2	1.17	0.00	7.00
Street Sign	Existing	48	16	0.1	7	5.31	0.01	6.00

Total Dead Load = 0.58 kips
Total Moment Due to Dead Load Eccentricities = 1.14 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.35 kips
Total Moment due to Wind in Z Dir = 22.47 kip-ft
Total Wind Force in X Direction = 0.71 kips
Total Moment due to Wind in X Dir = 15.81 kip-ft
Total Torque = 1.50 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.56 kips
Total Moment due to Wind in Z Dir = 9.01 kip-ft
Total Wind Force in X Direction = 0.29 kips
Total Moment due to Wind in X Dir = 6.26 kip-ft
Total Torque = 0.64 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components - Light Pole Components - Strength Check

6.2.2.1
Sec. 5.12

Maximum Factored Axial Load $P_u = 0.71$ kips
Factored Compression Strength $\phi_c P_n = 0.81$ kips
Stress Ratio $P_u / \phi_c P_n = 0.88$ Less than 0.2

Element Strength Check

Maximum Factored Bending Moment $M_u = 22.5$ kip-ft
Factored Flexural Strength $\phi_b M_n = 28.9$ kip-ft
Moment Magnifier Factor (2nd Order Effects) $\delta_m = 1.01$
Stress Ratio $M_u / \phi_b M_n = 0.78$

Wind and Seismic Strength Check

Maximum Factored Shear $V_u = 1.51$ kips
Factored Shear Strength $\phi_v V_n = 11.94$ kips
Stress Ratio $V_u / \phi_v V_n = 0.04$

Maximum Factored Torsion $T_u = 1.50$ kips
Factored Torsional Strength $\phi_t T_n = 16.92$ kips
Stress Ratio $T_u / \phi_t T_n = 0.01$
 f_u / f_y = Less than 0.2. Normal and shear effects can be ignored.

Combined Forces Interaction

Sec. 5.12

$$\frac{P_u}{\phi_c P_n} + \frac{M_u}{\phi_b M_n} + \frac{V_u}{\phi_v V_n} + \frac{T_u}{\phi_t T_n} = 0.88 + 0.78 + 0.04 + 0.01 = 1.71 < 1.10$$

Combined Forces Interaction = 0.880 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Components - Lamp Arm

Element Strength Check

Maximum Factored Bending Moment $M_u = 3.46$ kip-ft
Factored Flexural Strength $\phi_b M_n = 6.11$ kip-ft
Stress Ratio $M_u / \phi_b M_n = 0.36$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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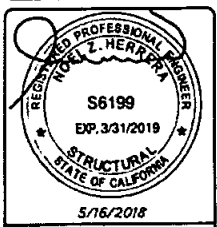
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10089 WILLOW CREEK RD
SUITE 8500
SAN DIEGO, CA 92131

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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET LIGHT POLE WITH SIDE ARM ANTENNA MOUNT AND MICRO RADIO EQUIPMENT STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15-11

6.6 Base Plate & Anchorage

6.6.1 Base Plate

ASCE Design Guide 3

Design Data

Maximum Factored Bending Moment (at moment magnifier)	$M_u = 29.10$	kip-in	(ref Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	$P_u = 1.00$	kip	(ref Analysis & Design Section 6.2.1)
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$L = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.90$		Sec. 6.2.2
Base Plate Thickness	$t_p = 1.5$	in	
Anchor Rod Edge Distance	$e_{min} = 1.25$	in	

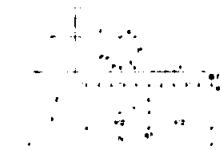


Fig. 6.6.1 Base Plate with Anchor Rods

Design Method: Small or Large Moment Base Plates

Sec. 6.4

Compressive Eccentricity	$e = \frac{M_u}{P_u} = 29.10$	in	Eq. 6.4.4
Maximum Bearing Stress	$f_{max} = 1.06$	ksi	Sec. 6.6
Maximum Bearing Pressure	$f_{max} = 10.6$	ksi	Eq. 6.4.5
Critical Eccentricity	$e_{crit} = 6.0$	in	Eq. 6.4.7

Base Plate Design Method: Small Moment = $e \leq e_{crit}$
Large Moment = $e > e_{crit}$

Design Method = Large Moment Base Plate

Sec. 6.5.3.1

Base Plate Design

Eq. 6.4.6

$$f_{max} = \frac{P_u}{A} + \frac{M_u}{S} \leq f_{allow}$$

Check = Plate Size OK

$$L \geq \frac{1}{2} \left(\frac{P_u}{f_{allow}} + \frac{M_u}{f_{allow} S} \right) \leq L_{max}$$

Eq. 6.4.8

$$f_{max} = \frac{P_u}{A} + \frac{M_u}{S} \leq f_{allow}$$

Eq. 6.4.8

Base Plate Thickness Check

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Check = OK. Use Eq. 6.5.3.1b-2

Sec. 6.5.3.2

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

(Eq. 6.5.3.1b-2)

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Eq. 6.5.3.2

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Eq. 6.4.6

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Eq. 6.4.6

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Eq. 6.4.6

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Eq. 6.4.6

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Eq. 6.4.6

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Eq. 6.4.6

$$t_p \geq \sqrt{\frac{P_u}{\phi_c F_y}} \leq t_{max}$$

Eq. 6.4.6

6.6.2 Anchorage Check

ASCE Sec. 12.7

Design Data

Maximum Factored Tension	$T_u = 2.2$	kip	(ref Section 6.5.1)
Maximum Factored Shear	$V_u = 1.84$	kip	(ref Section 6.2.1)
Number of Bolts in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{ur} = 0.5$	kip	
Factored Shear per Anchor Rod	$V_{ur} = 0.45$	kip	

Anchor Rod Diameter	$d = 1.25$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Bearing-Type Connections

Sec. 12.16.1-125

Nominal Unthreaded Area of Anchor Rod	$A_n = 1.23$	in ²	
Nominal Tensile Stress of Anchor Rod	$F_u = 43.50$	ksi	Table A3.2
Nominal Shear Stress of Anchor Rod	$F_u = 26.10$	ksi	Table A3.2
Required Shear Stress of Anchor Rod	$L = 0.28$	ksi	Sec. 12.16.1-125
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 12.16.1-125
Nominal Tensile Stress Modified to Include Shear Stress	$F_u = 43.50$	ksi	Sec. 12.16.1-125

Nominal Tensile Strength of Anchor Rod	$R_n = F_u A_n$	kip	Eq. 12.16.1-125
Factored Tensile Strength of Anchor Rod	$\phi R_n = 40.0$	kip	Eq. 12.16.1-125
Stress Ratio	$SR = 0.014$	Pass	

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 1.15$	k	
Vertical Force	$V = 0.63$	k	
Height above grade of Lateral Force	$H = 15.71$	ft	
Diameter of Pier	$D = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 7.00$		Section 1806.3.4
Trail Depth	$D_{req} = 5.35$	ft	

Applicable Equation

$$D_{req} = (4.25 P H / S) / F \quad (\text{IBC 2012 Eq. 18-2})$$

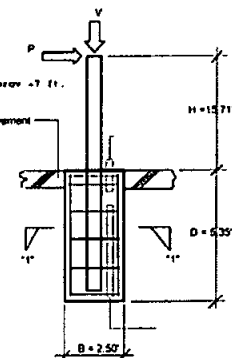
Lateral Soil Bearing Capacity	$F \times S = 0.20$	ksf	
Allowable lateral pressure at "D"	$S_1 = F \times S \times D = 1.07$	ksf	
Required Calculated Depth	$D_{req} = 5.35$	ft = $D_{prev} + 7$ ft.	

Vertical Soil bearing Check, (Section 1807.3.2.3)

$$Q_{ult} = (0.83 + 4.91 \times 5.35 \times 0.10) / 4.91$$

$$= 0.97 \text{ ksf}$$

$$= 94.7\% \quad \text{OK}$$



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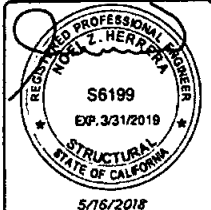
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10089 WILLOW CREEK RD
SUITE 8350
SAN DIEGO, CA 92131

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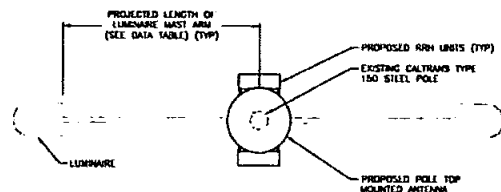
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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15-12



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	H RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
8'-0"	2'-0"	3-1/2"	0.1196"	TYPE 150
8'-0"	2'-0"	3-1/2"		31'-0"
10'-0"	2'-3/4"	3-1/2"		32'-0"
12'-0"	3'-0"	3-1/2"		33'-0"
14'-0"	3'-3/4"	3-1/2"		34'-0"

STEEL POLE PLAN VIEW

NO SCALE

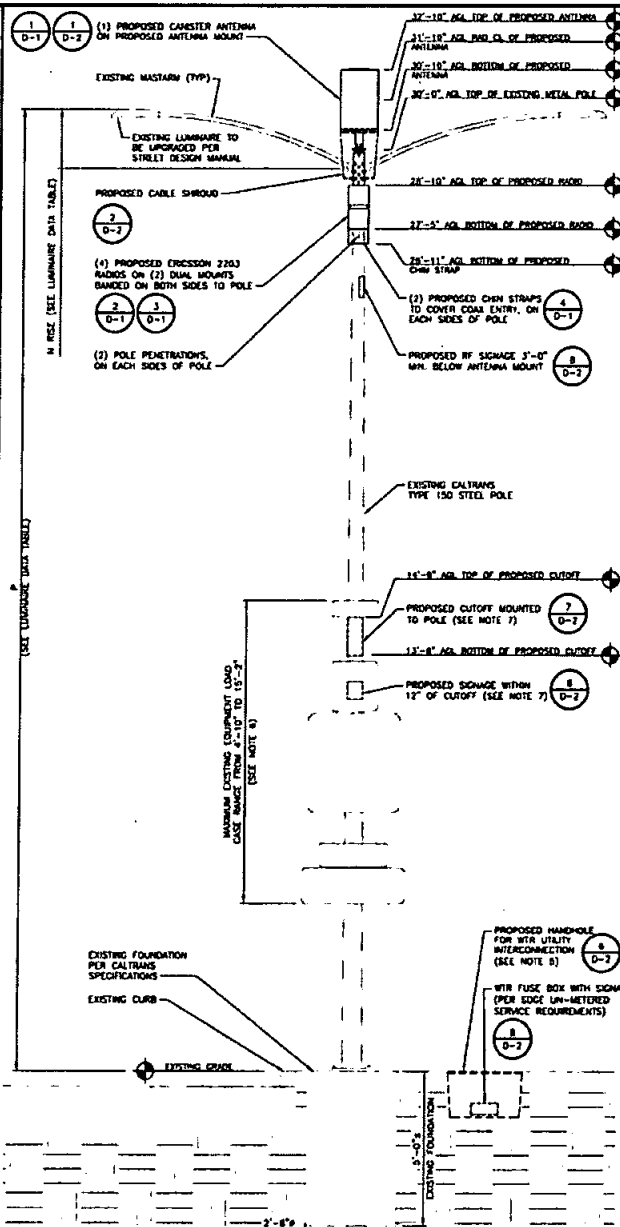
PROJECT DESCRIPTION

- AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:
- INSTALL (1) CANTENNA ANTENNA & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (4) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-2F150-12P OR EQUAL ANTENNA	33.3	33.3
4	ERICSSON RRUS-2203 RADIO	14.4	57.6
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHIN STRAP	5	10
1	PACKED/SOL PTS30122 CUTOFF	12	12
TOTAL			149.9

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE ASDHD 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR SHOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF (LOAD CENTER, RADIOS OR ANTENNA).
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 4-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.

GENERAL NOTES



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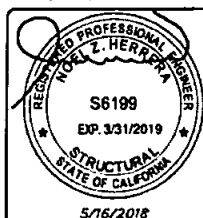
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10099 WILLOW CREEK RD
SUITE #300
SAN DIEGO, CA 92131

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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 150 STREET LIGHT POLE WITH POLE TOP ANTENNA MOUNT AND PICO RADIO EQUIPMENT SCHEMATIC

SHEET NUMBER

MS15D-1

Site Information: Address: San Diego, CA
Description: 30' Generic Existing Steel Light Pole
Type 15D
Loading Scenario: Pico-1

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 69.0% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 98.9% Pass
Existing Concrete Pier Foundation: 64.7% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

- The analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed appurtenance loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
- Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
- Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
- This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
- This analysis assumes that all existing and/or proposed equipments mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
- Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
- At the time of this structural analysis, exact details were not available for the following items:
 - hardware: (type & model, weight & dimensions)
 - foundation rebar dia and quantity, soil parameters
 - signages on poles were assumed

POLE DATA		WIND PROVISION	
Type of Material	Steel - 55 ksi (N/A)	From Equation: $P_r = 0.00236 K_d K_{zt} K_{ex} K_{f1} K_{f2} V_{50}^2$	
Bottom Pole Diameter	8 in	Gust Effect Factor	$G = 1.34$
Top Pole Diameter	3.6475 in	Basic Wind Speed	$V = 120$ mph
Pole Thickness	0.1793 in	Service Wind Speed	$V_{50} = 76$ mph
Height of Pole	30 ft	Exposure Category	C

LAMP ARM DATA	
Type of Material	Steel A500 Gr. B (N/A)
Arm Diameter	1.875 in
Arm Thickness	0.120 in
Weight of Arm	72.5 lbs
Horizontal Length of Arm	12.00 ft
Total Length of Arm	12.5 ft

Modifications made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These modifications include the decision of (1) cut-off and above the vehicle impact zone on the pole. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appurtenances	Existing or Proposed	Dimensions (in)			Weight (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		Z Dir	X Dir	
Cable Head	Existing	-	-	-	45	1.50	1.50	33.75
ALL ACOG 2515D 12P with control cable	Proposed	15	64	15	69.94	4.58	4.58	31.61
(2) Erasmee KRU-5 201	Proposed	4.13	17.1	7.87	28.8	0.49	0.93	28.17
(2) Erasmee KRU-5 201	Proposed	4.13	17.1	7.87	28.8	0.49	0.93	28.13
Ball Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	23.00
Ball Board Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	22.00
Police Panel	Existing	17	3	12	10	0.75	0.25	15.00
Sign	Existing	14	14	3	5	1.06	0.79	12.00
Antennarium Support	Existing	11	13	0.1	8	7.56	0.02	10.00
Traffic Sign	Existing	28	6	0.1	2	1.17	0.00	7.00
Street Sign	Existing	48	16	0.1	7	5.33	0.01	6.00
Code's Head	Existing	-	-	-	45	1.50	1.50	33.75
Lamp Arm	Existing	-	-	-	72.5	4.04	4.04	31.63

Total Dead Load = 0.73 kips
Total Moment Due to Dead Load Eccentricities = 0.01 kip-ft

Strength Down Wind Loads

Total Wind Force in Z Direction = 1.48 kips
Total Moment due to Wind in Z Dir = 27.26 kip-ft
Total Wind Force in X Direction = 0.92 kips
Total Moment due to Wind in X Dir = 31.19 kip-ft
Total Torsion = 0.02 kip-ft

Service Down Wind Loads

Total Wind Force in Z Direction = 0.59 kips
Total Moment due to Wind in Z Dir = 10.91 kip-ft
Total Wind Force in X Direction = 0.37 kips
Total Moment due to Wind in X Dir = 9.30 kip-ft
Total Torsion = 0.01 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components: Utility Pole Compressive Strength Check

AASHTO Sec. 5.12

Maximum Factored Axial Load $P_u = 0.91$ kips
Factored Compressive Strength $P_n = 5.57$ kips
Stress Ratio $P_u/P_n = 0.164$ Less than 0.2

Flexural Strength Check

Maximum Factored Bending Moment $M_u = 27.3$ kip-ft
Factored Flexural Strength $M_n = 45.2$ kip-ft
Moment Magnifier Factor (2nd Order Effects) $\delta = 1.03$
Stress Ratio $M_u/M_n = 0.609$

Shear and Torsion Strength Check

Maximum Factored Shear $V_u = 1.74$ kips
Factored Shear Strength $V_n = 47.38$ kips
Stress Ratio $V_u/V_n = 0.037$
Maximum Factored Torsion $T_u = 0.02$ kips
Factored Torsional Strength $T_n = 108.67$ kips
Stress Ratio $T_u/T_n = 0.000$
 T_u/T_n is less than 0.2, torsional and shear effects can be ignored

Combined Forces Interaction

Sec. 5.12

$$\frac{P_u}{P_n} + \frac{M_u}{M_n} + \frac{T_u}{T_n} = 0.164 + 0.609 + 0.000 = 0.773 < 1.0$$

Combined Forces Interaction = 0.690 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Components: Lamp Arm

Flexural Strength Check

Maximum Factored Bending Moment $M_u = 2.44$ kip-ft
Factored Flexural Strength $M_n = 6.33$ kip-ft
Stress Ratio $M_u/M_n = 0.385$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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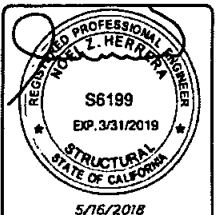
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10089 WILLOW CREEK RD
SUITE 3500
SAN DIEGO, CA 92131

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MASTER STRUCTURAL PLAN

EXISTING TYPE 15D STREET LIGHT POLE WITH POLE TOP ANTENNA MOUNT AND PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15D-2

6.6 Base Plate & Anchorage

6.6.1 Base Plate

AKC Design Guide 1

Design Data

Maximum Factored Bending Moment (M_u)	27.52	kip-ft	ref Analysis & Design Section 6.2.1
Maximum Factored Axial Load (P_u)	0.81	kips	ref Analysis & Design Section 6.2.1
Concrete Compressive Strength (f'_c)	3	ksi	(assumed)
Yield Strength of Base Plate (F_y)	36	ksi	
Base Plate Length (L)	12	in	
Base Plate Width (B)	12	in	
Resistance Factor in Compression (ϕ_c)	0.65		Sec. 6.3.2.2
Base Plate Thickness (t)	1.5	in	
Anchor Rod Edge Distance	1.25	in	



Fig. 6.6.1 Base plate, 12x12 small diameter

Design Method: Small or Large Moment, Base Plates

Sec. 3.4

Equivalent Eccentricity (e)	$e = \frac{M_u}{P_u}$	30	in	Eq. 3.2.6
Maximum Bearing Stress (f_{max})	$f_{max} = \frac{P_u}{A_g} \left(1 + \frac{6e}{B} \right)$	106	ksi	Eq. 3.6
Maximum Bearing Pressure (q_{max})	$q_{max} = f_{max} \times H$	10.9	kip/in	Eq. 3.4
Critical Eccentricity (e_{crit})	$e_{crit} = \frac{B}{6}$	6.0	in	Eq. 3.3.7
Base Plate Design Method	Design Method = Large Moment Base Plate			Sec. 3.3.3.4
Small Moment = $e < e_{crit}$				
Large Moment = $e > e_{crit}$				

Base Plate Size Check

f_{max}	106	ksi	Eq. 3.4.4
$2P_u \leq \phi_c F_y A_g$	115.8		
Check = Plate Size OK	3.0		

Bearing Length (l)	$l = \sqrt{\frac{P_u}{q_{max}}}$	9.15	in	Eq. 3.4.3
Factored Anchor Rod Tension (T_u)	$T_u = P_u - P_c$	2.1	kips	Eq. 3.4.2

Base Plate Thickness Check

Base Plate Yielding Limit at Bearing Interface (t_{req})	$t_{req} = \sqrt{\frac{4P_u e}{\phi_c F_y B}}$	2.2	in	Sec. 3.4.2
Check = $t > t_{req}$, Use Eq. 3.3.3.2-2				

$$t_{req} = \sqrt{\frac{4P_u e}{\phi_c F_y B}} = \sqrt{\frac{4(0.81 \text{ kips})(30 \text{ in})}{(0.65)(36 \text{ ksi})(12 \text{ in})}} = 2.2 \text{ in}$$

$$t_{req} = \sqrt{\frac{4P_u e}{\phi_c F_y B}} = \sqrt{\frac{4(0.81 \text{ kips})(30 \text{ in})}{(0.65)(36 \text{ ksi})(12 \text{ in})}} = 2.2 \text{ in}$$

Required Base Plate Thickness (t_{req})	2.2	in	Eq. 3.3.3.2
---	-----	----	-------------

Base Plate Yielding Limit at Tension Interface			
Contender Length (Plot Number is Pipe Thickness Center)	0.68	in	Eq. 3.4.6
Required Base Plate Thickness (t_{req})	0.11	in	Eq. 3.4.7a

$$t_{req} = 2.61 \sqrt{\frac{F_y}{B}} = 2.61 \sqrt{\frac{36 \text{ ksi}}{12 \text{ in}}} = 0.28 \text{ in}$$

Maximum Required Base Plate Thickness	0.28	in	
Base Plate Thickness	1.50	in	
Stress Ratio	0.176	Pass	

6.6.2 Anchorage Check

AKC Sec. 3.1.1

Design Data

Maximum Factored Tension	$T_u = 2.1$	kips	(ref Section 6.5.1)
Maximum Factored Shear	$V_u = 1.74$	kips	(ref Section 6.2.1)
Number of Bolts in Both Tension & Shear	$n = 4$		
Factored Tension per Anchor Rod	$T_{rod} = 0.5$	kips	
Factored Shear per Anchor Rod	$V_{rod} = 0.44$	kips	
Anchor Rod Diameter	$D = 1.25$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Base Plate Connections

Sec. 3.18.1.2

Nominal Unthreaded Area of Anchor Rod	$A_n = 1.73$	in ²	
Nominal Tensile Stress of Anchor Rod	$F_u = 43.50$	ksi	Table 3.2
Nominal Shear Strength of Anchor Rod	$F_v = 26.10$	ksi	Table 3.2
Required Shear Stress of Anchor Rod	$\tau_u = 0.35$	ksi	Sec. 3.18.1.1.2
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 3.18.1.1.2
Nominal Tensile Stress Modified to Include Shear Stress	$F'_u = 43.50$	ksi	Sec. 3.18.1.1.2
Nominal Tensile Strength of Anchor Rod	$R_n = F'_u A_n$	18.4	kips
Factored Tensile Strength of Anchor Rod	$\phi R_n = 40.0$	kips	Eq. 3.2
Stress Ratio	$SR = 0.013$	Pass	Eq. 3.2

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

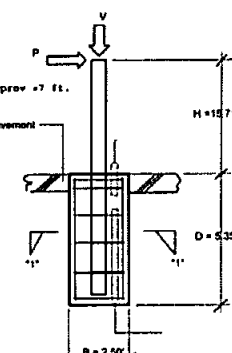
Lateral Force	$P = 1.15$	k	
Vertical Force	$V = 0.85$	k	
Height above grade of Lateral Force	$H = 15.71$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
trial Depth	$D_{trial} = 5.35$	ft	

Applicable Equation

$$D_{min} = (4.25 P H / S, B \text{ ft}) \quad (\text{IBC 2012 Eq. 18-2})$$

Lateral Soil Bearing Capacity	$F = S = 0.20$	ksf	
Allowable lateral pressure at "D"	$S_1 = F \times B \times D = 1.07$	ksf	
Required Calculated Depth	$D_{min} = 5.35$	ft. - Oprov = 7 ft.	

Vertical Soil bearing Check, (Section 1807.3.2.3)			
$Q_{ult} = (0.83 + 4.91 \times 5.35 \times 0.15) / 4.91$			
$= 0.97$	ksf		
OK	1.50	ksf	



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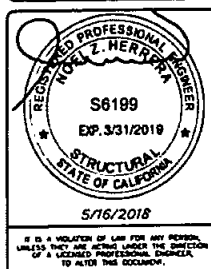
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BLACK & VEATCH CORPORATION
10088 WILLOW CREEK RD
SUITE 8300
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	03/15/18	REVISED PER COMMENTS
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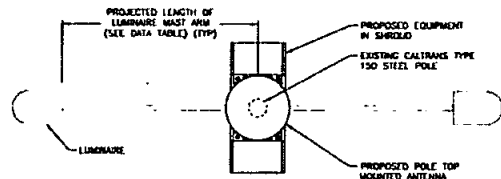


AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15D STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15D-3



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	H RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
6'-0"	7'-0"	3-1/4"	0.1196"	TYPE 150
8'-0"	7'-0"	3-1/4"		31'-6"
10'-0"	7'-0"	3-1/4"		32'-0"
12'-0"	7'-0"	3-1/4"		32'-6"

STEEL POLE PLAN VIEW

NO SCALE

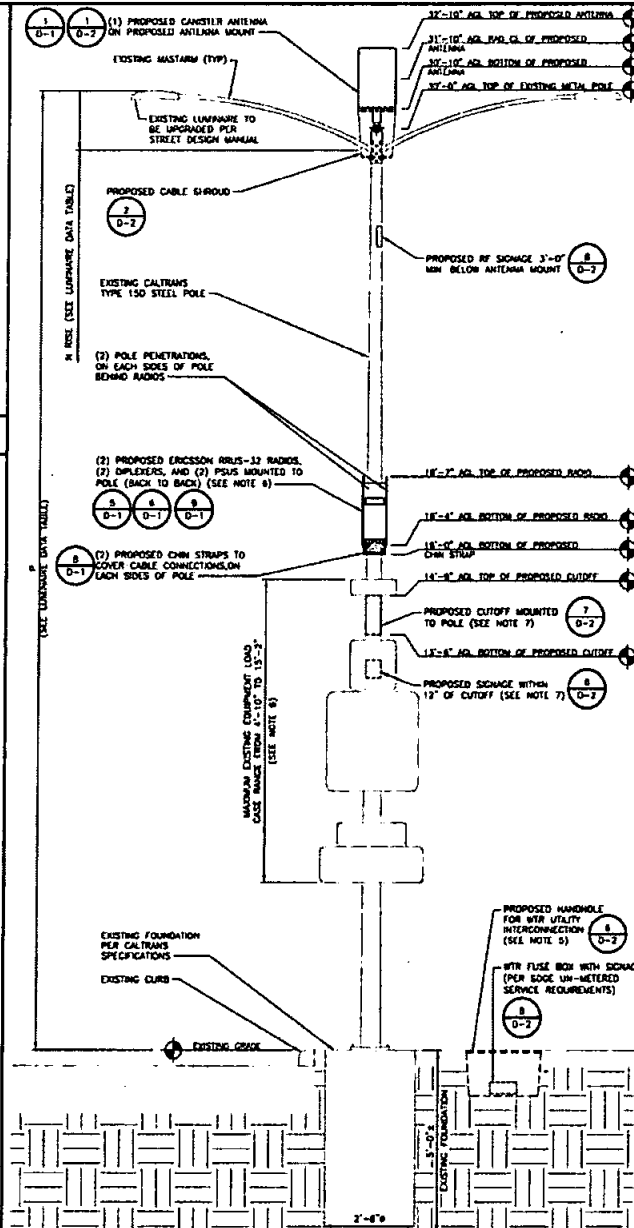
PROJECT DESCRIPTION

- AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:
- INSTALL (1) CANISTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-27150-12P OR EQUAL ANTENNA	33.3	33.3
2	ERICSSON RRUS-32 RADIO & PSU AC DB UNIT	62.21	124.42
2	RP'S FDP4020AD4-NC DIPLEXER	3.1	6.2
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHN STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	PACTECOSOL PFS80122 CUTOFF	12	12
	TOTAL		225.83

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

- A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSIGNED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE AASHTO 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
- THE GENERAL CONTRACTOR SHOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
- A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
- ELECTRICAL CONDUIT SHALL BE GROUNDING ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

- ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
- WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 1-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
- EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
- NO CHIPPING OF FOUNDATION.
- HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY. ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
- ACTUAL EXISTING SHROUD AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
- POLE MOUNTED CUTOFF AND ASSOCIATED SHROUD ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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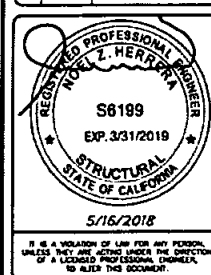
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BLACK & VEATCH CORPORATION
1000 WILLOW CREEK RD
SUITE #300
SAN DIEGO, CA 92131

PTS NUMBER

593784

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1	05/16/18	REVISED FOR COMMENTS
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3	05/16/18	REVISED FOR COMMENTS
4	05/16/18	REVISED FOR APPROVAL



AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 150 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MS15D-4

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 30' Generic Existing Steel Light Pole
Type 15D
Loading Scenario: Micro-2

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 71.4% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 99.6% Pass
Existing Concrete Pier Foundation: 64.7% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

1. This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
2. Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
3. Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
4. This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
5. This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
6. Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
7. At the time of this structural analysis, exact details were not available for the following items:
 - hardware: (type & model, weight & dimensions)
 - foundation: (type & quantity, soil parameters)
 - signage on poles were assumed

POLE DATA

Type of Material	Steel - 55 ksi	(N/A)	WIND PRESSURE	From Equation: $P_s = 0.00256 K_z K_{zt} G C_f V^2$
Bottom Pole Diameter	8 in		Gust Effect Factor	$G = 1.14$
Top Pole Diameter	3.6875 in		Basic Wind Speed	$V = 120$ mph
Pole Thickness	0.1793 in		Service Wind Speed	$V_s = 76$ mph
Height of Pole	30 ft		Exposure Category	C

