

# **APPENDIX F: ELECTRICAL AND TELECOMMUNICATIONS ASSESSMENT**



## Appendix F

### Electrical Systems

Electrical Site, Facility, and Utility Assessment scope:

1. County facility assessment affirmation:
  - a. The Placer County Campus has existing electrical site plans developed by West Yost Associates. These plans were found to be accurate relative to conditions observed in the field. That said, these drawings are limited in scope in that they do not fully depict the entire electrical installations on Campus. Most medium voltage feeder runs were included, but most 480v and 120v circuits were not included. This is typical for a big picture approach on a large campus like the Government Center.
  - b. Other building specific assessments from Lionakis Architects, dated May 2013 were also reviewed. These documents were deemed accurate relative to the current field inspections and survey work completed. Although, since 2013 there have been a number of advancements with LED luminaires and lighting controls. This when combined with the most current revolution of CA T24 part 6 (the energy code), it now makes sense to consider updating the lighting systems in all of these buildings to LED while simultaneously integrating advanced dimming/daylighting controls systems.
2. Electrical Utility and service assessment:
  - a. The medium voltage electrical infrastructure on the Placer County Government Center is owned and maintained by PG&E.
  - b. The nominal medium voltage service voltage used on Campus is 12kV.
  - c. Most medium voltage cabling is routed below grade in the streets and right of way. However, there are a number of locations/areas where risers to power poles, and cabling routed on power poles exist. There areas are:
    - B Ave. animal control center yard
    - E Ave.
    - 3<sup>rd</sup> Street
    - F Ave.
    - 2<sup>nd</sup> Street
    - 1<sup>st</sup> Street
    - B Ave (East of Richardson)
    - County Center Drive
  - d. The primary electrical service cabling routed through Campus originates in multiple locations from PG&E as follows:
    - Bell Road/Richardson Drive
    - Bell Road/County Center Drive

- Bell Road/1<sup>st</sup> Street
  - 3<sup>rd</sup> Street/Atwood Road
  - Atwood Road/11432 F Avenue
- e. PG&E has indicated they have sufficient capacity on their systems to serve the current Campus electrical demand with no concerns.
  - f. PG&E expressed confidence in their ability to serve the new Placer County Government Center properties in the future as the Campus develops new buildings, adds additional square footage, and continues to both maintain and renovate their existing facilities.
  - g. Note that PG&E will not install or engineer new capital infrastructure for future projects until proposed projects are engineered and applications submitted to PG&E for service design.
  - h. Electrically speaking, the Campus’s point of demarcation with PG&E is at the service transformers for each building. This point represents the handoff from PG&E owned and maintained facilities to County Owned and maintained facilities.
  - i. All medium voltage cabling, conduits, and site box/vault infrastructure on site is controlled by PG&E and dictated by their standards and engineering design.
  - j. The Government Center Campus has been decommissioning facilities over the last few years and this effort has led to a decrease in the electrical demand on Campus.
  - k. The observed PG&E transformers and corresponding building main switchboards were in good working condition. No breaker failures, or nuisance trips were reported by the County electricians or staff. See table 1 below for a summary of electrical service transformers for the buildings on campus.

<b>Buildings Served</b>	<b>Transformer size (KVA)</b>	<b>Secondary Configuration</b>
11106 B Ave	300	120/208V, 3P, 4W
CES lift station	45	277/480V, 3P, 4W
Peace for Families	150	120/208V, 3P, 4W
Animal Shelter	300	277/480V, 3P, 4W
Animal Control	75	120/208V, 3P, 4W
B Ave Yard	150	120/208V, 3P, 4W
2929 Richardson	1,000	277/480V, 3P, 4W
2775 Richardson	1,000	277/480V, 3P, 4W

*Table 1*

3. Campus Photovoltaic System assessment:
  - a. There are multiple photovoltaic (PV) systems installed on the campus. They are a mix of ground mount, and roof mount with a total capacity of approximately 580 KW.
  - b. The existing PV systems are located at the Finance Administration Building (FAB), the 100 ramp (buildings 110-114), the DPWF Garage

(building 400), and a large ground mount array just South of the Juvenile Detention Center (JDC).

- c. The PV systems are in good working condition, with no problems noted during interviews with Facilities. Most systems have useful lives that exceed 20 years and the oldest campus system is approaching 10 years old at this time.
- d. The JDC array is the system coming up on its 10 year Energy Service Contract and Ground Lease where the County will need to make a decision about its future use. Currently this is the largest system on campus.
- e. The PV system arrays are currently producing approximately 906,000 KWhr's per year. The Campus is currently using about 7,450,000 KWhr's of electricity per year. This generation represents about 13% of the total demand on Campus in 2015.
- f. No future installations, or pending additional PV system projects are currently in planning for the Government Center Campus.
- g. Note that additional PV system installations will be required to achieve the Campus's goal of being zero net energy (ZNE).
- h. ZNE will be required in California for new construction projects as soon as 2030. In preparation of this mandate the PCGC should start thinking about where on site new PV arrays could be placed. New building should consider PV arrays on their roof and parking lot areas. These two locations have significant additional benefits such as reducing the heat island effect and providing shade for building occupants and vehicles in the hot summer months.
- i. All new buildings on the Campus moving forward should be designed as ZNE at the minimum. In addition, additional PV arrays will be required to be installed to offset the existing buildings electrical use.

