



SAN FRANCISCO  
**PLANNING**  
DEPARTMENT

# Design Preferences for Personal Wireless Service Facilities

FOR DISTRIBUTED ANTENNA SYSTEMS, "DAS"  
OR SMALL CELLS ON WOODEN UTILITY POLES &  
WOODEN STREET LIGHT POLES

August 2015



## Purpose of the Design Preferences

*“The experience of traveling along a picturesque street is different from the experience of traveling through the shadows of a WCF [personal wireless services facility], and we see nothing exceptional in the City’s determination that the former is less discomforting, less troubling, less annoying and less distressing than the latter. After all, travel is often as much about the journey as it is about the destination.”*

- 2009 decision by the United States Court of Appeals, for the Ninth Circuit, in a case involving the ability for local communities to review the design of wireless facilities on locations in the public right-of-way. The court determined that communities have a right, under California law, to take aesthetics into account when considering an application to install a wireless facility in the public right-of-way.

The City and County of San Francisco seeks to balance the development of small personal wireless service facilities in the public right-of-way (e.g. wooden utility poles), that allow wireless carriers (or similar) to provide robust coverage and capacity; while installing (well-maintained) facilities that do not significantly detract from City streetscapes.<sup>1</sup> These facilities are permitted by the Department of Public Works, under Article 25 of the Public Works Code.

The City does not regulate the technologies wireless carriers use. As wireless carriers have expressed an interest in working collaboratively, with the City and community members to better integrate wireless facilities in a less intrusive manner; these preferences are intended to convey design preferences that may not apply to every facility.

These guidelines also do not address pole selection. However, the City recommends that wireless carriers avoid pole locations where equipment would be close to windows (especially residential windows), in front of historically/architecturally significant buildings, or in locations where they would disturb views of significance (e.g streets that have clear views of local landmarks or natural features such as the San Francisco Bay).

Common challenges to avoid when developing these types of facilities include:

- 1) noisy cooling fans;
- 2) large/bulky/wide equipment enclosures;
- 3) cluttered/messy cabling;
- 4) flashing lights, decals, and stickers that are repetitive, distracting, poorly placed, or non-essential;
- 5) excessive and/or unnecessary pole height increases; and
- 6) equipment in front of windows.

<sup>1</sup> Given the small-scale nature of streets in San Francisco; well-designed and scale-appropriate rooftop (micro/macro) wireless facilities are generally less intrusive, and preferred over (a comparatively larger number of) wireless facilities on multiple wooden poles.

NOTE: Pictures are often more effective than words when discussing design preferences. The pictures provided here are for illustration purposes only and are not intended to limit what applicants can or should propose. The City encourages creative designs and solutions that may or may not resemble photos shown as “preferred” in this guidance. Some of the facilities shown are considered “legacy” in nature and would no longer be proposed by wireless carriers. Some designs from out-of-State deployments (which may be found online) may not comply with State-established rules known as General Order 95 (California Public Utilities Commission).