LAMP ARM DATA

Type of Material	Steel A500 Gr B	(N/A)
Arm Diameter	3.875 in	
Arm Thickness	0.120 in	
Weight of Arm	22.5 lbs	
Horizontal Length of Arm	12.00 ft	
Total Length of Arm	12.5 ft	

Alterations made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the addition of (1) catwalk unit above the vehicle impact zone on the pole, and the addition of (1) containment system for shielding the sides of the radio units. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Apparatus	Existing or Proposed	Dimensions (in.)			Weight (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		Z On	X On	
Cable Head	Existing	-	-	-	45	1.30	1.90	31.75
ACE ACOR 351SD 13P with some cables	Proposed	15	44	15	69.94	4.58	4.58	31.83
(1) KMLG 42 - (1) MSA AC 08	Proposed	12.05	37.17	9.73	324.87	2.27	1.84	32.45
Chin Strap	Proposed	12.05	6	8.75	10	0.50	0.36	36.08
Ball Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	33.00
Ball Board Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	22.00
Solar Panel	Existing	12	3	12	10	0.25	0.25	35.00
Box	Existing	14	14	3	5	1.36	0.29	32.00
Antenna Support	Existing	11	11	0.1	8	2.54	0.03	30.00
Trailer Sign	Existing	28	6	0.1	2	1.17	0.00	7.00
Street Sign	Existing	48	16	0.1	7	5.33	0.03	8.00
Cable Head	Existing	-	-	-	45	1.30	1.90	31.75
Lamp Arm	Existing	-	-	-	72.5	4.04	4.04	31.63

Total Dead Load = 0.81 kips
Total Moment Due to Dead Load Eccentricities = 0.01 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.54 kips
Total Moment due to Wind in Z Dir = 27.93 kip-ft
Total Wind Force in X Direction = 0.93 kips
Total Moment due to Wind in X Dir = 22.39 kip-ft
Total Torson = 0.03 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.67 kips
Total Moment due to Wind in Z Dir = 11.21 kip-ft
Total Wind Force in X Direction = 0.37 kips
Total Moment due to Wind in X Dir = 6.98 kip-ft
Total Torson = 0.00 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components: Light Pole Compressive Strength Check

ASCE 10
Sec. 5.12

Maximum Factored Axial Load $P_u = 1.01$ kips
Factored Compressive Strength $P_n = 5.37$ kips
Stress Ratio $P_u/P_n = 0.187$ Less than 0.2

Flexural Strength Check

Maximum Factored Bending Moment $M_u = 27.9$ kip-ft
Factored Flexural Strength $M_n = 45.2$ kip-ft
Moment Magnifier Factor (2nd Order Effects) $\delta = 1.01$
Stress Ratio $M_u/M_n = 0.617$

Shear and Torsion Strength Check

Maximum Factored Shear $V_u = 1.80$ kips
Factored Shear Strength $V_n = 47.38$ kips
Stress Ratio $V_u/V_n = 0.038$
Maximum Factored Torson $T_u = 0.03$ kips
Factored Torsional Strength $T_n = 108.67$ kips
Stress Ratio $T_u/T_n = 0.000$
 T_u/T_n - Less than 0.2, torsional and shear effects can be ignored

Combined Flexure/Torsion

Sec. 5.12

$$\frac{P_u}{P_n} + \frac{M_u}{M_n} + \frac{T_u}{T_n} = 0.187 + 0.617 + 0.000 = 0.804 < 1.0$$

Combined Flexure Interaction = 0.714 Pass
Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Components: Lamp Arm

Flexural Strength Check

Maximum Factored Bending Moment $M_u = 2.44$ kip-ft
Factored Flexural Strength $M_n = 6.33$ kip-ft
Stress Ratio $M_u/M_n = 0.385$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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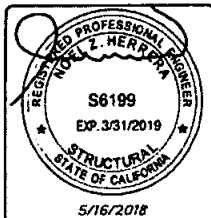
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BLACK & VEATCH CORPORATION
10049 VILLAGE CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

593784

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1	05/16/18	REVISED PER COMMENTS
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3	06/26/18	REVISED PER COMMENTS
4	05/24/18	ISSUED FOR APPROVAL



5/16/2018
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE SUPERVISION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15D STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15D-5

6.6 Base Plate & Anchorage

6.6.1 Base Plate

ASK Results Guide 1

Design Data

Maximum Factored Bending Moment (per moment magnifier)	$M_u = 78.21$	k-in	(ref. Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	$P_u = 1.01$	kips	(ref. Analysis & Design Section 6.2.1)
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$B = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.65$		Sec. 6.5.5.2
Base Plate Thickness	$t_p = 1.5$	in	
Anchor Rod Edge Distance	$e_{ar} = 1.25$	in	



Fig. 6.6.1 Base plate with small moment

Design Method: Small or Large Moment Base Plates

Sec. 6.6

Equivalent Eccentricity	$e = \frac{M_u}{P_u} = 78.21$	in	Eq. 6.6.1
Maximum Bearing Stress	$f_{max} = \frac{P_u}{B} \left(1 + \frac{6e}{B} \right) = 1.86$	ksi	Sec. 6.6
Maximum Bearing Pressure	$f_{max} = \frac{P_u}{B} \left(1 + \frac{6e}{B} \right) = 15.9$	ksi	Eq. 6.6.1
Critical Eccentricity	$e_{crit} = \frac{B}{6} = 2.0$	in	Eq. 6.6.2

Base Plate Design Method: Small Moment = $M_u \leq 5 P_u e_{crit}$
Large Moment = $M_u > 5 P_u e_{crit}$

Design Method = Large Moment Base Plate

Sec. 6.6.2

Base Plate Size Check: $F_y = 36$ ksi, $t_p = 1.5$ in, $B = 12$ in, $L = 12$ in

Eq. 6.6.3

$$f_{max} = \frac{P_u}{B} \left(1 + \frac{6e}{B} \right) = 1.86 \text{ ksi}$$

$$f_{max} = \frac{P_u}{B} \left(1 + \frac{6e}{B} \right) = 15.9 \text{ ksi}$$

$$f_{max} = \frac{P_u}{B} \left(1 + \frac{6e}{B} \right) = 15.9 \text{ ksi}$$

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$$f_{max} = \frac{P_u}{B} \left(1 + \frac{6e}{B} \right) = 15.9 \text{ ksi}$$

6.6.2 Anchorage Check

ASK Results Guide 1

Design Data

Maximum Factored Tension	$T_u = 2.1$	kips	(ref. Section 6.5.1)
Maximum Factored Shear	$V_u = 1.80$	kips	(ref. Section 6.2.1)
Number of Rods in Both Tension & Shear	$n = 4$		
Factored Tension per Anchor Rod	$T_{ar} = 0.5$	kips	
Factored Shear per Anchor Rod	$V_{ar} = 0.45$	kips	
Anchor Rod Diameter	$D = 1.25$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Reinforced Concrete Connections

Sec. 18.10.1.2

Normal Unstressed Area of Anchor Rod	$A_n = 1.23$	in ²	Table 18.2
Normal Tensile Stress of Anchor Rod	$F_u = 43.50$	ksi	Table 18.2
Normal Shear Stress of Anchor Rod	$F_u = 28.10$	ksi	Table 18.2
Required Shear Stress of Anchor Rod	$F_u = 0.37$	ksi	Sec. 18.10.1.2
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 18.10.1.2
Normal Tensile Stress Modified to Include Shear Stress	$F_u = 43.50$	ksi	Sec. 18.10.1.2
Normal Tensile Strength of Anchor Rod	$R_n = F_u A_n$	kips	Eq. 18.2
Factored Tensile Strength of Anchor Rod	$\phi R_n = 40.0$	kips	Eq. 18.2
Stress Ratio	$\phi R_n = 0.613$	Ratio	Eq. 18.2

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 1.15$	k	
Vertical Force	$V = 0.83$	k	
Height above grade of Lateral Force	$H = 15.71$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf/ft	Table 1806.2
Vertical Soil bearing Capacity	$S_v = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
Final Depth	$D_{final} = 0.35$	ft	

Applicable Equation

$$Q_{ult} = (4.25 P H / S_v B)^{0.5} \quad (\text{IBC 2012 Eq. 18-7})$$

Lateral Soil Bearing Capacity	$F = S = 0.10$	ksf/ft
Allowable lateral pressure at "D"	$S_v = F \times S = 0$	ksf
Required Calculated Depth	$Q_{ult} = 5.35$	ft

Vertical Soil bearing Check:

$$Q_{ult} = (0.83 \times 4.91 \times 5.35 \times 0.15)^{0.5} / 4.91$$

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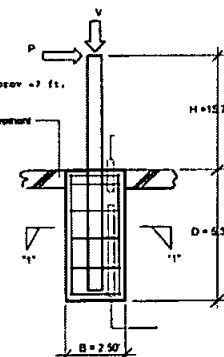
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SAN DIEGO, CA 92121



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BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

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1	02/16/18	REVISED PER COMMENTS
2	02/16/18	REVISED PER COMMENTS
3	02/16/18	REVISED PER COMMENTS
4	02/16/18	REVISED PER COMMENTS
5	02/16/18	REVISED PER COMMENTS
6	02/16/18	REVISED PER COMMENTS
7	02/16/18	REVISED PER COMMENTS
8	02/16/18	REVISED PER COMMENTS
9	02/16/18	REVISED PER COMMENTS
10	02/16/18	REVISED PER COMMENTS



5/16/2018

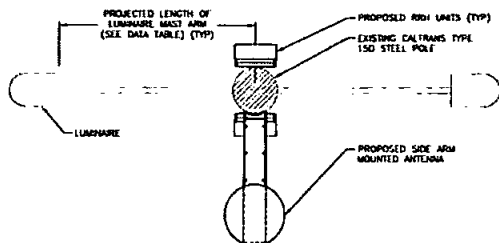
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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15D STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15D-6



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	N RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
8'-0"	2'-0"	3'-1/4"	0.1196"	TYPE 150
8'-0"	2'-0"	3'-1/2"		31'-6"
10'-0"	3'-3"	3'-7/8"		32'-0"
12'-0"	4'-3"	3'-7/8"		33'-6"

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

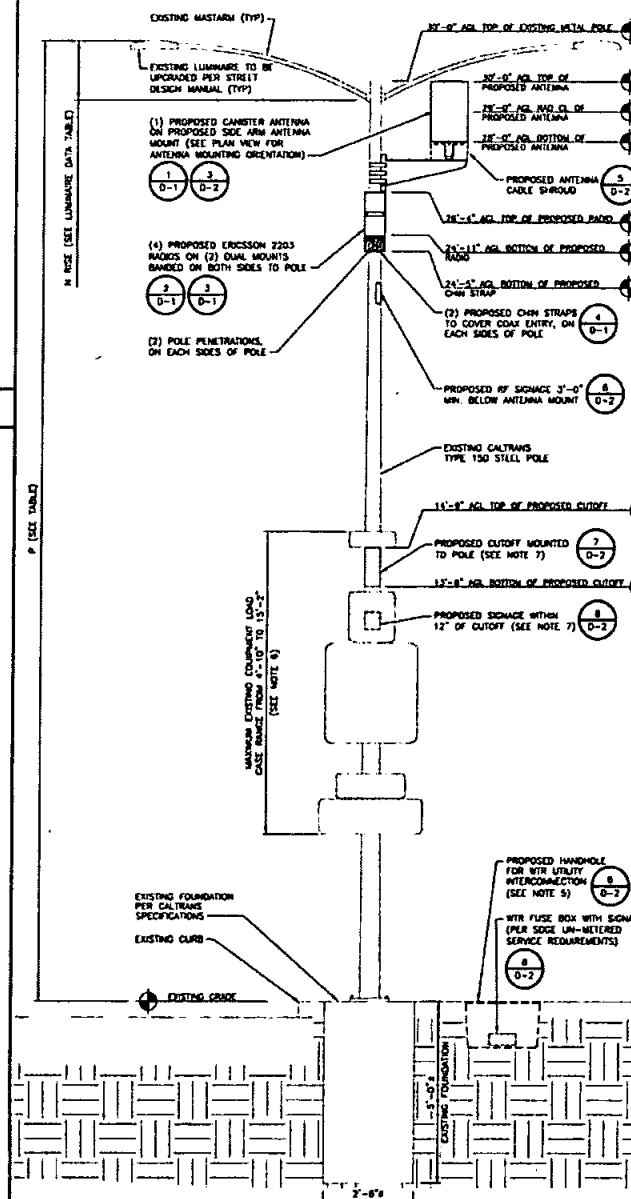
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANISTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (4) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-27150-12P ON EQUAL ANTENNA	33.3	33.3
4	ERICSSON RRUS-2203 RADIO	14.4	57.6
1	SIDE ARM ANTENNA MOUNT BRACKET	25	25
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHIN STRAP	5	10
1	PANTECHSOL PT390123 CUTOFF	12	12
	TOTAL		152.9

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

- A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFLECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET LIGHT POLE WILL FULLY COMPLY WITH THE RASHED 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
- THE GENERAL CONTRACTOR SHOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
- A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION HANDLER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
- ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ASSUMPTION NOTES

- ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
- WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 1-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
- EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
- NO CHIPPING OF FOUNDATION.
- HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY. ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
- ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
- POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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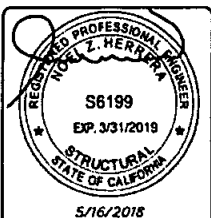
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10089 WILLOW CREEK RD
SUITE 8350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	04/26/18	REVISED PER COMMENTS
2	06/14/18	REVISED PER COMMENTS
3	06/14/18	REVISED PER COMMENTS
4	06/26/18	ISSUED FOR APPROVAL



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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 150 STREET LIGHT POLE WITH SIDE ARM ANTENNA MOUNT AND PICO RADIO EQUIPMENT SCHEMATIC

SHEET NUMBER

MS15D-7

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 30' Generic Existing Steel Light Pole
Type 15D
Loading Scenario: Pico-3

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 71.1% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 77.0% Pass
Existing Concrete Pier Foundation: 64.7% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

1. This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
2. Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to: missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
3. Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to: replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
4. This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
5. This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
6. Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
8. At the time of this structural analysis, exact details were not available for the following items:
 - hardware: (type & model, weight & dimensions)
 - foundation: (type, size and quantity, soil parameters)
 - signage on poles were assumed.

POLE DATA

Type of Material	Steel - SS	(N/A)	WIND PRESSURES
Bottom Pole Diameter	6 in		Topographic Factor: $P_z = 0.00756K_zK_{zt}(G/H)^{1/4}$
Top Pole Diameter	7.625 in		G = 1.14
Pole Thickness	0.1793 in		Basic Wind Speed: $V = 120$ mph
Height of Pole	30 ft		Service Wind Speed: $V_{st} = 76$ mph
			Exposure Category: C

LAMP/ARM DATA

Type of Material	Steel A500 Gr B	(N/A)
Arm Diameter	1.875 in	
Arm Thickness	0.120 in	
Weight of Arm	72.5 lbs	
Horizontal Length of Arm	12.00 ft	
Total Length of Arm	12.5 ft	

*Alterations made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the addition of (1) cut-off and above the vehicle impact zone of the pole. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appendances	Existing or Proposed	Dimensions (in)			Weight (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		z Dir	x Dir	
Color Head	Existing	-	-	-	45	1.80	1.80	33.75
ALL ACOM 2015D 120 with cable all	Proposed	15	11.5	15	17.8	3.28	3.28	28.69
Side Arm Mount	Proposed	34.5	34.5	8	25	1.24	0.60	26.77
Chen Strap	Proposed	3	6	3	5	0.11	0.11	23.67
2015 ACOM 2015 2203	Proposed	4.11	17.1	7.87	28.8	0.49	0.93	25.62
2015 ACOM 2015 2203	Proposed	4.11	17.1	7.87	28.8	0.49	0.93	25.62
Ball Mount Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	23.00
Ball Mount Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	22.00
Tower Panel	Existing	12	8	12	10	0.25	0.25	15.00
Box	Existing	14	14	3	5	1.86	0.75	12.00
Production Signage	Existing	33	33	0.1	8	7.56	0.02	10.00
Traffic Sign	Existing	28	8	0.1	2	1.17	0.00	7.00
Unid Sign	Existing	48	16	0.1	7	5.17	0.01	6.00
Color Head	Existing	-	-	-	45	1.80	1.80	33.75
Lamp Arm	Existing	-	-	-	72.5	4.04	4.04	31.63

Total Dead Load = 0.73 kips
Total Moment Due to Dead Load Eccentricity = 0.11 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.53 kips
Total Moment due to Wind in Z Dir = 28.70 kip-ft
Total Wind Force in X Direction = 0.93 kips
Total Moment due to Wind in X Dir = 22.71 kip-ft
Total Torsion = 0.20 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.61 kips
Total Moment due to Wind in Z Dir = 11.11 kip-ft
Total Wind Force in X Direction = 0.57 kips
Total Moment due to Wind in X Dir = 9.11 kip-ft
Total Torsion = 0.08 kip-ft

6.1 Structural Components Capacity Checks

6.1.1 Structural Components Capacity Checks

Maximum Factored Axial Load: $P_u = 0.91$ kips
Factored Compressive Strength: $\phi_c P_n = 3.57$ kips
Shear Ratio: $\phi_v P_n = 0.164$ Less than 0.2

Flexural Strength Check

Maximum Factored Bending Moment: $M_u = 28.7$ kip-ft
Factored Flexural Strength: $\phi_b M_n = 49.3$ kip-ft
Moment Magnifier Factor (2nd Order Effect): $\delta = 1.01$
Shear Ratio: $M_u/P_u = 0.162$

Warp and Torsion Strength Check

Maximum Factored Torsion: $T_u = 1.79$ kips
Factored Torsional Strength: $\phi_t T_n = 47.98$ kips
Shear Ratio: $T_u/P_u = 0.248$
Minimum Factored Torsion: $T_u = 0.20$ kips
Factored Torsional Strength: $\phi_t T_n = 108.67$ kips
Shear Ratio: $T_u/P_u = 0.003$
1/P = Less than 0.2, torsion and shear effects can be ignored

Combined Forces Interaction

$$\frac{P_u}{\phi_c P_n} + \frac{M_u}{\phi_b M_n} + \frac{T_u}{\phi_t T_n} = 0.164 + 0.572 + 0.003 = 0.739 < 1.0$$

Combined Forces Interaction = 0.739 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.1.2 Structural Components Capacity Checks

Flexural Strength Check

Maximum Factored Bending Moment: $M_u = 2.44$ kip-ft
Factored Flexural Strength: $\phi_b M_n = 0.23$ kip-ft
Shear Ratio: $M_u/P_u = 0.182$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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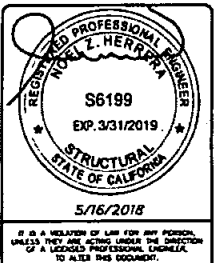
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10008 WILLOW CREEK RD
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SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	05/16/18	REVISED PER COMMENTS
2	05/17/18	REVISED PER COMMENTS
3	06/26/18	REVISED PER COMMENTS
4	06/26/18	REVISED FOR APPROVAL



AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15D STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15D-8

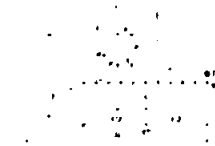
6.6 Base Plate & Anchorage

6.6.1 Base Plate

AKC Design Guide 1

Design Data

Maximum Factored Bending Moment (at moment magnifier)	$M_u = 26.42$	kip-ft	per Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	$P_u = 9.91$	kip	per Analysis & Design Section 6.2.1)
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$N = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.85$		Sec. 5.3.2.2
Base Plate Thickness	$t_p = 1.5$	in	
Anchor Rod Edge Distance	$L_{ar} = 1.25$	in	



Design Method - Small or Large Moment Base Plates

Sec. 3.4

Equivalent Eccentricity	$e = \frac{M_u}{P_u}$	in	31	in	Eq. 3.3.6
Maximum Bearing Stress	$f_{max} = \frac{P_u}{A_g} \left(1 + \frac{6e}{N} \right)$	ksi	1.66	ksi	Sec. 3.5
Maximum Bearing Pressure	$q_{max} = 1.5 f_{max}$	ksi	15.9	ksi	Eq. 3.3.4
Critical Eccentricity	$e_{crit} = \frac{N}{6}$	in	6.0	in	Eq. 3.3.7

Base Plate Design Method	Design Method - Large Moment Base Plate	Sec. 3.3.2.4
Bract Moment = $\phi_c F_y A_g$		
Large Moment = $\phi_c F_y A_g$		

Base Plate Design Check	$\phi_c F_y A_g \geq M_u$	Eq. 3.3.4
	$115.8 \geq 26.42$	
	OK = Plate Size OK	

Bearing Length	$Y = \sqrt{\frac{2M_u}{\phi_c F_y}}$	in	0.15	in	Eq. 3.3.2
Factored Anchor Rod Tension	$T_u = P_u \left(\frac{e}{N} - 1 \right)$	kip	2.2	kip	Eq. 3.3.2

Base Plate Thickness Check

Base Plate Yielding Limit at Bearing Interface	$t_p \geq \sqrt{\frac{F_y}{\phi_c f_{max}}}$	in	2.2	in	Sec. 3.4.2
Check = $t_p \geq t_{req}$, Use Eq. 3.3.15a-2					

$$t_{req} = \sqrt{\frac{F_y}{\phi_c f_{max}}} = \sqrt{\frac{36}{0.85 \times 15.9}} = 1.5 \text{ in}$$

Required Base Plate Thickness	$t_{req} = 1.5$	in	0.26	in	Eq. 3.3.15a-2
-------------------------------	-----------------	----	------	----	---------------

Base Plate Yielding Limit at Tension Interface	$t_p \geq \sqrt{\frac{F_y}{\phi_c f_{max}}}$	in	0.34	in	Eq. 3.4.4
Continuous Length (After Bolting to Pier Thickness Center)	$t_p \geq \sqrt{\frac{F_y}{\phi_c f_{max}}}$	in	0.14	in	Eq. 3.4.6

Maximum Required Base Plate Thickness	$t_{req} = 0.34$	in	0.26	in	
Base Plate Thickness	$t_p = 1.5$	in			
Stress Ratio	$SR = 0.172$	Pass			

6.6.2 Anchorage Check

AKC Sec. 3.1

Design Data

Maximum Factored Tension	$T_u = 2.2$	kip	(ref Section 6.2.1)
Maximum Factored Shear	$V_u = 1.76$	kip	(ref Section 6.2.1)
Number of Bolts in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{ar} = 0.55$	kip	
Factored Shear per Anchor Rod	$V_{ar} = 0.44$	kip	

Anchor Rod Diameter	$D = 1.25$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Bearing-Type Connections

Sec. 3.10.1-125

Nominal Unstressed Area of Anchor Rod	$A_n = 1.23$	in ²	
Nominal Tensile Stress of Anchor Rod	$F_u = 43.50$	ksi	Table 3.2.2
Nominal Shear Strength of Anchor Rod	$F_u = 26.10$	ksi	Table 3.2.2
Required Shear Stress of Anchor Rod	$L_u = 0.36$	ksi	Sec. 3.10.1-125
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 3.10.1-125
Nominal Tensile Stress Modified to Include Shear Stress	$F_u = 43.97$	ksi	Sec. 3.10.1-125

Nominal Tensile Strength of Anchor Rod	$R_t = F_u A_n$	kip	Eq. 3.2
Factored Tensile Strength of Anchor Rod	$\phi R_t = 40.0$	kip	Eq. 3.2
Stress Ratio	$SR = 0.014$	Pass	

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 1.15$	k	
Vertical Force	$V = 0.83$	k	
Height above grade of Lateral Force	$H = 15.71$	ft	
Diameter of Pier	$D = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
Final Depth	$D_{req} = 5.35$	ft	

Applicable Equation

$$D_{req} = (4.25 P H / S) / F^3 \quad (\text{IBC 2012 Eq. 18.2})$$

Lateral Soil Bearing Capacity	$F \times S = 0.20$	ksf	
Allowable lateral pressure at "D"	$S_2 = F \times S \times D = 1.07$	ksf	
Required Calculated Depth	$D_{req} = 5.35 \text{ ft} \times D_{prev} \times 1.1 \text{ etc.}$		

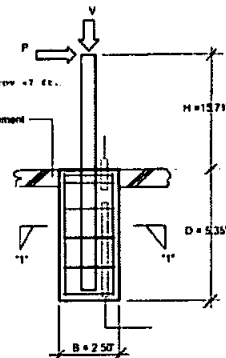
Vertical Soil bearing Check

(Section 1807.3.2.3)

$$Q_{ult} = (0.83 \times 4.91 \times 5.35 \times 0.15) / 4.91$$

$$= 0.97 \text{ ksf}$$

$$64.7\% \quad \text{OK}$$



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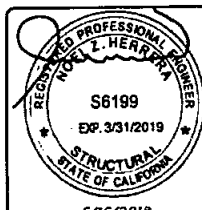
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SUITE #350
SAN DIEGO, CA 92131

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4	03/16/18	REVISED FOR APPROVAL



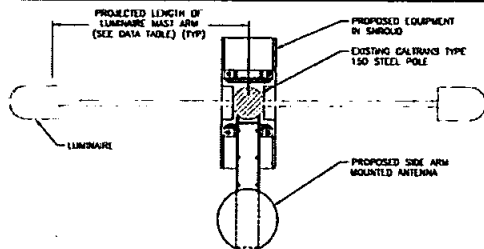
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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 150 STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15D-9



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	N RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
8'-0"	2'-0"	3-1/4"	0.1196"	TYPE 150
8'-0"	2'-0"	3-1/4"		31'-6"
10'-0"	2'-0"	3-1/4"		32'-0"
12'-0"	2'-0"	3-1/4"		32'-6"

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

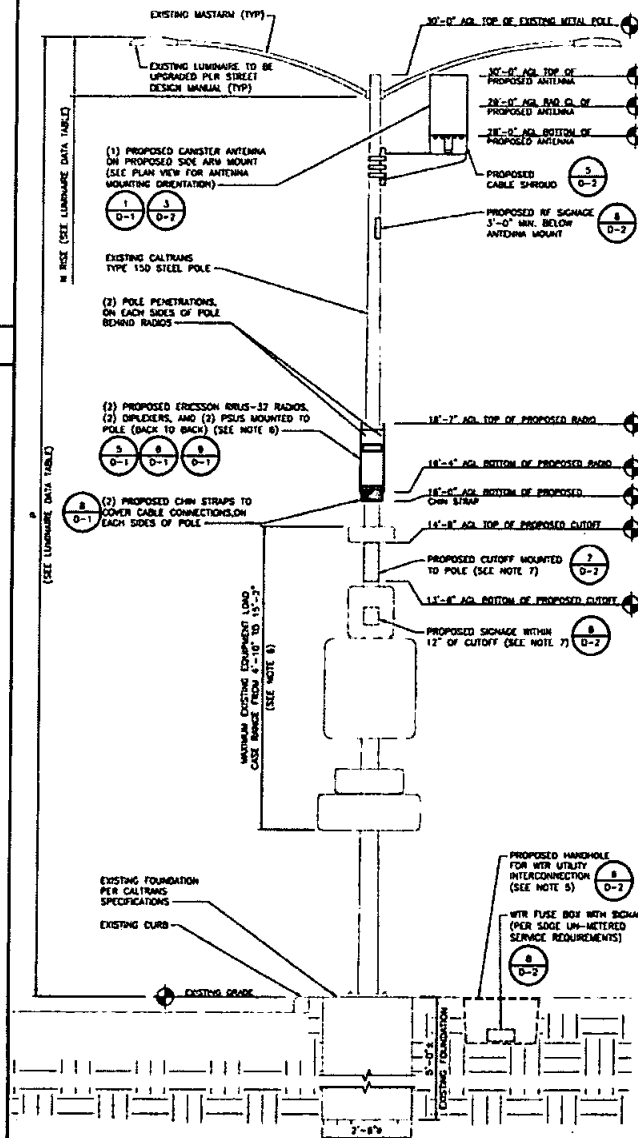
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CAMSTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-2F150-12P OR EQUAL ANTENNA	33.3	33.3
2	ERICSSON RRUS-32 RADIO & PSU AC DB UNIT	62.21	124.42
2	RF'S FOR 40302044-HC DIPLEXER	3.1	6.2
1	SIDE ARM ANTENNA MOUNT BRACKET	25	25
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHM STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	PACTECBOL PTEB0122 CUTOFF	12	12
TOTAL			228.97

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE AASHTO 2013 REQUIREMENTS. THE EXISTING STREET POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR WOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER OF RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF I-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE ORIGINAL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED FOR THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.

GENERAL NOTES



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SAN DIEGO, CA 92121



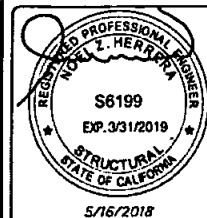
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	05/16/18	REVISED PER COMMENTS
2	05/16/18	REVISED PER COMMENTS
3	06/26/18	REVISED PER COMMENTS
4	03/26/18	ISSUED FOR APPROVAL



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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 150 STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MS15D-10

Site Information:

Address: San Diego, CA
 Description: 30' Generic Existing Steel Light Pole
 Type 15D
 Loading Scenario: Micro-4

Applicable Codes:

AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 73.5% Pass
 Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 77.9% Pass
 Existing Concrete Pier Foundation: 64.7% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

- This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
- Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
- Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
- This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
- This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
- Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
- At the time of this structural analysis, exact details were not available for the following items:
 - luminaire: (type & model, weight & dimensions)
 - foundation rebar dia and quantity, soil parameters
 - signages on poles were assumed.