4. Campus Generator System assessment:

- a. The observed generator systems on campus were a mix of diesel fuel and propane/natural gas, and in good working conditions.
- b. At the facility assessment interview it was mentioned that one of the two Jail facility generators may be undersized relative to the building loads. It was also mentioned the Auburn Justice Center's generator may be too big. These conditions should be further reviewed.
- c. Another comment the facilities team made relative to the existing generators on campus was that some of the diesel units do not have enough building demand load and are experiencing wet stacking. Wet staking results when generator equipment operates at low loads and not all the fuel is properly burned. In the worst case scenario this can result in generator failure during a utility outage condition, or damage to the generator related to unburned fuel combusting.
- d. Wet stacking can be prevented by using either a resistive load bank during testing, or with the addition of appropriate building load during testing. Per NFPA 110 section 8.4.2 the County should exercise their generators

with at least 30% nameplate load on the generators for their monthly testing. This is in addition to the yearly load bank testing that is currently included by the County's generator maintenance vendor.

5. Electrical distribution, transformers, and panel boards assessment:
  - a. The observed building distribution boards were in good working condition.
  - b. The observed building low voltage transformers were in good working condition.
  - c. The observed building branch circuit panelboards were in good working condition. But there were multiple buildings with a lack of branch circuit breaker spare and space availability. There are also buildings where multiple sub feed panels serve additional sub fed panels, and so on.
    - This condition often happens in buildings over time as new loads are added and changed in a given facility. Eventually over time there will be no spare breakers available or spaces left to install new breakers in a panelboard.
    - The most effective solution for this is to either add additional sub fed branch circuit panelboards or to replace existing panelboards with new boards that have more breaker positions available (new panelboards can have as many as 84 circuits in a single panel section where original construction boards were often limited to 30).
    - Another option is to add multi section panels instead of single section boards.
    - We suggest clients maintain 20% spare or space in panelboards to allow for future flexibility during renovations or maintenance. At no point in time should a panel be allowed to have less than 3 branch circuit breaker positions available without addressing the concern before it becomes a problem.
    - The 100, 200, 300, and 400 block building areas were specifically identified as facilities where breaker spares and spaces were not consistently available for the electricians. Separate construction projects should be planned for these buildings to add additional panelboard sections to help meet the 20% criteria.
    - The 100 Ramp buildings have some Zinsco panels installed. Historically, Zinsco brand electrical panels have been associated with problematic electrical events, centered around a lack of tripping during electrical overcurrent scenarios. These panels are no longer manufactured and also have a lack of available spare breakers in the marketplace. As such, they are becoming very expensive to maintain. We suggest the panels be replaced with new equipment where possible.
6. Campus lighting assessment:
  - a. Exterior lighting:

- Most exterior wall mounted light fixtures have been converted to LED by the County. This is a good step towards improved energy efficiency as LED lighting on the exterior of buildings is a great retrofit option. Some benefits are improved light quality, decreased energy usage, minimizing future maintenance/lamp replacements, and better security for the buildings.
  - Parking lot lighting fixtures should also be considered for retrofit. Most of these fixtures are HID and are great retrofit candidates for future projects.
- b. Interior lighting:
- Most of the County building observed had fluorescent luminaires in good to fair condition.
  - Occupancy sensors were observed on Campus, but there is a lack of uniformity across the buildings for occupancy sensors, controls type, and switching (checker board vs. a/b switching).
  - Recent advancements in LED lighting technologies coupled with the decrease in LED controls and fixture costs have made this a perfect time to consider retrofits. New wireless sensors, and switches have even eliminated the need for surface mounted conduits and difficult installations. The County should plan for upgrades to LED type fixtures and controls for all facilities to meet their ZNE objectives.
  - New luminaires will allow for enhanced lighting quality for both building occupants and the public which patron the buildings.
  - Energy savings is available when fixtures are paired with advanced controls like continuous daylight dimming and occupancy based sensors. The advent of dimming has now allowed for a high low protocol based on occupancy. This advancement in controls ensures that people will not step into public spaces within the buildings were all of the fixtures are turned off. Instead the fixtures are dimmed down to low levels in public spaces when no occupancy is detected, and then raise up to full output when a person enters the space. The fade rate for this transition can be controlled such that most people do not even notice the lighting levels and energy savings.
7. Fire alarm assessment:
- a. All buildings surveyed had current and operational fire alarm systems. These systems were in good working condition. Pull stations and strobes were observed in public spaces.
  - b. No maintenance or programmatic concerns were noted by the facilities maintenance department during their interview.
8. Opportunities for improvement:
- a. The Campus should consider development of Campus electrical design standards (they currently have low voltage system design standards).

