Interim Small Cell Design Guidelines

CITY OF MADISON

July 31, 2019

These guidelines have been drafted with input from the following agencies:

- Attorney's Office
- Engineering Division
- Information Technology
- Traffic Engineering Division

Table of Contents

1 Background

The City of Madison oversees and manages hundreds of miles of highway right-of-way within the City's municipal limits. There are numerous competing demands upon the use of this space, including by pedestrians, bicycles, vehicles, adjoining property owners, municipal utilities and regulated utilities. The City is responsible for managing these competing present and future demands while at the same time promoting and protecting the public health, safety and welfare.

The City has a rich history of establishing a unique streetscape that sets it apart from other cities. A crucial component of that streetscape is its extensive network of public space within each neighborhood. The public space enhances the quality of life for our residents and visitors, and ensures that the city has the foundation to become more pedestrian friendly and sustainable. It also serves as the City's civic, cultural, and physical framework that provides the opportunity for public assembly. Any new use made of that public space must be adapted to the special characteristics of Madison, while also taking into account the City's obligations noted above.

To address growing customer demand for faster wireless technology, cellular providers have proposed to increase the capacity of their networks by deploying small cell infrastructure, a new low-powered antenna technology, to reduce data traffic load on larger cell towers. Small cell infrastructure consists of antennas and related power equipment that are installed in closer proximity to users on the ground to improve cellular and data coverage in small geographic areas. Installed small cell facilities will improve the provider's ability to meet current 4G (LTE) voice and data demands, but may be modified with future 5G high speed equipment as technology improves. To provide the necessary coverage to support these more robust communication networks, each telecommunications provider is expected to install infrastructure to serve their individual needs; additionally, some companies serve as an infrastructure providers, installing equipment that will house infrastructure for specific or multiple cellular providers. Like other utilities, State law allows telecommunication providers to place Small Cell infrastructure equipment in the public right-of-way.

In anticipation of 5G implementation, and in response to recent orders of the Federal Communication Commission (FCC) and forthcoming State legislation, the City adopted ORD-19-00037 on May 21, 2019 (Legistar File No. 55033), which ordinance will create Section 10.053 Madison General Ordinances on August 1, 2019. This ordinance creates a new small cell facility permit, thereby providing the City with a process for managing, and uniform standards for acting upon, requests for the placement of wireless telecommunications facilities (Small Cell facilities) within the right-of-way consistent with the City's obligation to promote the public health, safety, and welfare; to manage the right-of-way; and to ensure that the public's use is not obstructed or incommoded by the use of the right-of-way for the placement of wireless telecommunications facilities.

Pursuant to Section 10.053(5)(b)1 of the small cell ordinance, and consistent with the FCC Orders and anticipated State laws, the City has developed guidelines that will allow cellular companies to locate Small Cell installations in a way that maximizes technological benefits, while attempting to preserve street-side aesthetics. Small Cell infrastructure will affect the function and aesthetics of public spaces. Moreover, there are numerous providers already operating in Madison. The end result is a significant demand upon a limited recourse. Cities across the nation are beginning to address the issue of balancing the need to accommodate increased cellular demand with their community's public space character and function. These guidelines build off of those efforts in a way that is appropriate to the needs of the City of Madison.

1.1 Federal and State Law on Small Cell Infrastructure

Local regulation of wireless infrastructure is subject to the parameters of Federal and State law. In 2018, the Federal Communications Commission (FCC) issued a series of orders that imposed requirements on municipalities regarding wireless infrastructure regulations. Under the FCC orders, no local regulation may prohibit or have the effect of prohibiting the ability of any entity to provide telecommunications service. Any local regulations must be competitively neutral and nondiscriminatory. Under State law, municipalities retain the authority to regulate wireless infrastructure in the right-of-way under Wis. Stat. Secs. 182.017(1r) and 196.58(1r), provided that any such local regulation must be reasonable and defensible on public health, safety, and welfare grounds. As required by federal and state law, these guidelines are non-discriminatory and apply to other utility facilities in the right-of-way where applicable.

1.2 Local Laws on Small Cell Infrastructure

The City of Madison has multiple local ordinances that apply, or may apply, to the installation of Small Cell facilities in the right-of-way. It is up to the providers to secure all necessary permits before proceeding with installation. As a general rule, every telecommunications utility with facilities within the right-of-way must be registered with the City under Madison General Ordinances (MGO) Section 10.05(2). In addition, any work in the right-of-way which may require excavations requires an excavation permit (ENGROW Permit) under MGO Section 10.05(6). Included in the ENGROW permit process, and not covered by these guidelines, are approval requirements for new poles or towers within the right-of-way. Also, any work which necessitates the occupation of the right-of-way on a temporary basis may require a street occupancy permit under MGO Section 10.055. Finally, as discussed above, beginning on August 1, 2019, small cell facilities will require a small cell permit under MGO Section 10.053.

2 Adoption

These guidelines are intended to cover the general standards and aesthetics for the design and installation of Small Cell technology in the public right-of-way across Madison. They are comprehensive in nature while recognizing the unique characteristics and history of Madison. The guidelines cover the different areas of Madison while keeping generally applicable standards based on the type of infrastructure installed.

As a result of this comprehensive approach, the guidelines have been drafted with input from a variety of stakeholders. Input was also received from staff of the Traffic Engineering Division, Information Technology, the Department of Planning, Community, & Economic Development (DPCED), Planning Commission, Department of Public Works, the Historic Preservation – Landmarks Commission, and Urban Design Commission.

The guidelines are also the result of the review of information shared by telecommunication providers, technical limitations, and requirements of Small Cell infrastructure standards and practices across the country, including Denver, Boston, Dublin-OH, Washington DC, and Lincoln-NE.

As 5G technology is only just now being deployed across the nation, and laws and regulations are actively being created or modified to address the challenges posed to providers and all levels of government, it may be necessary to periodically update these guidelines. Hence, these guidelines incorporate the currently applicable local and federal policies and regulations and are subject to future change. The applications shall comply with the most current version of guidelines and regulations made available by the City.

Pursuant to the directive of the Common Council in ORD-19-00037 and under MGO Section 10.053(5)(b)1, the City Engineer hereby adopts these Small Cell Design Guidelines. Prior to their application, these guidelines shall be readily made available online.

3 Purpose

3.1 Goals of the Guidelines

The Small Cell Design Guidelines set forth requirements and specifications for the placement and design of utility infrastructure within the City's public right-of-way (ROW) to address engineering, safety, and aesthetic concerns within the parameters outlined above and consistent with the City's regulatory role over the right-of-way. The guidelines intend to accommodate the functional needs of the cellular infrastructure industry while recognizing the character and function of the City's public space. The City's specific goals of these guidelines include, but are not limited to:

- Avoiding impact on the most important view sheds and vistas within the Capitol Corridor & Downtown Districts;
- Minimizing the impact on the character of designated districts, including Urban Design Districts, historic districts, landmarks, and protected open spaces;
- Protecting access and circulation to buildings and public open spaces; and,
- Minimizing visual and physical clutter within the streetscape.

3.2 Areas of Special Interest

The character of Madison's streetscape reinforces the importance of the public realm, where the streets, squares, and public spaces are the primary features in the city defined against the background of urban development. The City has designed these areas of special interest within its zoning code, in City plans, and by resolution. Such areas include Urban Design Districts, Urban-Mixed Use Districts (UMX), Downtown Core District (DC), the State Street Mall Concourse, Historic Districts, the Capitol Corridor, Undergrounding District, and the like. These guidelines will detail any special design guidelines that may apply in such areas of the City.

