# Wireless Communications Facilities Development Standards

City of Loveland

**Loveland Water and Power**

**Public Works**

**Current Planning**

**Building Department**

**Updated 02/18/2020**

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# Wireless Communication Facilities Development Standards

The *Wireless Communications Facilities Development Standards* apply to all new installations and additions to or modifications of existing installations of small cell wireless facilities in the City of Loveland Right of Way (ROW). Visit www.cityofloveland.org/smallcell to access this document electronically.

## Intent

Small cell wireless facilities must demonstrate compliance with all applicable provisions within these *Wireless Communications Facilities Development Standards* before receiving approval from the City of Loveland for an attachment to a facility or other installation within the City ROW, unless exempted in writing by the Director of the Department of Water & Power or his or her designee. Existing installations that fail to meet requirements for clearance and/or access to City equipment may be subject to additional fees and/or disconnection of electric service. Note that the requirements contained herein are for reference and guideline purposes and are not intended to cover all installation practices. Please contact the appropriate City of Loveland representative for any questions regarding installations or modification.

## Revisions and Updated Standards

Revisions to these Standards shall be pursuant to Larimer County Urban Area Street Standards 1.6.2. The Department will maintain these Standards and any amendments hereto. The Department will post these Standards and amendments on the City's Internet website, under the Department's specific website location. The Department does not keep a database of holders of these Standards; consequently, it shall be the responsibility of each holder to verify the most current Standards are being used for any project area.

This edition of Wireless Communications Facilities Development Standards is effective February 18, 2020. This book replaces all previous editions of the Wireless Communications Facilities Development Standards. All previous editions should be destroyed.

## Important Contacts

**Before doing any digging or excavation call for an underground cable location:**

**Colorado 811**

- Call 811 or,
- call 1-800-922-1987 or,
- visit https://call811.com/map-page/colorado

## City of Loveland Department Contacts

| Department | Phone Number | Email |
|---|---|---|
| Water and Power<br>• Electric Design<br>• Electric Metering<br>• Municipal Fiber | 970-962-3000 | PowerDevelopment@cityofloveland.org |
| Public Works<br>• ROW Permitting<br>• Traffic Engineering | 970-962-2524 | Engineering@cityofloveland.org |
| Current Planning | 970-962-2523 | Eplan-planning@cityofloveland.org |
| Building Department | 970-962-2505 | Eplan-buildingFastTrack@cityofloveland.org |

## Important Documents

The documents below are separate from these Wireless Communications Facilities Development Standards; however, there are references made to these throughout this document. Please check the City of Loveland website for electronic copies or contact us at 970-962-3000 to obtain a copy.

## City of Loveland Documents

- Contractor License Application
- Directions for Small Cell Wireless Facilities Building Permit Application
- Exemption/Revision Form
- Municipal Code Title 13 Utilities Chapter 13.12 Electricity
- Municipal Code Title 18 Wireless Telecommunications Standards 18.02.411
- Electric Service Worksheet
- Schedule of Rates, Charges and Fees
- Site Supplement Application in Rights-of-Way
- Master License Agreement for the Use of the City's Public Right-of-Way Property in Connection with the Operation of a Wireless Network (MLA)
- Requirements for Electric Service
- Municipal Code Title 14 – Wireless Communications Code

## Other Documents or Standards Organizations Referenced

- American Concrete Institute (ACI American Concrete Institute (ACI)
- American Association of State Highway and Transportation Officials (AASHTO)
- American National Standards Institute (ANSI)
- American Society for Testing and Materials Specifications (ASTM)
- American Public Works Association (APWA)
- Colorado Department of Transportation Specifications (C-DOT)
- Institute of Electrical & Electronics Standards (IEEE)
- Larimer County Urban Area Street Standards (LCUASS)
- National Electric Code (NEC)
- National Electric Safety Code (NESC)
- Occupational Safety and Health Administration Regulations (OSHA)

## Definitions and Acronyms

**AASHTO -** American Association of State Highway and Transportation Officials

**Antenna** - Communications equipment transmitting or receiving electromagnetic radio frequency signals used in providing Wireless Service

**ANSI** - American National Standards Institute See www.ansi.org

**Applicable Code** - uniform building, fire, electrical, plumbing, or mechanical codes adopted by a recognized national code organization; and City of Loveland's amendments to those codes

**APWA** - American Public Works Association (APWA)

**ACI** - American Concrete Institute (ACI, formerly National Association of Cement Users or NACU)

**ASTM** - American Society for Testing and Materials is an international standards organization that develops and publishes voluntary consensus technical standards for a wide range of materials, products, systems, and services.

**Cantenna** - A waveguide antenna, directional in nature, used to better detect or broaden a wireless network's range generally in the shape of a can.

**Carrier** –a Wireless Service Provider; or an entity who does not provide Wireless Service and is not an electric utility but builds or installs on behalf of a Wireless Service provider network equipment; or poles or any other structure supporting or capable of supporting network equipment.

**Carrier Space** – Space either on or within the pole designated for network and Carrier-owned equipment.

**CDOT** - Colorado Department of Transportation

**City of Loveland** – City of Loveland, Colorado or COL

**COL-owned Utility Pole** - A Utility Pole owned or operated by a COL department and located in Public ROW

**Demarcation Point** – The dividing point on the service which marks who is responsible for maintenance and repairs.

**Disconnect Switch** - A visible open disconnect device that the Carrier is required to install and maintain in accordance with the requirements set forth in this document. It will completely isolate the Carrier's Facility from the City's electric power system, including the Utility metering equipment located at the service entrance. It will also allow for disconnect of radio frequency emitting equipment.

**Freestanding Pole** - a Pole installed and owned by a Carrier for the primary purpose of supporting small cell network equipment

**IEEE** - The Institute of Electrical and Electronic Engineers. See www.ieee.org/index

**LCUASS** - Larimer County Urban Area Street Standards

**LWP** – Loveland Water and Power

**Metering** - The function related to measuring the transfer of electric power and energy.

**NEC** - National Electric Code. See www.necdirect.org

**NFPA** - – National Fire Protection Association. See www.nfpa.org

**NEMA** - National Electrical Manufacturers Association. See www.nema.org

**NESC** - National Electric Safety Code

**OSHA** – Occupational Safety and Health Administration. See www.osha.gov

**Permit** - Written authorization to use Public ROW or collocation on a Service Pole required from COL before a Carrier may perform an action or initiate, continue, or complete a project over which COL has police power authority.

**Pole** - A Service Pole, COL-owned Utility Pole, Freestanding Pole or Utility Pole.

**ROW** – Public Right of Way. The surface of and the space above and below the public roads, streets, highways, freeways, lanes, public way, alleys, courts, sidewalks, boulevards, parkways, drives, bridges, and tunnels. The term does not include:

- a utility easement;
- a private easement; or
- the airwaves above a public right-of-way with regard to wireless telecommunications.

**Small cell facility or small cell** – has the meaning set forth in Section 29-27-402(4) of the Colorado Revised Statutes.

**UDC** – City of Loveland Unified Development Code

**UL** – Underwriters Laboratories Inc. See www.ul.com

## Background and Purpose

Pursuant to Colorado House Bill 17-1193, effective July 1, 2017, wireless service providers and wireless infrastructure providers are permitted to locate small wireless facilities in the public right-of-way.

A small cell wireless network consists of small micro antennas that provide cellular and data coverage in smaller geographic areas. These small cells are intended to supplement the Carrier's existing network of macro cellular infrastructure. Small cell infrastructure requires three key components: a fiber connection, a power source, and an elevated mounting location such as a streetlight or pole.

These design standards provide design and aesthetic requirements and specifications that all small wireless facilities installed within the ROW must meet prior to installation within City of Loveland municipal boundaries or on City-owned facilities outside of the municipal boundary. All small cells installed within the City's ROW, including installations on equipment or poles owned by other entities, must follow these design standards and all referenced standards and requirements.

# Section 1 – General Information

## 1.1. General

This document provides information to small cell wireless Carriers and small cell infrastructure providers concerning the design standards, materials, construction, and other requirements for installation of small cell infrastructure within ROW in the City of Loveland, and on City-owned poles outside of the City.

These design standards are not exhaustive and the City, as the owner, keeper, and manager of the ROW retains the right to modify or adjust the requirements on a case-by-case basis.

