

LICENSE AGREEMENT
(1040 14th Street, Denver, Colorado)

This **LICENSE AGREEMENT** (“Agreement”) is made (the “Effective Date”) by and between the **CITY AND COUNTY OF DENVER**, a municipal corporation of the State of Colorado (hereinafter referred to as the “City”) and **CELLCO PARTNERSHIP** doing business as **VERIZON WIRELESS**, a Delaware General Partnership authorized to conduct business in Colorado, whose principal office is located at One Verizon Way, Basking Ridge NJ 07920 (“Licensee”).

RECITALS

WHEREAS, the City owns and operates the real property located at 1040 14th Street, Denver, Colorado, and all appurtenances thereto (the “Subject Property”);

WHEREAS, the City has right, title, and interest in and to the Subject Property together with the facilities, easements, rights, licenses, and privileges hereinafter granted, and has full power and authority to enter into an agreement in respect thereof;

WHEREAS, the Parties desire to enter into this Agreement regarding Licensee’s use of certain designated areas and a certain Licensed System at the Subject Property for Licensee’s operation of a cellular site at the Subject Property as described in **Exhibit A** attached hereto (the “Licensed Area” or “Licensed System”);

NOW, THEREFORE, in consideration of the premises and the mutual covenants and obligations herein set forth, the Parties agree as follows:

DEFINITIONS

The capitalized terms used in this Agreement and any and all exhibits hereto, will have the meanings given such terms in the paragraph in which such terms are parenthetically defined. The meanings given to terms defined will be equally applicable to the singular and plural forms of such terms. In addition, the following capitalized terms shall have the following meanings:

A. “Agreement” shall have the meaning set forth in the preamble hereto.

B. “ADA” means Americans with Disabilities Act and any other federal or state laws requiring access for the disabled to public accommodations.

C. “Applicable Law” means all federal, state, and local laws applicable in the context of the specific matter addressed in this Agreement, including but not limited to: 1) the constitutions, laws, and rules and regulations of the United States of America and the State of Colorado; 2) the City Charter, the Denver Revised Municipal Code, and building, fire, electrical, plumbing and other applicable codes, as they may be amended from time to time; 3) rules and regulations, including any standards and specifications, promulgated or amended by the Denver DPAC Cellco Partnership dba Verizon Wireless – License Agreement

CCN: FINAN-202476013

Added on behalf of Licensee: VZW site name “DEN Denver Arts”, the MDG #: 5000139904.

Department of Safety and the Denver Fire Department; 4) any rules and regulations promulgated or amended by other City departments and agencies applicable to this Agreement; 5) executive orders issued by the Mayor; 6) any court order, judgment, or decree or any appellate decision applicable to this Agreement; 7) any federal, state, or local administrative decision or order applicable to this Agreement; 8) any anti-discrimination laws;

D. “Cancellation” means the revocation of the License and the termination or cancellation of the Agreement, including mutual termination by the parties, in the manner specified in this Agreement.

E. “City Representative” means the Division of Real Estate’s designee(s) who will oversee and direct all activities of Licensee under this Agreement. The City Representative(s) may be employees or contractors of the City, Denver’s Facilities Management division, Denver’s Technology Services, the Electronic Engineering Bureau of the Department of Safety, and/or Denver’s Division of Real Estate. Contact information for the City Representative and the assigned responsibilities, if there is more than one City Representative, shall be provided to Licensee upon execution of this Agreement. The City may identify, change, add or delete City Representative(s) by written notice to Licensee.

F. “City System” means all existing and future communication and other electronic facilities, equipment and instrumentation and related infrastructure and utility connections located at the Subject Property including, but not limited to, public safety channels, radio system or other electronic means of sending, receiving, processing and recording information and data for public safety purposes.

G. “DRMC” means the Denver Revised Municipal Code as it may be amended from time to time.

H. “Effective Date” means the date this Agreement goes into effect, as specified in section 2.01.

I. “Emergency” means an occurrence or incident that presents an imminent threat of widespread or severe damage, injury, or loss of life or property resulting from any natural cause or cause of human origin, including but not limited to fire, explosion, flood, earthquake, wind, storm, structural failure, hazardous substance, environmental contamination, civil disturbance, vandalism, or breach of security.

J. “FCC” means the Federal Communications Commission.

K. “Director” means the director of the City’s Division of Real Estate.

L. “License” means the license granted as specified in section 1.01(a) which is exclusive only to the extent specified in this Agreement and which is restricted and only revocable as specified in this Agreement. No property or leasehold interest or right is granted by the License.

M. “Licensed Area” means the location at the Subject Property where Licensee is authorized to install and operate the Licensed System, as specified in section 1.01(a).

N. “Licensed System” means the radio frequency equipment and wireless communication facility, and related equipment, infrastructure and utility connections authorized by the City and installed and operated by Licensee within the Licensed Area of the Subject Property, as specified in section 1.01(a).

O. “Licensee” means the legal entity to which the License is granted under and in accordance with this Agreement, as identified in opening paragraph of this Agreement. To the extent that Licensee retains contractors, consultants, or subcontractors to perform any of Licensee’s rights and obligations under the Agreement, Licensee shall also mean those contractors, consultants, and subcontractors.

P. “License Fee” means the compensation to be paid by Licensee to the City for the use of the Licensed Area and the operation of the Licensed System at the Subject Property as specified in section 3.01.

Q. “Minimum Technical Standards” mean those standards set forth in **Exhibit B** as these Minimum Technical Standards may be updated from time-to-time, as needed, to address the state-of-the-art.

R. “Party” means either the City or Licensee, as appropriate in the context, and Parties means both the City and Licensee.

S. “Permitted Use” means the uses (subject to restrictions) as specified in section 1.02, which Licensee may make of the Licensed Area in the installation and operation of the Licensed System.

T. “RF” (Radio Frequency) Interference means any emission, radiation or induction from or associated with the Licensed System that affects the functioning of or degrades, obstructs, or interrupts radio or other wireless communications being made by the City or other authorized parties to or from the Subject Property or the operation of any communication system located at the Subject Property.

U. “Point of Contact” means the Chief Deputy for the Technical Services Division of the Denver Fire Department, or the Chief Deputy’s designated representative, during regular business hours of the Denver Fire Department and the Denver Fire Department’s non-emergency Dispatch for Licensee’s urgent need for access after regular business hours of the Denver Fire Department.

V. “Site Study” means a site and technical interference study, **Exhibit C**, field tests or other activities or investigations related to the resolution of RF Interference that may be associated with the Licensed System as specified in section 5.02

W. “Term” means the duration of the Agreement running from the Effective Date of the Agreement, as specified in section 2.01 including any Term Extensions as specified in section 2.02.

X. “Term Extension” means any extensions of the duration of the Agreement as specified in section 2.02.

SECTION 1 LICENSE; PERMITTED USE; and ACCESS

1.01 Grant of License.

(a) City hereby grants a License to Licensee for the use of certain designated areas at the Subject Property as depicted on **Exhibit A** (the “Licensed Area”) for the installation and operation by Licensee, of the Licensed System, as the Licensed System is technically described, also in **Exhibit A**. The Licensed System shall be situated within the Licensed Area as depicted in **Exhibit A**. The Licensed Area shall not include any existing City System. Any proposed change to the Licensed Area depicted in **Exhibit A** shall require an amendment in writing to this Agreement.

1.02 Permitted Use/Restrictions.

(a) The Licensed Area at the Subject Property shall be used for the installation, maintenance, alteration, repair, replacement, operation, and removal of the Licensed System within the Licensed Area, in accordance with this Agreement (“Permitted Use”). The Licensed System shall be owned by Licensee. Except as expressly provided in this Agreement, the City may not disturb or modify the Licensed System without the prior written permission of Licensee.

(b) Licensee may access the Subject Property, use the Licensed Area, and install and operate the Licensed System only as set forth in this Agreement. The Permitted Use does not authorize any activity that would conflict or interfere with the public health, safety or welfare purpose or operation of the Subject Property or any City System. Such prohibited conflict or interference includes RF Interference as set forth in this Agreement and **Exhibit C** (“Site Study”). Licensee shall likewise take every reasonable measure to promptly and effectively avoid or remedy any emergency situation within its control that could adversely impact the Subject Property, the City System, the Licensed Area, or the Licensed System.

(c) Licensee must acquire City Approval, such approval not to be unreasonably withheld, conditioned or delayed, prior to making any change to the Licensed System as shown in **Exhibit A** and may trigger a change in license fee and a license amendment. Notwithstanding the foregoing, Licensee may add base station equipment to the Licensed System within the Licensed Area and may also repair or replace any other equipment comprising the Licensed System with “like-for-like” equipment upon notice to Licensor.

1.03 Access.

(a) Provided that Licensee gives at least forty-eight (48) hours prior notice to the Point of Contact, Licensee has the reasonable right of access, ingress to and egress from the Licensed Area during regular business hours for Licensee's employees, contractors and agents, including suppliers of materials and furnishers of service (collectively "Licensee's Personnel").

(b) In the event of an urgent situation where Licensee needs prompt access to the Licensed System during or outside of regular business hours, which shall be deemed to include any failure of Licensed System or any portion thereof, Licensee shall communicate with the Point of Contact, as defined above, to arrange for access by Licensee's Personnel. Similarly, should Licensor need to reach Licensee in the event of an emergency and regarding this agreement, Licensee's designated point of contact shall be: Verizon Network Operations Center (NOC) at (800) 224-6620 / (800) 621-2622.

(c) With respect to all access to the Subject Property, Licensee's Personnel must present legally sufficient identification, preferably in the form of a badge with picture ID issued by Licensee; will be subject to escort by the City's Designee and search and inspection of items brought onto the Subject Property; and will comply with all restrictions and security protocols set by the Director and the City Representative. All equipment, vehicles, machinery and other materials brought onto the Subject Property site must be necessary for the work authorized to be performed.

(d) Should Licensee require access into a secure area of the Subject Property which may require prior approval or escort, then the permission of the City Representative must be obtained and any security protocols must be strictly observed by Licensee.

(e) The exercise of access by Licensee or Licensee's personnel shall not conflict or interfere with the operations of the Subject Property or the City System and may not block access at or the use of the Subject Property nor be in violation of the ADA. In addition, the exercise of access shall not conflict or interfere with the City System unless prior written permission is obtained from the City Representative.

(f) Any particular access on the Subject Property may, at any time, temporarily or permanently, be closed, so long as an alternative means of access is made available to Licensee within a reasonable time. During the duration of any state of Emergency declared by the President of the United States, the Governor of the State of Colorado, or the Mayor of the City and County of Denver, access may be denied for security and public safety reasons. Licensee hereby releases and discharges the City from any and all claims, demands or causes of action which Licensee may now, or at any time hereafter, have against the City, arising or alleged to arise out of the closing of any point of access on the Subject Property site or the temporary unavailability of such access.

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Added on behalf of Licensee: VZW site name "DEN Denver Arts", the MDG #: 5000139904.

SECTION 2 TERM and TERM EXTENSION

2.01 Term.

Except as otherwise specified or agreed upon, the Term of this Agreement shall be **March 1, 2024 – February 28, 2034**. The Term of this Agreement may be extended as described in section 2.02. The City shall deliver the fully executed agreement to the Licensee no later than thirty (30) calendar days after all authorized representatives for the City shall have signed, dated, and executed the Agreement by affixing their respective signatures to the Agreement.

2.02 Term Extension.

Licensee shall have three (3) options to extend this License for an additional 5-year term (“Option Term”) with a continuing 3% annual rent increase on March 1 of each year of the extended Term. Licensee shall provide written notice to the City of its intent to exercise each option no sooner than one hundred and eighty (180) days and no later than sixty (60) days before the end of the then-current Term. All terms and conditions shall remain in effect in accordance with this Agreement during the Option Term, including the percentage fee increase herein and under Section 3.01, unless otherwise modified by mutual written agreement.

SECTION 3 LICENSE FEE

3.01 License Fee.

(a) Licensee agrees to pay City a monthly License Fee of **FOUR THOUSAND SIXTY-EIGHT DOLLARS AND FIFTY-SIX CENTS (\$4,068.56)**, beginning upon commencement of this License and continuing the first day of each month thereafter for the Term of the Agreement and any Term renewal. License Fee shall increase three percent (3%) each year, with the increased License Fee taking effect on the **March 1** of each year and the first rent increase will occur on **March 1, 2025**. This License Fee is subject to modification should there be any modification to the Licensed System as described in **Exhibit A** by Licensee.

(b) The License Fee does not include the payment for electrical service for the Licensed System. Licensee shall bear the costs of all maintenance and repairs to the Licensed System, and Licensee shall pay for a separate electric meter for the operation of the Licensed System, as well as all monthly costs of utility and electricity associated with the use and operation of the Licensed System. Licensee shall make these payments directly to the utility provider, not to the City.

(c) Any License Fee paid to the City shall not be refundable in the event of early termination, as provided in this Agreement.

3.02 Maximum Contract Amount

(a) Notwithstanding any other provision of the Agreement and any renewal options exercised by the Licensee, Licensee's maximum payment obligation under this Agreement shall not exceed **FIVE HUNDRED FIFTY-NINE THOUSAND SIX HUNDRED NINETY-SEVEN DOLLARS AND SEVENTY-SEVEN CENTS (\$559,697.77)** (the "Maximum Contract Amount").

3.03 Place and Manner of Payments.

All sums payable to City, including the License Fee and other costs and expenses incurred by the City and reimbursable by Licensee under this Agreement, shall be made payable, without notice, to the "Manager of Finance for the City and County of Denver" and delivered to:

City and County of Denver
Division of Real Estate
201 West Colfax Avenue, Dept. 1010
Denver, Colorado 80202

All payments shall be made in legal tender of the United States. Any payment not made to City accrues interest at the lesser of (i) 18% per annum, or (ii) the maximum interest rate allowed under law, commencing on the fifth (5th) calendar day after the date such amount is due and owing until paid to City. Licensee agrees to pay any charges, fees, or costs incurred by the City for collection of unpaid License Fees or other unpaid costs and expenses of Licensee specified in this Agreement, including reasonable attorney's fees.

SECTION 4 DESIGN, CONSTRUCTION, AND INSTALLATION

4.01 General.

(a) On or after the Effective Date of this Agreement, Licensee shall, at its sole cost and expense, properly maintain and preserve within the Licensed Area, the Licensed System in accordance with **Exhibit A** (unless changes are authorized under section 4.02), and in accordance with the terms and conditions of this Agreement.

(b) The Licensed System shall in all respects be designed and maintained in

accordance with Applicable Law, and pursuant to any required building permit and zoning permit to be obtained by Licensee from the City, and according to requirements or design guidelines of the Denver's Technology Services division, the Denver Department of Safety and the Denver Fire Department.

(c) The implementation of the design and installation of the Licensed System, as described and depicted in **Exhibit A**, as well as any changes, elaborations or additions to the design, construction and installation of the Licensed System beyond those described and depicted in **Exhibit A** shall be subject to the oversight and approval of the City Representative as well as any other approvals required in this Agreement.

4.02 Plans and Specifications.

(a) Prior to any installation or any modification to the Licensed System, a copy of complete and accurate plans and specifications for the Licensed System must be submitted to the City Representative for review. These plans and specifications must include complete specifications of transmitter power, operating frequencies, filter passband and rejection characteristics, antenna model numbers and radiation patterns (both horizontal and vertical plane patterns), antenna height and location, and placement of utilities servicing the Licensed System.

(b) Licensee shall cooperate with the City Representative in the review of the plans and specifications and shall make any reasonable modifications required by the City Representative. Upon completion of the review and any required modifications, the City Representative will approve the plans and specifications. Modifications to the Licensed System may be denied pursuant to Section 1.02(c). An amendment to this Agreement may be required to accommodate system changes.

(c) To the extent that the approved plans and specifications are different from the information contained in **Exhibit A**, Licensee shall prepare, to the reasonable satisfaction of the City Representative, new exhibits reflecting such changes, and the changed exhibits will replace and supersede the corresponding exhibits attached to this Agreement.

(d) Installation work shall not commence, nor shall continue, until Licensee has established to the City Representative's reasonable satisfaction that the work will proceed in conformance with the approved plans and specifications and that all Applicable Law has been or will be fully and appropriately satisfied. Licensee also cannot commence any cutting of concrete without the express written permission from the Denver Fire Department. If Licensee cuts concrete on City property without first obtaining written permission from the Denver Fire Department, Licensee agrees to reimburse the City for costs of concrete restoration and/or repair.

4.03 Maintenance, Preservation, and Modifications of Licensed Area and Licensed System

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Added on behalf of Licensee: VZW site name "DEN Denver Arts", the MDG #: 5000139904.

(a) Licensee is responsible for undertaking all measures necessary and appropriate under Applicable Law in the maintenance of the Licensed Area and operation of the Licensed System to protect the health and safety of the public, City employees, and Licensee's employees and contractors and to lawfully conduct the work associated with the use, maintenance, and preservation of the Licensed Area and the Licensed System. Licensee shall be responsible for securing and maintaining all required and valid permits, licenses and approvals for Licensee's maintenance and preservation of the Licensed Area and Licensed System.

(b) To the extent that building codes or other City requirements mandate that modifications be made to the roof or other infrastructure of the Fire Station as part of the installation, Licensee shall be required to include those modifications in its Exhibit A plans (unless changes are authorized under section 4.02) and to make such modifications, at its sole cost and expense and subject to prior written approval of such modifications by the City Representative and the City Representative's oversight of the modifications as they are being made. The City is not obligated to make any modifications to the Fire Station, including the Licensed Area, to support the installation.

(c) Licensee shall include in Licensee's contract(s) with its consultants, contractors, and sub-contractors, provisions whereby such consultants, contractors, and subcontractors shall defend and hold harmless the City from all costs, liens, damages and expenses related to the design, construction, installation, and modification work regarding the Licensed Area or Licensed System.

(d) Licensee shall be responsible for obtaining utility locates prior to starting any authorized digging on City property. If damage should occur to any existing underground utilities or other underground facilities on City property, whether or not a utility locate was obtained, Licensee shall immediately report the damage to the City Representative and shall take all actions and incur all costs and expenses necessary to repair the damage in a manner satisfactory to the City Representative.

(e) Upon completion of the installation of any modifications or alterations, Licensee shall timely furnish to the City Representative with documented evidence of payment, contractor's affidavits and full and final waivers of all liens for labor, services, or materials.

(f) Equipment shall be located in designated locations as depicted on **Exhibit A** within the Licensed Area. The temporary placement of any equipment or materials outside of the Licensed Area shall require the prior written approval of the City Representative. No equipment or materials shall be placed so as to block access at or use of the Subject Property or in violation of the ADA.

(g) Licensee is responsible for acquiring land lines required for the installation and operation of the Licensed System. The installation or modification of land lines at the Subject Property shall be subject to the prior written approval of the City Representative. Licensee shall be solely responsible for paying any fees, charges, surcharges, taxes, assessments, and similar

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costs and expenses associated with the land lines.

(h) The City is not responsible for the Licensed System or Licensee's other authorized installations or modifications. Licensee shall be responsible for securing the Licensed System and Licensee's other authorized installations or modifications and keeping them in good working order.

SECTION 5 USE AND OPERATION

5.01 Authorized Frequencies.

In the operation of the Licensed System, Licensee may only operate Licensee's System in the radio bands and frequencies (and no others), as set forth in **Exhibit C**, which Licensee or FirstNet are authorized by the FCC to use. Operation in any radio band licensed for use by a City System is prohibited. Addition or change in radio bands or frequencies is prohibited unless Licensee first provides prior written notice to the Director and first provides an intermodulation report to the Director.

5.02 RF (Radio Frequency) Interference.

(a) Licensee acknowledges that City's unimpeded use and operation of the Fire Station is critical to the health, safety and welfare of the City and County of Denver and its inhabitants. Licensee shall use its best efforts, at all times, to avoid any RF Interference or interference of any kind with the operation or use of any City System as set forth in this Agreement and **Exhibit C**. Licensee shall diligently work to prevent and, in the event of failure to do so, immediately correct radio frequency interference to the City System and any component elements, including the City's WiFi system, and to cooperate with, and comply with the directions from, the City Representative assigned to deal with RF Interference. To help achieve this goal, Licensee shall comply with the following:

(b) Licensee agrees to comply with all federal, state, local, or other government regulations applicable to Licensee and its activities operating or using the Licensed System, including, but not limited to, regulations and standards published by the FCC.

(c) Upon written request by the City Representative, Licensee agrees to conduct an Interference Study prior to commencing operations and/or during the entire Term or Term Extension of this Agreement, and to furnish the City Representative with the results of the Site Study and to include it as part of Licensee's System Plans and Specifications. If Licensee should fail within a period specified by the City Representative to undertake or complete an Interference

Study, the City may arrange for such an Interference Study and Licensee shall reimburse the City for the cost and expense of conducting and preparing the Interference Study.

(d) Licensee agrees to comply with the current Minimum Technical Standards attached hereto as **Exhibit B**.

(e) In order to prevent RF Interference, Licensee shall maintain and repair, at no cost to the City, the Licensed System, in order to comply with FCC rules and the reasonable requirements of the City Representative. If this maintenance should necessitate changing out or replacing existing antennas, the requirements of section 5.04 shall be applicable.

(f) If authorized to make changes, Licensee shall notify the City Representative of the specific changes to associated RF equipment, transmit and receive frequencies, transmitter output power, antenna configurations, and effective radiated power before making the changes. An Interference Study shall be conducted by Licensee, if directed by the City Representative and at Licensee's sole cost and expense, prior to any proposed frequency changes. The requirements of section 5.04 shall be applicable to the changes addressed herein.

(g) To extent there are more than one licensee operating RF equipment at the Subject Property, all licensees are encouraged to resolve potential or real interference problems amongst themselves. Licensee agrees to cooperate fully with City and other licensees to diagnose and correct interference problems. Such cooperation may require Licensee to temporarily reduce or shut down transmit power to help diagnose problems.

(h) When the City Representative, based on inquiry and evaluation, becomes aware of a potential or existing RF Interference problem caused directly or indirectly, wholly or partially, by the Licensed System, the City may require Licensee to reimburse City for the cost of an Interference Study to include radio frequency measurements. The purpose of this Interference Study is to identify the problem and determine if the problem is caused directly or indirectly, wholly or partially, by the Licensed System. This Interference Study shall be conducted by a consulting engineer selected by the Director after consultation with Licensee and the City Representative. In the event there are additional licensees operating at the Subject Property, Licensee shall pay for a pro rata share of the costs of the Interference Study, unless Licensee or another party is determined to be solely responsible for the interference, in which case the responsible party shall pay all costs and expenses. Pro rata share shall be determined by dividing the costs by the number of non-City licensees operating at the Subject Property.

(i) When necessary to correct RF Interference problems, as determined by the Chief in the Chief's reasonable discretion, Licensee agrees, at its sole cost and expense, to install cavity-type bandpass filters, notch filters, isolators, or other state-of-the-art equipment. These equipment items are in addition to the minimum equipment of the Minimum Technical

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Standards. The minimum equipment items shall be installed regardless.

(j) Licensee shall ensure that its frequencies used for the operation of the Licensed System do not interfere with any operation of the Subject Property, including without limitation interference with public safety or the City System. Licensee shall provide documentation of the frequencies that it is authorized to use and is using for the Licensed System. Licensee shall not occupy any frequencies that they are not using for the purposes of blocking other licensees from operating. Prior to modifying the Licensed System, Licensee shall be responsible for conducting an RF scan to verify there will be no RF Interference with other systems.

(k) If Licensee's equipment or operations cause RF Interference, as determined by the City in the City's reasonable discretion, including without limitation interference with the City System, and if the interference is not eliminated within ten (10) days after written notice from the Director, then City may, at Licensee's sole cost and expense, temporarily turn off the power to the Licensed System, except for intermittent testing. The City Representative shall contact Licensee at the time the Licensed System needs to be deactivated so Licensee can facilitate the effort to deactivate the Licensed System, isolate any interference, and turn the Licensed System back on with minimal interruption. Licensee, at its sole cost and expense and subject to the requirements of section 5.06, shall (i) have the right to make such repairs, maintenance, replacements or adjustments to the Licensed System as may be reasonably necessary to prevent such RF Interference, and (ii) have the right to conduct intermittent tests of the Licensed System at times mutually agreeable to the City Representative to determine if the Licensed System will continue to cause such RF Interference.

(l) The City requires that Licensee operate its Licensed System with no RF Interference to other licensees' systems. Any unresolved disputes regarding the cause or resolution of specific RF Interference problems or complaints must be evaluated by an independent third party selected by the Director who is competent to evaluate the potential causes of the interference and the measures required for its resolution. If it is determined that RF Interference to the equipment, frequencies or channels of Licensee or other licensees operating at the Subject Property is a result of the non-compliance of those facilities with the Minimum Technical Standards, it shall be the responsibility of Licensee or other licensees to resolve the interference in accordance with the Minimum Technical Standards. If the RF Interference continues when these facilities are brought into compliance with the Minimum Technical Standards, then it shall be Licensee's responsibility to take whatever measures are necessary to resolve the interference promptly and effectively or disengage the operation of the Licensed System or equipment causing the RF Interference until the RF Interference is resolved to the satisfaction of the City Representative.

5.03 Operational Test Procedures.

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The following test procedures shall be approved by City prior to or during, whichever is applicable, Licensee's operation of the Licensed System.

(a) Perform a desktop interference study to include all frequencies to be used by Licensee to ensure no RF Interference is likely from intermodulation products or out-of-band emissions.

(b) Verify the results of the Interference Study by conducting appropriate measurements of the installed systems.

(c) If problems are found, make recommendations for additional filtering, channel changes, greater antenna separation, or other fixes, as necessary.

5.04 Changes to Licensed System.

(a) Licensee shall provide prior written notice to the Director of any proposed change in radio cabinets, transmitter power, frequencies, filters, number of antennas, antenna locations, antenna height, antenna orientation, or related aspects of the Licensed System. Any proposed new, or proposed changes to, antennas, antenna mounts or mounting hardware, or structural changes to the Subject Property, require that Professional Engineer stamped structural drawings be provided for review and approval. All reviews of proposed changes shall be subject to such process as prescribed by the Director and undertaken by the City Representative.

(b) Any proposed changes which are significant (as determined by the Director) will require a review of the current lease rate and may result in an additional License Fee being charged to Licensee and possible other changes to the terms and conditions of the Agreement. These changes, along with any addition, relocation or replacement of antennas or other equipment outside the Licensed Area, shall require an amendment to the Agreement which must be approved in the same manner as this Agreement. Changes or occupation or use of areas outside of the Licensed Area which are not authorized as provided herein will be considered to be in breach of this Agreement.

(c) All such changes shall be subject to the Minimum Technical Standards and the installation and operational conditions set forth in this Agreement. The approval form must be attached to the scope of work and stamped structural drawings sheets (not separate). All contractors, subcontractors and vendors must have a copy of the signed approval sheets to present to the officer in charge of the Subject Property, before any work may begin.

5.05 Repairs and Maintenance; Removal.

(a) The maintenance, care, repair, alteration, enhancement or replacement of the Licensed System or infrastructure within the Licensed Area shall be made by Licensee at its sole cost and expense. Licensee covenants and agrees during the Term or Term Extension of this Agreement, after the installation of the Licensed System and occupancy of the Licensed Area, that Licensee:

(1) shall keep the Licensed System in good order and condition, and will make all necessary and appropriate repairs or changes thereof if approved as required in section 5.04 above;

(2) shall not permit rubbish, debris, waste materials or anything unsightly or detrimental to health, or likely to create a fire or explosion hazard, or conducive to deterioration, to remain in any part of the Licensed Area or the Subject Property or to be disposed of improperly;

(3) shall at all times maintain the Licensed System in accordance with Applicable Law, the Minimum Technical Standards, FCC requirements, and manufacturer's specifications;

(4) shall promptly repair any and all damage to, among other things, the structures, equipment and surrounding property at the Subject Property which result from Licensee's installation and operation of its Licensed; and

(5) shall store tools, test equipment and work materials only in areas at Subject Property approved by the City Representative.

(6) shall restore any damage resulting from roof or other building penetrations and actions or omissions of the License in the Licensed Area or at the Fire Station so that the damaged property is restored to original condition.

(b) All portions of the Licensed System brought onto the Subject Property by Licensee will be and remain Licensee's personal property and, at Licensee's option, may be removed by Licensee at any time during or after the Term. City waives any and all lien rights it may have, statutory or otherwise, concerning the Licensed System or any portion thereof. Removal or other modifications are subject to Section 1.03 regarding access to the Licensed Area. The Licensed System shall be deemed personal property for purposes of this Agreement, regardless of whether any portion is deemed real or personal property under applicable law; City consents to Licensee's right to remove all or any portion of the Licensed System from time to time in Licensee's sole discretion subject to Section 1.03.

(c) If Licensee should be of the opinion that repair, alteration or replacement of the DPAC Cellco Partnership dba Verizon Wireless – License Agreement
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Subject Property is needed (“Alteration”), Licensee shall submit in writing a request to the Director explaining the perceived need for the Alteration. City will maintain and repair the Subject Property, and all areas of the Licensed Area where Licensee does not have exclusive control, in reasonably good condition, subject to reasonable wear and tear and damage from the elements. Any obligation of the City to perform the work shall be strictly contingent upon approvals, including contracts, required by Applicable Law and obtaining all funding needed for the Alteration. If Licensee proposes to make and pay for the Alterations, it should provide plans and a budget with the request submitted to the Director.

5.06 Right to Enter, Inspect and Make Repairs and Improvements.

(a) The City and its authorized officers, employees, agents, contractors, subcontractors and other representatives shall have the right (at such times as may be reasonable under the circumstances to avoid unreasonable interruption of Licensee’s operations) to access the Licensed Area for the following purposes:

(1) to inspect such equipment at reasonable intervals during regular business hours (or at any time in case of Emergency or urgent need to protect the City System) to determine whether Licensee has complied and is complying with the terms and conditions of this Agreement;

(2) to perform maintenance and make repairs and replacements in cases where Licensee is obligated but has failed to do so, after the City has given Licensee reasonable notice so to do, in which event Licensee shall reimburse the City for the reasonable cost thereof within thirty (30) days of Licensee’s receipt of City’s invoice accompanied by reasonable substantiation of the costs incurred. The City shall have the right to seek recovery of the cost of the maintenance or repair by any judicial remedy available should Licensee fail to pay the cost of the repair. Under no circumstances will City attempt to repair or alter in any way Licensee’s Licensed System, including its operational equipment such as base station radios, other electronic equipment, alarm systems, antennas, coaxial cable, DAS, UPS, etc.; however, this restriction shall not limit the City in performing inspections and repairs and protecting the City System and the Subject Property as provided in this Agreement.

(b) The City reserves the right at all times to take any action it deems necessary, in its sole discretion, to repair, maintain, alter, expand, or improve the City System and the Subject Property and the improvements thereon in connection with their use and operation. The City agrees to give reasonable advance notice of any such activities to Licensee and to reasonably cooperate with Licensee to carry out such activities with a minimum amount of interference to Licensee’s use of the Licensed Area. Licensee agrees to cooperate with the City with respect to such repairs, maintenance, alterations, expansions, or improvements and to accommodate such work to the extent the City deems necessary and at Licensee’s sole expense..

5.07 Utilities.

(a) Licensee shall pay for a separate electric meter for the operation of the Licensed System, as well as all monthly costs of utility and electricity associated with the use and operation of the Licensed System. Licensee shall make these payments directly to the utility provider, not to the City.

(b) Licensee shall be responsible for providing and properly maintaining and replacing, subject to the requirements of section 5.04 above and the installation requirements of section 4.03 above, an independent ventilation, heating, and air conditioning system for those portions of the Licensed System, if any, that are expressly required by the manufacturer of the System to maintain manufacturer's warranties based upon Licensee's installation of the Licensed System at the Subject Property.

5.08 Interruption of Utility Services.

(a) Licensee agrees that City shall not be liable for failure of any utility services to be supplied to the Licensed System, or for a failure of the electrical generator, or for any interruption of utility services to the Licensed System caused by third parties.

(b) The City reserves the right to temporarily interrupt utility services at such time as may be necessary by reason of accident, unavailability of employees, repairs, alterations or improvements or whenever by reason of *force majeure*, including any state of Emergency declared by the President of the United States, the Governor of the State of Colorado, or the Mayor of the City and County of Denver for which such interruption is reasonable for security and public safety reasons. The City shall not be liable for operational or business losses or for damages to persons or property due to such interruptions. Nor shall such interruptions in any way be construed as cause for abatement of the License Fee, unless caused by the demonstrated gross negligence or intentional misconduct of the City or its agents, contractors or employees.

(c) No backup power supplies shall be placed within the Licensed Area or elsewhere on the Subject Property without the prior, written approval of the City Representative and after obtaining any required permits, licenses or approvals for such backup power supplies.

SECTION 6

INSURANCE; INDEMNITY and DEFENSE; GOVERNMENTAL IMMUNITY; LIMITS ON LIABILITY; and TAXES, LICENSES, LIENS AND FEES

6.01 Insurance.

(a) **General Conditions:** Licensee agrees to secure, at or before the time of execution of this Agreement, the following insurance covering all operations, goods or services

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provided pursuant to this Agreement. Licensee shall keep the required insurance coverage in effect at all times during the term of the Agreement, including any extension thereof, and during any warranty period. The required insurance shall be underwritten by an insurer eligible to do business in Colorado and rated by A.M. Best Company as "A-VII" or better. Each policy shall require notification to the City in the event any of the required policies be canceled before the expiration date thereof. Such written notice shall be sent to the parties identified in the Notices section of this Agreement. Said notice shall be sent thirty (30) days prior to such cancellation. If such written notice is unavailable from the insurer, Licensee shall provide written notice of cancellation, non-renewal of any required coverage that is not replaced to the parties identified in the Notices section by - mail, referencing the City's contract number. Licensee shall be responsible for the payment of any deductible or self-insured retention. The insurance coverages specified in this Agreement are the requirements, and these requirements do not lessen or limit the liability of the Licensee. The Licensee shall maintain, at its own expense, any additional kinds or amounts of insurance that it may deem necessary to cover its obligations and liabilities under this Agreement.

(b) **Proof of Insurance:** Licensee may not commence services or work relating to this Agreement prior to placement of coverages required under this Agreement. Licensee certifies that the certificate of insurance attached as **Exhibit D**, preferably an ACORD form, complies with all insurance requirements of this Agreement. The City requests that the City's contract number be referenced on the certificate of insurance. The City's acceptance of a certificate of insurance or other proof of insurance that does not comply with all insurance requirements set forth in this Agreement shall not act as a waiver of Licensee's breach of this Agreement or of any of the City's rights or remedies under this Agreement. In the event of a claim giving rise to a coverage dispute, The City reserves the right to request a copy of the applicable Policy giving rise to such dispute.

(c) **Additional Insureds:** For Commercial General Liability, Auto Liability and Excess Liability/Umbrella (if required), Licensee's insurer(s) shall include the City and County of Denver, its elected and appointed officials, employees and volunteers as additional insured.

(d) **Waiver of Subrogation:** For all coverages required under this Agreement, Licensee's insurer shall waive subrogation rights against the City.

(e) **Subcontractors and Subconsultants:** Licensee shall confirm and document that all subcontractors and subconsultants (including independent contractors, suppliers or other entities providing goods or services required by this Agreement) procure and maintain coverage as approved by the Licensee and appropriate to their respective primary business risks considering the nature and scope of services provided.

(f) **Workers' Compensation and Employer's Liability Insurance:** Licensee shall maintain the coverage as required by statute for each work location and shall maintain Employer's Liability insurance with limits of \$100,000 per occurrence for each bodily injury claim, \$100,000 per occurrence for each bodily injury caused by disease claim, and \$500,000

aggregate for all bodily injuries caused by disease claims.

(g) **Commercial General Liability:** Licensee shall maintain a Commercial General Liability insurance policy per ISO form CG 00 01 or equivalent with - limits of \$1,000,000 for each bodily injury and property damage occurrence, \$2,000,000 products and completed operations aggregate (if applicable), and \$2,000,000 policy aggregate.

(h) **Automobile Liability:** Licensee shall maintain Automobile Liability with - limits of \$1,000,000 per accident combined single limit applicable to all owned, hired and non-owned vehicles used at the Leased Premises.

(i) **Property Insurance:** Licensee shall provide 100% replacement cost for Licensee's tenant improvements and personal property. Business Interruption coverage shall be included with limits not less than the annual payments due to the City under this License Agreement. Licensee understands and acknowledges that the City does not provide any insurance coverage for any property of the Licensee, its agents, employees or assignees located in the Leased Premises and Licensee acknowledges and agrees that the Licensee, its agents, employees, and assignees have no claim against the City for any damage or loss of personal property and belongings of Licensee, its agents, employees or assignees in the Licensed Area.

(j) Failure to comply with the requirements of this section 6.01 shall be legal grounds under this Agreement for work by Licensee at the Subject Property to be ordered to cease or to be restricted, as deemed appropriate by the Director or the Denver Risk Management Office, until compliance is achieved and any unpaid claims are resolved to the reasonable satisfaction of the City Representative and the Denver Risk Management Office. These insurance obligations shall survive the expiration of the Agreement and Cancellation for three (3) years.

6.02 Indemnification & Defense.

(a) Licensee hereby agrees to defend, indemnify, and hold harmless City, its appointed and elected officials, agents and employees against all liabilities, claims, judgments, suits or demands for damages to persons or property arising out of, resulting from, or relating to regarding the use and occupancy of, and activities and operations on, the Subject Property site by Licensee (including its officers, employees, representatives, suppliers, contractors, subcontractors and agents) under this Agreement ("Claims"), unless such Claims have been specifically determined by the trier of fact to be the sole negligence or willful misconduct of City. This indemnity shall be interpreted in the broadest possible manner to indemnify City for any acts or omissions of Licensee (including its officers, employees, representatives, suppliers, contractors, subcontractors and agents) either passive or active, irrespective of fault, including City's concurrent negligence whether active or passive, except for the sole negligence or willful misconduct of City.

(b) Licensee's duty to defend and indemnify City shall arise at the time written notice of the Claim is first provided to City regardless of whether an action has been filed in court on the Claim. Licensee's duty to defend and indemnify the City shall arise even if City is the only party sued and/or it is alleged that City's negligence or willful misconduct was the sole cause of the alleged damages.

(c) Licensee will defend any and all Claims which may be brought or threatened against City and will pay on behalf of City any expenses incurred by reason of such Claims including, but not limited to, court costs and attorney fees incurred in defending and investigating such Claims or seeking to enforce this indemnity obligation. Such payments on behalf of City shall be in addition to any other legal remedies available to City and shall not be considered City's exclusive remedy.

(d) Insurance coverage requirements specified in this Agreement shall in no way lessen or limit the liability of Licensee under the terms of this indemnification obligation. Licensee shall obtain, at its own expense, any additional insurance that it deems necessary for City's protection.

(e) This indemnification and defense obligation shall survive the expiration of this Agreement and Cancellation.

6.03 Colorado Governmental Immunity Act.

Licensee understands and agrees that City is relying upon, and has not waived, the monetary limitations and all other rights, immunities and protection provided by the Colorado Governmental Act, § 24-10-101 *et seq.*, C.R.S., and any related statutory protections against liability.

6.04 Limitation on Liability.

Licensee agrees that no liability shall attach to the City for any damages or losses incurred or claimed by Licensee or any other person or party on account of the installation, construction or operation of the Licensed System by Licensee. Licensee agrees that it shall not in any way seek damages or make any claims against the City for any interference or delay caused by construction in adjacent areas, other businesses or operations, including without limitation damages or losses in the nature of delay damages, lost labor productivity, and impact damages.

6.05 Environmental Requirements.

(a) Licensee and its contractor(s) and subcontractor(s) shall obtain all federal, state,

and local environmental permits necessary for the work to be performed and shall comply with all applicable federal, state, and local environmental permit requirements applicable to any work performed on the Subject Property. Licensee and its contractor(s) and subcontractor(s) shall comply with all applicable local, state, and federal environmental guidelines, rules, regulations, statutes, laws, and orders applicable to the work (collectively, “Environmental Requirements”), including but not limited to Environmental Requirements regarding the storage, use, transportation, and disposal of Hazardous Materials and regarding releases or threatened releases of Hazardous Materials to the environment.

(b) The term “Hazardous Materials” shall mean asbestos, asbestos-contaminated soils, and asbestos-containing materials, special wastes, polychlorinated biphenyls (PCBs), any petroleum products, natural gas, radioactive source material, pesticides, any hazardous waste as defined at 42 U.S.C. § 6903(5) of the Solid Waste Disposal Act, any hazardous substance as defined at 42 U.S.C. § 9601(14) of the Comprehensive Environmental Response, Compensation and Liability Act, and chemical substance as defined at 15 U.S.C. § 2602(2) of the Toxic Substances Control Act, and any guidelines issued and rules or regulations promulgated pursuant to such statutes, or any other applicable federal or state statute.

(c) No Hazardous Materials shall be brought onto, or stored on, the Subject Property site without the prior, written approval of the City Representative and, if required by the City Representative, the prior, written approval of the Denver Department of Environmental Health and/or the Colorado Department of Public Health and Environment.