### Breakdown of one type of Personal Wireless Services Facility on a wood pole owned by the Joint Pole Association

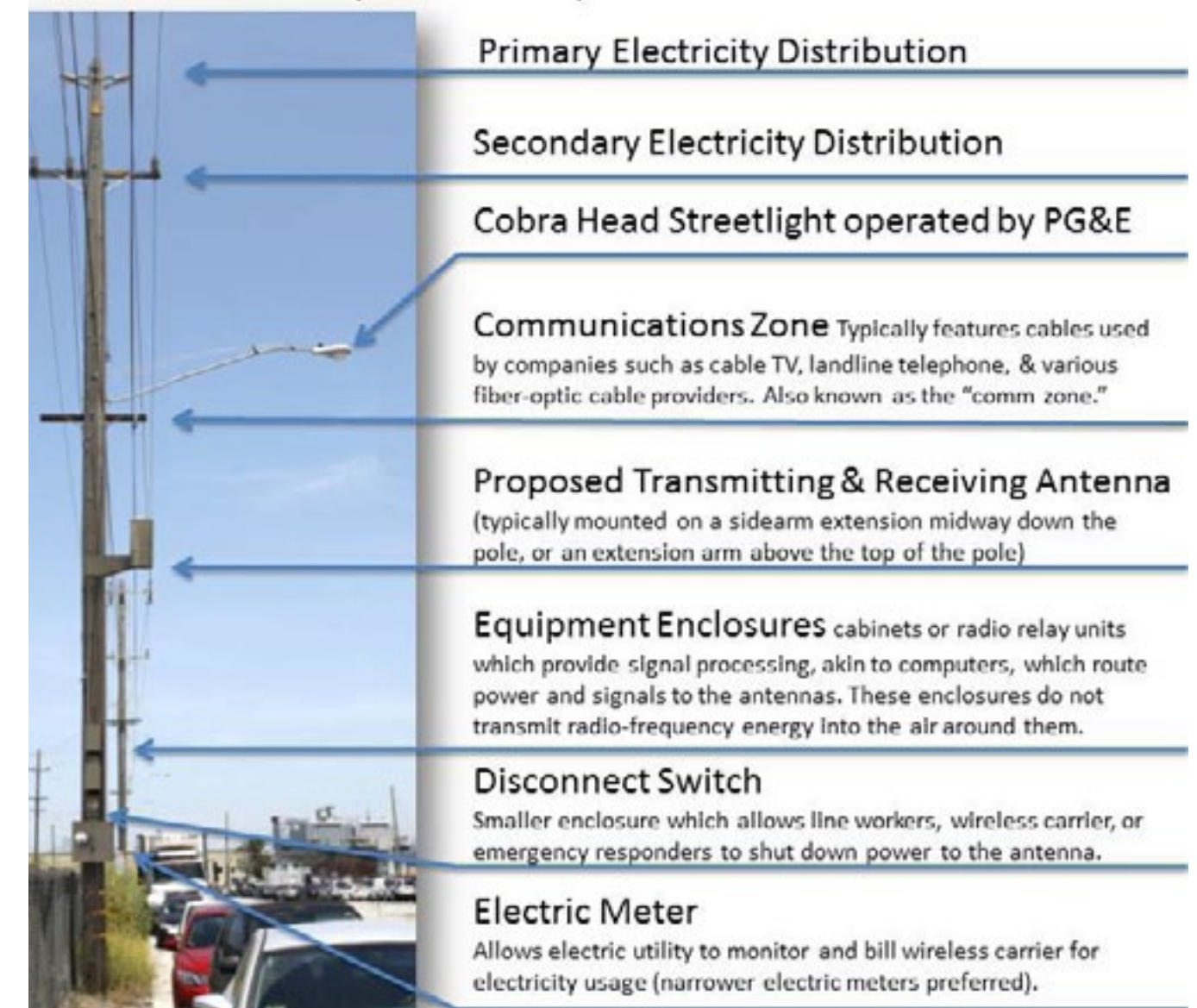


Photo Courtesy AdvanceSim Photo Simulation

## Thirteen Recommended Design Preferences

### 1. “LONG AND NARROW”

Consider the use of equipment enclosures that are nearly the same width as the pole, even if they need to be slightly longer as a result. Narrow enclosures are less likely to impair views of buildings and scenic resources or to detract from streetscapes. Utilize equipment mounting base plates that are no wider than the pole.

Typically, the wide variation in enclosure surface materials and sizes on a single pole can draw more attention (clutter compared to mass) to the facility than a system of enclosures that is comparatively larger, but more uniform in profile and longer instead of wider or deeper.

There are a large number of equipment vendors that offer an array of options. Take the time to design a system that works well together in terms of network needs, overall cumulative effect, cable port locations, and ease of installation and maintenance.

**Equipment Orientation:** While equipment orientation may be limited due to operating requirements, utility or State rules; depending on pole type, orienting equipment, facing away from nearby residential windows, and/or the primary travel direction, is preferred.

### 2. NO METER IF POSSIBLE

Utilize a line drop (no electric meter enclosure), if allowed by the utility company, or use the narrowest electric meter and disconnect available. Ensure meter and other enclosures are well maintained, including regular painting, and the use of a graffiti-resistant paint. Stack the disconnect switch above/below the meter, instead of attached to the side of the meter.