4 Review Process – Public Right-of-Way (ROW) Permit

All Small Cell installations will require a Wireless Telecommunications Facility Permit (Small Cell Permit) from the City under MGO Sec. 10.053. All applications will require review to ensure adherence to these guidelines and all other applicable standards, regulations, and laws. Applications that comply with these guidelines and all other applicable standards, regulations, and laws will be processed by City of Madison's Engineering Division.

Applicants will be notified if their application is not consistent with these guidelines, with reasons why their application is not consistent, and, at such time, the applicant will have an opportunity to revise their application and resubmit.

5 General Guidelines

5.1 General Location Guidelines

5.1.1 Preferred Locations. It is preferred to have small cell infrastructure installed in industrial and commercial areas, whenever possible. A facility may be permitted in a location other than a preferred location if the applicant provides evidence showing that.

5.1.1.1 Adequate coverage can be maintained, existing services can be improved, or new services can be added only if facilities are placed in a non-preferred location; or

5.1.1.2 The proposed facility will meet all applicable requirements for the non-preferred location and will complement the character of the surrounding area.

5.1.2 Non-Preferred Locations. The applicant should avoid locating new support structures, towers, or utility poles within residential neighborhoods, designated open space, conservation areas, or Special Interest Area Districts.

5.1.3 Avoid Significant Buildings and View Sheds. Wireless communication facilities shall not interfere with prominent vistas or significant public view corridors. Small cell facilities shall not obstruct contributing vistas and views as designated by any Neighborhood Plans or the City of Madison Planning Division.

5.1.4 Small Cell infrastructure shall not be located along the front or side boundary lines of a Madison Landmark, a National Historic Landmark, or a property individually listed in the National Register of Historic Places.

5.1.5 City street trees may not be removed for the purposes of installing a small cell facility. The City will also preserve locations where a street tree may be planted.

5.2 Collocation

5.2.1 Collocation Generally. Subject to the provisions of this section, collocation of facilities is generally preferred over new support structures if it can be accomplished in a way that better compliments the character of the surrounding area.

5.2.2 Collocation with non-municipal facilities. Collocation on facilities or support structures owned by parties other than the City of Madison is subject to the following:

5.2.2.1 Where an existing facility or support structure can potentially accommodate collocation of a new wireless facility, collocation will be required unless:

- The applicant submits substantial evidence supporting the unsuitability of the collocation;
- The owner of the existing facility or support structure is unwilling to accommodate the applicant's equipment and cannot be required to cooperate; or

5.2.2.2 Authorization for collocation on a facility or support structure owned by a party other than the City of Madison will be voided if the facility or support structure is destroyed, removed, relocated, or replaced, unless:

- The owner of the collocated facility obtains a new right-of-way use permit; or
- The facility or support structure accommodating the collocation is replaced with a facility or support structure comparable in size, mass, appearance, and placement, as determined by the City Engineer.

5.3 Location Specifications

5.3.1 **Vision Requirements** – Facilities and support structures must be located so as not to create a vision hazard at intersections or driveways. Equipment near these areas must be placed below 2.5 ft.

5.3.2 **Obstruction of Traffic** – All equipment and support structures are to be installed such that they do not obstruct, impede or hinder vehicular, pedestrian or bicycle travel, including any facilities necessary to meet Americans with Disabilities Act of 1990 along with any updates to the ADA guidelines. A clear pedestrian path shall be maintained at all locations, and the minimum width of the path may vary and will be determined by City Engineering with each application.

5.3.3 **Obstruction of Maintenance Activities** – To the extent possible, a facility, support structure, tower, or utility pole should be located and designed so as to avoid interference with right-of-way maintenance activities, such as:

5.3.3.1 Grass mowing, brush collection, tree trimming, and landscaping maintenance;

5.3.3.2 Trash collection;

5.3.3.3 Maintenance of streets, pavement, sidewalks, and bicycle lanes; and

5.3.3.4 Maintenance of other facilities in the rights-of-way.

5.3.4 **Alignment** – Facilities and support structures, towers, and utility poles are to be located in alignment with existing trees, facilities, support structures, towers, utility poles, and streetlights, and are to be spaced evenly between any of these other objects.

5.3.5 **Frontage** – New or replacement facilities and support structures, towers, and utility poles are to be located at or near the extension of property lines, whenever possible, and are not to be located directly in front of a building entrance area or window of existing structures.

5.3.6 **Spacing** – See Table 5-1. below regarding spacing of support structures to specific right-of-way features and applicable notes.

Table 5-1: Pole Spacing Standards

Object	Required Minimum Spacing
Curb	2.5 ft. to face of curb
Mainline Sidewalk	1.5 ft.
Bike Paths	2 ft.
Pavement Edge (unimproved streets)	4 ft.
Residential Driveway	6 ft.
Commercial Driveway	10 ft.
Street Light	10 ft.
Traffic Signal	10 ft.
Utility Pole	25 ft.
Street Tree	15 ft.
Building Face	8 ft.
Fire Hydrant	6 ft.
Bike Rack	10 ft.
Bus Stop	8 ft. (see note 5)

Notes:

1. *Minimum spacing is to nearest face of pole.*
2. *If an existing pole that violates any of these standards is being replaced, it may remain in the same location, but it may not be placed any closer to any object than existing condition.*
3. *In certain circumstances, City Engineering may request further spacing than what is noted Examples - driveways with heavy truck use, more sensitive street trees, streets with right-of-way reservations or planned sidewalk installation, etc.*
4. *Exceptions may be allowed in extreme circumstances, such as very narrow terraces.*
5. *The design of bus stops vary throughout the City and each location is unique. Poles must be placed such that they do not interfere with Metro operations and accessible loading/unloading passengers in and around bus stop zones.*

Figure 5-3.1: Freestanding Small Cell in Amenity Zone

Freestanding small cells shall be located such that they in no way impede, obstruct, or hinder reasonable pedestrian or vehicular travel, affect public safety, obstruct the legal access to or use of the public right of way, violate applicable law, violate or conflict with public right of way design standards, specifications, or design district requirements, violate the Federal Americans with Disabilities Act of 1990, or in any way create a risk to public health, safety, or welfare.