(d) The obligations of Licensee set out in this section 6.05 shall survive the expiration of the Agreement.

6.06 Taxes, Licenses, Liens and Fees.

(a) Licensee agrees to promptly pay all taxes, excises, license fees and permit fees of whatever nature applicable to its operations hereunder and to take out and keep current all municipal, state or federal licenses required for the conduct of its business or operations under this Agreement and further agrees not to permit any of said taxes, excises, license fees or permit fees to become delinquent.

(b) Licensee also agrees not to permit any mechanic’s or materialman’s or any other lien to become attached or be foreclosed upon the Subject Property, or improvements thereto, or any part or parcel thereof, by reason of any work or labor performed or materials furnished by any mechanic or materialman for Licensee, as contractors or subcontractors.

(c) Licensee further agrees to promptly pay when due all bills, debts and obligations incurred by it in connection with its operations hereunder, and not to permit the same to become delinquent and to suffer no lien, mortgage, judgment or execution to be filed against the Subject

Property, the City System, the Licensed System, or related improvements, which may in any way impair the rights of the City under this Agreement or to the City's property.

(d) The obligations of Licensee set out in this section 6.06 shall survive the expiration of the Agreement and Cancellation.

6.07 No Waiver.

No failure of either Party to insist upon the strict performance of a term, covenant or agreement contained in this Agreement shall be deemed or taken to be a waiver by such Party of any succeeding failure to perform or any breach or default.

**SECTION 7
CITY RIGHTS**

7.01 City's Rights.

(a) City shall retain all the rights to the use, occupancy and ownership of the Subject Property; and such use, occupancy and ownership by the City shall be the primary use of the Subject Property and shall not be interfered with by the exercise of the rights granted hereunder during the Term or Term Extension of the Agreement, except to the extent interference shall be a result of Licensee's reasonable uses and actions in the installation, inspection, maintenance, alteration, repair, replacement, operation and removal of the Licensed System as authorized under this Agreement; provided, however, that Licensee shall be liable to the City for any damage to improvements that may result from such installation, inspection, maintenance, alteration, repair, replacement, operation and removal.

(b) If the City desires Licensee to leave in place any modifications made by Licensee and so states in a written notice to Licensee, then Licensee shall leave such modifications in place without compensation from or to the City. If Licensee is required to remove the modifications and does not restore damage resulting from said removal and thereby causing the City to have to undertake the restoration, then Licensee shall promptly reimburse the City for the work. The City specifically reserves for itself, other Licensees, licensees and assignees of City, all rights which do not materially and adversely interfere with Licensee's exercise of its License under this Agreement; provided, however, the City will not materially and adversely interfere with, and will not knowingly permit or allow other licensees to materially and adversely interfere with, the rights of Licensee under the terms of this Agreement except to the extent expressly provided in this Agreement.

(c) Upon expiration of the Agreement or Cancellation or on the date specified in any demand for possession by the City after any default by Licensee (after any applicable notice and cure periods), Licensee covenants and agrees to surrender possession of the Licensed Area and

all other parts of the Subject Property site to the City in the same condition as when first occupied, ordinary wear and tear excepted but subject to the repair and restoration requirements provided in this Agreement.

(d) Licensee shall remove, at its sole cost, upon expiration of the Agreement or Cancellation, the Licensed System and all of Licensee's personal property within thirty (30) calendar days after expiration or Cancellation, as applicable. If such removal should damage the Subject Property, Licensee agrees, at its sole cost, to immediately repair such damage in a good and workmanlike manner and to put the property in the same condition as it would have been if the Licensed System had not been installed, reasonable wear and tear excepted but subject to the repair and restoration requirements provided in this Agreement. If Licensee fails to remove the Licensed System and Licensee's personal property within thirty (30) calendar days after the expiration of this Agreement or Cancellation, as applicable, the City, at its option, may remove, store and/or dispose of same and retain any proceeds therefrom, and further is entitled to recover any cost incurred by the City in removing same and in restoring the Subject Property.

(e) If Licensee holds over after the expiration of this Agreement or Cancellation, and so long as the Licensed System is still situated on the Subject Property site (even if it has been disconnected), Licensee shall pay to City a holdover fee equal to 250% of the then total License Fee prorated from the effective expiration or Cancellation date, whichever is applicable, to the date the Licensed System is properly and completely removed from the property. Nothing herein shall be construed to give Licensee the right to hold over at any time, and the City may exercise any and all remedies at law or in equity to recover possession of the Property, as well as any damages caused by Licensee.

SECTION 8 LOSS OF, AND LIABILITIES PERTAINING TO THE LICENSED SYSTEM

8.01 Damage or Destruction and Restoration.

In case of damage or loss of all or any portion of the Licensed System, Licensee will give prompt notice thereof to the City; and, except as otherwise provided herein, Licensee shall promptly commence and complete with due diligence (subject to delays beyond its control), the restoration of the Licensed System as nearly as reasonably practicable to the value and condition thereof immediately prior to such damage or destruction. In the event of such damage or destruction, Licensee shall be entitled to use or receive reimbursement from the proceeds of all property insurance policy or policies held by Licensee for the Licensed System. The License Fee payable under section 3.01 shall continue to be due and owing.

8.02 Licensee's Election Not to Restore Damaged Licensed System.

In case of the damage or destruction of all or any part of the Licensed System, Licensee, within ninety (90) days thereafter, may elect not to restore or replace the Licensed System, and this Agreement shall be terminated. Licensee must notify the City within said 90 days of the damage or destruction to all or any part of the Licensed System of its intentions not to restore or replace the Licensed System and shall pay the City, in full, six (6) months of payments for the License Fee under section 3.01 from the date that the notice not to restore or replace is provided to the City. Licensee shall promptly proceed to remove the Licensed System from the Licensed Area and to repair and restore the Subject Property in accordance with Section 4 and section 7.01 and as otherwise provided in this Agreement within thirty (30) days after Licensee elects not to restore or replace the Licensed System. The obligations of Licensee under this section 8.02 shall survive the expiration of this Agreement and Cancellation.

SECTION 9 DEFAULT; REMEDIES; and DISPUTES

9.01 Licensee Default.

Licensee shall be in substantial default under this Agreement if Licensee:

(a) Fails to timely pay to the City on the fifth (5th) calendar day after the date License Fee or any other payments are due and owing under this Agreement; provided, however, default shall not occur until the tenth (10th) calendar day after written notice is provided by the City to Licensee; or

(b) Becomes insolvent, or takes the benefit of any present or future insolvency or bankruptcy statute, or makes a general assignment for the benefit of creditors, or consents to the appointment of a receiver, trustee or liquidator of any or substantially all of its property; or

(c) Transfers its interest under this Agreement, unless such transfer is specifically authorized pursuant to section 10.01; or

(d) Fails to submit or fails to timely submit complete and accurate plans and specifications, bonds, proof of insurance and other submittals as required by the express terms of this Agreement, and such failure continues for a period of thirty (30) calendar days after Licensee has received written notice from the City of such failure; or

(e) Abandons, deserts or vacates the Licensed System or Licensed Area; or

(f) Suffers any materialmen's or mechanic's lien or attachment to be filed against the Licensed System, the City System, or the Subject Property because of any act or omission of Licensee, and such lien or attachment is not discharged or contested by Licensee in good faith

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Added on behalf of Licensee: VZW site name “DEN Denver Arts”, the MDG #: 5000139904.

by proper legal proceedings within thirty (30) calendar days after Licensee's receipt of written notice thereof from City; or

(g) Fails to keep, perform and observe any other promise, covenant or agreement set forth in this Agreement and such failure continues for a period of more than thirty (30) calendar days after delivery by City of a written notice of such breach or default, except where a shorter period is specified herein, or where fulfillment of its obligation requires activity over a period of time and Licensee within thirty (30) days of Licensee notice Licensee commences in good faith to perform whatever may be required to correct its failure to perform and continues such performance without interruption except for causes beyond its control (which must be documented in a written notice to the City); or

(h) Gives its permission to any person to use for any illegal or unauthorized purpose any portion of the City's property made available to Licensee for its use under this Agreement; or

(i) Or any of its officers or employees are convicted, plead nolo contendere, enter into a formal agreement in which they admit guilt, enter a plea of guilty, or otherwise admit culpability to criminal offenses of bribery, kickbacks, collusive bidding, bid-rigging, antitrust, fraud, undue influence, theft, racketeering, extortion or any offense of a similar nature, in connection with the Licensee's business or operations in the State of Colorado.

9.02 Remedies.

If Licensee substantially defaults in any of the covenants, terms and conditions herein and such default is not cured within any applicable notice and cure periods, the City may exercise any one or more of the following remedies:

(a) The City may elect to allow this Agreement to continue in full force and effect and to enforce all of City's rights and remedies hereunder, including without limitation the right to collect compensation as it becomes due together with interest or recover any damages or losses resulting from the action or inaction of Licensee.

(b) The City may engage in Cancellation and repossess the Licensed Area, without liability for so doing and without having to comply with any eviction process under state law, upon giving thirty (30) calendar days written notice to Licensee of the intended Cancellation, at the end of which time all the rights hereunder of Licensee shall terminate, unless the default shall have been cured as prescribed in section 9.01 or elsewhere in this Agreement. Licensee shall be liable to the City for all amounts owing to the City or any other party with respect to Licensee's operations at the Subject Property or under this Agreement.

(c) The remedies provided in this Agreement shall be cumulative and shall in no way
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affect any other remedy available to the City under law or equity. The obligations of Licensee under this section 9.02 shall survive the expiration of the Agreement and Cancellation.

9.03 City Default.

City's failure to perform any term or condition under this Agreement within thirty (30) days after written notice from Licensee specifying the failure will be deemed a default by City and a breach of this Agreement. No such failure, however, will be deemed to exist if City has commenced to cure the default within such period and provided such efforts are prosecuted to completion with reasonable diligence. Delay in curing a default will be excused if due to causes beyond the reasonable control of City. If City remains in default beyond any applicable cure period, Licensee will have: (i) the right to cure City's default and to deduct the costs of such cure from any monies due to City from Licensee, and (ii) any and all other rights available to it under law and equity. The Parties agree to work diligently together and in good faith, using reasonable efforts to resolve any unforeseen issues and disputes and to expeditiously take such actions as are necessary and appropriate to perform the duties and obligations of this Agreement. Any dispute between the City and Licensee, including whether a default by Licensee is substantial or has been timely and effectively cured, shall be taken to administrative hearing, pursuant to the procedure established by Section 56-106, DRMC.

SECTION 10 MISCELLANEOUS PROVISIONS

10.01 Assignments.

(a) Licensee shall not assign or otherwise transfer its interest in this Agreement, in whole or in part, or otherwise transfer any rights or interest in or to the License granted under this Agreement, without the prior written consent of the Director, which consent can be given or denied in Director's sole discretion, and subject to approval, under section 10.16 below, of an amendment to this Agreement authorizing the assignment. The Director may require any proposed assignee to demonstrate that it is appropriately licensed and authorized to provide the same services as Licensee and has the ability to perform the terms and conditions of this Agreement including any financial obligations under this Agreement.

(b) Notwithstanding the foregoing, Licensee may assign this Agreement, and the License granted herein, in whole, to any business entity which is parent, subsidiary, affiliate of Licensee, or to any party that acquires all or substantially all of Licensee's radio spectrum assets in the Denver market area, by reason of a merger, acquisition or other business reorganization. The burden shall be on Licensee to demonstrate, to the satisfaction of the Director, that any proposed assignment qualifies under this sub-section 10.01(b).

(c) The License granted under this Agreement may not be sold under any circumstances. Any contract entered by Licensee to sell or convey the License granted herein shall not be binding on the City and shall be grounds for terminating the Agreement, at the

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discretion of the Director.

(d) Under no circumstances shall Licensee be authorized to allow any other licensee or sub-licensee to co-locate or operate any system at the Subject Property.

10.02 Fair Dealing; Further Assurances.

(a) In all cases where the consent or approval of one Party is required before the other may act, or where the agreement or cooperation of the Parties is separately or mutually required as a legal or practical matter, then in that event the Parties agree that each will act in a fair and reasonable manner with a view to carrying out the intents and goals of this Agreement as the same are set forth herein, subject to the terms hereof.

(b) From time to time, upon the request of a Party, the other Party agrees to make, execute and deliver or cause to be made, executed and delivered to the requesting Party any and all further instruments, certificates and documents consistent with the provisions of this Agreement as may, in the reasonable opinion of the requesting Party, be necessary or desirable in order to effectuate, complete or perfect the rights of said Party under this Agreement, provided said requesting Party is currently in full compliance with the provisions of this Agreement and has tendered or offered to tender any reciprocal instruments, certificates and documents to which the other Party is entitled under the Agreement.

10.03 Bond Ordinance.

This Agreement and the rights granted or conveyed hereby are in all respects subject and subordinate to any and all City bond ordinances related to the Subject Property and to any other bond ordinances which should amend, supplement or replace such bond ordinances. The parties agree that the bond ordinances permit the terms of this Agreement as written and that Licensee shall comply with all IRS regulations and take no action that would jeopardize the tax-exempt status of the bonds. This Agreement has been approved by the City's bond counsel and such approval is on file with the City and County of Denver. This Agreement may not be executed and may not be amended in the future without prior written approval of the City's bond counsel.

10.04 Financial Interests.

Except for financial interests authorized by the City in accordance with the City Charter and ordinances, any financial interests created in, or used to secure financing and payment for the costs of, any work performed or improvements made under this Agreement by Licensee, including but not limited to any bonds, certificates of participation, purchase agreements, and Uniform Commercial Code filings, shall expressly exclude from such debt or financial security contained in such financial instrument(s) any title, rights and interests held by the City in the property subject to this Agreement. The terms and conditions of this Agreement must be

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expressly recognized in any such financial instrument(s) created or entered by or on behalf of Licensee, which must specifically acknowledge and affirm that any financial interests created by the financial instrument(s) are subordinate to this Agreement and may not encumber the City's title, rights and interests in the subject property or under this Agreement.

10.05 Appropriation.

Notwithstanding any provision of this Agreement to the contrary, the rights and obligations of the City under this Agreement are contingent upon all funds necessary for work or expenditures contemplated under this Agreement being budgeted, appropriated and otherwise made available by the City. The Parties acknowledge that this Agreement is not intended to create a multiple-fiscal year direct or indirect debt or financial obligation of the City, except to the extent that capital improvement funds that are lawfully appropriated can be lawfully carried over to subsequent years.

10.06 Contracting or Subcontracting.

Any work that is allowed to be contracted or subcontracted under this Agreement shall be subject, by the terms of the contract or subcontract, to every provision of this Agreement. Compliance with this provision shall be the responsibility of the Party who arranged the contract or authorized the subcontract. Except as otherwise expressly stated in this Agreement, no Party shall be liable or have a financial obligation to or for any contractor, subcontractor, supplier, or other person or entity with which the other Party contracts or has a contractual arrangement.

10.07 Third Parties.

This Agreement does not, and shall not be deemed or construed to, confer upon or grant to any third party or parties any right to claim damages or to bring any suit, action or other proceeding against either the City or Licensee because of any breach hereof or because of any of the terms, covenants, agreements and conditions herein.

10.08 Force Majeure.

Neither Party hereto shall be liable to the other for any failure, delay or interruption in the performance of any of the terms, covenants or conditions of this Agreement due to causes beyond the reasonable control of that Party, including without limitation strikes, boycotts, labor disputes, embargoes, shortages of materials, acts of God, acts of the public enemy, acts of superior governmental authority, severe weather conditions, fire, floods, riots, rebellion, sabotage or any other circumstance for which such Party is not responsible or which is not in its power to control, but in no event shall this section be construed so as to allow Licensee to reduce or abate its obligation to pay the License Fee prescribed in this Agreement.

10.09 No Discrimination in Employment (City Executive Order No. 8):

In connection with the performance of work under the Agreement, Licensee may not refuse to hire, discharge, promote, demote, or discriminate in matters of compensation against any person otherwise qualified, solely because of race, color, religion, national origin, ethnicity, citizenship, immigration status, gender, age, sexual orientation, gender identity, gender expression, marital status, source of income, military status, protective hairstyle, or disability. Licensee shall insert the foregoing provision in all subcontracts.

10.10 Non-Discrimination and Equal Employment Opportunity

(a) In carrying out its obligations under the Agreement, Licensee and its officers, employees, members, and subcontractors hereby affirm current and ongoing compliance with 29 CFR Part 37, Title VII of the Civil Rights Act of 1964, The Americans With Disabilities Act of 1990, Section 504 of the Rehabilitation Act of 1973, the Age Discrimination Act of 1975, Title IX of the Education Amendments of 1972, and all other nondiscrimination and equal employment opportunity statutes, laws, and regulations. Licensee agrees not discriminate against any employee or applicant for employment because of race, religion, national origin, ancestry, color, gender, gender identity, sexual orientation, age, disability, political affiliation or belief, or veteran status. Licensee will ensure that all qualified applicants are hired, and all employees are considered for promotion, demotion, transfer; recruitment or recruitment advertising, layoff, termination, rates of pay, other forms of compensation, selection for training (including apprenticeship), or any other employment-related opportunities, without regard to race, religion, national origin, ancestry, color, gender, gender identity, sexual orientation, age, disability, political affiliation or belief, or veteran status.

(b) Licensee agrees to post notices affirming compliance with all applicable federal and state non-discrimination laws in conspicuous places accessible to all employees and applicants for employment. Licensee will affirm that all qualified applicants will receive consideration for employment without regard to race, religion, national origin, ancestry, color, gender, gender identity, sexual orientation, age, disability, political affiliation or belief, or veteran status in all solicitations or advertisements for employees placed by or on behalf of Licensee.

(c) Licensee will incorporate the foregoing requirements of this Section in all of its subcontracts.

(d) Licensee agrees to collect and maintain data necessary to show compliance with the nondiscrimination provisions of this section.

10.11 Conflict of Interest.

DPAC Cellco Partnership dba Verizon Wireless – License Agreement

CCN: FINAN-202476013

Added on behalf of Licensee: VZW site name “DEN Denver Arts”, the MDG #: 5000139904.

The Parties agree that no official, officer or employee of the City shall have any personal or beneficial interest whatsoever in the services or property described herein, and Licensee further agrees not to hire or contract for services any official, officer or employee of the City or any other person which would be in violation of the Denver Revised Municipal Code Chapter 2, Article IV, Code of Ethics, or Denver City Charter provisions 1.2.9 and 1.2.12.

10.12 Applicable Law; Authority; Venue; Enforcement; and Claims.

(a) The Parties agree to comply with all Applicable Law in existence as of the Effective Date of this Agreement or as may be subsequently enacted or adopted and become applicable.

(b) This Agreement shall be construed and enforced in accordance with the laws of the United States, the State of Colorado, and the applicable provisions of the Charter and Revised Municipal Code of the City and County of Denver.

(c) Venue for any legal action relating to this Agreement shall lie in the District Court in and for the City and County of Denver.

(d) The Parties agree that this Agreement may be enforced in law or in equity for specific performance, injunctive, or other appropriate relief, including actual damages (notwithstanding Cancellation), as may be available according to the laws and statutes of the State of Colorado; provided, however, the Parties agree to and hereby release any claims for incidental, consequential, or punitive damages; provided, further, no provision of this Agreement may be enforced by the creation or recording of any type of lien against real property owned by the City, nor may any foreclosure process be utilized to recover any moneys owed by the City to Licensee. It is specifically understood that, by executing this Agreement, each Party commits itself to perform pursuant to these terms and conditions contained in this Agreement, and that any failure to comply which results in any recoverable damages shall not cause, by itself, the revocation or termination of any rights or obligations under this Agreement.

(e) Nothing in this section 10.12 shall be construed as a waiver, release, reduction or modification of any insurance, bond, indemnification or other liability obligations of Licensee or Licensee's design professional, contractor or sub-contractor expressly provided for in this Agreement.

(f) No official, officer, director, agent, or employee of either Party shall be charged personally or held contractually liable to the other Party or its officials, officers, directors, agents, or employees under any term or condition of this Agreement or for any breach, default, or violation under this Agreement.

(g) In the event that any claim, demand, suit, or action is made or brought in writing by any person or entity against one of the Parties related in any way to this Agreement, the Party in receipt of same shall promptly notify and provide a copy of said claim, demand, suit, or action to the other Party.

10.13 Use, Possession or Sale of Alcohol or Drugs; Smoking Policy.

(a) Licensee and its officers, agents, employees, and contractors shall cooperate and comply with the provisions of the City and County of Denver's policy or order or any successor policy or order concerning the use, possession or sale of alcohol or drugs on City property.

(b) Licensee and its officers, agents, employees, and contractors shall cooperate and comply with the provisions of the City's policy or order prohibiting smoking in buildings and certain facilities, and Licensee agrees it will take reasonable action to prohibit smoking by its employees in the public areas of the Subject Property.

10.14 Notices.

All legal and administrative notices hereunder shall be given in writing to the following, by a nationally recognized overnight courier, or by certified mail, postage prepaid, return receipt requested.

To the City:

City and County of Denver
Division of Real Estate
201 W Colfax Ave, Dept 1010
Denver, CO 80202
Attn: Director of Real Estate

City Attorney's Office
City and County of Denver
1437 Bannock Street, Room 353
Denver, CO 80202

To the Licensee:

Cellco Partnership d/b/a Verizon Wireless
180 Washington Valley Road
Bedminster NJ 07921
Attn: Network Real Estate

DPAC Cellco Partnership dba Verizon Wireless – License Agreement

CCN: FINAN-202476013

Added on behalf of Licensee: VZW site name "DEN Denver Arts", the MDG #: 5000139904.

Cell Site Name: DPAC

With a copy to: Basking Ridge Mail Hub
Attention: Legal Intake
One Verizon Way
Basking Ridge, New Jersey 07920

All proposed amendments to the Agreement, letter approvals for proposed actions by Licensee, proposed changes to the exhibits, and any document or affidavit seeking the signature of the Director or the Executive Director of Safety, shall be provided to both the Director and the City Attorney's Office. Licensee and City shall designate local contact personnel for operational and otherwise day-to-day business communications which may be made by telephone or email. Any changes to this contact information shall be provided immediately once known.

10.15 Examination of Records and Audit

Any authorized agent of the City, including the City Auditor or his or her representative, has the right to access, and the right to examine, copy and retain copies, at City's election in paper or electronic form, any pertinent books, documents, papers and records related to Licensee's performance pursuant to this Agreement, and any other transactions related to this Agreement. Licensee shall cooperate with City representatives and City representatives shall be granted access to the foregoing documents and information during reasonable business hours and until the latter of three (3) years after the final payment under the Agreement or expiration of the applicable statute of limitations. When conducting an audit of this Agreement, the City Auditor shall be subject to government auditing standards issued by the United States Government Accountability Office by the Comptroller General of the United States, including with respect to disclosure of information acquired during the course of an audit. No examination of records and audits pursuant to this paragraph shall require Licensee to make disclosures in violation of state or federal privacy laws. Licensee shall at all times comply with D.R.M.C. 20-276.

10.16 Parties' Obligation Regarding Confidential Information.

The Parties agree that issues governing the use and disclosure of Confidential Information, as defined below, provided to or made available to the City by Licensee will be governed by the following provisions:

(a) As used herein, the term "Confidential Information" means all information, of any nature and in any form, regardless of when given, that (i) is disclosed or provided by or through Licensee to the City pursuant to performance of this Agreement; and (ii) has been clearly marked or indicated in writing as being confidential by Licensee; provided, that no part of this

DPAC Cellco Partnership dba Verizon Wireless – License Agreement

CCN: FINAN-202476013

Added on behalf of Licensee: VZW site name "DEN Denver Arts", the MDG #: 5000139904.

Agreement or the exhibits attached to this Agreement shall be deemed to contain Confidential Information. Information falling within this definition shall be treated by the City as confidential proprietary information of Licensee pursuant to the provisions of the Colorado Open Records Act and under any rule of court. Information not so marked or indicated will not be so considered.

(b) Except as expressly provided in this Agreement or as otherwise mandated by the Colorado Open Records Act or other applicable law, the City will not disclose Confidential Information to anyone other than individuals required for the administration and enforcement of this Agreement, including the City Representative, without the prior written consent of Licensee. The City will not use, or permit others to use, Confidential Information for any purpose other than actions incidental to the performance and enforcement of this Agreement between the City and Licensee, including but not limited to auditing of records of Licensee by the City Auditor and/or other representatives of the City. The City will take all reasonable measures to avoid disclosure, dissemination or unauthorized use of Confidential Information, including, at a minimum, those measures that it takes to protect its own Confidential Information of a similar nature.

(c) The Parties recognize that the mere marking of a document as “Confidential” does not render it conclusively confidential under the Colorado Open Records Act. Consequently, in the event that the City is served with an Open Records Request or subpoena from any third party requesting all or part of any Confidential Information as defined herein, the City shall give timely notice to Licensee of such request or subpoena within the time parameters of the Colorado Open Records Act or of any applicable court rule. In that event, Licensee agrees upon receipt of actual notice from the City of such Open Records Request or subpoena to immediately undertake, at its own cost and expense, to defend such Confidential Information from disclosure pursuant to the Colorado Open Records Act or applicable court rule and shall defend, save and hold harmless and indemnify the City and its agents and employees with respect to such issues.

(d) Licensee shall not at any time or in any manner, either directly or indirectly, divulge, disclose or communicate to any person, firm or corporation in any manner whatsoever any information concerning any matters which are not subject to public disclosure, including without limitation the trade secrets of businesses or entities doing business with the City, security measures utilized by the City, and other privileged or confidential information.

10.17 Entire Agreement; Amendment.

The Parties acknowledge and agree that the provisions contained herein, including all exhibits attached hereto, constitute the entire agreement and that all representations made by any officer, agent or employee of the respective Parties unless included herein are null and void and of no effect. No alterations, amendments, changes or modifications, unless expressly reserved

to the City herein, shall be valid unless executed by an instrument in writing by all the Parties with the same formality as this Agreement.

10.18 Severability.

If any term or provision of this Agreement is held by a court of law (following all legal rights of appeal or the expiration of time therefore) to be illegal or unenforceable or in conflict with any law of the State of Colorado or the City Charter or City ordinance, the validity of the remaining portions or provisions shall not be affected, and the rights and obligations of the Parties shall be construed and enforced as if the Agreement did not contain the particular term or provision held to be invalid; provided, however, if the invalidated term or provision was a critical or material consideration of either Party in entering this Agreement, the Parties shall work together, in good faith, to come up with an amendment to this Agreement that substantially satisfies the previously intended consideration while being in compliance with Applicable Law and the judgment of the court. Judicial invalidation of the License Fee, in whole or part, shall result in a failure of consideration and termination of this Agreement.

10.19 Time of Essence.

The Parties agree that in the performance of the terms and requirements of this Agreement by Licensee and the City, time is of the essence.

10.20 Section Headings.

The section headings herein are for convenience in reference only and are not intended to define or limit the scope of any provision of this Agreement.

10.21 Approval and Execution of Agreement.

This Agreement is expressly subject to and shall not be or become effective or binding on the City until City Council approval, if required by Charter, is obtained and the Agreement is fully executed by all required City signatories and all required Licensee signatories.

10.22 Authority

Each Party represents and warrants that it has taken all actions that are necessary or that are required by its applicable law to legally authorize the undersigned signatories to execute this Agreement on behalf of the Party and to bind the Party to its terms. The person(s) executing this Agreement on behalf of each Party warrants that he/she/they have full authorization to execute this Agreement. The City shall have the right, in its discretion, to either temporarily suspend or permanently terminate the Agreement if there is any valid dispute as to the legal authority of Licensee or the person signing this Agreement on behalf of Licensee to enter into this

DPAC Cellco Partnership dba Verizon Wireless – License Agreement

CCN: FINAN-202476013

Added on behalf of Licensee: VZW site name “DEN Denver Arts”, the MDG #: 5000139904.

Agreement.

10.23 Electronic Signatures and Electronic Records.

The Parties consent to the use of electronic signatures. The Agreement, and any other documents requiring a signature hereunder, may be signed electronically. The Parties agree not to deny the legal effect or enforceability of the Agreement solely because it is in electronic form or because an electronic record was used in its formation. The Parties agree not to object to the admissibility of the Agreement in the form of an electronic record, or a paper copy of an electronic document, or a paper copy of a document bearing an electronic signature, on the ground that it is an electronic record or electronic signature or that it is not in its original form or is not an original.

10.24 Compliance with Denver Wage Laws.

To the extent applicable to the Contractor's provision of Services hereunder, the Contractor shall comply with, and agrees to be bound by, all rules, regulations, requirements, conditions, and City determinations regarding the City's Minimum Wage and Civil Wage Theft Ordinances, Sections 58-1 through 58-26 D.R.M.C., including, but not limited to, the requirement that every covered worker shall be paid all earned wages under applicable state, federal, and city law in accordance with the foregoing D.R.M.C. Sections. By executing this Agreement, the Contractor expressly acknowledges that the Contractor is aware of the requirements of the City's Minimum Wage and Civil Wage Theft Ordinances and that any failure by the Contractor, or any other individual or entity acting subject to this Agreement, to strictly comply with the foregoing D.R.M.C. Sections shall result in the penalties and other remedies authorized therein.

Exhibit List:

Exhibit A – Licensed Area

Exhibit B – City's Minimum Technical Standards

Exhibit C – Site Study

Exhibit D – Certificate of Insurance

SIGNATURE PAGES AND EXHIBITS FOLLOW THIS PAGE

Contract Control Number:
Contractor Name:

FINAN-202476013-00
CELCO PARTNERSHIP DBA VERIZON WIRELESS

IN WITNESS WHEREOF, the parties have set their hands and affixed their seals at
Denver, Colorado as of:

SEAL

CITY AND COUNTY OF DENVER:

ATTEST:

By:

APPROVED AS TO FORM:

REGISTERED AND COUNTERSIGNED:

Attorney for the City and County of Denver

By:

By:

By:

Contract Control Number:
Contractor Name:

FINAN-202476013-00
CELCO PARTNERSHIP DBA VERIZON WIRELESS

By:  Signed by:
5E160F18A7E3459...

Name: Eric Fradette
(please print)

Title: AVP-Ntwk Engring
(please print)

ATTEST: [if required]

By: _____

Name: _____
(please print)

Title: _____
(please print)

EXHIBIT A – LICENSED SYSTEM AND LOCATION



Construction Clarification #1

September 19, 2019

Denver Fire Department
745 W. Colfax Ave.
Denver, CO 80204

Plan Review Comments
Verizon Wireless telecommunications facility:
Den Denver Arts Center
1040 14th ST.
Denver, CO 80202

Please remove and replace sheet G1.00 dated 02/25/19 CD RE-ISSUE with sheet dated 09/19/19 CC#1.

I am writing to address to the revisions made to sheet G1.00. The battery information was updated to show the correct battery information.

General Notes

Item 1

Sheet G1.00 was updated to show the battery information for the batteries installed.

END

If you have any questions / comments, please call / email.

Thank You,

Micah DeHaan
CSAi



SITE NAME: DEN DENVER ARTS CENTER
PROJECT: NEW BUILD CONSTRUCTION DRAWINGS
ADDRESS: 1040 14TH STREET DENVER, CO 80202



PROJECT INFORMATION
 SITE NAME
DEN DENVER ARTS CENTER
 SITE ADDRESS
 1040 14TH STREET
 DENVER, CO 80202

CONSULTANT

PHOTO SIMULATION



PROJECT DESCRIPTION

- NEW VERIZON WIRELESS OUTDOOR EQUIPMENT CABINETS ON 8TH LEVEL MECHANICAL MEZZANINE.
- (8) NEW PANEL ANTENNAS ON EXISTING PARKING STRUCTURE.

PROJECT TEAM

OWNER
 CITY & COUNTY OF DENVER
 201 W. COLFAX AVE. 401
 DENVER, CO 80202
 MARK NAJARIAN
 PHONE: 720.865.4236

CLIENT
 VERIZON WIRELESS
 CONSTRUCTION ENGINEER
 MARK WILSON
 3131 S. VAUGHN WAY
 SUITE 550
 AURORA, CO 80014
 CELL: 303.905.9324

SITE ACQUISITIONIST
 CLOSSER CONSULTING
 KELLY HARRISON
 1917 LOWELL BLVD
 DENVER, CO 80204
 PHONE: 303.748-0599

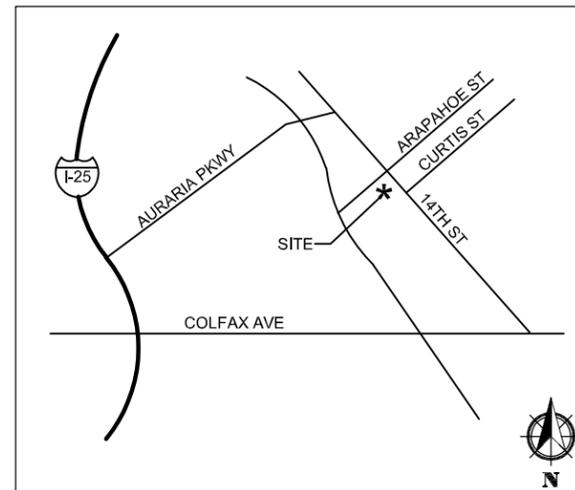
RF ENGINEER
 VERIZON WIRELESS
 RF ENGINEER
 KEVIN BROWN
 3131 S. VAUGHN WAY SUITE 550
 AURORA, CO 80014
 PHONE: 303.787.7316

ARCHITECT
 CHARLES STECKLY, AIA
 CSAi
 5935 S. ZANG STREET
 SUITE 280
 LITTLETON, CO 80127
 PHONE: 303.932.9974

STRUCTURAL ENGINEER
 OTEGUI STRUCTURAL
 SERVICES, LLC
 MICHAEL OTEGUI
 10812 WEST POWERS PLACE
 LITTLETON, CO 80127
 PHONE: 720.981.5333

ELECTRICAL
 DENNIS GREVEL, P.E.
 12311 WEST PRENTICE PLACE
 LITTLETON, CO 80127
 PHONE: 303.478.3337

VICINITY MAP



DIRECTIONS

- FROM DENVER:
- EXIT FROM I-25 ONTO AURARIA PARKWAY (EXIT 210B)
 - CONTINUE ON AURARIA PARKWAY 0.8 MILES
 - CONTINUE ON MARKET STREET 0.1 MILES
 - RIGHT ONTO 14TH STREET GO 0.4 MILES
 - RIGHT ON ARAPAHOE
 - PARKING GARAGE ON THE LEFT, SITE ON 8TH LEVEL OF GARAGE

PROJECT DATA

JURISDICTION:	-	CITY OF DENVER
APN	-	0233612023000
ZONING DESIGNATION:	-	INDUSTRIAL MISC RECREATION
(E) OCCUPANCY GROUP:	-	A-3 THEATRE, S-2 PKG. GARAGE
(E) CONSTRUCTION TYPE:	-	I-B
NEW CONSTRUCTION TYPE	-	I-B, SHELTER ON PKG. GARAGE
FULLY SPRINKLERED:	-	YES-THEATER, NO-PKG. GARAGE
(E) NO. OF STORIES:	-	6

GOVERNING CODES IF APPLICABLE:
 2015 IBC, 2015 IMC, 2015 IFC, 2016 DBC AMENDMENTS, 2017 NEC

A.D.A. COMPLIANCE:
 THIS FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION.

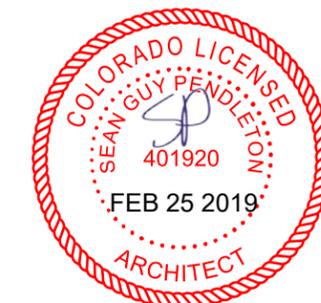
DRAWING INDEX

SHEET	DESCRIPTION
T1.00	TITLE SHEET
G1.00	GENERAL NOTES
LS1	TOPOGRAPHIC SURVEY
LS2	TOPOGRAPHIC SURVEY
A1.00	SITE PLAN
A1.10	PARTIAL GARAGE ROOF PLAN
A1.20	PARTIAL 7TH LEVEL PARKING GARAGE FLOOR PLAN
A2.00	ENLARGED 8TH LEVEL MECHANICAL MEZZANINE PLAN
A2.30	EQUIPMENT SECTION
A3.00	ELEVATIONS
A4.00	DETAILS
A4.10	DETAILS
S1.00	STRUCTURAL NOTES
S2.00	PARTIAL 8TH FLOOR FRAMING PLAN
S3.00	DETAILS
E1.00	ONE LINE DIAGRAM, PANEL SCHEDULE & CALCULATIONS
E2.00	PARTIAL 8TH LEVEL ELECTRICAL SITE PLAN
E2.10	PARTIAL 7TH LEVEL ELECTRICAL SITE PLAN
E3.00	GROUNDING PLAN & SCHEMATIC
E4.00	ELECTRICAL DETAILS

A	01/27/16	CD REVIEW	DPL
0	02/25/19	CD RE-ISSUE	SGP

1st REVIEW	TN 2nd REVIEW	SGP
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CHARLES STECKLY
ARCHITECTURE
 5935 SOUTH ZANG STREET, SUITE 280
 LITTLETON, COLORADO 80127
 OFFICE: 303.932.9974



TITLE SHEET

T1.00



VERIZON WIRELESS SERVICES
3131 S. VAUGHN WAY, SUITE 550
AURORA, CO 80014

PROJECT INFORMATION

SITE NAME
DEN DENVER ARTS CENTER
SITE ADDRESS
1040 14TH STREET
DENVER, CO 80202

CONSULTANT

A	01/27/16	CD REVIEW	DPL
0	02/25/19	CD RE-ISSUE	SGP
△	04/30/19	PLAN REVIEW COMMENTS	SGP
△	09/19/19	CC#1	MAD

1st REVIEW TN 2nd REVIEW SGP



5935 SOUTH ZANG STREET, SUITE 280
LITTLETON, COLORADO 80127
OFFICE: 303.932.9974



GENERAL NOTES

G1.00

- DRAWINGS ARE NOT TO BE SCALED, WRITTEN DIMENSIONS TAKE PRECEDENCE, AND THIS SET OF PLANS IS INTENDED TO BE USED FOR DIAGRAMMATIC PURPOSES ONLY, UNLESS NOTED OTHERWISE. THE GENERAL CONTRACTOR'S SCOPE OF WORK SHALL INCLUDE FURNISHING ALL MATERIALS, EQUIPMENT, LABOR, AND ANYTHING ELSE DEEMED NECESSARY TO COMPLETE INSTALLATIONS AS DESCRIBED HEREIN. REFER TO BID PACKAGE FOR MORE DATA.
- PRIOR TO THE SUBMISSION OF BIDS, THE CONTRACTORS INVOLVED SHALL VISIT THE JOB SITE AND FAMILIARIZE THEMSELVES WITH ALL CONDITIONS AFFECTING THE PROPOSED PROJECT WITH THE CONSTRUCTION AND CONTRACT DOCUMENTS, FIELD CONDITIONS AND CONFIRM THAT THE PROJECT MAY BE ACCOMPLISHED AS SHOWN PRIOR TO PROCEEDING WITH CONSTRUCTION. ANY ERRORS, OMISSIONS, OR DISCREPANCIES ARE TO BE BROUGHT TO THE ATTENTION OF THE ARCHITECT/CONSTRUCTION ENGINEER IN WRITING.
- THE GENERAL CONTRACTOR SHALL RECEIVE WRITTEN AUTHORIZATION TO PROCEED WITH CONSTRUCTION PRIOR TO STARTING WORK ON ANY ITEM NOT CLEARLY DEFINED BY THE CONSTRUCTION DRAWINGS/CONTRACT DOCUMENTS.
- THE CONTRACTOR SHALL SUPERVISE AND DIRECT THE PROJECT DESCRIBED HEREIN. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ALL CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES AND FOR COORDINATING ALL PORTIONS OF THE WORK UNDER THE CONTRACT.
- THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT AND MATERIALS ACCORDING TO MANUFACTURER'S, VENDOR'S, & VERIZON WIRELESS SPECIFICATIONS UNLESS NOTED OTHERWISE OR WHERE LOCAL CODES OR ORDINANCES TAKE PRECEDENCE NOTIFY CONSTRUCTION ENGINEER.
- ALL WORK PERFORMED ON PROJECT AND MATERIALS INSTALLED SHALL BE IN STRICT ACCORDANCE WITH ALL APPLICABLE CODES, REGULATIONS, AND ORDINANCES. CONTRACTOR SHALL GIVE ALL NOTICES AND COMPLY WITH ALL LAWS, ORDINANCES, RULES, REGULATIONS AND LAWFUL ORDERS OF ANY PUBLIC AUTHORITY, MUNICIPAL AND UTILITY COMPANY SPECIFICATIONS, AND LOCAL AND STATE JURISDICTIONAL CODES BEARING ON THE PERFORMANCE OF THE WORK.
- THE STRUCTURAL COMPONENTS OF THIS PROJECT SITE/FACILITY ARE NOT TO BE ALTERED BY THIS CONSTRUCTION PROJECT UNLESS NOTED OTHERWISE.
- NEW TOWERS ARE UNDER A SEPARATE CONTRACT. THE CONTRACTOR SHALL ASSIST ANTENNA INSTALLATION SUBCONTRACTOR IN TERMS OF COORDINATION AND SITE ACCESS. ERECTION SUBCONTRACTOR SHALL BE RESPONSIBLE FOR PROTECTION OF PERSONNEL AND PROPERTY FROM HAZARDOUS EXPOSURE TO OVERHEAD DANGERS.
- GENERAL CONTRACTOR SHALL PROVIDE AT THE PROJECT SITE A FULL SET OF PERMITTED CONSTRUCTION DOCUMENTS UPDATED WITH THE LATEST REVISIONS AND ADDENDA OR CLARIFICATIONS FOR THE USE BY ALL PERSONNEL INVOLVED WITH THE PROJECT.
- DETAILS INCLUDED HEREIN ARE INTENDED TO SHOW END RESULT OF DESIGN. MINOR MODIFICATIONS MAY BE REQUIRED TO SUIT JOB CONDITIONS OR SITUATIONS, AND SUCH MODIFICATIONS SHALL BE INCLUDED AS PART OF THE SCOPE OF WORK.
- THE FACILITY IS CELLULAR RADIO EQUIPMENT, ANTENNAS, & SUPPORTING UTILITIES.
- THE CONTRACTOR SHALL MAKE NECESSARY PROVISIONS TO PROTECT EXISTING IMPROVEMENTS, EASEMENTS, PAVING, CURBING, ETC. DURING CONSTRUCTION UPON COMPLETION OF WORK. CONTRACTOR SHALL REPAIR ANY DAMAGE THAT MAY HAVE OCCURRED DUE TO CONSTRUCTION ON OR ABOUT THE PROPERTY.
- CONTRACTOR SHALL ENSURE THE GENERAL WORK AREA IS KEPT CLEAN AND HAZARD FREE DURING CONSTRUCTION AND DISPOSE OF ALL DIRT, DEBRIS, RUBBISH AND REMOVE EQUIPMENT NOT SPECIFIED AS REMAINING ON THE PROPERTY, PREMISES SHALL BE LEFT IN CLEAN CONDITION AND FREE FROM PAINT SPOTS, DUST, OR SMUDGES OF ANY NATURE.
- THE ARCHITECTS/ENGINEERS HAVE MADE EVERY EFFORT TO SET FORTH IN THE CONSTRUCTION AND CONTRACT DOCUMENTS THE COMPLETE SCOPE OF WORK. CONTRACTORS BIDDING THE JOB ARE NEVERTHELESS CAUTIONED THAT MINOR OMISSIONS OR ERRORS IN THE DRAWINGS AND OR SPECIFICATIONS SHALL NOT EXCUSE SAID CONTRACTOR FROM COMPLETING THE PROJECT AND IMPROVEMENTS IN ACCORDANCE WITH THE INTENT OF THESE DOCUMENTS. THE BIDDER SHALL BEAR THE RESPONSIBILITY OF NOTIFYING (IN WRITING) THE CONSTRUCTION ENGINEER OF ANY CONFLICTS, ERRORS, OR OMISSIONS PRIOR TO THE SUBMISSION OF CONTRACTOR'S PROPOSAL.
- SPECIAL INSPECTION TESTING REQUIRING SPECIAL INSPECTIONS SHALL BE PERFORMED BY AN INDEPENDENT SPECIAL INSPECTOR PER SECTION 1704 OF THE INTERNATIONAL BUILDING CODE (IBC) FOR ITEMS NOTED ON S.1.00 IF INCLUDED IN CONSTRUCTION DOCUMENTS. THE INSPECTOR SHALL BE HIRED BY THE CONTRACTOR & COORDINATION SHALL BE ARRANGED BY THE CONTRACTOR FOR REQUIRED INSPECTIONS.