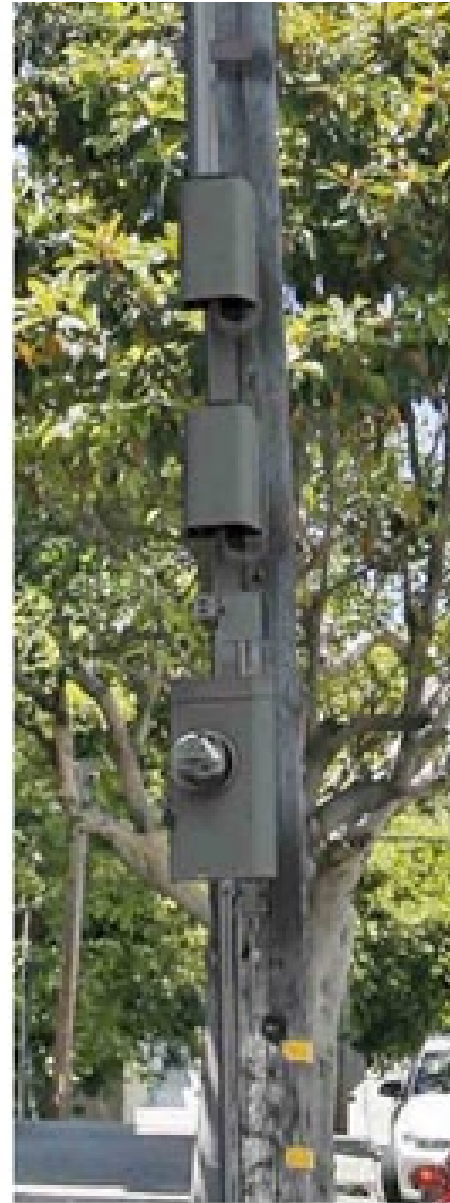
**ABOVE:** Disfavored use of a bulky/wide battery backup enclosure (with graffiti) and non-linear arrangement of other enclosures. Use slimmer/longer enclosures, including those specifically made for battery backup units (which are longer but about as wide as the pole), and possible re-location of portion of equipment (battery backup enclosure) to adjacent pole.



**LEFT:** Disfavored (rusted) meter and other elements which lack a uniform paint color. However the relatively narrow electric meter is preferred.



**RIGHT:** Disfavored facility featuring a leaning pole, rusted elements (equipment in photo has since been painted), very noticeable panel antennas (near cobra head street light), large node ID sticker on side of pole, and various form factors for equipment cabinets. In this example, the lowermost elements are the electric meter and disconnect switch. The square box is typically a battery backup unit used to provide limited backup power to the network, in case of a power outage. The skinny enclosure midway up the pole is essentially a computer used to route power and signal, via cables, up to the (disfavored) panel antennas.



ABOVE: Disfavored Wide Electric Meter (lowest enclosure on pole) in simulation on the left. Use a meter that is roughly as wide as the pole (preferred simulation on the right), if a line drop (meterless system) is not possible. There are meter models that feature a required bypass, but without the wider size.