Figure 5-3.2: Freestanding Small Cell Location Between Property and Trees

Figure 5-3.3: Freestanding small cell between property lines

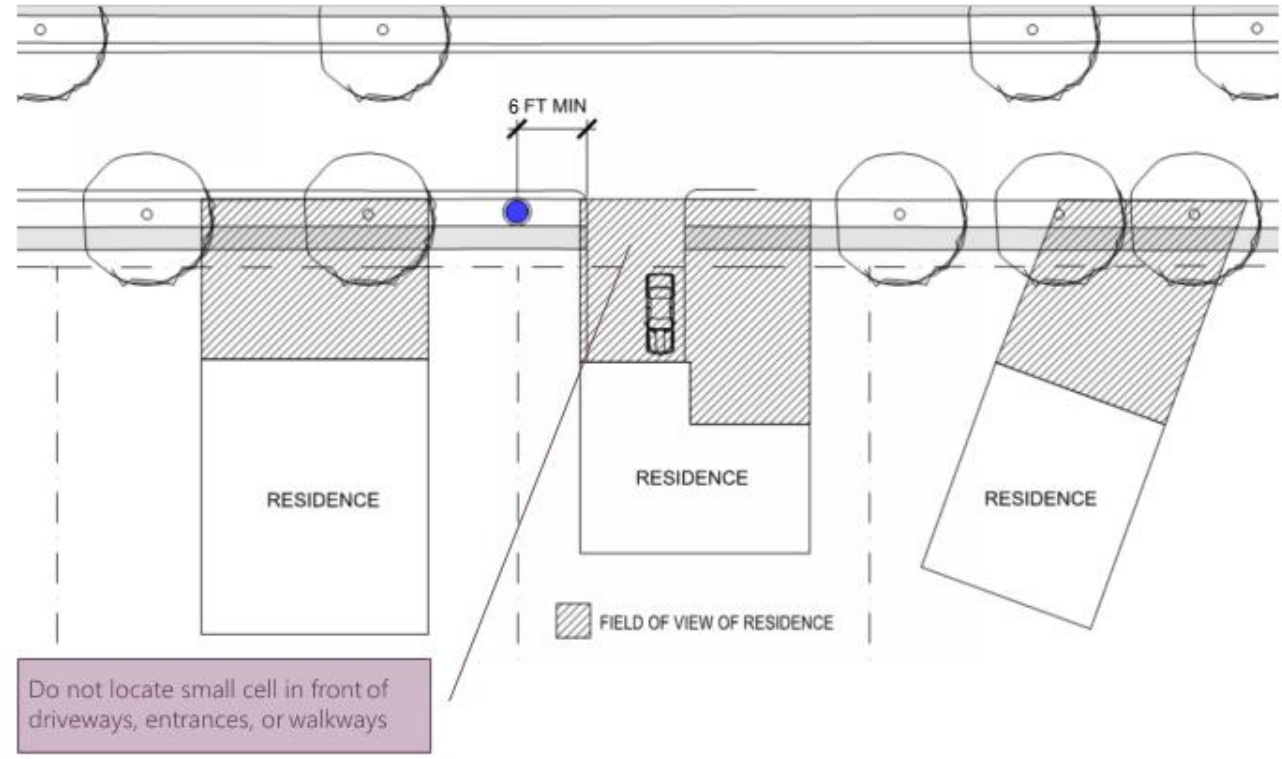


Figure 5-3.4: Small Cell in Commercial Area

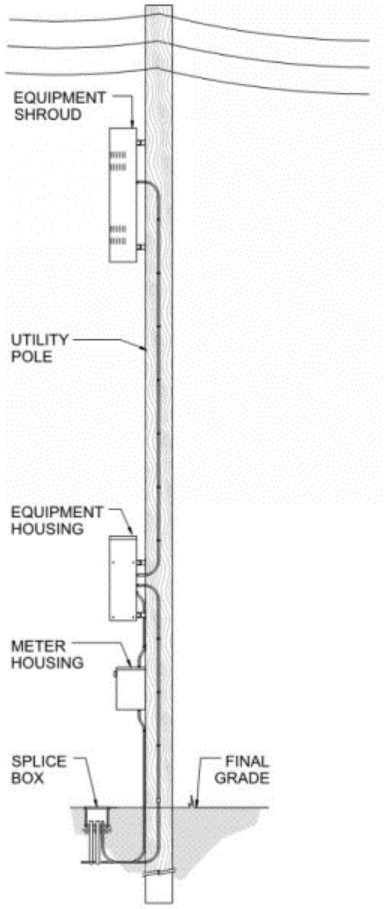
5.4 Height Restrictions and Requirements

5.4.1 Support Structures, Towers, and Utility Poles. The height of a support structure, tower, or utility pole in the right-of-way shall be no more than 10% higher of any pole on the same block as the proposed structure up to a maximum height of 50 feet.

5.4.2 Small Wireless Facility. The height of a small wireless facility in the right-of-way may not exceed 50 feet above ground and is to remain within 10 ft. of the tallest existing support structure, tower, or utility pole that is in place on the same block, excluding a proposed support structure for the new small cell facility.

5.4.3 Minimum Height of Wireless Communications Equipment. Equipment mounted to support structures must not interfere with or create a hazard to pedestrian or vehicular traffic and must be a minimum of 12 feet above any pedestrian or bicycle thoroughfare and a minimum of 16 feet above any traffic lane.

Figure 5-4.1: Attachment to Utility Pole



6 General Aesthetic Standards

6.1.1 Each new or modified facility must be compatible in size, mass, and color to similar facilities in the immediate area, with a goal of minimizing the physical and visual impact on the area.

6.1.2 The diameter of new support structures is to be minimized such that it is sufficient only for the structural support of the existing and currently proposed attachments.

6.1.3 Antennas located at the top of support structures shall be incorporated into the structure, or placed within shrouds of a size such that the antenna appears to be part of the support structure.

6.1.4 All small cell equipment is to be shrouded. Wiring and cabling shall be neat and concealed within or flush to the support structure, ensuring concealment of these components to the greatest extent possible.

6.1.5 No wireless telecommunications facility is permitted in any local historic district or Urban design district if it will be contrary to or destructive of the character of the district, without the approval of the Landmarks Commission for historic districts and the Urban Design Commission for urban design districts.

6.1.6 Noise. Facilities must be constructed and operated in a manner that minimizes noise that is audible as provided in Madison General Ordinances.

6.1.7 Lighting. Facilities must not be illuminated, except in accordance with state or federal regulations or if incorporated as part of a street light pole.

6.1.8 Signage Prohibited. Signage is not permitted except to comply with FCC or Wisconsin regulations to provide safety warning or emergency contact information.

6.1.9 Trees. Tree "topping" or improper pruning of trees within the right-of-way is prohibited. Any proposed pruning of trees, shrubs, or other landscaping already existing in the right-of-way must be noted in the application and approved separately by permit issued by the City Forester. Any such work shall be performed by a certified arborist and subject to other review, input, and requirements of the City Forestry Division.

6.1.10 Pole Type. New or replacement poles shall match existing pole types on the same block. There are a variety of pole types within the City of Madison, and typical situations and allowed pole types are noted in Table 6-1 below.

6.1.11 Frequency of Installations. Small Cell facilities are to be spaced appropriately to maintain aesthetics of the streetscape. Spacing in Special Interest Areas will be greater than in typical areas of the City. See table 6-2 for typical spacing requirements. In extraordinary circumstances, the City Engineer may approve different spacing if no feasible alternative exists.

Table 6-1: Pole Type Areas

Name	Ex Pole Types	Allowed Pole Types	Note Regarding Area
Area 1	Painted Steel Poles	Galvanized steel pole painted, color and pole style (taper, cross section, detailing) to match existing poles. Contractor to insure paint is compatible and will stick to a galvanized surface.	Downtown areas, including Cap Square, E & W Wash
Area 2	Painted Steel Poles Wood Utility Poles	Wood pole or galvanized steel pole painted, color and pole style (taper, cross section, detailing) to match existing poles. Contractor to insure paint is compatible and will stick to a galvanized surface.	Limited areas, Willy St., for example
Area 3	Galvanized Steel Poles	Galvanized steel pole	Various locations throughout City

Table 6-1: Pole Type Areas

Name	Ex Pole Types	Allowed Pole Types	Note Regarding Area
Area 4	Galvanized Steel Poles Wood Utility Poles	Galvanized steel or wood poles	Various locations throughout City
Area 5	Concrete Poles	Concrete or galvanized steel poles	Newer residential subdivisions
Area 6	Wood Poles	Wood or galvanized steel poles	Near east & west side neighborhoods

Notes:

1. *Pole areas are only considering the style of taller street light, traffic signal and any other utility poles. It does not consider locations with pedestrian scale and ornamental lighting as it is assumed that those poles will be too short for use with small cells.*
2. *The City will not take ownership of or perform maintenance on any new poles installed for the sole purpose of installing small cell equipment.*
3. *Poles with rust, peeling paint, faded paint or unsightly in appearance shall be repainted or replaced in accordance with these specifications.*
4. *The minimum paint system shall be an epoxy prime paint and polyester polyurethane topcoat paint, applied by electrostatic means, or the manufacturer's best paint system. The paint system chosen shall result in a durable weather-resistant paint well adhered to the pole and suitable for streets with heavy salting and the resulting salt spray from passing vehicles. Any green finish paint color shall match a Tiger-Drylac RAL color (6009 for green), with glossy finish. Any black finish paint color shall match a Tiger Drylac RAL 9004 with 80% gloss. The manufacturer shall fully warrant the paint system for five years.*

Table 6-2: Permissible Spacing and Frequency of Installations

	Outside Areas of Special Interest		Inside Areas of Special Interest		
Blockface Length Intervals[1]	**Number of Small Cell Facilities Permitted per Blockface[2]**	**Minimum Distance between Facilities on same Blockface[3]**	**Number of Small Cell Facilities Permitted per Blockface**	**Minimum Distance between Facilities on same Blockface**	**Limit per Carrier per Block[4]**
0'-150'	1	N/A	1	N/A	1
151'-300'	1	N/A	1	N/A	1
301'-450'	2	100'	1	N/A	1
451'-600'	2	100'	2	120'	1
601'-750'	3	100'	2	150'	2
Over 750'	3	100'	2	200'	2

[1]Block lengths should be measured along the edge of curb between the edge line extended of adjacent intersecting streets.

[2]This is inclusive of all types of installations and regardless of carrier.

[3]In other words, the minimum distance between two facilities sharing the same side of the block. Distance should be measured in a linear fashion along the edge of curb between the two facilities' center points.

[4]A block is defined as two opposing blockfaces.

7 Guidelines Regarding Areas of Special Interest

7.1 Definition of Areas of Special Interest

With respect to these guidelines, areas of special interest shall be defined and include the following:

7.1.1 Historic Districts
7.1.2 Historic Landmarked Properties
7.1.3 Areas included within Urban Design Districts, UMX, DC, properties zoned as DR-1 and DR-2, and the Downtown Capitol Corridor
7.1.4 Undergrounding Districts
7.1.5 Other Areas of Interest as defined in Maps Below. Note that these maps do not cover all Areas of Special Interest as listed under 7.1.3.

7.2 General Guidelines for Areas of Special Interest

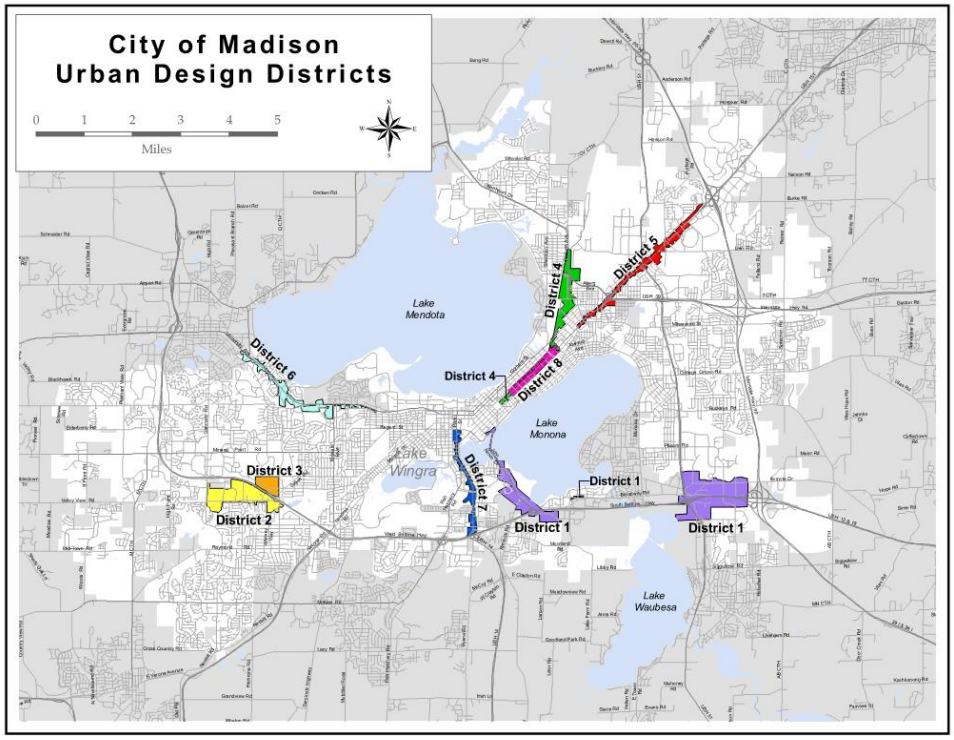
7.2.1 Small Cell infrastructure located in unnamed alleys within a historic district shall setback a minimum of twenty feet (20') from the inside edge of adjoining sidewalk.
7.2.2 In any Special Interest Area, where allowed, small cell equipment, other than the antenna, may be mounted on the pole, but in such situations all equipment shall be a minimum of 17 ft. above ground or must be completely concealed or placed underground. If necessary, a meter may be placed near ground level for visibility and access by the electrical provider.

7.3 Downtown Capitol Corridor

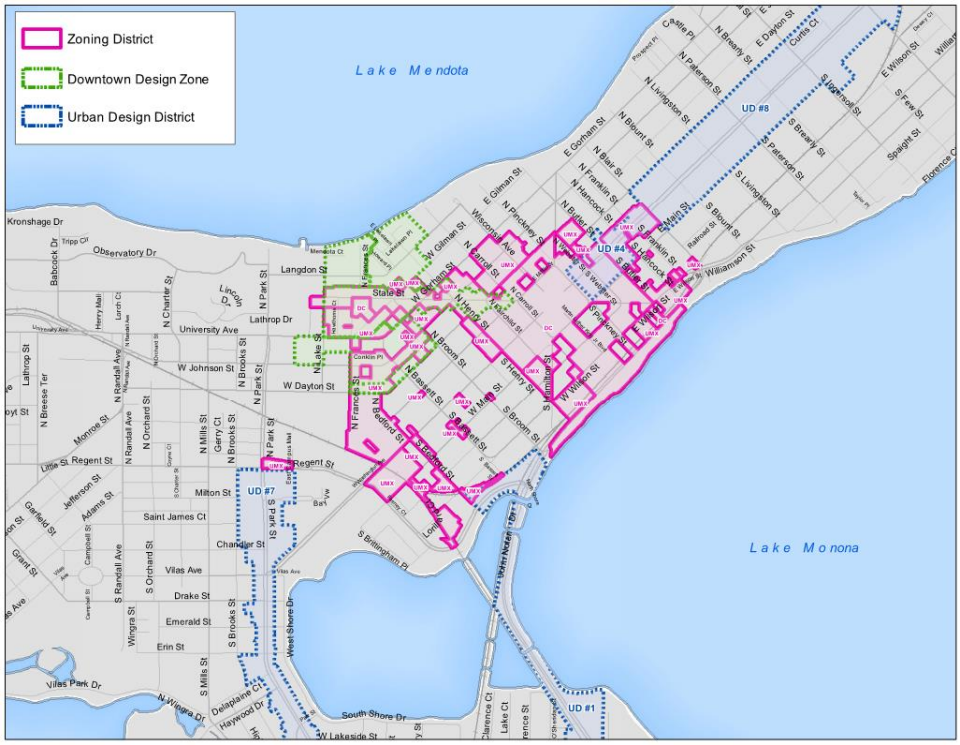
7.3.1 New small cell infrastructure on the Capitol Square, Outer Loop, State Street, or any of the spoke streets between the Square and Outer Loop must have all equipment, other than the antenna, either completely concealed in a decorative street amenity (to be owned and maintained by the small cell company) or be installed in an underground vault. This is consistent with the existing streetscape in this area.