UNDERGROUND SERVICE ALERT
UTILITY NOTIFICATION CENTER OF COLORADO
1-800-922-1987
WWW.UNCC.ORG

3 WORKING DAYS UTILITY NOTIFICATION PRIOR TO CONSTRUCTION

1 - GENERAL NOTES

BATTERY SPECIFICATION:
(DEKA FAHRENHEIT HT200ET, NON-SPILLABLE) EACH CELL HAS AN ELECTROLYTE CAPACITY OF 2.59 GALLONS EACH.
(16) CELLS IN THIS OCCUPANCY, RESULTING IN AN AGGREGATE ELECTROLYTE VOLUME OF 41.44 GALLONS.
A. STATIONARY NICKEL CADMIUM (NI-CD) BATTERY SYSTEMS CONTAINING MORE THAN 50 GALLONS OF ELECTROLYTE SHALL COMPLY WITH IFC 608.

4 - HAZMAT REVIEW - BATTERY SYSTEM

2009 IECC SEC. 501.1 SCOPE:
PROPOSED BUILDING IS UNOCCUPIED AND NOT FOR HUMAN HABITATION. A/C IS REQUIRED FOR EQUIPMENT COOLING ONLY (PROCESS LOAD) AND NOT HUMAN COMFORT & THEREFORE EXEMPT PER ASHRAE 90.1

3 - MECHANICAL REVIEW

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

CALL BEFORE YOU DIG - COLORADO LAW REQUIRES 3 WORKING DAYS NOTICE FOR CONSTRUCTION PHASE.

THESE DRAWINGS MAY NOT SHOW ALL UNDERGROUND PIPING AND UTILITIES. THE CONTRACTOR SHALL EXERCISE EXTREME CARE DURING ALL EXCAVATION AND OTHER CONSTRUCTION ACTIVITIES.

X-RAY FLOOR BEFORE EACH CORE DRILL AND REPORT FINDINGS TO STRUCTURAL ENGINEER FOR LOCATION APPROVAL PRIOR TO CORE DRILL, CONTACT ARCHITECT IF ANY DISCREPANCIES OCCUR.

UTILITY NOTIFICATION CENTER OF COLORADO - 1-800-922-1987

VERIZON WIRELESS IS RESPONSIBLE FOR ALL UTILITY LOCATES AND UTILITY RELOCATIONS REQUIRED FOR THIS INSTALLATION. VERIZON WIRELESS WILL SCHEDULE AND COORDINATE ALL WORK WITH THE OWNER TO ENSURE NO DISRUPTION TO OWNERS OPERATIONS.

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

2 - GENERAL CONTRACTOR NOTES

ABBREVIATIONS

@	AT	H.M.	HOLLOW METAL
°	CENTERLINE	HORZ.	HORIZONTAL
°	DEGREES	HR.	HOUR
∅	DIAMETER	HT.	HEIGHT
APPROX.	APPROXIMATE	INT.	INTERIOR
ARCH.	ARCHITECTURAL	MAX.	MAXIMUM
A.F.F.	ABOVE FINISH FLOOR	MECH.	MECHANICAL
A.F.G.	ABOVE FINISH GRADE	MTL.	METAL
BLDG.	BUILDING	MFG.	MANUFACTURER
B.O.	BOTTOM OF	MIN.	MINIMUM
BOT.	CEILING	N.T.S.	NOT TO SCALE
COL.	COLUMN	O.C.	ON CENTER
CONC.	CONCRETE	O.D.	OUTSIDE DIAMETER
DBL.	DOUBLE	RAD.	RADIUS
DIA.	DIAMETER	R.O.	ROUGH OPENING
DIM.	DIMENSION	SHTG.	SHEATHING
DN.	DOWN	SIM.	SIMILAR
DWG.	DRAWING	SPEC.	SPECIFICATION
(E)	EXISTING	S.S.	STAINLESS Steel
EA.	EACH	STL.	STEEL
ELEV.	ELEVATION	STRUCT.	STRUCTURAL
ELEC.	ELECTRICAL	T.O.	TOP OF
EQ.	EQUAL	TYP.	TYPICAL
EXT.	EXTERIOR	U.N.O.	UNLESS NOTED OTHERWISE
F.E.	FIRE EXTINGUISHER	V.I.F.	VERIFY IN FIELD
FIN.	FINISH	W/	WITH
FLR.	FLOOR		
FUT.	FUTURE		
GA.	GAUGE		
GALV.	GALVANIZED		
GWB.	GYPSUM WALLBOARD		

SYMBOLS LEGEND

-----	EASEMENT		ENLARGED VIEW
-----	LEASE LINE		ENLARGED VIEW
-----	PROPERTY LINE		ENLARGED VIEW
—□—□—	WOODEN FENCE		ELEVATION MARKER
— X — X —	CHAIN LINK FENCE		SPOT ELEVATION
— OH —	(E) OVERHEAD UTILITY		SECTION CUT
— OHE —	(E) OVERHEAD ELEC.		EXTERIOR ELEVATION
— SS — SS —	(E) SANITARY SEWER		INTERIOR ELEVATION
— W — W —	(E) WATER LINE		REVISION NUMBER
— T — T —	(E) TELCO CABLE		
— FIBER —	(E) FIBER CABLE		
— E — E —	(E) ELECTRICAL		
— COAX —	(E) COAX CABLE		

NEW WORK COLOR LEGEND

HYBRID & COAX CABLES	
DC POWER	
FIBER	
ANTENNAS	
RRH/BBU	
PENETRATIONS	

5 - LEGEND AND SYMBOLS

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PLOTTED Sep 19, 2019 AT 1:26pm

HYBRID & COAX CABLES
POWER/GROUNDING
FIBER
ANTENNAS
RRH/BBU
PENETRATIONS

LESSOR'S LEGAL DESCRIPTION

A PARCEL OF LAND BEING LOCATED IN THE SOUTHEAST QUARTER OF SECTION 33, TOWNSHIP 3 SOUTH, RANGE 68 WEST, OF THE 6TH PRINCIPAL MERIDIAN, CITY AND COUNTY OF DENVER, STATE OF COLORADO, BEING MORE PARTICULARLY DESCRIBED AS FOLLOWS:

BEGINNING AT THE MOST NORTHERLY CORNER OF BLOCK 100, EAST DENVER, ORIGINALLY RECORDED IN THE BOOK OF MAPS AT PAGE 1 IN THE CLERK AND RECORDER'S OFFICE OF ARAPAHOE COUNTY, NOW CLERK AND RECORDER'S OFFICE OF THE CITY AND COUNTY OF DENVER; THENCE SOUTH 45°26'48" EAST, A DISTANCE OF 314.58 FEET, ALONG THE NORTHEASTERLY LINE OF SAID BLOCK 100 AND SAID LINE EXTENDED; THENCE SOUTH 44°35'09" WEST, A DISTANCE OF 139.41 FEET; THENCE NORTH 45°24'51" WEST, A DISTANCE OF 18.00 FEET; THENCE SOUTH 44°35'09" WEST, A DISTANCE OF 204.78 FEET; THENCE NORTH 45°24'51" WEST, A DISTANCE OF 20.50 FEET; THENCE SOUTH 44°35'09" WEST, A DISTANCE OF 55.85 FEET; THENCE NORTH 45°25'22" WEST, A DISTANCE OF 13.38 FEET; THENCE SOUTH 44°35'09" WEST, A DISTANCE OF 11.00 FEET; THENCE NORTH 45°26'55" WEST, A DISTANCE OF 262.81 FEET; THENCE NORTH 44°36'03" EAST, A DISTANCE OF 411.02 FEET, ALONG THE SOUTHWESTERLY EXTENSION OF THE NORTHWESTERLY LINE OF SAID BLOCK 100 AND ALONG SAID NORTHWESTERLY LINE TO THE POINT OF BEGINNING.

LESSEE UTILITY EASEMENT LEGAL DESCRIPTION

A 10.00 FOOT WIDE STRIP OF LAND BEING A PORTION OF CITY TRACT PARCEL B ACCORDING TO RECORD NUMBER 2001103862, DENVER COUNTY RECORDS, LYING 5.00 FEET ON EACH SIDE OF THE FOLLOWING DESCRIBED CENTERLINE:

BEGINNING AT THE MOST NORTHERLY CORNER OF BLOCK 100, EAST DENVER, ORIGINALLY RECORDED IN THE BOOK OF MAPS AT PAGE 1 IN THE CLERK AND RECORDER'S OFFICE OF ARAPAHOE COUNTY, NOW CLERK AND RECORDER'S OFFICE OF THE CITY AND COUNTY OF DENVER; THENCE SOUTH 44°35'16" WEST ALONG THE WESTERLY LINE OF SAID BLOCK 100, 206.67 FEET TO THE POINT OF BEGINNING.

THENCE DEPARTING SAID WESTERLY LINE SOUTH 45°24'56" EAST, 2.03 FEET TO THE POINT OF TERMINUS.

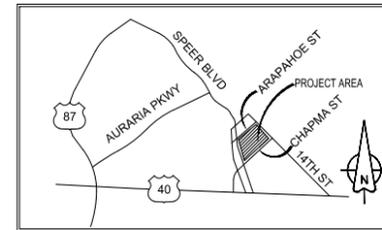
SIDELINES SHALL BE LENGTHENED OR SHORTENED TO FORM ONE CONTIGUOUS PARCEL.

SURVEYOR NOTES

1. A TITLE REPORT WAS NOT PROVIDED AT THE TIME OF THE SURVEY.
2. SURVEYOR HAS NOT PERFORMED A SEARCH OF PUBLIC RECORDS TO DETERMINE ANY DEFECT IN TITLE.
3. THE BOUNDARY SHOWN HEREON IS PLOTTED FROM RECORD INFORMATION AND DOES NOT CONSTITUTE A BOUNDARY SURVEY OF THE PROPERTY.
4. SURVEYOR DOES NOT GUARANTEE THAT ALL UTILITIES ARE SHOWN OR THEIR LOCATIONS. IT IS THE RESPONSIBILITY OF THE CONTRACTOR AND DEVELOPER TO CONTACT BLUE STAKE AND ANY OTHER INVOLVED AGENCIES TO LOCATE ALL UTILITIES PRIOR TO CONSTRUCTION. REMOVAL, RELOCATION AND/OR REPLACEMENT IS THE RESPONSIBILITY OF THE CONTRACTOR.

PROJECT META DATA

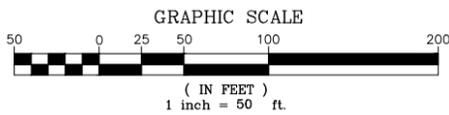
1. ELEVATIONS SHOWN HEREON ARE REPRESENTED IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) ESTABLISHED FROM GPS DERIVED ELLIPSOID HEIGHTS, APPLYING GEOID 09 SEPARATIONS CONSTRAINING TO NGS CORS STATIONS PROVIDED IN THE "ONLINE POSITIONING USER SERVICE" (OPUS) SOLUTION FOR THIS SPECIFIC SITE.
2. BEARINGS SHOWN HEREON ARE BASED UPON U.S. STATE PLANE NAD83 COORDINATE SYSTEM COLORADO STATE PLANE COORDINATE ZONE CENTRAL, DETERMINED BY GPS OBSERVATIONS.
3. FIELD WORK FOR THIS PROJECT WAS PERFORMED ON 01/05/16.



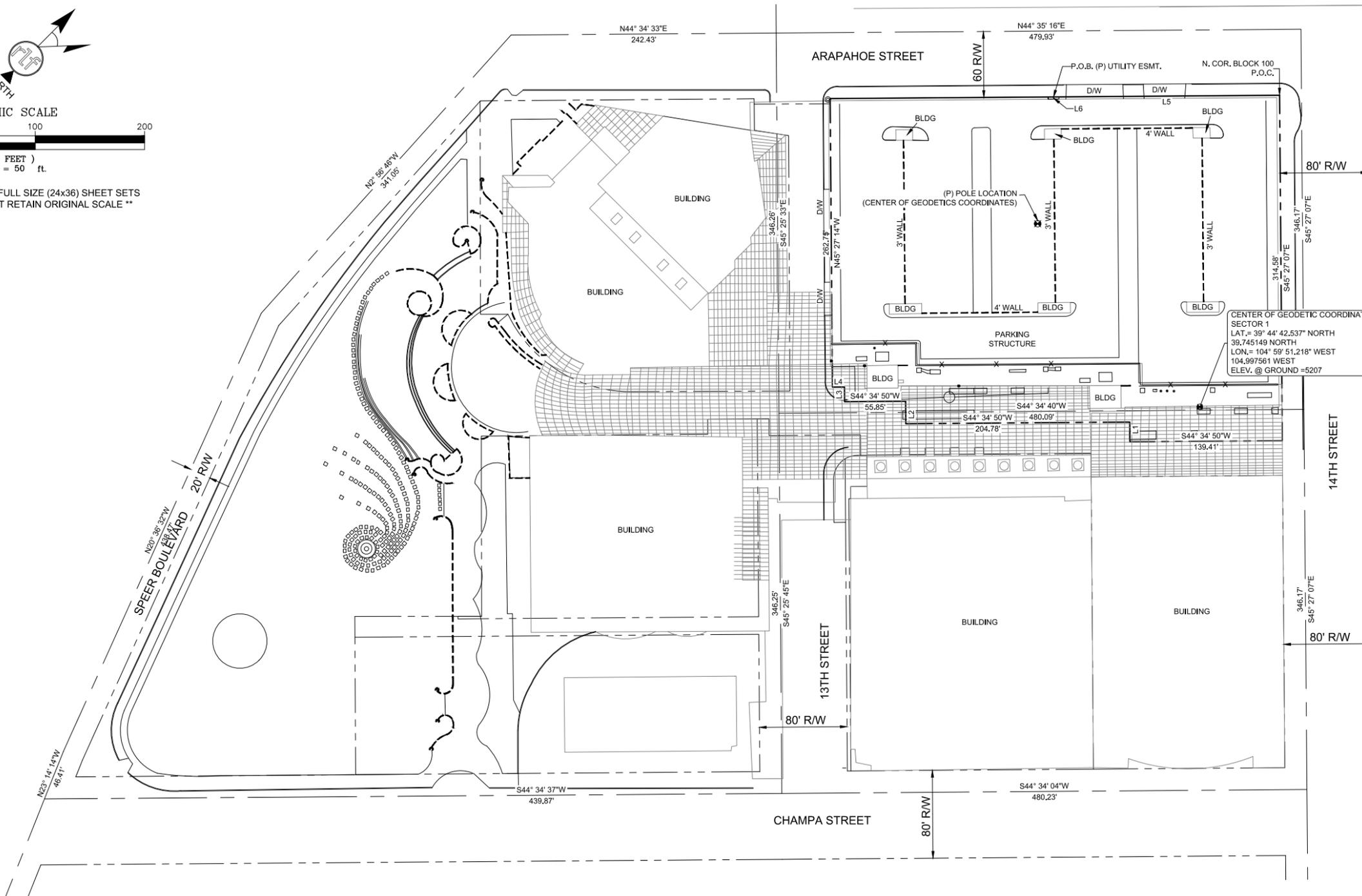
LINE	LENGTH	BEARING
L1	18.00	S45° 25' 10"E
L2	20.50	S45° 25' 10"E
L3	13.38	S45° 25' 41"E
L4	11.00	S44° 34' 50"W
L5	206.67	S44° 35' 16"W
L6	2.03	S45° 24' 56"E

POSITION OF GEODETIC COORDINATES

LATITUDE 39° 44' 42.68" NORTH (NAD83)
 LONGITUDE 104° 59' 57.07" WEST (NAD83)
 ELEVATION @ GROUND= 5207' (NAVD88)

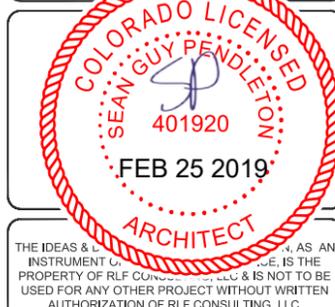


** SCALE IS INTENDED FOR FULL SIZE (24x36) SHEET SETS REPRODUCTIONS MAY NOT RETAIN ORIGINAL SCALE **



FIELD BY:	JTS
DRAWN BY:	CRS
CHECKED BY:	RLF

REVISIONS		
NO.	DATE	DESCRIPTION
3	06/07/16	FINAL
2	01/29/16	REVISION
1	01/12/16	PRELIMINARY



PROJECT No. 15010002
 SITE NAME: DEN DENVER ARTS CENTER
 SITE ADDRESS: 1040 14TH STREET DENVER, CO 80202

SHEET TITLE: BOUNDARY DETAIL

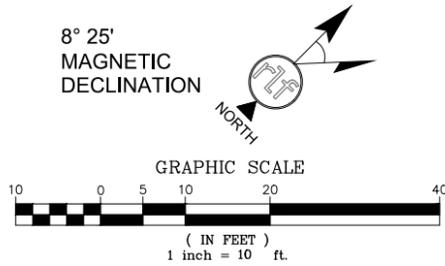
SHEET NO. LS-1	REVISION:
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SURVEYOR NOTES

1. A TITLE REPORT WAS NOT PROVIDED AT THE TIME OF THE SURVEY.
2. SURVEYOR HAS NOT PERFORMED A SEARCH OF PUBLIC RECORDS TO DETERMINE ANY DEFECT IN TITLE.
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PROJECT META DATA

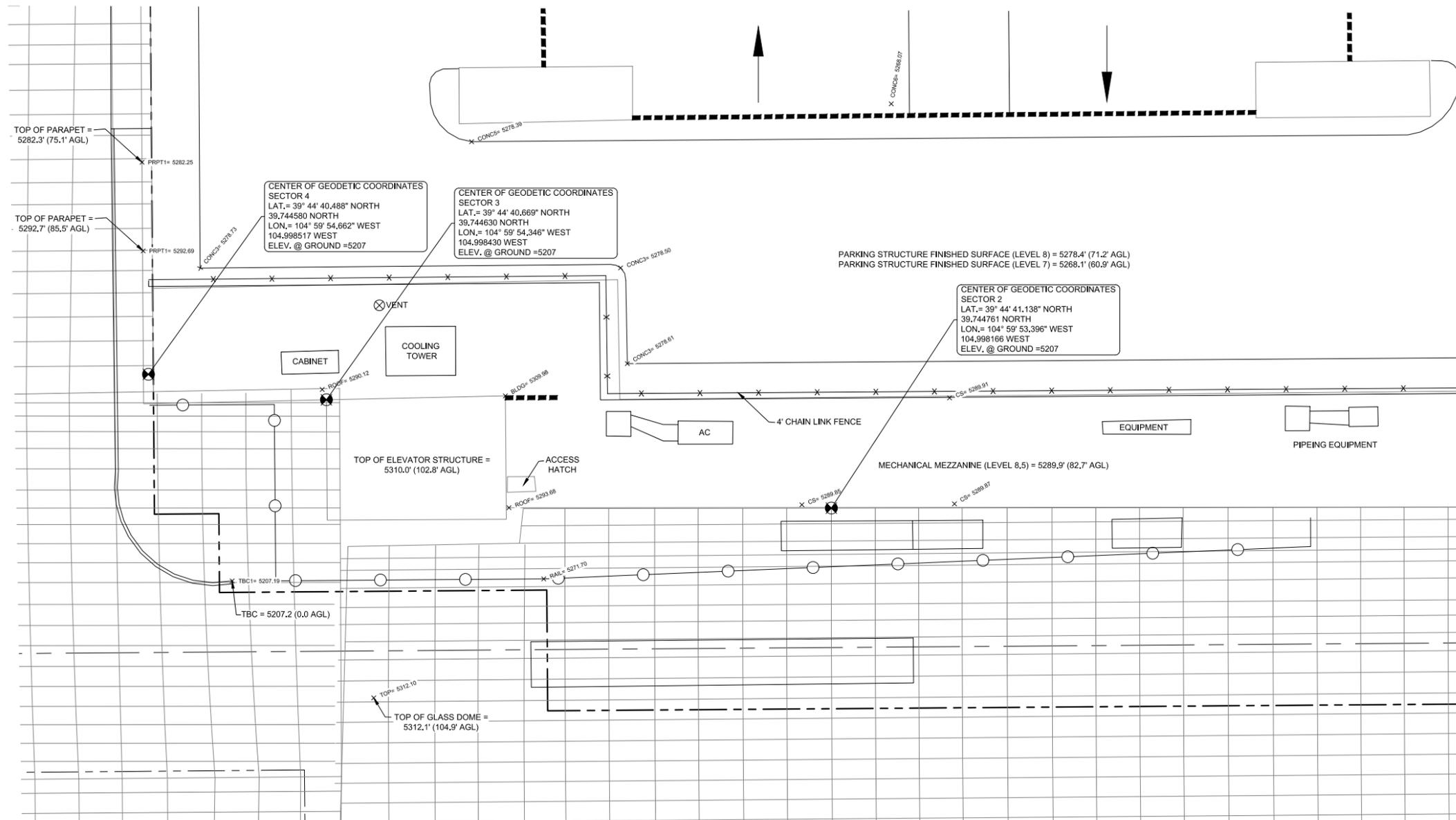
1. ELEVATIONS SHOWN HEREON ARE REPRESENTED IN NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88) ESTABLISHED FROM GPS DERIVED ELLIPSOID HEIGHTS, APPLYING GEOID 09 SEPARATIONS CONSTRAINING TO NGS CORS STATIONS PROVIDED IN THE "ONLINE POSITIONING USER SERVICE" (OPUS) SOLUTION FOR THIS SPECIFIC SITE.
2. BEARINGS SHOWN HEREON ARE BASED UPON U.S. STATE PLANE NAD83 COORDINATE SYSTEM COLORADO STATE PLANE COORDINATE ZONE CENTRAL, DETERMINED BY GPS OBSERVATIONS.
3. FIELD WORK FOR THIS PROJECT WAS PERFORMED ON 01/05/16.



** SCALE IS INTENDED FOR FULL SIZE (24x36) SHEET SETS REPRODUCTIONS MAY NOT RETAIN ORIGINAL SCALE **

LEGEND

⊠	BRASS CAP IN HANDHOLE	⊠	FIRE HYDRANT
NG	NATURAL GRADE	⊠	WATER VALVE
TBC	TOP BACK OF CURB	⊠	STORM MANHOLE
R/W	RIGHT OF WAY	⊠	CATCH BASIN
PV	ASPHALT	⊠	DECIDUOUS TREE
SW	SIDEWALK	⊠	SIGN
CMU	CONCRETE MASONRY UNIT	⊠	BREAKLINE
CS	CONCRETE	⊠	SCHEDULE B HEX
1419.18	SPOT ELEVATION	⊠	POSITION OF GEODETIC COORDINATES
FS	FINISHED SURFACE	⊠	PROPERTY LINE
⊠	GAS VALVE	⊠	PROPERTY LINE (OTHER)
⊠	ELECTRIC MANHOLE	⊠	CENTERLINE
⊠	ELECTRICAL PULL BOX	⊠	U/G ELECTRIC LINE
⊠	SANITARY SEWER MANHOLE	⊠	U/G TELECOMMUNICATION LINE
⊠	TRAFFIC SIGNAL WITH MAST	⊠	U/G FIBER OPTIC LINE
⊠	MISC. MANHOLE	⊠	U/G GAS LINE
⊠	PARKING METER	⊠	STORM SEWER LINE
⊠	STREET LIGHT W/ MAST ARM	⊠	WATER LINE



FIELD BY:	JTS
DRAWN BY:	CRS
CHECKED BY:	RLF

REVISIONS		
NO.	DATE	DESCRIPTION
3	06/07/16	FINAL
2	01/29/16	REVISION
1	01/12/16	PRELIMINARY



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PROJECT No.	15010002
SITE NAME:	DEN DENVER ARTS CENTER

SITE ADDRESS:
1040 14TH STREET
DENVER, CO 80202

SHEET TITLE:
SURVEY DETAIL

SHEET NO.	LS-2	REVISION:	
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VERIZON WIRELESS SERVICES
3131 S. VAUGHN WAY, SUITE 550
AURORA, CO 80014

PROJECT INFORMATION

SITE NAME

DEN DENVER ARTS CENTER

SITE ADDRESS
1040 14TH STREET
DENVER, CO 80202

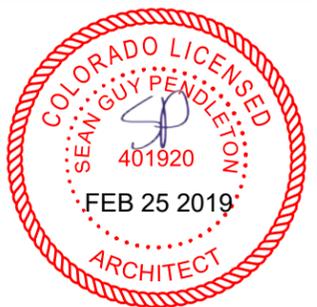
CONSULTANT

A	01/27/16	CD REVIEW	DPL
0	02/25/19	CD RE-ISSUE	SGP

1st REVIEW	TN 2nd REVIEW	SGP
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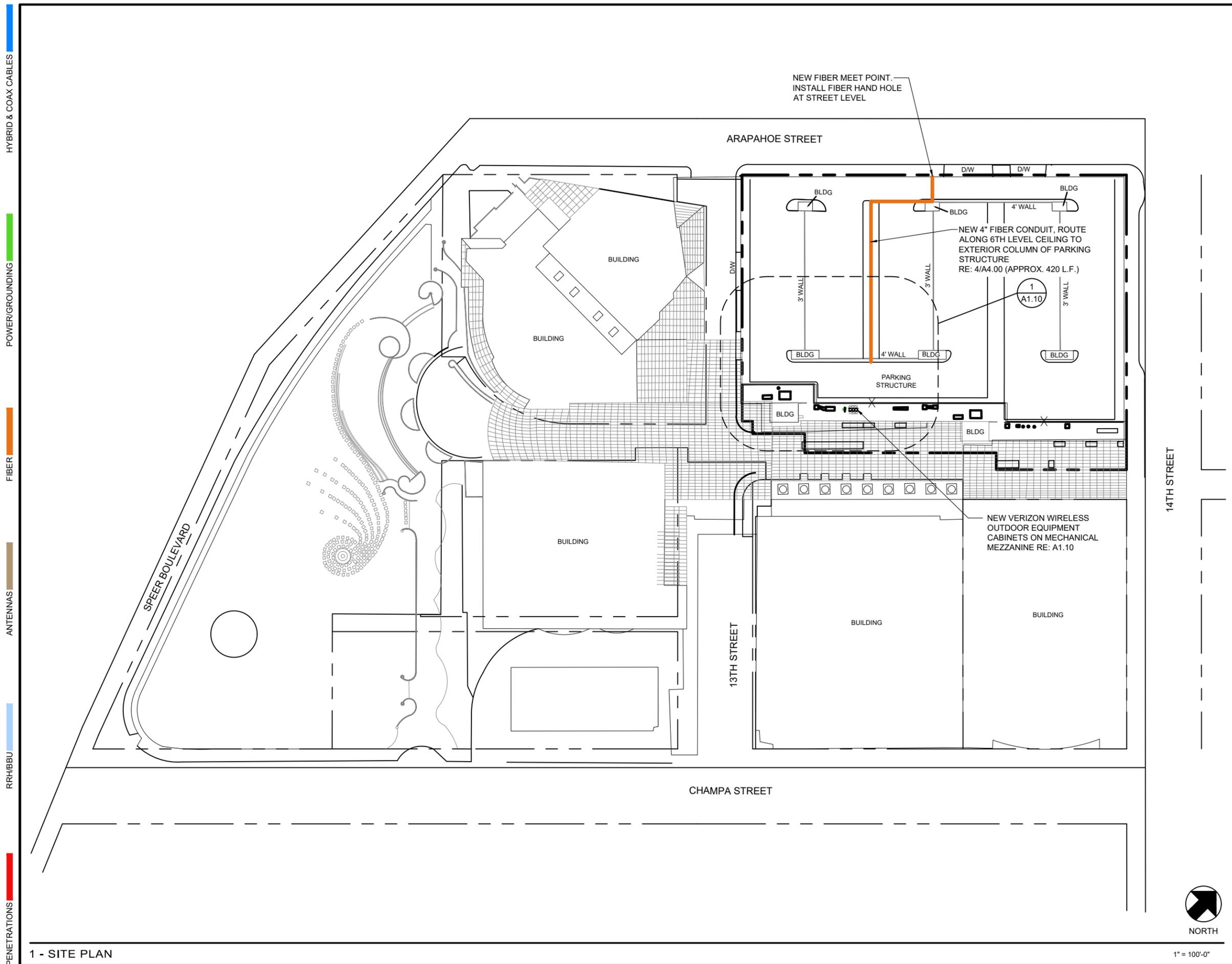


5935 SOUTH ZANG STREET, SUITE 280
LITTLETON, COLORADO 80127
OFFICE: 303.932.9974



SITE PLAN

A1.00



HYBRID & COAX CABLES

POWER/GROUNDING

FIBER

ANTENNAS

RRH/BBU

PENETRATIONS

1 - SITE PLAN



1" = 100'-0"

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PLOTTED: Feb 25, 2019 AT 2:17pm



VERIZON WIRELESS SERVICES
3131 S. VAUGHN WAY, SUITE 550
AURORA, CO 80014

PROJECT INFORMATION

SITE NAME
**DEN DENVER ARTS
CENTER**

SITE ADDRESS
1040 14TH STREET
DENVER, CO 80202

CONSULTANT

A	01/27/16	CD REVIEW	DPL
0	02/25/16	CD RE-ISSUE	SGP
△	04/30/16	PLAN REVIEW COMMENTS	SGP

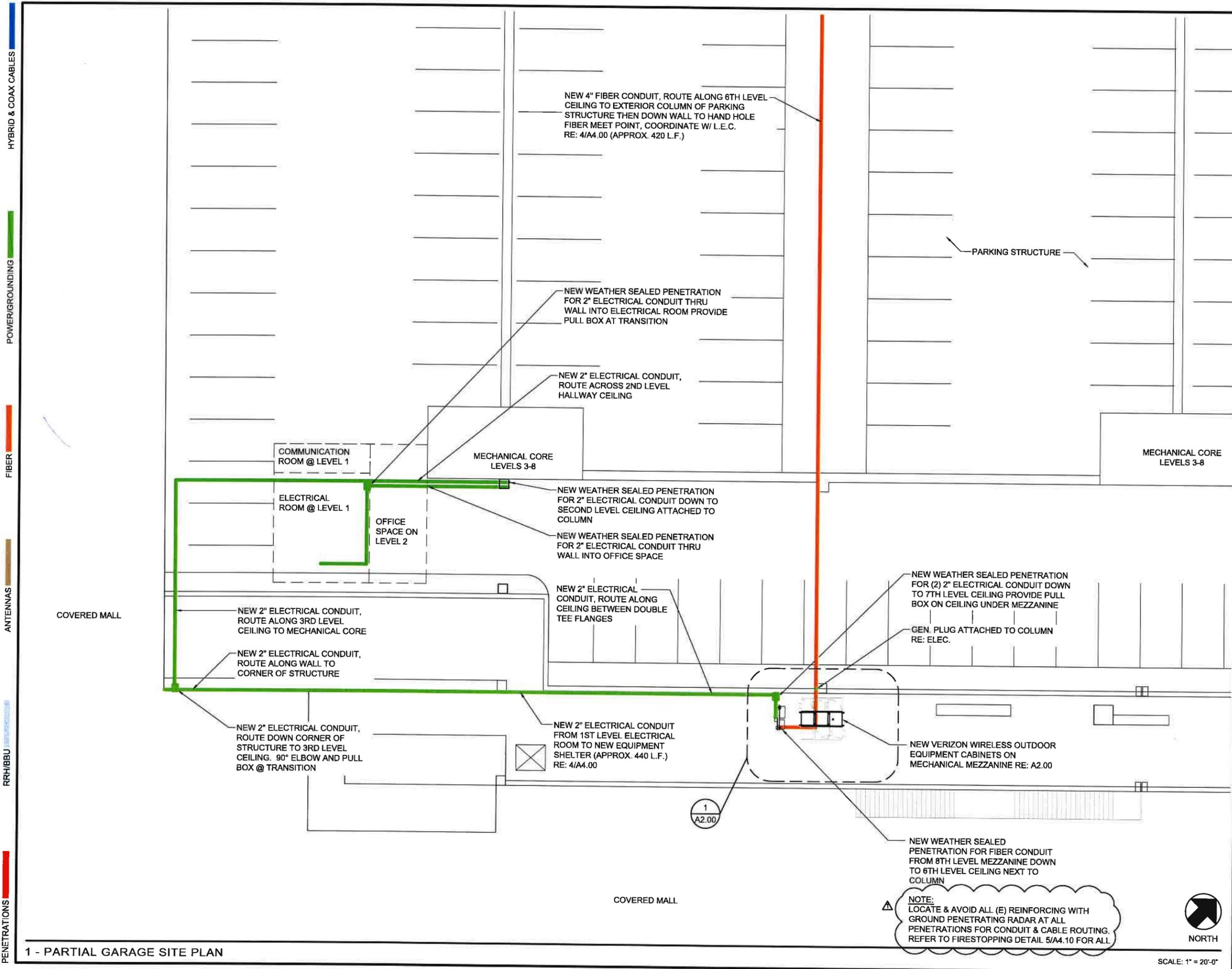
1st REVIEW TN 2nd REVIEW SGP

**CHARLES
STECKLY**
ARCHITECTURE
5935 SOUTH ZANG STREET, SUITE 280
LITTLETON, COLORADO 80127
OFFICE: 303.932.9974



**PARTIAL GARAGE
ROOF PLAN**

A1.10



1 - PARTIAL GARAGE SITE PLAN

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PLOTTED May 01, 2019 AT 10:48am



VERIZON WIRELESS SERVICES
3131 S. VAUGHN WAY, SUITE 550
AURORA, CO 80014

PROJECT INFORMATION
SITE NAME

DEN DENVER ARTS CENTER

SITE ADDRESS
1040 14TH STREET
DENVER, CO 80202

CONSULTANT

A 01/27/16 CD REVIEW DPL
0 02/25/19 CD RE-ISSUE SGP
▲ 04/30/19 PLAN REVIEW COMMENTS SGP

1st REVIEW TN 2nd REVIEW SGP

CHARLES STECKLY

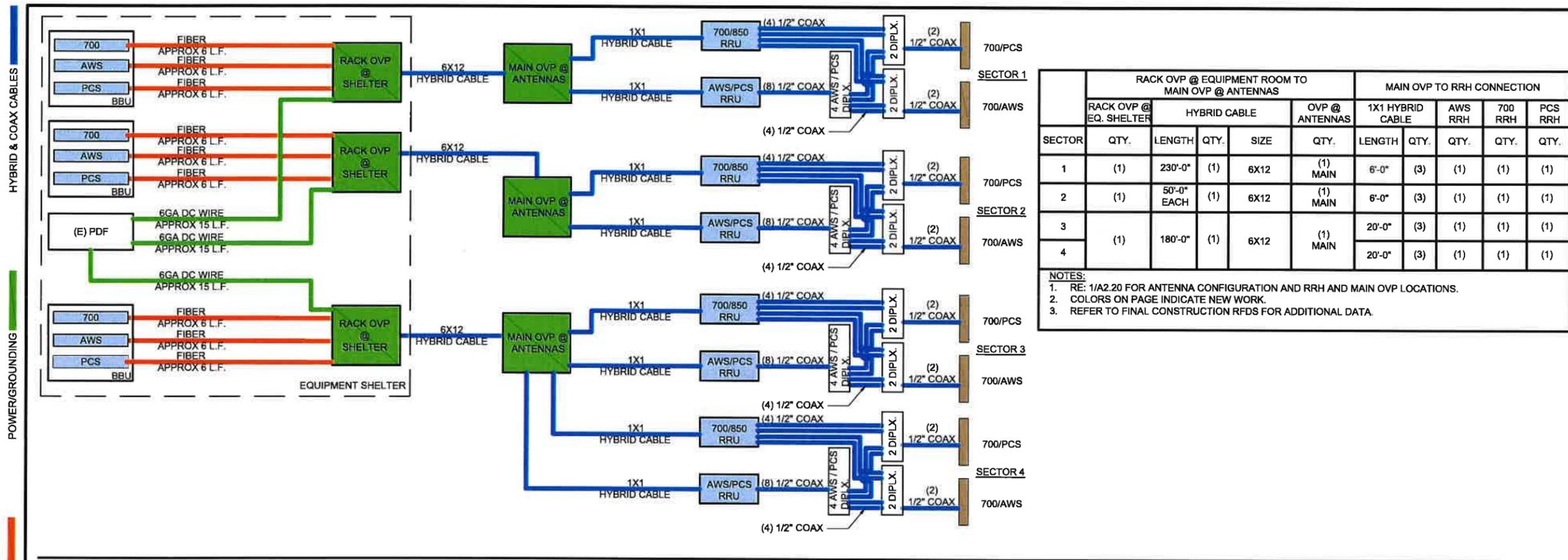
ARCHITECTURE

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LITTLETON, COLORADO 80127
OFFICE: 303.932.9974



PARTIAL 7TH LEVEL PARKING GARAGE FLOOR PLAN

A1.20

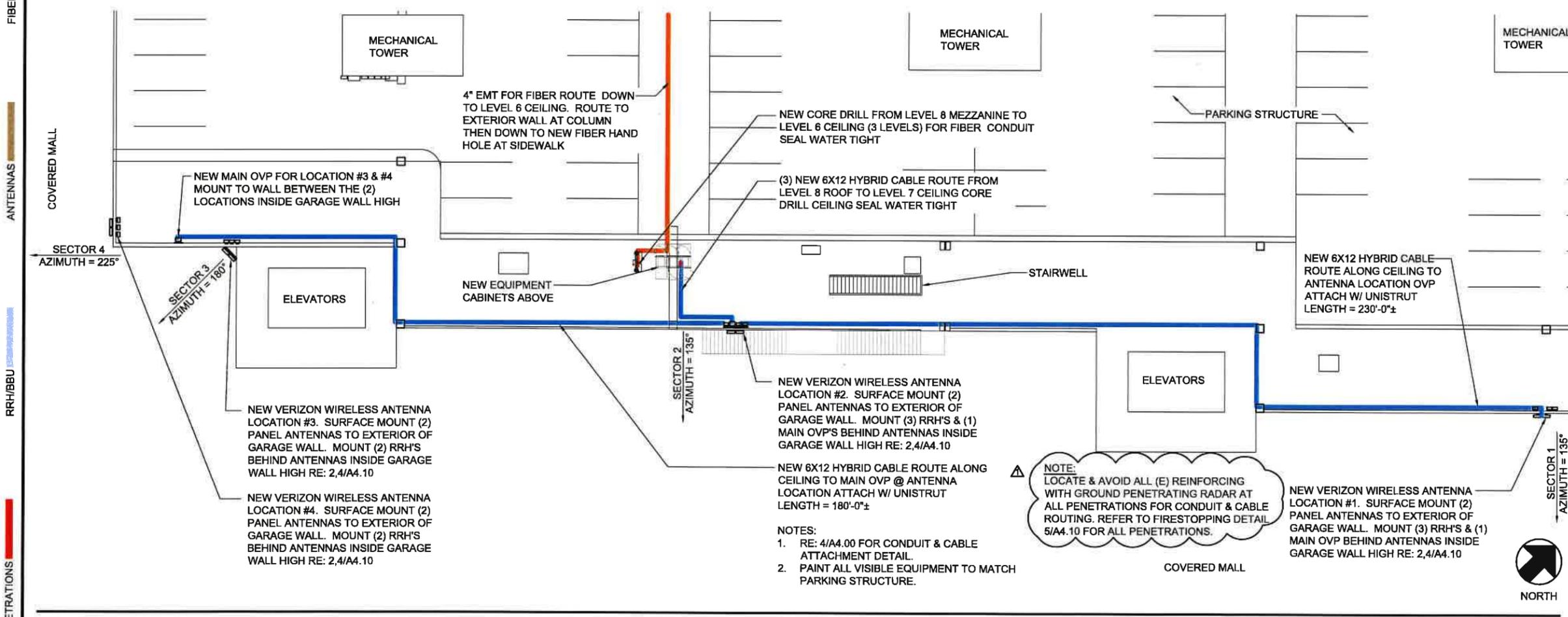


SECTOR	RACK OVP @ EQUIPMENT ROOM TO MAIN OVP @ ANTENNAS				MAIN OVP TO RRH CONNECTION					
	RACK OVP @ EQ. SHELTER	HYBRID CABLE	OVP @ ANTENNAS	1X1 HYBRID CABLE	AWS RRH	700 RRH	PCS RRH	QTY.	QTY.	
1	(1)	230'-0"	(1)	6X12	(1) MAIN	6'-0"	(3)	(1)	(1)	(1)
2	(1)	50'-0" EACH	(1)	6X12	(1) MAIN	6'-0"	(3)	(1)	(1)	(1)
3	(1)	180'-0"	(1)	6X12	(1) MAIN	20'-0"	(3)	(1)	(1)	(1)
4	(1)	180'-0"	(1)	6X12	(1) MAIN	20'-0"	(3)	(1)	(1)	(1)

NOTES:

- RE: 1/A2.20 FOR ANTENNA CONFIGURATION AND RRH AND MAIN OVP LOCATIONS.
- COLORS ON PAGE INDICATE NEW WORK.
- REFER TO FINAL CONSTRUCTION RFDS FOR ADDITIONAL DATA.