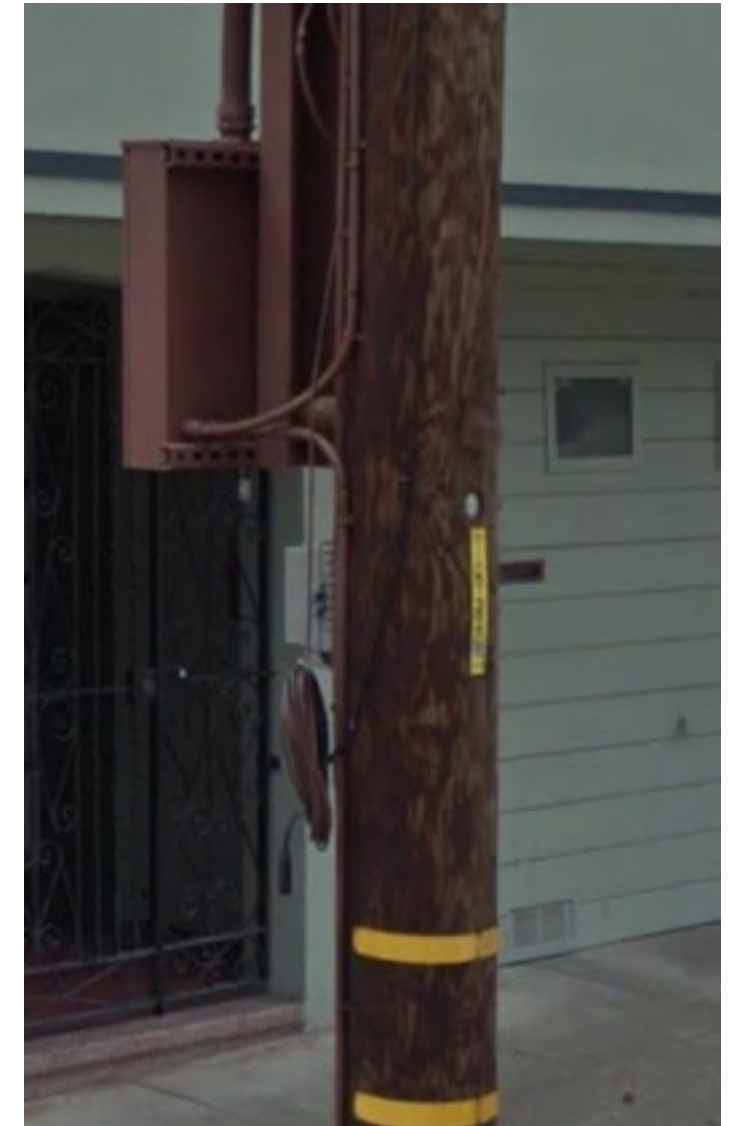
However, the equipment cabinets (two boxes above electric meter) are preferred as they are comparatively unobtrusive (as wide as the pole with a limited depth), feature no equipment decals/stickers, and use passive cooling (no noise from fans).

### 3. FORETHOUGHT IN CABLING - REQUIRE INSTALLERS TO REMOVE EXCESS SERVICE CABLE SLACK OR LOOPS

Consider the use of shrouds, risers or conduit, to reduce the appearance of cluttered or tangled cabling. In some instances, installation practices such as using equipment enclosures with specific port locations, or crossing wires below a down-facing port on an equipment enclosure, can reduce the likelihood that cabling will appear cluttered or bend outward from the pole and further away from the enclosure.

It's highly recommended that instructional notes containing such best practices be included on the plan drawings in a checklist format in order to ensure proper field installation.

RIGHT: Disfavored presence of an excess cable loop (freely hanging at pedestrian level below the electric meter), a wide electric meter, and a lower mounted box not painted to match other equipment.



Antenna mounting arm with cabling and other electronic elements screened from view inside bracket

Photo Courtesy AdvanceSim Photo Simulation

LEFT: Preferred antenna arm extension which hides cabling and passive RF gear inside the arm and two (2) equipment cabinets as wide as the pole. Disfavored wide electric meter enclosure (box at bottom of pole).



ABOVE: Disfavored excess loose cabling, excess decals/stickers, and cluttered appearance of equipment cabinets.



ABOVE: Disfavored example of cabling that is cluttered & tangled. Riser not painted.