Installations on private property must meet all aesthetic and design requirements in accordance with Chapter 14.40 of the Loveland Municipal Code.

See table located in Section 1.30 for an overview of small cell facility general requirements.

## 1.2. Aesthetics

Carriers shall consider the aesthetics of existing street lights, street furniture, and other development aesthetics in the neighborhood of the proposed small cell locations.

The City of Loveland requires that all new wire, cable, and fiber infrastructure be installed underground.

## 1.3. Poles

The pole design must match the aesthetics of existing streetlights installed in the vicinity of the pole. The small cell components must be sized to be visually pleasing. For a pole to be considered visually pleasing, the transition between the equipment cabinet and upper pole should be considered. A decorative transition must be installed over the equipment cabinet upper bolts, or decorative base cover must be installed to match the equipment cabinet size. The upper pole must be scaled to 0.5 to 0.75 the size of the equipment cabinet, with a 10-inch minimum outer diameter. All hardware connections must be hidden from view. No horizontal flat spaces greater than 1.5 inches may exist on the equipment cabinet to prevent cups, trash, and other objects from being placed on the equipment cabinet. Each pole component must be architecturally compatible to create a cohesive aesthetic. All poles must be round, straight and made of galvanized steel.

## 1.4. Finishes

The color of all small cell equipment must match the predominant color of existing COL pole infrastructure within 500 feet of the proposed installation site. The proposed finish must be listed on the construction plans submitted with the application. Equipment placed within historic, metro district areas, or areas or structures that have unique architectural design requirements, may require finishes different from those listed below and may require a color

sample to be submitted for approval. When the appropriate color choice is not clear, please contact the COL Water & Power Department at 970-962-3365

The colors listed below are the most common found within the COL:

- Dark Bronze (RAL # 8019)
- Gray (RAL #7040)
- Light Gray (ANSI No. 70; Munsell Notation 5.0 BG 7.0/0.4) - All utility pole mounted and stand-alone equipment cabinets shall be Light Gray

## 1.5. Other Structures

Structures designed to disguise or camouflage small cell infrastructure other than approved freestanding poles, streetlights, traffic poles, and utility infrastructure may not be installed in the ROW. These types of structures are allowed on private property and must meet all requirements and standards in the UDC.

## 1.6. Electrical Service and Metering

All small cell infrastructure, regardless of attachment type, must have individual electric meters provided by the City of Loveland Water and Power Department. The metering must be either mounted within the pole base or within an approved ground mounted equipment enclosure. The electric service installation and all metering requirements must be completed in accordance with the City's Requirements for Electric Service in effect at the time of installation.

## 1.7. Warning Tape

All warning tape must be installed per the Requirements for Electric Services book.

## 1.8. Tracer Wire

All tracer wire must be installed per the Requirements for Electric Services book.

## 1.9. Wind Loading

All poles and other structures installed in the ROW must be designed to the current version of the AASHTO for wind and load calculations.

## 1.10. Radio Frequency Certification Report

The City of Loveland requires a Radio Frequency (RF) Certification Report for all new small cell wireless infrastructure installations. Each certification must be signed and stamped by a qualified Professional RF Emissions Engineer and include the following:

1. Descriptions of the proposed equipment and deployment type, include heights.
2. All frequencies on which the proposed equipment will operate.
3. The number of channels that will be used on each frequency.

4. A table explaining the Federal Communications Commissions (FCC) Rules and Regulations for the Maximum Permissible Exposure (MPE) limits for general populations or occupational situations. The MPE output levels for proposed equipment shall be clearly shown on a table at the antenna level and ground level with the following columns: predicted power density ($mW/cm^2$), FCC limits of power density ($mW/cm^2$), and FCC general population limits (%MPE). See **Table 1** for an example.

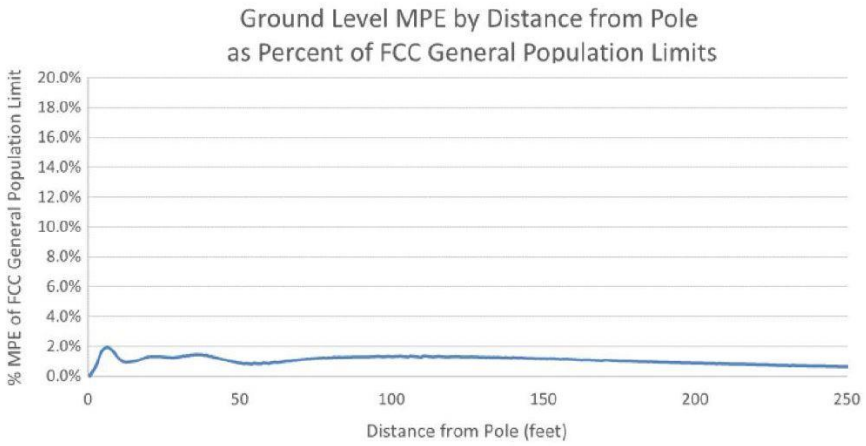
### Table 1

| Location | Predicted Power Density ($mW/cm^2$) | FCC Limit Power Density ($mW/cm^2$) | FCC General Population Limits (%MPE) |
|---|---|---|---|
| **Antenna level** | 1.958 | 1.0 | 195.8% |
| **Ground level** | 0.0092 | 1.0 | 0.92% |

***Data within table is for example only and does not indicate specific requirements or limits***

5. A graphic of the predicted FCC General Population Limits (%MPE) at ground level as a function of distance up to 250 feet away from the pole. See **Figure 1** for an example.

### Figure 1




6. A compliance statement noting and depicting any requirement for RF alerting signage and occupational environment compliance.

## 1.11. Warning Signs and Labels

Radio frequency warning labels must be mounted exterior to Carrier's equipment, and clearly marked on both sides of the enclosure and be visible from the ground, roadside, and field side. A 4-inch by 6-inch (maximum) plate with the Carrier's name, location identifying information, and emergency telephone number must be permanently fixed to the shroud. See **Figure 2** for signage examples.

Portions of any transmitter site may have high power densities that could cause exposure in excess of the FCC Occupational or General Population guidelines.

The companies that operate the antennae are required by law to implement the following:

- Restrict access
- Post notification signs on every access point to increase awareness of the potential for exposure BEFORE anyone enters and area with antennae.
- Place additional notification signs and visual indicators in an area with antennae (beyond an access point) where RF exposure levels may start to exceed the FCC's limits.

**Figure 2**


### *(Notice) Radio Frequency Guidelines*

Informs people of the basic safety guidelines for working in an RF environment


### *Information*

Provides relevant contact information about the pole and/or antenna location for any questions, emergencies, or requests.


### *(Blue) Notice*

Indicates that, beyond the sign, RF exposure levels may exceed the General Population MPE limit but will remain below the Occupational MPE limit.


### *(Yellow) Caution*

Indicates that, beyond the sign, RF exposure levels may exceed the General Population and Occupational MPE limits.


### *(Red/ Orange) Warning*

Indicates that, beyond the sign, RF exposure levels may substantially exceed the General Population and Occupational MPE limits.

## 1.12. Antenna

The antenna must be located within a cantenna located on top of the pole. The outer diameter must be 16" maximum and the cantenna may be no more than 6 feet 8 inches tall, including antenna, radio head, mounting bracket, and all other hardware necessary for a complete installation.

5G remote-mounted antennas may not exceed a 19" outer diameter protrusion.

## 1.13. Equipment and Hardware

All small cell Carrier equipment must be housed internal to the equipment cabinet or hidden behind the antenna. Carrier equipment may not be strapped to the outside of the pole or otherwise visible external to the pole, all the network provider equipment must be located internal to the pole and cantenna. The exception to these requirements are utility pole applications, which are discussed in Section 3.

## 1.14. Equipment Cabinet

All equipment must be located internal to the equipment cabinet or recessed as much as possible in the equipment cabinet and meet City of Loveland power utility requirements. All equipment must be mounted per the Carrier's requirements. Pole bases must be sized to handle the listed equipment and all other equipment attached to the pole. The equipment compartment or cabinet must have a lockable access door sized to install, maintain, and remove all small cell equipment as needed to meet Carrier's requirements.