POLE DATA

Type of Material: Steel - 55 ksi (N/A)
 Bottom Pole Diameter: 8 in
 Top Pole Diameter: 16.875 in
 Pole Thickness: 0.1793 in
 Height of Pole: 30 ft

WIND PRESSURE

From Equation: $P_z = 0.00256 K_z K_{zt} G Z V^2$
 Gust Effect Factor: $G = 1.14$
 Basic Wind Speed: $V = 120$ mph
 Service Wind Speed: $V_{90} = 75$ mph
 Exposure Category: C

LAMP ARM DATA

Type of Material: Steel A500 Gr B (N/A)
 Arm Diameter: 1.875 in
 Arm Thickness: 0.120 in
 Weight of Arm: 77.5 lbs
 Horizontal Length of Arm: 12.00 ft
 Total Length of Arm: 12.5 ft

*Modifications made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These modifications include: the addition of (1) catwalk and (2) antenna mounting system on the pole, and the addition of (1) concealing system for obscuring the faces of the road units. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appendances	Existing or Proposed	Dimensions (in)			Weight (lbs)	Effective Projected Area (sq ft)		Elevation (ft)
		W	H	D		Z Dir	X Dir	
Cable Head	Existing	-	-	-	45	1.30	1.30	11.75
ACE ACORN 27 15D 12P with concealment	Proposed	15	11.5	15	27.8	3.28	3.28	28.68
Side Arm Mount	Proposed	18.5	14.5	6	75	1.78	0.60	26.77
12' BRUS 32 x (2) PMU AC OR	Proposed	17.05	27.17	6.75	114.42	2.37	1.84	17.45
Chen Sign	Proposed	17.05	6	6.75	10	0.50	0.36	16.04
Ball Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	21.00
Ball Board Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	22.00
Yoke Panel	Existing	12	3	12	10	0.25	0.25	15.00
Box	Existing	14	14	3	5	1.36	0.75	12.00
Undermount Signage	Existing	23	11	0.1	8	7.56	0.02	10.00
Trunk Sign	Existing	28	6	0.1	7	1.12	0.00	7.00
Street Sign	Existing	48	16	0.1	7	5.13	0.01	6.00
Cable Head	Existing	-	-	-	45	1.30	1.30	11.75
Lamp Arm	Existing	-	-	-	72.5	4.04	4.04	11.63

Total Dead Load = 0.80 kips
 Total Moment due to Dead Load Eccentricities: 0.16 kip-ft

Strength Design Wind Loads

Total Wind Force in X Direction = 1.59 kips
 Total Moment due to Wind in Z Dir = 28.25 kip-ft
 Total Wind Force in Z Direction = 0.93 kips
 Total Moment due to Wind in X Dir = 22.03 kip-ft
 Total Torsion = 0.22 kip-ft

Service Design Wind Loads

Total Wind Force in X Direction = 0.64 kips
 Total Moment due to Wind in Z Dir = 11.59 kip-ft
 Total Wind Force in Z Direction = 0.37 kips
 Total Moment due to Wind in X Dir = 8.84 kip-ft
 Total Torsion = 0.09 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components: Luminaire Pole Concealing System Strength Check

AASHTO Sec. 9.12

Maximum Factored Axial Load: $P_u = 3.00$ kips
 Factored Compressive Strength: $P_n = 5.17$ kips
 Stress Ratio: $P_u/P_n = 0.100$ Less than 0.2

Strength Checks

Maximum Factored Bending Moment: $M_u = 28.6$ kip-ft
 Factored Flexural Strength: $M_n = 45.2$ kip-ft
 Moment Magnifier Factor (1st Order Effects): $\delta = 1.01$
 Stress Ratio: $M_u/M_n = 0.645$

Shear and Torsion Strength Checks

Maximum Factored Shear: $V_u = 1.84$ kips
 Factored Shear Strength: $V_n = 47.38$ kips
 Stress Ratio: $V_u/V_n = 0.039$

Maximum Factored Torsion: $T_u = 0.22$ kips
 Factored Torsional Strength: $T_n = 108.67$ kips
 Stress Ratio: $T_u/T_n = 0.002$
 T_u/T_n - Less than 0.2, torsional and shear effects can be ignored

Combined Forces Interaction

Sec. 9.12

$$\frac{P_u}{P_n} + \frac{M_u}{M_n} + \frac{T_u}{T_n} = 0.100 + 0.645 + 0.002 = 0.747 < 1.0$$

Combined Forces Interaction = 0.745 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Components: Lamp Arm

Strength Checks

Maximum Factored Bending Moment: $M_u = 2.44$ kip-ft
 Factored Flexural Strength: $M_n = 5.17$ kip-ft
 Stress Ratio: $M_u/M_n = 0.105$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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 SAN DIEGO, CA 92121



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BLACK & VEATCH CORPORATION
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 SUITE 8350
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5/16/2018

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AT&T SMALL CELL (CRAN) PROJECT
 MASTER STRUCTURAL PLAN

EXISTING TYPE 15D STREET LIGHT POLE WITH SIDE ARM ANTENNA MOUNT AND MICRO RADIO EQUIPMENT STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15D-11

6.4 Base Plate & Anchorage

6.4.1 Base Plate

ASCE Design Guide 1

Design Data			
Maximum Factored Bending Moment (for moment magnifier)	$M_u = 29.18$	kip-ft	(ref Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	$P_u = 1.00$	kip	(ref Analysis & Design Section 6.2.1)
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$N = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.85$		Sec. 5.5.2.2
Base Plate Thickness	$t_p = 1.5$	in	
Anchor Rod Edge Distance	$e_{ar} = 1.25$	in	

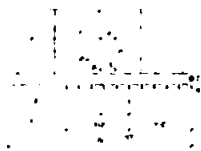


Fig. 6.4.1 Base plate with small moment

Design Method: Small or Large Moment Base Plates

Sec. 3.4

Equivalent Eccentricity	$e = \frac{M_u}{P_u} = 29$	in	Eq. 3.2.8
Maximum Bearing Stress	$f_{max} = 0.4(1 + \frac{6e}{N}) \sqrt{\frac{P_u}{B}}$	ksi	Sec. 4.6
Maximum Bearing Pressure	$f_{max} = 1.66$	ksi	Eq. 3.2.7
Check Eccentricity	$e = \frac{M_u}{P_u} = 29$	in	Eq. 3.2.7
Base Plate Design Method	Small Moment: $e \leq 5$ in Large Moment: $e > 5$ in		Design Method - Large Moment Base Plate Sec. 3.2.4

Base Plate Check			Eq. 3.4.4
$\left(\frac{f_{max}}{F_y} \right)^2 + \left(\frac{P_u}{\phi_c F_y A_g} \right)^2 \leq 1$	$f_{max} = 1.66$	ksi	
$2P_u / \phi_c F_y A_g \leq 1$	$P_u = 1.00$	kip	
Check - Plate Size OK			

Bearing Length	$L = \left(\frac{P_u}{\phi_c F_y B} \right) \left(\frac{1}{1 + \frac{6e}{N}} \right) \sqrt{\frac{1}{1 + \frac{6e}{N}}}$	in	Eq. 3.4.3
Factored Anchor Rod Tension	$T_u = P_u (1 - \frac{e}{N})$	kip	Eq. 3.4.2

Base Plate Thickness Check			Sec. 3.4.2
Base Plate Yielding Limit at Bearing Interface	$t_p = 7.2$	in	
Check - $t_p \geq 7.2$ in, Use Eq. 3.3.15a-2			

Required Base Plate Thickness	$t_{req} = 0.26$	in	Eq. 3.3.15a-2
-------------------------------	------------------	----	---------------

Base Plate Yielding Limit at Tension Interface	$t_p = 0.84$	in	Eq. 3.4.6
Required Base Plate Thickness	$t_{req} = 0.84$	in	Eq. 3.4.6

Maximum Required Base Plate Thickness	$t_{max} = 0.26$	in	
Base Plate Thickness	$t_p = 1.50$	in	
Stress Ratio	$SR = 0.176$	Pass	

6.4.2 Anchor Rod Check

ASCE Design Guide 1

Design Data			
Maximum Factored Tension	$T_u = 2.7$	kip	(ref Section 6.3.1)
Maximum Factored Shear	$V_u = 1.84$	kip	(ref Section 6.2.1)
Number of Rods in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{ar} = 0.5$	kip	
Factored Shear per Anchor Rod	$V_{ar} = 0.46$	kip	
Anchor Rod Diameter	$D = 1.25$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Bearing-Three Connections			Sec. 3.3.16.1-125
Nominal Unstressed Area of Anchor Rod	$A_n = 1.23$	in ²	
Nominal Tensile Stress of Anchor Rod	$F_t = 43.50$	ksi	Table 23.2
Nominal Shear Stress of Anchor Rod	$F_v = 26.10$	ksi	Table 23.2
Required Shear Stress of Anchor Rod	$F_{vr} = 0.38$	ksi	Sec. 3.3.16.1-125
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 3.3.16.1-125
Nominal Tensile Stress Modified to Include Shear Stress	$F_{tr} = 43.50$	ksi	Sec. 3.3.16.1-125

Nominal Tensile Strength of Anchor Rod	$R_n = F_u A_n$	kip	Eq. 3.2
Factored Tensile Strength of Anchor Rod	$\phi R_n = F_u A_n$	kip	Eq. 3.2
Stress Ratio	$SR = 0.014$	Pass	

Prior with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

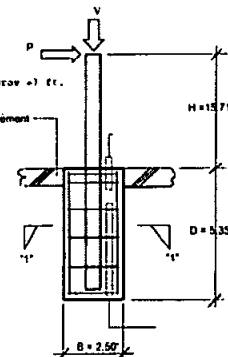
Design Parameters

Lateral Force	$P = 1.15$	k	
Vertical Force	$V = 0.81$	k	
Height above grade of Lateral Force	$H = 15.71$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf	Table 1806.2
Vertical Soil bearing Capacity	$O_{max} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
Tral Depth	$O_{max} = 5.35$	B	

Applicable Equation
 $O_{max} = (4.25 P H / S) B F^*$ (IBC 2012 Eq. 18-2)

Lateral Soil Bearing Capacity	$F = S = 0.20$	ksf	
Allowable lateral pressure at "D"	$S_f = F \times D = 1.07$	ksf	
Required Calculated Depth	$O_{max} = 5.35$	B < D (prov.) = 11 ft	

Vertical Soil bearing Check,	(Section 1807.3.2.3)		
$O_{max} = (0.83 + 4.91 \times 5.35 \times 0.15) / 4.91$			
$= 0.97$	ksf	<	1.50 ksf
OK			



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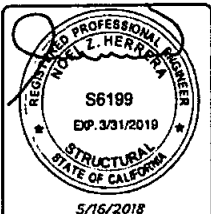
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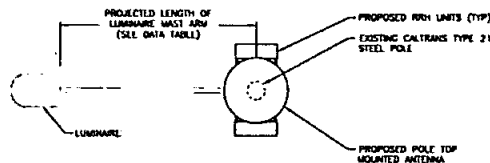
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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15D STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS15D-12



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	H RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
8'-0"	2'-0"	3-1/4"	0.1190"	TYPE 21
8'-0"	2'-0"	3-1/2"		36"-8"
10'-0"	2'-3"	3-1/2"		37'-0"
12'-0"	2'-3"	3-7/8"		38'-8"
15'-0"	4'-0"	4-1/4"		38'-3"

STEEL POLE PLAN VIEW

NO SCALE

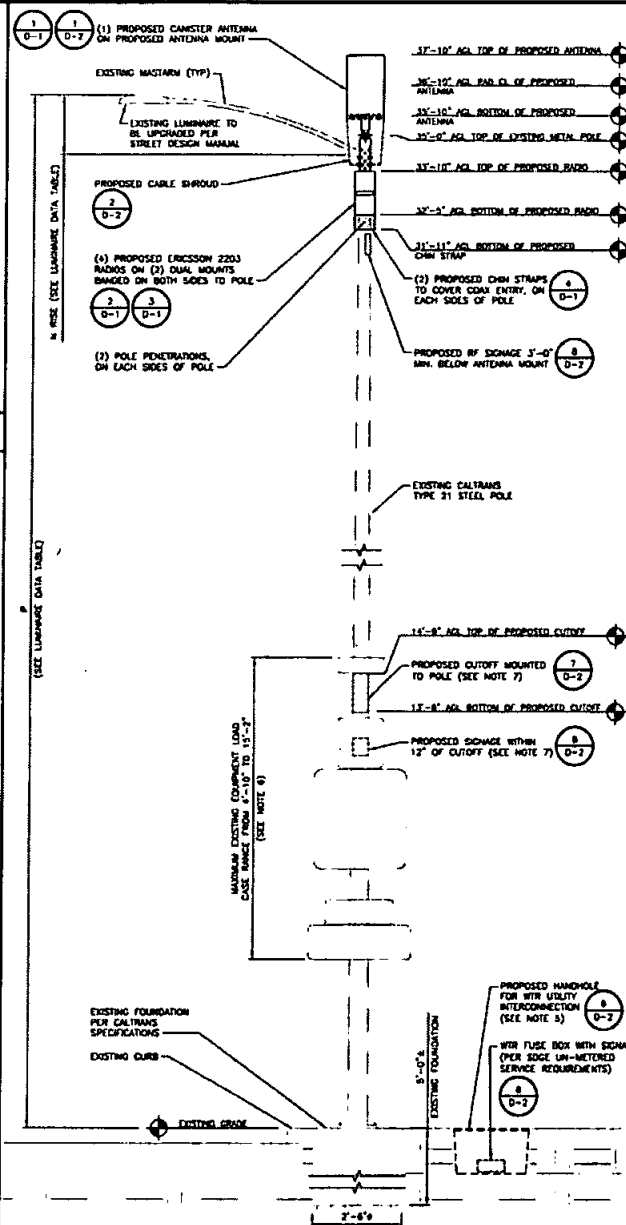
PROJECT DESCRIPTION

- AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:
- INSTALL (1) CANTENNA ANTENNA & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (4) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
 - INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-2F150-13P OR EQUAL ANTENNA	33.3	33.3
4	ERICSSON RRUS-2203 RADIO	14.6	57.6
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	8	8
2	CHIN STRAP	5	10
1	FACTEC-SOL PYS90122 CUTOFF	12	12
TOTAL			149.9

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE AASHTO 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR SHOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 1-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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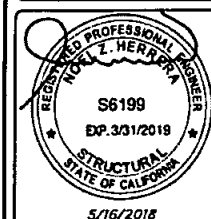
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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21 STREET LIGHT POLE WITH POLE TOP ANTENNA MOUNT AND PICO RADIO EQUIPMENT SCHEMATIC

SHEET NUMBER

MS21-1

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 35' Generic Existing Steel Light Pole
Type 21
Loading Scenario: Pico-1

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 56.2% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 81.7% Pass
Existing Concrete Pier Foundation: 64.0% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

- This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed appearance loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
- Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
- Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
- This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
- This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
- Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
- At the time of this structural analysis, exact details were not available for the following items:
 - luminaire: (type & model, weight & dimensions)
 - foundation rebar dia and quantity, soil parameters
 - signages on poles were assumed.

POLE DATA

Type of Material: Steel - 55 ksi (N/A)
Bottom Pole Diameter: 8.625 in
Top Pole Diameter: 1.5625 in
Pole Thickness: 0.1793 in
Height of Pole: 35 ft

WIND PRESSURE

From Equation: $P_z = 0.0025 K_z K_{zt} G C_F V^2$
Gust Effect Factor: $G = 1.34$
Basic Wind Speed: $V = 120$ mph
Service Wind Speed: $V_{10} = 76$ mph
Exposure Category: C

LAMP ASSEMBLY DATA

Type of Material: Steel A500 Gr. B (N/A)
Arm Diameter: 1.875 in
Arm Thickness: 0.120 in
Weight of Arm: 72.3 lbs
Horizontal Length of Arm: 12.00 ft
Total Length of Arm: 12.5 ft

*Alterations made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the addition of (1) shaft unit above the vehicle impact zone on the pole. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appendices	Existing or Proposed	Dimensions (in)			Weights (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		1 Dir	2 Dir	
Cable Head	Existing	-	-	-	45	1.30	1.30	34.75
ACS ACORN 21150 1.2W with cable head	Proposed	15	44	15	59.94	4.58	4.58	36.00
(2) Extension BBLN 2203	Proposed	4.13	17.1	7.87	28.8	0.49	0.93	33.12
(2) Extension BBLN 2203	Proposed	4.13	17.1	7.87	28.8	0.49	0.93	33.12
B&B Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	23.00
B&B Board Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	23.00
Solar Panel	Existing	33	9	3.2	10	0.25	0.25	15.00
Antenna Signage	Existing	24	14	3	5	1.36	0.29	12.00
Antenna Signage	Existing	33	33	0.1	8	7.54	0.02	10.00
Trailer Sign	Existing	28	6	0.1	2	1.17	0.00	7.00
Trailer Sign	Existing	48	16	0.1	2	5.33	0.01	6.00

Total Dead Load = 0.68 kips
Total Moment Due to Dead Load Eccentricities = 1.00 kip-ft

Strength Design Wind Loads

Total Wind Force in 2 Direction = 1.34 kips
Total Moment due to Wind in 2 Dir = 24.63 kip-ft
Total Wind Force in 1 Direction = 0.79 kips
Total Moment due to Wind in 1 Dir = 20.78 kip-ft
Total Torsion = 1.43 kip-ft

Service Design Wind Loads

Total Wind Force in 2 Direction = 0.54 kips
Total Moment due to Wind in 2 Dir = 9.87 kip-ft
Total Wind Force in 1 Direction = 0.32 kips
Total Moment due to Wind in 1 Dir = 8.34 kip-ft
Total Torsion = 0.57 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components: Light Pole Components: Windward Vents

ASCE 10.12

Maximum Factored Axial Load: $P_u = 0.85$ kips
Factored Compressive Strength: $\phi_c P_n = 4.66$ kips
Stress Ratio: $P_u / \phi_c P_n = 0.182$ less than 0.2

General Strength Check

Maximum Factored Bending Moment: $M_u = 24.6$ kip-ft
Factored Flexural Strength: $\phi_b M_n = 51.8$ kip-ft
Moment Magnifier Factor (2nd Order Effects): $\delta_m = 1.05$
Stress Ratio: $M_u / \phi_b M_n = 0.473$

Shear and Tension Strength Check

Maximum Factored Shear: $V_u = 1.56$ kips
Factored Shear Strength: $\phi_v V_n = 49.47$ kips
Stress Ratio: $V_u / \phi_v V_n = 0.031$
Maximum Factored Tension: $T_u = 1.43$ kips
Factored Tensile Strength: $\phi_t T_n = 103.08$ kips
Stress Ratio: $T_u / \phi_t T_n = 0.014$
 T_u / A_n = Less than 0.2, torsion and shear effects can be ignored

Combined Forces Interaction

Sec. 5.12

$$\frac{P_u}{\phi_c P_n} + \frac{M_u}{\phi_b M_n} + \frac{V_u}{\phi_v V_n} + \frac{T_u}{\phi_t T_n} \leq 1.0$$

Combined Forces Interaction = 0.542 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Components: Lamp Arm

General Strength Check

Maximum Factored Bending Moment: $M_u = 7.48$ kip-ft
Factored Flexural Strength: $\phi_b M_n = 6.75$ kip-ft
Stress Ratio: $M_u / \phi_b M_n = 0.250$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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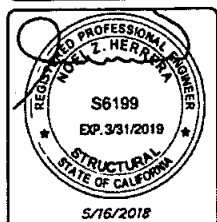
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BLACK & VEATCH CORPORATION
10069 WILLOW CREEK RD
SUITE 8350
SAN DIEGO, CA 92131

PTS. NUMBER

593784

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3	04/10/18	REVISED PER COMMENTS
4	05/29/18	ISSUED FOR APPROVAL



5/16/2018

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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21-2

6.6 Base Plate & Anchorage

6.6.1 Base Plate

ASCE Design Guide 3

Design Data

Maximum Factored Bending Moment (at moment transfer)	$M_u = 24.86$	kip-ft	(ref Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	$P_u = 9.25$	kip	(ref Analysis & Design Section 6.2.1)
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$L = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.65$		Sec. 5.5.2
Base Plate Thickness	$t_p = 7$	in	
Anchor Rod Edge Distance	$e_{ar} = 1.75$	in	

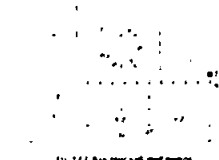


FIG. 6.6.1 Base plate and anchor rods

Design Method: Single or Large Moment Base Plates Sec. 3.4

Equivalent Eccentricity $e = \frac{M_u}{P_u} = 2.69$ in Eq. 3.2.8

Maximum Bearing Stress $f_{pu} = \frac{P_u}{A_g} + \frac{M_u}{S_g} = 1.86$ ksi Sec. 4.6

Maximum Bearing Pressure $f_{pu} = 1.86$ ksi Eq. 3.2.4

Critical Eccentricity $e_c = \frac{P_u}{f_{pu} A_g} = 0.0$ in Eq. 3.2.7

Base Plate Design Method Design Method = Large Moment Base Plate Sec. 3.2.2

Short Moment = $P_u e_c$

Large Moment = $P_u e$

Base Plate Size Check Eq. 3.4.4

$\frac{P_u}{\phi_c F_y A_g} + \frac{M_u}{\phi_b F_y S_g} \leq 1.0$

Check = Plate Size OK

Bearing Length $\ell_b = 8.14$ in Eq. 3.4.3

Factored Anchor Rod Tension $T_u = 1.8$ kips Eq. 3.4.2

Base Plate Thickness Check

Base Plate Yielding Limit at Bearing Interface $t_p = 1.9$ in Sec. 3.4.2

Check = $T_u \leq t_p$ Use Eq. 3.3.15a-2

$t_p = 1.9$ in

$t_p = 1.9$ in

$t_p = 1.9$ in

Required Base Plate Thickness $t_{req} = 0.23$ in Eq. 3.3.15a-2

Base Plate Yielding Limit at Tension Interface

Continuity Length (Red Route in Plate Thickness Corner)

Required Base Plate Thickness $t_{req} = 0.10$ in Eq. 3.3.15a

$t_{req} = 0.10$ in

Maximum Required Base Plate Thickness $t_{req} = 0.23$ in

Base Plate Thickness $t_p = 7$ in

Stress Ratio $SR = 0.112$ Pass

6.6.2 Anchorage Check

ASCE Design Guide 3

Design Data

Maximum Factored Tension	$T_u = 1.8$	kip	(ref Section 6.5.1)
Maximum Factored Shear	$V_u = 1.56$	kip	(ref Section 6.2.1)
Number of Rods in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{ur} = 0.5$	kip	
Factored Shear per Anchor Rod	$V_{ur} = 0.39$	kip	
Anchor Rod Diameter	$D = 1.25$	in	(minimum)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Reinforcing Steel Connections

Normal Unstressed Area of Anchor Rod	$A_n = 1.23$	in ²	Sec. 13.16.1.125
Normal Tensile Stress of Anchor Rod	$f_{tu} = 43.53$	ksi	Table 13.2
Normal Shear Stress of Anchor Rod	$f_{sv} = 26.10$	ksi	Table 13.2
Required Shear Stress of Anchor Rod	$f_{sv} = 0.32$	ksi	Sec. 13.16.1.125
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 13.16.1.125
Normal Tensile Stress Modified to Include Shear Stress	$f_{tu} = 43.53$	ksi	Sec. 13.16.1.125
Normal Tensile Strength of Anchor Rod $R_n = F_u A_n$	$R_n = 53.4$	kip	Eq. 13.2
Factored Tensile Strength of Anchor Rod $\phi R_n = F_u A_n$	$\phi R_n = 40.0$	kip	Eq. 13.2
Stress Ratio	$SR = 0.012$	Pass	

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 1.00$	k	
Vertical Force	$V = 0.75$	k	
Height above grade of Lateral Force	$H = 17.40$	ft	
Diameter of Pier	$D = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
Trail Depth	$D_{req} = 5.40$	ft	

Applicable Equation

$D_{req} = (4.25 P H / S) \sqrt{F}$ (IBC 2012 Eq. 18-2)

Lateral Soil Bearing Capacity

Allowable lateral pressure at "D", $S_s = F \times S = 0.20$ ksf

Required Calculated Depth $D_{req} = 5.40$ ft. $< D_{prov} = 7$ ft.

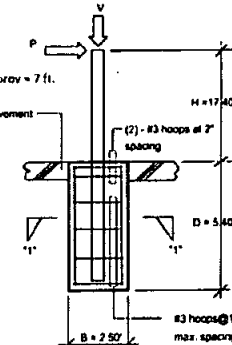
Vertical Soil bearing Check, (Section 1807.3.2.3)

$Q_{ult} = 10.76 + 4.91 \times 5.40 \times 0.15 / 4.91$

$= 0.96$ ksf

$SR = 64$ %

OK



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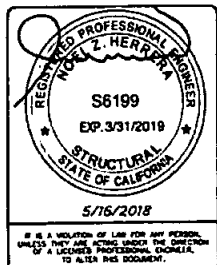
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10005 WILLOW CREEK RD
SUITE #300
SAN DIEGO, CA 92131

PTS NUMBER

593784

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1	01/15/18	REVIEW FOR COMMENTS
2	01/15/18	REVIEW FOR COMMENTS
3	01/26/18	REVIEW FOR COMMENTS
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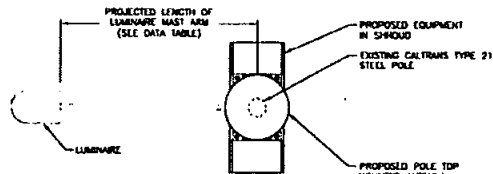


AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21-3



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	N RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
8'-0"	2'-0"	3-1/4"	0.1188"	TYPE 21
8'-0"	2'-0"	3-1/4"		36'-8"
10'-0"	3'-0"	3-1/4"		37'-0"
12'-0"	4'-0"	3-7/8"		38'-8"
15'-0"	6'-0"	4-1/4"		39'-3"

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

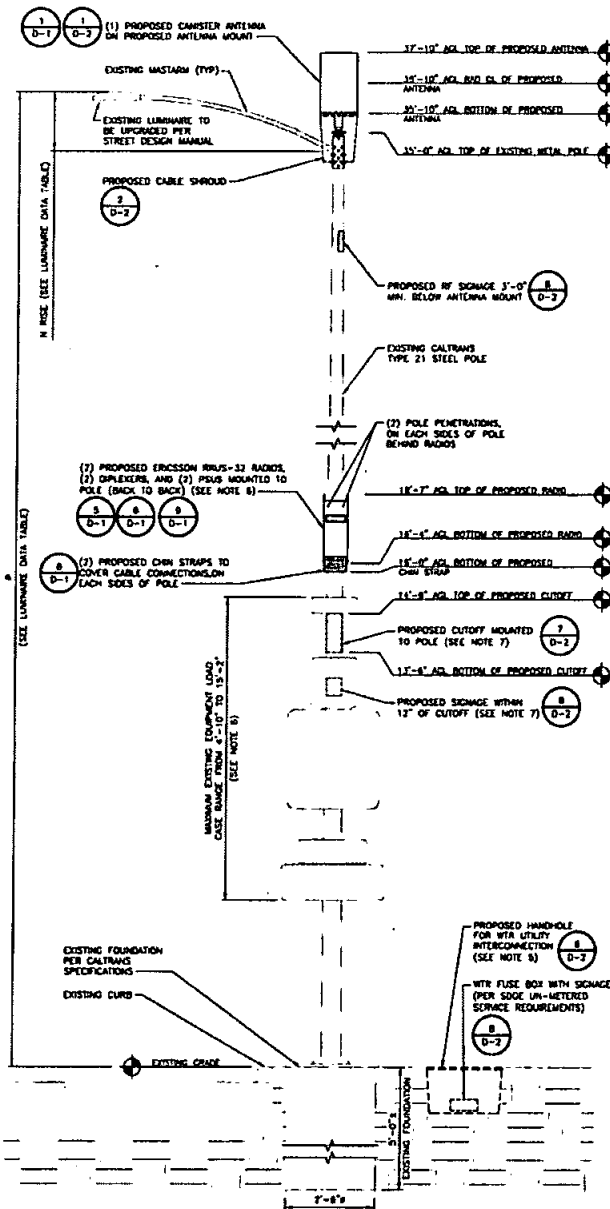
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANTENNA ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACON-3F150-17P OR EQUAL ANTENNA	33.3	33.3
2	ERICSSON RRUS-32 RADIO & PSU AC OR UNIT	61.21	124.42
2	RFS DPL4020A4-NC DUPLEXER	3.1	6.2
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	8	8
2	CHIN STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	PACTEC-HSD, PYSB0122 CUTOFF	12	12
TOTAL			225.92

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET LIGHT POLE WILL FULLY COMPLY WITH THE AASHTO 2010. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR SHALL NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF I-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HMD POLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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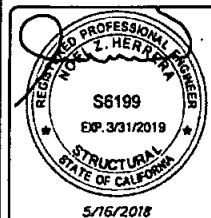
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BLACK & VEATCH CORPORATION
10009 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

593784

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1	06/14/18	REVISED PER COMMENTS
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3	06/26/18	REVISED PER COMMENTS
4	01/26/18	REVISED PER APPROVAL



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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21 STREET LIGHT POLE WITH POLE TOP ANTENNA MOUNT AND MICRO RADIO EQUIPMENT SCHEMATIC

SHEET NUMBER

MS21-4

Site Information: Address: San Diego, CA
Description: 35' Generic Existing Steel Light Pole
Type 21
Loading Scenario: Micro-2

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: **62.4% Pass**
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: **78.4% Pass**
Existing Concrete Pier Foundation: **64.0% Pass**

ASSUMPTIONS, DISCLAIMERS, AND NOTES

1. This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed appearance loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
2. Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
3. Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
4. This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
5. This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
6. Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
8. At the time of this structural analysis, exact details were not available for the following items:
 - luminaire (type & model, weight & dimensions)
 - foundation rebar dia and quantity, soil parameters
 - signages on poles were assumed.