2 - HYBRID CABLE DIAGRAM



1 - 7TH LEVEL PARKING GARAGE FLOOR PLAN

SCALE: 1" = 30'-0"

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VERIZON WIRELESS SERVICES
3131 S. VAUGHN WAY, SUITE 550
AURORA, CO 80014

PROJECT INFORMATION

SITE NAME

DEN DENVER ARTS

CENTER

SITE ADDRESS

1040 14TH STREET
DENVER, CO 80202

CONSULTANT

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0	02/25/19	CD RE-ISSUE	SGP

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CHARLES
STECKLY

ARCHITECTURE

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LITTLETON, COLORADO 80127
OFFICE: 303.932.9974



ENLARGED 8TH LEVEL
MECHANICAL
MEZZANINE PLAN

A2.00



SCALE: 1" = 10'-0"

HYBRID & COAX CABLES

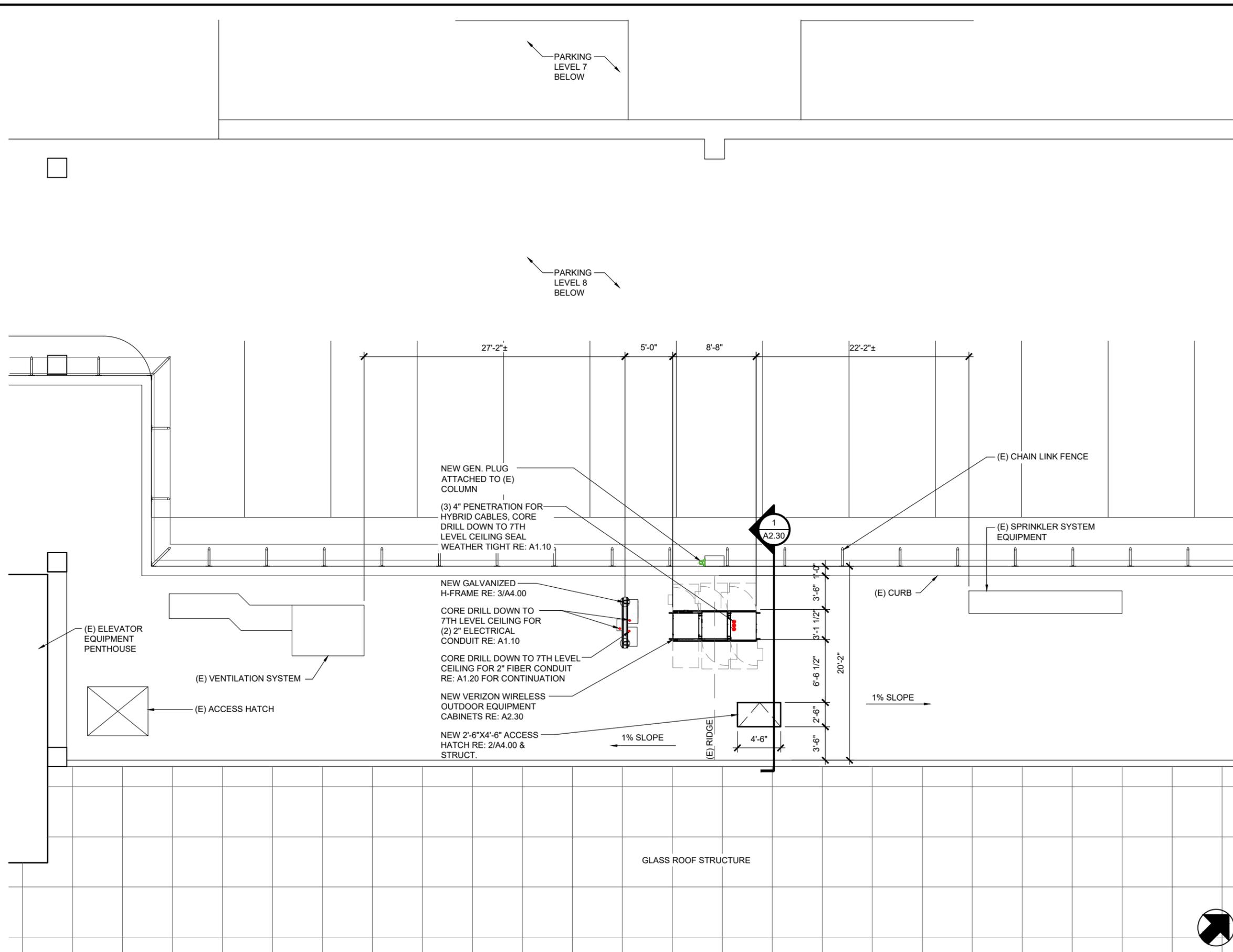
POWER/GROUNDING

FIBER

ANTENNAS

RRH/BBU

PENETRATIONS



1 - ENLARGED 8TH LEVEL MECHANICAL MEZZANINE PLAN

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PLOTTED May 01, 2019 AT 10:48am

HYBRID & COAX CABLES

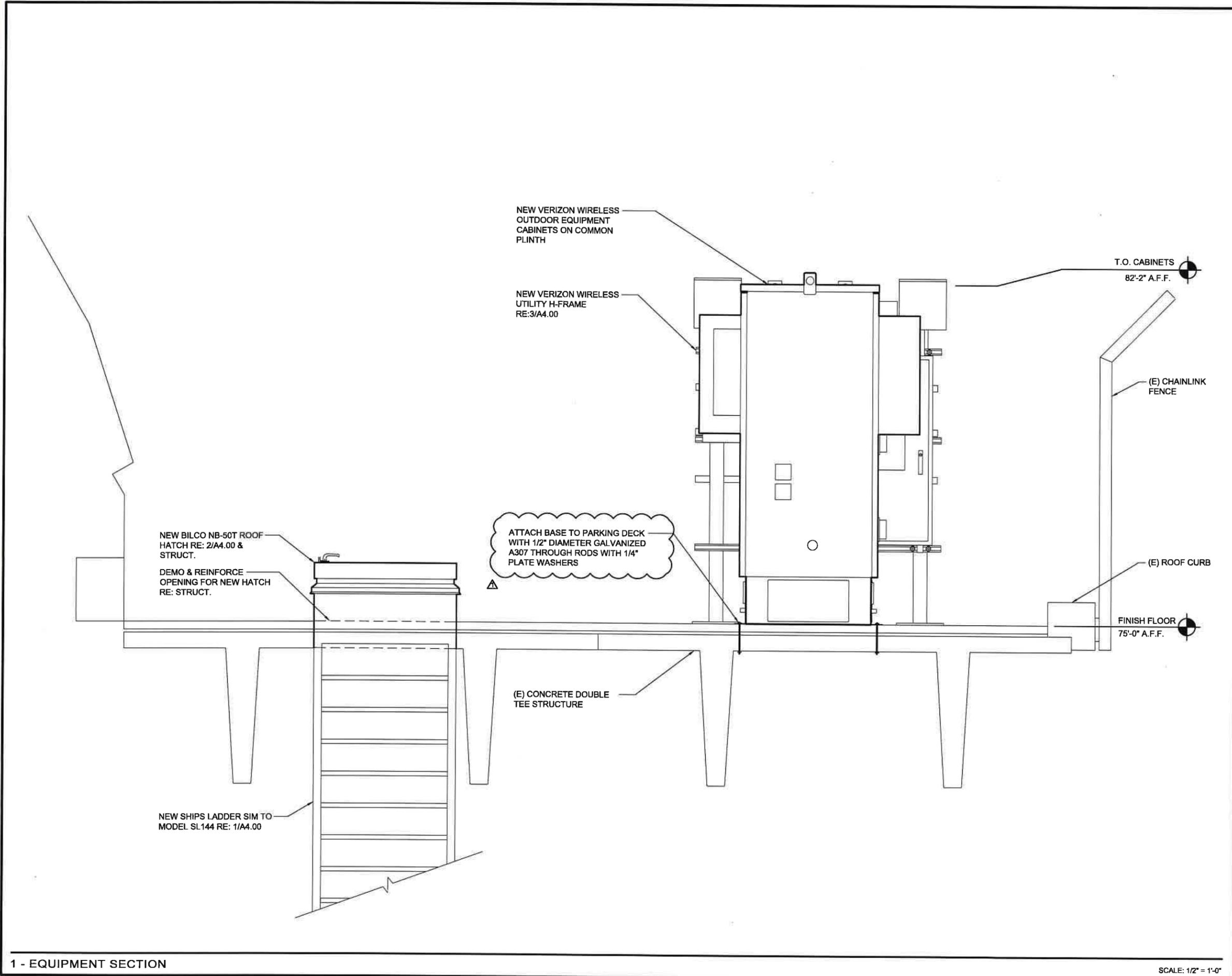
POWER/GROUNDING

FIBER

ANTENNAS

RRH/IBBU

PENETRATIONS



PROJECT INFORMATION
SITE NAME
DEN DENVER ARTS CENTER
SITE ADDRESS
1040 14TH STREET
DENVER, CO 80202
CONSULTANT

A	01/27/16	CD REVIEW	DPL
0	02/25/19	CD RE-ISSUE	SGP
▲	04/30/19	PLAN REVIEW COMMENTS	SGP

1st REVIEW TN 2nd REVIEW SGP

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LITTLETON, COLORADO 80127
OFFICE: 303.932.9974



EQUIPMENT SECTION

A2.30

1 - EQUIPMENT SECTION

SCALE: 1/2" = 1'-0"

PROJECT INFORMATION
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DEN DENVER ARTS CENTER
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 1040 14TH STREET
 DENVER, CO 80202
 CONSULTANT

A	01/27/16	CD REVIEW	DPL
0	02/25/19	CD RE-ISSUE	SGP

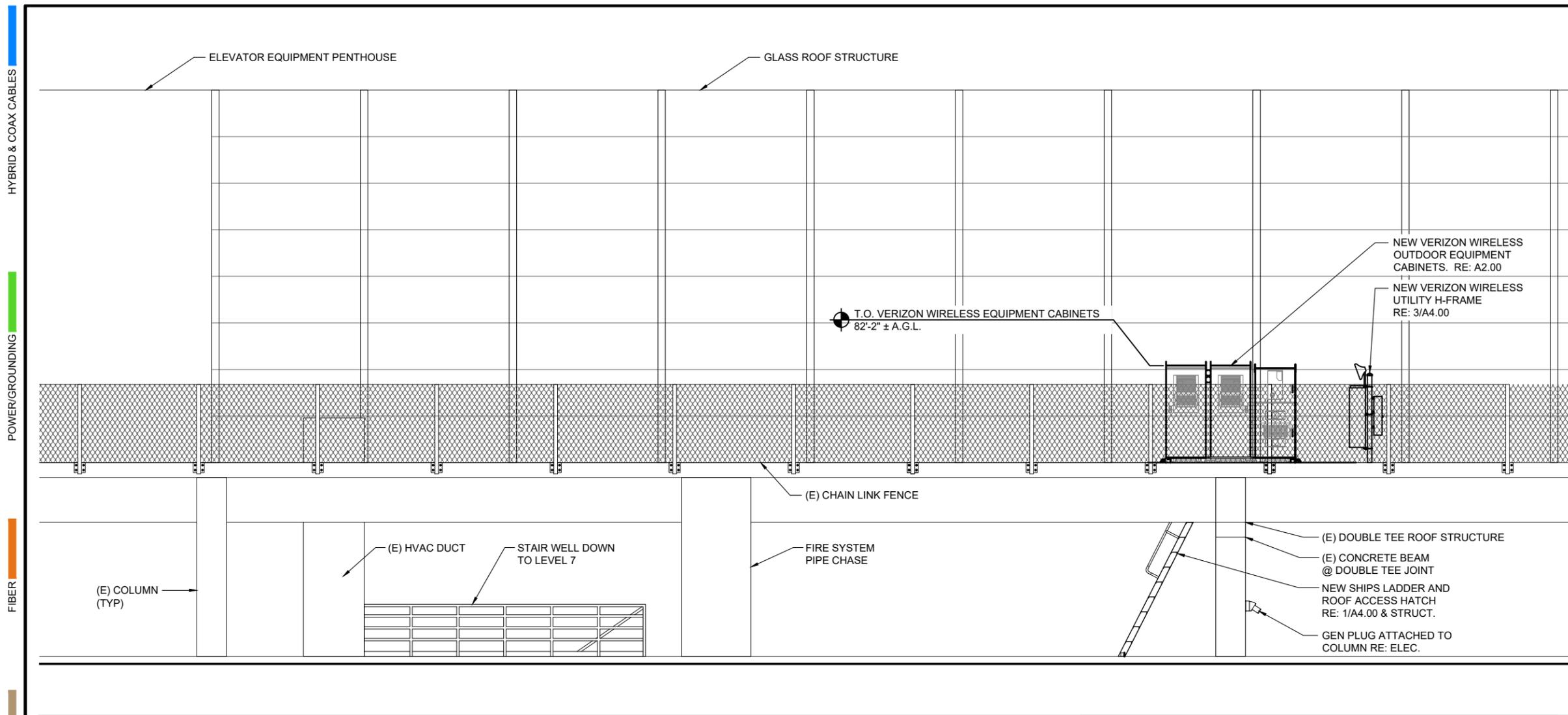
1st REVIEW	TN 2nd REVIEW	SGP
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CHARLES STECKLY ARCHITECTURE
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 OFFICE: 303.932.9974



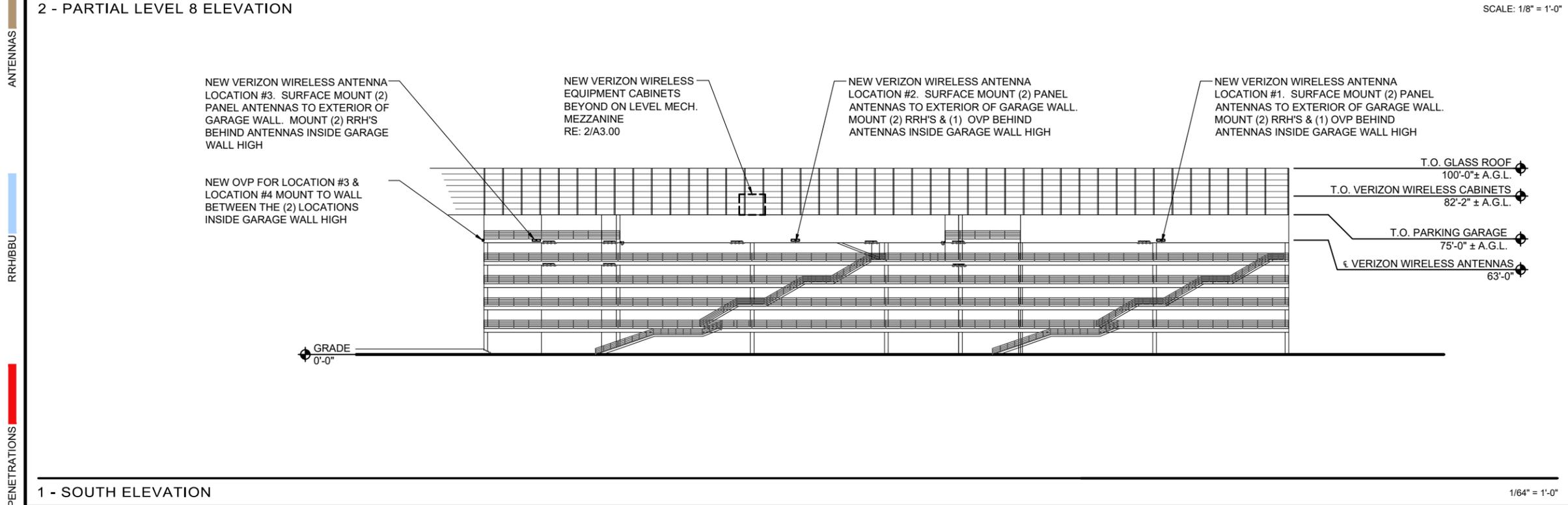
ELEVATIONS

A3.00



2 - PARTIAL LEVEL 8 ELEVATION

SCALE: 1/8" = 1'-0"



1 - SOUTH ELEVATION

1/64" = 1'-0"

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 PLOTTED Feb 25, 2019 AT 2:17pm

HYBRID & COAX CABLES
 POWER/GROUNDING
 FIBER
 ANTENNAS
 RRR/BBU
 PENETRATIONS

HYBRID & COAX CABLES

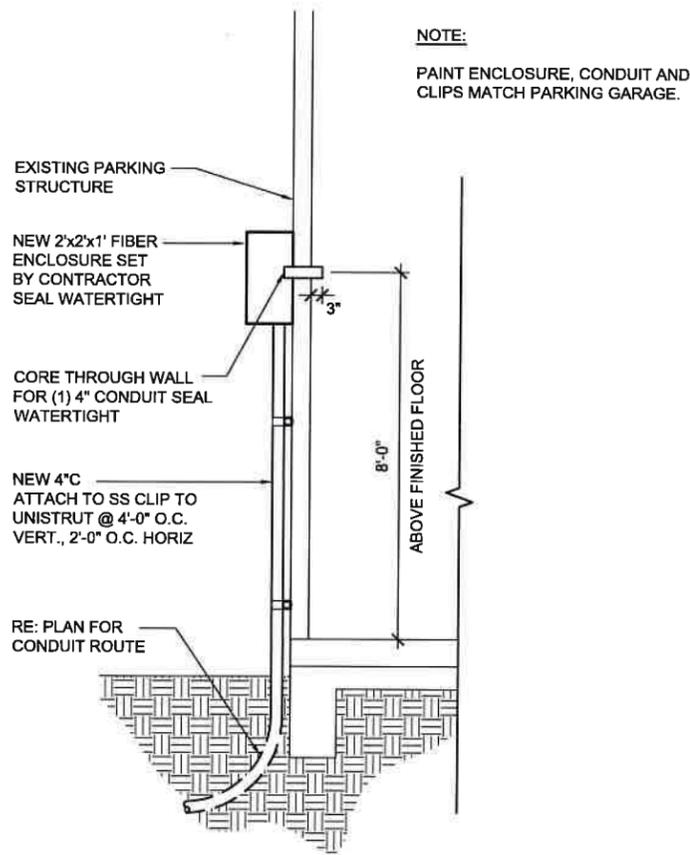
POWER/GROUNDING

FIBER

ANTENNAS

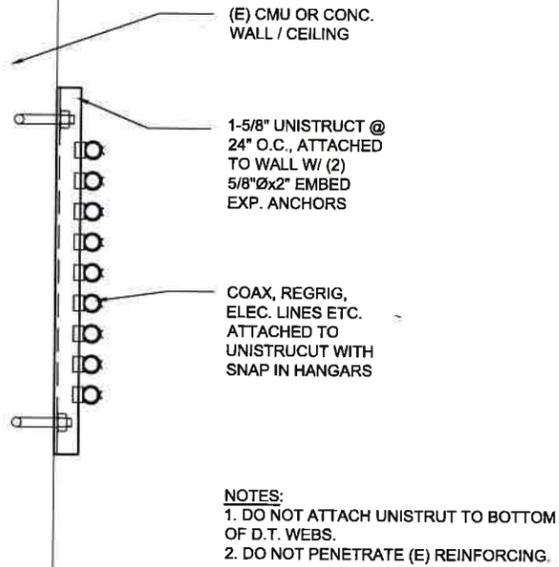
RRH/BBU

PENETRATIONS



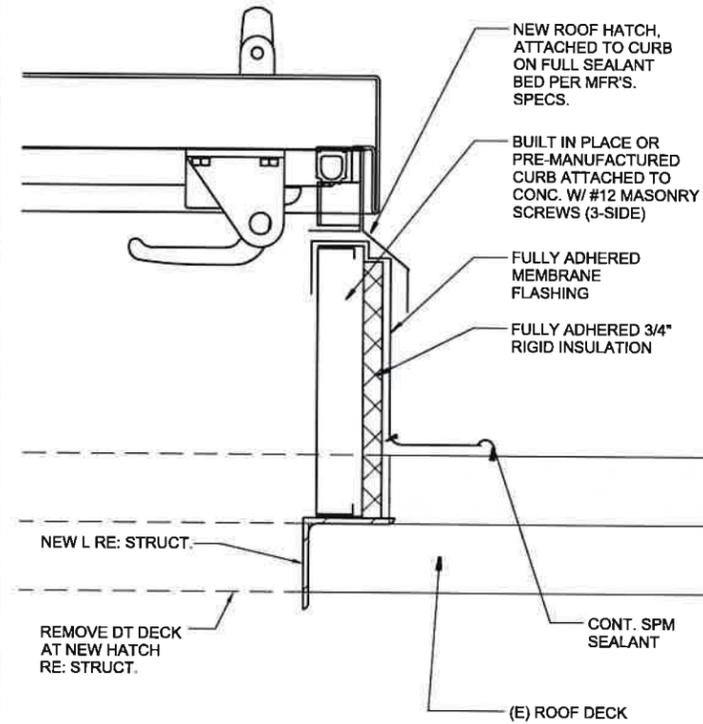
5 - FIBER ENCLOSURE DETAIL

NTS



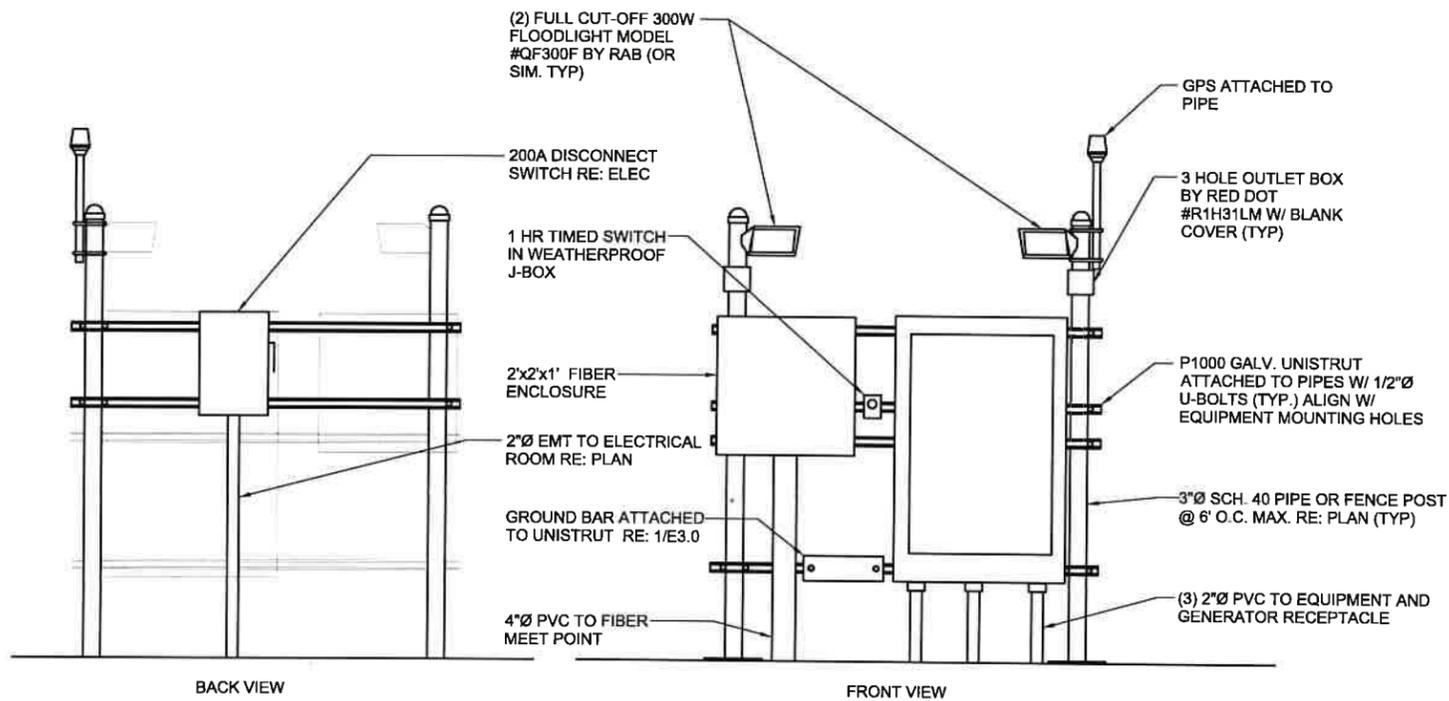
4 - CONDUIT ATTACHMENT DETAIL

NTS



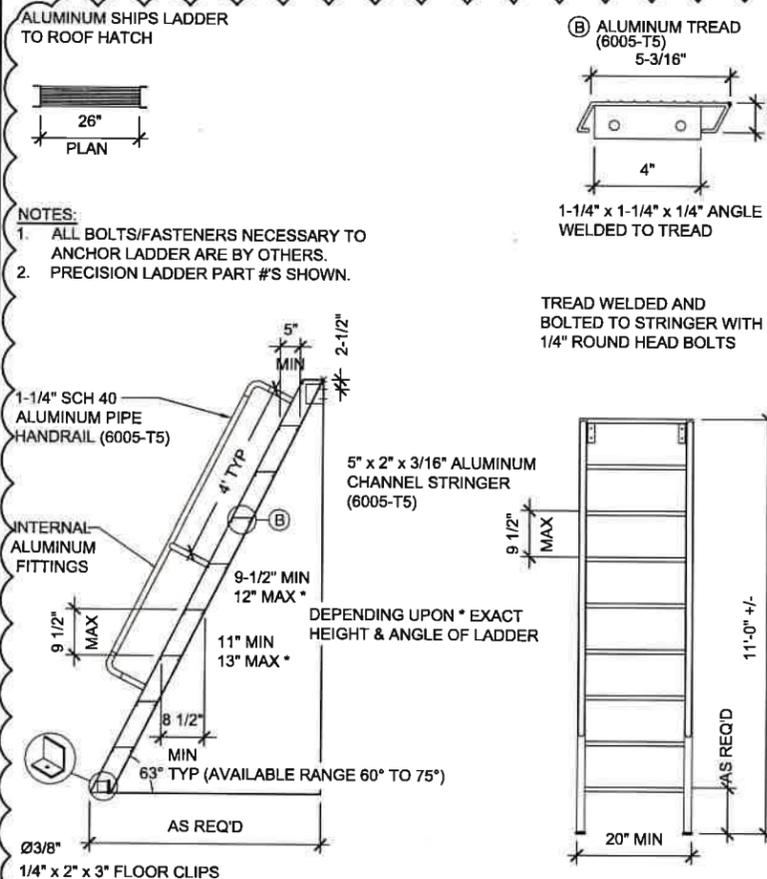
2 - ROOF HATCH DETAIL

NTS



3 - H-FRAME DETAIL

3/8" = 1'-0"



1 - ROOF ACCESS LADDER DETAIL

NTS

verizon
VERIZON WIRELESS SERVICES
3131 S. VAUGHN WAY, SUITE 550
AURORA, CO 80014

PROJECT INFORMATION
SITE NAME
DEN DENVER ARTS CENTER
SITE ADDRESS
1040 14TH STREET
DENVER, CO 80202
CONSULTANT

A 01/27/18 CD REVIEW DPL
0 02/25/18 CD RE-ISSUE SGP
04/30/18 PLAN REVIEW COMMENTS SGP

1st REVIEW TN 2nd REVIEW SGP

CHARLES STECKLY
ARCHITECTURE
5935 SOUTH ZANG STREET, SUITE 280
LITTLETON, COLORADO 80127
OFFICE: 303.932.9974



DETAILS

A4.00

HYBRID & COAX CABLES

POWER/GROUNDING

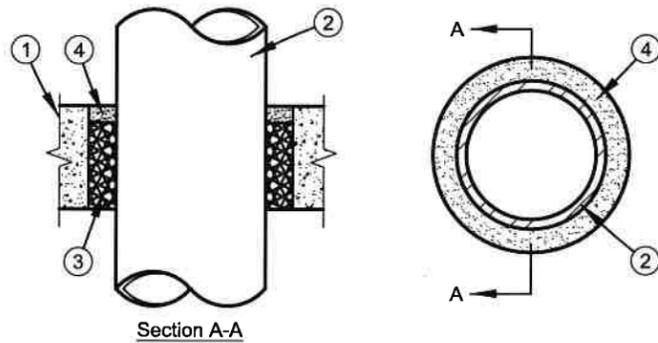
FIBER

ANTENNAS

RRH/BBU

PENETRATIONS

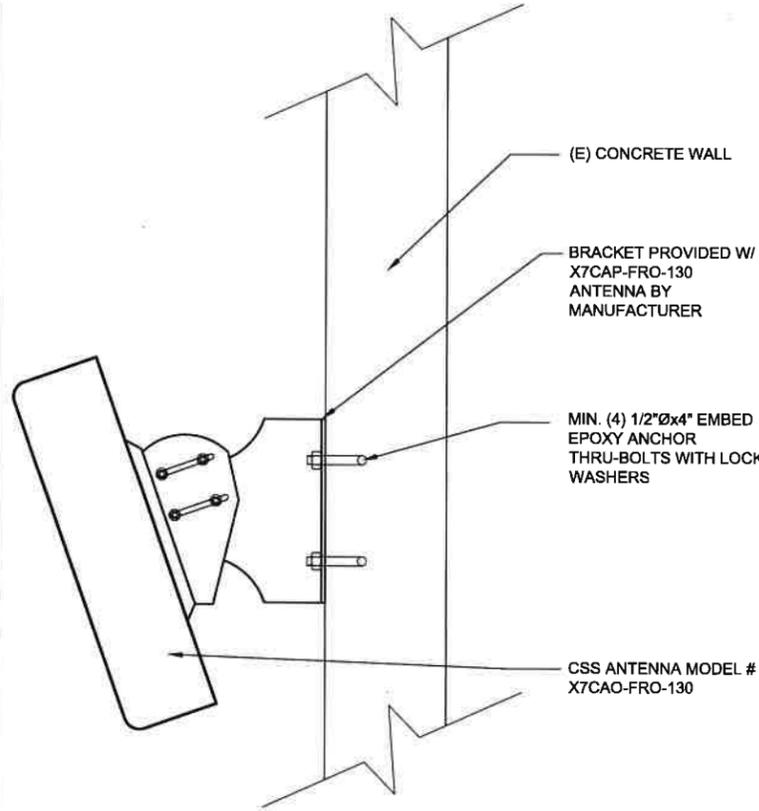
System No. CAJ1014
 (Formerly System No. 133)
 F Rating - 2 Hr
 T Rating - 0 Hr
 L Rating At Ambient - Less Than 1 CFM/sq ft (See Item 4)
 L Rating At 400 F - Less Than 1 CFM/sq ft (See Item 4)



- Floor or Wall Assembly** - Min. 3-1/4 in. thick reinforced lightweight or normal weight (100-150 pcf) concrete. Wall may also be constructed of any UL Classified Concrete Blocks*. Max. diameter of circular opening is 6 in.
 See Concrete Block (CAZT) category in the Fire Resistance Directory for names of manufacturers.
- Through Penetrations** - One metallic pipe or conduit to be centered within the firestop system. A nominal annular space of 3/4 in. is required within the firestop system. Pipe or conduit to be rigidly supported on both sides of floor or wall assembly. The following types and sizes of metallic pipes or conduits may be used:
 - Steel Pipe** - Nom 4 in. diameter (or smaller) Schedule 10 (or heavier) steel pipe.
 - Conduit** - Nom 4 in. diameter (or smaller) steel electrical metallic tubing or steel conduit.
- Packing Material** - Min. 4 pcf mineral wool batt insulation firmly packed into opening as a permanent form. Packing material to be recessed from top surface of floor or from both surfaces of wall as require to accommodate the required thickness of fill material. Min thickness of packing material in floors and walls to be 2-3/4 in. and 2-1/4 in., respectively.
Fill, Void or Cavity Material* - Sealant - Min 1/2 in. thickness o fill material applied within annulus, flush with top surface of floor or with both surfaces of wall. As an alternate, the permanent forming material (Item 3) may be omitted if the fill material thickness is increased to a min 1-1/2 in.
 Minnesota Mining & Mfg. Co. - Types FB-2000, FB-2000+, FB 2003 (floors only).
 (Note: L Ratings apply only when FB-2000+ is used.)
 * Bearing the UL Classification Marking

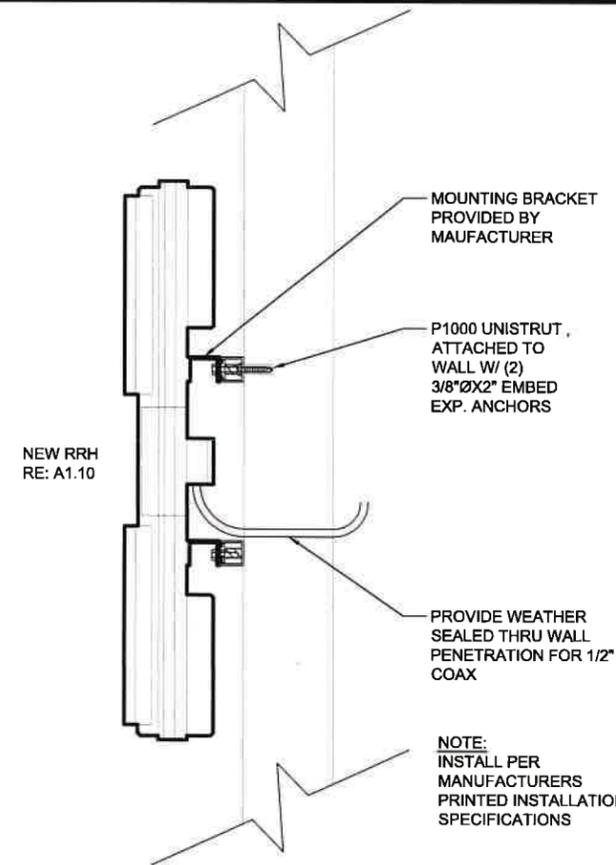
5 - FIRESTOPPING DETAIL

N.T.S.



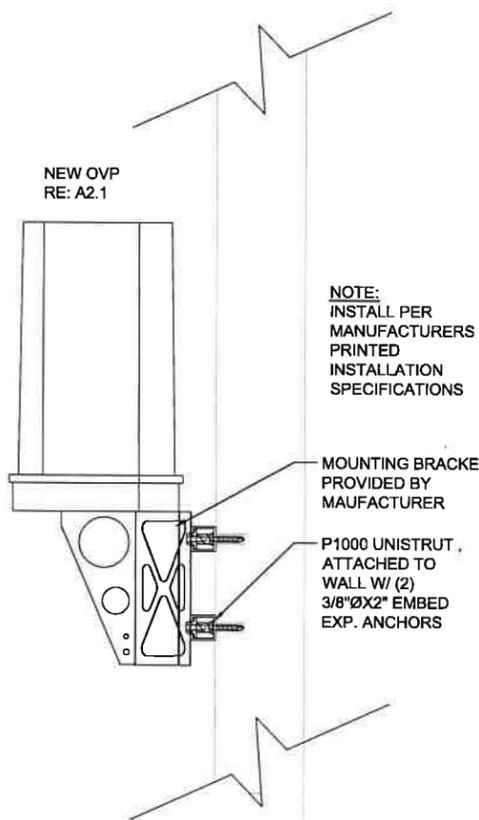
4 - CONDUIT ATTACHMENT DETAIL

NTS



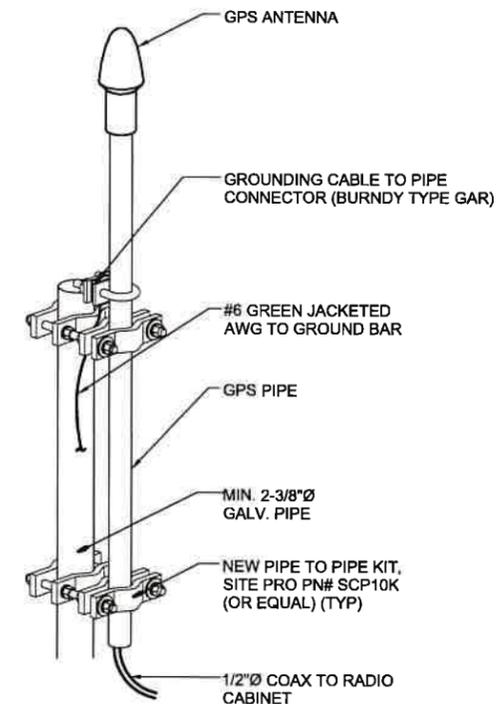
2 - RRH MOUNTING DETAIL

NTS



3 - OVP MOUNTING DETAIL

NTS



1 - GPS PIPE MOUNT DETAIL

1/2" = 1'-0"



PROJECT INFORMATION
 SITE NAME
DEN DENVER ARTS CENTER
 SITE ADDRESS
 1040 14TH STREET
 DENVER, CO 80202
 CONSULTANT

A	01/27/18	CD REVIEW	DPL
0	02/25/19	CD RE-ISSUE	SGP
Δ	04/30/19	PLAN REVIEW COMMENTS	SGP

1st REVIEW TN 2nd REVIEW SGP



DETAILS

A4.10

PROJECT INFORMATION

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CONSULTANT

OTEGUI STRUCTURAL SERVICES
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 LITTLETON, CO 80162
 PHONE: 720.981.5333
 FAX: 720.922.7935

A	01/27/16	CD REVIEW	DPL
0	02/25/19	CD RE-ISSUE	SGP

1st REVIEW TN 2nd REVIEW SGP

CHARLES STECKLY
ARCHITECTURE
 5935 SOUTH ZANG STREET, SUITE 280
 LITTLETON, COLORADO 80127
 OFFICE: 303.932.9974



STRUCTURAL NOTES

S1.00

HYBRID & COAX CABLES

POWER/GROUNDING

FIBER

ANTENNAS

RRH/BBU

PENETRATIONS

SPECIAL INSPECTION CHECKLIST			
INSPECTIONS		TESTING	
STRUCTURAL STEEL	Y/N	STRUCTURAL STEEL	Y/N
Visual insp. of material and member installation	Y	Non-Destructive Weld testing	NA
Visual insp. of bolts	Y	Bolt Pre-Tension testing	Y
Visual insp. of welds	NA	Shear Stud Hammer test	NA
Visual insp. of shear studs	NA		

NOTES:
 1) Special Inspections and Site Observations shall comply with section 1704 of the International Building Code and tables 1704.3, 1704.4, 1704.5.1, 1704.5.3 as they apply.
 2) Contractor shall coordinate with the Owner to hire a special inspection and testing agency. Contractor shall contact testing and inspection agency as often as required to meet the above inspection requirements.

