

## Designing a 5G small cell street light pole for the LA Bureau of Street Lighting

*Los Angeles Bureau of Street Lighting (BSL) has long pursued an ambitious initiative for smart city services. An important element is based on strengthening wireless services for “constituents, businesses, visitors and for use during emergency situations”<sup>1</sup>. To facilitate new services such as 5G, LA BSL has published established policies, specification and procedures for co-location of cellular sites on streetlight poles. Raycap engineered a small cell streetlight design, based on LA BSL specifications, that provides a path to widespread installation of small cells in Los Angeles and possibly even neighboring cities. This is unique to the industry, and a closer look at the design will help other cities understand some things to consider when integrating 5G small cells into streetlights.*

### 5G small cells are key to the smart city

The advent of 5G wireless networks offers urban planners and dwellers a generational jump in bandwidth, connectivity and opportunities to launch smart city services. First and most obvious will be the gigabit throughput from 5G cell phones and Fixed Wireless Access (FWA) connections. The 5G infrastructure will also be a platform for new industries such as autonomously driven vehicles, ultra-high-definition video and virtual reality.

As this infrastructure becomes widespread, it will increasingly support the operations of municipalities. Forward-looking planners in Los Angeles and other cities are preparing for wireless services that can help improve traffic movement and congestion, monitor air pollution, improve safety and medical services and optimize use of city resources. These are the elements of the “smart city.”

The City of Los Angeles has long recognized that citywide wireless service coverage is an important element for supporting smart city services. The city considers streetlights to be the best location for new wireless sites since they are at the optimum height, have an existing electrical infrastructure, and do not add an additional structure into the public right of way.<sup>2</sup>

The city has proactively worked with carriers to attach their small cells to existing infrastructure as much as possible in order to eliminate additional unsightly poles and cabinets installed in already busy sidewalks.<sup>3</sup>

The LA BSL is responsible for the design, construction, operation, maintenance and repair of more than 210,000 lights in the City consisting of more than 400 designs. BSL regulations provide a framework for integrating wireless services with its more modern streetlights, striking a “delicate balance” to meet the demand for 5G small cell sites and evolve the aesthetics of the attachments.



Raycap worked closely with the Los Angeles Bureau of Street Lighting to develop this design for an integrated 5G small cell pole.



Figure 1. The City of Los Angeles recognizes the role that small cells play in becoming a smart city.

## Fitting the LA BSL Form Factor

Raycap has worked with a tier-one carrier to design streetlight poles that integrate 5G small cells and meet the specifications from LA BSL. These poles will replace existing streetlights, so they needed to conform to a very specific form factor. The pole itself is 12 inches in diameter and all the wireless small cell electronics, and as much wiring as possible must fit within the pole to maintain aesthetics. The pole design needed to work at three designated heights: 31, 33 and 35 feet. LA BSL regulations also dictated the way a selection of luminaires are attached to the pole.

At the base, the integrated pole had to be 100% compatible with other common light poles that BSL would use just to provide lights on the street level. For example, it needed to meet existing bolt patterns on baseplates to fit existing streetlight foundations. This simplifies replacement of existing poles by avoiding rework of the foundation. In addition, the LA BSL wanted to be sure that, in the future, if the site is no longer needed for telecom services, the city can easily remove the pole and replace with a normal streetlight.

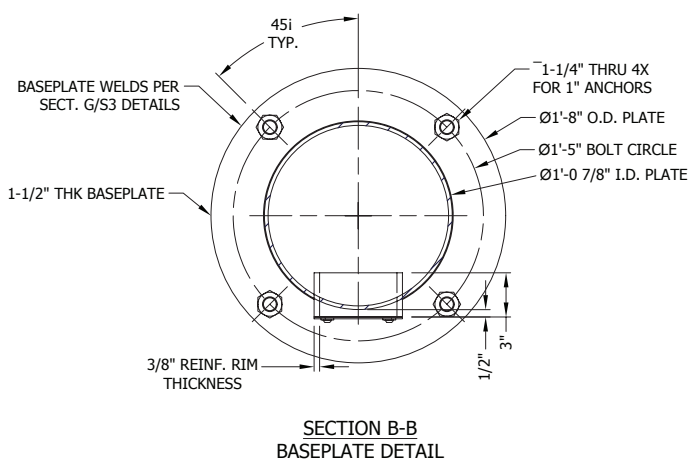


Figure 2. The Raycap small cell pole design matches the existing streetlight specifications to simplify installation.

The design, dimensions and thickness of the 12-inch pole have been verified to meet LA BSL structural specifications by Vector Engineers, a California-licensed engineer. While this design was executed for a specific tier one carrier. Raycap anticipates that, having carefully executed this design, it is flexible enough to support the needs of other carriers as well.

## Engineering challenges to integrating 5G small cell sites

While the specifications for the dimensions of the small cell streetlight pole were fairly specific, Raycap's engineers still had a few challenges to overcome to make the design as useful as possible.

**Space for radios from multiple manufacturers** – Raycap engineers tackled the challenge of integrating the radios, antennas, support electronics, power and fiber management and the ventilation system in the interior of the 12-inch pole pipe. Because no individual manufacturer's radios were specified at that time, Raycap depended on its extensive experience with 5G radio electronics, and in designing its own integrated small cell pole product. They interacted quite frequently with BSL to solve all the mechanical challenges and to provide confidence that future 5G radio equipment would operate correctly once installed inside the pole.