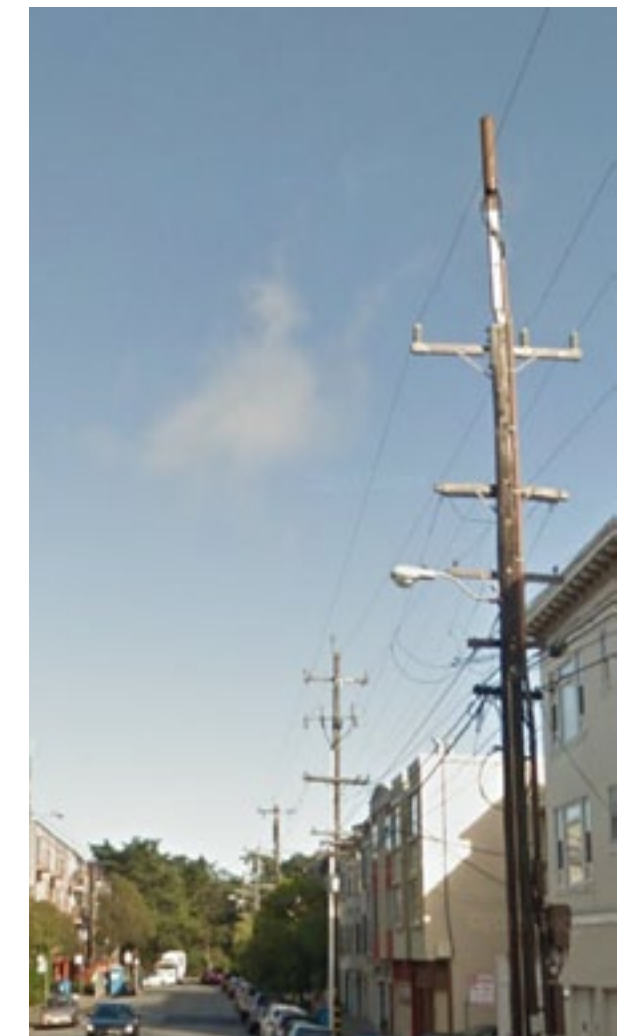
TOP: Preferred installation:  
 1) Equipment boxes and antennas that are painted gray, and are not bulky in appearance.  
 2) No cluttered cabling is present, though the cabling near the antenna should be painted gray as well.  
 3) Relatively slim profile antenna.

RIGHT: The facility on the right features a preferred (slim) antenna type, but is made more noticeable by both the darker color of the antenna and the lack of paint matching either the cabling or the extension bracket ("bayonet") below the antenna.

#### 4. PAINT

"ABC" - Antennas, Brackets (mounting), and Cabling, should match the color of the equipment (including the fiber termination enclosure). Many installations feature wide variations in paint colors, which appears distracting. On dark brown poles, also paint the PVC or steel risers, to match pole.

In areas such as the Sunset and Richmond districts, the Planning Department will generally recommend that equipment cabinets, cables, brackets, and antennas be painted light gray; primarily for locations where there are no nearby mature tree canopies and the existing poles appear washed out. In other parts of the City, the likely color choice will be mesa brown. Choose a durable paint, especially in areas near the ocean.



## 5. ANTENNAS

Consider using antenna designs that provide robust coverage without appearing more distracting than necessary. Avoid placements that may impair light, air, or views from adjacent windows.

Consider using antenna models that include a GPS antenna (if needed) integrated into the same cylindrical shape on top of the main antenna.

Consider using antennas with electronic tilt mechanisms that could reduce the need for bulky mechanical tilt brackets.

Utilize single element side-arms instead of dual parallel side-arms. Evaluate opportunities to utilize cylindrical antennas in-lieu of panel antennas. If panel antennas are utilized, consider the use of mini shrouds below each panel antenna to reduce the visibility of the cable loops. While this will make the antenna look slightly longer, it reduces the noticeability of various elements, such as multiple cable loops, that can draw more attention than the antenna itself. Avoid the use of large bracket systems for panel antennas, which create a significant offset from the pole.



Photo Courtesy Applied Imagination Photo Simulation

**ABOVE:** Non-recommended (triple panel) antenna design that is bulky/obtrusive, and rises well into view.



**LEFT:** Disfavored use of multiple panel antennas with cables loops dangling below each panel.

**RIGHT:** Disfavored GPS antenna (atop small stick) mounted in a manner that is highly visible above the top of the transmitting antenna. The transmitting antenna is well placed (preferred) and sized, though painted too dark, and therefore more noticeable.



**TOP:** Disfavored use of multiple panel antennas with wide offset mechanical tilt brackets (evaluate electronic tilt alternatives) and loose cabling

### ANTENNA PLACEMENT

Both top-mounted and side mounted antennas offer various advantages and challenges from both an RF and visibility perspective; requiring a case by case review. For example, a top-mount antenna with a very tall extension arm may look out of character in a low lying residential neighborhood, but a top mount antenna that is relatively narrow and nearly flush with the top of the pole may offer a very minimal profile, which is preferred.

An antenna may not obstruct the view from, or light into, any adjacent residential window.