## 1.15. Wiring and Cabling

Wiring and cabling for City utility and traffic infrastructure will be physically separate from wiring and cabling for small cell wireless infrastructure. The pole must be designed with a physical interior divider to allow for separation of city wiring and cabling from small cell infrastructure. The equipment cabinet must include provisions to allow for the physical separation of City utility wiring and cabling from the foundation base to the meter housing.

## 1.16. Conduit

All wiring and fiber-optics to the pole, must be installed in conduit, handhole, pull boxes, or other ground mounted equipment. All infrastructure must be installed per the Requirements for Electric Services book. Conduit must also be included internal to the foundation. Eight (8) 2" PVC conduit sweeps must be installed on streetlight applications. Conduit shall accommodate City electrical, City fiber, and Carrier electrical and fiber with up to four (4) spare sweeps for future service.

## 1.17. Shrouding

For metal or fiberglass poles, all small cell carrier equipment shall be housed internal to the pole. Network provider equipment shall not be mounted to the exterior of the pole. For wood

poles, all equipment must be visibly hidden behind an exterior shroud with maximum external shroud dimensions of 49”H x 19”W x 13”D.

## 1.18. Handholes/Pull Boxes

All fiber and power infrastructure shall be installed in a handhole adjacent to the pole. All handholes/pull boxes shall be installed per the Requirements for Electric Services book.

## 1.19. Foundations

Concrete bases and equipment pads shall be pre-cast concrete and shall be designed by a professional structural engineer licensed in the state of Colorado to meet ACI 318. A stamped detail drawing shall be included with the construction documents submitted during the application process. A complete foundation includes the concrete, reinforcing steel, anchor bolts, leveling nuts, conduit stubs, ground rod and wire, excavation and backfill, restoration, and accessories as required to provide a complete unit. Streetlight, mast arm, and banner arm (if required) wind loading shall be incorporated into foundation structural design.

## 1.20. Anchor Bolts and Bolt Pattern

The anchor bolts and bolt circle should be sized per the manufacturer’s specifications to accommodate a 20-inch equipment base.

## 1.21. Disconnect

For all small cell wireless infrastructure mounted on non-carrier owned infrastructure (i.e. streetlights, utility poles, traffic signals) the Carrier shall include in the design the ability to easily shut off radio signals and power while City staff and contractors are working on the pole. The disconnect switch shall be clearly labeled in the construction drawings and shall be clearly identified on the pole. The City reserves the right to turn off or disconnect the equipment at any time for necessary operations and maintenance activities.

## 1.22. Dual Carrier

To the extent reasonably feasible, the small cell wireless infrastructure must be collocated with other small cell wireless infrastructure on the same pole or structure to limit the number of poles within the ROW.

## 1.23. Location Preferences

1. Third-party poles under the terms of a fully executed pole attachment agreement with the Owner of such poles,
2. City-owned poles, including street lighting poles and utility poles, in the ROW,
3. New street lighting poles approved by the City for street lighting purposes that are purchased by the Licensee and ownership conveyed by the Licensee to the City (via bill of sale), or

4. Licensee's proprietary poles to the extent permitted by, and in conformance with, City regulations and ordinances.
5. City's traffic signal poles.

## 1.24. Placement Requirements

Any ground-mounted equipment must be located in a manner that does not interfere with public safety and aesthetic concerns. The City may, where reasonably feasible based on construction, engineering, and design standards, require ground-mounted equipment for a small cell wireless infrastructure to be installed in a flush-to-grade underground equipment vault. Due to the frequency with which median mounted and round-a-bout poles are struck by traffic, streetlights located within raised medians or installed within round-a-bouts shall not be eligible for small cell installation to ensure public safety.

## 1.25. Separation

If there is a suitable streetlight within 250 feet of the proposed freestanding small cell installation, the small cell shall be deployed at an existing streetlight location unless the Carrier can demonstrate substantial hardship. Combination streetlight and small cell poles shall only be added in locations where it has been identified by LWP that a streetlight is necessary.

Refer to Section 4.2 for placement requirements for freestanding infrastructure in the ROW.

## 1.26. ROW Interference Prohibited

All equipment located within the public ROW shall be located such that it meets ADA requirements and does not obstruct, impede, or hinder usual pedestrian or vehicular travel or interferes with the operation and maintenance of signal lights, signage, street lights, street furniture, fire hydrants, or business district maintenance.

No small cell infrastructure or Alternative Tower Structure may be located or maintained in a manner that causes unreasonable interference to the Public Right of Way. Unreasonable interference means any use of the Right-of-Way that disrupts or interferes with use of the Public Right of Way by the City, the general public, or other person authorized to use or be present upon the Public Right-of-Way, when there exists an alternative that would result in less disruption or interference. Unreasonable interference also includes any use of the Public Right-of-Way that disrupts vehicular or pedestrian traffic, any interference with public utilities, and any other activity that will present a hazard to public health, safety, or welfare.

## 1.27. Noise

Noise from fans and other motorized equipment must not be greater than 50dBA measured at one meter (3.28 feet) from the equipment.

## 1.28. Construction and Make Ready

City of Loveland infrastructure (streetlights, utility poles, traffic poles, etc.) located in the ROW was not originally designed to accommodate additional attachments such as small cell wireless infrastructure. The Carrier should assume that existing infrastructure will need to be upgraded, at the cost of the Carrier, to accommodate the additional equipment and loading on the poles. Further information is available in the Loveland Municipal Code and the Master License Agreement required prior to installation of infrastructure within the ROW.

At the sole cost of the carrier, the City of Loveland shall perform all make ready work to replace and upgrade all poles and any associated infrastructure as required to accommodate the carrier's small cell infrastructure. The Carrier will be responsible for installing their equipment once make ready work is completed.

For freestanding poles in the ROW, the Carrier is required to meet the standards outlined in Section 4 of this document and all other relevant and applicable standards and requirements. Substitution shall only be allowed with express prior consent from the City and must meet or exceed all City standards for safety, performance and aesthetics.

## 1.29. Historic, Metro Districts, and Architecturally Unique Areas or Structures

The City of Loveland may require deviations from these standards in areas that are considered historic, metro district areas, or areas or structures that have unique architectural design requirements, such as decorative pedestrian lighting. The deviations will be required in order to match existing infrastructure and design standards. These deviations may include, but are not limited to, color, shape, and height of the pole, or the inclusion of pole base shrouds. Please contact the COL Water & Power Department at 970-962-3365 for questions about unique design requirements for public infrastructure in certain areas of the City.

Information on the City of Loveland's historic preservation areas can be found online at https://www.lovgov.org/services/development-services/building-division/contractor-licensing

## 1.30. Small Cell Facility General Requirements Overview

This table is intended to provide an overview of the general requirements for small cell wireless facilities. Refer to Section 1 for more details and specifics for small cell requirements

| Description | Requirement |
|---|---|
| **Pole Type/Aesthetics** | All poles must be round, straight and made of galvanized steel.<br>Per Sections 1.2 and 1.3 |
| **Pole Color** | The pole must be painted to match existing streetlights in the area, which are typically a dark bronze color (RAL # 8019), per Section 1.4. |
| **Separation of Installations** | Per Section 1.25 |