**Hosting 5G antennas** – Likewise, when the design was underway, no specific 5G antennas were identified for use, partly because the technology is evolving so rapidly. Working with LA BSL, Raycap engineers designed a section for 5G antennas below the mounts for the luminaire arms. The section is large and flexible enough to accommodate a range of expected 5G antenna products. In addition, carriers can install preformatted shrouds over that section of the pole if 5G antennas are not ready or not planned for a particular site.

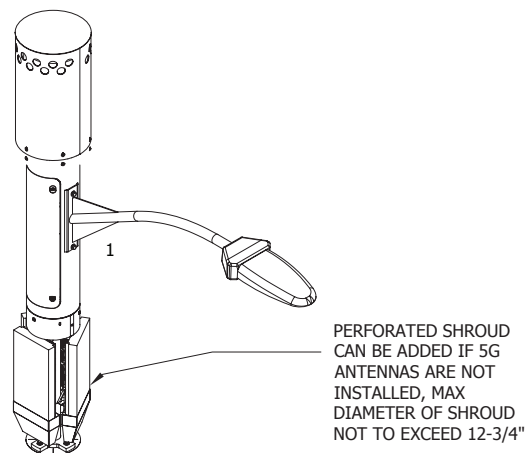


Figure 3. Raycap engineers created a convenient location for 5G radio antennas that can also be shrouded.

**Integration of all support electronics** – In addition to hosting radios and antennas, small cell sites have a number of support systems that must be integrated. Raycap engineered all of these systems within the pole: power metering and management, AC disconnect with surge protection, fiber management and air ventilation systems. The engineers performed sophisticated thermal analysis of the assembly to ensure it would operate as expected during LA's hot summer days. The design also specifies cable management, to limit any need for external cabling.

The pole design includes doors for accessing the equipment for installation, maintenance and future upgrades. To help prevent unauthorized access, all doors are at least 10 feet above ground level and have quarter-turn cam locks with optional padlock attachments.

## The next step: prototype and audit

Next, Raycap manufactured a prototype of this pole design and delivered it for BSL inspection in January of 2020. Passing inspection, the pole was installed in February. The electronics and radios from the carrier were delayed by the Pandemic and were not yet installed at that time. LA BSL approved the shop drawings for the pole (number RAYCAP RCP-BSL2) on March 27, 2020.

After Raycap completed the trial, the process continued: a materials control inspector from the LA Bureau of Contract Administration scheduled a shop inspection to complete certification. A few weeks later, a representative came to Raycap's South Carolina manufacturing facility (one of three domestic U.S. factories) to assess its production capabilities and process.

Raycap is ready to deliver the small cell pole to customers and partners in the LA area. Since this is a fully engineered design, the company is prepared to ramp up to mass production within three to four weeks of orders. To meet installation schedules, Raycap can even arrange for weekend shipments. If carriers want an even faster deployment process, Raycap can pre-install, pre-integrate and pre-test radios and electronics at the factory, so that the products can be sent ready to be installed.



Figure 4. Raycap can fully manufacture and integrate small cell products in its three domestic manufacturing plants.

## Supporting the Smart City vision for LA and others

Advanced 5G wireless services for Fixed Wireless Access (FWA) and mobile applications are critical platforms to deliver smart city services for municipalities and their constituents and businesses. Wireless technologies will evolve rapidly for the foreseeable future as 5G technologies mature, so the ability to easily update the radios after installation is a critical capability.

Integrated small cell poles that form the backbone for 5G deployment can also host other smart city initiatives. For example, many cities like LA are looking to integrate traffic sensors and EV charging stations across the cityscape. There is room within the Raycap small cell pole design to accommodate functions like these and example, many cities like LA are looking to integrate traffic sensors and EV charging stations across the cityscape. There is room within the Raycap small cell pole design to accommodate functions like these and maintain street-level aesthetic goals.

Because they share similar environmental and governmental goals, municipalities in the greater Los Angeles area can look at the Raycap pole design as a model for pursuing their own 5G and smart city initiatives.

*Learn more about Raycap's solutions for small cell concealment at [www.raycap.com](http://www.raycap.com) or [sales@raycap.com](mailto:sales@raycap.com)*



Raycap LA BSL demo pole with exposed 5G radios.

## About Raycap

Raycap is a solutions provider and manufacturer of telecommunications infrastructure products for mobile and broadband networks with operations throughout Europe and North America. Raycap has a large installed base including connectivity and lightning protection solutions for telecommunications infrastructure and RF concealments. In June 2018, Raycap acquired STEALTH® Concealment Solutions, the pioneer in concealment solutions for RF antenna equipment, and in 2019 it acquired APELIO Integrated Industries, a manufacturer of custom enclosures and mounting solutions for the next generation of wireless networks. As a known and trusted vendor for Tier-1, Tier-2 & Tier-3 carriers, Raycap products can be found in a wide variety of telecom sites with more than 400,000 site installations across North America alone.

Raycap has the small cell experience, technology and the reputation for understanding customer needs and delivering the right products on-time for smooth product installation.

*Talk to Raycap about integrated  
small cell concealment options.  
Contact us today at [info@raycap.com](mailto:info@raycap.com)*

# Raycap

[raycap.com](http://raycap.com)  
[stealthconcealment.com](http://stealthconcealment.com)

 **STEALTH** APELIO

STEALTH and Apelio are Raycap brands.  
InvisiWave is a registered trademark of Raycap.

©2020 Raycap All Rights Reserved.  
G09-00-164 200708