POLE DATA

Item	Value	Unit
Type of Material	Steel - SS	(N/A)
Bottom Pole Diameter	8.625 in	
Top Pole Diameter	3.5625 in	
Pole Thickness	0.1791 in	
Height of Pole	35 ft	

WIND PRESSURE

Item	Value	Unit
From Equation $P_z = 0.00256 K_z K_{zt} K_d V^2$		
Gust Effect Factor	0.9	
Basic Wind Speed	120	mph
Service Wind Speed	76	mph
Exposure Category	C	

LAMP ARM DATA

Item	Value	Unit
Type of Material	Steel A500 Gr B	(N/A)
Arm Diameter	1.875 in	
Arm Thickness	0.120 in	
Weight of Arm	72.5 lbs	
Horizontal Length of Arm	17.00 ft	
Total Length of Arm	12.5 ft	

*Modifications made to the following load cases, as shown on the previous sheet within the submittal, do not significantly impact the structural results. These alterations include: the addition of (1) detail and above the vehicle impact zone on the pole, and the addition of (1) concealment system for surrounding the sides of the road units. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Apparatus	Existing or Proposed	Dimensions (in.)			Weight		Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D	(lbs)	F Dr	A Dr	A Br	
Antenna Mount	Existing	-	-	-	45	1.30	1.30	1.30	16.75
ACT ACORN 21THD 13P with antenna	Proposed	15	44	15	43.94	4.54	4.54	4.54	21.00
12' Extension Mast 12 - (1) PHU ACOR	Proposed	12.05	27.17	9.73	124.42	2.27	1.84	1.84	19.77
Clear Sign	Proposed	12.05	6	8.75	10	0.50	0.36	0.36	16.08
Ball Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	0.00	23.00
Ball Board Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	0.00	22.00
Water Panel	Existing	12	3	12	10	0.25	0.25	0.25	25.00
Box	Existing	14	14	1	5	1.36	0.29	0.29	12.00
Redundant Signage	Existing	24	33	8.1	8	7.56	0.42	0.42	10.00
Traffic Sign	Existing	28	6	0.1	2	1.17	0.00	0.00	7.00
Street Sign	Existing	48	16	0.1	7	5.11	0.01	0.01	6.00

Total Dead Load = 0.76 kips
Total Moment Due to Dead Load Eccentricities = 0.96 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.43 kips
Total Moment due to Wind in Z Dir = 24.72 kip-ft
Total Wind Force in X Direction = 0.79 kips
Total Moment due to Wind in X Dir = 19.12 kip-ft
Total Torque = 1.42 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.56 kips
Total Moment due to Wind in Z Dir = 9.91 kip-ft
Total Wind Force in X Direction = 0.12 kips
Total Moment due to Wind in X Dir = 7.67 kip-ft
Total Torque = 0.57 kip-ft

8.1 Structural Components Capacity Checks

8.1.1 Structural Component: Light Pole

Component Strength Check

Maximum Factored Axial Load $P_u = 0.76$ kips
Factored Compressive Strength $\phi_c P_n = 6.68$ kips
Stress Ratio $P_u / \phi_c P_n = 0.103$ Yes, it is equal or greater than 0.2

Flexural Strength Check

Maximum Factored Bending Moment $M_u = 24.7$ kip-ft
Factored Flexural Strength $\phi_b M_n = 52.8$ kip-ft
Moment Magnifier Factor (2nd Order Effect) $\delta = 1.02$
Stress Ratio $M_u / \phi_b M_n = 0.471$

Shear and Tension Strength Check

Maximum Factored Shear $V_u = 1.43$ kips
Factored Shear Strength $\phi_v V_n = 49.47$ kips
Stress Ratio $V_u / \phi_v V_n = 0.031$

Maximum Factored Tension $T_u = 1.42$ kips
Factored Tensile Strength $\phi_t T_n = 163.06$ kips
Stress Ratio $T_u / \phi_t T_n = 0.014$
 $T_u / T_n < 0.2$ Tension and shear effects can be ignored

Combined Forces Interaction

$$\frac{P_u}{\phi_c P_n} + \frac{M_u}{\phi_b M_n} + \frac{V_u}{\phi_v V_n} + \frac{T_u}{\phi_t T_n} = 0.103 + 0.471 + 0.031 + 0.014 = 0.619 < 1.0$$

Combined Forces Interaction = 0.619 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

8.2.2 Structural Component: Lamp Arm

Flexural Strength Check

Maximum Factored Bending Moment $M_u = 2.48$ kip-ft
Factored Flexural Strength $\phi_b M_n = 6.15$ kip-ft
Stress Ratio $M_u / \phi_b M_n = 0.403$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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SAN DIEGO, CA 92121



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10083 WILLOW CREEK RD
SUITE #250
SAN DIEGO, CA 92131

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AT&T SMALL CELL
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MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21-5

6.6 Base Plate & Anchorage

6.6.1 Base Plate

(See Design Guide 3)

Design Data			
Maximum Factored Bending Moment (at moment magnifier)	M_u	24.57	kip-ft (per Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	P_u	6.55	kip (per Analysis & Design Section 6.2.1)
Concrete Compressive Strength	f'_c	3	ksi (assumed)
Yield Strength of Base Plate	F_y	36	ksi
Base Plate Length	L	12	in
Base Plate Width	B	12	in
Resistance Factor in Compression	ϕ_c	0.85	Sec. 6.5.3.2
Base Plate Thickness	t	2	in
Anchor Rod Edge Distance	e_{ar}	1.25	in

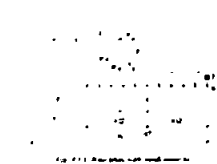


Fig. 6.6.1 Base Plate with Moment Magnifier

Design Method: Small or Large Moment Base Plates

Sec. 6.4

Equivalent Eccentricity	e	20	in	Eq. 6.2.6
Maximum Bearing Stress	f_{max}	1.06	ksi	Sec. 6.4
Maximum Bearing Pressure	q	19.9	psf	Eq. 6.2.4
Critical Eccentricity	e_c	6.8	in	Eq. 6.2.7
Base Plate Design Method				Sec. 6.5.3.2
Small Moment	$M_u \leq 1.5 P_u e_c$			
Large Moment	$M_u > 1.5 P_u e_c$			

With Concrete Check				Eq. 6.4.4
	f_u	4.8	ksi	
	$f_u \cdot A_s$	115.6	kip	
	$2P_u + 1.5M_u / e_c$	3.0	kip	
	Check			Plate Size OK

Bearing Length	ℓ	0.16	in	Eq. 6.4.3
Factored Anchor Rod Tension	T_u	1.8	kip	Eq. 6.4.2

Base Plate Thickness Check

Base Plate Yielding Limit at Bearing Interface	t	1.6	in	Sec. 6.4.2
Check	$t \geq 1.6$ in			Use Eq. 6.3.1.1a-2

$$t = 1.6 \text{ in} \quad (1.61 \text{ in from 6.3.1.1a-2})$$

$$t = 2.11 \sqrt{\frac{f_u}{F_y}} \quad (6.3.1.1a-2)$$

Required Base Plate Thickness	t_{req}	0.73	in	Eq. 6.3.1.1a-2
-------------------------------	-----------	------	----	----------------

Base Plate Yielding Limit at Tension Interface	t	0.52	in	Eq. 6.4.4
Continued Length (Use Ratio to Plate Thickness Center)	t_{req}	0.10	in	Eq. 6.4.4

$$t_{req} = 2.11 \sqrt{\frac{f_u}{F_y}} \quad (6.3.1.1a-2)$$

Maximum Required Base Plate Thickness	t_{max}	0.73	in	
Base Plate Thickness	t	2.08	in	
Stress Ratio	SR	0.116	Pass	

6.6.2 Anchorage Check

(See Design Guide 3)

Design Data

Maximum Factored Tension	T_u	1.8	kip	per Section 6.5.1
Maximum Factored Shear	V_u	1.81	kip	per Section 6.2.1
Number of Bars in Both Tension & Shear	N	4		
Factored Tension per Anchor Rod	T_{ar}	0.9	kip	
Factored Shear per Anchor Rod	V_{ar}	0.45	kip	

Anchor Rod Diameter	D	1.25	in	(assumed)
Yield Strength of Anchor Rod	F_y	36	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	F_u	58	ksi	(A36 assumed)

Combined Tension and Shear in Base-Type Connections

Sec. 6.5.1.1-2

Nominal Unstressed Area of Anchor Rod	A_n	1.22	in ²	
Nominal Tensile Stress of Anchor Rod	F_u	43.50	ksi	Table J3.2
Nominal Shear Stress of Anchor Rod	F_u	26.10	ksi	Table J3.2
Required Shear Stress of Anchor Rod	U_t	0.33	ksi	Sec. J3.16.1-125
Resistance Factor for Shear and Tension	ϕ	0.75		Sec. J3.16.1-125
Nominal Tensile Stress Modified to Include Shear Stress	F_u	43.50	ksi	Sec. J3.16.1-125
Nominal Tensile Strength of Anchor Rod	R_n	53.4	kip	Eq. J3.2
Factored Tensile Strength of Anchor Rod	ϕR_n	40.0	kip	Eq. J3.2
Stress Ratio	SR	0.011	Pass	

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	P	1.00	kip	
Vertical Force	V	0.75	kip	
Height above grade of Lateral Force	H	17.40	ft	
Diameter of Pier	D	2.50	ft	
Lateral Soil Bearing Capacity	S	0.10	ksf	Table 1806.2
Vertical Soil bearing Capacity	Q_{ult}	1.50	ksf	Table 1806.2
Transient Load factor	F	2.00		Section 1806.3.4
Final Depth	D_{req}	5.40	ft	

Applicable Equation

$$D_{req} = (4.25 P H / S) / F^2 \quad (\text{IBC 2012 Eq. 18-3})$$

Lateral Soil Bearing Capacity	$F \times S =$	0.20 ksf	ϕ
Allowable lateral pressure at "D"	$S_1 = F \times S \times D =$	1.08 ksf	
Required Calculated Depth	$D_{req} =$	5.40 ft	< Dprov = 7 ft.

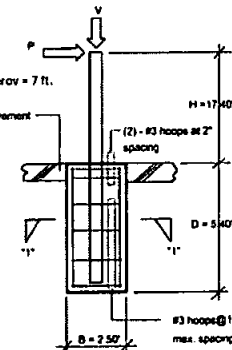
Vertical Soil bearing Check

(Section 1807.3.2.3)

$$Q_{ult} = (0.78 \times 4.91 \times 5.40 \times 0.15) / 4.91$$

$$= 0.95 \text{ ksf}$$

$$SR = 64.07\% \quad \text{OK}$$



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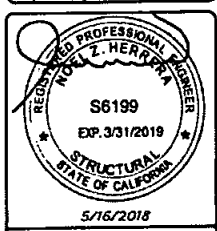
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SAN DIEGO, CA 92131

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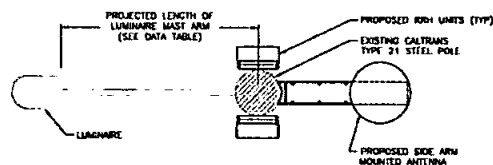
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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21-6



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	H RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	TYPE 21
8'-0"	2'-0"	3-1/4"	0.1196"	36'-8"
8'-0"	2'-0"	3-1/2"		37'-0"
10'-0"	3'-0"	3-7/8"		38'-8"
12'-0"	4'-0"	4-1/4"		39'-0"
15'-0"	5'-0"	5-1/4"		39'-5"

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

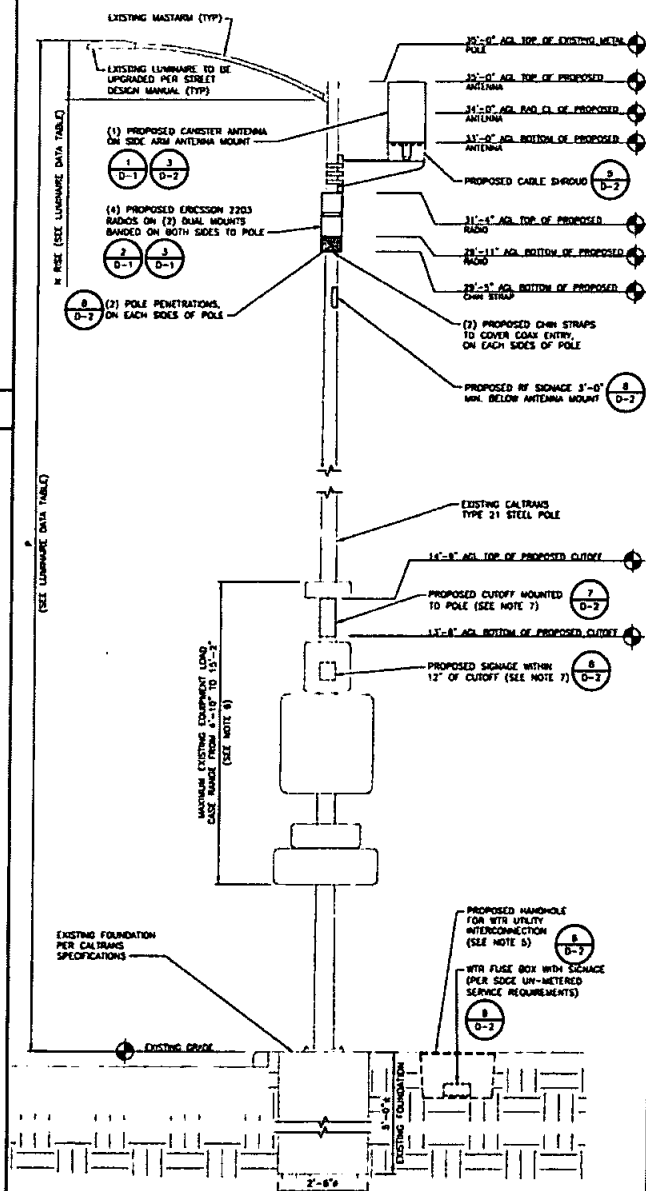
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CAMSTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (4) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACON-27150-12P OR EQUAL ANTENNA	35.3	35.3
4	ERICSSON RTRUS-2203 RADIO	14.4	57.6
1	SIDE ARM ANTENNA MOUNT BRACKET	25	25
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHN STRAP	5	10
1	PACTEC-SOL P1380122 CUTOFF	12	12
TOTAL			152.9

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE QUALITY ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE ASD/SD 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR SHOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDING ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WOF REQUIREMENT - PROJECT TO COMPLY WITH WOF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF I-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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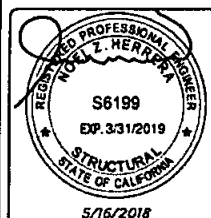
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18	01/18/18	REVISED PER COMMENTS
19	01/18/18	REVISED PER COMMENTS
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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21 STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MS21-7

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 35' Generic Existing Steel Light Pole
Type 21
Loading Scenario: Pico-3

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 60.6% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 89.1% Pass
Existing Concrete Pier Foundation: 64.0% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

1. This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
2. Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to existing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
3. Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
4. This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
5. This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
6. Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
6. At the time of this structural analysis, exact details were not available for the following items:
 - luminaire: (type & model, weight & dimensions)
 - foundation rebar dia and quantity; soil parameters
 - signage on poles were assumed

POLE DATA		WIND PRESSURE
Type of Material	Steel - SS30	(N/A)
Bottom Pole Diameter	6.625 in	From Equation: $P_f = 0.00256 K_z K_{zt} G C_f$
Top Pole Diameter	1.5625 in	$G = 1.14$
Pole Thickness	0.1793 in	Basic Wind Speed
Height of Pole	35 ft	$V = 120$ mph
		Service Wind Speed
		$V_{10} = 76$ mph
		Exposure Category
		C

LAMP ARM DATA	
Type of Material	Steel A500 Gr B
Arm Diameter	3.875 in
Arm Thickness	0.120 in
Weight of Arm	22.5 lbs
Horizontal Length of Arm	11.00 ft
Total Length of Arm	12.5 ft

*Alterations made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the location of (1) offset just above the vehicle impact zone on the pole. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Apparatuses	Existing or Proposed	Dimensions (in)			Weight (lbs)	Effective Projected Area (ft ²)		Deviation (ft)
		W	H	D		L Dr	B Dr	
Cable Head	Existing	-	-	-	45	1.50	1.50	58.75
ACE ACCOM 21 LMD 117 with luminaire	Proposed	15	44	15	69.94	4.58	4.58	33.17
Tube Arm Mount	Proposed	24.5	14.5	6	25	1.74	0.60	30.71
171 (Envision RRU/A 220)	Proposed	4.13	17.1	7.87	22.8	0.49	0.91	30.61
171 (Envision RRU/A 240)	Proposed	4.13	17.1	7.87	22.8	0.49	0.91	30.61
Chimney Cap	Proposed	3	6	2	5	0.11	0.11	29.61
Self Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	23.00
Self Board Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	22.00
Radial Panel	Existing	22	3	17	10	0.25	0.25	15.00
Box	Existing	14	14	3	5	1.16	0.29	12.00
Frederick Springs	Existing	13	11	0.1	8	7.56	0.02	10.00
Traffic Sign	Existing	28	6	0.1	2	1.37	0.00	7.00
Street Sign	Existing	48	16	0.1	2	5.33	0.01	6.00

Total Dead Load = 0.71 kips
Total Moment Due to Dead Load Eccentricity = 1.19 kip-ft

Strength/Service Wind Loads		Service Down Wind Loads	
Total Wind Force in Z Direction	= 1.42 kips	Total Wind Force in Z Direction	= 0.57 kips
Total Moment due to Wind in Z Dir	= 26.30 kip-ft	Total Moment due to Wind in Z Dir	= 10.71 kip-ft
Total Wind Force in X Direction	= 0.82 kips	Total Wind Force in X Direction	= 0.31 kips
Total Moment due to Wind in X Dir	= 21.20 kip-ft	Total Moment due to Wind in X Dir	= 8.50 kip-ft
Total Torsion	= 1.68 kip-ft	Total Torsion	= 0.67 kip-ft

6.2 Structural Component Capacity Checks

6.2.1 Structural Component, Luminaire Component Strength Checks

ASCE 10
Sec. 5.12

Maximum Factored Dead Load $P_u = 0.89$ kips
Factored Compression Strength $\phi_c P_n = 4.68$ kips
Stress Ratio $P_u / \phi_c P_n = 0.190$ less than 0.2

Element Strength Check

Maximum Factored Bending Moment $M_u = 25.7$ kip-ft
Factored Flexural Strength $\phi_b M_n = 32.8$ kip-ft
Moment Magnitude Factor (2nd Order Effects) $\delta = 1.01$
Stress Ratio $M_u / \phi_b M_n = 0.511$

Shear and Torsion Strength Checks

Maximum Factored Shear $V_u = 1.64$ kips
Factored Shear Strength $\phi_v V_n = 49.47$ kips
Stress Ratio $V_u / \phi_v V_n = 0.033$

Maximum Factored Torsion $T_u = 1.68$ kips
Factored Torsional Strength $\phi_t T_n = 102.06$ kips
Stress Ratio $T_u / \phi_t T_n = 0.017$
 $T_u / \phi_t T_n$ - less than 0.2, torsional and shear effects can be ignored

Combined Forces Interaction

Sec. 5.12

$$\left(\frac{P_u}{\phi_c P_n} \right)^2 + \left(\frac{M_u}{\phi_b M_n} \right)^2 + \left(\frac{V_u}{\phi_v V_n} \right)^2 + \left(\frac{T_u}{\phi_t T_n} \right)^2 \leq 1.0$$

Combined Forces Interaction = 0.006 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Component, Lamp Arm

Element Strength Check

Maximum Factored Bending Moment $M_u = 2.48$ kip-ft
Factored Flexural Strength $\phi_b M_n = 6.75$ kip-ft
Stress Ratio $M_u / \phi_b M_n = 0.366$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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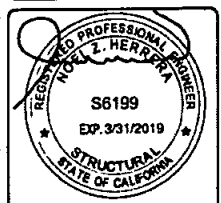
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10089 WILLOW CREEK RD
SUITE 8350
SAN DIEGO, CA 92131

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MASTER STRUCTURAL PLAN

EXISTING TYPE 21 STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21-8

6.6 Base Plate & Anchorage

6.6.1 Base Plate

CSX Design Sheet 1

Design Data

Maximum Factored Bending Moment (see Appendix A) $M_u = 26.57$ kip-ft (see Appendix A & Design Section 6.2.1)
Maximum Factored Axial Load $P_u = 8.85$ kips (see Appendix A & Design Section 6.2.1)

Concrete Compressive Strength $f'_c = 3$ ksi (assumed)
Yield Strength of Base Plate $F_y = 36$ ksi
Base Plate Length $l_p = 12$ in
Base Plate Width $b_p = 12$ in
Resistance Factor in Compression $\phi_c = 0.85$ (see 6.5.3.2)
Base Plate Thickness $t_p = 2$ in
Anchor Rod Edge Distance $e_{ar} = 1.75$ in

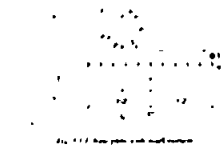


Fig. 6.6.1 Base plate with anchor rods

Design Method: Small or Large Moment Base Plates

See 6.4

Lateral Extension $e = 20$ in (see 6.4.2)

Maximum Bearing Stress $f_{pmax} = 1.08$ ksi (see 6.4.3)

Maximum Bearing Pressure $q_{max} = 19.9$ kips/in (see 6.4.3)

Calculated Extension $e = 20$ in (see 6.4.3)

Base Plate Design Method: Small Moment $M_u < 1.5 P_u e$ Design Method = Large Moment Base Plate (see 6.5.3.2)

Base Plate Size Check $t_p = 2$ in (see 6.4.4)

$t_p = 2$ in (see 6.4.4)

$t_p = 2$ in (see 6.4.4)

Bearing Length $l_b = 0.15$ in (see 6.4.3)

Factored Anchor Rod Tension $T_u = 2.0$ kips (see 6.4.3)

Base Plate Thickness Check $t_p = 2$ in (see 6.4.4)

Base Plate Yielding Limit at Bearing Interface $t_p = 2$ in (see 6.4.4)

$t_p = 2$ in (see 6.4.4)

$t_p = 2$ in (see 6.4.4)

$t_p = 2$ in (see 6.4.4)

$t_p = 2$ in (see 6.4.4)

$t_p = 2$ in (see 6.4.4)

Required Base Plate Thickness $t_p = 0.23$ in (see 6.4.4)

Base Plate Yielding Limit at Tension Interface $t_p = 0.13$ in (see 6.4.4)

Cover Length (from Rods to Plate Thickness Center) $t_p = 0.11$ in (see 6.4.4)

Required Base Plate Thickness $t_p = 0.11$ in (see 6.4.4)

$t_p = 0.11$ in (see 6.4.4)

Maximum Required Base Plate Thickness $t_p = 0.23$ in (see 6.4.4)

Base Plate Thickness $t_p = 2$ in (see 6.4.4)

Stress Ratio $SR = 0.117$ (see 6.4.4)

6.6.2 Anchor Rod Check

CSX Design Sheet 1

Design Data

Maximum Factored Tension $T_u = 2.0$ kips (see Section 6.5.1)
Maximum Factored Shear $V_u = 1.84$ kips (see Section 6.5.1)
Number of Rods in Both Tension & Shear $N = 4$
Factored Tension per Anchor Rod $T_{ur} = 0.5$ kips
Factored Shear per Anchor Rod $V_{ur} = 0.41$ kips

Anchor Rod Diameter $d = 1.25$ in (minimum)
Yield Strength of Anchor Rod $F_y = 36$ ksi (A36 assumed)
Ultimate Tensile Strength of Anchor Rod $F_u = 58$ ksi (A36 assumed)

Symbolical Tension and Shear in Bearing Type Connections

See 6.5.3.2

Nominal Unstressed Area of Anchor Rod $A_n = 1.23$ in²
Nominal Tensile Stress of Anchor Rod $F_u = 43.90$ ksi (Table 2.2.2)
Nominal Shear Stress of Anchor Rod $F_u = 26.10$ ksi (Table 2.2.2)
Required Shear Stress of Anchor Rod $F_u = 0.33$ ksi (see 6.5.3.2.1.2)
Resistance Factor for Shear and Tension $\phi = 0.75$ (see 6.5.3.2.1.2)
Nominal Tensile Stress Modified to Include Shear Stress $F_u' = 43.90$ ksi (see 6.5.3.2.1.2)

Nominal Tensile Strength of Anchor Rod $R_n = F_u A_n = 53.4$ kips (Eq. 6.5.3.2)
Factored Tensile Strength of Anchor Rod $\phi R_n = 40.0$ kips (Eq. 6.5.3.2)
Stress Ratio $SR = 0.013$ (see 6.5.3.2)

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force $P = 1.06$ kips
Vertical Force $V = 0.75$ kips
Height above grade of Lateral Force $H = 17.40$ ft
Diameter of Pier $D = 2.50$ ft
Lateral Soil Bearing Capacity $S = 0.10$ ksf/ft
Vertical Soil Bearing Capacity $S_v = 1.50$ ksf/ft
Transient Load factor $F = 2.00$
Trial Depth $D_{trial} = 5.40$ ft
Table 1806.2
Table 1806.2
Section 1806.3.4

Anchor Equation

$D_{min} = (4.25 P H / S_v B)^{1/3}$ (IBC 2012 Eq. 18-7)

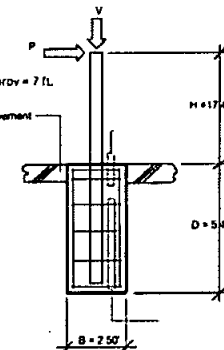
Lateral Soil Bearing Capacity $F \times S = 0.20$ ksf/ft
Allowable lateral pressure at "D" $S_v = F \times S \times D = 1.08$ ksf
Required Calculated Depth $D_{req} = 5.40$ ft < $D_{prov} = 7$ ft

Vertical Soil bearing Check (Section 1807.3.3.3)

$Q_{all} = (0.75 \times 4.91 \times 5.40 \times 0.15) / 4.91$

$= 0.06$ ksf

$SR = 64.0\%$ OK



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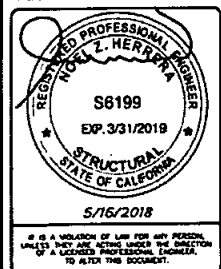
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6	05/15/18	REVISED PER COMMENTS
7	05/15/18	REVISED PER COMMENTS
8	05/15/18	REVISED PER COMMENTS
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17	05/15/18	REVISED PER COMMENTS
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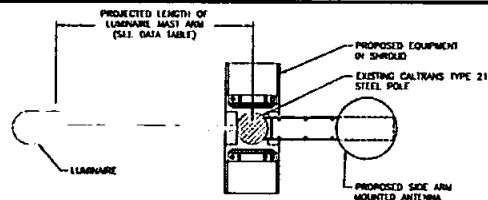


AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21 STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21-9



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	H RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
6'-0"	3'-0"	3-1/4"	0.1196"	TYPE 21
8'-0"	3'-0"	3-1/2"		36"-8"
10'-0"	3'-0"	3-1/2"		37'-0"
12'-0"	3'-0"	3-7/8"		37'-8"
15'-0"	4'-0"	4-1/4"		39'-2"