ABBREVIATIONS	
A.B.	ANCHOR BOLTS
ARCH.	ARCHITECT
BOT.	BOTTOM
BRG.	BEARING
C.J.	CONTROL JOINT
CONC.	CONCRETE
CONT.	CONTINUOUS
DWN.	DOWN
(E)	EXISTING
ELEV.	ELEVATION
E.O.S.	EDGE OF SLAB
EXT.	EXTERIOR
G.L.	GLUE LAM
HORIZ.	HORIZONTAL
JST.	JOIST
MAX.	MAXIMUM
MIN.	MINIMUM
O.C.	ON CENTER
PL	PLATE
RE:	REFER TO
REINF.	REINFORCING
SIM.	SIMILAR
T.O.	TOP OF
T.O.S.	TOP OF STEEL
TYP.	TYPICAL
U.O.N.	UNLESS OTHERWISE NOTED
VERT.	VERTICAL
W/	WITH
W/O	WITH OUT

GENERAL NOTES
<p>1. This structure has been designed using the 2015 International Building Code and the TIA/EIA G (1609.1.1 Exception 5, 3108). Loading used in the design are as follows: Snow Loads Ground Snow Load, Pg.....30psf Flat Roof Snow Load, Pf.....30psf Snow Exposure Factor, Ce.....1 Snow Importance Factor, Is.....1.0 Thermal Factor, Ct.....1 Wind Loads Vasd.....90mph Vult.....120mph Occupancy Category.....II Wind Importance Factor, Iw.....1.0 Exposure.....C</p> <p>2. Structural Tests and Special Inspections a) Special Inspections are required in accordance to IBC Section 1704 and tables: 1704.3...Steel Construction b) Contractor shall coordinate with the Owner the hiring of an appropriate testing agency to perform Special Inspections. c) Quality Assurance for Wind Requirements: Contractor shall abide by the quality assurance plan for wind force resisting systems as defined in IBC Section 1706.</p> <p>3. Structural Steel a) Steel construction, fabrication, and erection shall comply with the American Institute of Steel Construction (AISC) "Design Specifications for Structural Steel Buildings", "RCSC Specification for Structural Joints Using ASTM A325 or A490 Bolts", and "Code of Standard Practice for Steel Buildings and Bridges". b) Carbon Materials shall conform to: 1) Pipes..... A53, 35 ksi 2) Angles, Plates and All Others.....A36, 36 ksi c) Fasteners: all bolt min A307 e) All exterior steel to be hot dipped galvanized</p> <p>4. Coordination a) All dimensions shall be coordinated with the architect. b) Any conflicts with other trades shall be brought to the attention of the Architect immediately. c) If any existing conditions are not as assumed on these drawings, contact Otegui Structural Services, LLC immediately.</p>



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0	02/25/19	CD RE-ISSUE	SGP

1st REVIEW TN 2nd REVIEW SGP

CHARLES STECKLY

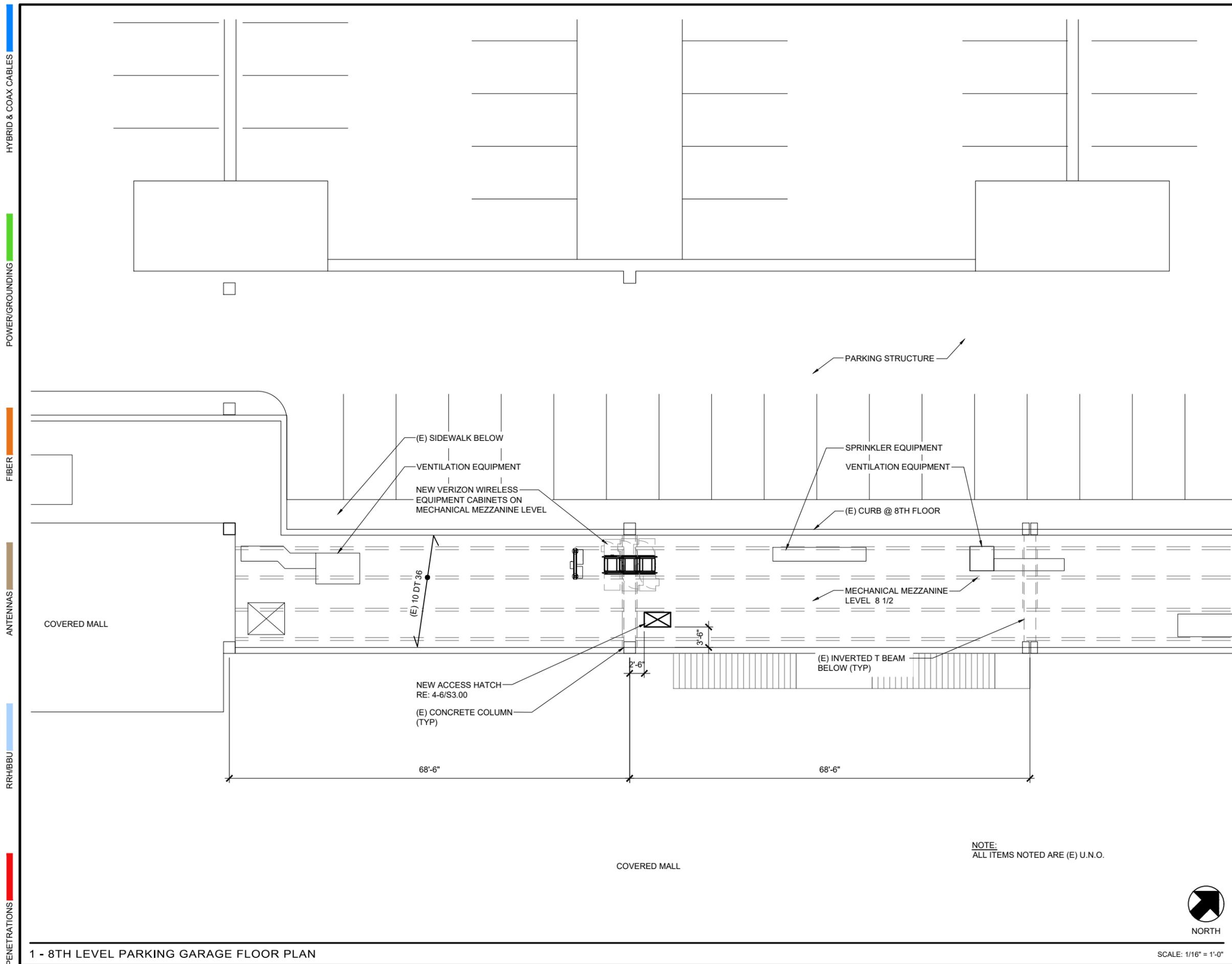
ARCHITECTURE

5935 SOUTH ZANG STREET, SUITE 280
LITTLETON, COLORADO 80127
OFFICE: 303.932.9974



PARTIAL 8TH FLOOR FRAMING PLAN

S2.00



NOTE:
ALL ITEMS NOTED ARE (E) U.N.O.



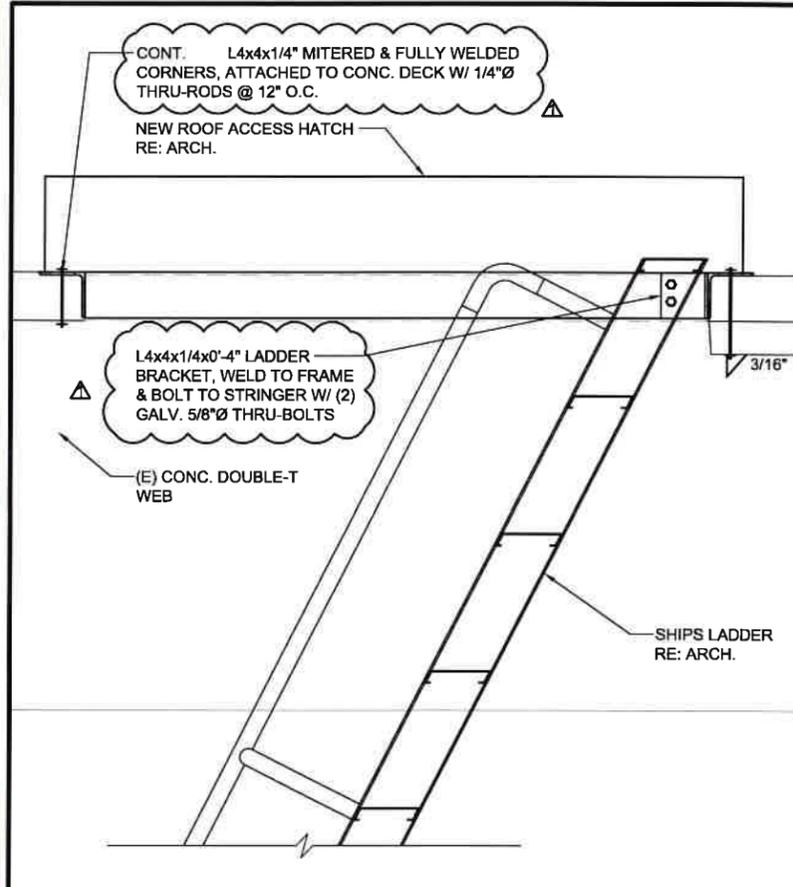
SCALE: 1/16" = 1'-0"

1 - 8TH LEVEL PARKING GARAGE FLOOR PLAN

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PLOTTED Feb 25, 2019 AT 2:17pm

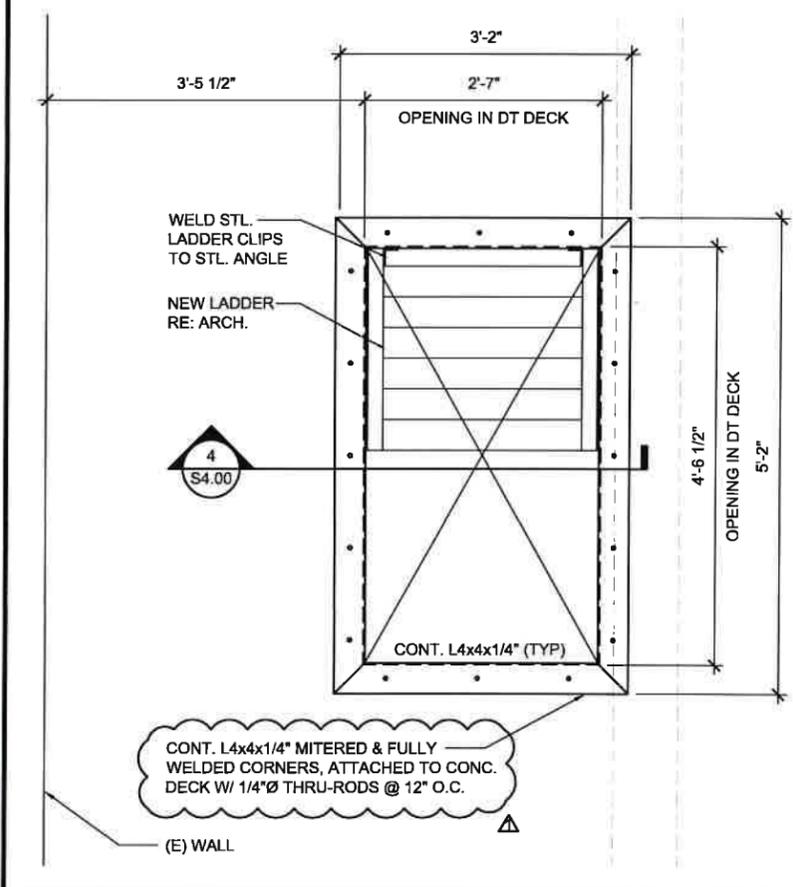
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PLOTTED May 01, 2019 AT 10:48am

PENETRATIONS
RRH/BBU
ANTENNAS
FIBER
POWER/GROUNDING
HYBRID & COAX CABLES

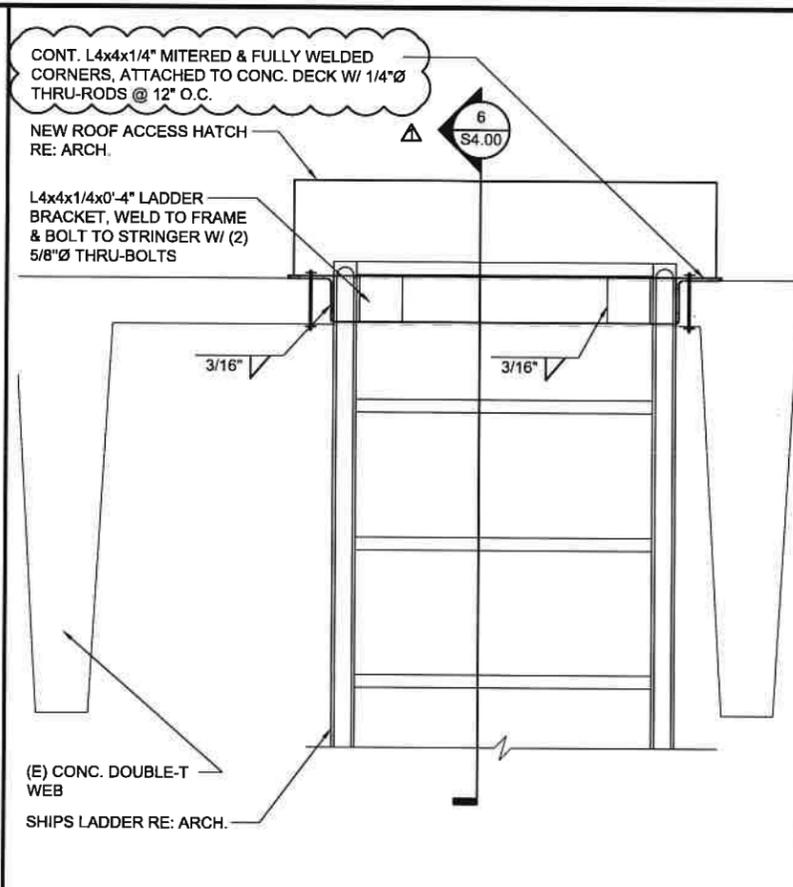


6 - LADDER ATTACHMENT DETAIL

SCALE: 3/4" = 1'-0"



5 - HATCH OPENING DETAIL

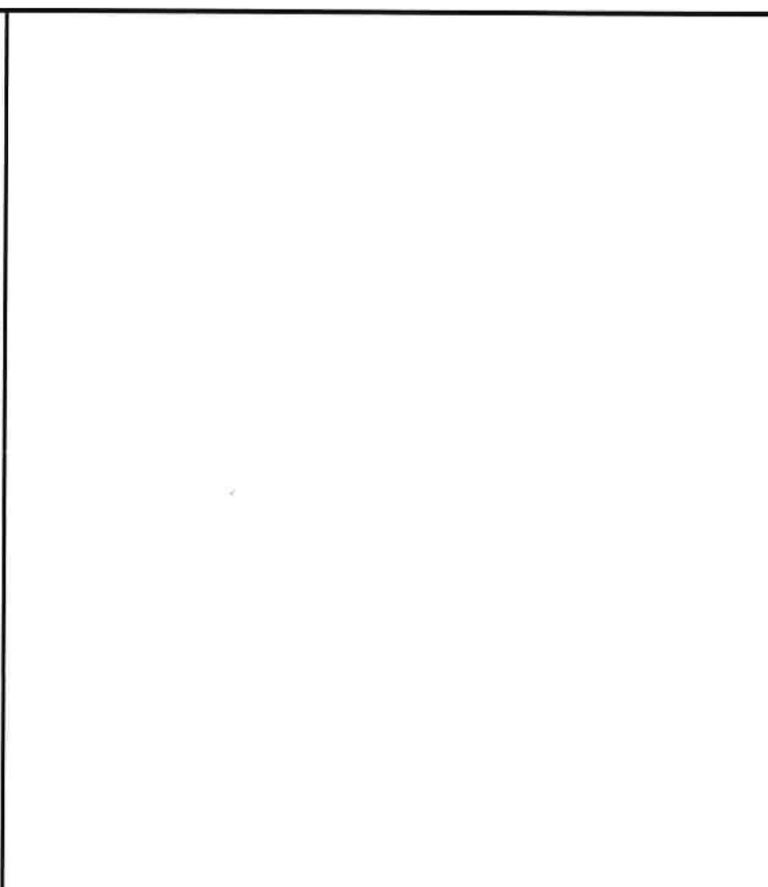


4 - LADDER CONNECTION DETAIL

SCALE: 3/4" = 1'-0"

3 - NOT USED

SCALE: NTS



2 - NOT USED

SCALE: NTS

1 - NOT USED

SCALE: NTS



VERIZON WIRELESS SERVICES
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0	02/25/19	CD RE-ISSUE	SGP
△	04/30/19	PLAN REVIEW COMMENTS	SGP

1st REVIEW TN 2nd REVIEW SGP

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DETAILS

S3.00

HYBRID & COAX CABLES
 POWER/GROUNDING
 FIBER
 ANTENNAS
 RR/HBBU
 PENETRATIONS

- SUBMITTAL OF BID INDICATES CONTRACTOR IS COGNIZANT OF ALL JOB SITE CONDITIONS AND WORK TO BE PERFORMED UNDER THIS CONTRACT. CONTRACTOR IS RESPONSIBLE FOR ALL FIELD VERIFICATION.
- THESE PLANS ARE DIAGRAMMATIC ONLY, AND NOT TO BE SCALED.
- ELECTRICAL CONTRACTOR SHALL PROVIDE ALL LABOR, MATERIALS, INSURANCE, EQUIPMENT, INSTALLATION, CONSTRUCTION TOOLS, TRANSPORTATION, ETC. FOR A COMPLETE AND PROPERLY OPERATIVE SYSTEM ENERGIZED THROUGHOUT AND AS INDICATED ON DRAWINGS, AS SPECIFIED HEREIN AND/OR AS OTHERWISE REQUIRED.
- ALL MATERIALS AND EQUIPMENT SHALL BE NEW AND IN PERFECT CONDITION WHEN INSTALLED AND SHALL BE OF THE BEST GRADE AND OF THE SAME MANUFACTURER THROUGHOUT FOR EACH CLASS OR GROUP OF EQUIPMENT. MATERIALS SHALL BE LISTED AND APPROVED BY UNDER- WRITER'S LABORATORY AND SHALL BEAR THE INSPECTION LABEL "J" WHERE SUBJECT TO SUCH APPROVAL. MATERIALS SHALL MEET WITH APPROVAL OF THE DIVISION OF INDUSTRIAL SAFETY AND ALL GOVERNING BODIES HAVING JURISDICTION. MATERIALS SHALL BE MANUFACTURED IN ACCORDANCE WITH APPLICABLE STANDARDS ESTABLISHED BY ANSI, NEMA, AND NBFU.
- ALL CONDUIT INSTALLED SHALL BE SURFACE MOUNTED UNLESS OTHERWISE NOTED.
- ELECTRICAL CONTRACTOR SHALL CARRY OUT HIS WORK IN ACCORDANCE WITH ALL GOVERNING STATE, COUNTY, LOCAL CODES AND O.S.H.A.
- ELECTRICAL CONTRACTOR SHALL SECURE ALL NECESSARY ELECTRICAL PERMITS, AND PAY ALL REQUIRED FEES.
- COMPLETE JOB SHALL BE GUARANTEED FOR A PERIOD OF NO LESS THAN ONE YEAR AFTER THE DATE OF JOB COMPLETION. ANY WORK, MATERIAL, OR EQUIPMENT FOUND TO BE FAULTY DURING THAT PERIOD SHALL BE CORRECTED AT ONCE, UPON WRITTEN NOTIFICATION, AT THE EXPENSE OF THE ELECTRICAL CONTRACTOR.
- ALL CONDUIT ONLY (C.O.) SHALL HAVE A PULL WIRE OR ROPE, AND TRUE TAPE.
- PROVIDE THE OWNER WITH ONE SET OF COMPLETE DIMENSIONS AND CIRCUITS, WITHIN 10 WORKING DAYS OF PROJECT COMPLETION ELECTRICAL "AS BUILT" DRAWINGS, SHOWING ACTUAL
- ALL BROCHURES, OPERATING MANUALS, CATALOGS, SHOP DRAWINGS, ETC. SHALL BE TURNED OVER TO PROJECT MANAGER AT JOB COMPLETION.
- USE T-TAP CONNECTIONS ON ALL MULTI-CIRCUITS WITH COMMON NEUTRAL CONDUCTOR FOR LIGHTING FIXTURE. ALL CONDUCTORS SHALL BE COPPER.
- THE EXTERIOR GROUND RING SHALL BE TESTED PER VERIZON WIRELESS SPECIFICATIONS AND SHALL HAVE A RESISTANCE TO EARTH OF 5 OHMS OR LESS. IF NOT NOTIFY ENGINEER.
- ALL CIRCUIT BREAKERS, FUSES AND ELECTRICAL EQUIPMENT SHALL HAVE AN INTERRUPTING RATING NOT LESS THAN THE MAXIMUM SHORT CIRCUIT CURRENT TO WHICH THEY MAY BE SUBJECTED, AND A MINIMUM OF 10,000 A.I.C.
- THE ENTIRE ELECTRICAL INSTALLATION SHALL BE GROUNDED AS REQUIRED BY ALL APPLICABLE CODES.
- PATCH, REPAIR AND PAINT ANY AREA THAT HAS BEEN DAMAGED IN THE COURSE OF THE ELECTRICAL WORK.
- IN DRILLING HOLES INTO CONCRETE (WHETHER FOR FASTENING OR ANCHORING PURPOSES OR PENETRATIONS THROUGH THE FLOOR FOR CONDUIT RUNS, PIPE RUNS, ETC.) IT MUST BE CLEARLY UNDERSTOOD THAT TENDONS AND REBARS WILL NOT BE DRILLED INTO, CUT, OR DAMAGED UNDER ANY CIRCUMSTANCES.
- LOCATION OF TENDONS AND RE-BARS ARE NOT DEFINITELY KNOWN AND THEREFORE MUST BE SEARCHED FOR BY APPROPRIATE METHODS AND EQUIPMENT VIA X-RAY, OR OTHER DEVICES THAT CAN ACCURATELY LOCATE THE REINFORCING STEEL TENDONS.
- PENETRATIONS IN FIRE RATED WALLS SHALL BE FIRE STOPPED IN ACCORDANCE WITH APPLICABLE LOCAL BUILDING CODES. USING U.L. RATED MATERIALS
- ELECTRICAL CONTRACTOR IS TO COORDINATE WITH UTILITY COMPANY FOR CONNECTION OF TEMPORARY AND PERMANENT POWER TO THE SITE. THE TEMPORARY POWER AND ALL HOOK-UP COSTS SHALL BE PAID BY THE CONTRACTOR.
- ELECTRICAL CONTRACTOR SHALL SUBMIT SHOP DRAWINGS AND/OR CATALOG CUT-SHEETS ON ALL NON-SPECIFIED ORIGINAL MATERIALS AND EQUIPMENT, TO PROJECT MANAGER PRIOR TO COMMENCEMENT OF THE WORK.
- UPON COMPLETION OF WORK, CONDUCT CONTINUITY AND SHORT CIRCUIT, AS WELL AS, GROUNDING TEST. GROUNDING TEST SHALL BE PERFORMED BY INDEPENDENT TESTING AGENCY, WITH WRITTEN REPORT SUBMITTED TO THE PROJECT MANAGER FOR REVIEW AND APPROVAL.
- CLEAN PREMISES DAILY OF ALL DEBRIS RESULTING FROM WORK AND LEAVE WORK PREMISES IN A COMPLETE AND UNDAMAGED CONDITION.
- ALL EXTERIOR WALL PENETRATIONS SHALL BE SEALED WITH POLYSEAM SEALANT.
- ALL #2 TINNED BARE COPPER DOWN LEADS TO BE PROTECTED BY 1/2" P.V.C. PIPE AND SECURED.
- COMPRESSION FITTINGS TO BE USED ON ALL CONDUITS (NO SET SCREWS).
- ALL #6 STRANDED COPPER WITH GREEN INSULATION TO BE ATTACHED WITH CRIMPED DOUBLE LUG, ATTACHED WITH NUTS, BOLTS AND STAR WASHERS TYPICAL AND NO-OX GREASE BETWEEN LUG AND BUS BAR.
- ALL ABOVE GROUND CONDUIT SHALL BE EMT GALVANIZED CONDUIT WITH WEATHERPROOF FITTINGS.
- LABEL PANEL WITH AVAILABLE FAULT VALUE (PERMANENT LABEL).

* DATE OF JOB COMPLETION SHALL BE THE DATE ON THE CONTRACTOR'S "NOTICE OF COMPLETION" SUBMITTED TO THE OWNER.

5 - ELECTRICAL NOTES

- | | | |
|----------------------------------|---------------------------------|--|
| — UNDERGROUND RACEWAY | ⚡ TELEPHONE SERVICE WEATHERHEAD | ⊙ COPPER CLAD GROUND ROD (5/8" x 10') |
| ⊞ FUSED DISCONNECT | ▾ PATH AND NUMBER OF CONDUCTORS | ■ EXOTHERMIC WELD |
| ⚡ TRANSFORMER | ⚡ TINNED COPPER GROUND BAR | ● COMPRESSION TYPE CONNECTION |
| ○ FEEDER KEY | ⚡ GROUND CONDUCTOR | ⊙ TEST WELL |
| ⚡ GROUND | ⚡ PANELBOARD | ⊞ AUTOMATIC TRANSFER SWITCH |
| ⚡ PANELBOARD | ⚡ METER | ⊙ STAND-BY GENERATOR |
| ⚡ ELECTRICAL EQUIPMENT ENCLOSURE | ⚡ FUSED DISCONNECT | ▶ MECHANICAL CONNECTION (LUG CRIMP OR C CLAMP) |
| ⚡ ELECTRICAL SERVICE WEATHERHEAD | ⚡ LOCAL DISCONNECT | ⊙ GENERATOR RECEPTACLE |

4 - SYMBOLS

LOAD CALCULATIONS

A. 5000A MAIN SWITCHBOARD

MAX. DEMAND (7 DAY, 30 DAY BY FINAL)	540A
+25%	135A
+VERIZON @ 480V	83.4A
TOTAL	758.4A ON 5000A MAIN

FAULT CALCULATIONS

A. PANEL

$$f = \frac{2 \times 440 \text{ FT} \times 52,500\text{A}}{15,082 \times 208\text{V}} = 14.7$$

$$M = \frac{1}{1+14.7} = 0.06$$

$$I_{sc} = 0.06 \times 52,500\text{A} = 3,150 \text{ AIC}$$

3 - CALCULATIONS

PANEL LA

120/208 VOLTS, 1 PHASE, 3 WIRES, SN, 200 AMP BUS, 200 AMP MAIN, CB 10,000 A.I.C. RATING (MINIMUM), NEMA 3R ENCLOSURE, SURFACE MOUNTED

MFR RE: 1-LINE

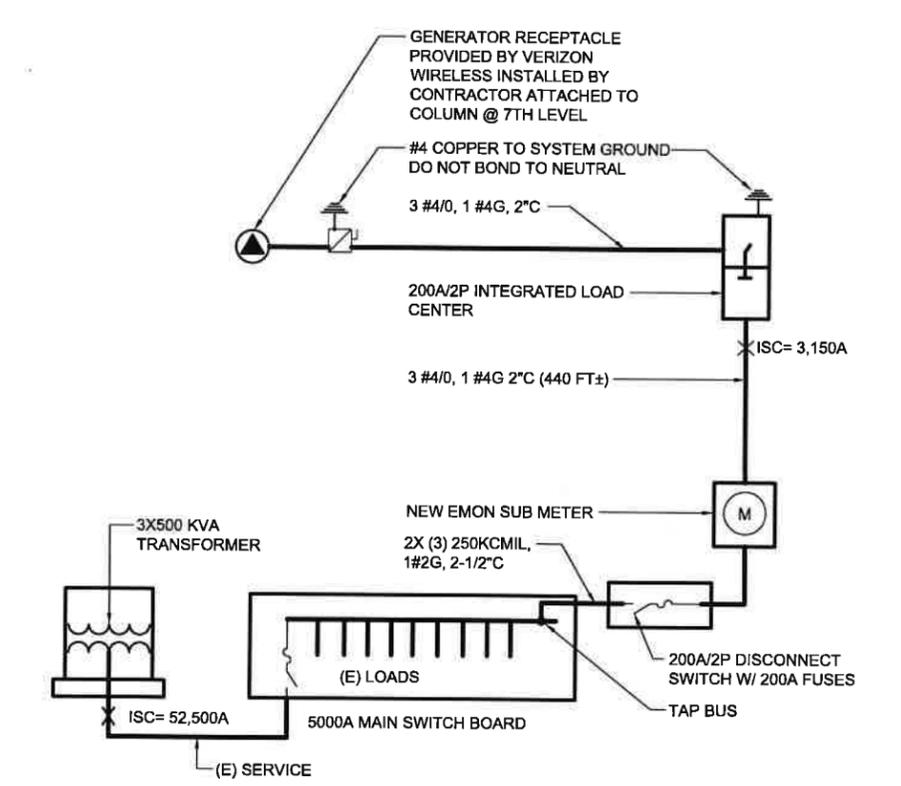
DESCRIPTION	WIRE	BKR	POLE	CKT	VA	VA	VA	CKT	POLE	BKR	WIRE	DESCRIPTION
LIGHTS	#12	20	1	1	1000	A	1300	2	2	30	#10	RECT 1
RECEPT	#12	20	1	3	360	B	1300	4				
HVAC 1	#6	60	2	5	3660	A	1300	6	2	30	#10	RECT 2
HVAC 2	#6	60	2	9	3660	A	1300	10	2	30	#10	RECT 3
EXT. RECEPT	#12	20	1	13	360	A	1300	14	2	30	#10	RECT 4
HVAC CONTROL	#12	20	1	15	180	B	1300	16				
SMOKE DETECT	#12	20	1	17	180	A	1300	18	2	30	#10	RECT 5
				19		B	1300	20				
				21		A	1300	22	2	30	#10	RECT 6
				23		B	1300	24				
				25		A		26				
				27		B		28				
				29		A		30				
				31		B		32				
				33		A		34				
				35		B		36				
				37		A		38				
				39		B		40				
				41		B		42				

PHASE A = 17960 VOLTAMPS PHASE B = 20,140 VOLTAMPS

PANEL LOAD CALCULATIONS

LIGHTING	1220	VOLTAMPS X 1.25 =	1525	VOLTAMPS
RECEPTACLES - 1ST 10 KVA	900	VOLTAMPS X 1.00 =	900	VOLTAMPS
LARGEST MOTOR	7320	VOLTAMPS X 1.25 =	9150	VOLTAMPS
REMAINDER MOTOR	7320	VOLTAMPS X 1.00 =	7320	VOLTAMPS
RECTIFIER	15,600	VOLTAMPS X 1.00 =	15,600	VOLTAMPS
OTHER	180	VOLTAMPS X 1.00 =	180	VOLTAMPS
			34,675	TOTAL DEMAND VA
			166.7	AMPS, 1Ø, 3W

2 - PANEL SCHEDULES



1 - ONE LINE DIAGRAM



PROJECT INFORMATION

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A	01/27/18	CD REVIEW	DPL
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1st REVIEW TN 2nd REVIEW SGP



**ONE LINE DIAGRAM
 PANEL SCHEDULE
 & CALCS**

E1.00



VERIZON WIRELESS SERVICES
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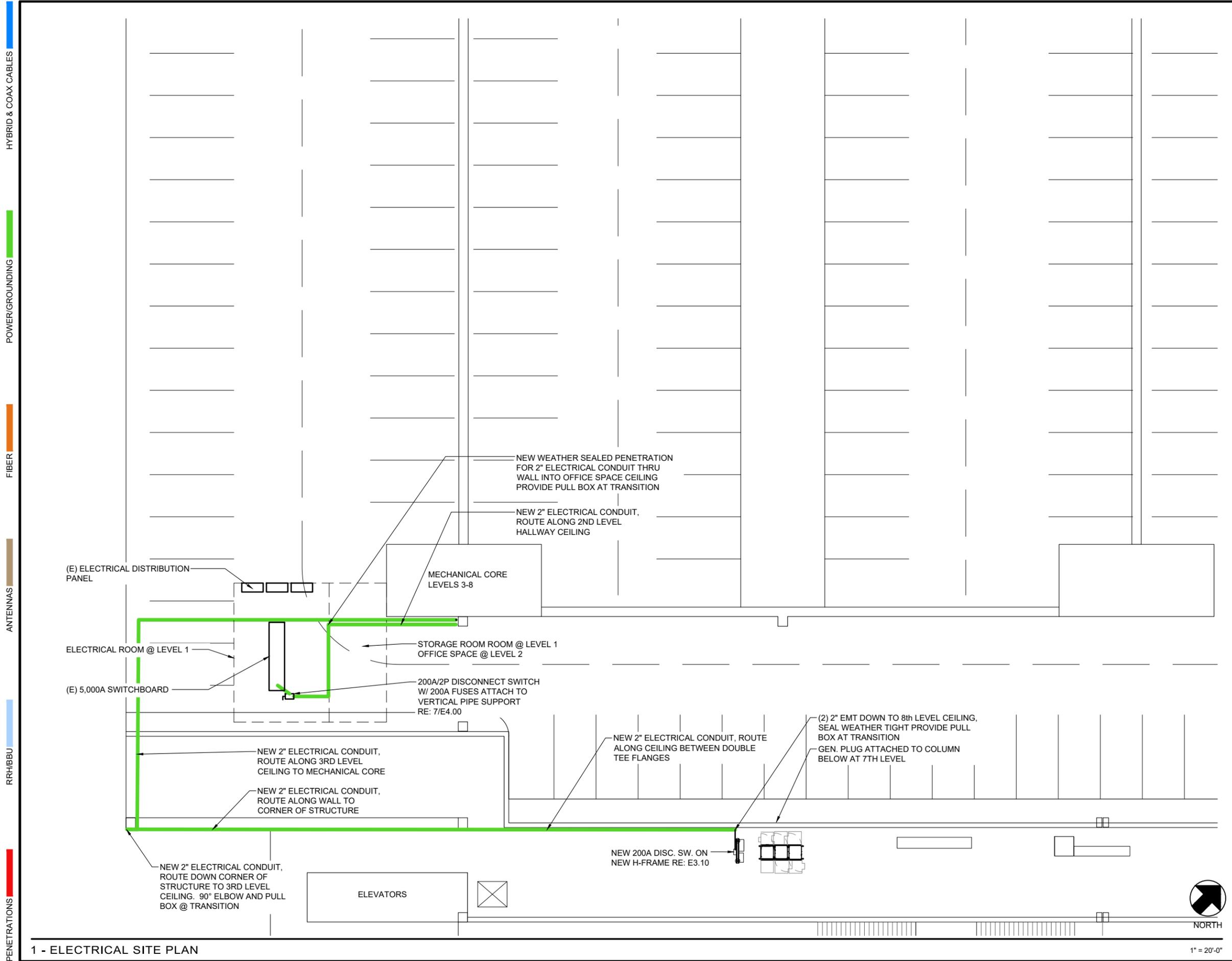


5935 SOUTH ZANG STREET, SUITE 280
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OFFICE: 303.932.9974



ELECTRICAL SITE PLAN

E2.00



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PLOTTED Feb 25, 2019 AT 2:18pm



VERIZON WIRELESS SERVICES
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1st REVIEW TN 2nd REVIEW SGP

**CHARLES
STECKLY**

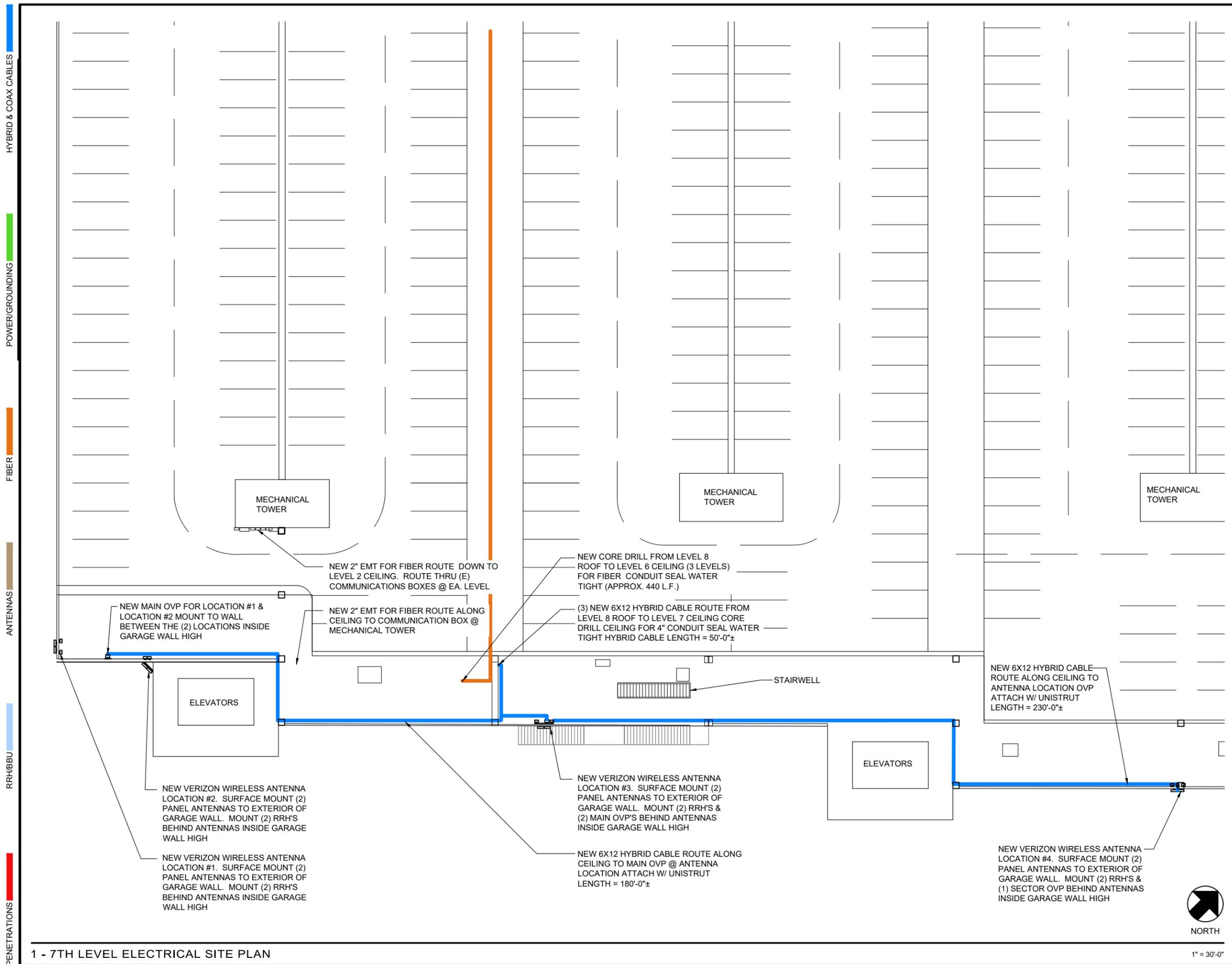
ARCHITECTURE

5935 SOUTH ZANG STREET, SUITE 280
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OFFICE: 303.932.9974



**7TH LEVEL
ELECTRICAL SITE PLAN**

E2.10



HYBRID & COAX CABLES
POWER/GROUNDING
FIBER
ANTENNAS
RRH/BBU
PENETRATIONS

1 - 7TH LEVEL ELECTRICAL SITE PLAN



1" = 30'-0"

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PLOTTED Feb 25, 2019 AT 2:18pm