7.4 Special Interest Area Maps

Map 1: Urban Design Districts

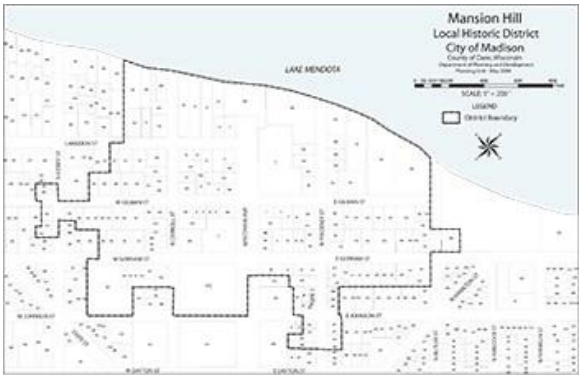


Map 2: Isthmus Special Districts – not comprehensive

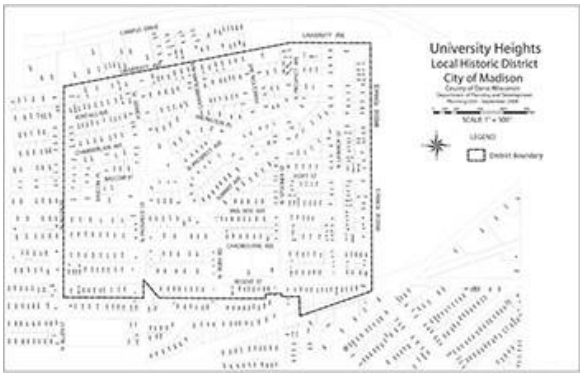


Map 3: Local Historic Districts

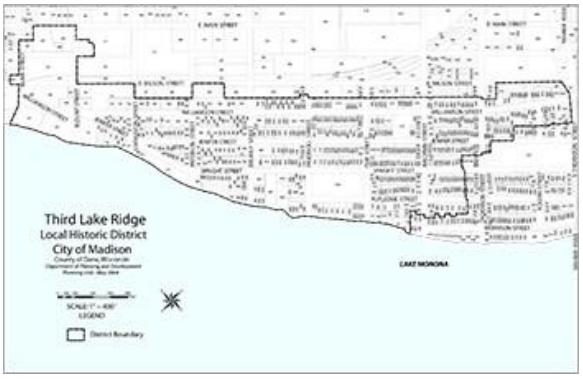
Mansion Hill Historic District



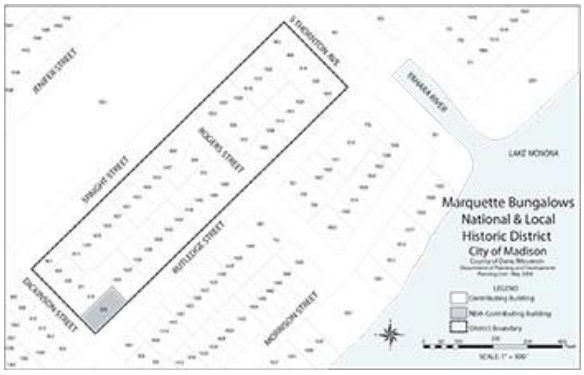
University Heights Historic District



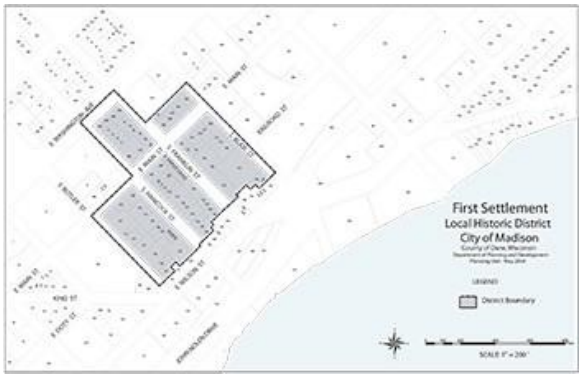
Third Lake Ridge Historic District



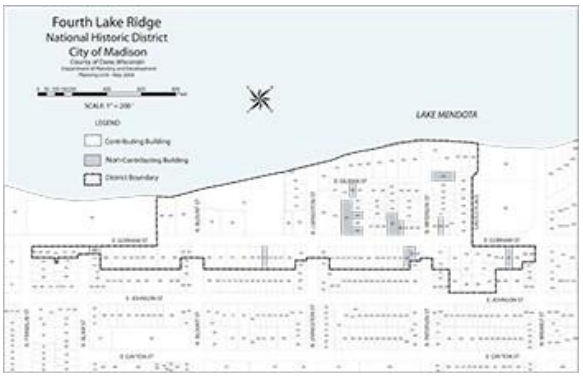
Marquette Bungalows Historic District



First Settlement Historic District



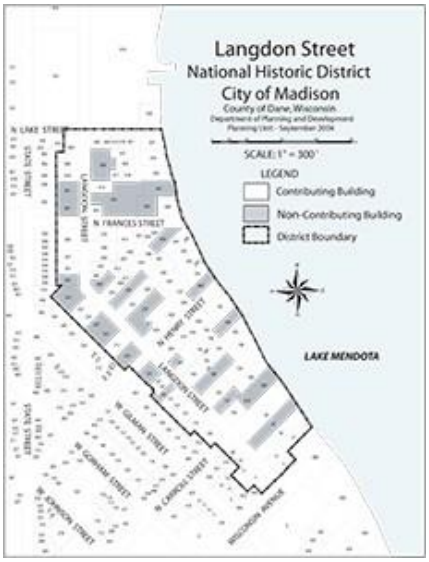
Fourth Lake Ridge



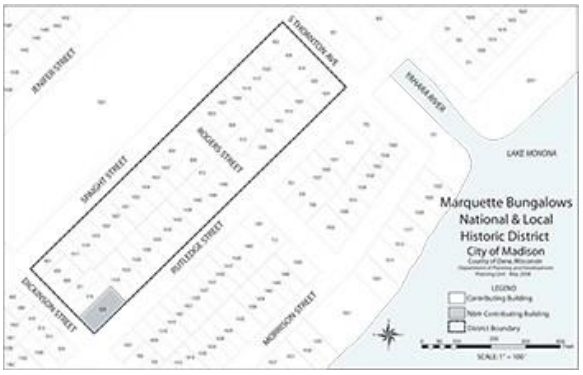
Jenifer-Spaight

East Wilson Street

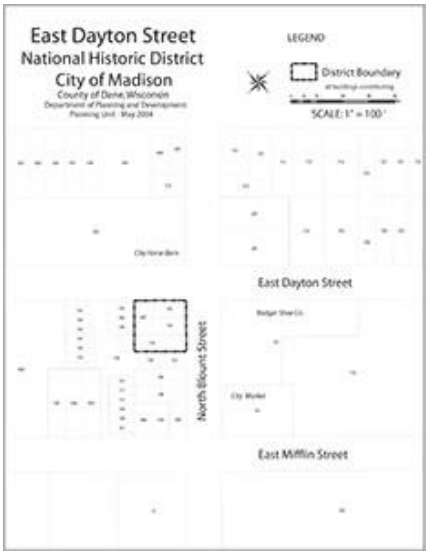
Langdon Street



Marquette Bungalows



East Dayton Street



8 General Requirements for Small Cell Equipment

8.1 General Design Requirements

All small attachments shall meet the following requirements:

8.1.1 Be reviewed and approved by a licensed professional structural engineer in the State of Wisconsin, which shall include review of any structures and foundations. All pertinent calculations shall be stamped by a Professional Engineer and submitted to the City as part of the permit review process.