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

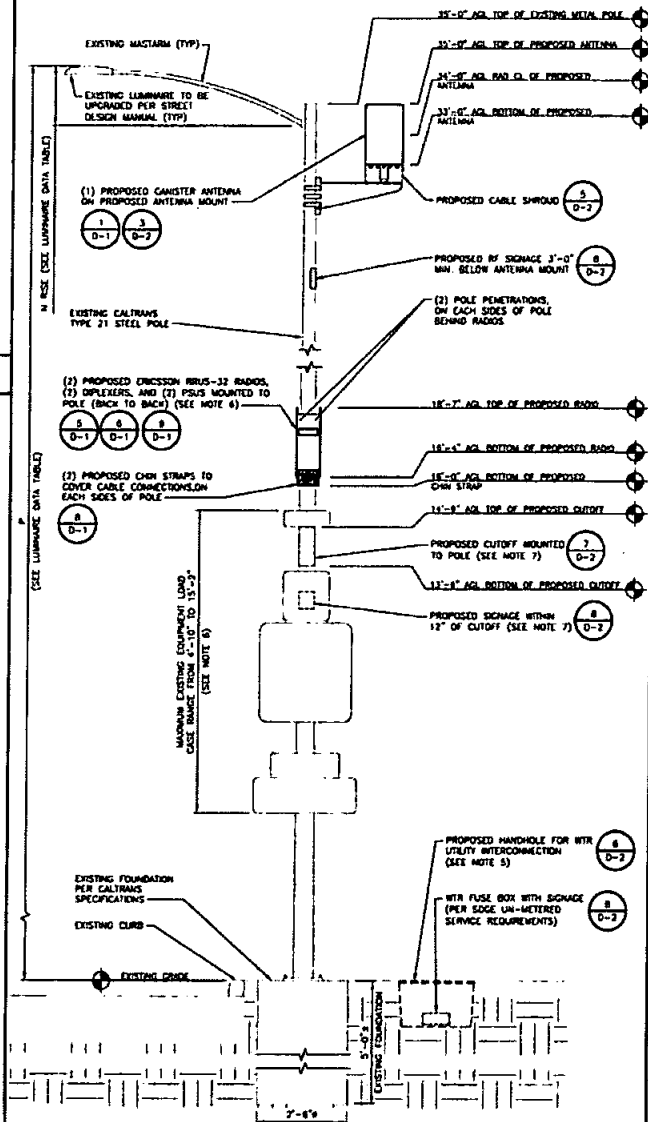
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANISTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-27150-12P OR EQUAL ANTENNA	33.3	33.3
2	ERICSSON RRUS-32 RADIO & PSU AC 06 UNIT	62.21	124.42
2	RF'S FOP1402040A-NC DUPLEXER	3.1	6.2
1	SIDE ARM ANTENNA MOUNT BRACKET	25	25
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHN STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	PRACTICAL-SOL PYS60122 CUTOFF	12	12
	TOTAL		228.92

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET LIGHT POLE DEFLECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET LIGHT POLE WILL FULLY COMPLY WITH THE AASHTO 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR SHALL NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-DRY LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 1-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 50' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY. ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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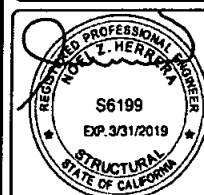
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SUITE 8300
SAN DIEGO, CA 92131

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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21 STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MS21-10

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 35' Generic Existing Steel Light Pole
Type 21
Loading Scenario: Micro-4

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 68.3% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 92.2% Pass
Existing Concrete Pier Foundation: 64.0% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

1. This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed appearance loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
2. Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
3. Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
4. This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
5. This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
6. Fatigue does not govern the design of common light poles per AASHTO Sec. C13.4.
8. At the time of this structural analysis, exact details were not available for the following items:
 - hardware, (type & model, weight & dimensions)
 - foundation rebar dia and quantity, soil parameters
 - signages on poles were assumed

POLE DATA		WIND PRESSURE	
Type of Material	Steel - SS ksi	(N/A)	From Equation: $P_s = 0.00256 K_z K_{zt} G C_f V^2$
Bottom Pole Diameter	8.625 in		$G = 3.14$
Top Pole Diameter	1.5625 in		$V = 120$ mph
Pole Thickness	0.1793 in		Service Wind Speed
Height of Pole	35 ft		Exposure Category
			C

LAMP ARM DATA	
Type of Material	Steel A500 Gr. B
Arm Diameter	1.875 in
Arm Thickness	0.120 in
Weight of Arm	77.5 lbs
Horizontal Length of Arm	12.00 ft
Total Length of Arm	12.5 ft

*Alterations made to the following load cases, as shown on the previous sheet, either the superimposed do not significantly impact the structural results. These alterations include: the addition of (1) catch unit above the office model zone on the pole, and the addition of (1) convenience system for showing the signs of the radio units. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appurtenances	Existing or Proposed	Dimensions (in.)			Weight		Effective Projected Area		Elevation (ft)
		W	H	D	(lbs)		F Dr	X Dr	
Cobra Head	Existing	-	-	-	45		1.50	1.50	38.75
ACE Air/DMA 31 (50-120 with camera)	Proposed	15	48	15	69.96		4.58	4.58	33.17
Tube Arm Mount	Proposed	34.5	14.5	6	25		1.74	0.90	38.15
21' Existing Arm, 12' x 12' (11' P&ID AC DB)	Proposed	12.05	27.12	9.73	124.42		2.77	1.84	36.97
Chain Link	Proposed	12.05	6	8.75	10		0.50	0.36	36.08
Ball Board Arm 1	Existing	60	0.5	0.5	5		0.21	0.00	23.00
Ball Board Arm 2	Existing	60	0.5	0.5	5		0.21	0.00	22.00
Tube Mount	Existing	12	5	12	10		0.25	0.25	35.00
Antenna	Existing	16	14	8	5		1.36	0.29	32.00
Antenna Signage	Existing	33	33	0.1	8		7.56	0.02	10.00
Traffic Sign	Existing	28	6	0.1	2		1.17	0.00	7.00
Street Sign	Existing	48	16	0.1	7		5.33	0.01	6.00

Total Dead Load = 0.79 kips
Total Moment Due to Dead Load (ccentricities) = 1.16 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.49 kips
Total Moment due to Wind in Z Dir = 27.74 kip-ft
Total Wind Force in X Direction = 0.82 kips
Total Moment due to Wind in X Dir = 20.19 kip-ft
Total Torsion = 1.87 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.60 kips
Total Moment due to Wind in Z Dir = 11.13 kip-ft
Total Wind Force in X Direction = 0.33 kips
Total Moment due to Wind in X Dir = 8.10 kip-ft
Total Torsion = 0.67 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components: Light Pole Compressive Section Check

AASHTO
Sec. 5.17

Maximum Factored Axial Load $P_u = 0.99$ kips
Factored Compressive Strength $P_n = 4.68$ kips
Stress Ratio $P_u/P_n = 0.213$ Yes, it is equal or greater than 0.2

Flexure or Strength Check

Maximum Factored Bending Moment $M_u = 27.7$ kip-ft
Factored Flexural Strength $M_n = 52.8$ kip-ft
Moment Magnifier Factor (1st Order Effects) $\delta_m = 1.01$
Stress Ratio $M_u/M_n = 0.531$

Shear and Tension Strength Check

Maximum Factored Shear $V_u = 1.70$ kips
Factored Shear Strength $V_n = 49.47$ kips
Stress Ratio $V_u/V_n = 0.034$

Maximum Factored Torsion $T_u = 1.87$ kips
Factored Torsional Strength $T_n = 101.06$ kips
Stress Ratio $T_u/T_n = 0.016$
 $T_u/T_n < \text{Less than } 0.2$, torsional and shear effects can be ignored

Combined Forces Interaction

Sec. 5.17

$$\frac{P_u}{P_n} + \frac{M_u}{M_n} + \frac{T_u}{T_n} \leq 1.0 \quad (5.17.1.1)$$

Combined Forces Interaction = 0.683 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Components: Lamp Arm

Flexural Strength Check

Maximum Factored Bending Moment $M_u = 7.48$ kip-ft
Factored Flexural Strength $M_n = 6.35$ kip-ft
Stress Ratio $M_u/M_n = 0.990$

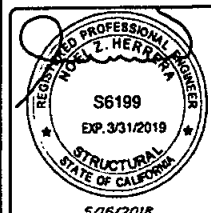
Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN
EXISTING TYPE 21 STREET LIGHT POLE WITH SIDE ARM ANTENNA MOUNT AND MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21-11

6.6 Base Plate & Anchorage

6.6.1 Base Plate

ASCE Design Guide 1

Design Data

Maximum Factored Bending Moment per member (kip-ft) $M_u = 26.02$ (see Analysis & Design Section 6.2.1)
Maximum Factored Axial Load $P_u = 0.00$ kips (see Analysis & Design Section 6.2.1)

Concrete Compressive Strength	$f'_c = 3$ ksi (assumed)
Yield Strength of Base Plate	$F_y = 36$ ksi
Base Plate Length	$l_p = 12$ in
Base Plate Width	$b_p = 12$ in
Resistance Factor in Compression	$\phi_c = 0.85$ (see Sec. 6.3.3.2)
Base Plate Thickness	$t_p = 2$ in
Anchor Rod Edge Distance	$e_{ar} = 1.25$ in



Fig. 6.6.1 Base plate with small moment

Design Method: Small or Large Moment Base Plates

Sec. 6.6

Equivalent Eccentricity	$e = \frac{M_u}{P_u}$	$e = 0$ in	Eq. 6.6.1
Maximum Bearing Stress	$f_p = \frac{P_u}{A_g} \left(1 + \frac{6e}{b_p} \right)$	$f_p = 0.00$ ksi	Eq. 6.6.2
Maximum Bearing Pressure	$f_{p,max} = f_p + 1.25$	$f_{p,max} = 1.25$ ksi	Eq. 6.6.3
Critical Eccentricity	$e_{crit} = \frac{b_p}{6}$	$e_{crit} = 0.5$ in	Eq. 6.6.4

Base Plate Design Method: Small Moment $e \leq 5$ in, Large Moment $e > 5$ in, Design Method - Large Moment Base Plate (see Sec. 6.6.3.2)

Base Plate Size Check: $f_p \leq f_{p,max}$ (Eq. 6.6.2)

$$\left(\frac{f_p}{f_{p,max}} \right)^2 \leq \left(\frac{f_p}{f_{p,max}} \right)^2 \quad \text{Check - Plate Size OK}$$

Bearing Length	$l_p = 12$ in	Eq. 6.6.5
Factored Anchor Rod Tension $T_u = P_u - P_c$	$T_u = 2.1$ kips	Eq. 6.6.6

Base Plate Thickness Check

Base Plate Yielding Limit at Bearing Interface: $t_p \geq \frac{F_y}{\phi_c f_{p,max}}$ (see Eq. 6.6.3.2)

$$t_p = \frac{F_y}{\phi_c f_{p,max}} = \frac{36}{0.85 \times 1.25} = 34.3 \text{ in}$$

$$t_p = 2.11 \sqrt{\frac{F_y}{\phi_c f_{p,max}}} = 2.11 \sqrt{\frac{36}{0.85 \times 1.25}} = 2.11 \times 5.3 = 11.3 \text{ in}$$

Required Base Plate Thickness $t_{p,req} = 11.3$ in (Eq. 6.6.3.2)

Base Plate Yielding Limit at Tension Interface: $t_p \geq \frac{F_y}{\phi_c f_{t,max}}$ (Eq. 6.6.3.3)

Carbonation Length (Not Refer to Plate Thickness Criteria) $t_p \geq 4$ in (Eq. 6.6.3.4)

Required Base Plate Thickness $t_{p,req} = 4$ in (Eq. 6.6.3.4)

$$t_p = 2.11 \sqrt{\frac{F_y}{\phi_c f_{t,max}}} = 2.11 \sqrt{\frac{36}{0.85 \times 1.25}} = 2.11 \times 5.3 = 11.3 \text{ in}$$

Maximum Required Base Plate Thickness $t_{p,max} = 11.3$ in

Base Plate Thickness $t_p = 2.00$ in

Stress Ratio $SR = 0.12$ (see Sec. 6.6.3.2)

6.6.2 Anchorage Check

ASCE Sec. 6.6.2

Design Data

Maximum Factored Tension	$T_u = 2.1$ kips	(see Section 6.2.1)
Maximum Factored Shear	$V_u = 1.70$ kips	(see Section 6.2.1)
Number of Bolts in Both Tension & Shear	$n = 4$	
Factored Tension per Anchor Rod	$T_{ar} = 0.5$ kips	
Factored Shear per Anchor Rod	$V_{ar} = 0.42$ kips	

Anchor Rod Diameter	$D = 1.25$ in	(minimum)
Yield Strength of Anchor Rod	$F_y = 36$ ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$ ksi	(A36 assumed)

Combined Tension and Shear in Bracket-Type Connections

Sec. 23.18.1.125

Nominal Unstressed Area of Anchor Rod	$A_n = 1.23$ in ²	Table 23.2
Nominal Tensile Stress of Anchor Rod	$F_t = 43.50$ ksi	Table 23.2
Nominal Shear Strength of Anchor Rod	$F_v = 26.10$ ksi	Table 23.2
Required Shear Stress of Anchor Rod	$V_{ar} = 0.35$ ksi	Sec. 23.18.1.125
Resistance Factor for Shear and Tension	$\phi = 0.75$	Sec. 23.18.1.125
Nominal Tensile Stress Modified to Include Shear Stress	$F'_t = 43.50$ ksi	Sec. 23.18.1.125

Nominal Tensile Strength of Anchor Rod $R_t = F'_t A_n$	$R_t = 53.4$ kips	Eq. 23.2
Factored Tensile Strength of Anchor Rod $\phi R_t = F'_t A_n$	$\phi R_t = 40.0$ kips	Eq. 23.2
Stress Ratio	$SR = 0.013$	Table

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

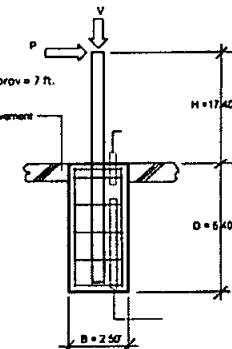
Lateral Force	$P = 1.06$ k	
Vertical Force	$V = 0.76$ k	
Height above grade of Lateral Force	$H = 17.40$ ft	
Diameter of Pier	$D = 2.50$ ft	
Lateral Soil Bearing Capacity	$S = 0.10$ ksf	: Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$ ksf	: Table 1806.2
Transient Load factor	$F = 2.00$	: Section 1806.3.4
Trail Depth	$D_{tr} = 5.40$ ft	

Applicable Equation

$$D_{tr} = (4.25 P H / S) \sqrt{F} \quad (\text{IBC 2012 Eq. 18-2})$$

Lateral Soil Bearing Capacity	$F \times S = 0.20$ ksf
Allowable lateral pressure at "D"	$S_t = F \times S \times D = 1.08$ ksf
Required Calculated Depth	$D_{tr} = 5.40$ ft < Dprov = 7 ft.

Vertical Soil bearing Check: $Q_{ult} = (0.70 + 4.91 \times 5.40 \times 0.15) / 4.91$	$Q_{ult} = 0.96$ ksf
SR = 64.0%	OK



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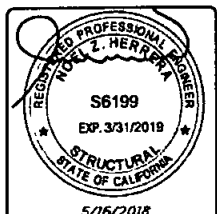
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SUITE 650
SAN DIEGO, CA 92131

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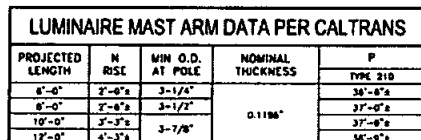
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LIGHT POLE WITH SIDE
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STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21-12



STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

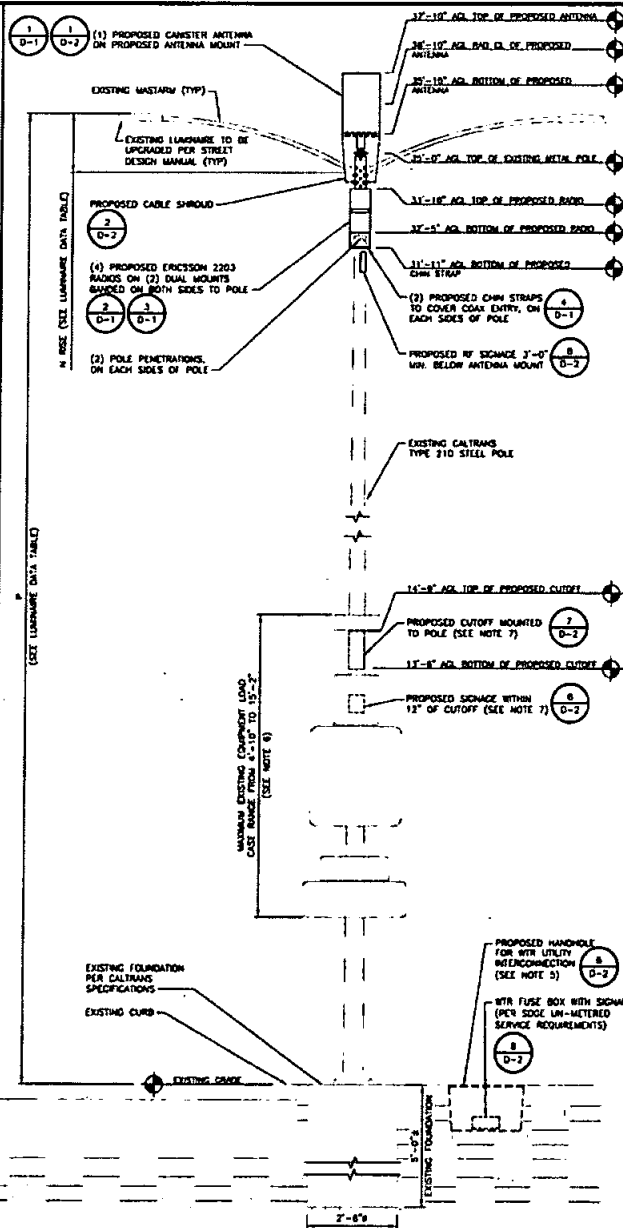
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANISTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (4) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

PROPOSED EQUIPMENT			
AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-27150-12P OR EQUAL ANTENNA	33.3	33.3
4	ERICSSEN RR193-7203 RADIO	14.4	57.6
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHOULDER	6	6
2	DRUM STRAP	5	10
1	PANCLIOSH, PPS0132 CUTOFF	12	12
		TOTAL	149.8

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED: THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF ANALYSIS. ANALYSIS OF THE EXISTING STREET LIGHT AND EXISTING STREET POLE WILL FULLY COMPLY WITH THE AASHTO 2011. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR WOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CITY TOWER OWNER AND CABLE STATION NUMBER SHALL BE PLACED IN THE LOAD CENTER, OR ON ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE LOADED ACCORDING TO THE GENERAL ORDER OF THE PUBLIC WORKS DEPARTMENT, ELECTRIC DIVISION, OF CO. 150.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL APPROVED EQUIPMENT TO BE COMPATIBLE TO MATCH EXISTING POLE.
2. WSP REQUIREMENT - PROJECT TO CONPLY WITH WSP REQUIREMENT, TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 1-5 PER PLANNING REQUIREMENT, IN SUCH SITUATIONS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. IF ANY VIOLATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLED WITH CUTTER LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.

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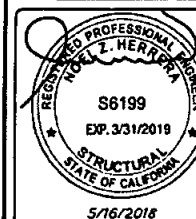
BLACK & VEATCH

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10080 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

593784

3	06/15/18	REVISED PER COMMENTS
3	06/15/18	REVISED PER COMMENTS
1	06/30/18	REVISED PER COMMENTS
6	07/28/18	SUBMIT FOR APPROVAL
REV	DATE	DESCRIPTION



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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21D STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MS21D-1

MS21D-2

6.6 Base Plate & Anchorage

6.6.1 Base Plate

ASCE Design Guide 1

Design Data				
Maximum Factored Bending Moment (at column centerline)	M_u	34.88	kip-ft	(ref Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	P_u	8.25	kip	(ref Analysis & Design Section 6.2.1)
Concrete Compressive Strength	f'_c	3	ksi	(assumed)
Yield Strength of Base Plate	F_y	36	ksi	
Base Plate Length	l_p	12	in	
Base Plate Width	b_p	12	in	
Resistance Factor in Compression	ϕ_c	0.85		Sec. 6.5.2.2
Base Plate Thickness	t_p	2	in	
Anchor Rod Edge Distance	e_{min}	1.25	in	

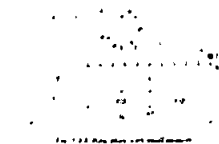


Fig. 6.6.1 Base plate with small moment

Design Method: Small or Large Moment Base Plate

Equivalent Eccentricity	$e = \frac{M_u}{P_u}$	4.23	in	Eq. 3.3.6
Maximum Bearing Stress	$f_{max} = 1.33 \sqrt{\frac{P_u}{A_g}}$	1.88	ksi	Sec. 6.6
Maximum Bearing Pressure	$f_{max} = 1.33 \sqrt{\frac{P_u}{A_g}}$	189	ksi/in	Eq. 3.3.4
Critical Eccentricity	$e_{crit} = \frac{P_u}{f'_c A_g}$	4.9	in	Eq. 3.3.7
Base Plate Design Method	Small Moment = $e \leq e_{crit}$ Large Moment = $e > e_{crit}$			Sec. 3.3.2.1

Base Plate Size Check	$f_{max} = 1.33 \sqrt{\frac{P_u}{A_g}}$	1.88	ksi	Eq. 3.3.4
	$f_{max} = 1.33 \sqrt{\frac{P_u}{A_g}}$	189	ksi/in	
	$f_{max} = 1.33 \sqrt{\frac{P_u}{A_g}}$	2.9	ksi/in	
Check: Plate Size OK				

Bearing Length	$l_p = \left\{ \frac{P_u}{\phi F_y} \right\} \sqrt{\frac{E}{F_y}}$	$\phi = 0.34$	in	Eq. 3.3.2
Factored Anchor Rod Tension	$T_u = P_u = 1.9$	kips		Eq. 3.4.2

Base Plate Thickness Check

Base Plate Yielding Limit at Bearing Interface	$t_p \geq \sqrt{\frac{F_y}{\phi_c f_{max}}}$	1.8	in	Sec. 3.4.2
Check: $t_p = 2$ in, Use Eq. 3.11a-2				

$$t_p = \sqrt{\frac{F_y}{\phi_c f_{max}}} = \sqrt{\frac{36}{0.85 \times 1.88}} = 1.8 \text{ in}$$

$$t_p = 2 \text{ in} > 1.8 \text{ in} \quad \text{OK}$$

Required Base Plate Thickness	$t_p = 2.23$	in	Eq. 3.11a
Base Plate Yielding Limit at Tension Interface	$t_p \geq 0.53$	in	Eq. 3.4.6
Committed Length (Ref. to Plate Thickness Center)	$t_p = 0.49$	in	Eq. 3.4.7a
Required Base Plate Thickness	$t_p = 2.11$	in	

Maximum Required Base Plate Thickness	$t_p = 2.23$	in	
Base Plate Thickness	$t_p = 2.00$	in	
Stress Ratio	$SR = 0.112$		

6.6.2 Anchorage Check

ACI 308-11

Design Data

Maximum Factored Tension	T_u	1.8	kip	(ref Section 6.5.1)
Maximum Factored Shear	V_u	1.56	kip	(ref Section 6.2.1)
Number of Bars in Both Tension & Shear	N	4		
Factored Tension per Anchor Rod	$T_{u/rod}$	0.5	kip	
Factored Shear per Anchor Rod	$V_{u/rod}$	0.39	kip	

Anchor Rod Diameter	D	1.25	in	(assumed)
Yield Strength of Anchor Rod	F_y	36	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	F_u	58	ksi	(A36 assumed)

Cylindrical Tension and Shear in Reinforcing Steel Connections

Sec. 23.18.1-25

Nominal Unstressed Area of Anchor Rod	A_n	1.23	in ²	
Nominal Tensile Stress of Anchor Rod	F_u	43.50	ksi	Table 23.2
Nominal Shear Strength of Anchor Rod	F_v	26.10	ksi	Table 23.2
Required Shear Stress of Anchor Rod	$V_{u/rod}$	0.32	ksi	Sec. 23.18.1-25
Resistance Factor for Shear and Tension	ϕ	0.75		Sec. 23.18.1-25
Nominal Tensile Stress Modified to Include Shear Stress	F_u'	43.50	ksi	Sec. 23.18.1-25

Nominal Tensile Strength of Anchor Rod	$R_n = F_u A_n$	55.4	kip	Eq. 23-2
Factored Tensile Strength of Anchor Rod	$\phi R_n = \phi F_u A_n$	40.5	kip	Eq. 23-2
Stress Ratio	SR	0.012		

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

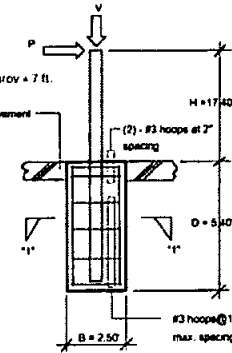
Lateral Force	$P = 1.05$	kip	
Vertical Force	$V = 0.75$	kip	
Height above grade of Lateral Force	$H = 17.40$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf/ft	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
Final Depth	$D_{prov} = 5.40$	ft	

Applicable Equation

$$D_{prov} = (4.25 P H / S_b B)^{0.5} \quad (\text{IBC 2012 Eq. 18-2})$$

Lateral Soil Bearing Capacity	$F \times S = 0.20$	ksf/ft
Allowable lateral pressure at "D"	$S_b = F \times S \times D = 1.08$	ksf
Required Calculated Depth	$D_{prov} = 5.40$	ft

Vertical Soil bearing Check	(Section 1807.3.2.3)	rigid pavement
$Q_{ult} = (0.78 + 4.91 \times 5.40 \times 0.19) / 4.91$		
$= 0.98$	ksf	
$SR = 64.0\%$		OK



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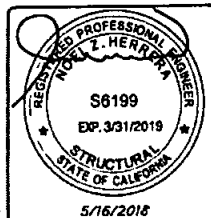
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10089 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	02/16/18	REVISED FOR COMMENTS
2	02/16/18	REVISED FOR COMMENTS
3	04/26/18	REVISED FOR COMMENTS
4	03/26/18	ISSUED FOR APPROVAL



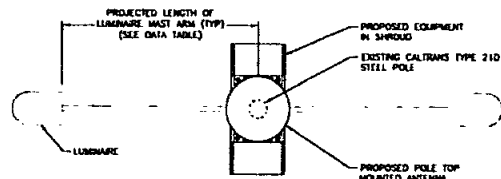
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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21D STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21D-3



LUMINAIRE MAST ARM DATA PER CALTRANS				
PROJECTED LENGTH	N RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
6'-0"	2'-0"	3-1/4"	0.1196"	TYPE 210
8'-0"	2'-0"	3-1/2"		34'-8"
10'-0"	2'-0"	3-1/2"		37'-0"
12'-0"	2'-0"	3-1/2"		37'-8"

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

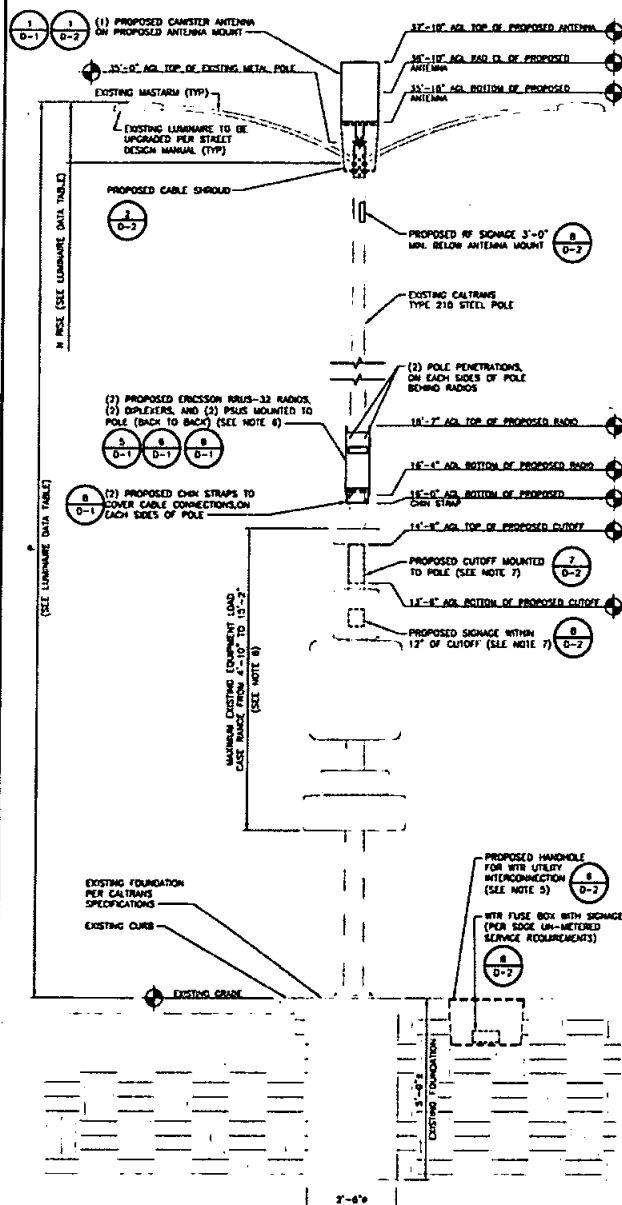
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANISTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-2F150-12P OR EQUAL ANTENNA	33.3	33.3
2	ERICSSON RRUS-32 RADIO & PSU AC OR UNIT	62.21	124.42
2	RRS DP44220A4-4C DIPLEXER	3.1	6.2
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHIN STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	PACTECORL P7890122 CUTOFF	12	12
TOTAL			225.97

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

- A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE AASHTO 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
- THE GENERAL CONTRACTOR WOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
- A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
- ELECTRICAL CONDUIT SHALL BE GUARDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ASSUMPTION NOTES

- ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
- WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF I-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
- EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
- NO CHIPPING OF FOUNDATION.
- WIND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
- ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
- POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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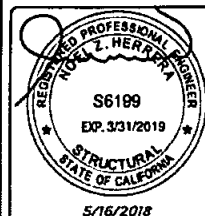
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2	04/16/19	REVISED PER COMMENTS
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1	04/10/19	REVISED PER COMMENTS
0	03/29/19	ISSUED FOR APPROVAL



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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 210 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MS21D-4

Site Information: Address: San Diego, CA
Description: 30' Generic Existing Steel Light Pole
Type 15D
Loading Scenario: Micro-2