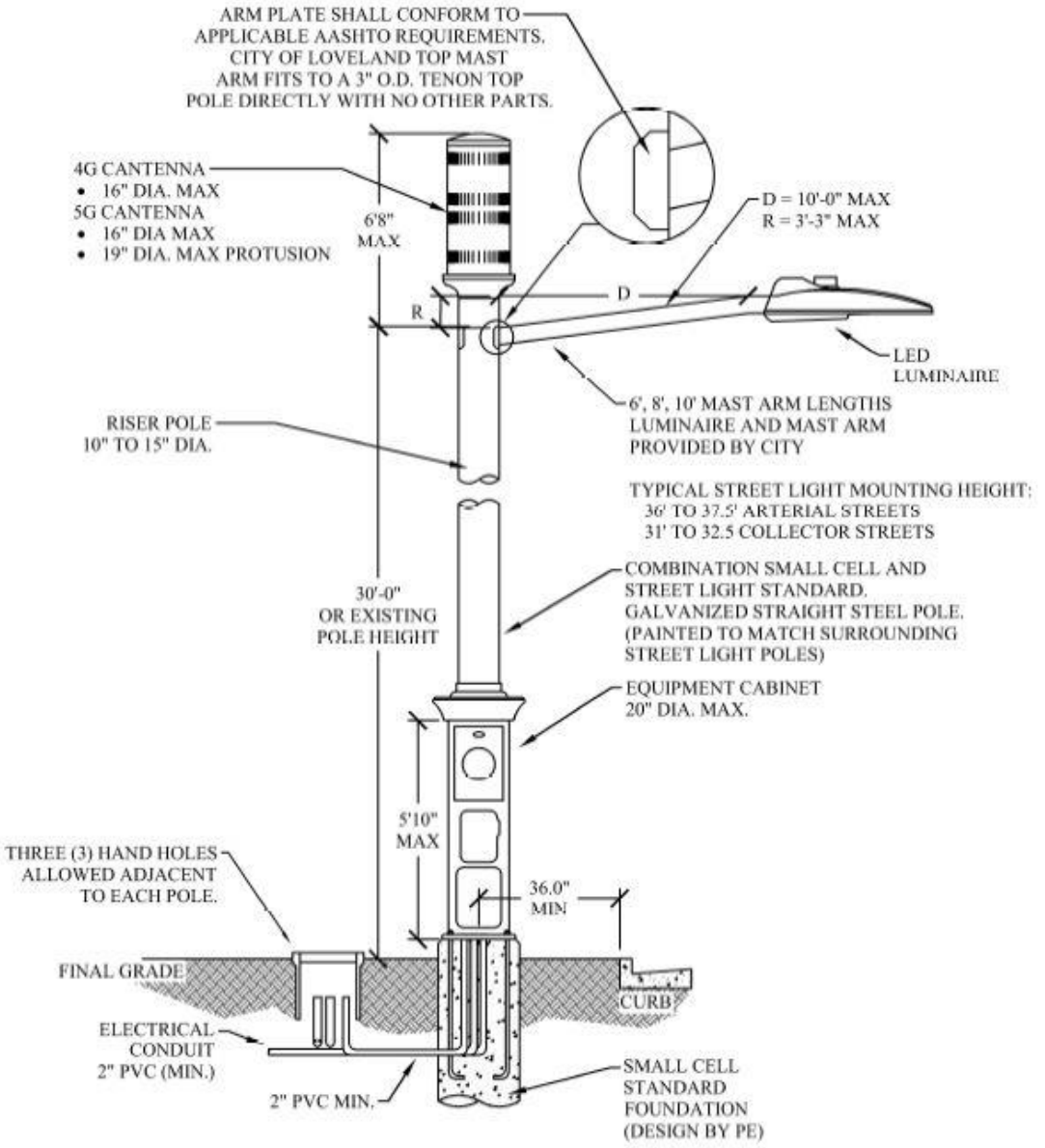
| Description | Requirement |
|---|---|
| **Foundations** | Precast concrete foundations are required and must meet ACI 318 per Section 1.19 |
| **Electric Service and Metering** | Must be completed in accordance with the City's Requirements for Electric Service in effect at the time of installation. Per Section 1.6. |
| **Separation of Service** | Wiring and cabling for city utility and traffic infrastructure will be physically separate from wiring and cabling for small cell wireless infrastructure per Section 1.15. |
| **Antenna Shrouding** | Antenna and associated equipment shall be installed in a cantenna shroud to disguise or camouflage the small cell infrastructure per Section 1.17. |
| **Demarcation Point** | • If power is currently available in a handhole near the base of the pole, the demarcation point is the secondary terminal block in the handhole.<br>• If a new transformer is installed, the demarcation point is the secondary bushings of the transformer.<br>The customer owns, installs, and maintains, at their expense, all wire, conduit, and equipment past that point with the exception of the City's metering equipment. |
| **External Equipment Shroud Dimensions** | 49"H x 19"W x 13"D maximum, wood utility poles only. |
| **Cantenna Height** | The cantenna must be located on top of the pole and may be no more than 6 feet 8 inches tall, including antenna, radio head, mounting bracket, and all other hardware necessary for a complete installation per Section 1.12. |
| **Cantenna Diameter** | Outer diameter must be 16" maximum. 5G remote mounted antennas will be allowed a 19" outer diameter protrusion.<br>Per Section 1.12. |
| **Noise** | No greater than 50dBA measured at one meter (3.28 feet) from the equipment per Section 1.27. |
| **RF Equipment Disconnect** | RF equipment shall have a disconnect for City staff and contractors to easily shut off radio signals and power while working on the pole. The disconnect switch shall be clearly labeled in the construction drawings and shall be clearly identified on the pole. Per Section 1.21. |
| **Warning Labels** | Per Section 1.11 |
| **Owner Identification** | Per Section 1.11 |

# Section 2 – Streetlight Attachments

## 2.1. General

This section describes the standards and requirements for placement of small cell infrastructure at the location of an existing streetlight pole in the ROW. Existing streetlights are typically owned and maintained by Loveland Water and Power (LWP). Streetlight poles shall meet all LWP standards for placement, spacing and design and must comply with all requirements in Section 1 – General of this document as well as all other applicable standards, codes, and requirements. Combination streetlight and small cell poles shall only be added in locations where it has been identified by LWP that a streetlight is necessary.

### Figure 3




## 2.2. Streetlight Attachments Specifications Overview

**This table is intended to provide an overview of the specification for small cell wireless attachments to existing streetlight poles in the ROW. Refer to Section 2.1 and Section 1 for more details and specifics for small cell requirements.**

| Description | Requirement |
|---|---|
| **Luminaire** | **All luminaires shall be the same height as adjacent streetlights.** |

| Description | Requirement |
|---|---|
| **Electrical Service** | Must be completed in accordance with the City's Requirements for Electric Service in effect at the time of installation. Per Section 1.6. |
| **Electric Metering** | Each installation must be individually metered by the City of Loveland Water and Power Department. Electric metering equipment must be either mounted within the pole base or within an approved ground mounted equipment enclosure. Per Section 1.6. |
| **Demarcation Point** | • If power is currently available in a handhole near the base of the pole, the demarcation point is the secondary terminal block in the handhole.<br>• If a new transformer is installed, the demarcation point is the secondary bushings of the transformer.<br>The customer owns, installs, and maintains, at their expense, all wire, conduit, and equipment past that point with the exception of the City's metering equipment. |
| **Pole Requirements** | Per Section 1.3 |
| **Pole Type** | All poles must be round, straight and made of galvanized steel.<br>Per Sections 1.2 and 1.3 |
| **Total Pole Height** | The top of the cantenna shall be located no more than 6'-8" above the adjacent streetlight heights, 36'-8" is typical. |
| **Street Light Mounting Height** | Per Drawing SC-04. Must match mounting height on adjacent poles as closely as possible. |
| **Wind Loading** | Must meet current version of the AASHTO for wind and load calculations. Per Section 1.9 |
| **Foundation** | Precast concrete foundations are required and must meet meet ACI 318 per Section 1.19 |
| **Conduit Sweeps in Foundation** | Conduit installation must be installed per the Requirements for Electric Services book. Conduit must be included internal to the foundation. Eight (8) 2" PVC conduit sweeps must be installed on streetlight applications. Conduit shall accommodate City electrical, City fiber, and Carrier electrical and fiber with up to four (4) spare sweeps for future service. Per Section 1.16. |
| **Anchor Bolts & Bolt Pattern** | Per Section 1.20 |
| **Shroud** | All small cell carrier equipment shall be housed internal to the pole or visibly hidden behind an exterior shroud. No network provider equipment shall be mounted to the exterior of the pole. Per Section 1.17. |