8.1.2 All installations shall meet or exceed all applicable structural standards, clearance standards, and provisions of the latest National Electrical Safety Code (NESC).

8.1.3 All structures with small cell equipment shall have an identification tag attached to the structure with the company information and emergency contact information.

8.1.4 The Small Cell Company is responsible for providing, installing, permitting, and metering all necessary electrical, fiber optic, and telecommunication connections to the small cell equipment. All connections shall comply with all local, state and federal codes.

8.1.5 When installed within the right-of-way, the small cell equipment and any support structures shall be relocated at owner's expense, when the City deems necessary for public improvements.

8.1.6 Documentation confirming FCC compliance with RF emission standards must be provided for each location. This documentation is to be signed and stamped by a Professional Engineer and submitted to the City as part of the permit review process.

Table 8-1: General Requirements for Small Cell Equipment

Electrical Service	Per electric utility provider.
Grounding	Per electric utility provider and the NESC requirements.
Separation of Service	All new electrical conduit and fiber shall be separated by Owner.
Utility Equipment	Per electric utility provider.
Radio Frequency Equipment Disconnect	Radio frequency equipment shall have a disconnect that meets or exceeds electric utility provider's and the City's requirements.
Warning Label	Radio frequency warning labels shall be mounted on the exterior of the Network Provider's equipment, clearly marked, and visible from the ground/roadside.
Owner Identification	A 4-inch by 6-inch (maximum) aluminum plate with the Network Provider's name, location identifying information, and emergency telephone number shall be permanently fixed to the equipment, 5 feet above finished grade.

8.2 Attachments to Utility Poles and Lines

8.2.1 If a small cell attachment is proposed for an existing utility pole with an existing street light attachment, the small cell equipment shall be installed such that the street light will remain in the same location and height and such that the small cell equipment will not obstruct proper lighting of the area. See Tables 8-2 and 8-3 for more specifics and Figures 8-1 and 8-2 for images/examples.

Table 8-2: Small Cell Equipment Attachments to Utility Poles

Equipment Color	Visible attachments and hardware shall be colored to match pole, or colored gray (RAL 7038) if located on a wooden pole.
Equipment Shroud	Maximum size of all equipment on the pole, related to the small cell or otherwise, shall not exceed 28 cubic feet in volume. All equipment shall be shrouded to the extent possible, taking into consideration the function of each particular piece of equipment and needs for access, heat dissipation, etc. All wiring shall be concealed to the extent possible. Wires shall not be hanging or draped between pieces of equipment and shall be kept tight and contained. Wires on the exterior of poles shall be concealed in guards mounted on the pole. Wires for small cell facilities on steel poles shall be on the interior of the pole. Equipment shall be located such that it meets the Americans with Disabilities Act of 1990 and does not obstruct, impede, or hinder the typical pedestrian or vehicular travel way.
Cantenna	The cantenna shall include all the antenna, radio head, mounting bracket, and all other hardware necessary for a complete installation. Antennas shall not exceed 3 cubic feet in volume, and the following equipment sizes shall be allowed per type of antenna installed: 4G-LTE: Maximum 14” outer diameter, maximum height shall be 5’-0” from top of cantenna to pole attachment point. 5G only: Maximum 16” outer diameter with 19” (maximum) protrusions for 5G antennas. Maximum height shall be 5’-0” from top of cantenna to pole attachment point. Dual technology (Typically 4G & 5G): 16” outer diameter with 19” (maximum) protrusions for 5G antennas. Maximum height shall be 6’-8” from top of cantenna to pole attachment point.

Table 8-3: Small Cell Attachment to Utility Strand Specification Overview

Equipment Color	Visible attachments and hardware shall be colored gray (RAL 7038).
Strand Mount Equipment Shroud	1 cubic foot maximum strand mount equipment shroud. Only one equipment shroud shall be installed per permit location.
Strand Mounted Warning Label	Radio frequency warning labels shall be mounted on the equipment, and clearly marked on both sides of the shrouds and be visible from the ground, roadside, and field side.