For side-mounted antennas, consider using an arm that features flanges/channels so that cabling and passive RF gear can be better hidden from view. For top-mounted antennas, consider using a shroud around the base of the antenna, especially for antenna models with four or more cabling ports, as cable systems without a shroud at the base of the antenna, can appear cluttered. If a shroud cannot be used, utilize velcro ties (or similar) to neatly arrange cabling (and note such on the site completion checklist on the cover sheet of plans).

Pole top extension arms should not appear offset from the pole, making the antenna more noticeable. Utilize an arm that is as wide as the top of the pole and tapers toward the antenna.



**RIGHT:** Preferred top-mounted antenna design with shroud cap below the actual antenna (below seam line); and without a significant pole height increase.

**LEFT:** Disfavored extension arm. Too narrow and noticeable due to shape change and height increase.



Photos Courtesy AdvanceSim Photo Simulation

### 6. LOGOS/DECALS/FLASHING LIGHTS

Use equipment that does not feature flashing lights that may be visible to the public. Remove or paint over unnecessary equipment manufacturer decals and fill-in any visibly depressed manufacturer logos on equipment boxes.



SIDE-MOUNT ANTENNA

NON-ESSENTIAL FLASHING INDICATOR LIGHTS

ABOVE: Disfavored presence of multiple stickers and manufacturer logos, which should be removed or painted over.



ABOVE: Please note, some of the square boxes mounted on poles in San Francisco, similar to the one shown in the photo above, are also used for non-wireless providers, such as cable television. These boxes are typically used to boost power and increase signal quality for **wired** communications.

### 7. RF WARNING STICKER AND NODE ID

Utilize the smallest and lowest visibility (e.g. yellow instead of blue) radio-frequency (RF) warning sticker required by government or electric utility regulations. Place the RF sticker as close to the antenna as possible, facing directly out toward the street, or directly away from street if there is no window within 25 feet of the pole (preferred).

For the Node ID sticker; avoid the use of large and highly visible site (node) identification tags (with carrier's phone number). Consider combining with disconnect information.

Use sticker colors that are more muted (e.g. tan), such as the same color as the equipment but with white color lettering. Consider placing the Node ID sticker on the underside of the equipment enclosure so it is only visible when standing next to the pole and looking up. If the node ID sticker cannot be placed on the underside of the main equipment area then place the sticker on the side of the enclosure facing in the direction of travel (e.g. north facing for a pole on the right hand side of the street on a north-south street).



LEFT: Non-recommended, repetitive, and highly visible RF warning stickers, and equipment manufacturer decals located near bottom of pole and visible to pedestrians.

### 8. THE OTHER POLE

In the event that a portion of the proposed facility requires installation of equipment on a secondary pole, consider using a secondary pole that is near a mature street tree, alley, or other streetscape feature where the equipment would be less visible.

### 9. POLE HEIGHT INCREASES

Avoid the replacement of streetlight-only wooden poles with poles that are significantly taller by evaluating a different pole or attachment method. This could include evaluating opportunities to:

- 1) choose a nearby Joint Pole Association (JPA) pole, where a modest height increase would be less noticeable, than a streetlight-only pole;
- 2) working with the utility to re-route power lines serving the cobra head street light in a manner that meets height clearance requirements;
- 3) or running the power line, for the street light, from a JPA pole across the street in a different manner, while complying with State rules (e.g. General Order 95).