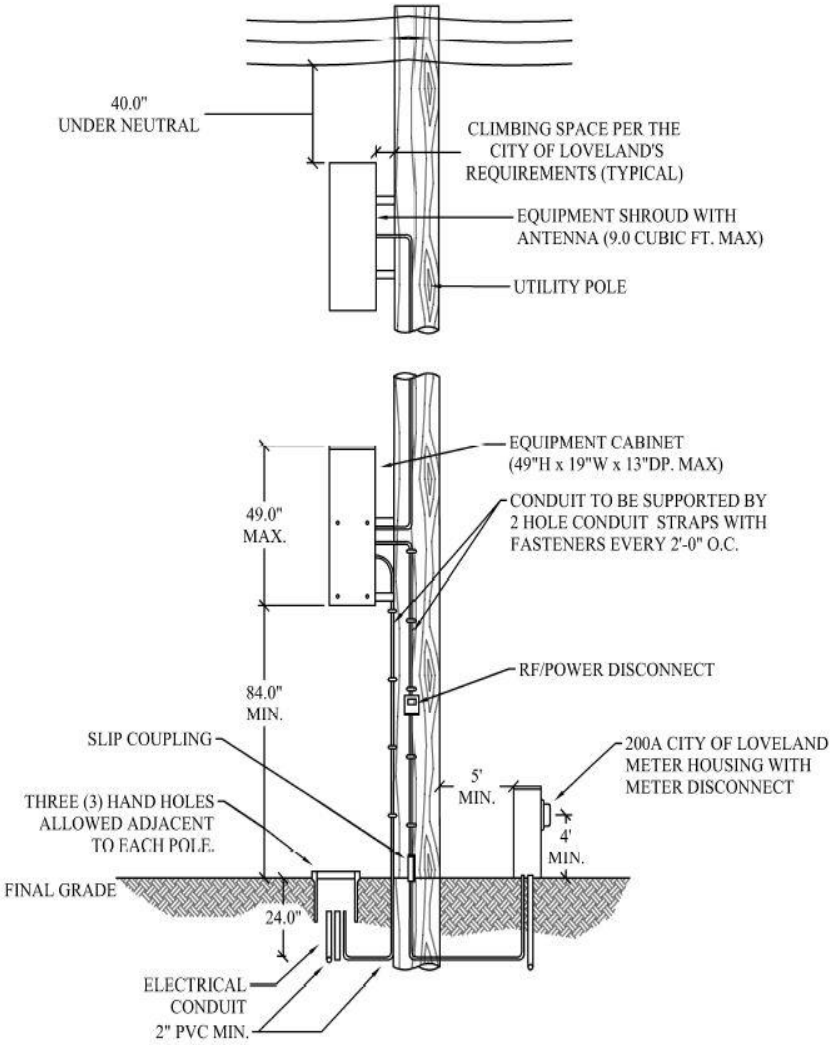
| Description | Requirement |
|---|---|
| **Electrical Separation** | Wiring and cabling for City utility and traffic infrastructure will be physically separate from wiring and cabling for small cell wireless infrastructure per Section 1.15. |
| **Handholes/Pull Boxes** | All fiber and power infrastructure shall be installed in a handhole adjacent to the pole. All handholes and pull boxes shall be installed per the Requirements for Electric Services book. Per Section 1.18. |
| **Equipment Cabinet Dimensions** | Per Section 1.14 |
| **Noise** | No greater than 50dBA measured at one meter (3.28 feet) from the equipment per Section 1.27. |

# Section 3 – Utility Pole Attachments

## 3.1. General

This section describes the standards and requirements for placement of small cell infrastructure on existing utility poles in the ROW. All attachments to utility poles must be approved by the owner utility prior to application. All equipment must meet the owner utility's requirements.

### Figure 4




## 3.2. Pole Loading

Prior to submitting an application for a utility pole attachment, the Carrier must ensure the supporting poles and appurtenances are appropriately sized and have sufficient strength to accommodate the additional equipment loads. This information, along with confirmation from

the utility pole owner, must be included in the application. If not structurally capable, the Carrier will be responsible for all make ready work costs associated with replacing any existing pole.

## 3.3. Color

All visible equipment, attachments and hardware must be nonspecular and light gray in color. See Section 1.13 for details.

## 3.4. Clearances

All fiber and electric service conduits must be separate on the pole. All installations must meet or exceed all applicable structural standards, clearance standards, and provisions of the latest National Electrical Safety Code (NESC), or the owner utility's clearance requirements. In case of conflict, the most stringent requirements apply. All necessary permits must be obtained by the wireless Carrier owner and provided to the pole owner in addition to the City with the permit application.

## 3.5. Grounding

All equipment on the utility pole must be grounded in accordance with the NESC, the utility owner's requirements, and City's Requirements for Electric Service. In case of conflict, the most stringent requirements apply.

## 3.6. Future Undergrounding

All Carrier equipment must be removed and relocated by the Carrier at no cost to the City when the City elects to underground the overhead utility lines in the future. The equipment must be removed within a reasonable time frame determined by LWP. A reasonable time frame refers to a period of time that does not delay the removal of the utility poles and lines.

## 3.7. Equipment Mounting

The Carrier must comply with mounting requirements of the owner utility for each pole. Equipment may either be mounted on the utility pole or strand mounted at the discretion of the pole owner.

For City-owned utility poles, no equipment may be mounted above energized equipment. All communications equipment, including small cell infrastructure, must be mounted in the communications space on the pole and must maintain all clearances in accordance with the NESC and City standards.

## 3.8. Pole Mounted

Only one utility pole mount shroud installation is allowed per site. The shroud must contain all required small cell equipment. The shroud must measure no more than 49”H x 19”W x 13”D in size.

## 3.9. Strand Mounted

Only one strand mount shroud installation is allowed per site. No strand-mounted small cell devices may be installed on poles with mounted streetlights. The equipment shroud may not exceed 9.0 cubic feet in size.

Aerial fiber and power strand installations may be allowed in areas with existing aerial fiber infrastructure only with express approval from the City.

## 3.10. Utility Pole Attachments Specifications Overview

This table is intended to provide an overview of the specification for small cell wireless attachments to existing utility poles in the ROW. Refer to Section 1 and Section 3 for more details and specifics for small cell requirements.

| Description | Requirement |
|---|---|
| **Pole Loading** | If utility pole is not structurally capable, it is expected that the Applicant will be responsible for replacing any existing pole per Section 3.2. |
| **Color** | All surfaces of equipment and attachments must be nonspecular and light gray in color, per Section 1.13. |
| **Clearances** | Per Section 3.4 |
| **Grounding** | All equipment on the utility pole must be grounded in accordance with the NESC, the utility owner's requirements, and City's Requirements for Electric Service. Per Section 3.5. |
| **Future Undergrounding** | Per Section 3.6 |
| **Equipment Mounting** | For COL owned utility poles, no equipment may be mounted above energized equipment. All communications equipment, including small cell infrastructure, must be mounted in the communications space on the pole and must maintain all clearances in accordance with the NESC and City standards. |
| **Pole Mounted** | One utility pole mount shroud containing all small cell equipment is allowed per site. Shroud dimensions measure no more than 49"H x 19"W x 13"D in size. |
| **Strand Mounted** | One strand mount shroud installation is allowed per site. No strand-mounted small cell devices may be installed on poles with mounted streetlights. The equipment shroud may not exceed 9.0 cubic feet in size. |
| **Electric Meter** | Each installation must be individually metered by the City of Loveland Water and Power Department. Electric meters cannot be mounted on wood utility poles. See the Requirements for Electric Service for metering information. |

| Description | Requirement |
|---|---|
| **Demarcation Point** | • If power is currently available in a handhole near the base of the pole, the demarcation point is the secondary terminal block in the handhole.<br>• If a new transformer is installed, the demarcation point is the secondary bushings of the transformer.<br>The customer owns, installs, and maintains, at their expense, all wire, conduit, and equipment past that point with the exception of the City's metering equipment. |