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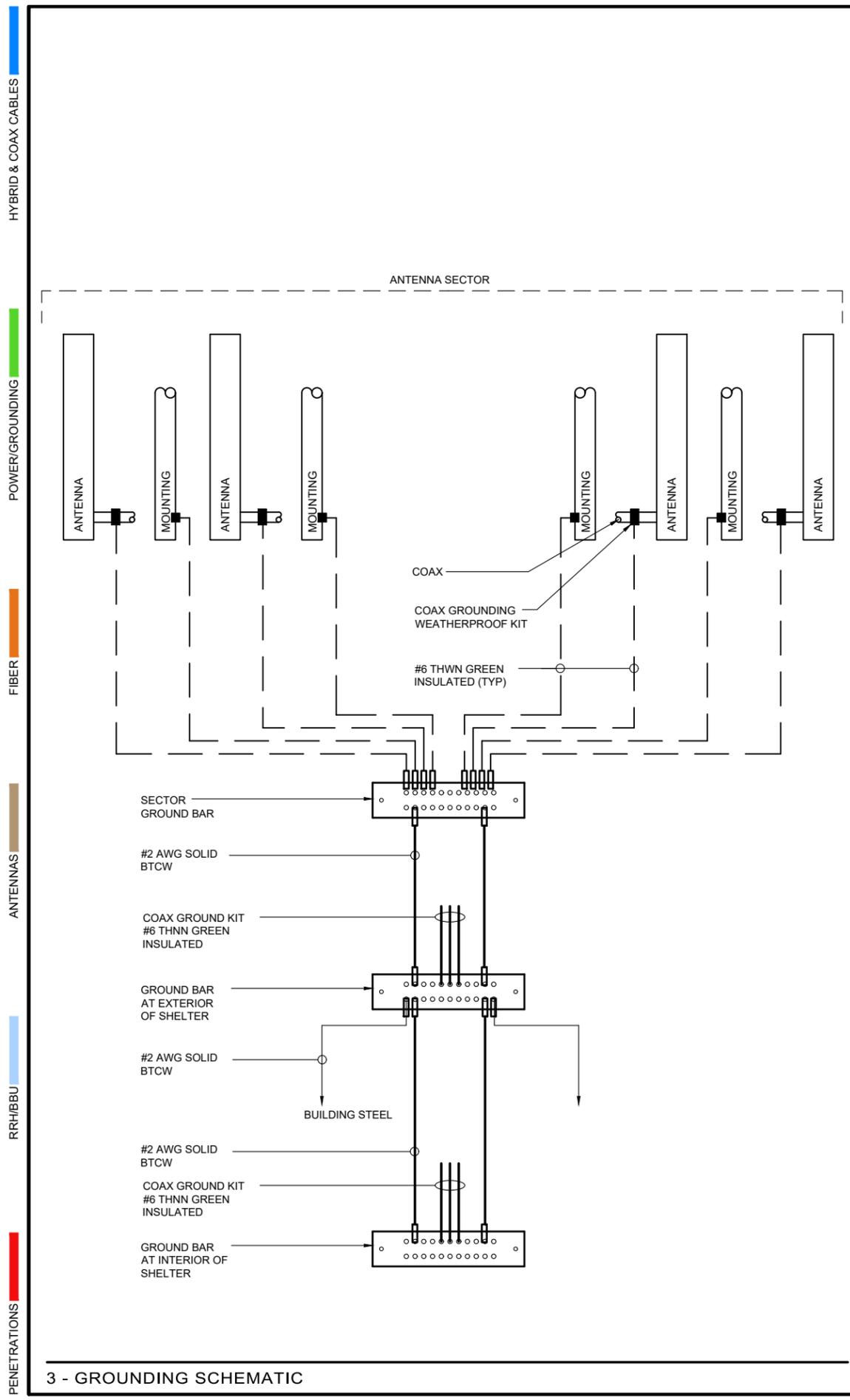
CHARLES STECKLY ARCHITECTURE

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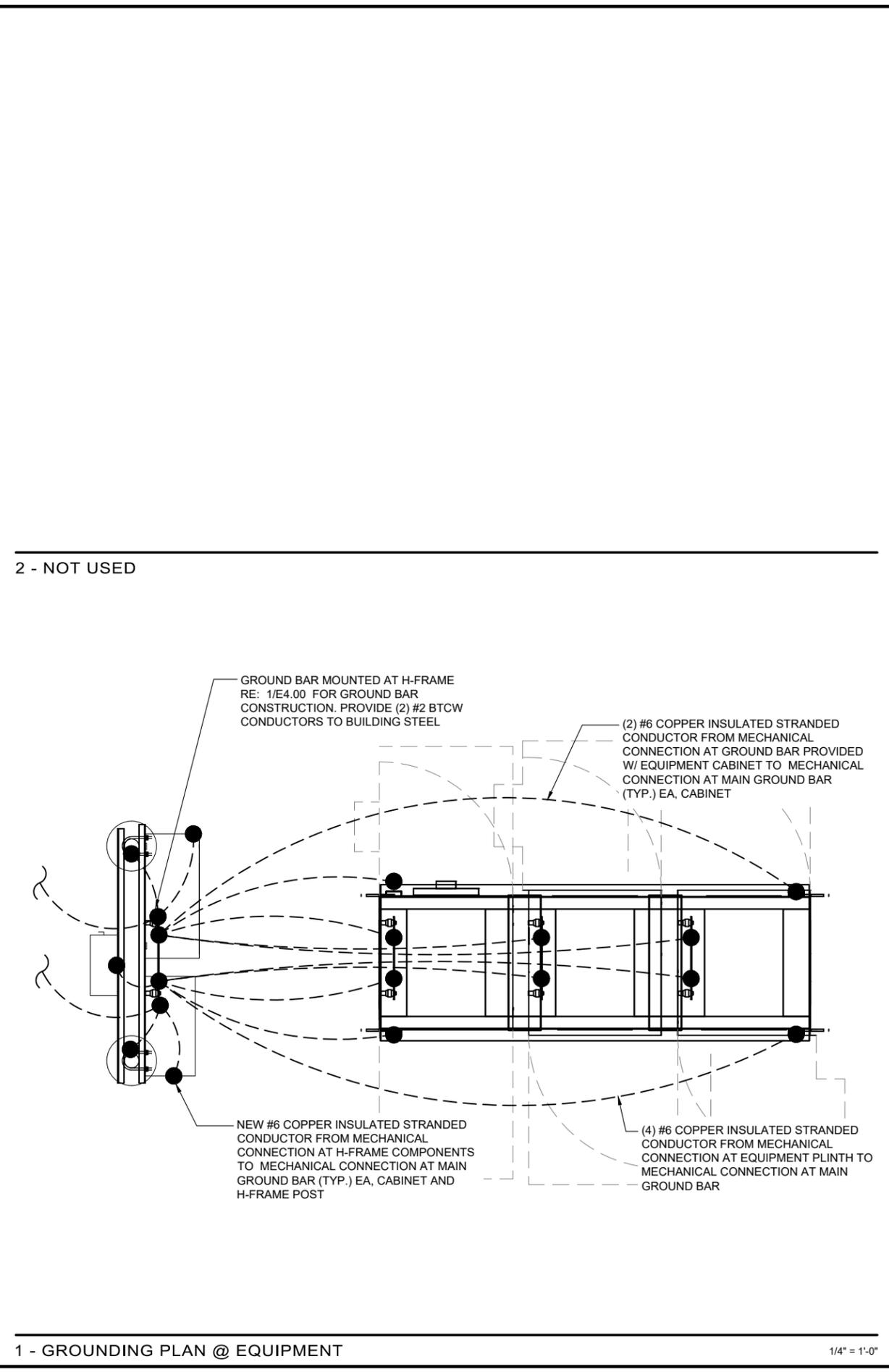


GROUNDING PLAN & SHEMATIC

E3.00



3 - GROUNDING SCHEMATIC



2 - NOT USED

1 - GROUNDING PLAN @ EQUIPMENT

1/4" = 1'-0"



VERIZON WIRELESS SERVICES
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**CHARLES
STECKLY**

ARCHITECTURE

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ELECTRICAL DETAILS

E4.00

HYBRID & COAX CABLES

POWER/GROUNDING

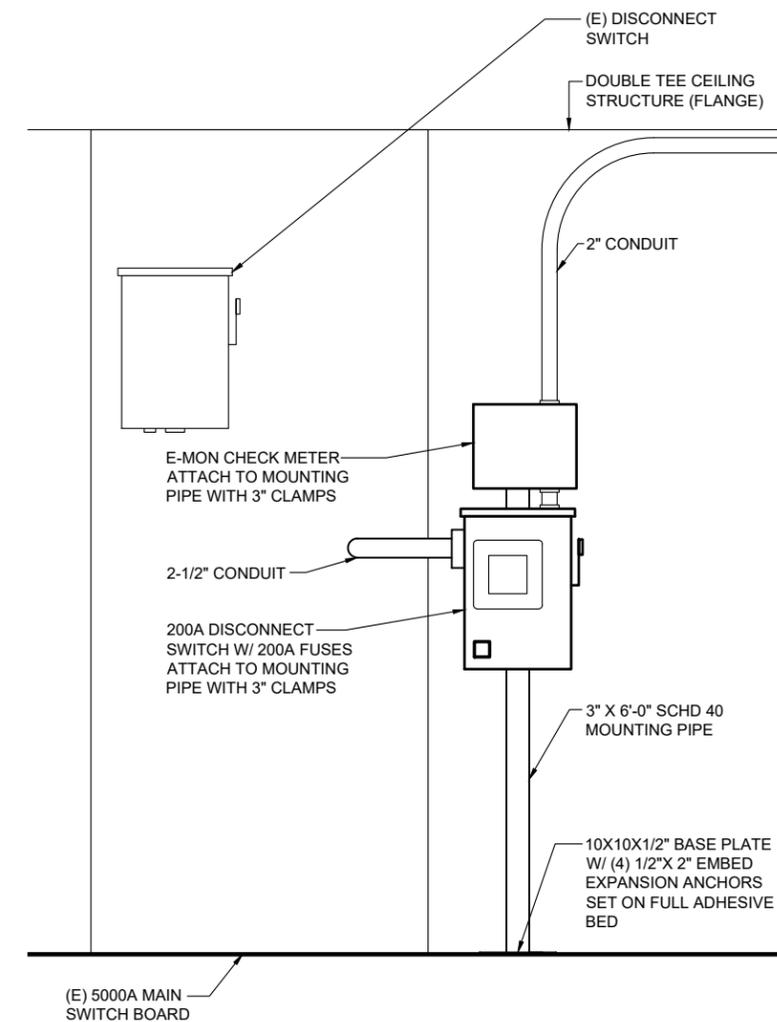
FIBER

ANTENNAS

RRH/BBU

PENETRATIONS

8 - NOT USED



7 - DISCONNECT MOUNT DETAIL

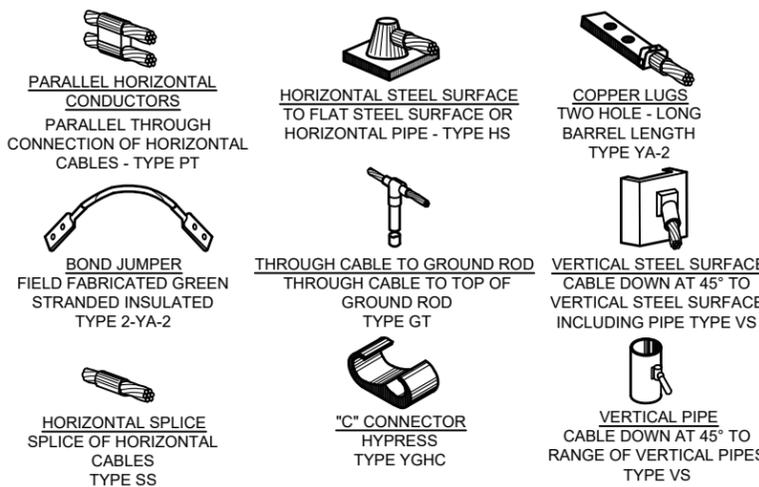
N.T.S.

6 - NOT USED

N.T.S.

5 - NOT USED

N.T.S.



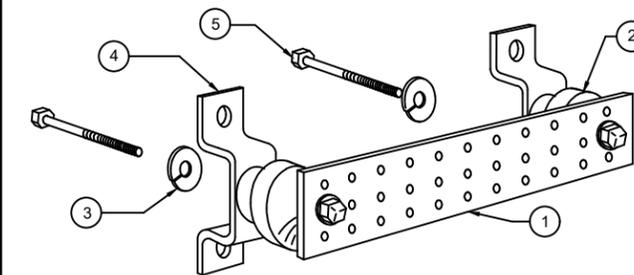
4 - CONNECTION DETAILS

N.T.S.

3 - NOT USED

2 - NOT USED

N.T.S.



NOTES:

1. COPPER GROUND BAR OR APPROVED EQUAL, 1/4" x 4" x 12". HOLE CENTERS TO MATCH NEMA DOUBLE LUG CONFIGURATION.
2. SPACERS AS REQUIRED
3. 5/8" LOCKWASHERS
4. WALL MOUNTING BRACKET
5. 5/8" -11 x 1" H.H.C.S. BOLTS
6. GROUND BAR TO BE PURCHASED FROM ROHN.

1 - GROUND BAR DETAIL

N.T.S.

Exhibit B — City's Minimum Technical Standards

Note: Some standards may not apply to your facility due to frequency of operation or type of service.

1.0 General

1.1 Posting of Information. The following information shall be posted on or near your cabinet:

Copy of FCC license (if applicable)

Equipment Identification Card with the following information:

Transmit and receive frequencies (or frequency bands in case of wireless operators)

Type of service

Authorized output power & ERP

Antenna model number

Transmission line model number and type

Name of licensee

Contact information for responsible person (name, phone, email)

Unidentified equipment shall be considered unauthorized and may be red tagged and removed after 30 days.

1.2 Installations at City Fire Stations. The City may require that the Tenant (Licensee) upgrade City radio equipment to ensure interference-free coexistence. Specifically, there is a problem with installing an isolator on the existing 900 MHz Alligator Model 1888 MAS transceiver used at most City fire stations. The isolator must be installed only on the transmit line, but the transceiver uses a duplexed (switched) output whereby both the transmitter and the receiver share the same antenna line. Similarly, separate cavity filters are required for the receiver and transmitter, but it is not possible to install both on a single duplexed line. For this reason, the City usually directs that the Alligator Model 1888 be replaced with a Model 1800 Master unit with separate transmit and receive antenna ports. A duplexer cavity filter should be used to combine transmit and receive into the existing antenna. Contact the City's Technical Representative for recommended vendors for these components.

1.3 Changes. Notify the City's Technical Representative immediately of any changes to frequencies, antennas or other equipment configuration. Obtain City's approval prior to making those changes as required by the Lease (License). Approved changes shall be shown on an updated Equipment ID Card.

2.0 Mobile Wireless Services

2.1 Land Mobile Radio Filter and Isolator Requirements. For land mobile radio (LMR), as a minimum, each transmitter shall employ a dual stage isolator followed by a single cavity

bandpass filter. All transmitters shall have built-in or external harmonic (low pass) filters. The low pass filter must be a true low pass filter, not a notch filter tuned to just one or two harmonic frequencies. Harmonic rejection shall be at least 60 dB at the second harmonic and at least 50 dB at the third harmonic. The following minimum isolator and bandpass cavity filter specifications apply:

30-50 MHz

Isolators - None required.

TX cavity - minimum of 20 dB rejection at + 0.5 MHz

72-76 MHz

Isolators - Minimum of 25 dB

TX cavity - minimum of 20 dB rejection at + 0.5 MHz

138-174, 216-222 MHz

Dual Stage Isolators - minimum of 60 dB

TX cavity - minimum of 20 dB rejection at + 1.5 MHz

406-512 MHz

Dual Stage Isolators - minimum of 60 dB

TX cavity - minimum of 20 dB rejection at + 3.5 MHz

698-941 MHz (excluding airphone)

Dual Stage Isolators - minimum of 60 dB

Tx cavity - minimum of 20 dB rejection at + 6 MHz

Explanation. The bandpass filter and lowpass filter must follow the isolator because ferrite isolators are nonlinear and can create harmonics. Please note that most bandpass cavity filters will pass odd harmonics of the tuned frequency, so an external lowpass filter following the isolator is also required. Transmitter combiners will be considered on a case-by-case basis. Please provide all combiner technical information to the City's Technical Representative.

2.2 Airphone (849-851 MHz transmit, 894-896 MHz receive)

Transmitter out-of-band emissions shall not cause harmful interference to cellular base station receivers (824-849 MHz). Tenant (Licensee) shall submit plans, including bandpass filter response curves, to the City's Technical Representative for approval prior to installation. Tenant (Licensee) shall install adequate receiver bandpass filtering to preclude receiver desensitization or receiver intermodulation caused indirectly by cellular base stations on the site.

2.3 LMR Duplexers. Notch duplexers are not adequate. The duplexer must also have a bandpass characteristic to ensure other transmit signals do not enter the transmitter or over drive the receiver. This is especially important for VHF repeaters which are vulnerable to FM broadcast signals and other closely-spaced VHF transmitters.

2.4 Personal Wireless Services. These services include, but are not limited to the 698-806, 806-

869, 1710-1755, 1850-2000, 2110-2155, 2500-2600 MHz bands (excluding 700 and 800 MHz public safety bands). Because the wireless provider is assumed to have exclusive use of a band of frequencies, out-of-band emissions are expected to be attenuated significantly by the manufacturer's standard combiners, duplexers and cross-band couplers. Ferrite isolators may not be required. Submit your plans to the City's Technical Representative for approval.

2.5 Unlicensed Band (License-Free) Radios. Unlicensed band radios and shared-band services, including, but not limited to those operating in the 902-928 MHz, 2.4-2.4835 GHz, 3.5 GHz, 4.9 GHz (public safety only) and 5 GHz bands are not allowed unless specifically authorized in the Tenant's (Licensee's) Lease (License). When authorized, Tenant (Licensee) shall not change operating frequencies without first getting approval from City. License-free radios are notorious for their poor quality in a harsh RF environment and specific make, model and technical specifications must be provided to the City's Technical Representative for approval. Additional protective devices, shielded CAT 6 cable and shielded NEMA cases may be required before such devices can be installed on the tower.

2.6 Receivers. The site may have relatively high radio frequency (RF) levels in all mobile radio bands. Your receiver amplifier must be robust to work in this environment. Ensure the receiver has good intermodulation (IM) rejection and high 1 dB compression point. If interference is encountered and we find the receiver is not performing up to the standards exhibited by state-of-the-art equipment, the City may require receiver improvements or upgrades before requiring changes to other tenant (licensee) equipment or configurations. This requirement applies to both new and existing tenants (licensees).

Filters are required for mobile radio receivers. Single receivers must employ a minimum of a single 7" diameter (or equivalent) cavity bandpass filter with a rejection curve corresponding to 1 dB insertion loss or better. Additional filter isolation may be required in special cases. Receiver multicouplers must use a bandpass filter (preselector) prior to the multicoupler amplifier.

2.7 Antennas. Select antennas designed to minimize passive intermodulation generation. Note that antennas that pass intermodulation tests at the factory may not provide good intermodulation rejection after years of exposure to heat, cold, vibration from wind, and humidity. Only new antennas are allowed for new installations. Select antennas specifically designed to reject intermodulation over the life of the antenna. Unless the antenna is a duplex configuration, transmit and receive antennas should be separated vertically on the tower. If the tower is owned by the City, the City will designate antenna locations. Antennas must be DC grounded to the tower for lightning protection.

2.8 Transmission Lines. Coaxial cable should be grounded at the top and the bottom of the run with an Andrew ground kit or equivalent. Ensure that ground conductors run straight down with no sharp bends because bends will increase the impedance of the grounding conductor. We also require that the line be marked so we can identify it later. We suggest bands of colored electrical tape at the bottom, middle and top of the run (similar to a resistor color code). Install a Huber-Suhner (or equivalent) coaxial surge arrester at the bulkhead. All exterior transmission lines must be solid outer conductors. If possible, receive and transmit lines should be separated by at

least one foot from cabinet to antenna.

2.9 Connectors. Connectors are often sources of RF leakage and passive intermodulation. UHF connectors (PL259) are not allowed on connections external to the radio cabinet. Type “N” connectors are allowed below 512 MHz. 7/16 DIN connectors should be used at 698 MHz and above and are required above 1.7 GHz. Connectors using dissimilar metal contacts or ferrous materials (e.g., nickel plating) are not allowed. The preferred connector uses a silver plated body with gold plated inner conductor. Brass bodies and silver or brass inner conductors are also allowed.

2.10 Additional Protective Devices May Be Required. The specifications above are minimum requirements. Additional protective devices may be required based upon evaluation of the following information:

- Theoretical TX mixes, particularly second and third order
- Antenna location and type
- Combiner/multicoupler configurations
- Transmitter specifications
- Receiver specifications
- Historical problems
- Transmitter to transmitter isolation
- Transmitter to antenna isolation
- Transmitter to receiver isolation
- Calculated and measured level of IM products
- Transmitter output power
- Transmitter ERP
- Spectrum analyzer measurements
- VSWR measurements
- Existing cavity selectivity
- Antenna to antenna proximity

3.0 FM & IBOC Broadcast (Part 73, ERP > 1 kW)

3.1 FM Broadcast Transmitters. FM and IBOC Broadcast transmitters will be either combined with other stations into a common antenna or stand-alone. If combined, the combiner design shall be approved by the City's Technical Representative. If stand-alone, the transmitter shall employ a bandpass cavity filter with the following minimum performance specifications:

3.1.1. Rejection. The bandpass filter shall provide the following minimum rejection for Class C, C0 and C1 stations:

- From Center +/- Minimum Rejection
- 800 kHz 22 dB
- 1 MHz 28 dB
- 1.2 MHz 32 dB

- 1.4 MHz 38 dB
- 1.6 MHz 43 dB

Note that four cavities are required to meet this specification. Class C2 and C3 stations may use three-cavity filters. These filter requirements also apply to stations with FM & IBOC combined outputs. A stand alone IBOC transmitter and antenna shall comply with the following requirements: IBOC ERP greater than 5,000 Watts: 4 cavity filter (see rejection above), IBOC ERP less than or equal to 5,000 Watts: 3 cavity filter.

3.1.2 Gain Flatness. +/-0.5 dB from +/-200 kHz from center frequency.

3.1.3. Group Delay Flatness. No greater than +/- 150 nanoseconds (symmetrical) in +/- 200 kHz (I.e., minimum to maximum delay difference shall be no greater than 300 nanoseconds in the band $f_c - 200$ kHz to $f_c + 200$ kHz).

3.1.4. VSWR. No greater than 1.1:1 in +/- 200 kHz (assuming filter is terminated in perfect 50 ohm load).

3.1.5. Insertion Loss. No greater than 0.3 dB in +/- 200 kHz.

The transmitter should comply with current FCC rules regarding out-of-band emissions at transmitter output (before the bandpass cavity filter). The external filter is required to provide further rejection of out-of-band emissions to ensure electromagnetic compatibility with other users on the site.

3.2 FM Broadcast Antennas. FM Broadcast antennas mounted below 250' AGL (center of radiation) shall employ short element spacing to reduce downward radiation and ensure compliance with CFR 47, Parts 1.1307-1.1310. This requirement does not apply to stations that employ a single element antenna. Examples of short element spacing are a 6 bay antenna with half-wavelength spacing or an 8 bay antenna with 3/4 wavelength spacing. Submit a plot of predicted power density versus distance at ground level for City's Technical Representative approval.

4.0 Full-Power Television

4.1 Full-power television transmitters shall include band pass and low pass filters.

4.2 For television transmitters, measured out-of-band emissions (including harmonics) greater than 3 MHz from the respective channel edge shall be more than 80 dB below the measured power over the entire channel. Both measurements shall use a 6 MHz measurement bandwidth.

5.0 Low Power Television (analog and digital)

5.1 Low Power Television (LPTV) transmitters and television translators must have low pass filters that attenuate all harmonics and spurious products at least 80 dB below the power

measured at the carrier frequency. To facilitate measurements of spurious products, each LPTV and translator transmitter shall have installed a line section and appropriate directional coupler element. For routine use, the line section may employ a standard DC element and be connected to a wattmeter capable of measuring forward and reflected power. In addition, the Tenant (Licensee) shall own or have access to an RF load capable of dissipating the full power of the transmitter for troubleshooting purposes.

6.0 Grounding, Bonding and Shielding

6.1 Shielding. RF interference can get directly into the electronics of a receiver or transmitter. Cabinet shielding must be in place and maintained to the manufacturer's specifications. Do not leave cabinet doors open because open cabinet doors defeat the shielding.

6.2 Grounding. Equipment grounding and bonding should be accomplished in accordance with Mil Std 188-124, Military Handbook 419 and Motorola R56. Contact the City's Technical Representative for guidance on grounding and bonding at your particular facility.

7.0 Site Work

7.1 Tower Work Insurance and Experience Requirements. All tower riggers or installers of antennas, transmission lines, cabinets, wiring or similar hardware or apparatus must meet the minimum basic requirements of the City. These will include, but not be limited to, the following:

- The rigging company must have a current Certificate of Insurance on file with the City. The certificate will include, but not be limited to the following:

1. General Comprehensive & Liability: \$5,000,000
2. Vehicle Liability: \$1,000,000
3. Workman's Compensation Insurance (By Statute)

- Demonstrated experience on similar tower types and similar work activity on similar towers within the past two years with a list of at least two recent clients or professional references with actual knowledge of experience and necessary qualifications, or in lieu thereof; previous working relationship with the City and known by the City's personnel.

City reserves the right, at its sole discretion, to reject the use of any person or tower rigging company on City-owned towers or properties.

7.2 Work Standards. The installation of any and all materials on the tower and in the accompanying shelter must be pre-authorized and approved by the City's Technical Representative. The following guidelines will be strictly enforced:

7.2.1 Equipment or cabinets mounted on platforms will be constructed of galvanized or stainless steel and will be securely attached to the tower members or platforms with J-bolts, U-

bolts or similar clamping devices which do not penetrate tower members or any part of the galvanized coating. All mounting hardware must be hot-dipped galvanized or stainless steel (NOT PLATED). All mounting nuts, bolts, washers or similar must be Grade 5 or better.

7.2.2 Antennas and the mounting thereof must be approved in advance of installation. Data in reference to antenna type, weight, wind loading, gain, bandwidth and mounting details must be provided to the City's Technical Representative and may not be modified or replaced without expressed written permission of City. Installation of antennas on City-owned towers may require a new structural study at the Tenant (Licensee)'s expense.

7.2.3 Transmission lines and hardware must be approved in advance of installation by the City's Technical Representative and must be specified as to manufacturer, size and type and shown on the City's New Tenant Questionnaire. All the mounting hardware must be of appropriate type and design to support the transmission lines with strain-reliefs installed at the manufacturer's recommended intervals. Under no circumstances will stainless steel automotive-type hose clamps be used to secure transmission lines or cables to tower members. Where not previously designated, all lines will be positioned on the tower to minimize wind loading and provide a minimum of obstruction to climbing or removal/replacement of other lines. Each line will be mounted independently of other lines on the tower. Cable trays, waveguide entrances, tower ladders, elevator rails and other similar members are to be kept clear of all cables on the tower. Stainless steel lashing ties are acceptable for use on the tower but are not to be used as strain reliefs.

7.2.4 Antenna jumper cables or cables to/from crossband couplers or similar devices on the tower will be kept to minimum required lengths and will be made of solid shield outer conductor cables with outer jackets capable of withstanding severe weather and ultraviolet rays. All such cable types must be pre-approved by the City.

7.2.5 UNDER NO CIRCUMSTANCES –

- will welding or drilling of tower members be allowed;
- will modifications to the tower, bridge, building entrance fittings or similar be permitted;
- will transmission line splices (a pair of connectors at other than the top or bottom of the run on the tower) be permitted except by prior approval or necessitated by damage only repairable by splicing;
- will any tampering, retuning, rerouting or other modifications be permitted to equipment owned by City or other tenants.

7.2.6 All installations will be performed in accordance with good engineering practice and within the guidelines of this document. Any deviation from these minimum requirements and technical standards must be approved in writing prior to installation or modification.

7.3 Removal of Unused Antennas and Lines. Tenant (Licensee) shall remove all unused antennas, transmission lines and associated mounting hardware from City's tower within 90 days of the date an antenna is no longer in service.

7.4 NO PRESENT INSTALLATION WILL BE "GRANDFATHERED" and must conform to these work standards within a reasonable time period to be determined by the City's Technical Representative. Periodic inspections may be performed to ensure that all installations meet technical standards.

8.0 Shelters

8.1 Cable Dressing Inside Building or Shelter. All wiring and cables within a given rack will be properly dressed and/or bundled with cable ties with excess cut close to the barbs. Twisted wire, tape, rope, twine, phone wire and similar bits of debris usually available on site ARE NOT ACCEPTABLE substitutes for proper securing hardware. All inter-rack cables and wiring must be properly routed and utilize the cable trays provided even if between adjacent racks. Overhead cables and RF lines must be easily removed or reworked within the cable trays. Proper care must be taken to ensure that new cables added to the trays are not stressed or intertwined with existing cables. OVERHEAD CABLES MAY NOT CROSS PERPENDICULARS OR BE SUSPENDED IN MID AIR WITHOUT SUPPORTS. NO SUPPORTS MAY BE INSTALLED WITHOUT PRIOR APPROVAL. All long cable runs must be properly identified at each end indicating the opposite cable end address. All cabling within the building must be cut to proper length except phasing harnesses, where required.

9.0 Towers

9.1 Tenant (Licensee) may not erect new towers without the City's prior written consent, which may be granted or denied in City's sole discretion, and towers that are approved may only be constructed after plans for the tower have been approved by the City and by the zoning authority.

9.2 New towers shall comply with TIA-222-G or the most recent edition adopted by the local zoning authority. Changes to an existing tower, including addition or replacement of antennas requires that TIA-222-G or the most recent edition be used. Tenant (Licensee)-owned towers that present an immediate safety hazard shall be corrected by Tenant (Licensee) regardless of the status of the current lease or the particular edition of TIA-222 in use at the time of tower construction. Installation of antennas on City-owned towers may require a new structural study at the Tenant (Licensee)'s expense.

10.0 Permits

10.1 Tenant (Licensee) shall comply with all local and Federal regulations. Tenant (Licensee) is responsible for acquiring all applicable permits, including, but not limited to FCC construction permits and building permits. Tenant (Licensee) is also responsible for performing any required studies, including RF exposure and RF interference studies required by the FCC, local government, and City. Tenant (Licensee) shall furnish all applicable permits, studies, and

approvals to the City for approval before starting any construction, including antenna installation.

11.0 Radio Frequency Safety

11.1 The engineering, design, configuration, installation, and maintenance of high power (> 1 kW ERP) radio facilities on the site shall be accomplished in a manner that minimizes downward radiation. Changes to proposed systems may be directed by City to comply with this objective.

11.2 Everyone on the site shall follow these guidelines:

- All personnel entering the site must be authorized
- Obey all posted signs
- Assume all antennas are active unless proven otherwise
- Before working on an antenna, notify the owner and disable the transmitter
- Use a radio frequency (RF) personal monitor when working near antennas
- Never operate transmitters without shields

11.3 Power densities on towers can be much higher than at ground level. For this reason, tower climbers should request power reductions from high-power tenants and carry RF personal monitors when climbing towers. The City's Technical Representative can tell you which transmitters should be turned down before climbing the tower.

11.4 Federal Government guidelines regarding human exposure to radio frequency energy are found in the Code of Federal Regulations (CFR) Title 47, Parts 1.1307-1.1310.



Figure 1 - Warning Sign to be Posted at Base of Tower
(Available from Tessco, Holaday, Narda and other Sources)

EXHIBIT C – SITE STUDY

RADIO FREQUENCY INTERFERENCE ANALYSIS REPORT

DEN Denver Arts

August 18, 2024

No harmful interference to existing public safety radio systems is predicted as a result of the proposed operations on this structure



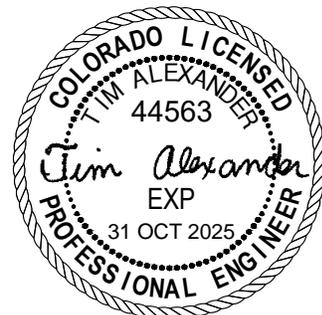
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Date: 2024.08.19 11:25:18 -0700'



SIGNED, 19 AUG 2024

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1.0 Executive Summary

This report presents a radio frequency interference (RFI) analysis which was performed on the DEN Denver Arts site. The RFI analysis consists of transmitter noise, receiver desensitization, intermodulation, harmonic and transmitter spurious output interference. The report consists of Sections that provide details of the communications site, antenna systems, operational frequencies and each interference analysis mode.

A summary of the interference analysis results is depicted in the following Table.

Interference Analysis Mode	Type Mix	Status	Summary	Worst-Case Margin (dB)
Transmitter Noise	N/A	Passed	No Interference was predicted	15.1
Receiver Desensitization	N/A	Passed	No Interference was predicted	50.4
Transmitter Intermodulation	1 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	2 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	3 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	4 Tx	Passed	No Interference was predicted	N/A
Transmitter Intermodulation	5 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	1 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	2 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	3 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	4 Tx	Passed	No Interference was predicted	N/A
Receiver Intermodulation	5 Tx	Passed	No Interference was predicted	N/A
Transmitter Harmonics	N/A	Passed	No Interference was predicted	N/A
Transmitter Spurious Output	N/A	Passed	No Interference was predicted	N/A
Interference Level Summing - C/(I+N)	N/A	Passed	No Interference was predicted	N/A
Wideband IM Spectral Analysis	N/A	N/A	No Analysis performed	N/A

The analysis was performed with the setup options depicted in the Table below.

Analysis	Description
Receiver Performance	Receiver Sensitivity Threshold
Receiver Bandwidth	Receiver Dependent
Antenna Patterns Considered	Yes
Measured Antenna Isolation Data	No
Filters/Multicouplers Considered	Yes
Number of Simultaneous Transmitters Mixed	5
Highest Intermodulation Order Tested	7
Condense Intermodulation Hit Quantity	Yes - 100000/Order
TX IM Bandwidth Multiplication	No
Tx/Rx Systems Excluded	None
Site File Name	DEN Denver Arts 081824.dta
Report File Name	DEN Denver Arts.docx
WirelessSiteRFI Software Version	10.1.20

2.0 Site Description

The communication systems located at this site are described in this section as well as the configuration of the antenna systems.

The site parameters are:

Site Name: DEN Denver Arts
Site Description: Building Mounted
Address: 1040 14th Street, Denver, CO 80202
Latitude: 39:44:42.7 N
Longitude: 104:59:54.1 W
Notes: This analysis is based on Verizon Wireless' proposed installation and licensed wireless operations in the vicinity of this site.

2.1 Communications Systems

System	Provider	Technology	Frequency Band
1	Verizon 700 MHz Upper C LTE	LTE	746 - 806 MHz - 700 MHz Band
2	Verizon Cellular B LTE	LTE	806 - 896 MHz - Land Mobile
3	Verizon PCS E LTE	LTE	1710 - 1990 MHz - PCS
4	Verizon PCS F LTE	LTE	1710 - 1990 MHz - PCS
5	Verizon AWS B LTE	LTE	1710 - 2155 MHz - AWS
6	Verizon AWS J LTE	LTE	1695 - 2180 MHz - AWS
7	Verizon CBRS	TD-LTE	3500 MHz - CBRS
8	Verizon C-Band	5G	3700 MHz
9	Verizon 28 GHz	5G	28 GHz 5G
10	DFD 150 MHz Receive Only Land Mobile Radio	FM Land Mobile	150 - 174 MHz - Land Mobile
11	DFD Public Safety Broadband	Mesh	4940 - 4944 MHz
12	DFD 900 MHz Microwave	Microwave	900 MHz Microwave
13	TMO 600 MHz B LTE	LTE	WT - 600 MHz Band
14	TMO 600 MHz C LTE	LTE	WT - 600 MHz Band
15	TMO 600 MHz D LTE	LTE	WT - 600 MHz Band
16	TMO 700 MHz Lower A LTE	LTE	746 - 806 MHz - 700 MHz Band
17	TMO PCS B LTE 15 MHz	LTE	1710 - 1990 MHz - PCS
18	TMO PCS C LTE 10 MHz	LTE	1710 - 1990 MHz - PCS
19	TMO PCS G LTE	LTE	1710 - 1990 MHz - PCS
20	TMO AWS A LTE	LTE	1710 - 2155 MHz - AWS
21	TMO AWS F LTE	LTE	1710 - 2155 MHz - AWS
22	TMO TD-LTE	TD-LTE	2500 - 2700 MHz - AWS
23	Denver City County - P25	800 MHz Trunking	806 - 896 MHz - Land Mobile
24	Denver City County - ASR	800 MHz Trunking	806 - 896 MHz - Land Mobile
25	Denver City County - RMRS	800 MHz Trunking	806 - 896 MHz - Land Mobile
26	Denver City County - Repeaters	800 MHz Trunking	806 - 896 MHz - Land Mobile
27	Denver City County - Simulcast	800 MHz Trunking	806 - 896 MHz - Land Mobile
28	Denver Fire Department Repeaters	700 MHz Trunked	769 - 805 MHz - Land Mobile

29	Conventional Systems	800 MHz Trunking	806 - 896 MHz - Land Mobile
30	Data Channels - DCC	800 MHz Trunking	806 - 896 MHz - Land Mobile
31	450 MHz Land Mobile Radio	FM Land Mobile	420 - 470 MHz - Land Mobile
32	450 MHz Land Mobile Radio - DPAC	FM Land Mobile	420 - 470 MHz - Land Mobile
33	150 MHz LMR	FM Land Mobile	150 - 174 MHz - Land Mobile

2.2 Antenna Systems

Ant #	Mfg	Antenna Model	Gain (dBd)	Hgt (ft)	Orient (deg)	Sector	Ant Use	Transmission Line Type	Line Loss (/100')	Line Length (ft)
1	JMA	SX08FRO128-01 00DT 700	8.55	73.5	135	A	Dplx	1/2 in. Foam	0.5	10
2	JMA	SX08FRO128-01 00DT 700	8.55	73.5	135	B	Dplx	1/2 in. Foam	0.5	10
3	JMA	SX08FRO128-01 00DT 700	8.55	73.5	195	C	Dplx	1/2 in. Foam	0.5	10
4	JMA	SX08FRO128-01 00DT 700	8.55	73.5	225	D	Dplx	1/2 in. Foam	0.5	10
5	JMA	SX08FRO128-01 00DT 850	8.55	73.5	135	A	Dplx	1/2 in. Foam	1.2	10
6	JMA	SX08FRO128-01 00DT 850	8.55	73.5	135	B	Dplx	1/2 in. Foam	1.2	10
7	JMA	SX08FRO128-01 00DT 850	8.55	73.5	195	C	Dplx	1/2 in. Foam	1.2	10
8	JMA	SX08FRO128-01 00DT 850	8.55	73.5	225	D	Dplx	1/2 in. Foam	1.2	10
9	JMA	SX08FRO128-01 00DT 1900	8.85	73.5	135	A	Dplx	1/2 in. Foam	0.5	10
10	JMA	SX08FRO128-01 00DT 1900	8.85	73.5	135	B	Dplx	1/2 in. Foam	0.5	10
11	JMA	SX08FRO128-01 00DT 1900	8.85	73.5	195	C	Dplx	1/2 in. Foam	0.5	10
12	JMA	SX08FRO128-01 00DT 1900	8.85	73.5	225	D	Dplx	1/2 in. Foam	0.5	10
13	JMA	SX08FRO128-01 00DT 1900	8.85	73.5	135	A	Dplx	1/2 in. Foam	0.5	10
14	JMA	SX08FRO128-01 00DT 1900	8.85	73.5	135	B	Dplx	1/2 in. Foam	0.5	10
15	JMA	SX08FRO128-01 00DT 1900	8.85	73.5	195	C	Dplx	1/2 in. Foam	0.5	10
16	JMA	SX08FRO128-01 00DT 1900	8.85	73.5	225	D	Dplx	1/2 in. Foam	0.5	10
17	JMA	SX08FRO128-01 00DT 2100	9.05	73.5	135	A	Dplx	1/2 in. Foam	0.5	10
18	JMA	SX08FRO128-01 00DT 2100	9.05	73.5	135	B	Dplx	1/2 in. Foam	0.5	10
19	JMA	SX08FRO128-01 00DT 2100	9.05	73.5	195	C	Dplx	1/2 in. Foam	0.5	10
20	JMA	SX08FRO128-01 00DT 2100	9.05	73.5	225	D	Dplx	1/2 in. Foam	0.5	10
21	JMA	SX08FRO128-01 00DT 2100	9.05	73.5	135	A	Dplx	1/2 in. Foam	0.5	10
22	JMA	SX08FRO128-01 00DT 2100	9.05	73.5	135	B	Dplx	1/2 in. Foam	0.5	10
23	JMA	SX08FRO128-01 00DT 2100	9.05	73.5	195	C	Dplx	1/2 in. Foam	0.5	10
24	JMA	SX08FRO128-01 00DT 2100	9.05	73.5	225	D	Dplx	1/2 in. Foam	0.5	10