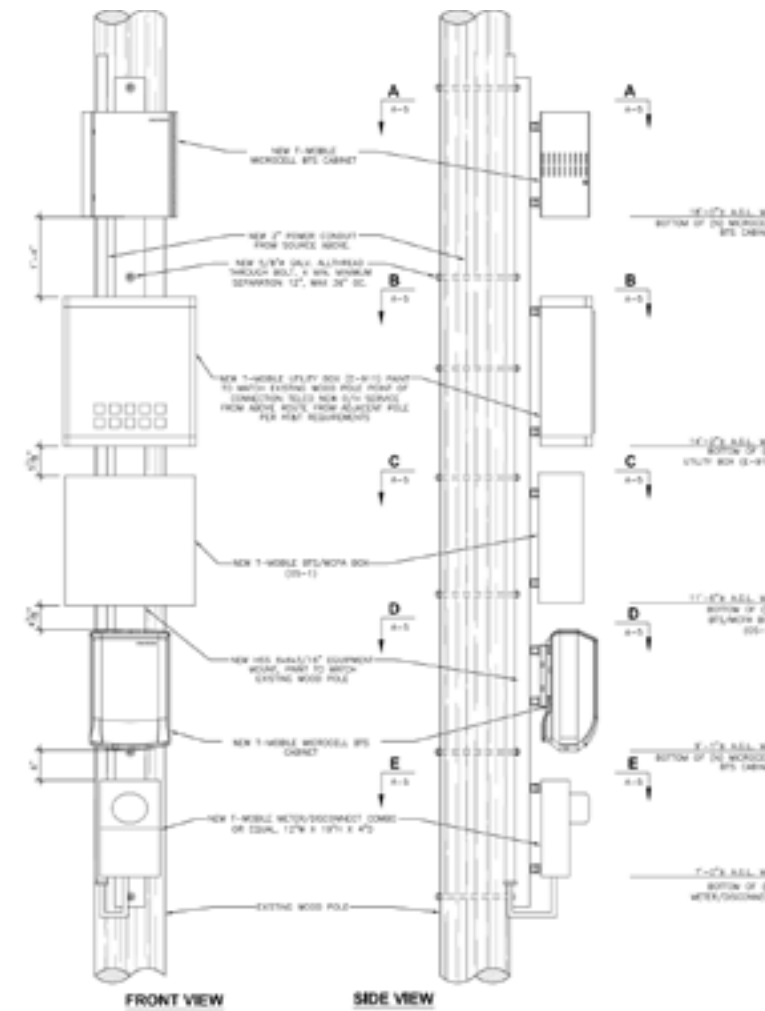


**ABOVE:** Non-recommended pole height increase (existing pole on left side and previously proposed design on right side) on a signature City-defining street (Lombard Street at Columbus Avenue).

Photo Courtesy: AdvanceSim Photo Simulation

### 10. EQUIPMENT PLACEMENT

Stack equipment close together and on the same side of the pole. If a long rectangular disconnect switch is used, rotate the enclosure so the elements can be stacked closer together on the pole. Avoid wide offsets (more than 4 inches) of equipment enclosure brackets from the pole.



Original Design featuring a narrow offset from pole (preferred)



**TOP RIGHT:** Current Site Photo (after modifications) with disfavored elements such as a wide offset between the pole and equipment enclosures; excess cabling, large bright node identification (yellow placard) and RF warning sticker next to equipment (instead of up near antenna) at pedestrian level.





Disfavored wide offset (from pole) of electric meter, unpainted fiber (PBX) node box (green element) and large white RF warning sticker on non-RF emitting equipment enclosure.

### 11. COOLING FANS

In areas close to residences or windows use a passive cooling system. In the event that a fan is needed, consider using longer enclosures with sufficient space to allow for additional airflow and a different cooling fan with a lower noise profile. In some instances, a larger fan often may have a lower noise profile, due to fewer revolutions per minute.

### 12. PHOTO SIMULATIONS

Ensure that photo simulations, which are sent to local residents and neighborhood groups, are realistic with respect to cabling/conduit, the RF warning and node ID stickers, and equipment offset from the pole. Verify whether a GPS antenna is needed; as submittals often feature (macro-sized) GPS antennas on simulations when none are shown on plans (or needed).

If the existing pole is leaning and slated for replacement, the simulation should show a new upright pole.

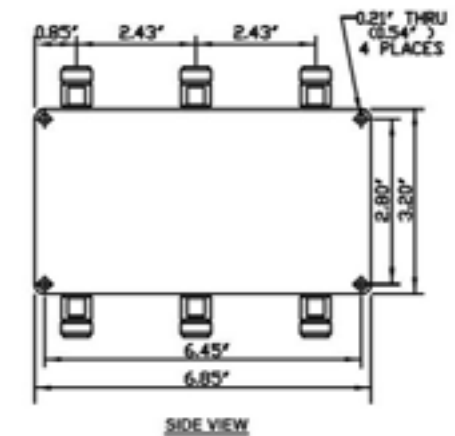
If an arrow is placed pointing only at the antenna with a callout, then an additional callout should be shown pointing at the equipment cabinets.