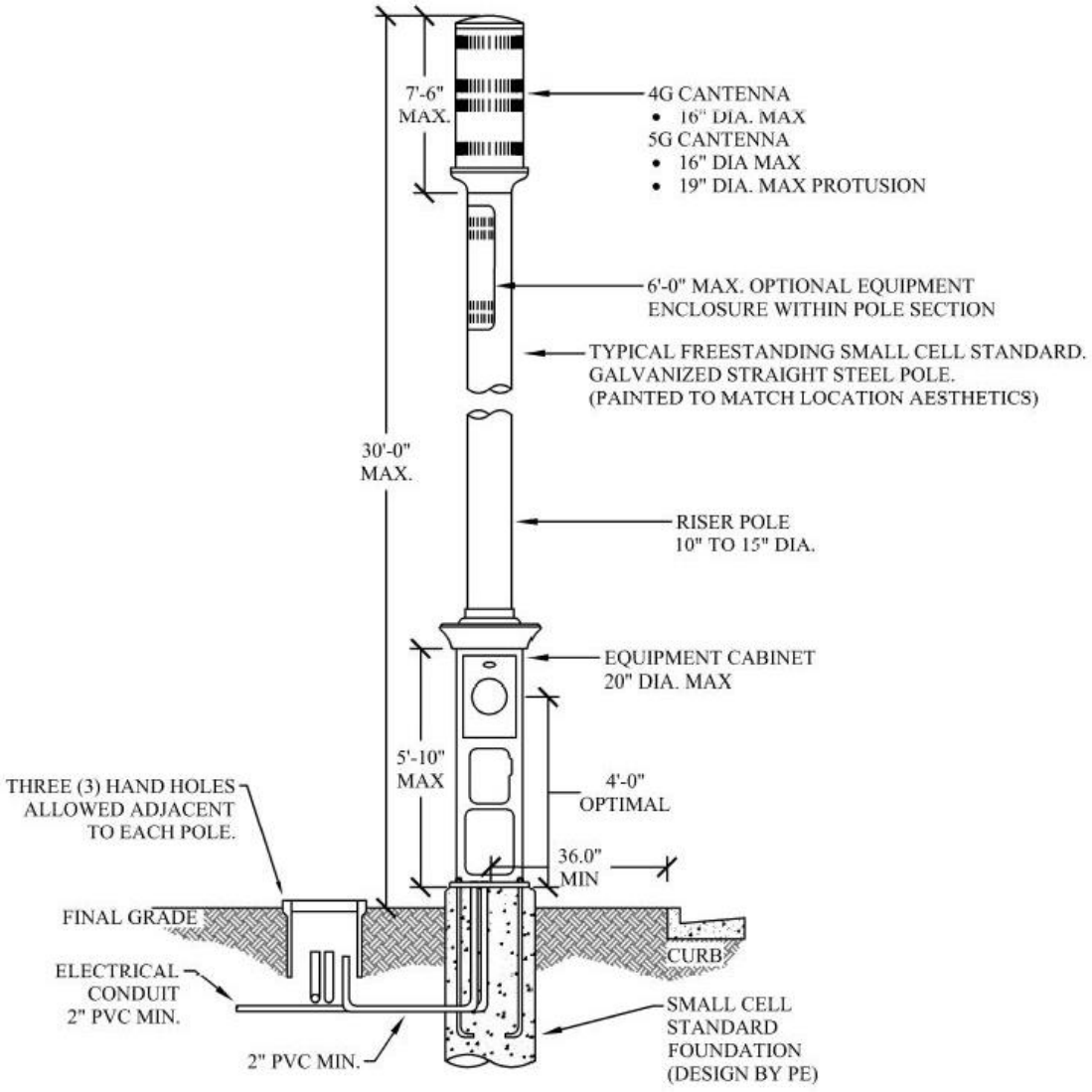
# Section 4 – Freestanding Infrastructure

## 4.1. General

This section applies to the installation of freestanding privately owned small cell poles in the ROW. It describes the standards and requirements for placement of small cell infrastructure at a location with no existing infrastructure available for attachment (such as a streetlight, utility pole, or other structure in the ROW). All freestanding pole permit applications must be approved by the City of Loveland prior to installation and must comply with all requirements in Section 1 – General and Section 4 – Freestanding Infrastructure of this document as well as all other applicable standards, codes, and requirements.

Freestanding small cell pole components include the foundation, equipment cabinet, upper pole, cantenna, and all hardware and electrical equipment necessary for a complete assembly.

### Figure 5



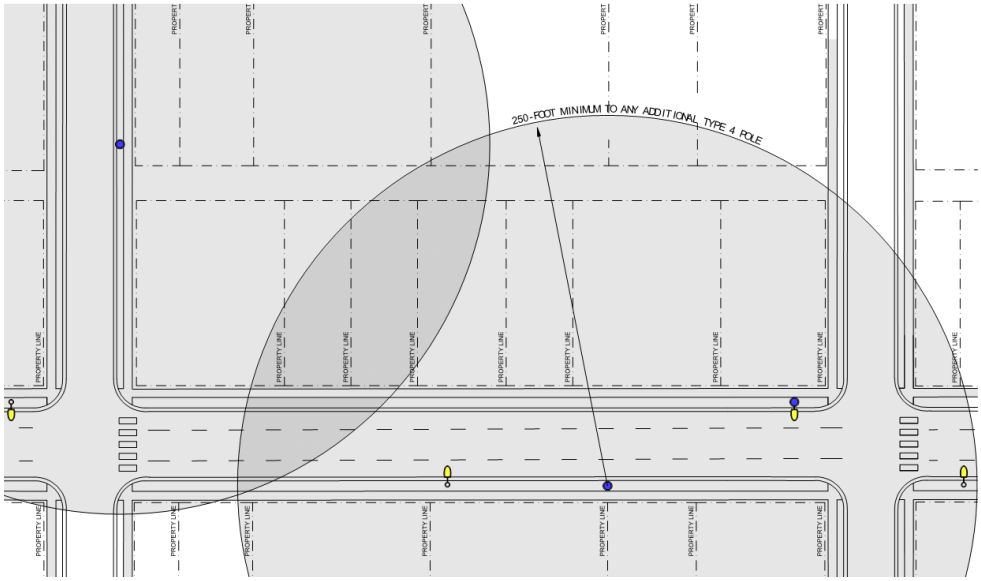
## 4.2. Placement Requirements

If there is a suitable streetlight within 250 feet of the proposed freestanding small cell installation, the small cell shall be deployed at an existing streetlight location unless the Carrier can demonstrate substantial hardship. Otherwise, freestanding poles must be placed:

a. In a manner that does not impede, obstruct, or hinder pedestrian or vehicular travel as shown in **Figure 7**.
b. So as not to be located along the frontage of a historical building deemed historical on a federal, state, or local level.
c. So as not to significantly create a new obstruction to property sight lines.
d. At the intersection of property lines, or along secondary property street facing.
e. Within the street amenity zone whenever possible.
f. In alignment with existing trees, utility poles, and streetlights.
g. Equal distance between trees when possible, with a minimum of 25 feet separation such that no disturbance will occur within the critical root zone or dripline of any tree.
h. With appropriate clearance from existing utilities.
i. Outside of the 30-foot clear sight triangle (for base cabinets equal to or greater than 18-inches in diameter) at intersection corners as shown in **Figure 8**.
j. 10 feet away from the triangle extension of an alley way flare.
k. No closer than 25 feet of an existing COL owned streetlight pole.
l. No closer than 100 feet of the apron of a fire station or other adjacent emergency service facility.
m. No closer than 250 feet, radially, from another privately-owned freestanding small cell pole as shown in **Figure 6**.
n. In a manner that avoids, to the maximum extent feasible, new installations in residential areas, near schools, and parks.

### Figure 6

Figure 6 shows freestanding poles which shall be a minimum of 250 feet apart radially. This radius extends around corners and into alleys.