25	JMA	SX08FRO128-01 00DT 3600	11.95	73.5	135	A	Tx/Rx	Integrated	0.1	0.1
26	JMA	SX08FRO128-01 00DT 3600	11.95	73.5	135	B	Tx/Rx	Integrated	0.1	0.1
27	JMA	SX08FRO128-01 00DT 3600	11.95	73.5	195	C	Tx/Rx	Integrated	0.1	0.1
28	JMA	SX08FRO128-01 00DT 3600	11.95	73.5	225	D	Tx/Rx	Integrated	0.1	0.1
29	Ericsson	AIR6449 2500 NR	21.35	73.5	135	A	Tx/Rx	Integrated	0.1	0.1
30	Ericsson	AIR6449 2500 NR	21.35	73.5	135	A	Tx/Rx	Integrated	0.1	0.1
31	Ericsson	AIR6449 2500 NR	21.35	73.5	210	A	Tx/Rx	Integrated	0.1	0.1
32	Other	SM6701 half array	21.85	73.5	0	A	Tx/Rx	Integrated	0.1	0.1
33	Other	Generic Omni	9	74	135		Rx	7/8 in. Foam	0.45	230
34	Other	Generic Omni	3	74	135		Tx/Rx	1/2 in. Foam	0.5	10
35	Other	Microwave Dish	32.2	74	135		Dplx	1/2 in. Foam	0.5	10
36	RFS	APXVAARR24_43-U- NA20-1-0-698+	13.17	74	135	A	Dplx	1/2 in. Foam	0.5	10
37	RFS	APXVAARR24_43-U- NA20-1-0-698+	13.17	74	135	A	Dplx	1/2 in. Foam	0.5	10
38	RFS	APXVAARR24_43-U- NA20-1-0-698+	13.17	74	135	A	Dplx	1/2 in. Foam	0.5	10
39	RFS	APXVAARR24_43-U- NA20-1-0-698+	13.17	74	135	A	Dplx	1/2 in. Foam	0.5	10
40	Andrew	SBNHH-1D65C 00DT 1920	15.5	74	135	A	Dplx	1/2 in. Foam	0.32	10
41	Andrew	NHH-65C-R2B 00DT 1900	15.17	74	135	A	Dplx	1/2 in. Foam	0.32	10
42	Andrew	NHH-65C-R2B 00DT 1900	15.17	74	135	A	Dplx	1/2 in. Foam	0.5	10
43	Andrew	SBNHH-1D65C 00DT 2110	16.2	74	135	A	Dplx	1/2 in. Foam	0.5	10
44	Ericsson	AIR3246	15.5	74	135	A	Dplx	1/2 in. Foam	0.5	10
45	Andrew	FFV4-65C-R3-V1 02DT 2500	16	74	135	A	Tx/Rx	1/2 in. Foam	0.5	10
46	Other	Generic Omni	10	206	0		Dplx	7/8 in. Foam	1.31	200
47	Other	Generic Omni	10	206	0		Dplx	7/8 in. Foam	1.31	200
48	Other	Generic Omni	10	206	0		Dplx	7/8 in. Foam	1.31	200
49	Other	Generic Omni	10	206	0		Dplx	7/8 in. Foam	1.31	200
50	Other	Generic Omni	10	206	0		Dplx	7/8 in. Foam	1.31	200
51	Other	Generic Omni	9	303	0		Dplx	7/8 in. Foam	0.45	230
52	Other	Generic Omni	10	206	0		Tx/Rx	7/8 in. Foam	1.31	200
53	Other	Generic Omni	10	206	0		Dplx	7/8 in. Foam	1.31	200
54	Other	Generic Omni	5.25	200	0		Dplx	7/8 in. Foam	1.01	230
55	Other	Generic Omni	5.25	200	0		Dplx	7/8 in. Foam	1.01	230
56	Other	Generic Omni	9	200	0		Tx/Rx	7/8 in. Foam	0.45	230

3.0 Transmitter Frequencies

Freq #	Ant #	Provider	Model	Technology	Channel Label	ID	Frequency	Power (Watts)	BW (kHz)
1	1	Verizon 700 MHz Upper C LTE	Generic	FM Land Mobile	VZ-1	A	751.00000	40	10000
2	2	Verizon 700 MHz Upper C LTE	Generic	FM Land Mobile	VZ-2	B	751.00000	40	10000
3	3	Verizon 700 MHz Upper C LTE	Generic	FM Land Mobile	VZ-3	C	751.00000	40	10000
4	4	Verizon 700 MHz Upper C LTE	Generic	FM Land Mobile	VZ-4	D	751.00000	40	10000
5	5	Verizon Cellular B LTE	Generic	FM Land Mobile	VZ-5	E	885.00000	40	10000
6	6	Verizon Cellular B LTE	Generic	FM Land Mobile	VZ-6	F	885.00000	40	10000
7	7	Verizon Cellular B LTE	Generic	FM Land Mobile	VZ-7	G	885.00000	40	10000
8	8	Verizon Cellular B LTE	Generic	FM Land Mobile	VZ-8	H	885.00000	40	10000
9	9	Verizon PCS E LTE	Generic	FM Land Mobile	VZ-9	I	1967.5000	40	5000
10	10	Verizon PCS E LTE	Generic	FM Land Mobile	VZ-10	J	1967.5000	40	5000
11	11	Verizon PCS E LTE	Generic	FM Land Mobile	VZ-11	K	1967.5000	40	5000
12	12	Verizon PCS E LTE	Generic	FM Land Mobile	VZ-12	L	1967.5000	40	5000
13	13	Verizon PCS F LTE	Generic	FM Land Mobile	VZ-13	M	1972.5000	40	5000
14	14	Verizon PCS F LTE	Generic	FM Land Mobile	VZ-14	N	1972.5000	40	5000
15	15	Verizon PCS F LTE	Generic	FM Land Mobile	VZ-15	O	1972.5000	40	5000
16	16	Verizon PCS F LTE	Generic	FM Land Mobile	VZ-16	P	1972.5000	40	5000
17	17	Verizon AWS B LTE	Generic	FM Land Mobile	VZ-17	Q	2125.0000	40	10000
18	18	Verizon AWS B LTE	Generic	FM Land Mobile	VZ-18	R	2125.0000	40	10000
19	19	Verizon AWS B LTE	Generic	FM Land Mobile	VZ-19	S	2125.0000	40	10000
20	20	Verizon AWS B LTE	Generic	FM Land Mobile	VZ-20	T	2125.0000	40	10000
21	21	Verizon AWS J LTE	Generic	FM Land Mobile	VZ-21	U	2175.0000	40	10000
22	22	Verizon AWS J LTE	Generic	FM Land Mobile	VZ-22	V	2175.0000	40	10000
23	23	Verizon AWS J LTE	Generic	FM Land Mobile	VZ-23	W	2175.0000	40	10000
24	24	Verizon AWS J LTE	Generic	FM Land Mobile	VZ-24	X	2175.0000	40	10000
25	25	Verizon CBRS	Generic	FM Land Mobile	VZ-25	Y	3560.0000	5	20000
26	25	Verizon CBRS	Generic	FM Land Mobile	VZ-26	Z	3580.0000	5	20000
27	25	Verizon CBRS	Generic	FM Land Mobile	VZ-27	AA	3600.0000	5	20000
28	26	Verizon CBRS	Generic	FM Land Mobile	VZ-28	AB	3560.0000	5	20000
29	26	Verizon CBRS	Generic	FM Land Mobile	VZ-29	AC	3580.0000	5	20000
30	26	Verizon CBRS	Generic	FM Land Mobile	VZ-30	AD	3600.0000	5	20000
31	27	Verizon CBRS	Generic	FM Land Mobile	VZ-31	AE	3560.0000	5	20000
32	27	Verizon CBRS	Generic	FM Land Mobile	VZ-32	AF	3580.0000	5	20000
33	27	Verizon CBRS	Generic	FM Land Mobile	VZ-33	AG	3600.0000	5	20000
34	28	Verizon CBRS	Generic	FM Land Mobile	VZ-34	AH	3560.0000	5	20000
35	28	Verizon CBRS	Generic	FM Land Mobile	VZ-35	AI	3580.0000	5	20000
36	28	Verizon CBRS	Generic	FM Land Mobile	VZ-36	AJ	3600.0000	5	20000
37	29	Verizon C-Band	Generic	FM Land Mobile	VZ-37	AK	3725.0000	200	50000
38	29	Verizon C-Band	Generic	FM Land Mobile	VZ-38	AL	3775.0000	200	50000
39	29	Verizon C-Band	Generic	FM Land Mobile	VZ-39	AM	3825.0000	200	50000
40	30	Verizon C-Band	Generic	FM Land Mobile	VZ-40	AN	3725.0000	200	50000
41	30	Verizon C-Band	Generic	FM Land Mobile	VZ-41	AO	3775.0000	200	50000
42	30	Verizon C-Band	Generic	FM Land Mobile	VZ-42	AP	3825.0000	200	50000
43	31	Verizon C-Band	Generic	FM Land Mobile	VZ-43	AQ	3725.0000	200	50000
44	31	Verizon C-Band	Generic	FM Land Mobile	VZ-44	AR	3775.0000	200	50000
45	31	Verizon C-Band	Generic	FM Land Mobile	VZ-45	AS	3825.0000	200	50000
46	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-46	AT	27500.0000	1.6	50000
47	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-47	AU	27525.0000	1.6	50000
48	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-48	AV	27575.0000	1.6	50000
49	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-49	AW	27625.0000	1.6	50000
50	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-50	AX	27675.0000	1.6	50000
51	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-51	AY	27725.0000	1.6	50000
52	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-52	AZ	27775.0000	1.6	50000
53	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-53	BA	27825.0000	1.6	50000
54	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-54	BB	27875.0000	1.6	50000
55	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-55	BC	27925.0000	1.6	50000

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56	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-56	BD	27975.0000	1.6	50000
57	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-57	BE	28025.0000	1.6	50000
58	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-58	BF	28075.0000	1.6	50000
59	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-59	BG	28125.0000	1.6	50000
60	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-60	BH	28175.0000	1.6	50000
61	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-61	BI	28225.0000	1.6	50000
62	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-62	BJ	28275.0000	1.6	50000
63	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-63	BK	28325.0000	1.6	50000
64	34	DFD Public Safety Broadband	Generic	FM Land Mobile	DFD-2	BM	4942.0000	10	4000
65	35	DFD 900 MHz Microwave	Generic	FM Land Mobile	DFD-3	BN	928.75625	0.63	300
66	36	TMO 600 MHz B LTE	Generic	FM Land Mobile	TMO-1	BO	624.50000	40	5000
67	37	TMO 600 MHz C LTE	Generic	FM Land Mobile	TMO-2	BP	629.50000	40	5000
68	38	TMO 600 MHz D LTE	Generic	FM Land Mobile	TMO-3	BQ	634.50000	40	5000
69	39	TMO 700 MHz Lower A LTE	Generic	FM Land Mobile	TMO-4	BR	731.00000	40	5000
70	40	TMO PCS B LTE 15 MHz	Generic	FM Land Mobile	TMO-5	BS	1957.5000	100	15000
71	41	TMO PCS C LTE 10 MHz	Generic	FM Land Mobile	TMO-6	BT	1985.0000	100	10000
72	42	TMO PCS G LTE	Generic	FM Land Mobile	TMO-7	BU	1992.5000	100	5000
73	43	TMO AWS A LTE	Generic	FM Land Mobile	TMO-8	BV	2115.0000	40	10000
74	44	TMO AWS F LTE	Generic	FM Land Mobile	TMO-9	BW	2150.0000	40	10000
75	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-10	BX	2518.4000	80	20000
76	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-11	BY	2538.2000	80	20000
77	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-12	BZ	2558.0000	80	20000
78	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-13	CA	2598.0000	80	20000
79	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-14	CB	2628.8000	40	20000
80	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-15	CC	2648.6000	40	20000
81	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-16	CD	2668.4000	40	20000
82	46	Denver City County - P25	Generic	FM Land Mobile	DCC-1	CE	852.37500	100	12.5
83	46	Denver City County - P25	Generic	FM Land Mobile	DCC-2	CF	852.65000	100	12.5
84	46	Denver City County - P25	Generic	FM Land Mobile	DCC-3	CG	853.27500	100	12.5
85	46	Denver City County - P25	Generic	FM Land Mobile	DCC-4	CH	853.72500	100	12.5
86	46	Denver City County - P25	Generic	FM Land Mobile	DCC-5	CI	851.56250	100	12.5
87	46	Denver City County - P25	Generic	FM Land Mobile	DCC-6	CJ	853.15000	100	12.5
88	46	Denver City County - P25	Generic	FM Land Mobile	DCC-7	CK	853.42500	100	12.5
89	46	Denver City County - P25	Generic	FM Land Mobile	DCC-8	CL	854.58750	100	12.5
90	46	Denver City County - P25	Generic	FM Land Mobile	DCC-9	CM	856.48750	100	12.5
91	46	Denver City County - P25	Generic	FM Land Mobile	DCC-10	CN	857.23750	100	12.5
92	46	Denver City County - P25	Generic	FM Land Mobile	DCC-11	CO	858.23750	100	12.5
93	46	Denver City County - P25	Generic	FM Land Mobile	DCC-12	CP	852.12500	100	12.5
94	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-1	CQ	859.26250	100	25
95	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-2	CR	858.71250	100	25
96	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-3	CS	857.13750	100	25
97	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-4	CT	856.76750	100	25
98	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-5	CU	856.21250	100	25
99	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-6	CV	855.98750	100	25

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100	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-7	CW	855.48750	100	25
101	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-8	CX	855.23750	100	25
102	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-9	CY	854.43750	100	25
103	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-10	CZ	853.86250	100	25
104	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-11	DA	853.32500	100	25
105	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-12	DB	852.77500	100	25
106	48	Denver City County - RMRS	Generic	FM Land Mobile	RMRS-1	DC	858.08750	100	25
107	48	Denver City County - RMRS	Generic	FM Land Mobile	RMRS-2	DD	858.33750	100	25
108	48	Denver City County - RMRS	Generic	FM Land Mobile	RMRS-3	DE	859.08750	100	25
109	48	Denver City County - RMRS	Generic	FM Land Mobile	RMRS-4	DF	859.63750	100	25
110	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-1	DG	851.58750	100	25
111	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-2	DH	851.88750	100	25
112	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-3	DI	852.86250	100	25
113	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-4	DJ	853.08750	100	25
114	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-5	DK	854.98750	100	25
115	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-6	DL	855.06250	100	25
116	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-7	DM	855.53750	100	25
117	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-8	DN	857.48750	100	25
118	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-9	DO	858.46250	100	25
119	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-10	DP	858.48750	100	25
120	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-11	DQ	859.23750	100	25
121	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-12	DR	859.46250	100	25
122	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-13	DS	859.48750	100	25
123	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-14	DT	859.58750	100	25
124	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-15	DU	859.73750	100	25
125	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-1	DV	859.71250	100	25
126	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-2	DW	859.61250	100	25
127	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-3	DX	859.21250	100	25
128	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-4	DY	856.13750	100	25
129	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-5	DZ	858.21250	100	25
130	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-6	EA	857.73750	100	25
131	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-7	EB	858.13750	100	25
132	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-8	EC	857.46250	100	25
133	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-9	ED	857.06250	100	25

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134	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-10	EE	856.71250	100	25
135	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-11	EF	856.63750	100	25
136	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-12	EG	856.23750	100	25
137	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-13	EH	858.73750	100	25
138	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-14	EI	855.73750	100	25
139	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-15	EJ	855.46250	100	25
140	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-16	EK	854.56250	100	25
141	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-17	EL	854.06250	100	25
142	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-1	EM	799.31875	100	11
143	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-2	EN	799.85625	100	11
144	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-3	EO	800.50625	100	11
145	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-4	EP	800.75625	100	11
146	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-5	EQ	801.18125	100	11
147	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-6	ER	801.43125	100	11
148	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-7	ES	802.43125	100	11
149	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-8	ET	802.68125	100	11
150	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-9	EU	799.86875	100	11
151	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-10	EV	800.51875	100	11
152	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-11	EW	800.76875	100	11
153	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-12	EX	801.19375	100	11
154	52	Conventional Systems	Generic	FM Land Mobile	8CALL90	EY	851.01250	100	25
155	52	Conventional Systems	Generic	FM Land Mobile	8TAC91	EZ	851.51250	100	25
156	52	Conventional Systems	Generic	FM Land Mobile	8TAC92	FA	852.01250	100	25
157	52	Conventional Systems	Generic	FM Land Mobile	8TAC93	FB	852.51250	100	25
158	52	Conventional Systems	Generic	FM Land Mobile	8TAC94	FC	853.01250	100	25
159	52	Conventional Systems	Generic	FM Land Mobile	STAC	FD	853.78750	100	26
160	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-1	FE	855.91250	100	12.5
161	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-2	FF	856.78750	100	12.5
162	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-3	FG	855.68750	100	12.5
163	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-4	FH	854.23750	100	12.5
164	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-5	FI	851.18750	100	12.5
165	54	450 MHz Land Mobile Radio	Generic	FM Land Mobile	CLEER	FJ	460.42500	100	11
166	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-1	FK	460.56250	100	11
167	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-2	FL	460.63750	100	11
168	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-3	FM	458.16250	100	11
169	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-4	FN	458.51250	100	11
170	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-5	FO	458.60000	100	11
171	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-6	FP	458.65000	100	11
172	56	150 MHz LMR	Generic	FM Land Mobile	VLAW31	FQ	155.47500	100	11
173	56	150 MHz LMR	Generic	FM Land Mobile	VMED28	FR	155.34000	100	11

4.0 Receiver Frequencies

Freq #	Ant #	Provider	Model	Technology	Channel Label	ID	Frequency	Sen (dBm)	BW (kHz)
1	1	Verizon 700 MHz Upper C LTE	Generic	FM Land Mobile	VZ-1	A	781.00000	-123	10000
2	2	Verizon 700 MHz Upper C LTE	Generic	FM Land Mobile	VZ-2	B	781.00000	-123	10000
3	3	Verizon 700 MHz Upper C LTE	Generic	FM Land Mobile	VZ-3	C	781.00000	-123	10000
4	4	Verizon 700 MHz Upper C LTE	Generic	FM Land Mobile	VZ-4	D	781.00000	-123	10000
5	5	Verizon Cellular B LTE	Generic	FM Land Mobile	VZ-5	E	840.00000	-123	10000
6	6	Verizon Cellular B LTE	Generic	FM Land Mobile	VZ-6	F	840.00000	-123	10000
7	7	Verizon Cellular B LTE	Generic	FM Land Mobile	VZ-7	G	840.00000	-123	10000
8	8	Verizon Cellular B LTE	Generic	FM Land Mobile	VZ-8	H	840.00000	-123	10000
9	9	Verizon PCS E LTE	Generic	FM Land Mobile	VZ-9	I	1887.5000	-123	5000
10	10	Verizon PCS E LTE	Generic	FM Land Mobile	VZ-10	J	1887.5000	-123	5000
11	11	Verizon PCS E LTE	Generic	FM Land Mobile	VZ-11	K	1887.5000	-123	5000
12	12	Verizon PCS E LTE	Generic	FM Land Mobile	VZ-12	L	1887.5000	-123	5000
13	13	Verizon PCS F LTE	Generic	FM Land Mobile	VZ-13	M	1892.5000	-123	5000
14	14	Verizon PCS F LTE	Generic	FM Land Mobile	VZ-14	N	1892.5000	-123	5000
15	15	Verizon PCS F LTE	Generic	FM Land Mobile	VZ-15	O	1892.5000	-123	5000
16	16	Verizon PCS F LTE	Generic	FM Land Mobile	VZ-16	P	1892.5000	-123	5000
17	17	Verizon AWS B LTE	Generic	FM Land Mobile	VZ-17	Q	1725.0000	-123	10000
18	18	Verizon AWS B LTE	Generic	FM Land Mobile	VZ-18	R	1725.0000	-123	10000
19	19	Verizon AWS B LTE	Generic	FM Land Mobile	VZ-19	S	1725.0000	-123	10000
20	20	Verizon AWS B LTE	Generic	FM Land Mobile	VZ-20	T	1725.0000	-123	10000
21	21	Verizon AWS J LTE	Generic	FM Land Mobile	VZ-21	U	1775.0000	-123	10000
22	22	Verizon AWS J LTE	Generic	FM Land Mobile	VZ-22	V	1775.0000	-123	10000
23	23	Verizon AWS J LTE	Generic	FM Land Mobile	VZ-23	W	1775.0000	-123	10000
24	24	Verizon AWS J LTE	Generic	FM Land Mobile	VZ-24	X	1775.0000	-123	10000
25	25	Verizon CBRS	Generic	FM Land Mobile	VZ-25	Y	3560.0000	-123	20000
26	25	Verizon CBRS	Generic	FM Land Mobile	VZ-26	Z	3580.0000	-123	20000
27	25	Verizon CBRS	Generic	FM Land Mobile	VZ-27	AA	3600.0000	-123	20000
28	26	Verizon CBRS	Generic	FM Land Mobile	VZ-28	AB	3560.0000	-123	20000
29	26	Verizon CBRS	Generic	FM Land Mobile	VZ-29	AC	3580.0000	-123	20000
30	26	Verizon CBRS	Generic	FM Land Mobile	VZ-30	AD	3600.0000	-123	20000
31	27	Verizon CBRS	Generic	FM Land Mobile	VZ-31	AE	3560.0000	-123	20000
32	27	Verizon CBRS	Generic	FM Land Mobile	VZ-32	AF	3580.0000	-123	20000
33	27	Verizon CBRS	Generic	FM Land Mobile	VZ-33	AG	3600.0000	-123	20000
34	28	Verizon CBRS	Generic	FM Land Mobile	VZ-34	AH	3560.0000	-123	20000
35	28	Verizon CBRS	Generic	FM Land Mobile	VZ-35	AI	3580.0000	-123	20000
36	28	Verizon CBRS	Generic	FM Land Mobile	VZ-36	AJ	3600.0000	-123	20000
37	29	Verizon C-Band	Generic	FM Land Mobile	VZ-37	AK	3725.0000	-123	50000
38	29	Verizon C-Band	Generic	FM Land Mobile	VZ-38	AL	3775.0000	-123	50000
39	29	Verizon C-Band	Generic	FM Land Mobile	VZ-39	AM	3825.0000	-123	50000
40	30	Verizon C-Band	Generic	FM Land Mobile	VZ-40	AN	3725.0000	-123	50000
41	30	Verizon C-Band	Generic	FM Land Mobile	VZ-41	AO	3775.0000	-123	50000
42	30	Verizon C-Band	Generic	FM Land Mobile	VZ-42	AP	3825.0000	-123	50000
43	31	Verizon C-Band	Generic	FM Land Mobile	VZ-43	AQ	3725.0000	-123	50000
44	31	Verizon C-Band	Generic	FM Land Mobile	VZ-44	AR	3775.0000	-123	50000
45	31	Verizon C-Band	Generic	FM Land Mobile	VZ-45	AS	3825.0000	-123	50000
46	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-46	AT	27500.0000	-100	50000
47	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-47	AU	27525.0000	-100	50000
48	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-48	AV	27575.0000	-100	50000
49	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-49	AW	27625.0000	-100	50000
50	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-50	AX	27675.0000	-100	50000
51	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-51	AY	27725.0000	-100	50000
52	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-52	AZ	27775.0000	-100	50000
53	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-53	BA	27825.0000	-100	50000
54	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-54	BB	27875.0000	-100	50000
55	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-55	BC	27925.0000	-100	50000
56	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-56	BD	27975.0000	-100	50000

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57	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-57	BE	28025.0000	-100	50000
58	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-58	BF	28075.0000	-100	50000
59	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-59	BG	28125.0000	-100	50000
60	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-60	BH	28175.0000	-100	50000
61	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-61	BI	28225.0000	-100	50000
62	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-62	BJ	28275.0000	-100	50000
63	32	Verizon 28 GHz	Generic	FM Land Mobile	VZ-63	BK	28325.0000	-100	50000
64	33	DFD 150 MHz Receive Only Land Mobile Radio	Generic	FM Land Mobile	DFD-1	BL	154.07000	-116	11
65	34	DFD Public Safety Broadband	Generic	FM Land Mobile	DFD-2	BM	4942.0000	-123	4000
66	35	DFD 900 MHz Microwave	Generic	FM Land Mobile	DFD-3	BN	952.72625	-123	300
67	36	TMO 600 MHz B LTE	Generic	FM Land Mobile	TMO-1	BO	670.50000	-123	5000
68	37	TMO 600 MHz C LTE	Generic	FM Land Mobile	TMO-2	BP	675.50000	-123	5000
69	38	TMO 600 MHz D LTE	Generic	FM Land Mobile	TMO-3	BQ	680.50000	-123	5000
70	39	TMO 700 MHz Lower A LTE	Generic	FM Land Mobile	TMO-4	BR	701.00000	-123	5000
71	40	TMO PCS B LTE 15 MHz	Generic	FM Land Mobile	TMO-5	BS	1877.5000	-123	15000
72	41	TMO PCS C LTE 10 MHz	Generic	FM Land Mobile	TMO-6	BT	1905.0000	-123	10000
73	42	TMO PCS G LTE	Generic	FM Land Mobile	TMO-7	BU	1912.5000	-123	5000
74	43	TMO AWS A LTE	Generic	FM Land Mobile	TMO-8	BV	1715.0000	-123	10000
75	44	TMO AWS F LTE	Generic	FM Land Mobile	TMO-9	BW	1750.0000	-123	10000
76	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-10	BX	2518.4000	-123	20000
77	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-11	BY	2538.2000	-123	20000
78	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-12	BZ	2558.0000	-123	20000
79	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-13	CA	2598.0000	-123	20000
80	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-14	CB	2628.8000	-123	20000
81	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-15	CC	2648.6000	-123	20000
82	45	TMO TD-LTE	Generic	FM Land Mobile	TMO-16	CD	2668.4000	-123	20000
83	46	Denver City County - P25	Generic	FM Land Mobile	DCC-1	CE	807.37500	-116	12.5
84	46	Denver City County - P25	Generic	FM Land Mobile	DCC-2	CF	807.65000	-116	12.5
85	46	Denver City County - P25	Generic	FM Land Mobile	DCC-3	CG	808.27500	-116	12.5
86	46	Denver City County - P25	Generic	FM Land Mobile	DCC-4	CH	808.72500	-116	12.5
87	46	Denver City County - P25	Generic	FM Land Mobile	DCC-5	CI	806.56250	-116	12.5
88	46	Denver City County - P25	Generic	FM Land Mobile	DCC-6	CJ	808.15000	-116	12.5
89	46	Denver City County - P25	Generic	FM Land Mobile	DCC-7	CK	808.42500	-116	12.5
90	46	Denver City County - P25	Generic	FM Land Mobile	DCC-8	CL	809.58750	-116	12.5
91	46	Denver City County - P25	Generic	FM Land Mobile	DCC-9	CM	811.48750	-116	12.5
92	46	Denver City County - P25	Generic	FM Land Mobile	DCC-10	CN	812.23750	-116	12.5
93	46	Denver City County - P25	Generic	FM Land Mobile	DCC-11	CO	813.23750	-116	12.5
94	46	Denver City County - P25	Generic	FM Land Mobile	DCC-12	CP	807.12500	-116	12.5
95	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-1	CQ	814.26250	-116	25
96	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-2	CR	813.71250	-116	25
97	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-3	CS	812.13750	-116	25
98	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-4	CT	811.73750	-116	25
99	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-5	CU	811.21250	-116	25

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100	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-6	CV	810.98750	-116	25
101	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-7	CW	810.48750	-116	25
102	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-8	CX	810.23750	-116	25
103	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-9	CY	809.43750	-116	25
104	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-10	CZ	808.86250	-116	25
105	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-11	DA	808.32500	-116	25
106	47	Denver City County - ASR	Generic	FM Land Mobile	ASR-12	DB	807.77500	-116	25
107	48	Denver City County - RMRS	Generic	FM Land Mobile	RMRS-1	DC	813.08750	-116	25
108	48	Denver City County - RMRS	Generic	FM Land Mobile	RMRS-2	DD	813.33750	-116	25
109	48	Denver City County - RMRS	Generic	FM Land Mobile	RMRS-3	DE	814.08750	-116	25
110	48	Denver City County - RMRS	Generic	FM Land Mobile	RMRS-4	DF	814.63750	-116	25
111	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-1	DG	806.58750	-116	25
112	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-2	DH	806.88750	-116	25
113	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-3	DI	807.86250	-116	25
114	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-4	DJ	808.08750	-116	25
115	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-5	DK	809.98750	-116	25
116	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-6	DL	810.06250	-116	25
117	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-7	DM	810.53750	-116	25
118	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-8	DN	812.48750	-116	25
119	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-9	DO	813.46250	-116	25
120	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-10	DP	813.48750	-116	25
121	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-11	DQ	814.23750	-116	25
122	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-12	DR	814.46250	-116	25
123	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-13	DS	814.48750	-116	25
124	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-14	DT	814.58750	-116	25
125	49	Denver City County - Repeaters	Generic	FM Land Mobile	RPT-15	DU	814.73750	-116	25
126	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-1	DV	814.71250	-116	25
127	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-2	DW	814.61250	-116	25
128	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-3	DX	814.21250	-116	25
129	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-4	DY	811.13750	-116	25
130	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-5	DZ	813.21250	-116	25
131	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-6	EA	812.73750	-116	25
132	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-7	EB	813.13750	-116	25
133	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-8	EC	812.46250	-116	25

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134	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-9	ED	812.06250	-116	25
135	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-10	EE	811.71250	-116	25
136	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-11	EF	811.63750	-116	25
137	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-12	EG	811.23750	-116	25
138	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-13	EH	813.73750	-116	25
139	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-14	EI	810.73750	-116	25
140	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-15	EJ	810.46250	-116	25
141	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-16	EK	809.56250	-116	25
142	50	Denver City County - Simulcast	Generic	FM Land Mobile	SIM-17	EL	809.06250	-116	25
143	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-1	EM	769.31875	-116	1
144	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-2	EN	769.85625	-116	11
145	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-3	EO	770.50625	-116	11
146	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-4	EP	770.75625	-116	11
147	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-5	EQ	771.18125	-116	11
148	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-6	ER	771.43125	-116	11
149	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-7	ES	772.43125	-116	11
150	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-8	ET	772.68125	-116	11
151	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-9	EU	769.86875	-116	11
152	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-10	EV	770.51875	-116	11
153	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-11	EW	770.76875	-116	11
154	51	Denver Fire Department Repeaters	Generic	FM Land Mobile	DFD-12	EX	771.19375	-116	11
155	52	Conventional Systems	Generic	FM Land Mobile	8CALL90	EY	851.01250	-116	25
156	52	Conventional Systems	Generic	FM Land Mobile	8TAC91	EZ	851.51250	-116	25
157	52	Conventional Systems	Generic	FM Land Mobile	8TAC92	FA	852.01250	-116	25
158	52	Conventional Systems	Generic	FM Land Mobile	8TAC93	FB	852.51250	-116	25
159	52	Conventional Systems	Generic	FM Land Mobile	8TAC94	FC	853.01250	-116	25
160	52	Conventional Systems	Generic	FM Land Mobile	STAC	FD	853.78750	-116	25
161	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-1	FE	810.91250	-116	25
162	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-2	FF	811.78750	-116	25
163	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-3	FG	810.68750	-116	25
164	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-4	FH	809.23750	-116	25
165	53	Data Channels - DCC	Generic	FM Land Mobile	DATA-5	FI	806.18750	-116	25
166	54	450 MHz Land Mobile Radio	Generic	FM Land Mobile	CLEER	FJ	465.42500	-116	11
167	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-1	FK	465.56250	-116	11
168	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-2	FL	465.63750	-116	11
169	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-3	FM	463.16250	-116	11
170	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-4	FN	463.51250	-116	11
171	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-5	FO	463.60000	-116	11
172	55	450 MHz Land Mobile Radio - DPAC	Generic	FM Land Mobile	DPAC-6	FP	463.65000	-116	11
173	56	150 MHz LMR	Generic	FM Land Mobile	VLAW31	FQ	155.47500	-116	11

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174	56	150 MHz LMR	Generic	FM Land Mobile	VMED28	FR	155.34000	-116	11
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5.0 Transmitter Noise Analysis

Transmitter noise interference occurs because a transmitter radiates energy on its operating frequency as well as frequencies above and below the assigned frequency. The energy that is radiated above and below the assigned frequency is known as sideband noise energy and extends for several megahertz on either side of the operating frequency. This undesired noise energy can fall within the passband of a nearby receiver even if the receiver's operating frequency is several megahertz away. The transmitter noise appears as "on-channel" noise interference and cannot be filtered out at the receiver. It is on the receiver's operating frequency and competes with the desired signal, which in effect, degrades the operational performance.

The analysis predicts each transmitter's noise signal level present at the input of each receiver. It takes into account the transmitter's noise characteristics, frequency separation, power output, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in both systems. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required, if any, to prevent receiver performance degradation caused by transmitter noise interference. The Table below depicts the results of this analysis. For each receiver, the transmitter that has the worst-case impact is displayed. The Signal Margin represents the margin in dB, before the receiver's performance is degraded. A negative number indicates that the performance is degraded and the value indicates how much additional isolation is required to prevent receiver performance degradation.

Receiver Provider	Receive Channel	Receive Frequency (MHz)	Transmitter Provider	Transmit Channel	Transmit Frequency (MHz)	Attn Required (dB)	Attn Provided (dB)	Signal Margin (dB)
Verizon 700 MHz Upper C LTE	VZ-1	781.00000	Verizon 700 MHz Upper C LTE	VZ-1	751.00000	65.3	140.3	75
Verizon 700 MHz Upper C LTE	VZ-2	781.00000	Verizon 700 MHz Upper C LTE	VZ-2	751.00000	65.3	140.3	75
Verizon 700 MHz Upper C LTE	VZ-3	781.00000	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	65.3	140.3	75
Verizon 700 MHz Upper C LTE	VZ-4	781.00000	Verizon 700 MHz Upper C LTE	VZ-4	751.00000	65.3	140.3	75
Verizon Cellular B LTE	VZ-5	840.00000	DFD 900 MHz Microwave	DFD-3	928.75625	40.6	125.8	85.2
Verizon Cellular B LTE	VZ-6	840.00000	DFD 900 MHz Microwave	DFD-3	928.75625	40.6	153	112.4
Verizon Cellular B LTE	VZ-7	840.00000	Denver City County - P25	DCC-1	852.37500	73.6	181.3	107.7
Verizon Cellular B LTE	VZ-8	840.00000	Verizon Cellular B LTE	VZ-8	885.00000	58.6	171.7	113
Verizon PCS E LTE	VZ-9	1887.5000	Verizon PCS E LTE	VZ-9	1967.5000	61.6	137.1	75.5
Verizon PCS E LTE	VZ-10	1887.5000	Verizon PCS E LTE	VZ-10	1967.5000	61.6	137.1	75.5

Verizon PCS E LTE	VZ-11	1887.5000	Verizon PCS E LTE	VZ-11	1967.5000	61.6	137.1	75.5
Verizon PCS E LTE	VZ-12	1887.5000	Verizon PCS E LTE	VZ-12	1967.5000	61.6	137.1	75.5
Verizon PCS F LTE	VZ-13	1892.5000	Verizon PCS F LTE	VZ-13	1972.5000	61.6	133.6	71.9
Verizon PCS F LTE	VZ-14	1892.5000	Verizon PCS F LTE	VZ-14	1972.5000	61.6	133.6	71.9
Verizon PCS F LTE	VZ-15	1892.5000	Verizon PCS F LTE	VZ-15	1972.5000	61.6	133.6	71.9
Verizon PCS F LTE	VZ-16	1892.5000	Verizon PCS F LTE	VZ-16	1972.5000	61.6	133.6	71.9
Verizon AWS B LTE	VZ-17	1725.0000	Verizon AWS B LTE	VZ-17	2125.0000	61.6	169	107.4
Verizon AWS B LTE	VZ-18	1725.0000	Verizon AWS B LTE	VZ-18	2125.0000	61.6	169	107.4
Verizon AWS B LTE	VZ-19	1725.0000	Verizon AWS B LTE	VZ-19	2125.0000	61.6	169	107.4
Verizon AWS B LTE	VZ-20	1725.0000	Verizon AWS B LTE	VZ-20	2125.0000	61.6	169	107.4
Verizon AWS J LTE	VZ-21	1775.0000	Verizon AWS J LTE	VZ-21	2175.0000	61.6	172	110.4
Verizon AWS J LTE	VZ-22	1775.0000	Verizon AWS J LTE	VZ-22	2175.0000	61.6	172	110.4
Verizon AWS J LTE	VZ-23	1775.0000	Verizon AWS J LTE	VZ-23	2175.0000	61.6	172	110.4
Verizon AWS J LTE	VZ-24	1775.0000	Verizon AWS J LTE	VZ-24	2175.0000	61.6	172	110.4
DFD 150 MHz Receive Only Land Mobile Radio	DFD-1	154.07000	150 MHz LMR	VMED28	155.34000	72	165.2	93.2
DFD 900 MHz Microwave	DFD-3	952.72625	Denver City County - P25	DCC-1	852.37500	65.6	204.7	139.1
TMO 600 MHz B LTE	TMO-1	670.50000	450 MHz Land Mobile Radio	CLEER	460.42500	59	150.9	91.9
TMO 600 MHz C LTE	TMO-2	675.50000	450 MHz Land Mobile Radio	CLEER	460.42500	59	150.9	91.9
TMO 600 MHz D LTE	TMO-3	680.50000	450 MHz Land Mobile Radio	CLEER	460.42500	59	150.9	91.9
TMO 700 MHz Lower A LTE	TMO-4	701.00000	450 MHz Land Mobile Radio	CLEER	460.42500	59	150.9	91.9
TMO PCS B LTE 15 MHz	TMO-5	1877.5000	TMO PCS B LTE 15 MHz	TMO-5	1957.5000	65.6	140	74.4
TMO PCS C LTE 10 MHz	TMO-6	1905.0000	TMO PCS C LTE 10 MHz	TMO-6	1985.0000	65.6	118.6	53
TMO PCS G LTE	TMO-7	1912.5000	TMO PCS G LTE	TMO-7	1992.5000	65.6	112.2	46.6
TMO AWS A LTE	TMO-8	1715.0000	TMO AWS A LTE	TMO-8	2115.0000	61.6	169	107.3
TMO AWS F LTE	TMO-9	1750.0000	TMO AWS F LTE	TMO-9	2150.0000	61.6	169.7	108.1
TMO TD-LTE	TMO-10	2518.4000	TMO TD-LTE	TMO-11	2538.2000	73.5	88.6	15.1
TMO TD-LTE	TMO-11	2538.2000	TMO TD-LTE	TMO-12	2558.0000	73.5	88.6	15.1
TMO TD-LTE	TMO-12	2558.0000	TMO TD-LTE	TMO-11	2538.2000	73.5	110.2	36.7
TMO TD-LTE	TMO-13	2598.0000	TMO TD-LTE	TMO-14	2628.8000	64.8	188.7	123.9
TMO TD-LTE	TMO-14	2628.8000	TMO TD-LTE	TMO-15	2648.6000	70.5	88.6	18.1
TMO TD-LTE	TMO-15	2648.6000	TMO TD-LTE	TMO-16	2668.4000	70.5	88.6	18.1
TMO TD-LTE	TMO-16	2668.4000	TMO TD-LTE	TMO-15	2648.6000	70.5	110.2	39.7
Denver City County - P25	DCC-1	807.37500	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	121.2	87.6
Denver City County - P25	DCC-2	807.65000	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	121.1	87.5
Denver City County - P25	DCC-3	808.27500	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	119.9	86.3
Denver City County - P25	DCC-4	808.72500	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	121.7	88.1

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Denver City County - P25	DCC-5	806.56250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	121.1	87.5
Denver City County - P25	DCC-6	808.15000	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	119.7	86.1
Denver City County - P25	DCC-7	808.42500	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.5	86.9
Denver City County - P25	DCC-8	809.58750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	123.9	90.3
Denver City County - P25	DCC-9	811.48750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	131.4	97.8
Denver City County - P25	DCC-10	812.23750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	138.5	104.9
Denver City County - P25	DCC-11	813.23750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	154.9	121.3
Denver City County - P25	DCC-12	807.12500	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.8	87.2
Denver City County - ASR	ASR-1	814.26250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	161.9	128.4
Denver City County - ASR	ASR-2	813.71250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	158.2	124.6
Denver City County - ASR	ASR-3	812.13750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	137	103.4
Denver City County - ASR	ASR-4	811.73750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	133.3	99.7
Denver City County - ASR	ASR-5	811.21250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	128.5	94.9
Denver City County - ASR	ASR-6	810.98750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	125.2	91.6
Denver City County - ASR	ASR-7	810.48750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	119.8	86.2
Denver City County - ASR	ASR-8	810.23750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	121.9	88.3
Denver City County - ASR	ASR-9	809.43750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	123.8	90.2
Denver City County - ASR	ASR-10	808.86250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	122.3	88.7
Denver City County - ASR	ASR-11	808.32500	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.1	86.5
Denver City County - ASR	ASR-12	807.77500	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.9	87.3
Denver City County - RMRS	RMRS-1	813.08750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	153.4	119.8
Denver City County - RMRS	RMRS-2	813.33750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	155.8	122.2
Denver City County - RMRS	RMRS-3	814.08750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	160.4	126.8
Denver City County - RMRS	RMRS-4	814.63750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	166.7	133.1
Denver City County - Repeaters	RPT-1	806.58750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.9	87.3
Denver City County - Repeaters	RPT-2	806.88750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.1	86.6
Denver City County - Repeaters	RPT-3	807.86250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.7	87.1
Denver City County - Repeaters	RPT-4	808.08750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	119.9	86.3
Denver City County - Repeaters	RPT-5	809.98750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	123.2	89.6
Denver City County - Repeaters	RPT-6	810.06250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	122.9	89.3

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Denver City County - Repeaters	RPT-7	810.53750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	119.3	85.7
Denver City County - Repeaters	RPT-8	812.48750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	143.3	109.7
Denver City County - Repeaters	RPT-9	813.46250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	156.7	123.1
Denver City County - Repeaters	RPT-10	813.48750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	156.9	123.3
Denver City County - Repeaters	RPT-11	814.23750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	161.7	128.1
Denver City County - Repeaters	RPT-12	814.46250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	164.3	130.7
Denver City County - Repeaters	RPT-13	814.48750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	164.6	131
Denver City County - Repeaters	RPT-14	814.58750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	165.9	132.4
Denver City County - Repeaters	RPT-15	814.73750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	168.1	134.5
Denver City County - Simulcast	SIM-1	814.71250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	167.7	134.1
Denver City County - Simulcast	SIM-2	814.61250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	166.3	132.7
Denver City County - Simulcast	SIM-3	814.21250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	161.5	127.9
Denver City County - Simulcast	SIM-4	811.13750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	127.5	93.9
Denver City County - Simulcast	SIM-5	813.21250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	154.7	121.1
Denver City County - Simulcast	SIM-6	812.73750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	148.1	114.5
Denver City County - Simulcast	SIM-7	813.13750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	153.9	120.3
Denver City County - Simulcast	SIM-8	812.46250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	142.8	109.2
Denver City County - Simulcast	SIM-9	812.06250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	136.1	102.5
Denver City County - Simulcast	SIM-10	811.71250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	133.1	99.5
Denver City County - Simulcast	SIM-11	811.63750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	132.6	99
Denver City County - Simulcast	SIM-12	811.23750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	128.9	95.3
Denver City County - Simulcast	SIM-13	813.73750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	158.3	124.7
Denver City County - Simulcast	SIM-14	810.73750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	121.4	87.8

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Denver City County - Simulcast	SIM-15	810.46250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.1	86.5
Denver City County - Simulcast	SIM-16	809.56250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	123.9	90.3
Denver City County - Simulcast	SIM-17	809.06250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	123	89.4
Denver Fire Department Repeaters	DFD-1	769.31875	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.5	321.2	257.7
Denver Fire Department Repeaters	DFD-2	769.85625	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.5	322.8	259.3
Denver Fire Department Repeaters	DFD-3	770.50625	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.6	324.7	261.1
Denver Fire Department Repeaters	DFD-4	770.75625	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.5	325.4	261.9
Denver Fire Department Repeaters	DFD-5	771.18125	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.3	326.5	263.2
Denver Fire Department Repeaters	DFD-6	771.43125	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.1	327.2	264.1
Denver Fire Department Repeaters	DFD-7	772.43125	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	62.5	329.8	267.3
Denver Fire Department Repeaters	DFD-8	772.68125	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	62.5	330.4	268
Denver Fire Department Repeaters	DFD-9	769.86875	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.5	322.8	259.3
Denver Fire Department Repeaters	DFD-10	770.51875	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.6	324.7	261.2
Denver Fire Department Repeaters	DFD-11	770.76875	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.5	325.4	261.9
Denver Fire Department Repeaters	DFD-12	771.19375	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	63.3	326.6	263.3
Conventional Systems	8CALL90	851.01250	Data Channels - DCC	DATA-5	851.18750	66.6	226.2	159.6
Conventional Systems	8TAC91	851.51250	Denver City County - P25	DCC-5	851.56250	66.6	224.9	158.3
Conventional Systems	8TAC92	852.01250	Denver City County - Repeaters	RPT-2	851.88750	66.6	226.2	159.6
Conventional Systems	8TAC93	852.51250	Denver City County - P25	DCC-1	852.37500	66.6	227.2	160.6
Conventional Systems	8TAC94	853.01250	Denver City County - Repeaters	RPT-4	853.08750	66.6	227.6	161
Conventional Systems	STAC	853.78750	Denver City County - P25	DCC-4	853.72500	66.6	227.7	161.1
Data Channels - DCC	DATA-1	810.91250	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	124	90.4
Data Channels - DCC	DATA-2	811.78750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	133.6	100
Data Channels - DCC	DATA-3	810.68750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	120.7	87.1
Data Channels - DCC	DATA-4	809.23750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	123.4	89.9

Data Channels - DCC	DATA-5	806.18750	DFD 900 MHz Microwave	DFD-3	928.75625	33.6	122.8	89.2
450 MHz Land Mobile Radio	CLEER	465.42500	TMO 600 MHz B LTE	TMO-1	624.50000	48	237.1	189.1
450 MHz Land Mobile Radio - DPAC	DPAC-1	465.56250	TMO 600 MHz B LTE	TMO-1	624.50000	48	237.1	189.1
450 MHz Land Mobile Radio - DPAC	DPAC-2	465.63750	TMO 600 MHz B LTE	TMO-1	624.50000	48	237.1	189.1
450 MHz Land Mobile Radio - DPAC	DPAC-3	463.16250	TMO 600 MHz B LTE	TMO-1	624.50000	48	237.1	189.1
450 MHz Land Mobile Radio - DPAC	DPAC-4	463.51250	TMO 600 MHz B LTE	TMO-1	624.50000	48	237.1	189.1
450 MHz Land Mobile Radio - DPAC	DPAC-5	463.60000	TMO 600 MHz B LTE	TMO-1	624.50000	48	237.1	189.1
450 MHz Land Mobile Radio - DPAC	DPAC-6	463.65000	TMO 600 MHz B LTE	TMO-1	624.50000	48	237.1	189.1

No transmitter noise interference problems were predicted.