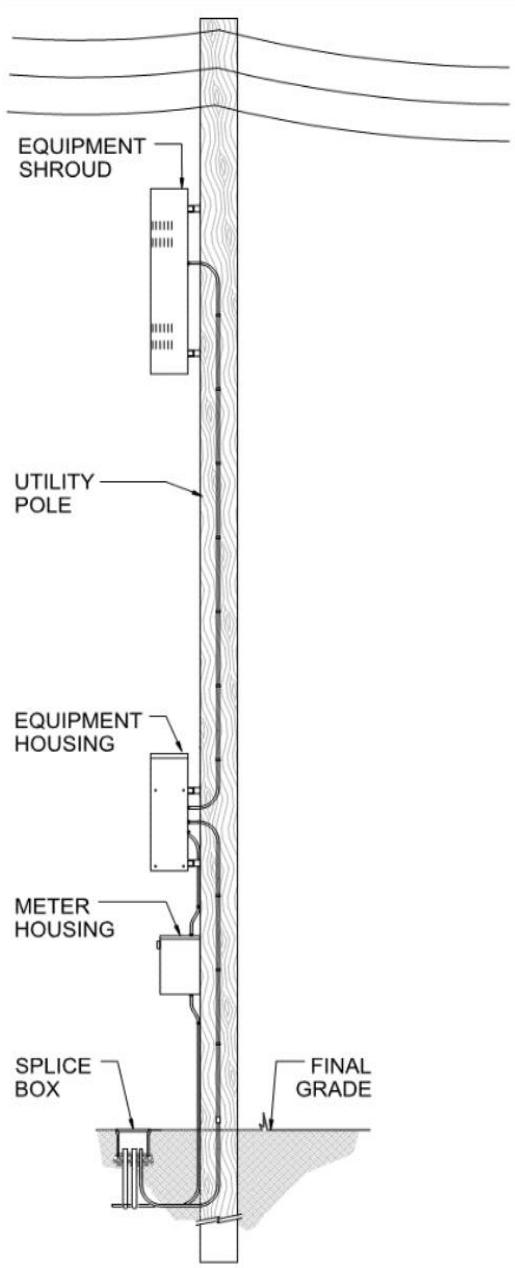


Figure 8-1: Attachment to Utility Pole

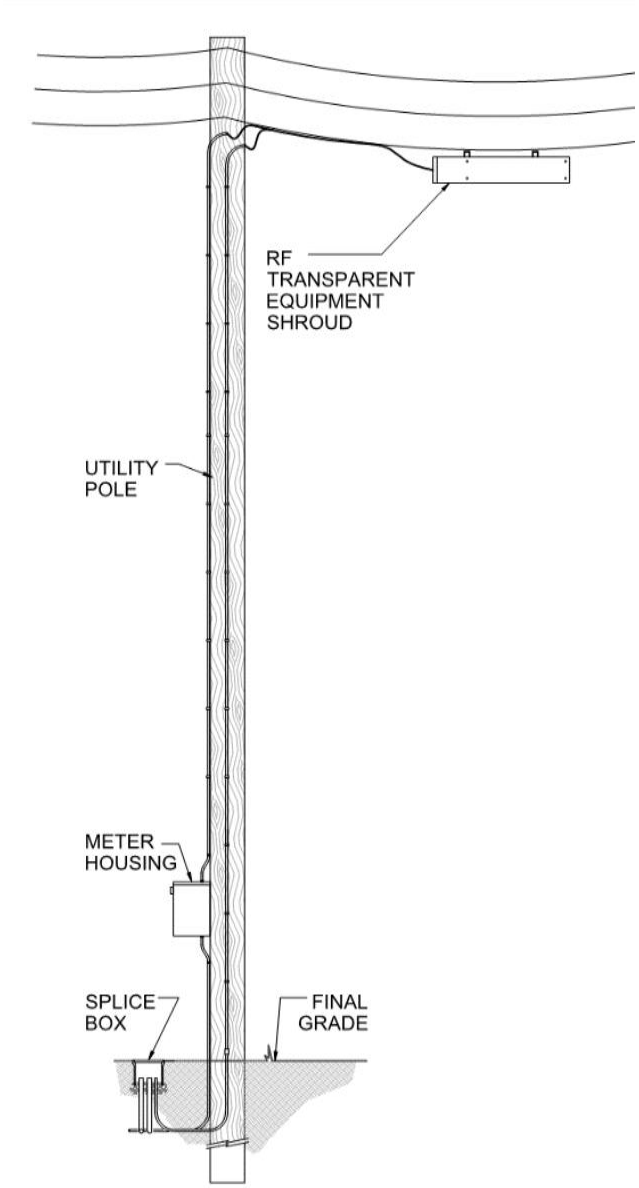


Figure 8-2: Attachment to Utility

8.3 Equipment for Freestanding Poles

8.3.1 The freestanding pole components include the foundation, equipment cabinet, upper pole, cantenna, and all hardware and internally integrated electrical equipment necessary for a complete assembly. The small cell components shall also be sized to be visually pleasing. For a combination pole to be considered visually pleasing, the transition between the equipment cabinet and upper pole should be considered. A decorative transition shall be installed over the equipment cabinet upper bolts. All hardware connections shall be hidden from view. No horizontal flat spaces greater than 1.5 inches shall exist on the equipment cabinet to prevent cups, trash, and other objects from being placed on the equipment cabinet. Each pole component shall be architecturally compatible to create a cohesive aesthetic. Examples of an unacceptable and an acceptable small cell installation can be found in Figure 8-3 and Figure 8-4, below, and a freestanding pole example can be found in Figure 8-5. Tables 8-4 and 8-5 provide additional equipment requirements for freestanding poles.