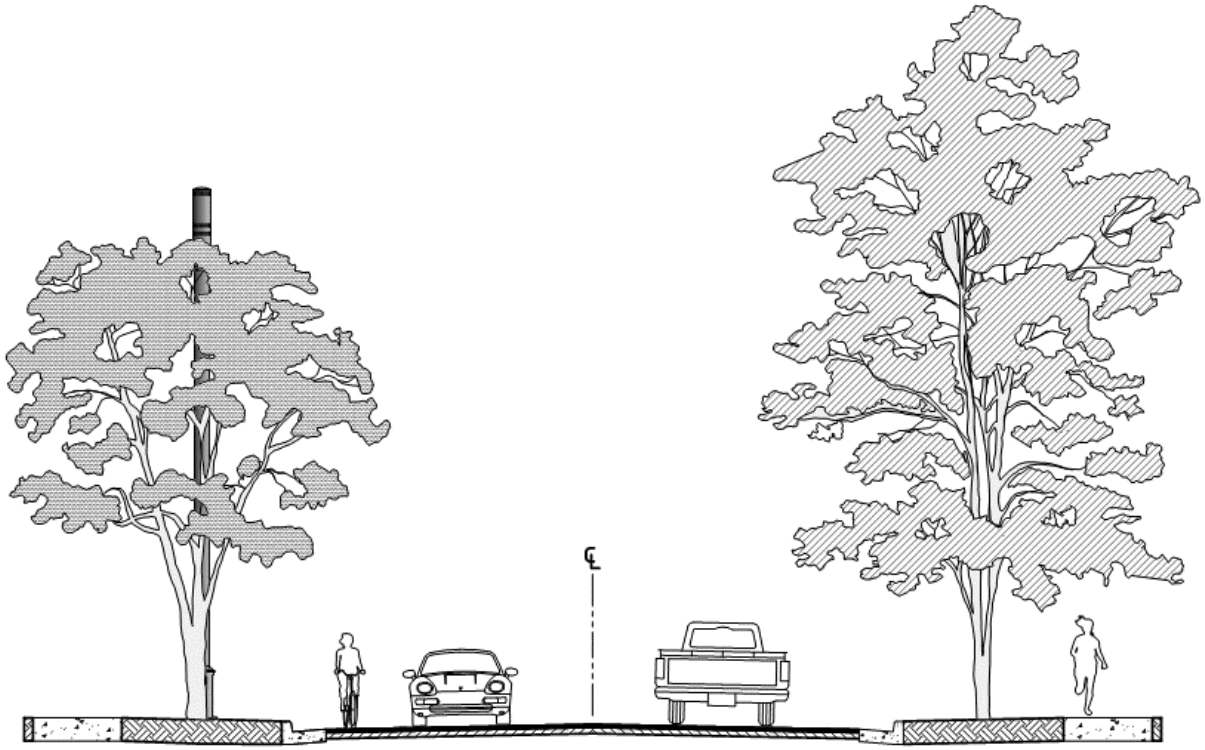



## 4.3. Setback within ROW

**Freestanding poles must be located such that they do not impede, obstruct, or hinder normal pedestrian and vehicular travel. They must not be placed in a way that affects public safety or obstructs the legal access or use of the public ROW. The placement must not violate or conflict with any public ROW design standards, specifications, or other special district requirements. The placement of a pole must not violate the Americans with Disabilities Act, or in any way create a risk to public health, safety, or welfare.**

### Figure 7

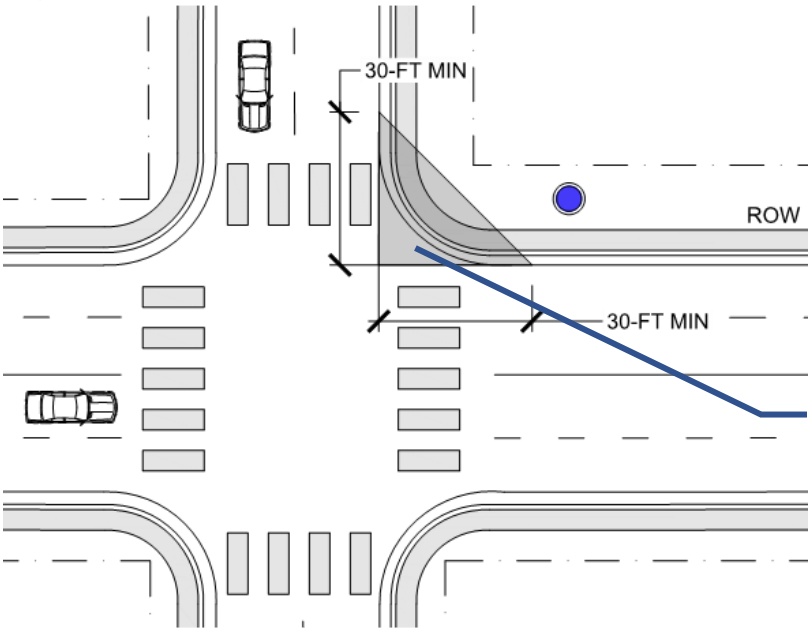
**Figure 7** shows the setback location of a freestanding small cell infrastructure within ROW.



## 4.4. Intersections

**Freestanding small cell poles must not be located in such a way that the pole hinders, blocks or otherwise obstructs the line of sight at intersections or the approaches to intersections. Freestanding small cell infrastructure may be never be placed in the line of sight triangle, as shown in Figure 8 below.**

## Figure 8

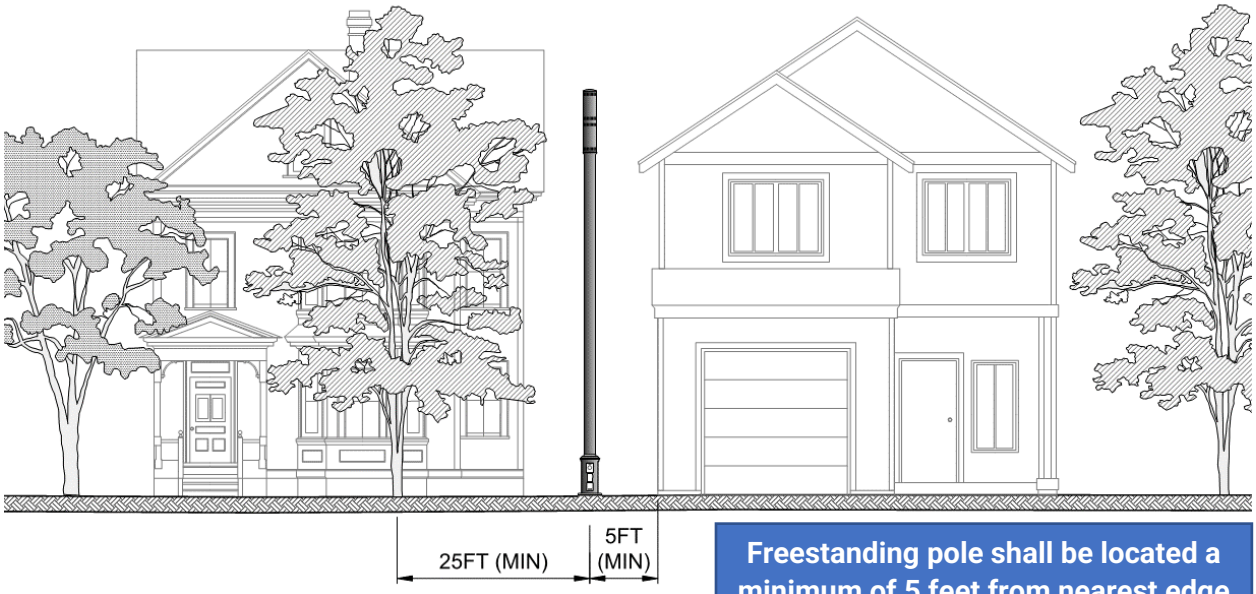



Do not locate small cell freestanding poles in clear sight triangles at intersections, alleys, driveways, etc.

## 4.5. Property Lines

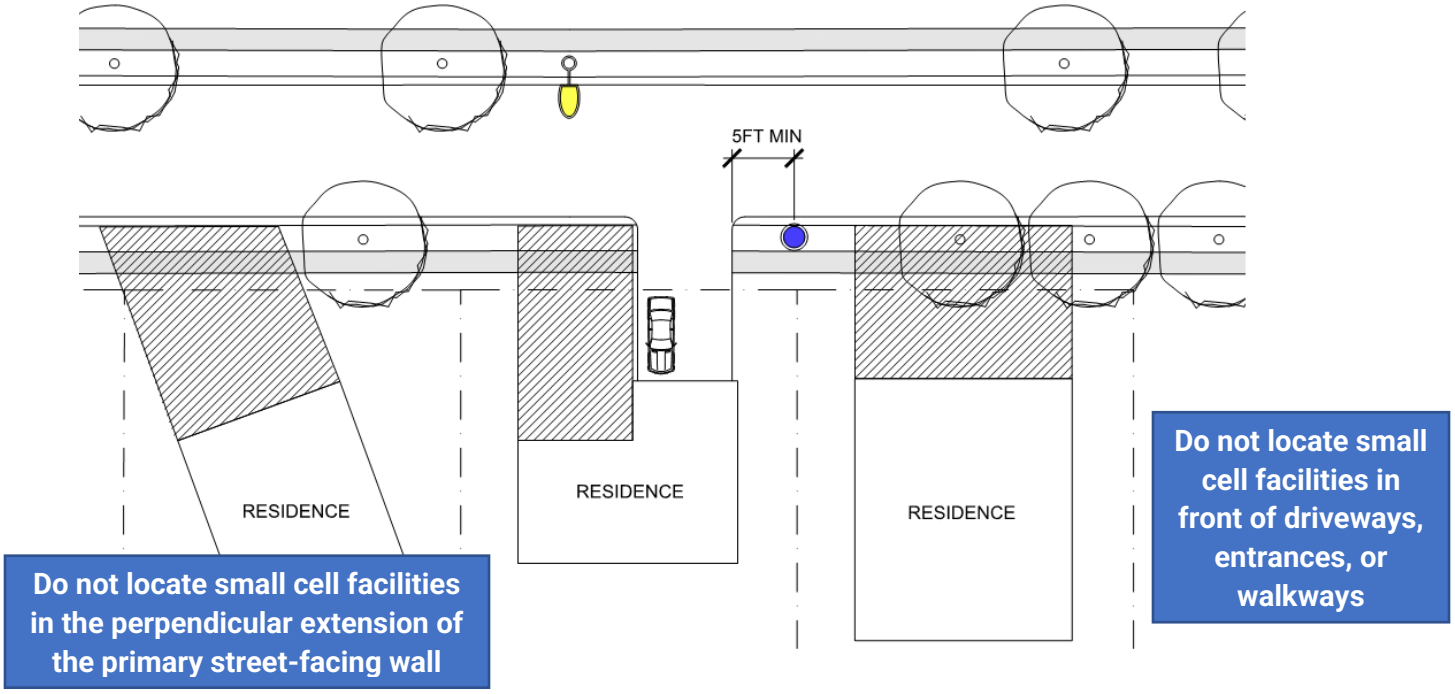
Freestanding small cell infrastructure may not be located within 25 feet of trees to prevent disturbance within the critical root zone or dripline of the tree, as shown in **Figure 9**. The freestanding small cell infrastructure shall not be installed between the perpendicular extension of the primary street-facing wall plane (recognized as the plane(s) with a front door) of any single or two-family residence as shown in **Figure 10**.