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 71.4% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 99.6% Pass
Existing Concrete Pier Foundation: 64.7% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

- This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
- Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
- Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
- The analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
- This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
- Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4
- At the time of this structural analysis, exact details were not available for the following items:
 - luminaire: (type & model, weight & dimensions)
 - foundation rebar dia and quantity, soil parameters
 - signages on poles were assumed

POLE DATA

Type of Material	Steel - S55	(N/A)	NOTED PRESSURE
Bottom Pole Diameter	8 in		From Equation: $P_0 = 0.00254 \sqrt{1.2 \times 10^6 \times V^3 / C}$
Top Pole Diameter	1.6875 in		G = 3.14
Pole Thickness	0.1993 in		Basic Wind Speed
Height of Pole	30 ft		Service Wind Speed
			Exposure Category

LAMP ARM DATA

Type of Material	Steel A500 Gr B	(N/A)
Arm Diameter	3.875 in	
Arm Thickness	0.180 in	
Weight of Arm	72.5 lbs	
Horizontal Length of Arm	12.00 ft	
Total Length of Arm	12.5 ft	

*Alterations made to the loading load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the addition of (1) cut-off unit above the vehicle impact zone on the pole, and the addition of (1) concourse system for enhancing the bases of the radio units. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appendices	Existing or Proposed	Dimensions (in)			Weight (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		Z ₀₁ x D ₀₁	Z ₀₂ x D ₀₂	
Cable Head	Existing	-	-	-	45	1.30	1.30	11.75
ALL ACCESS 21 150 177 with arms off	Proposed	15	64	15	59.94	4.58	4.58	21.83
(2) BRUL 12 - (1) PMD AC DA	Proposed	12.05	27.12	9.73	174.42	2.27	1.84	22.45
Chen Strap	Proposed	12.05	6	8.75	10	0.50	0.36	16.08
Ball Mount Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	21.00
Ball Mount Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	22.00
Total Panel	Existing	12	3	12	10	0.25	0.25	35.00
Box	Existing	14	14	3	5	1.56	0.78	12.00
Prediction System	Existing	33	13	0.5	8	7.56	0.02	10.00
Trailer Sign	Existing	28	6	0.1	2	1.17	0.00	7.00
Street Sign	Existing	48	16	0.1	7	5.33	0.01	6.00
Cable Head	Existing	-	-	-	45	1.30	1.30	33.75
Lamp Arm	Existing	-	-	-	72.5	4.04	4.04	31.63

Total Dead Load = 0.81 kips
Total Moment Due to Dead Load Concentrations = 0.01 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.54 kips
Total Moment due to Wind in Z Dir = 27.93 kip-ft
Total Wind Force in X Direction = 0.92 kips
Total Moment due to Wind in X Dir = 22.39 kip-ft
Total Torsion = 0.01 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.62 kips
Total Moment due to Wind in Z Dir = 11.23 kip-ft
Total Wind Force in X Direction = 0.37 kips
Total Moment due to Wind in X Dir = 8.98 kip-ft
Total Torsion = 0.00 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Components Light Pole Compression/Bending Check

AASHTO
Sec. 5.12

Maximum Factored Axial Load $P_u = 1.02$ kips
Factored Compressive Strength $P_n = 5.57$ kips
Stress Ratio $P_u/P_n = 0.182$ Less than 0.2

Flexural/Bending Check

Maximum Factored Bending Moment $M_u = 27.9$ kip-ft
Factored Flexural Strength $M_n = 45.2$ kip-ft
Moment Magnifier Factor (2nd Order Effects) $B_1 = 1.01$
Stress Ratio $M_u/M_n = 0.621$

Shear and Torsion Strength Check

Maximum Factored Shear $V_u = 1.80$ kips
Factored Shear Strength $V_n = 47.36$ kips
Stress Ratio $V_u/V_n = 0.038$
Maximum Factored Torsion $T_u = 0.01$ kips
Factored Torsional Strength $T_n = 108.67$ kips
Stress Ratio $T_u/T_n = 0.000$
 $T_u/T_n < \text{Less than } 0.2$, torsional and shear effects can be ignored

Combined Forces Interaction

Sec. 5.13

$$\frac{P_u}{P_n} + \frac{M_u}{M_n} + \frac{T_u}{T_n} \leq 1.0$$

Combined Forces Interaction = 0.714 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads

6.2.2 Structural Components Lamp Arm

Flexural/Bending Check

Maximum Factored Bending Moment $M_u = 2.64$ kip-ft
Factored Flexural Strength $M_n = 6.13$ kip-ft
Stress Ratio $M_u/M_n = 0.429$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads



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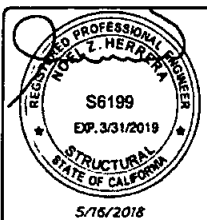
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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21D STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21D-5

6.4 Base Plate & Anchorage

6.4.1 Base Plate

ASCE DESIGN GUIDE 1

Design Data

Maximum Factored Bending Moment (at column face)	$M_u = 28.21$	kips	(ref Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	$P_u = 1.81$	kips	(ref Analysis & Design Section 6.2.1)
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$B = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.65$		Sec 6.3.2
Base Plate Thickness	$t_p = 1.5$	in	
Anchor Rod Edge Distance	$e = 1.25$	in	

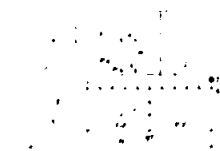


Fig. 6.4.1 Base plate with small moment

Design Method: Small or Large Moment Base Plates

Sec. 6.4

Equivalent Eccentricity	$e = \frac{M_u}{P_u} = 15.6$	in	Eq. 6.3.4
Maximum Bearing Stress	$f_{max} = 0.125 \sqrt{\frac{P_u}{A_g}}$	ksi	Sec. 6.4
Maximum Bearing Pressure	$f_{max} = 15.9$	ksi	Eq. 6.3.4
Critical Eccentricity	$e_c = \frac{B}{4} = 3.0$	in	Eq. 6.3.7
Base Plate Design Method	Small Moment = $P_u \leq P_{cr}$ Large Moment = $P_u > P_{cr}$		Sec. 6.3.2.1

Base Plate Not Check

Eq. 6.3.4

$$f_{max} = 0.125 \sqrt{\frac{P_u}{A_g}} = 15.9 \text{ ksi} < 15.9 \text{ ksi}$$

Check = Plate Size OK

Bearing Length

Eq. 6.3.4.2

$$f_{max} = 0.125 \sqrt{\frac{P_u}{A_g}} = 15.9 \text{ ksi} < 15.9 \text{ ksi}$$

Base Plate Thickness Check

Eq. 6.3.4.2

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

Base Plate Yielding Limit at Bearing Interface

Sec. 6.3.2

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

Required Base Plate Thickness

Eq. 6.3.3.2.2

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

Base Plate Yielding Limit at Tension Interface

Eq. 6.3.4.6

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

Maximum Required Base Plate Thickness

Eq. 6.3.4.6

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

Base Plate Thickness

Eq. 6.3.4.6

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

Base Plate

Eq. 6.3.4.6

$$t_p = 1.5 \text{ in} > 1.5 \text{ in}$$

6.5.2 Anchorage Check

ASCE DESIGN GUIDE 1

Design Data

Maximum Factored Tension	$T_u = 7.1$	kips	(ref Section 6.5.1)
Maximum Factored Shear	$V_u = 1.80$	kips	(ref Section 6.2.1)
Number of Bars in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{rod} = 1.775$	kips	
Factored Shear per Anchor Rod	$V_{rod} = 0.45$	kips	
Anchor Rod Diameter	$D = 1.25$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Bearing-Type Connections

Sec. 13.10.1.2.2

Normal Unstressed Area of Anchor Rod	$A_n = 1.23$	in ²	
Normal Tensile Stress of Anchor Rod	$F_u = 43.50$	ksi	Table 23.7
Normal Shear Stress of Anchor Rod	$F_u = 26.10$	ksi	Table 23.2
Required Shear Stress of Anchor Rod	$F_u = 0.37$	ksi	Sec. 13.10.1.1.2.5
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 13.10.1.1.2.5
Normal Tensile Stress Modified to Include Shear Stress	$F_u = 43.50$	ksi	Sec. 13.10.1.1.2.5
Normal Tensile Strength of Anchor Rod	$R_n = 53.4$	kips	Eq. 13.7
Factored Tensile Strength of Anchor Rod	$\phi R_n = 40.0$	kips	Eq. 13.7
Stress Ratio	$SR = 0.013$		Sec. 13.10.1.1.2.5

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 1.15$	k	
Vertical Force	$V = 0.83$	k	
Height above grade of Lateral Force	$H = 15.71$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
True Depth	$D_{true} = 5.35$	ft	

Applicable Equation

$$D_{req} = (4.25 P H / S) / B \quad (\text{IBC 2012 Eq. 18-2})$$

Lateral Soil Bearing Capacity

$$F \times S = 0.20 \text{ ksf}$$

Allowable lateral pressure at "D"

$$S_1 = F \times S \times D = 1.07 \text{ ksf}$$

Required Calculated Depth

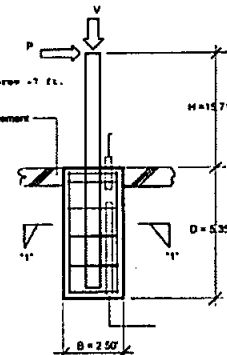
$$D_{req} = 5.35 \text{ ft} = D_{prev} + 7 \text{ ft}$$

Vertical Soil bearing Check

(Section 1807.3.2.3)

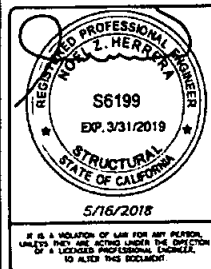
$$Q_{ult} = (0.83 + 4.91 + 5.35 \times 0.10) / 4.91 = 0.97 \text{ ksf}$$

$$66.7\% \quad \text{OK}$$



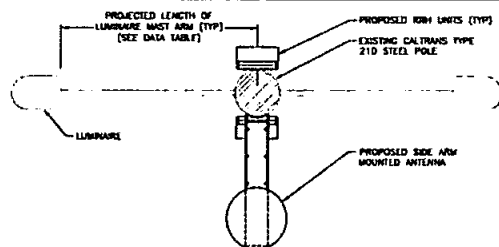
PTS NUMBER
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5	06/20/18	REVISED FOR APPROVAL



AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN
EXISTING TYPE 21D STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER
MS21D-6



LUMINAIRE MAST ARM DATA PER CALTRANS

PROJECTED LENGTH	N RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
6'-0"	2'-6"	3-1/4"	0.1196"	36'-6"
8'-0"	2'-6"	3-1/2"		37'-0"
10'-0"	3'-3"	3-7/8"		37'-8"
12'-0"	4'-3"			38'-8"

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

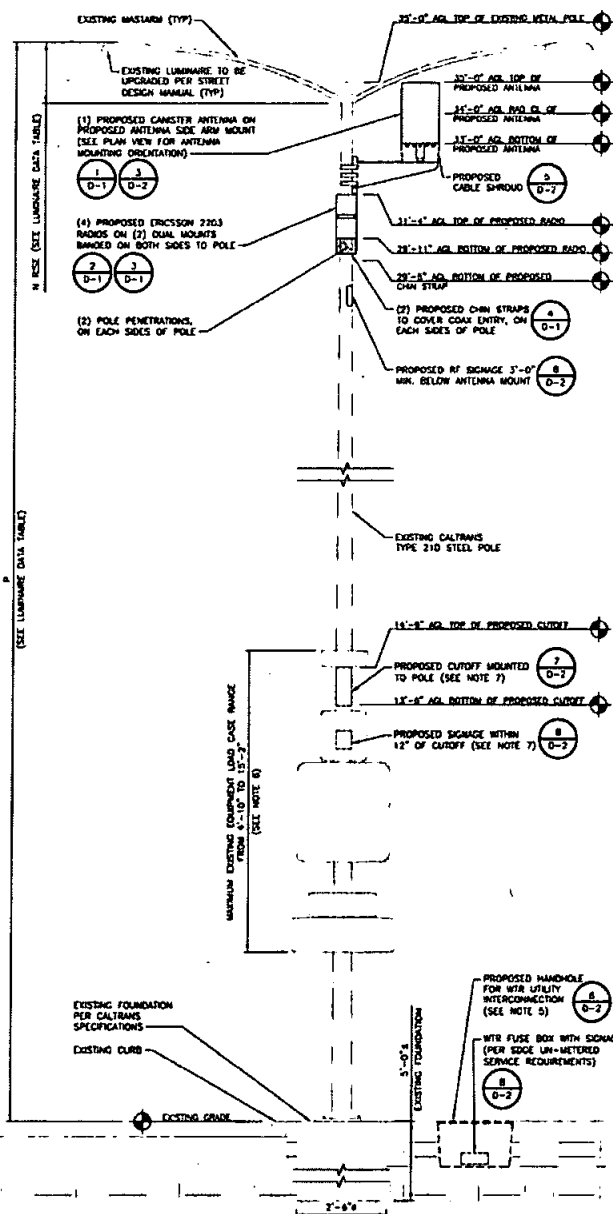
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANTENNA ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (4) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-27150-12P OR EQUAL ANTENNA	35.3	35.3
4	ERICSSON RRUS-2203 RADIO	14.4	57.6
1	SIDE ARM ANTENNA MOUNT BRACKET	25	25
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	8	8
2	CHIN STRAP	5	10
1	PACTEC-SOL PFS80122 CUTOFF	12	12
	TOTAL		152.9

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET LIGHT POLE WILL FULLY COMPLY WITH THE AASHTO 2010. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR WOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER OF RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 2-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING CUTOFF AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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SAN DIEGO, CA 92121



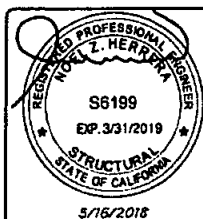
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10088 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

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5/16/2018
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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 210 STREET LIGHT POLE WITH SIDE ARM ANTENNA MOUNT AND PICO RADIO EQUIPMENT SCHEMATIC

SHEET NUMBER

MS21D-7

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 35' Generic Existing Steel Light Pole
Type 21D
Loading Scenario: Pico-3

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 74.0% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 104.6% Pass
Existing Concrete Pier Foundation: 64.7% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

1. This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/unproposed equipment loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
2. Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
3. Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
4. This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.

5. This analysis assumes that all existing and/or proposed equipment's mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.

6. Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4

8. At the time of this structural analysis, exact details were not available for the following items:

- luminaire: (type & model, weight & dimensions)
- foundation rebar dia and quantity, soil parameters
- signages on poles were assumed.

POLE DATA

Item	Value	Unit
Type of Material	Steel - 55 ksi	(N/A)
Bottom Pole Diameter	6.625 in	
Top Pole Diameter	1.6875 in	
Pole Thickness	0.1793 in	
Height of Pole	35 ft	

LAMP ARM DATA

Item	Value	Unit
Type of Material	Steel A500 Gr B	(N/A)
Arm Diameter	3.875 in	
Arm Thickness	0.130 in	
Weight of Arm	72.3 lbs	
Horizontal Length of Arm	12.00 ft	
Total Length of Arm	12.5 ft	

Alterations made to the following load cases as shown on the previous sheet when this submitter, do not significantly impact the structural results. These alterations include: the addition of (1) cut-off wall above the pile impact zone on the pole. Any questions or concerns should be addressed to the Engineer of Record for these calculations.

EQUIPMENT DATA

Equipment & Appendices	Existing or Proposed	Dimensions (in)			Weight (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		Z Dir	X Dir	
Cable Head	Existing	-	-	-	45	1.30	1.30	38.75
ALL AASHTO 21 (SD) 12P with concrete	Proposed	15	44	15	69.94	4.58	4.58	13.17
Side Arm Mount	Proposed	34.5	14.5	6	25	1.74	0.90	30.73
(2) Freeway Signs 2203	Proposed	4.13	17.1	7.87	28.8	0.49	0.93	30.62
(2) Freeway Signs 2203	Proposed	4.13	17.1	7.87	28.8	0.49	0.93	30.62
Chin Strap	Proposed	2	6	3	5	0.11	0.13	28.67
Ball Mount Arm 1	Existing	60	0.5	0.5	5	0.21	0.20	23.00
Ball Mount Arm 2	Existing	60	0.5	0.5	5	0.21	0.20	21.00
Tower Panel	Existing	12	3	12	10	0.25	0.25	15.00
Sign	Existing	14	14	8	5	1.36	0.29	12.00
Freeway Signage	Existing	11	13	0.1	8	7.56	0.03	10.00
Traffic Sign	Existing	28	8	0.1	2	1.17	0.00	7.00
Street Sign	Existing	48	16	0.1	7	5.33	0.01	6.00
Cable Head	Existing	-	-	-	45	1.30	1.30	38.75
Lamp Arm	Existing	-	-	-	73	4.04	4.04	36.61

Total Dead Load = 0.84 kips
Total Moment Due to Dead Load & Construction = 0.21 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.53 kips
Total Moment due to Wind in Z Dir = 30.72 kip-ft
Total Wind Force in X Direction = 0.93 kips
Total Moment due to Wind in X Dir = 25.23 kip-ft
Total Torsion = 0.86 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.61 kips
Total Moment due to Wind in Z Dir = 12.32 kip-ft
Total Wind Force in X Direction = 0.33 kips
Total Moment due to Wind in X Dir = 10.12 kip-ft
Total Torsion = 0.35 kip-ft

6.2 Structural Components Capacity Checks

6.2.1 Structural Steel Members, Lateral Force

AASHTO
Sec. 5.13

Maximum Factored Total Load $P_u = 0.05$ kips
Factored Compressive Strength $\phi_c P_n = 4.62$ kips
Stress Ratio $P_u / \phi_c P_n = 0.011$ Yes, it is equal or greater than 0.2

General Strength Check

Maximum Factored Bending Moment $M_u = 30.72$ kip-ft
Factored Tensile Strength $\phi_t F_u A_g = 12.8$ kip-ft
Moment Magnitude Factor (1st Order Effects) $\beta_1 = 1.01$
Stress Ratio $M_u / \phi_t F_u A_g = 0.588$

Shear and Flexure Interaction Check

Maximum Factored Shear $V_u = 1.79$ kips
Factored Tensile Strength $\phi_t F_u A_g = 10.00$ kips
Stress Ratio $V_u / \phi_t F_u A_g = 0.088$
Maximum Factored Torsion $T_u = 0.86$ kips
Factored Tensile Strength $\phi_t F_u A_g = 10.00$ kips
Stress Ratio $T_u / \phi_t F_u A_g = 0.008$
 $V_u / T_u = 1.99$ Less than 0.2, torsional and shear effects can be ignored

Combined Force Interaction

Sec. 5.13

$$\frac{P_u}{\phi_c P_n} + \frac{M_u}{\phi_t F_u A_g} + \frac{T_u}{\phi_t F_u A_g} \leq 1.0$$

Combined Force Interaction = 0.241 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2.2 Structural Steel Members, Lateral Force

General Strength Check

Maximum Factored Bending Moment $M_u = 2.48$ kip-ft
Factored Tensile Strength $\phi_t F_u A_g = 6.15$ kip-ft
Stress Ratio $M_u / \phi_t F_u A_g = 0.399$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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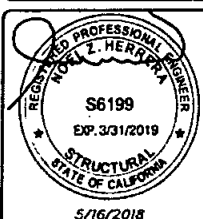
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BLACK & VEATCH CORPORATION
10068 WILLOW CREEK RD
SUITE 330
SAN DIEGO, CA 92131

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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21D STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21D-8

6.6 Base Plate & Anchorage

6.6.1 Base Plate

6.6.2 Anchor Bolt Check

Design Data			
Maximum Factored Bending Moment per moment magnifier	$M_u = 11.03$	kip-ft	ref Analysis & Design Section 6
Maximum Factored Axial Load	$P_u = 1.02$	kips	ref Analysis & Design Section 6
Concrete Compressive Strength	$f'_c = 3$	ksi	assumed
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$N = 12$	in	
Base Plate Width	$B = 12$	in	
Resistance Factor in Compression	$\phi_c = 0.65$		Sec 6.5.2.2
Base Plate Thickness	$t_p = 2$	in	
Anchor Rod Edge Distance	$e_{ar} = 1.25$	in	



Design Method: Limit of Lateral Shear Base Plates

Equivalent Eccentricity	$e = \frac{M_u}{P_u} = 10.8$	in	Eq 3.1.1
Maximum Bearing Stress	$f_{max} = \frac{P_u}{A_g} \left(1 + \frac{6e}{N} \right) = 1.00$	ksi	Sec 4.6
Maximum Bearing Pressure	$q_{max} = f_{max} = 1.0$	ksi	Eq 3.1.1
Critical Eccentricity	$e_{crit} = \frac{N}{6} = 2.0$	in	Eq 3.1.1

Base Plate Design Method

Small Moment $e < e_{crit}$	$\phi_c P_n = \phi_c F_y A_g = 115.5$	kips	Eq 3.1.1
Large Moment $e > e_{crit}$	$\phi_c P_n = 115.5$	kips	Eq 3.1.1

Bearing Length

Factored Anchor Rod Tension $T_u = P_u - \phi_c P_n$	$T_u = 2.3$	kips	Eq 3.1.1
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Base Plate Thickness Check

Base Plate Yielding Limit of Bending Interface	$t_p = 1.0$	in	Sec 3.1.2
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Base Plate Thickness Check

Required Base Plate Thickness	$t_p = 0.75$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Maximum Required Base Plate Thickness	$t_p = 0.75$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 2.00$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
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Base Plate Thickness Check

Base Plate Thickness	$t_p = 0.126$	in	Eq 3.1.2b.2
----------------------	---------------	----	-------------

6.6.2 Anchor Bolt Check

6.6.2 Anchor Bolt Check

Design Data			
Maximum Factored Tension	$T_u = 2.3$	kips	ref Section 6.5.1
Maximum Factored Shear	$V_u = 1.79$	kips	ref Section 6.5.1
Number of Bolts in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{ar} = 0.6$	kips	
Factored Shear per Anchor Rod	$V_{ar} = 0.45$	kips	
Anchor Rod Diameter	$D = 1.25$	in	(assumed)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Bearing-Type Connections

Normal Unstressed Area of Anchor Rod	$A_n = 1.23$	in ²	Sec. 13.6.1.1.2
Normal Tensile Stress of Anchor Rod	$f_t = 43.50$	ksi	Table J3.2
Normal Shear Stress of Anchor Rod	$f_v = 26.10$	ksi	Table J3.2
Required Shear Stress of Anchor Rod	$f_{vr} = 0.36$	ksi	Sec. J3.10.1-125
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. J3.10.1-125
Normal Tensile Stress Modified to Include Shear Stress	$f_{tr} = 43.50$	ksi	Sec. J3.10.1-125

Normal Tensile Strength of Anchor Rod	$R_t = F_u A_n$	ksi	Eq J3.2
Factored Tensile Strength of Anchor Rod	$\phi R_t = 40.0$	kips	Eq J3.2
Design Data	$\phi R_t = 40.0$	kips	

6.7 Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 1.13$	k	
Vertical Force	$V = 0.88$	k	
Height above grade of Lateral Force	$H = 17.61$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
Final Depth	$D_{req} = 5.26$	ft	

Applicable Equation

$$D_{req} = (4.25 P H / S)^{1/3} \quad (\text{IBC 2012 Eq. 18-2})$$

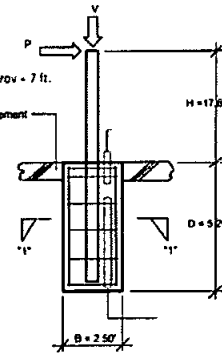
Lateral Soil Bearing Capacity	$F \times S = 0.20$	ksf	
Allowable lateral pressure at "D"	$S_1 = F \times S \times D = 1.05$	ksf	
Required Calculated Depth	$D_{req} = 5.87$	ft	< D _{prov} = 7 ft.

Vertical Soil bearing Check

$$Q_{ult} = (0.88 + 4.91 \times 5.26 \times 0.15) / 4.91$$

$$= 0.97 \text{ ksf}$$

$$SR = 64.7\% \quad \text{OK}$$



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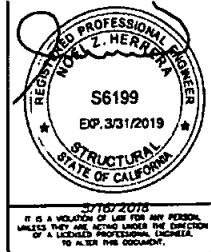
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	01/16/10	REVISED PER COMMENTS
2	01/16/10	REVISED PER COMMENTS
3	01/16/10	REVISED PER COMMENTS
4	01/16/10	REVISED PER APPROVAL

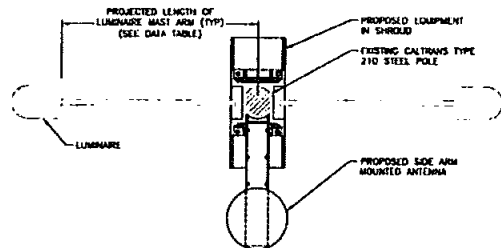


AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 21D STREET
LIGHT POLE WITH SIDE
ARM ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21D-9



LUMINAIRE MAST ARM DATA PER CALTRANS

PROJECTED LENGTH	H RISE	MIN O.D. AT POLE	NOMINAL THICKNESS	P
6'-0"	2'-0"	3-1/8"	0.1196"	36"-8"x
8'-0"	2'-8"x	3-1/2"		37'-0"x
10'-0"	3'-3"x	3-7/8"		37'-8"x
12'-0"	4'-3"x			38'-8"x

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

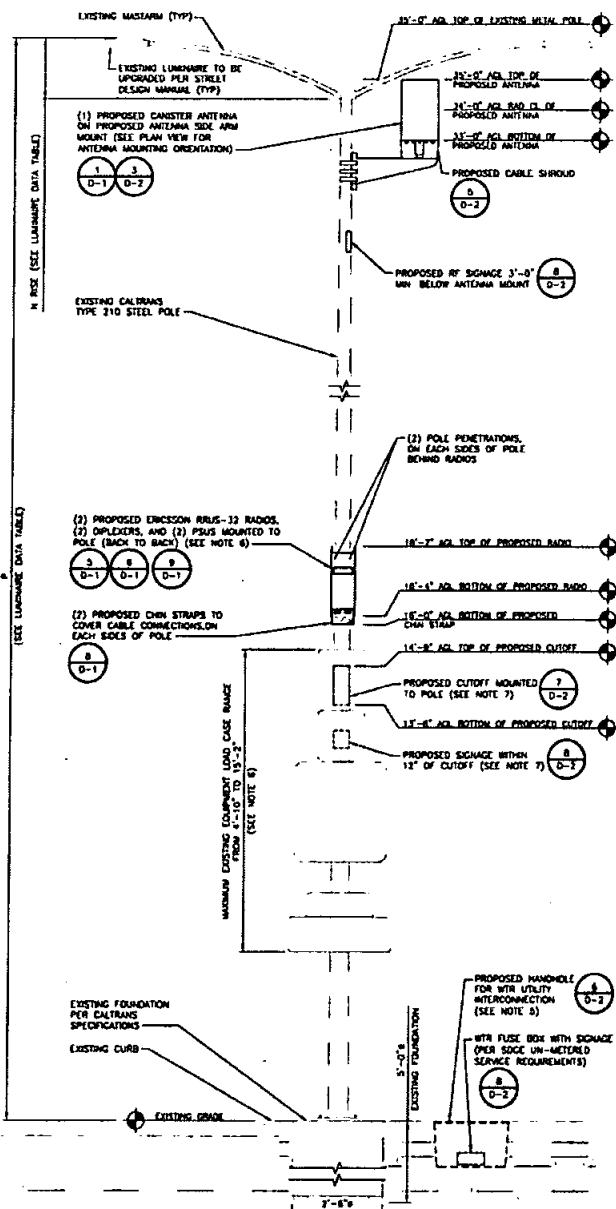
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANTENNA ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	NCE ACOM-2F150-12P OR EQUAL ANTENNA	35.3	35.3
2	ERICSSON RRU-32 RADIO & PSU AC DB UNIT	62.21	124.42
2	RFS FDL4020M4-NC DUPLEXER	3.1	6.2
1	SIDE ARM ANTENNA MOUNT BRACKET	25	25
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	8	8
2	CHIN STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	PACTECBOL PFSB0172 CUTOFF	12	12
	TOTAL		228.92

PROJECT NOTES



STEEL POLE ELEVATION VIEW

NO SCALE

1. A STRUCTURAL ANALYSIS WAS PERFORMED. THE EXISTING STREET LIGHT IS ASSUMED TO BE BUILT AND MAINTAINED IN ACCORDANCE WITH THE POLE MANUFACTURER'S SPECIFICATIONS AND IN GOOD CONDITION. EXISTING STREET POLE DEFECTS ASSESSMENT IS NOT WITHIN THE SCOPE OF THE ANALYSIS. BASED ON THE ANALYSIS, THE EXISTING STREET POLE WILL FULLY COMPLY WITH THE AASHTO 2015. THEREFORE, THE EXISTING STREET LIGHT POLE IS DEEMED SUFFICIENT FOR THE PROPOSED LOAD CASES.
2. THE GENERAL CONTRACTOR WOULD NOTIFY THE ENGINEER OF RECORD IF THERE ARE ANY FIELD DEFECTS THAT COMPROMISE STRUCTURAL INTEGRITY.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDING ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED TO MATCH EXISTING POLE.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 34' AQL ON THE POLES THAT ARE LOCATED TO THE WEST OF I-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY. ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.