6.0 Receiver Desensitization Analysis

Receiver desensitization interference occurs when an undesired signal from a nearby "off-frequency" transmitter is sufficiently close to a receiver's operating frequency. The signal may get through the RF selectivity of the receiver. If this undesired signal is of sufficient amplitude, the receiver's critical voltage and current levels are altered and the performance of the receiver is degraded at its operating frequency. The gain of the receiver is reduced, thereby reducing the performance of the receiver.

A transmitter can be operating several megahertz away from the receiver frequency and/or its antenna can be located several thousand feet from the receiver's antenna and still cause interference.

The analysis predicts each transmitter's signal level present at the input of each receiver. It takes into account the transmitter's power output, frequency separation, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in both systems. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required, if any, to prevent receiver performance degradation caused by receiver desensitization interference. The Table below depicts the results of this analysis. For each receiver, the transmitter that has the worst-case impact is displayed. The Signal Margin represents the margin in dB, before the receiver's performance is degraded. A negative number indicates that the performance is degraded and the value indicates how much additional isolation is required to prevent receiver performance degradation.

Receiver Provider	Receive Channel	Receive Frequency (MHz)	Transmitter Provider	Transmit Channel	Transmit Frequency (MHz)	Attn Required (dB)	Attn Provided (dB)	Signal Margin (dB)
Verizon 700 MHz Upper C LTE	VZ-1	781.00000	Verizon 700 MHz Upper C LTE	VZ-1	751.00000	29.3	159.3	130
Verizon 700 MHz Upper C LTE	VZ-2	781.00000	Verizon 700 MHz Upper C LTE	VZ-2	751.00000	29.3	159.3	130
Verizon 700 MHz Upper C LTE	VZ-3	781.00000	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	29.3	159.3	130
Verizon 700 MHz Upper C LTE	VZ-4	781.00000	Verizon 700 MHz Upper C LTE	VZ-4	751.00000	29.3	159.3	130
Verizon Cellular B LTE	VZ-5	840.00000	Verizon Cellular B LTE	VZ-5	885.00000	30.6	171.1	140.5
Verizon Cellular B LTE	VZ-6	840.00000	Conventional Systems	8CALL90	851.01250	48.6	180.9	132.3
Verizon Cellular B LTE	VZ-7	840.00000	Conventional Systems	8CALL90	851.01250	48.6	173.5	124.9
Verizon Cellular B LTE	VZ-8	840.00000	Conventional Systems	8CALL90	851.01250	48.6	180.1	131.5
Verizon PCS E LTE	VZ-9	1887.5000	Verizon PCS E LTE	VZ-9	1967.5000	26	154.1	128.1
Verizon PCS E LTE	VZ-10	1887.5000	Verizon PCS E LTE	VZ-10	1967.5000	26	154.1	128.1

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Verizon PCS E LTE	VZ-11	1887.5000	Verizon PCS E LTE	VZ-11	1967.5000	26	154.1	128.1
Verizon PCS E LTE	VZ-12	1887.5000	Verizon PCS E LTE	VZ-12	1967.5000	26	154.1	128.1
Verizon PCS F LTE	VZ-13	1892.5000	Verizon PCS F LTE	VZ-13	1972.5000	26	155.6	129.6
Verizon PCS F LTE	VZ-14	1892.5000	Verizon PCS F LTE	VZ-14	1972.5000	26	155.6	129.6
Verizon PCS F LTE	VZ-15	1892.5000	Verizon PCS F LTE	VZ-15	1972.5000	26	155.6	129.6
Verizon PCS F LTE	VZ-16	1892.5000	Verizon PCS F LTE	VZ-16	1972.5000	26	155.6	129.6
Verizon AWS B LTE	VZ-17	1725.0000	Verizon AWS B LTE	VZ-17	2125.0000	26	160.2	134.2
Verizon AWS B LTE	VZ-18	1725.0000	Verizon AWS B LTE	VZ-18	2125.0000	26	160.2	134.2
Verizon AWS B LTE	VZ-19	1725.0000	Verizon AWS B LTE	VZ-19	2125.0000	26	160.2	134.2
Verizon AWS B LTE	VZ-20	1725.0000	Verizon AWS B LTE	VZ-20	2125.0000	26	160.2	134.2
Verizon AWS J LTE	VZ-21	1775.0000	Verizon AWS J LTE	VZ-21	2175.0000	26	164.2	138.2
Verizon AWS J LTE	VZ-22	1775.0000	Verizon AWS J LTE	VZ-22	2175.0000	26	164.2	138.2
Verizon AWS J LTE	VZ-23	1775.0000	Verizon AWS J LTE	VZ-23	2175.0000	26	164.2	138.2
Verizon AWS J LTE	VZ-24	1775.0000	Verizon AWS J LTE	VZ-24	2175.0000	26	164.2	138.2
DFD 150 MHz Receive Only Land Mobile Radio	DFD-1	154.07000	150 MHz LMR	VMED28	155.34000	57.7	144.6	86.8
DFD 900 MHz Microwave	DFD-3	952.72625	Denver City County - Simulcast	SIM-11	856.63750	30	125.7	95.7
TMO 600 MHz B LTE	TMO-1	670.50000	TMO 600 MHz B LTE	TMO-1	624.50000	23	152.1	129.1
TMO 600 MHz C LTE	TMO-2	675.50000	TMO 600 MHz C LTE	TMO-2	629.50000	23	152.1	129.1
TMO 600 MHz D LTE	TMO-3	680.50000	TMO 600 MHz D LTE	TMO-3	634.50000	23	152.1	129.1
TMO 700 MHz Lower A LTE	TMO-4	701.00000	TMO 700 MHz Lower A LTE	TMO-4	731.00000	23	160.6	137.6
TMO PCS B LTE 15 MHz	TMO-5	1877.5000	TMO PCS B LTE 15 MHz	TMO-5	1957.5000	30	148.5	118.5
TMO PCS C LTE 10 MHz	TMO-6	1905.0000	TMO PCS C LTE 10 MHz	TMO-6	1985.0000	30	173.9	143.9
TMO PCS G LTE	TMO-7	1912.5000	TMO PCS G LTE	TMO-7	1992.5000	30	163.6	133.6
TMO AWS A LTE	TMO-8	1715.0000	TMO AWS A LTE	TMO-8	2115.0000	26	160.4	134.4
TMO AWS F LTE	TMO-9	1750.0000	TMO AWS F LTE	TMO-9	2150.0000	26	160.3	134.3
TMO TD-LTE	TMO-10	2518.4000	TMO TD-LTE	TMO-11	2538.2000	38.2	110.2	72
TMO TD-LTE	TMO-11	2538.2000	TMO TD-LTE	TMO-10	2518.4000	38.2	88.6	50.4
TMO TD-LTE	TMO-12	2558.0000	TMO TD-LTE	TMO-11	2538.2000	38.2	88.6	50.4
TMO TD-LTE	TMO-13	2598.0000	TMO TD-LTE	TMO-14	2628.8000	28.7	202.1	173.4
TMO TD-LTE	TMO-14	2628.8000	TMO TD-LTE	TMO-15	2648.6000	35.2	110.2	75
TMO TD-LTE	TMO-15	2648.6000	TMO TD-LTE	TMO-14	2628.8000	35.2	88.6	53.4
Denver City County - Repeaters	RPT-12	814.46250	Denver City County - Repeaters	RPT-1	851.58750	28.1	194.4	166.3
Denver City County - Repeaters	RPT-13	814.48750	Denver City County - Repeaters	RPT-1	851.58750	28.1	194.4	166.3
Denver City County - Repeaters	RPT-14	814.58750	Denver City County - Repeaters	RPT-1	851.58750	28.1	194.4	166.3

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Denver City County - Repeaters	RPT-15	814.73750	Denver City County - Repeaters	RPT-1	851.58750	28.2	194.4	166.3
Denver City County - Simulcast	SIM-1	814.71250	Denver City County - Simulcast	SIM-17	854.06250	28.1	197.6	169.5
Denver City County - Simulcast	SIM-2	814.61250	Denver City County - Simulcast	SIM-17	854.06250	28.1	197.6	169.5
Denver City County - Simulcast	SIM-3	814.21250	Denver City County - Simulcast	SIM-17	854.06250	28.1	197.6	169.5
Denver City County - Simulcast	SIM-4	811.13750	Denver City County - Simulcast	SIM-17	854.06250	27.8	197.6	169.8
Denver City County - Simulcast	SIM-5	813.21250	Denver City County - Simulcast	SIM-17	854.06250	28	197.6	169.6
Denver City County - Simulcast	SIM-6	812.73750	Denver City County - Simulcast	SIM-17	854.06250	27.9	197.6	169.7
Denver City County - Simulcast	SIM-7	813.13750	Denver City County - Simulcast	SIM-17	854.06250	28	197.6	169.6
Denver City County - Simulcast	SIM-8	812.46250	Denver City County - Simulcast	SIM-17	854.06250	27.9	197.6	169.7
Denver City County - Simulcast	SIM-9	812.06250	Denver City County - Simulcast	SIM-17	854.06250	27.9	197.6	169.7
Denver City County - Simulcast	SIM-10	811.71250	Denver City County - Simulcast	SIM-17	854.06250	27.8	197.6	169.8
Denver City County - Simulcast	SIM-11	811.63750	Denver City County - Simulcast	SIM-17	854.06250	27.8	197.6	169.8
Denver City County - Simulcast	SIM-12	811.23750	Denver City County - Simulcast	SIM-17	854.06250	27.8	197.6	169.8
Denver City County - Simulcast	SIM-13	813.73750	Denver City County - Simulcast	SIM-17	854.06250	28	197.6	169.6
Denver City County - Simulcast	SIM-14	810.73750	Denver City County - Simulcast	SIM-17	854.06250	27.8	197.6	169.8
Denver City County - Simulcast	SIM-15	810.46250	Denver City County - Simulcast	SIM-17	854.06250	27.8	197.6	169.8
Denver City County - Simulcast	SIM-16	809.56250	Denver City County - Simulcast	SIM-17	854.06250	27.6	197.6	170
Denver City County - Simulcast	SIM-17	809.06250	Denver City County - Simulcast	SIM-17	854.06250	27.6	197.6	170
Denver Fire Department Repeaters	DFD-1	769.31875	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	29.5	202.4	172.9
Denver Fire Department Repeaters	DFD-2	769.85625	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	29	202.4	173.4
Denver Fire Department Repeaters	DFD-3	770.50625	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	28.5	202.4	173.9
Denver Fire Department Repeaters	DFD-4	770.75625	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	28.2	202.4	174.2
Denver Fire Department Repeaters	DFD-5	771.18125	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	27.8	202.4	174.6

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Denver Fire Department Repeaters	DFD-6	771.43125	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	27.5	202.4	174.9
Denver Fire Department Repeaters	DFD-7	772.43125	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	26.7	202.4	175.7
Denver Fire Department Repeaters	DFD-8	772.68125	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	26.6	202.4	175.8
Denver Fire Department Repeaters	DFD-9	769.86875	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	29	202.4	173.4
Denver Fire Department Repeaters	DFD-10	770.51875	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	28.4	202.4	174
Denver Fire Department Repeaters	DFD-11	770.76875	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	28.2	202.4	174.2
Denver Fire Department Repeaters	DFD-12	771.19375	Verizon 700 MHz Upper C LTE	VZ-3	751.00000	27.8	202.4	174.6
Conventional Systems	8CALL90	851.01250	Data Channels - DCC	DATA-5	851.18750	41.6	223.8	182.2
Conventional Systems	8TAC91	851.51250	Conventional Systems	8CALL90	851.01250	41.6	223.4	181.8
Conventional Systems	8TAC92	852.01250	Conventional Systems	8CALL90	851.01250	41.6	223.4	181.8
Conventional Systems	8TAC93	852.51250	Conventional Systems	8CALL90	851.01250	41.6	223.4	181.8
Conventional Systems	8TAC94	853.01250	Conventional Systems	8CALL90	851.01250	41.6	223.4	181.8
Conventional Systems	STAC	853.78750	Conventional Systems	8CALL90	851.01250	41.6	223.4	181.8
Data Channels - DCC	DATA-1	810.91250	Data Channels - DCC	DATA-5	851.18750	28	193.6	165.5
Data Channels - DCC	DATA-2	811.78750	Data Channels - DCC	DATA-5	851.18750	28.1	193.6	165.5
Data Channels - DCC	DATA-3	810.68750	Data Channels - DCC	DATA-5	851.18750	28	193.6	165.5
Data Channels - DCC	DATA-4	809.23750	Data Channels - DCC	DATA-5	851.18750	27.9	193.6	165.7
Data Channels - DCC	DATA-5	806.18750	Data Channels - DCC	DATA-5	851.18750	27.6	193.6	166
450 MHz Land Mobile Radio	CLEER	465.42500	TMO 600 MHz B LTE	TMO-1	624.50000	16	186.5	170.4
450 MHz Land Mobile Radio - DPAC	DPAC-1	465.56250	TMO 600 MHz B LTE	TMO-1	624.50000	16	186.5	170.4
450 MHz Land Mobile Radio - DPAC	DPAC-2	465.63750	TMO 600 MHz B LTE	TMO-1	624.50000	16	186.5	170.4
450 MHz Land Mobile Radio - DPAC	DPAC-3	463.16250	TMO 600 MHz B LTE	TMO-1	624.50000	16	186.5	170.4
450 MHz Land Mobile Radio - DPAC	DPAC-4	463.51250	TMO 600 MHz B LTE	TMO-1	624.50000	16	186.5	170.4
450 MHz Land Mobile Radio - DPAC	DPAC-5	463.60000	TMO 600 MHz B LTE	TMO-1	624.50000	16	186.5	170.4
450 MHz Land Mobile Radio - DPAC	DPAC-6	463.65000	TMO 600 MHz B LTE	TMO-1	624.50000	16	186.5	170.4
TMO TD-LTE	TMO-16	2668.4000	TMO TD-LTE	TMO-15	2648.6000	35.2	88.6	53.4
Denver City County - P25	DCC-1	807.37500	Denver City County - P25	DCC-5	851.56250	27.7	194.4	166.7
Denver City County - P25	DCC-2	807.65000	Denver City County - P25	DCC-5	851.56250	27.7	194.4	166.7

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Denver City County - P25	DCC-3	808.27500	Denver City County - P25	DCC-5	851.56250	27.8	194.4	166.6
Denver City County - P25	DCC-4	808.72500	Denver City County - P25	DCC-5	851.56250	27.8	194.4	166.6
Denver City County - P25	DCC-5	806.56250	Denver City County - P25	DCC-5	851.56250	27.6	194.4	166.8
Denver City County - P25	DCC-6	808.15000	Denver City County - P25	DCC-5	851.56250	27.8	194.4	166.6
Denver City County - P25	DCC-7	808.42500	Denver City County - P25	DCC-5	851.56250	27.8	194.4	166.6
Denver City County - P25	DCC-8	809.58750	Denver City County - P25	DCC-5	851.56250	27.9	194.4	166.5
Denver City County - P25	DCC-9	811.48750	Denver City County - P25	DCC-5	851.56250	28.1	194.4	166.3
Denver City County - P25	DCC-10	812.23750	Denver City County - P25	DCC-5	851.56250	28.1	194.4	166.3
Denver City County - P25	DCC-11	813.23750	Denver City County - P25	DCC-5	851.56250	28.1	194.4	166.3
Denver City County - P25	DCC-12	807.12500	Denver City County - P25	DCC-5	851.56250	27.7	194.4	166.7
Denver City County - ASR	ASR-1	814.26250	Denver City County - ASR	ASR-12	852.77500	28.1	196.4	168.3
Denver City County - ASR	ASR-2	813.71250	Denver City County - ASR	ASR-12	852.77500	28.1	196.4	168.3
Denver City County - ASR	ASR-3	812.13750	Denver City County - ASR	ASR-12	852.77500	28	196.4	168.4
Denver City County - ASR	ASR-4	811.73750	Denver City County - ASR	ASR-12	852.77500	28	196.4	168.4
Denver City County - ASR	ASR-5	811.21250	Denver City County - ASR	ASR-12	852.77500	27.9	196.4	168.5
Denver City County - ASR	ASR-6	810.98750	Denver City County - ASR	ASR-12	852.77500	27.9	196.4	168.5
Denver City County - ASR	ASR-7	810.48750	Denver City County - ASR	ASR-12	852.77500	27.8	196.4	168.5
Denver City County - ASR	ASR-8	810.23750	Denver City County - ASR	ASR-12	852.77500	27.8	196.4	168.6
Denver City County - ASR	ASR-9	809.43750	Denver City County - ASR	ASR-12	852.77500	27.8	196.4	168.6
Denver City County - ASR	ASR-10	808.86250	Denver City County - ASR	ASR-12	852.77500	27.7	196.4	168.7
Denver City County - ASR	ASR-11	808.32500	Denver City County - ASR	ASR-12	852.77500	27.7	196.4	168.7
Denver City County - ASR	ASR-12	807.77500	Denver City County - ASR	ASR-12	852.77500	27.6	196.4	168.8
Denver City County - RMRS	RMRS-1	813.08750	Denver City County - RMRS	RMRS-1	858.08750	27.6	201.9	174.3
Denver City County - RMRS	RMRS-2	813.33750	Denver City County - RMRS	RMRS-1	858.08750	27.6	201.9	174.3
Denver City County - RMRS	RMRS-3	814.08750	Denver City County - RMRS	RMRS-1	858.08750	27.7	201.9	174.2
Denver City County - RMRS	RMRS-4	814.63750	Denver City County - RMRS	RMRS-1	858.08750	27.8	201.9	174.2
Denver City County - Repeaters	RPT-1	806.58750	Denver City County - Repeaters	RPT-1	851.58750	27.6	194.4	166.8
Denver City County - Repeaters	RPT-2	806.88750	Denver City County - Repeaters	RPT-1	851.58750	27.6	194.4	166.8
Denver City County - Repeaters	RPT-3	807.86250	Denver City County - Repeaters	RPT-1	851.58750	27.7	194.4	166.7
Denver City County - Repeaters	RPT-4	808.08750	Denver City County - Repeaters	RPT-1	851.58750	27.8	194.4	166.7
Denver City County - Repeaters	RPT-5	809.98750	Denver City County - Repeaters	RPT-1	851.58750	27.9	194.4	166.5

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Denver City County - Repeaters	RPT-6	810.06250	Denver City County - Repeaters	RPT-1	851.58750	27.9	194.4	166.5
Denver City County - Repeaters	RPT-7	810.53750	Denver City County - Repeaters	RPT-1	851.58750	28	194.4	166.5
Denver City County - Repeaters	RPT-8	812.48750	Denver City County - Repeaters	RPT-1	851.58750	28.1	194.4	166.3
Denver City County - Repeaters	RPT-9	813.46250	Denver City County - Repeaters	RPT-1	851.58750	28.1	194.4	166.4
Denver City County - Repeaters	RPT-10	813.48750	Denver City County - Repeaters	RPT-1	851.58750	28.1	194.4	166.4
Denver City County - Repeaters	RPT-11	814.23750	Denver City County - Repeaters	RPT-1	851.58750	28.1	194.4	166.3

No receiver desensitization interference problems were predicted.

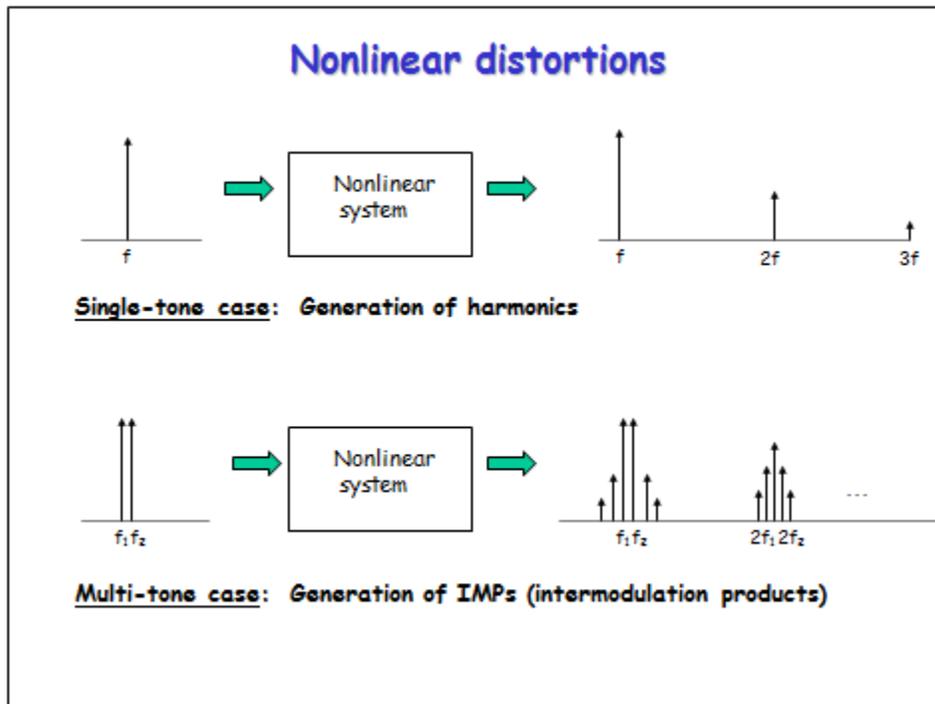
7.0 Intermodulation Interference Analysis

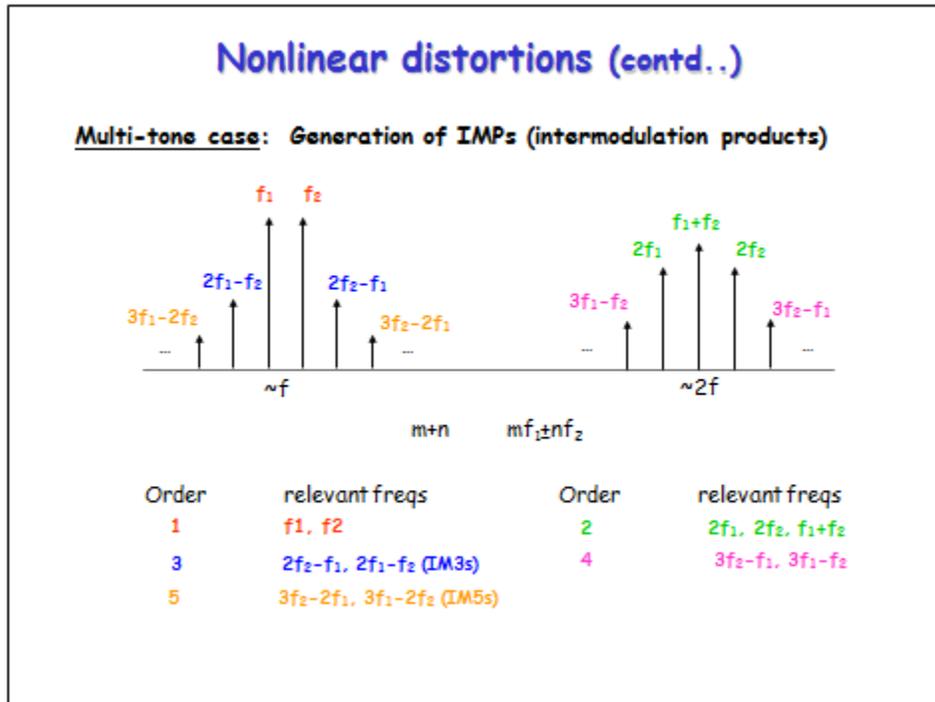
There are three basic categories of Intermodulation (IM) interference. They are receiver produced, transmitter produced, and "other" radiated IM. Transmitter produced IM is the result of one or more transmitters impressing a signal in the non-linear final output stage circuitry of another transmitter, usually via antenna coupling. The IM product frequency is then re-radiated from the transmitter's antenna. Receiver produced IM is the result of two or more transmitter signals mixing in a receiver RF amplifier or mixer stage when operating in a non-linear range.

"Other" radiated IM is the result of transmitter signals mixing in other non-linear junctions. These junctions are usually metallic, such as rusty bolts on a tower, dissimilar metallic junctions, or other non-linear metallic junctions in the area. IM products can also be caused by non-linearity in the transmission system such as antenna, transmission line, or connectors.

Communication sites with co-located transmitters, usually have RF coupling between each transmitter and antenna system. This results in the signals of each transmitter entering the nonlinear final output (PA) circuitry of the other transmitters. When intermodulation (IM) products are created in the output circuitry and they fall within the passband of the final amplifier, the IM products are re-radiated and may interfere with receivers at the same site or at other nearby sites. Additionally, these strong transmitter signals may directly enter a receiver and drive the RF amplifier into a nonlinear operation, or if not filtered effectively by the receiver input circuitry, these signals could mix in the nonlinear circuitry of the receiver front-end or mixer, creating IM products directly in the receiver.

The frequencies of IM mixing are known as nonlinear distortions. The images below depict how these IM products are derived when passing through a nonlinear junction/system.





Not all of the mixing possibilities are significant in creating interference signals. Some fall “out-of-band” of the receiver and the higher order IM products are usually weaker in signal strength.

7.1 Transmitter Generated Intermodulation Analysis

Intermodulation in transmitters occurs when a signal from another transmitter is impressed on the nonlinear final output stage circuitry, usually via antenna coupling. The power level of the IM product is determined by the power level of the incoming extraneous signal from another transmitter and by a conversion loss factor. The conversion loss factor takes into account the mixing efficiency of the transmitter's final output stage. Conversion loss differs with transmitter design, adjustment, frequency separation of the source signals, and with the order of the IM product.

The analysis calculates all possible IM product frequencies that could potentially interfere with receivers at the communications site based on each receiver’s individual bandwidth. It then predicts each IM signal level present at the input of each affected receiver. For each IM frequency, the analysis considers all possible sources of IM generation in the transmitters. For example, if there are four transmitters involve, the analysis will calculate the IM signal level that would be generated in each transmitter. For this example, that would be four possible mixing conditions.

The analysis takes into account the transmitter’s power output, modulation bandwidth, conversion losses, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna

separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for each IM interference signal that occurs. Receivers experiencing transmitter generated intermodulation interference are depicted in the following Table.

Tx 1 Source Mix Tx		Tx 2 Source		TX 3 Source		Tx 4 Source		Tx 5 Source		Intermod Hit		Affected Receiver		Attn Need
ID	Freq (MHz)	I D	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	ID	Freq (MHz)	Freq (MHz)	Ord	ID	Freq (MHz)	
None														

No transmitter generated intermodulation interference problems were predicted.

7.2 Receiver Generated Intermodulation Analysis

Within a receiver, when two or more strong off-channel signals enter and mix in the receiver and one of the IM product frequencies created coincides with the receiver operating frequency, potential interference results. This internal IM mixing process takes place in the receiver's RF amplifier when it operates in a nonlinear range and/or in the first mixer, which, of course, has been designed to operate as a nonlinear device.

Receivers have a similar conversion loss type factor and receiver performance is commonly described in terms of conversion loss with respect to the 2A - B type products. Here, conversion loss is the ratio of a specified level of A and B to the level of the resulting IM product, when the product is viewed as an equivalent on-channel signal. Receiver conversion loss varies with input levels, AGC action, and product order.

The analysis calculates all possible IM product frequencies that could potentially interfere with receivers at the communications site based on each receiver's individual bandwidth. It then predicts each IM signal level present at the input of each affected receiver. For each IM frequency, the analysis considers that the IM signal is generated directly in the receiver.

The analysis takes into account the transmitter's power output, modulation bandwidth, conversion losses, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for each IM interference signal that occurs. Receivers experiencing receiver generated intermodulation interference are depicted in the following Table.

Tx 1 Source		Tx 2 Source		TX 3 Source		Tx 4 Source		Tx 5 Source		Intermod Hit		Affected Receiver		Attn Need
ID	Freq (MHz)	Freq (MHz)	Ord	ID	Freq (MHz)									
None														

No receiver generated intermodulation interference problems were predicted.

8.0 Transmitter Harmonic Output Interference Analysis

Transmitter harmonic interference is due to non-linear characteristics in a transmitter. The harmonics are typically created due to frequency multipliers and the non-linear design of the final output stage of the transmitter. If the harmonic signal falls within the passband of a nearby receiver and the signal level is of sufficient amplitude, it can degrade the performance of the receiver.

The analysis takes into account the transmitter’s harmonic characteristics, output level, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for any harmonics that fall within a receiver’s passband. Receivers experiencing transmitter harmonic interference are depicted in the following Table.

Transmitter		Harmonic		Affected Receiver		Attn Needed
ID	Frequency (MHz)	Frequency (MHz)	Order	ID	Frequency (MHz)	
None						

No transmitter generated harmonic interference problems were predicted.

9.0 Transmitter Spurious Output Interference Analysis

Transmitter spurious output interference can be attributed to many different factors in a transmitter. The generation of spurious frequencies could be due to non-linear characteristics in a transmitter or possibly the physical placement of components and unwanted coupling. If a spurious signal falls within the passband of a nearby receiver and the signal level is of sufficient amplitude, it can degrade the performance of the receiver.

The analysis takes into account a transmitter’s spurious output specification, output levels, transmission line losses, filters, duplexers, combiners, isolators, multi-couplers and other RF devices that are present in each system. Additionally, the analysis considers the antenna separation space loss, horizontal and vertical gain components of the antennas as well as how they are mounted on the structure. The gain components are derived from antenna pattern data published by each manufacturer.

The analysis determines how much isolation is required to prevent receiver performance degradation for any transmitter spurious signals that fall within a receiver’s passband. Receivers experiencing transmitter spurious output interference are depicted in the following Table.

Transmitter		Affected Receiver		Attn Needed
ID	Frequency (MHz)	ID	Frequency (MHz)	
None				

No transmitter generated spurious interference problems were predicted.

10.0 Interference Power Level Summing Analysis

This section of the report provides a simulation of Intermodulation (IM) interference, transmitter wideband noise and receiver desensitization interference occurring on each individual receiver when all transmitters at the site are active at the same instance in time. Even though individual interference modes may not be reported in other report sections, this summing analysis represents a worst-case interference scenario.

However, the probability of this interference occurrence for an individual receiver could be low since it depends on the utilization of the transmitters involved in the interference generation.

The carrier-to-noise $C/(I + N)$ ratio for each receiver is based on the aggregate of interference power levels. A negative $C/(I + N)$ ratio indicates that the performance of the receiver could possibly be degraded by the value shown.

The following Table presents this data:

Receiver		Interference Power Level (dBm)				
Channel Label	Freq (MHz)	Tx Noise	Rx Desense	IM Power	Aggregate	C / (I+N)
None						

11.0 Discussion and Recommendations

Information regarding existing and proposed equipment, cabling and antennas has been provided by Verizon Wireless' representatives. Waterford Consultants, LLC has considered specific frequency information as well as spectrum blocks licensed to licensees listed herein based on FCC database query results. For wireless service providers, Waterford Consultants, LLC has assumed band and technology deployment based on available consumer sources that monitor wireless voice and data providers in specific markets. Typical channel plans have been assumed for this study and these results are limited to the information contained within this report.

No site visit was performed for this analysis and the condition of the structure and installed appurtenances as well as nearby environmental factors that could be potential sources of passive intermodulation interference have not been considered.

12.0 Professional Certification

Engineering Statement Re:

Potential for Interference to Existing Services

At

DEN Denver Arts

My signature on the cover of this study hereby certifies and affirms:

That I am a registered as a Professional Engineer in the jurisdiction indicated; and

That I am employed by Waterford Consultants, which provides engineering services to clients in the Radio Communications field; and

That I am familiar with the Rules and Regulations and the policies of the Federal Communications Commission both in general and specifically as they apply to the treatment of interference to other services such as may be created by Commission licenses; and

That I have examined the technical information supplied by Verizon Wireless and their representatives relating to their intention to install antennas, transmitters and associated technical equipment on an existing communication site, on an existing tower/structure, currently identified as the DEN Denver Arts Co-location Study site; and

That the technical equipment to be installed by Verizon Wireless represents the state of the art and that it has been carefully designed to preclude the possibility of interference to other services, including the transmission and reception of broadcast AM, FM, and Television and other communications services, such as police, fire, utility and other public safety and public service facilities as well as private communications installations, such as cordless telephones, and Citizen's Band and Radio Amateur stations; and

That the equipment to be installed by Verizon Wireless, meets or exceeds all Federal Communications Commission emission requirements to avoid interfering with other services and home/business equipment; and

That frequency information provided by Verizon Wireless concerning existing installations on this structure has been examined to estimate the potential for interference to existing and proposed operations, resulting from the introduction of the Verizon Wireless' operation; and

That this examination involved the computation of intermodulation products, transmitter harmonics, receiver desensitization, and transmitter spurious emissions produced by the combination of frequencies associated with existing services known to currently operate at the

DEN Denver Arts

DEN Denver Arts Co-location Study site, and these frequencies, which could be used by others at the DEN Denver Arts Co-location Study site; and

That intermodulation products were computed (as a minimum) for the fundamental (f_0), second ($2f_0$) thru seventh ($7f_0$) harmonic components of frequencies at this site; and

That predicted products were not found to potentially cause intermodulation to Verizon Wireless' proposed operations or to the other licenses currently operating at the DEN Denver Arts Co-location Study site; and

That no additional isolation needs to be provided between antennas in the horizontal and vertical planes, and the attenuation along the nadir and zenith associated with vertical plane radiation patterns; and

That after examination the levels of RF energy present at the DEN Denver Arts Co-location Study site, receiver sensitivity will not be degraded by either the existing or Verizon Wireless' proposed operations; and

That, if interference were to occur as a result of Verizon Wireless' operations, Verizon Wireless would be expected to recognize its responsibility to act promptly to take steps necessary to correct the interference, including, but not limited to, filtering and frequency coordination; and

In summary, it is stated here that there is not an indication that the installation being proposed by Verizon Wireless will create interference to their own operations, or the operations of any of the services currently operating at the DEN Denver Arts Co-location Study site. In the event that interference is identified after installation and is attributable to Verizon Wireless' equipment, frequency coordination and filtering would be Verizon Wireless' primary corrective course of action to resolve the problem.

EXHIBIT D



CERTIFICATE OF LIABILITY INSURANCE

DATE(MM/DD/YYYY) 12/18/2024

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement.

PRODUCER: Aon Risk Services Northeast, Inc. CONTACT NAME: INSURER(S) AFFORDING COVERAGE: INSURER A: LM Insurance Corporation, INSURER B: Liberty Insurance Corporation, INSURER C: Liberty Mutual Fire Ins Co, INSURER D: , INSURER E: , INSURER F: .

COVERAGES CERTIFICATE NUMBER: 570109840740 REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS.

Table with columns: INSR LTR, TYPE OF INSURANCE, ADDL INSD, SUBR WVD, POLICY NUMBER, POLICY EFF (MM/DD/YYYY), POLICY EXP (MM/DD/YYYY), LIMITS. Rows include Commercial General Liability, Automobile Liability, Umbrella Liab, and Workers Compensation and Employers' Liability.

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required) RE: Verizon Site: DEN Denver Arts. The City and County of Denver, its elected, appointed officials, employees and volunteers are included as Additional Insured with respect to the General Liability and Automobile Liability policies.

CERTIFICATE HOLDER: The City and County of Denver a Municipal Corporation. CANCELLATION: SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS. AUTHORIZED REPRESENTATIVE: Aon Risk Services Northeast, Inc.

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