# *UCCS OUTDOOR WIRELESS PROJECT*

## Phase 1 - LESSONS LEARNED

**Last Updated: 7.23.19**

### *DESIGN AND PRE-PLANNING*

- Before installers are on site, we need a more thorough high-level overview of the scope of their work so that we can plan ahead and coordinate with Facilities to help accommodate their expected needs. IE.. what specifically will the installers need? What specifically will the drilling team need? Examples are as follows…
    - Drilling team wanted to fill their water tanker from hydrants or spigots
        - How many gallons will they need? 10? 10000?
    - Drilling team asked about parking their vehicles somewhere overnight
    - Drilling team asked about dumping mud on-site
    - Install team needed a place to store their equipment overnight
        - Ladders, equipment, lifts, other tools, etc.
- Outside Plant paths had to be reviewed in order to find usable paths for installing the powered fiber and direct cat6 runs. Our outdoor plant was poorly documented.
- A drybox + bollard solution had to be designed. Caveats here included…
    - New AP bollards needed to match existing campus bollards (which had ~7-8" diameter).
    - This size bollard cannot accommodate an AP inside, nor a poe power extender.
    - A drybox had to be installed into the ground next to the bollard to house the AP, and in some cases an additional drybox was installed to house a POE extender where needed.
    - Length of antenna patch cable sometimes caused excessively large coils in the drybox and reduced space for AP, ground wires, etc. Might want to use shorter cables in future. This project used 10' cables and 6-8' cables may have been better.
    - The conduit from drybox into the bollard needs to be large enough to accommodate the quantity and size of the large, stiff antenna patch cables (and leave room for future cables if needed.)
    - Ground rod was installed after the drybox was installed. The ground rod had to be hammered in. This made it difficult to place the ground rod real far into the corner (and out of the way) due to needing clearance required to swing hammer to drive ground rod through bottom of drybox and into the ground. Suggestion: Dig hole for drybox, drive ground rod into ground without the box in the way and where the corner of the box will be, drill a hole in the bottom of the drybox in the corner, place drybox into pre-dug hole and slide box base over the ground rod. This will allow you to keep the ground rod closer to the corner.
- Consider using same style of dry box for areas where no AP or hardware is going. IE… at the base of some light poles where fiber or cat6a has a service loop then feeds into the pole – these are not the same style of drybox as the bollards. They are a standard ground box (not "dry").

***PREP AND INSTALLATION***

- Paint for the APs, mounting arms, bollards, and antennas
    - Specific paint colors had to be used in different locations
        - Access points mounted to buildings both brick and stucco: RAL 8019
        - Pole to be added to the top of the rear of centennial: RAL 8019
        - Access points mounted to light poles and new bollards: Anodized bronze or DB-P Dark Bronze
    - Light pole arms came out great, but when the metallic flake was removed from the paint being used on the APs, it came out very dark. They had to use a different color (***INSERT***) so the AP would better match the arms.
- Roof penetrations had to be performed by a licensed roofer (requested by Facilities). Piper had to subcontract a local licensed roofer to properly seal the penetrations he made. (lucky for us the roofer they found was the one Facilities usually contracts for their roof work)
- Bollard base conduit was barely large enough to fit the 6 antenna cables. In the current conduit we would not be able to add additional cables. In future bollard installs, this conduit size needs increased. Current inner diameter is 1.5". This was later increased to 2".
    - Original installation had the caisson several inches above the ground. It did not look good. We spoke with Piper and they agreed. They had their sub-contractor come back out to redo them. We asked they make the top of the caisson level, if not ½ inch below ground level (so dirt and grass would eventually overtake). We wanted the base of the actual bollard to be flush with the ground, similar to other bollard on campus.
- For bollards, use stainless steel washers and bolts to secure them to the ground lugs. They are starting to rust after just a month of install.
- Work in and on student dorms
    - Work in student dorm rooms needed to be coordinated through Housing staff.
    - Additional access panels needed to be added in some areas within the dorms so that cabling could be ran in the ceilings. Much of the room and hallway is hard lid with limited existing access panels.
- Powered Fiber Headend Unit – not able to remotely manage individual circuits with the current install. It supposedly was made clear we wanted that capability, but not sure where that communication breakdown was. As currently installed (as of 3/1/19) you can only remotely, via http web gui console, power cycle the rectifier on the controller. Doing this cycles the entire Power Express Shelf, rebooting ALL circuits and ALL poe extenders attached to this shelf. You can cycle individual circuits on  power shelf, but you have to be local and at the unit. There are buttons on the front of the unit that allow you to select and power cycle individual circuits.
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***POST INSTALLATION***

- Dry boxes have leaked

- Some, but not all. Two APs were damaged in the process. Not sure if the bolts were not tight enough, or debris was on the gasket prior to lid going on. I don't believe water is seeping up through ground rod penetration. The conduit, when it comes up into base of bollard, rise about 1" or so above the concrete pad. Its possible in a very heavy downpour, that water pooled at some of the bollard bases and water got down into the conduit and then down into the box.
- Need to apply a bead of silicon to lid lip areas when bolting on the lid.
- Future designs – the conduit should rise at least 3-4 inches up into the base of the bollard.