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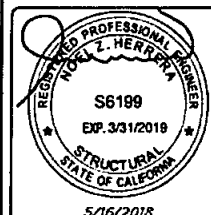
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SAN DIEGO, CA 92131

PTS NUMBER

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REV	DATE	DESCRIPTION
1	06/16/18	ISSUED PER COMMENTS
2	06/17/18	ISSUED PER COMMENTS
3	06/18/18	ISSUED PER COMMENTS
4	06/28/18	ISSUED FOR APPROVAL



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AT&T SMALL CELL (CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 210 STREET LIGHT POLE WITH SIDE ARM ANTENNA MOUNT AND MICRO RADIO EQUIPMENT SCHEMATIC

SHEET NUMBER

MS21D-10

GENERAL NOTES

Site Information: Address: San Diego, CA
Description: 35' Generic Existing Steel Light Pole
Loading Scenario: Type 21D
Micro-4

Applicable Codes: AASHTO 2015

Analysis Results

Existing Steel Light Pole Stress Ratio with Proposed Equipment: 75.0% Pass
Existing Steel Light Pole Service Deflection Ratio with Proposed Equipment: 102.4% Pass
Existing Concrete Pier Foundation: 64.7% Pass

ASSUMPTIONS, DISCLAIMERS, AND NOTES

- This analysis was performed under the assumption that all information provided to Black & Veatch is current and correct. This is to include site data, existing/proposed appearance loading, and pole data. If this information is not current and correct, this report should be considered obsolete and further analysis will be required.
- Black & Veatch assumes no responsibility for failures caused by factors beyond our control. These include but are not limited to: missing, corroding, decaying and/or deteriorating components, improper manufacturing and/or construction, and improper pole maintenance.
- Black & Veatch assumes no responsibility for modifications completed prior to or hereafter in which Black & Veatch was not directly involved. These modifications include but are not limited to: replacing or strengthening pole components, installing or removing antenna mounting components, installing or removing utility components, and changing loading configurations.
- This analysis assumes that the poles structural components and mounts, including all steel sections and attachment hardware, are in good working order and in their original state, free of rust or other forms of corrosion. Furthermore, it is assumed that the pole has been properly maintained and monitored since the time of construction. This report should be considered obsolete and further analysis will be required if the pole does not meet all of the above specifications.
- This analysis assumes that all existing and/or proposed equipment mounts on the tower will have adequate capacity to support the existing and proposed equipment loading.
- Fatigue does not govern the design of common light poles per AASHTO Sec. C11.4.
- At the time of this structural analysis, exact details were not available for the following items:
 - Hardware: Type & model, weight & dimensions
 - Foundation: rebar dia and quantity, soil parameters
 - Signages on poles were assumed.

POLE DATA

Type of Material: Steel - S5 Lbr D/A1
Bottom Pole Diameter: 18.25 in
Top Pole Diameter: 18.875 in
Pole Thickness: 0.1793 in
Height of Pole: 35 ft

LAMP ARM DATA

Type of Material: Steel A500 Gr B D/A1
Arm Diameter: 3.875 in
Arm Thickness: 0.120 in
Weight of Arm: 72.5 lbs
Horizontal Length of Arm: 12.00 ft
Total Length of Arm: 12.5 ft

WIND PRESSURE

From Equation $P_z = 0.0054 K_z K_{zt} G C_f$
Gust Effect Factor: $G = 1.34$
Basic Wind Speed: $V = 120$ mph
Service Wind Speed: $V_s = 76$ mph
Exposure Category: C

*Alterations made to the following load cases, as shown on the previous sheet within this submittal, do not significantly impact the structural results. These alterations include: the addition of (1) cut-off unit above the vehicle impact zone on the pole, and the addition of (1) cornermount system for shielding the back of the road units. Any questions or concerns should be addressed to the Engineer at Record for these calculations.

EQUIPMENT DATA

Equipment & Apparatus	Existing or Proposed	Connections (in)			Weight (lbs)	Effective Projected Area (ft ²)		Elevation (ft)
		W	H	D		Z De	V De	
Collar Head	Existing	-	-	-	45	1.30	1.30	18.75
MC-1000 21" x 12" with cone detail	Proposed	15	44	25	69.94	4.58	4.58	33.17
Side Arm Mount	Proposed	34.5	18.5	0	25	1.74	0.00	34.15
(2) Erection ARLA 12" x (2) PSL AE 08	Proposed	12.05	27.17	9.73	124.42	2.77	1.84	16.97
Chen Set up	Proposed	12.05	6	0.75	10	0.50	0.36	16.08
Ball Board Arm 1	Existing	60	0.5	0.5	5	0.21	0.00	23.00
Ball Board Arm 2	Existing	60	0.5	0.5	5	0.21	0.00	23.00
Tower Panel	Existing	12	3	12	10	0.75	0.25	15.00
Arm	Existing	14	14	3	5	1.38	0.29	12.00
Post-Installation Signage	Existing	33	33	0.1	8	7.56	0.02	10.00
Traffic Sign	Existing	28	6	0.1	2	1.87	0.00	7.00
Street Sign	Existing	48	16	0.1	7	9.33	0.01	6.00

Total Dead Load = 0.78 kips
Total Moment Due to Dead Load (x-direction) = 1.16 kip-ft

Strength Design Wind Loads

Total Wind Force in Z Direction = 1.49 kips
Total Moment due to Wind in Z Dir = 27.74 kip-ft
Total Wind Force in X Direction = 0.82 kips
Total Moment due to Wind in X Dir = 10.19 kip-ft
Total Torison = 1.67 kip-ft

Service Design Wind Loads

Total Wind Force in Z Direction = 0.60 kips
Total Moment due to Wind in Z Dir = 11.15 kip-ft
Total Wind Force in X Direction = 0.33 kips
Total Moment due to Wind in X Dir = 8.10 kip-ft
Total Torison = 0.67 kip-ft

6.1 Structural Components Capacity Checks

6.1.1 Structural Component: Light Pole Compressive Strength Check

AASHTO
Sec. 5.12

Maximum Factored Axial Load: $P_u = 0.99$ kips
Factored Compressive Strength: $\phi_c P_n = 4.68$ kips
Stress Ratio: $P_u / \phi_c P_n = 0.21$ Yes, it is equal or greater than 0.2

Flexural Strength Check

Maximum Factored Bending Moment: $M_u = 27.7$ kip-ft
Factored Flexural Strength: $\phi_b M_n = 13.9$ kip-ft
Moment Magnifier Factor (2nd Order Effect): $\delta = 1.01$
Stress Ratio: $M_u / \phi_b M_n = 0.53$

Torsion and Torsion Strength Check

Maximum Factored Torsion: $T_u = 1.70$ kips
Factored Torsion Strength: $\phi_b T_n = 49.67$ kips
Stress Ratio: $T_u / \phi_b T_n = 0.034$

Maximum Factored Torsion: $T_u = 1.67$ kips
Factored Torsion Strength: $\phi_b T_n = 101.08$ kips
Stress Ratio: $T_u / \phi_b T_n = 0.016$
 $T_u / T_n < \text{Less than } 0.2$, torsional and shear effects can be ignored

Combined Stress Interaction

Sec. 5.12

$$\left(\frac{P_u}{\phi_c P_n} \right)^2 + \left(\frac{M_u}{\phi_b M_n} \right)^2 + \left(\frac{T_u}{\phi_b T_n} \right)^2 < 1.0$$

Combined Stress Interaction = 0.663 Pass

Therefore, existing light pole has adequate capacity to support existing and proposed loads.

6.2 Structural Component: Lamp Arm

Flexural Strength Check

Maximum Factored Bending Moment: $M_u = 2.43$ kip-ft
Factored Flexural Strength: $\phi_b M_n = 6.35$ kip-ft
Stress Ratio: $M_u / \phi_b M_n = 0.38$

Therefore, existing lamp arm has adequate capacity to support existing and proposed loads.



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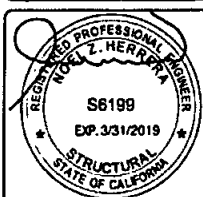
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10089 WILLOW CREEK RD
SUITE 8350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	05/16/18	REVISED PER COMMENTS
2	05/16/18	REVISED PER COMMENTS
3	04/30/19	REVISED PER COMMENTS
4	04/30/19	REVISED PER COMMENTS



5/16/2018

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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21D-11

6.6 Base Plate & Anchorage

6.6.1 Base Plate

ASCE Design Guide 1

Design Data

Maximum Factored Bending Moment (at moment resister)	$M_u = 28.12$	kip-in	(ref Analysis & Design Section 6.2.1)
Maximum Factored Axial Load	$P_u = 9.99$	kip	(ref Analysis & Design Section 6.2.1)
Concrete Compressive Strength	$f'_c = 3$	ksi	(assumed)
Yield Strength of Base Plate	$F_y = 36$	ksi	
Base Plate Length	$L = 12$	in	
Base Plate Width	$B = 12$	in	
Assurance Factor in Compression	$\phi_c = 0.95$		Sec. 5.3.3.2
Base Plate Thickness	$t_p = 2$	in	
Anchor Rod Edge Distance	$e_{anch} = 1.25$	in	

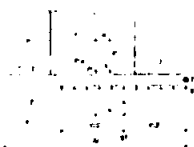


Fig. 6.6.1 Base plate with small anchors

Design Method: Small or Large Moment Base Plate

Sec. 3.4

$$Equivalent Eccentricity = e = \frac{M_u}{P_u}$$

$e = 2.8$

in

Eq. 3.5

$$Maximum Bearing Stress = f_{max} = \frac{P_u}{A} \left(1 + \frac{6e}{B} \right)$$

$f_{max} = 1.08$

ksi

Sec. 4.6

$$Maximum Bearing Pressure = q_{max} = \frac{P_u}{A} \left(1 + \frac{6e}{B} \right)$$

$q_{max} = 10.9$

kip/in

Eq. 3.4

$$Critical Eccentricity = e_c = \frac{B}{6} \left(\frac{f_{max}}{f'_c} - 1 \right)$$

$e_c = 0.0$

in

Eq. 3.7

Base Plate Design Method

Small Moment = $e \leq e_c$ Design Method = Large Moment Base Plate

Sec. 3.3.4

$$Small Moment = $e \leq e_c$$$

$e = 2.8$

in

Eq. 3.4

$$Large Moment = $e > e_c$$$

$e = 2.8$

in

Eq. 3.4

Base Plate Size Check

$f = 4.9$

ksi

Eq. 3.4

$$\left(\frac{P_u}{A} \right) \left(1 + \frac{6e}{B} \right) \leq f$$

$\frac{P_u}{A} \left(1 + \frac{6e}{B} \right) = 11.9$

ksi

Eq. 3.4

$$Bearing Length = \left(\frac{P_u}{f_{max}} \right) \left(1 + \frac{6e}{B} \right)$$

$B = 9.13$

in

Eq. 3.4

$$Factored Anchor Rod Tension = T_u = P_u \left(\frac{e}{B} \right)$$

$T_u = 2.1$

kip

Eq. 3.4

Base Plate Thickness Check

$m = 1.9$

in

Eq. 3.4

$$Base Plate Yielding Limit at Bearing Interface$$

$Y = m \leq t_p$

$Y = 1.9$

in

$$Check = Y \leq t_p, \text{ Use Eq. 3.3.1b-2}$$

$Y = 1.9$

in

Eq. 3.3.1b-2

$$t_p \geq m$$

$t_p = 2$

in

Eq. 3.3.1b-2

$$t_p \geq \frac{1}{2} \sqrt{\frac{P_u}{f_y}} \left(1 + \frac{6e}{B} \right)$$

$t_p = 0.34$

in

Eq. 3.3.1b-2

$$Base Plate Yielding Limit at Tension Interface$$

$m = 0.33$

in

Eq. 3.4

$$Check = m \leq t_p, \text{ Use Eq. 3.3.1b-2}$$

$m = 0.33$

in

Eq. 3.3.1b-2

$$t_p \geq \frac{1}{2} \sqrt{\frac{P_u}{f_y}} \left(1 + \frac{6e}{B} \right)$$

$t_p = 0.34$

in

Eq. 3.3.1b-2

$$Maximum Required Base Plate Thickness$$

$t_p = 0.34$

in

Eq. 3.3.1b-2

$$Base Plate Thickness$$

$t_p = 2.00$

in

Eq. 3.4.7a

$$Stress Ratio$$

$SR = 0.12$

Pass

Eq. 3.4.7a

6.6.2 Anchorage Check

ASCE Sec. 3.3.2

Design Data

Maximum Factored Tension	$T_u = 2.1$	kip	(ref Section 6.5.1)
Maximum Factored Shear	$V_u = 1.70$	kip	(ref Section 6.2.1)
Number of Bolts in Both Tension & Shear	$N = 4$		
Factored Tension per Anchor Rod	$T_{rod} = 0.5$	kip	
Factored Shear per Anchor Rod	$V_{rod} = 0.42$	kip	
Anchor Rod Diameter	$D = 1.25$	in	(minimum)
Yield Strength of Anchor Rod	$F_y = 36$	ksi	(A36 assumed)
Ultimate Tensile Strength of Anchor Rod	$F_u = 58$	ksi	(A36 assumed)

Combined Tension and Shear in Bearing-Type Connections

Sec. 3.18.1.12

Nominal Unthreaded Area of Anchor Rod	$A_n = 1.23$	in ²	Table 3.2
Nominal Tensile Stress of Anchor Rod	$F_u = 43.93$	ksi	Table 3.2
Nominal Shear Stress of Anchor Rod	$F_u = 26.10$	ksi	Table 3.2
Required Shear Stress of Anchor Rod	$L_u = 0.35$	ksi	Sec. 3.18.1.12
Resistance Factor for Shear and Tension	$\phi = 0.75$		Sec. 3.18.1.12
Nominal Tensile Stress Modified to Include Shear Stress	$F_u' = 43.90$	ksi	Sec. 3.18.1.12
Nominal Tensile Strength of Anchor Rod	$R_n = F_u' A_n$	kip	Eq. 3.2
Factored Tensile Strength of Anchor Rod	$\phi R_n = 40.0$	kip	Eq. 3.2
Stress Ratio	$SR = 0.013$	Pass	

Pier with Lateral Load, based on Chapter 18 of IBC 2012 (restrained condition)

Design Parameters

Lateral Force	$P = 1.06$	kip	
Vertical Force	$V = 0.75$	kip	
Height above grade of Lateral Force	$H = 17.40$	ft	
Diameter of Pier	$B = 2.50$	ft	
Lateral Soil Bearing Capacity	$S = 0.10$	ksf/ft	Table 1806.2
Vertical Soil bearing Capacity	$Q_{ult} = 1.50$	ksf	Table 1806.2
Transient Load factor	$F = 2.00$		Section 1806.3.4
Trail Depth	$D_{req} = 5.40$	ft	

Applicable Equation

$$D_{req} = (4.25 P H) / (S, B f^2) \quad (\text{IBC 2012 Eq. 18-2})$$

Lateral Soil Bearing Capacity

$$F \times S = 0.20 \text{ ksf/ft}$$

$$Allowable lateral pressure at "D", $S_y = F \times S \times D = 1.06 \text{ ksf}$$$

$$Required Calculated Depth, $D_{req} = 5.40 \text{ ft} < D_{prov} = 7 \text{ ft}$$$

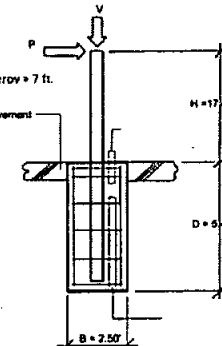
$$SR = 64.0\% \quad \text{OK}$$

$$Vertical Soil bearing Check, (Section 1807.3.2.3)$$

$$Q_{ult} = (0.75 \times 4.81 \times 5.40 \times 0.15) / 4.81$$

$$= 0.96 \text{ ksf}$$

$$SR = 64.0\% \quad \text{OK}$$



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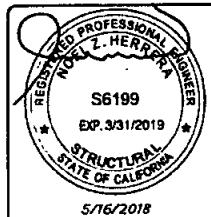
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SUITE 4350
SAN DIEGO, CA 92131

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2	05/16/18	REVIEW PER COMMENTS
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4	03/26/18	REVIEW PER APPROVAL



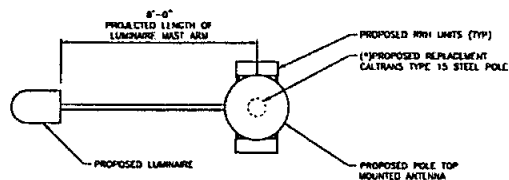
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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING TYPE 15 STREET
LIGHT POLE WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
STRUCTURAL CALCULATIONS

SHEET NUMBER

MS21D-12



*SEE POLE MANUFACTURER SPECIFICATIONS AND DETAILS

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

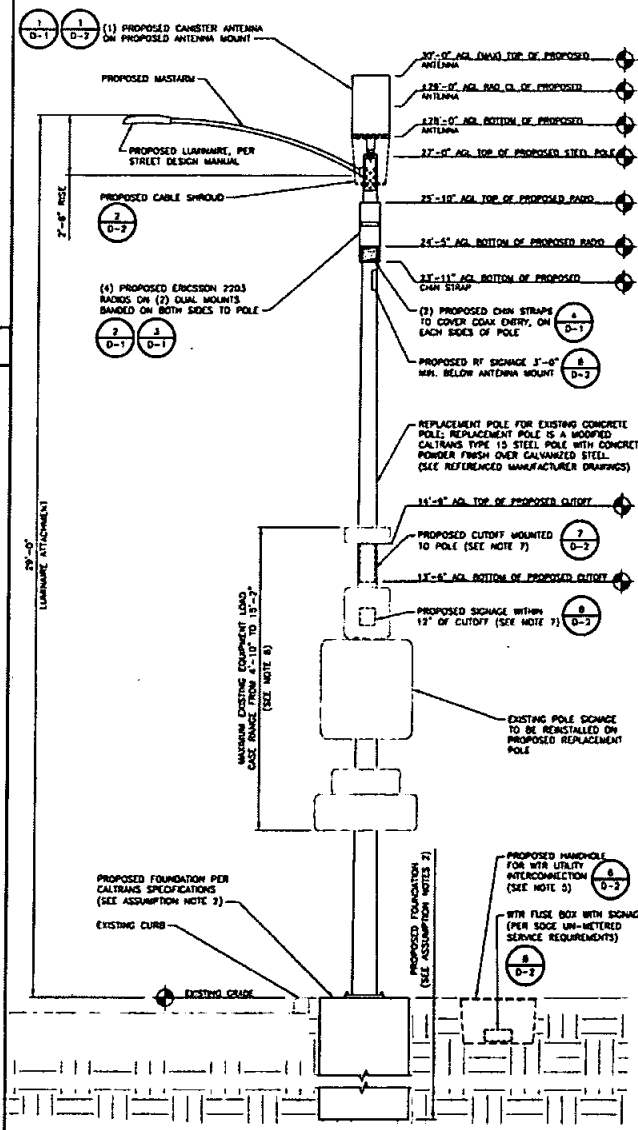
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANISTER ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (4) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE
- REMOVE AND REPLACE CONCRETE POLE WITH STEEL POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-2F150-12P OR EQUAL ANTENNA	35.3	35.3
4	ERICSSON BRUS-2203 RADIO	14.4	57.6
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHN STRAP	5	10
1	PACTCH-GDL PFS80123 CUTOFF	12	12
TOTAL			149.9

PROJECT NOTES



REPLACEMENT POLE ELEVATION VIEW

NO SCALE

1. PROPOSED POLE DESIGN IS TYPE 15 CALTRANS STANDARD, MODIFIED TO 27'-0" HEIGHT TO STAY WITHIN 30'-0" OVERALL HEIGHT LIMIT.
2. NEW POLE DESIGN DETAIL AND FOUNDATION DRAWINGS TO BE PROVIDED FOR LOCATION SPECIFIC CONDITIONS ON THE RIGHT OF WAY CONSTRUCTION PLANS. DRAWINGS ARE GENERIC DESIGN FOR MASTER STRUCTURAL PLAN REVIEW.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED GREY TO MATCH CONCRETE POLE FINISH.
2. WCF REQUIREMENT - PROJECT TO COMPLY WITH WCF REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF 1-5 PER PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND WTR CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SIGNAGE AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SIGNAGE ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.

GENERAL NOTES



5738 PACIFIC CENTER BLVD
SAN DIEGO, CA 92121



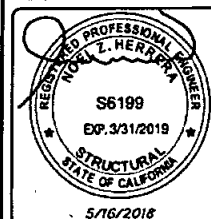
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10049 WILLOW CREEK RD
SUITE 8350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	06/16/18	REVISED FOR COMMENTS
2	06/16/18	REVISED FOR COMMENTS
3	06/16/18	REVISED FOR COMMENTS
4	06/16/18	REVISED FOR APPROVAL



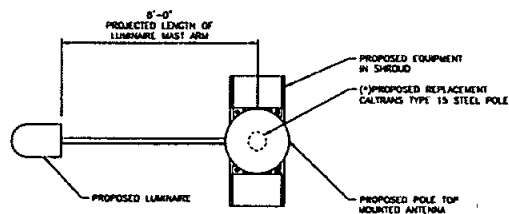
IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

EXISTING CONCRETE POLE
REPLACEMENT WITH POLE
TOP ANTENNA MOUNT AND
PICO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MSPR-1



*SEE POLE MANUFACTURER SPECIFICATIONS AND DETAILS

STEEL POLE PLAN VIEW

NO SCALE

PROJECT DESCRIPTION

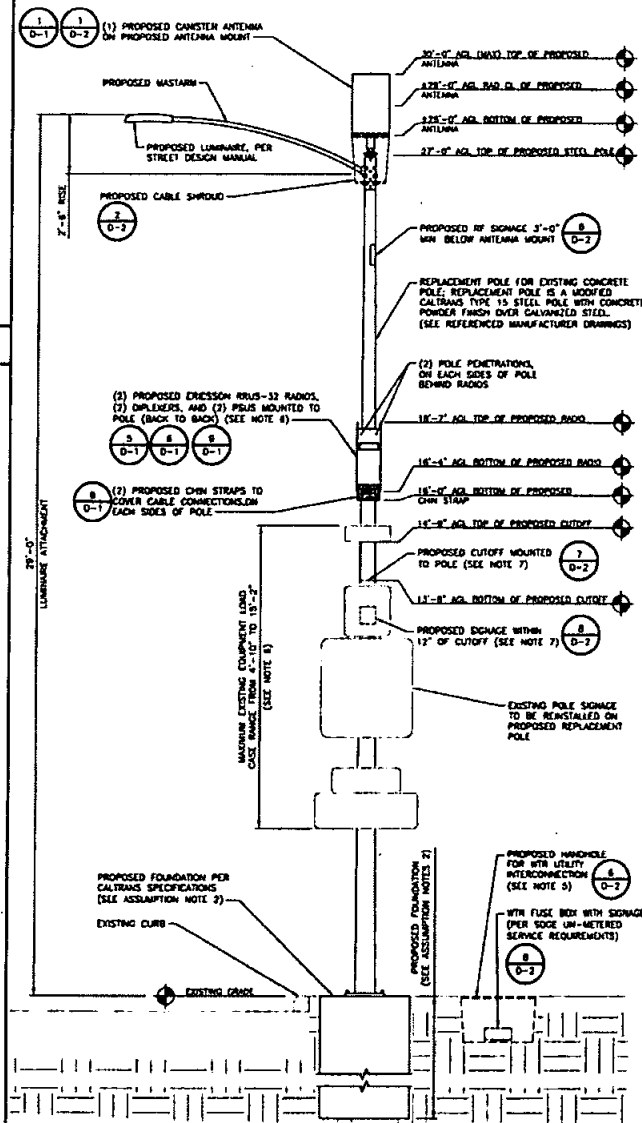
AT&T WIRELESS PROPOSES A NEW WIRELESS INSTALLATION ON A METAL LIGHT POLE. THE SCOPE WILL CONSIST OF THE FOLLOWING:

- INSTALL (1) CANTENNA ANTENNA & ASSOCIATED MOUNT/HARDWARE
- INSTALL (2) RADIO UNITS & ASSOCIATED MOUNT/HARDWARE
- INSTALL (1) CUTOFF TO POLE
- REMOVE AND REPLACE CONCRETE POLE WITH STEEL POLE

PROPOSED EQUIPMENT

AMOUNT	EQUIPMENT	WEIGHT (lbs) PER UNIT	TOTAL WEIGHT (lbs)
1	ACE ACOM-3F150-12P OR EQUAL ANTENNA	35.3	35.3
2	ERICSSON RRUS-12 RADIO & PSU AC OR UNIT	62.21	124.42
2	RTS FOP40220A4-NC DUPLEXER	3.1	6.2
1	ANTENNA TOP MOUNT BRACKET	22	22
1	ANTENNA SLEEVE MOUNT	7	7
1	CABLE SHROUD	6	6
2	CHN STRAP	5	10
1	RADIO CONCEALMENT SYSTEM	3	3
1	PACITECHSOL PTS80122 CUTOFF	12	12
	TOTAL		225.92

PROJECT NOTES



REPLACEMENT POLE ELEVATION VIEW

NO SCALE

1. PROPOSED POLE DESIGN IS TYPE 15 CALTRANS STANDARD, MODIFIED TO 27'-0" HEIGHT TO STAY WITHIN 30'-0" OVERALL HEIGHT LIMIT.
2. NEW POLE DESIGN DETAIL AND FOUNDATION DRAWINGS TO BE PROVIDED FOR LOCATION SPECIFIC CONDITIONS ON THE RIGHT OF WAY CONSTRUCTION PLANS. DRAWINGS ARE GENERIC DESIGN FOR MASTER STRUCTURAL PLAN REVIEW.
3. A 24 HOUR CONTACT INFORMATION OF CELL TOWER OWNER AND CELL STATION NUMBER SHALL BE PLACED IN THE CUT-OFF LOAD CENTER, RADIOS OR ANTENNA.
4. ELECTRICAL CONDUIT SHALL BE GROUNDED ACCORDING TO THE GENERAL ORDER OF THE CALIFORNIA PUC AND THE ELECTRICAL SAFETY ORDER OF CAL-OSHA.

ENGINEER ON RECORD

ASSUMPTION NOTES

1. ALL PROPOSED EQUIPMENT TO BE PAINTED GRAY TO MATCH CONCRETE POLE FINISH.
2. W/TH REQUIREMENT - PROJECT TO COMPLY WITH W/TH REQUIREMENT. TOP OF THE ANTENNA NOT TO EXCEED 30' AGL ON THE POLES THAT ARE LOCATED TO THE WEST OF I-5 FOR PLANNING REQUIREMENT. IN SUCH SCENARIOS, THE MASTER STRUCTURAL PLAN SCHEMATIC WITH THE OVERALL HEIGHT OF LESS THAN 30' WILL BE IMPLEMENTED.
3. EQUIPMENT MUST BE INSTALLED PER THE APPROVED CONFIGURATIONS ON THE MASTER STRUCTURAL PLAN. ANY DEVIATION WILL REQUIRE A NEW STRUCTURAL ANALYSIS.
4. NO CHIPPING OF FOUNDATION.
5. HAND HOLE AND W/TH CUTOFF LOCATION IS A SCHEMATIC REPRESENTATION ONLY; ACTUAL LOCATION TO BE SPECIFIED ON CONSTRUCTION PLANS FOR EACH SPECIFIC POLE LOCATION.
6. ACTUAL EXISTING SHIELDING AND EQUIPMENT WILL VARY BASED ON SITE LOCATION.
7. POLE MOUNTED CUTOFF AND ASSOCIATED SHIELDING ORIENTATION ON POLE MAY VARY BASED ON SITE LOCATION.

GENERAL NOTES



5738 PACIFIC CENTER BLVD
SAN DIEGO, CA 92131



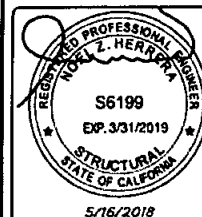
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE 8350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	06/16/14	REVISED FOR SHROUDS
2	06/16/14	REVISED FOR SHROUDS
3	06/26/14	REVISED FOR SHROUDS
4	02/26/14	ISSUED FOR APPROVAL



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AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

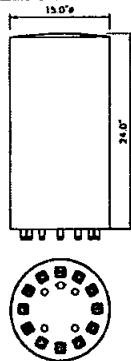
EXISTING CONCRETE POLE
REPLACEMENT WITH POLE
TOP ANTENNA MOUNT AND
MICRO RADIO EQUIPMENT
SCHEMATIC

SHEET NUMBER

MSPR-2

AGE ACOM-2F15D-12P

DIAMETER: 15.0" (381mm)
 HEIGHT: 24.0" (610mm)
 TOTAL WEIGHT (WITHOUT CLAMP): 35.3 lbs (16 kg)
 CONNECTOR INTERFACES: 4.3-10 DIN FEMALE
 RF CONNECTOR LOCATION: BOTTOM
 RF CONNECTOR QUANTITY: 12



ANTENNA SPECIFICATIONS

NO SCALE

1

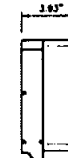
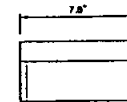
ERICSSON SUP 6503 DUAL RADIO MOUNT DETAIL

NO SCALE

2

ERICSSON RRUS-2203 RADIO

LENGTH: 7.8" (200mm)
 WIDTH: 7.8" (200mm)
 DEPTH: 3.93" (100mm)
 TOTAL WEIGHT (WITHOUT BRACKETS): <4.5 Kg



RADIO SPECIFICATIONS

NO SCALE

3



5738 PACIFIC CENTER BLVD
 SAN DIEGO, CA 92121



BLACK & VEATCH CORPORATION
 10089 WILLOW CREEK RD
 SUITE 8350
 SAN DIEGO, CA 92131

PTS NUMBER
 593784

REV	DATE	DESCRIPTION
1	05/16/18	REVISED PER COMMENTS
2	06/14/18	REVISED PER COMMENTS
3	06/28/18	REVISED PER COMMENTS
4	06/29/18	ISSUED FOR APPROVAL



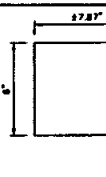
5/16/2018
 IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE REGISTERED UNDER THE SUPERVISION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT.