Ensure photo simulations accurately show the offset of equipment cabinets from the pole. Many simulations depict flush-mounted installations when the actual site features a significant offset from the pole.

Add a creation date to photo simulations.

### 13. ANCILLARY EQUIPMENT

Ensure plans and photo simulations accurately show smaller equipment items such as duplexers, ground buss bars, PBX or J-Boxes. Hide these elements in locations such as behind equipment enclosures (while complying with GO 95), or in mounting arms which feature recessed areas.



Sample duplexer. Multiple cables come in and out of this type of element in areas near the antennas, which should be hidden from view.

## San Francisco DAS Design Preferences Checklist

Best Practices to Ensure Clarity of Plan and Simulation Submittals

		YES	NO
1	<b>Cover Sheet</b>   Correct project site location shown on cover sheet. The wrong street address is often used (for nearest building). Utilize the San Francisco Property Information Map website (link)		
2	<b>Cover Sheet</b>   Clear project description describing types and numbers of equipment. Also indicate if pole will be replaced (with existing and proposed heights) or if any existing road signage is proposed to be relocated or removed.		
3	<b>Cover Sheet</b>   Provide information in a checklist format to ensure conformance by installers, as shown further below.		
4	<b>Site Plan</b>   Show location of any new vaults proposed.		
5	<b>Elevation Sheet</b>   Show location of Node ID sticker (low contrast colors) and RF warning sticker. Show RF warning sticker facing out to street and near antenna, or away from street and near antenna if no window within 50 feet.		
6	<b>Elevation Sheet</b>   Indicate height to top of pole, antenna, top and bottom of equipment enclosures.		
7	<b>Elevation Sheet</b>   Show any existing or proposed guy wires.		
8	<b>Elevation Sheet</b>   Show equipment enclosures stacked together as close as (4 inch offset from pole) possible (including rotation of rectangular disconnect switch enclosure) while complying with GO 95 and airflow requirements.		
9	<b>Elevation Sheet</b>   Ensure other elements (e.g. NEMA, PBX or J boxes), ground bus bars, and base plate mounts are shown, if utilized.		
10	<b>Elevation Sheet</b>   Clearly show offset (distance) of equipment cabinets from pole.		
11	<b>Photo Simulations</b>   Show cabling and equipment sizes, and offsets (cabinets from pole) correctly.		
12	<b>Photo Simulations</b>   Show RF warning and node identification stickers, if visible from given perspectives.		
13	<b>Photo Simulations</b>   Use perspectives that provide a true sense of distance to nearest residential windows or primary facades of historic buildings.		
14	<b>Photo Simulations</b>   Show new (straight/upright) pole if existing (leaning) pole is to be replaced.		

## San Francisco Site Completion Checklist

		YES	NO
1	<b>Durable Paint:</b> Antennas, Mounting/Standoff Brackets, Pole Extensions, PVC Conduit, Meter, and Radio Relay Units to be painted "Mesa Brown" using a durable paint (e.g. Sherwin Williams, Frazee or equivalent).		
2	<b>Cabling:</b> Cabling (Mesa Brown in Color) to be installed in a tidy manner without excess cable loops.		
3	<b>Spacing of Support Elements:</b> Support equipment (e.g. Meter, Disconnect Switch and Mrrus) to be clustered (vertically) as close as technically feasible on pole.		
4	<b>Logo Removal:</b> All equipment logos, other than those required by regulation (e.g. node identification of shutdown signage) or PG&E regulations shall be painted over or removed. Raised/Depressed logos/text on equipment enclosures (e.g. RRUs), if present to be sanded off, or covered with a sticker, and then painted.		
5	<b>Signage:</b> FCC mandated RF warning signage shall face out to street when placed in front of, or near a window. Signage shall face toward building if there is no window.		

*Sample Site Completion Checklist on Cover Sheet of Plans\**

\*This checklist can be modified to meet specific pole type applications.



SAN FRANCISCO  
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DEPARTMENT

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*Planning staff are available by phone and at the PIC counter.  
No appointment is necessary.*