## Figure 9




Freestanding pole shall be located a minimum of 5 feet from nearest edge of garage or driveway, whichever is

## Figure 10




## 4.6. Commercial Areas

When located adjacent to a commercial establishment, such as a shop, restaurant, or a multi-family or mixed use structure; care should be taken to locate the freestanding small cell infrastructure in such a way that it does not negatively impact the adjacent business. Small cells must not be located in front of primary windows, primary walkways, primary entrances or exits, or in such a way that it would impede normal operations or delivery to the properties. Small cells must be located between properties as much as possible, as shown in **Figure 11**.

## Figure 11


## 4.7. Freestanding Infrastructure Specifications Overview

This table is intended to provide an overview of the specification for the installation of freestanding privately owned small cell poles in the ROW. Refer to Section 1 and Section 4 for more details and specifics for small cell requirements.

| Description | Requirement |
|---|---|
| **Electrical Service** | Must be completed in accordance with the City's Requirements for Electric Service in effect at the time of installation. Per Section 1.6. |
| **Electric Metering** | Each installation must be individually metered by the City of Loveland Water and Power Department. Electric metering equipment must be either mounted within the pole base or within an approved ground mounted equipment enclosure. Per Section 1.6. |
| **Demarcation Point** | • If power is currently available in a handhole near the base of the pole, the demarcation point is the secondary terminal block in the handhole.<br>• If a new transformer is installed, the demarcation point is the secondary bushings of the transformer.<br>The customer owns, installs, and maintains, at their expense, all wire, conduit, and equipment past that point with the exception of the City's metering equipment. |
| **Pole Requirements** | Per Section 1.3 |
| **Pole Type** | All poles must be round, straight and made of galvanized steel.<br>Per Sections 1.2 and 1.3 |

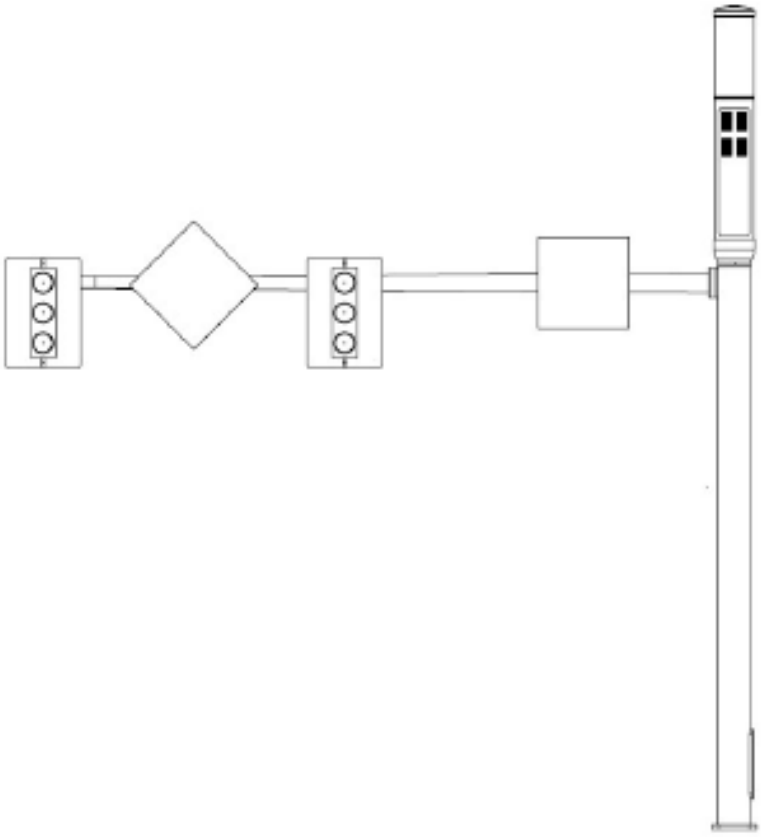
| Description | Requirement |
|---|---|
| **Total Pole Height** | Freestanding small cell poles shall not exceed 30 feet. Pole shall be measured from the top of the foundation to the top of the cantenna. Cantenna heights are limited to a maximum height of 7'6". |
| **Wind Loading** | Must meet current version of the AASHTO for wind and load calculations. Per Section 1.9 |
| **Foundation** | Precast concrete foundations are required and must meet ACI 318 per Section 1.19. |
| **Conduit Sweeps in Foundation** | Conduit installation must be installed per the Requirements for Electric Services book. Conduit must be included internal to the foundation. Eight (8) 2" PVC conduit sweeps must be installed on streetlight applications. Conduit shall accommodate City electrical, City fiber, and Carrier electrical and fiber with up to four (4) spare sweeps for future service. Per Section 1.16. |
| **Anchor Bolts and Bolt Pattern** | Per Section 1.20. |
| **Shroud** | All small cell carrier equipment shall be housed internal to the pole or visibly hidden behind an exterior shroud. No network provider equipment shall be mounted to the exterior of the pole, per Section 1.17. |
| **Electrical Separation** | Wiring and cabling for city utility and traffic infrastructure will be physically separate from wiring and cabling for small cell wireless infrastructure per Section 1.15. |
| **Handholes/Pull Boxes** | All fiber and power infrastructure shall be installed in a handhole adjacent to the pole. All handholes and pull boxes shall be installed per the Requirements for Electric Services book. Per Section 1.18. |
| **Equipment Cabinet Dimensions** | Per Section 1.14 |
| **Noise** | No greater than 50dBA measured at one meter (3.28 feet) from the equipment per Section 1.27. |

# Section 5 – Traffic Pole Attachments

## 5.1. General

All Carrier equipment other than the antenna must be housed inside a ground-mounted utility box or hidden within a cantenna. The utility box must be located in vicinity of the pole such that it does not impede line of sight or otherwise impact public safety. The antenna may only be attached to the top of the upright pole. No provider equipment shall be strapped to the outside of the signal pole or on a side arm extension. Poles housing existing radio antennae, CCTV cameras, weather stations, and Wi-Fi sniffers are not eligible for small cell installation. Pursuant to Section 38-5.5-104.5, no small cell facility or small cell network may be located or mounted on any apparatus, pole, or signal with tolling collection or enforcement equipment attached.

### Figure 12



## 5.2. Radio Interference

The Carrier must provide an analysis that the proposed small cell equipment to be installed on a traffic signal will not cause any interference with City public safety radio systems, traffic signal, emergency signal control devices, radio-read water meters, radar detection, Wi-Fi

sniffers, “smart” street lights, future “smart city” applications, other city communications components, or any other unforeseen interferences. The survey and analysis must be certified by qualified Professional RF Emissions Engineer.