AT&T SMALL CELL
 (CRAN) PROJECT
 MASTER STRUCTURAL PLAN

GENERAL DETAILS

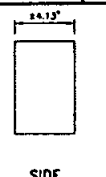
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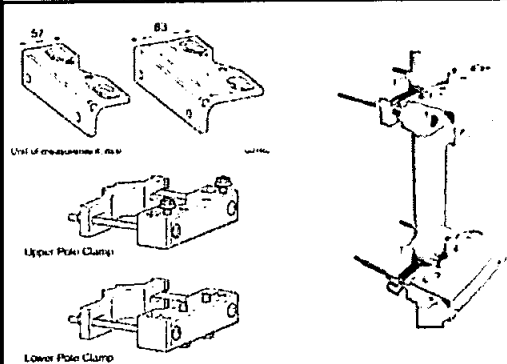
FRONT

SECTION A



SIDE

ISOMETRIC



Unit of measurement is inch

Upper Pole Clamp

Lower Pole Clamp

RADIO POLE MOUNT DETAIL

NO SCALE

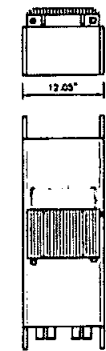
5

ERICSSON RRUS-32 RADIO

LENGTH: 27.17" (690mm)
 WIDTH: 12.03" (306mm)
 DEPTH: 7.01" (178mm)
 TOTAL WEIGHT (WITHOUT BRACKETS): <23 Kg



PROPOSED PSU



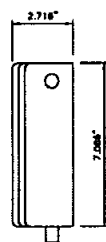
RADIO SPECIFICATIONS

NO SCALE

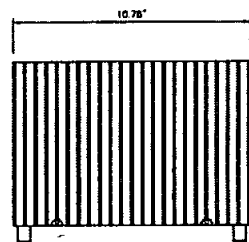
6

ERICSSON PSU AC 08

DIMENSIONS (mm/in): 7,086x10,78x2,718"
 WEIGHT: 11.5 lbs



SIDE VIEW

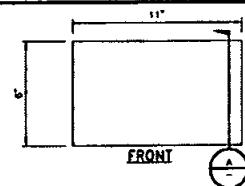


FRONT VIEW

PSU POWER CONVERTER DETAIL

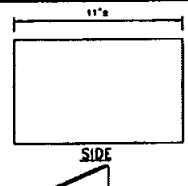
NO SCALE

7



FRONT

SECTION A



SIDE

ISOMETRIC

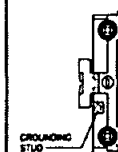
COAX CHIN STRAP DETAIL

NO SCALE

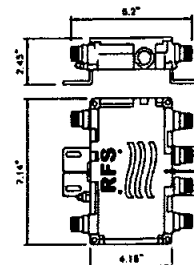
8

RES FDPL4020AD4-NC

DIMENSIONS, mm/in: 7,14x4,18x1,73" (181x106x44mm)
 CONNECTORS:
 (1) 4.3-10 DIN FEMALE (DF)
 (2) 4.3-10 DIN FEMALE (OUT)
 WEIGHT: 3.1 lbs (1.4 kg)



GROUNDING STUD

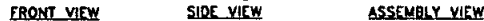


DUPLEXER DETAIL

NO SCALE

9

* DETAIL IS FOR GRAPHIC REPRESENTATION. CONTRACTOR MUST
REFERENCE MANUFACTURERS DRAWINGS PRIOR TO CONSTRUCTION.



SMALL DIAMETER POLE TOP MOUNT

FIGURE 1

1

WEIGHT: 6 lbs (2.7 kg)



STANDARD POLE TOP MOUNT CABLE SHROUD

8

2

* DETAIL IS FOR GRAPHIC REPRESENTATION, CONTRACTOR MUST
REFERENCE MANUFACTURERS DRAWINGS PRIOR TO CONSTRUCTION



SIDE ARM MOUNT

•

1

* DETAIL IS FOR GRAPHIC REPRESENTATION. CONTRACTOR MUST
REFERENCE MANUFACTURER'S DRAWINGS PRIOR TO CONSTRUCTION.



KMW ANTENNA SLEEVE MOUNT

MC

4



FRONT VIEW W/ANTENNA

SECTION A

WEIGHT: 2.5 gm (1.1 kg)



SIDE ARM MOUNT CABLE SHROUD

1

1



HAND HOLE SPECIFICATIONS

30

6



CUTOFF DETAIL

142

7



RF SIGNAGE DETAIL

M

8

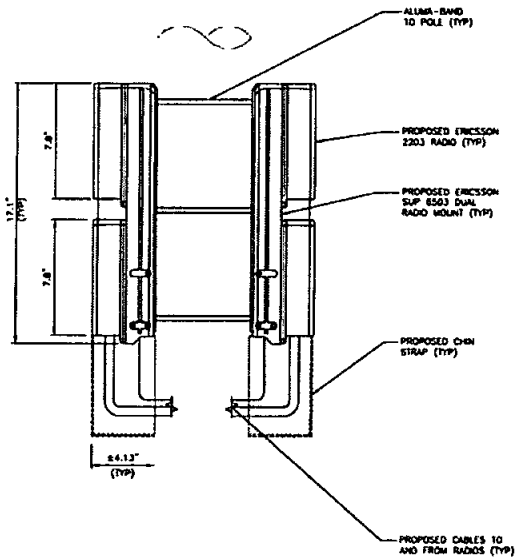


GENERAL DETAILS

SWIFT NUMBER

D-2

1. CHIN STRAP NOT ENTIRELY SHOWN FOR CLARITY.
2. ALL COAX JUMPERS FROM RADIOS TO ANTENNA SHOULD BE OF SAME LENGTH. CONTRACTOR TO COIL AND STORE ADDITIONAL COAX FOR THE RADIO ON THE TOP, BEHIND THE RADIO ITSELF.

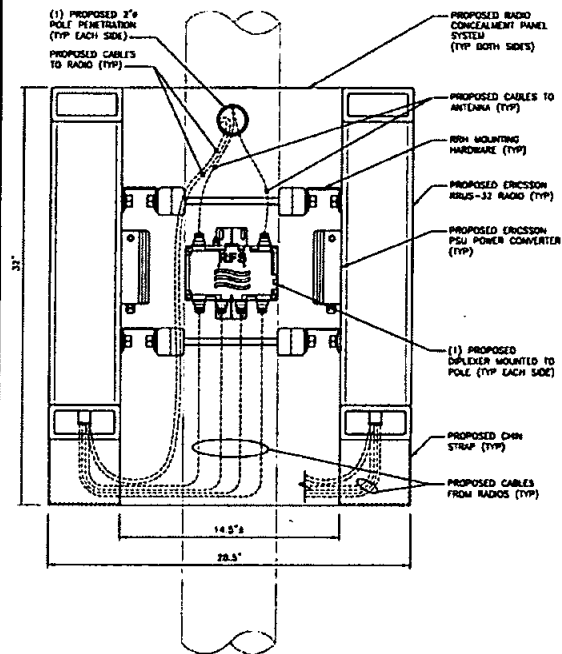


PICO - EQUIPMENT
PLACEMENT DETAIL

NO SCALE

1

1. CHIN STRAP NOT ENTIRELY SHOWN FOR CLARITY.
2. ALL COAX JUMPERS FROM RADIOS TO ANTENNA SHOULD BE OF SAME LENGTH. CONTRACTOR TO COIL AND STORE ADDITIONAL COAX FOR THE RADIO ON THE TOP, BEHIND THE RADIO ITSELF.
3. RADIO CONCEALMENT SYSTEM NOT ENTIRELY SHOWN FOR CLARITY.



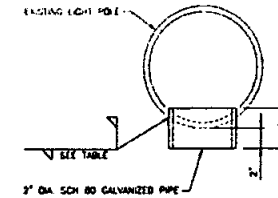
MICRO -EQUIPMENT
PLACEMENT DETAIL

NO SCALE

2

MINIMUM SIZE OF FILLET WELDS	
MATERIAL THICKNESS OF THICKER PART JOINED (IN.)	MINIMUM SIZE OF FILLET WELD* (IN.)
TO 1/8 INCLUSIVE	1/8
OVER 1/8 TO 1/4	3/16
OVER 1/4 TO 3/8	1/4
OVER 3/8	5/16

*SEE DIMENSION OF FILLET WELDS. SINGLE-PASS WELDS MUST BE USED.



VERTICAL ACCESS PORT DETAIL

NO SCALE

3

NOT USED

NO SCALE

4

NOT USED

NO SCALE

5

NOT USED

NO SCALE

6



5738 PACIFIC CENTER BLVD
SAN DIEGO, CA 92121



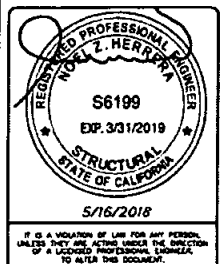
BLACK & VEATCH

BLACK & VEATCH CORPORATION
10089 WILLOW CREEK RD
SUITE #350
SAN DIEGO, CA 92131

PTS NUMBER

593784

REV	DATE	DESCRIPTION
1	04/16/19	REVISED PER COMMENTS
2	04/16/19	REVISED PER COMMENTS
3	04/30/19	REVISED PER COMMENTS
4	03/29/19	ISSUED FOR APPROVAL

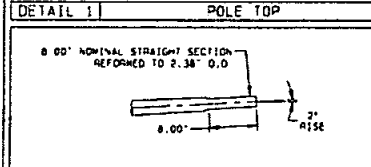
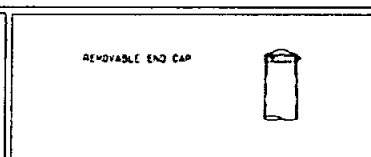
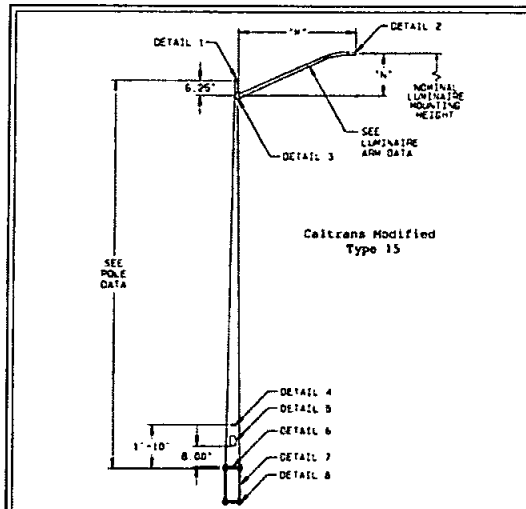


AT&T SMALL CELL
(CRAN) PROJECT
MASTER STRUCTURAL PLAN

GENERAL DETAILS

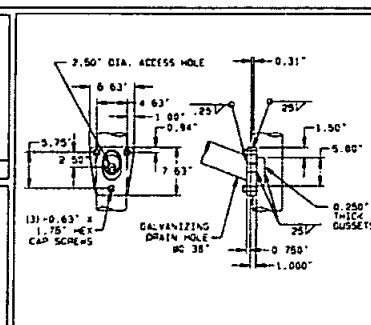
SHEET NUMBER

D-3



VIBRATION DISCLAIMER

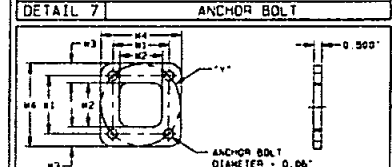
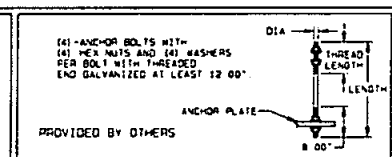
ALTHOUGH RARE, VIBRATIONS SEVERE ENOUGH TO CAUSE DAMAGE CAN OCCASIONALLY OCCUR IN STRUCTURES OF ALL TYPES BECAUSE THEY ARE INFLUENCED BY MANY INTERACTING VARIABLES. VIBRATIONS ARE GENERALLY UNPREDICTABLE. THE USER'S MAINTENANCE PROGRAM SHOULD INCLUDE OBSERVATION FOR EXCESSIVE VIBRATION AND EXAMINATION FOR ANY STRUCTURAL DAMAGE OR BOLT LOOSENING. THE VALMONT WARRANTY SPECIFICALLY EXCLUDES FATIGUE FAILURE OR SIMILAR PHENOMENA RESULTING FROM INDUCED VIBRATION, HARMONIC OSCILLATION OR RESONANCE ASSOCIATED WITH MOVEMENT OF AIR CURRENTS AROUND THE PRODUCT.



DETAIL 4: POLE I.D. TAG

SERIES/SPEC YEAR
VALMONT/MANU. YEAR
CONTRACT NUMBER
SERIAL NUMBER/ORDER NUMBER

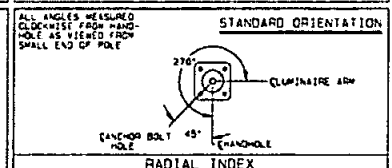
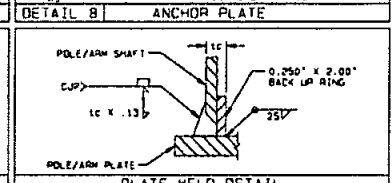
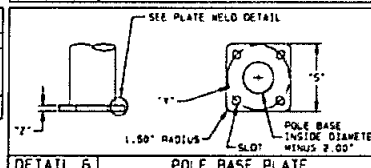
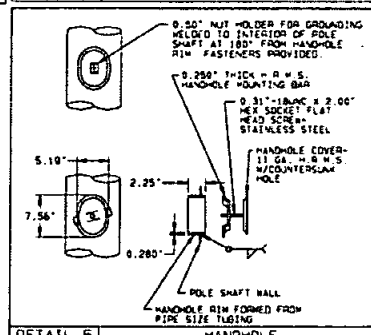
1.50\"/>



MATERIAL DATA			FINISH DATA	
COMPONENT	ASTM DESIGNATION	W.T. (LBS)		
TAPERED TUBES	A500 GR. A	50	Finish Point over Galvanized	
BASE PLATE	A572 GR. 50	50	Base Coat: Hot-Dip Galvanized	
SHIMMED PLATES	A572 GR. 50	50	to ASTM A123	
GUSSETS	A572 GR. 50	50	Prime Coat: None	
LUM. ARM BOLTS	A325	--	Finish Coat: TGIC or Urethane	
PIPE / TUBING	A501, A513, A518	36	Polyester Powder	
ANCHOR BOLTS	A550 GR. 8 OR C	55	Color: concrete-like	
HARDWARE COATING	NOT DIP TING	--		

LUMINAIRE ARM DATA				
PROJECTED LENGTH (FT)	RISE (FT)	ARM BASE DIA. (IN)	THICKNESS (IN)	NOMINAL LUMINAIRE H.T.O. HEIGHT
6.33	2.00	3.36	0.119	31.50
8.33	2.50	3.05	0.119	32.00
10.33	3.25	3.95	0.119	32.75
12.33	4.25	4.27	0.119	33.75

POLE DATA																
POLE TYPE	POLE TUBE				POLE BASE					ANCHOR BOLT			ANCHOR PLATE			
	LENGTH "A" (FT)	BASE DIA (IN)	TOP DIA. (IN)	THICKNESS (IN)	SQUARE "S" (IN)	BOLT CIRCLE "C" (IN)	TH. "Z" (IN)	SLOT (IN)	BOLT CIRCLE RANGE (IN)	DIA. (IN)	LENGTH (IN)	THREAD LENGTH (IN)	#1 (IN)	#2 (IN)	#3 (IN)	#4 (IN)
MODIFIED 15	27'	8.0"	4.22"	0.119	12.00	11.50	2.000	1.13 x 1.09	11.00 - 12.00	1.00	36.00	10.00	DESIGNED/PROVIDED BY OTHERS			



REV	DATE	BY	CHKD	DESCRIPTION
1	10/1/84	RPV	RPV	REVISION

Black & Veatch, San Diego CA Small Cell

VALMONT INDUSTRIES, INC. RESERVES THE RIGHT TO INSTALL VARIOUS ENGINEER APPROVED MATERIAL HANGING ACCOMMODATIONS TO FACILITATE THE MANUFACTURING PROCESS.

valmont
Valmont, NE 68064
(402) 339-2201

PROJECT NUMBER	REV

Exhibit B: Form of Use and Occupancy Permit

**USE AND OCCUPANCY PERMIT PURSUANT
TO THE TERMS OF THE MASTER USE AND OCCUPANCY AGREEMENT**

This _____ USE AND OCCUPANCY PERMIT PURSUANT TO THE TERM OF THE MASTER USE AND OCCUPANCY AGREEMENT (UOP) which is entered into this _____ (“Effective Date”), by and between the City of San Diego, a California municipal corporation (“CITY”), and NEW CINGULAR WIRELESS PCS, LLC, a Delaware limited liability company (“PERMITTEE”).

RECITALS

A. CITY and PERMITTEE entered into that certain Master Use and Occupancy Agreement dated and effective as of _____ (“MUOA”), pursuant to which PERMITTEE is allowed to install specific Communications Equipment as shown in the Master Structural Plan which is attached as Exhibit A to the MUOA, on up to 1,500 CITY Sites at certain Permit Areas.

B. The MUOA sets forth the general terms and conditions under which the CITY will prepare and execute subsequent UOPs to provide PERMITTEE a license to attach its equipment to Approved Sites once PERMITTEE has obtained all necessary regulatory permits to install, construct, maintain and operate on specific Approved Sites.

C. The MUOA also establishes the process by which PERMITTEE will request UOPs, including the type of information PERMITTEE must provide, and the standard for review of that request and the timelines for processing such a request.

D. Exhibit A of the MUOA is an approved Master Structural Plan which describes the equipment that will be placed on the Site and the location on the Site where the equipment will be installed. The MUOA also contains provisions that allow PERMITTEE to request modifications to the authorized Communications Equipment and sets forth the standard and timing requirements for reviewing and processing request for modifications.

E. Prior to entering into this UOP, the Parties have executed _____ UOPs under the MUOA, which include a total of ____ Approved Sites.

C. PERMITTEE and CITY now desire to enter into this UOP authorize PERMITTEE to enter upon, install, construct, maintain and operate its Communications Equipment within the Permit Areas on the Approved Sites, attached hereto as Exhibit A, in compliance with all of the terms and conditions as set forth herein and in the MUOA;

NOW THEREFORE, for valuable consideration, the sufficiency of which is hereby acknowledged, the Parties agree as follows:

1. Grant. Subject to the terms of this UOP and the terms of the MUOA which are all incorporated into this UOP by this reference without the necessity of restating those terms and conditions, CITY hereby grants to PERMITTEE, its officers, employees, agents, and contractors the right to enter upon and occupy the Permit Areas on the Approved Sites as more particularly identified in Exhibit A attached hereto, solely for the purpose of the Permit Use seven (7) days a week, twenty-four (24) hours a day.
2. UOP Term. The term of this UOP shall commence on the Effective Date of this UOP, and shall terminate ten (10) years following that date minus one day, for example, if the UOP has an Effective Date of February 15, 2020, the UOP shall terminate on February 14, 2030.
3. Authorized Communications Equipment. PERMITTEE acknowledges that the Communications Equipment being installed is in compliance with and authorized by the Master Structural Plan attached to the MUOA as Exhibit A. **[Alternative language to be inserted if the foregoing statement is not applicable: PERMITTEE acknowledges that it has requested a _____ (Minor/Major) Modification from the MSP, and acknowledges and warrants that the Communications Equipment being installed pursuant to this UOP complies with and is more particularly depicted in Exhibit B to this UOP.)**
4. Defined Words and Phrases. Capitalized words and phrases in this UOP not otherwise defined herein shall have the meaning given to those terms in the MUOA.
5. Survival of the Incorporation of MUOA. The terms and conditions of the MUOA as incorporated herein shall be applicable and enforceable by either Party as a term and condition of this UOP, regardless of the expiration of the MUOA itself.
6. Authority to Execute and Deliver UOP. Each individual executing this UOP on behalf of another person or legal entity represents and warrants that he or she is authorized to execute and deliver this UOP on behalf of such person or entity in and accordance with duly adopted resolutions or other authorizing actions which are necessary and proper and under such legal entity's articles, charter, bylaws, or other written rules of conduct or governing agreements, and that this UOP is binding upon such person or entity in accordance with its terms. Each person executing this UOP on behalf of another person or legal entity shall provide CITY with evidence, satisfactory to CITY, that such authority is valid and that such entity is a valid, qualified corporation, limited liability company, partnership, or other unincorporated association, in good standing in its home state, and that such entity is qualified to do business in the State of California.
7. Signed in Counterparts. This UOP may be executed in one or more counterparts, all of which taken together shall constitute one and the same original document and shall become effective when one or more counterparts have been signed by each of the parties.

IN WITNESS WHEREOF, this UOP is executed by CITY and PERMITTEE, to be effective as of the Effective Date.

Date: _____

THE CITY OF SAN DIEGO, a California municipal corporation

By _____
Cybele L. Thompson
Director, Real Estate Assets

Date: _____

NEW CINGULAR WIRELESS PCS, LLC,
a Delaware limited liability company

By: AT&T Mobility Corporation
Its: Manager

By _____
(Print Name) _____
(Title) _____

ENVIRONMENTAL ANALYSIS SECTION:

Date: _____

By _____

Name: _____
Title: _____

APPROVED AS TO FORM:

Date: _____

MARA W. ELLIOTT, City Attorney

By _____
_____, Deputy City Attorney

Exhibit A: Approved Sites List

Exhibit B: Depiction of Authorized Communication Equipment (**Only needs to be attached if different from MSP**)

Exhibit C: Interference Protection Requirements

1. **Interference.** Anytime during the term of this Master Agreement, PERMITTEE may be required to provide an intermodulation report ("Report") to CITY. This Report shall include the calculation parameters used to compile the Report, all intermodulation "hits," a brief description of the results of the intermodulation calculations, a list of possible interference situations that may result from the proposed equipment, transmission frequencies that are currently being operated on-site, and similar or other relevant data from the licensees and/or users operating on-site. The information required to compile this report, including transmit frequencies currently operated on-site, may require collection of data from other licensees operating on-site. A list of other licensees within the Permit Areas can be obtained from CITY. CITY is not responsible for any omitted data provided for the purpose of creating this Report. If required, the Report shall be provided to CITY's General Services Department, Communications Division, and Senior Communications Engineer.
2. **Pre-installation Notification.** PERMITTEE shall notify all licensees and/or users operating within the Permit Areas of any proposed installation and/or modification at least fourteen (14) calendar days prior thereto. A list of all licensees and/or users operating within the Permit Areas may be obtained from CITY and used to compile a notification list. The notification shall be in the form of a letter to each listed licensee and/or user operating within the Permit Areas, giving a technical data summary of the proposed new and/or modified equipment and/or installation to be installed within the Permit Areas, and shall specify the approximate date of the installation or modification. An additional notification letter shall be sent to CITY's Communication Engineer at CITY's General Services Department, Communications Division. This letter shall include a list of all licensees and/or users notified. PERMITTEE shall make complete arrangements and conduct all tests and operations in accordance with all applicable Federal (including FCC) Rules and Regulations.
3. **Radio Frequency Interference to CITY Radio Equipment.** The radio equipment use proposed by PERMITTEE shall not directly or indirectly result in degraded lawful technical performance of CITY's existing radio equipment installed within the Permit Areas or used in the general area. Resulting degraded technical performance in this instance includes, but is not limited to: (a) detectable or measurable received intermodulation; (b) audio distortion or noise; and (c) receiver desensitization in excess of 3.0 dB with respect to 12dB SINAD test.
4. **Modifications to Equipment.** Modifications to transmitting equipment (including, but not limited to, those which change effective radiated power, transmitter frequency, transmitter modulation, and/or transmitter spurious and harmonic emissions) may require re-notification to existing licensees and/or users operating within the Permit Areas, as well as a new Report.

5. Resulting Interference. Should an interference problem occur within the Permit Areas (or surrounding area) as a result of any new and/or modified equipment and/or installation, PERMITTEE shall initiate mutually agreeable actions among the affected parties to mitigate or resolve the interference problem. If harmful interference cannot be resolved, CITY may recognize the prior right of other authorized users and, in CITY's sole discretion, withhold consent or disallow use of the new and/or modified equipment and/or installation, pending settlement of the interference problems between PERMITTEE and other authorized users.
6. No Obligation by CITY for Loss. CITY shall not be obligated for any loss, financial or otherwise, which may be incurred by PERMITTEE as a result of the foregoing interference protection requirements, and PERMITTEE expressly waives any claim for expense or loss which PERMITTEE might incur as a result of CITY's enforcement thereof.

Exhibit D: Emergency Maintenance Procedures

If PERMITTEE discovers that any of the Communications Equipment is damaged, PERMITTEE shall immediately notify **CITY's Station 38 at (619) 527-7660**.

If CITY discovers that any of the Communications Equipment is damaged, CITY shall immediately notify **PERMITTEE's Network Operation Call Center at (800) 832-6662**.

CITY may require any replacement Communications Equipment to be relocated, as provided for in this Master Agreement.

If the Communications Equipment causes any interference to CITY's telecommunications equipment and/or system, CITY may require such Communications Equipment to be removed permanently and replaced at another location, as provided for in this Master Agreement.

If CITY's telecommunications and/or lighting systems require emergency repair or maintenance by CITY, CITY shall employ use of PERMITTEE's emergency shut off switch, per Section 19.2, and notify PERMITTEE immediately at the number above.

PERMITTEE shall not unreasonably interfere with pedestrian or vehicle traffic while installing or maintaining the Communications Equipment.

If a party changes its emergency contact telephone information, that party shall immediately notify the other party of the new contact information at the telephone number provided above, and, within ten (10) calendar days, provide the other party with written notice of the new contact information, in accordance with this Master Agreement.



THE CITY OF SAN DIEGO

DATE OF NOTICE: December 19, 2018

NOTICE OF RIGHT TO APPEAL ENVIRONMENTAL DETERMINATION

DEVELOPMENT SERVICES DEPARTMENT

SAP No. 11003679

PROJECT NO: N/A

PROJECT NAME: AT&T and Master Use and Occupancy Permit (MUOP) for Installation of a Small Cell Network

COMMUNITY PLAN AREA: Mira Mesa, Scripps Ranch, La Jolla, Pacific Beach, Eastern Area, City Heights, Southeastern San Diego, Otay Mesa/Nestor, Old Town, Downtown and Carmel Valley.

COUNCIL DISTRICT: 1, 2, 3, 4, 5, 6, 8, and 9

LOCATION: See Attachment

PROJECT DESCRIPTION: The project includes a Master Use and Occupancy Permit (MUOP) to allow for the installation of a Small Cell Network in various locations throughout the City of San Diego. The sites would be installed on City of San Diego owned street lights. The small cell network would be built within the public right of way. Each of the small cell sites would support an antenna with associated equipment and a power switch that would be placed on the existing streetlights at each site. Some installations would involve the replacement of a streetlight.

ENTITY CONSIDERING PROJECT APPROVAL: City of San Diego

ENVIRONMENTAL DETERMINATION: CEQA Exemption 15301 (Existing Facilities) and 15302 (Replacement or Reconstruction)

ENTITY MAKING ENVIRONMENTAL DETERMINATION: City of San Diego

STATEMENT SUPPORTING REASON FOR ENVIRONMENTAL DETERMINATION: The City of San Diego conducted an environmental review that determined the project would not have the potential for causing a significant effect on the environment. The project, as described in the Project

Description section of this notice, meets the criteria set forth in CEQA Sections 15301 and 15302, the operation, repair, maintenance, permitting, leasing, licensing, or minor alteration of existing facilities (public or private), involving negligible or no expansion of use beyond that existing at the time of the determination, and replacement of existing structures and facilities where the new structure will be located on the same site as the structure replaced and will have substantially the same purpose and capacity as the structure replaced, respectively. Additionally, none of the exceptions described in CEQA Guidelines Section 15300.2 apply.

CITY PROJECT MANAGER: Enza Charles
MAILING ADDRESS: 1200 Third Avenue, Suite 1700, MS 51A
San Diego, CA 92101
PHONE NUMBER/E-MAIL: (619) 236-6052/ECharles@sandiego.gov

On December 19, 2018 the City of San Diego made the above-referenced environmental determination pursuant to the California Environmental Quality Act (CEQA). This determination is appealable to the City Council. If you have any questions about this determination, contact the City Project Manager listed above.

Applications to appeal CEQA determination made by staff (including the City Manager) to the City Council must be filed in the office of the City Clerk within 10 business days from the date of the posting of this Notice (by January 2, 2019). The appeal application can be obtained from the City Clerk, 202 'C' Street, Second Floor, San Diego, CA 92101.

This information will be made available in alternative formats upon request.