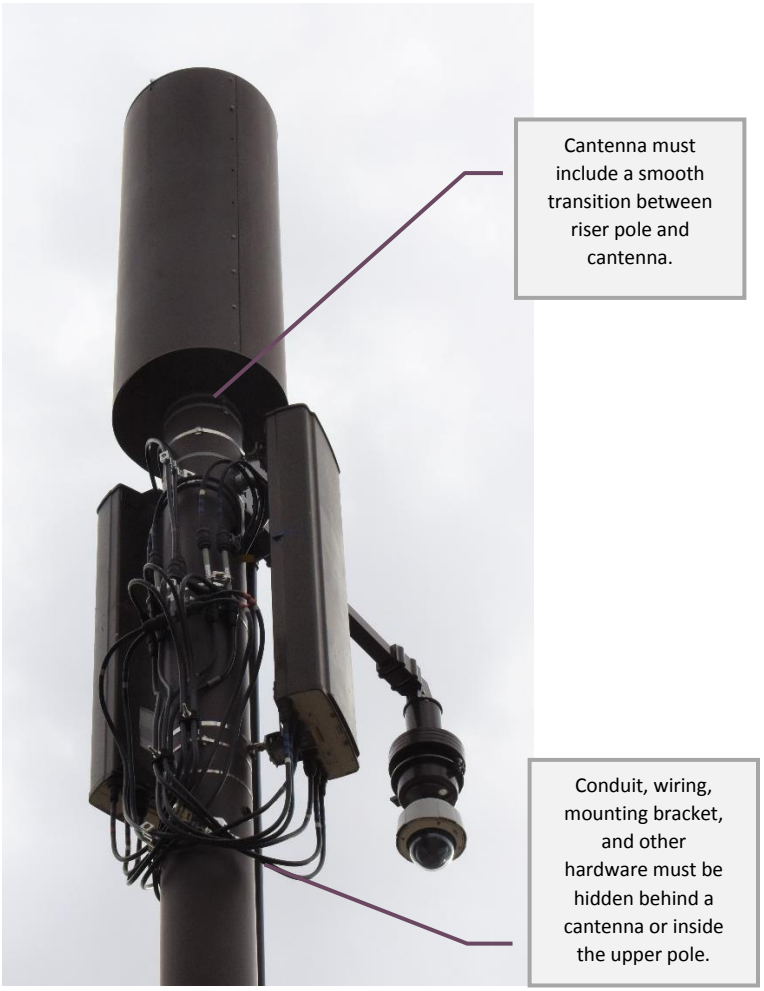


Figure 8-3: Unacceptable Installation

Figure 8-4: Acceptable Installation

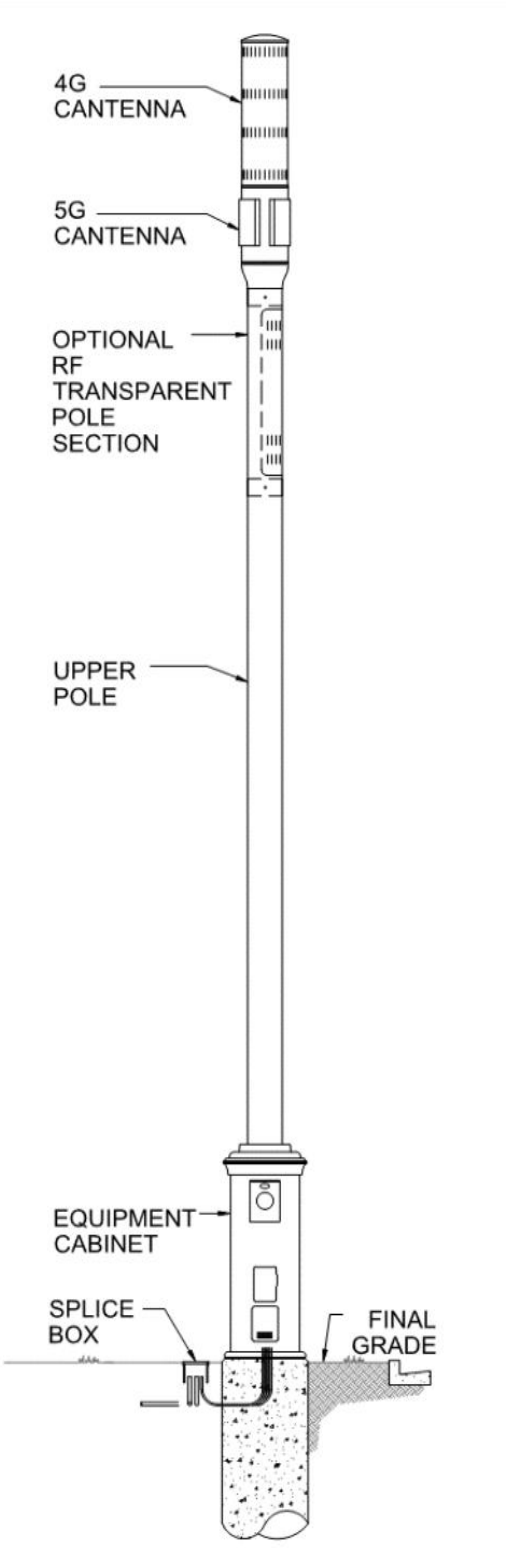


Figure 8-5: Freestanding Pole

Table 8-4: Equipment Requirements for Freestanding Poles

Equipment Cabinet Transition	All hardware attachments shall be hidden. Equipment cabinet and/or equipment cabinet cover shall not have a flat, horizontal surface larger than 1.5 inches.	
Equipment Cabinet Access Doors	Utility Access	Network Provider Access
	Per electric utility provider's meter access requirements. The meter shall be recessed as much as possible into the pole base.	Lockable access door sized to install, maintain, and remove all small cell equipment as needed.
Required Equipment	Utility Equipment*	Network Provider Equipment*
	Per electric utility provider's requirements.	Per small cell Network Provider's requirements.
	*All equipment shall be located internal to the equipment cabinet or recessed in the equipment cabinet to meet Utility requirements. All equipment shall be mounted per the Owner's requirements.	
Equipment separation	All equipment shall be separated by owner. All access doors shall be secured by owner requirements.	
Ventilation	Passive louvers and/or other passive ventilation systems shall be provided as the primary means of temperature control.	
Motorized Ventilation	If required, fan(s) shall not emit noise greater than 30dBa at one meter (3.28 feet).	
Hand Holes	Provide hand holes as necessary to provide access to underground utilities. All hand holes are to be installed flush with the top surface.	
Grommets	Weatherproof grommets shall be integrated into the pole design to allow cable to exit the pole, future IOT attachments, without water seeping into the pole.	
Cantenna Shroud Transition	The antenna and upper pole attachment shall be shrouded to meet City aesthetics. A tapered transition between the upper pole and cantenna shall be included.	
Cantenna Finish	Antenna shroud shall be colored to match pole.	
Design Wind Velocity	115 mph minimum per TIA-222 rev G, IBC 2012 with ASCE 710, and amendments for local conditions.	
Foundation	Plan details of concrete pole foundations, including anchor bolt pattern & placement, shall be stamped by a licensed professional engineer in the State of Wisconsin and approved by the Engineering Division.	
Potential Shroud	All fixed connections shall be hidden from view.	
Electrical Separation	An internal divider shall separate electrical wiring and fiber, per Owner. Separation of service shall meet electric utility provider's requirements.	

Table 8-5: 4G and 5G Equipment Requirements for Freestanding Poles

4G – LTE only	Equipment cabinet dimension	Round, galvanized equipment cabinet. Maximum 5'-8" height, from top of foundation to top of transition shroud, with 16" outer diameter equipment cabinet. A 20" outer diameter will be allowed if Applicant can show that a smaller equipment cabinet is incapable of housing the necessary equipment.
	Cantenna dimension	14" maximum outer diameter.
5G only	Equipment cabinet dimension	Round, galvanized equipment cabinet, painted if required to meet aesthetic standards. Maximum 5'-8" height, from top of foundation to top of transition shroud, with 16" outer diameter equipment cabinet. A 20" outer diameter will be allowed if Applicant can show that a smaller equipment cabinet is incapable of housing the necessary equipment.
	Cantenna dimension	16" maximum outer diameter with 19" (maximum) protrusions for 5G antennas.
Dual technology (4G & 5G)	Equipment cabinet dimension	Round, galvanized equipment cabinet. Maximum 5'-8" height, from top of foundation to top of transition shroud, with 20" maximum outer diameter.
	Cantenna dimension	16" maximum outer diameter with 19" (maximum) protrusions for 5G antennas.

8.4 Attachments to City Streetlight Poles

It may be possible for small cell infrastructure to be attached to streetlight poles owned by the City of Madison. However, these attachments will be covered under separate agreements between the City of Madison and the Small Cell provider. These design guidelines will still apply, but there will be additional requirements for the final design of the pole, foundation, cabinets, etc., which will described further under the separate agreement.

A possible example of a collocated facility is shown in figure 8-6 below. Note that this is not an approved design as the City would work with the Company to hide exposed wiring, etc., but this is another example of a possible small cell facility using a different technology.

Figure 8-6: Collocated Small Cell
Example using a different technology

9 Glossary

The following serve to define terms used in the guidelines as they relate to the public spaces in Madison.

Areas of Special Interest – Areas within Madison that have stricter aesthetic standards. These include the Capitol Corridor, Downtown Urban Design Guidelines, State Street & the Capitol Square Area, Underground Areas, Underground Districts, Urban Design Districts, etc.

Antenna – An apparatus designed for the purpose of emitting radiofrequency (RF) radiation, to be operated or operating from a fixed location, for the transmission of writing, signs, signals, data, images, pictures, and sounds of all kinds.

Building Entrance Area – The building entry setting is an integral component of the functional and decorative features of architectural design. These entrances are delineated by one or more of the following features, such as: doors, pilaster, entablatures, columns, balustrades, columns, fanlights, sidelights, stairs or ramps, podiums plinths, flagpoles, sculptural or decorative elements, and designed landscape plantings flanking the entry.

Building face – Any building wall, or its projection, that fronts a right-of-way.

Clear pedestrian path – The straight path that is free of all obstructions within the sidewalk between the amenity zone and the public parking area or property line/building restriction line. The clear pedestrian path is measured from the farthest extended portion of any element projecting out from the building facade, such as a sidewalk café, to the curb line or the nearest obstruction, such as the outer edge of a tree box.

Cobra head fixture – A City of Madison standard lighting fixture typically mounted on an arm that is attached either to a wood pole or a steel pole (galvanized or painted).

Undergrounding District – Areas of the City that historically had overhead utility lines but have now been undergrounded by either coordination with developments, by use of City funds, by resolution to enforce private property undergrounding of overhead services, or a combination of these means.

Underground Area – Newer areas of the City of Madison, in which all utility services are provided underground and the only poles in the area are either for street lights or traffic signals.

Small Cell infrastructure – Low-powered antennas and related equipment that provide cellular and data coverage to smaller geographic areas, supplementing the larger cellular network and improving service for wireless customers. This term is used interchangeably with Small Cell Equipment.

Standalone poles – Independent poles solely used for the attachment of small cell antennas and used only for the purpose of transmitting wireless signals. Also referred to as Freestanding poles.

Streetscape elements – Components that make up the city street, such as trees, light poles, bicycle racks, traffic cabinets, parking meters, signs, sculptures, and street furniture.

Terrace – The area of public space between the curb and the sidewalk reserved for the installation of street lights, parking meters, bicycle racks, signs regulating curbside management. It also includes the tree space, the area of public space reserved for the planting of street trees.

Utility pole – An existing pole in public space owned by a party other than Madison or the cellular provider installed to provide public utilities and that can accommodate Small Cell infrastructure equipment.

Traffic signal – A pole of any type to which a traffic or pedestrian signal or other traffic right-of-way regulating equipment is attached.

Views and Vistas – Primary, Radiating, Orthogonal, Major Cross-Axes, Tangential, Frontal, and Axial Street vistas that contribute to the Capitol Corridor & Downtown Urban Design Guidelines Plan National Register of Historic Places nomination.