These standards would help guide future projects completed on the Campus and would help regulate simple things like indoor and outdoor light fixture color temperatures (4,000 degrees Kelvin), minimum branch panel breaker spares and spaces, requiring panel schedules and cards to be updated for each project, making sure abandoned or old conductors and cabling are removed with each project, clarifying requirements for field testing of circuit breakers, etc.

- b. Lighting retrofits for interior lighting with a controls upgrade should be considered for any of the older buildings on campus that are not being removed as part of the Masterplan scope.
- c. Lighting retrofits should be considered for all exterior parking lot lighting fixtures that are not currently LED. Consider occupancy based controls for these fixtures to improve both security on Campus, and improve energy efficiency.

## **Telecommunication and Information Technology Systems**

### 1. AT&T Incoming Service

- a. The AT&T service is entering the campus site from a pole on Bell road at the corner of Richardson Blvd. The service has a secondary connection from the same pole. The cable transitions to underground from the pole to the MDF locations.
- b. The AT&T entrance facility has a primary fiber and copper entrance to the campus and serves two MDF locations. The primary MDF is located on B Ave. at the corner of Richardson Blvd. The second MDF is located on C Ave. on the corner of 2<sup>nd</sup> Street.
- c. AT&T fiber serves the B street Both MDF locations have ATT copper.
- d. The C street MDF serves some AT&T customers that will be effected when the building is demolished. AT&T will need to reroute there cable to there customers from the B street MDF.

### 2. Site Conduit (MDF Building)

- a. The communications Hub of the Placer County Government Center is the IT building located on B Ave. There are about seven existing 4" conduits serving the building from a vault on B-Ave. The conduits are all used and 30% to 100% full. All distribution to the site buildings and AT&T incoming service utilizes the conduit.
- b. An additional ten 4" conduits shall be provided from the building to Richardson Blvd.

### 3. Site Conduits

- a. The existing site conduit system utilizes a combination of AT&T maintained conduit and Placer County maintained conduit. The distribution by county owned cable utilizes both conduit systems to convey cable throughout the Campus Center. After meeting with the Placer County IT department, it was made clear that the conduit pathway is inadequate for future growth. In many instances, the routes taken for cable distribution uses Placer county conduit and then into AT&T conduit and back to placer county conduit. In some cases the route may enter several buildings before reaching its destination.
- b. AT&T uses the same method to route cable onto the campus utilizing both AT&T maintained and placer county maintained conduit pathway.
- c. Opportunities for improvement: It is best practice to only route placer county cable through county maintained conduit and to not use the AT&T utilities infrastructure. When well planned, the new conduit will provide the county with site pathway for new building projects. The instances where major backbone cable is routed through and between buildings, interruption in service can and will cause major outages and cost when these building are slated for demolition. A potential plan would be:
  - Tier 1: Provide a major conduit pathway from Richardson Blvd., west along B Ave. to County Center Dr. and C Ave..
    1. Provide new conduit or intercept existing conduit into existing buildings.
    2. Provide new conduit into new building/s
  - Tier 1: Provide a major conduit pathway from 1<sup>st</sup> Street and Bell Ave. to D Ave.
    1. Provide new conduit into new building/s
    2. This conduit will provide utilities for provider cabling.
  - Tier 2: Provide a major conduit pathway from Richardson Blvd. and B Ave to D Ave., D Ave to 1<sup>st</sup> Street, D Ave to F Ave., D Ave. to C Ave., D and 2<sup>nd</sup> St to F Ave, D Ave and Richardson Blvd to F Ave, F Ave to 2<sup>nd</sup> Street. D Ave and 1<sup>st</sup> to Willow Creek Dr., Willow Creek Dr to west and east of new housing development.
  - Tier 3: Provide a major conduit pathway from, Bell and County Center Dr. to B Ave., F Ave to 1<sup>st</sup> Street at maintenance buildings, Willow Creek Dr to the east side of 1<sup>st</sup> street.
    1. These routes will allow for extension of pathway to future projects and provide the conduit loops desired by the IT department.

### 4. Demolition

- a. Tier 1: Demolish all fiber optic cable and copper cable from Tier 1 project buildings to be demolished to secondary MDF.
- b. Tier 2: Demolish secondary MDF cable and racks from MDF building.
- c. Tier 2: Demolish all cable from secondary MDF to each building cable is served to (south and east of secondary MDF building).

- d. Tier 3: Remove Maintenance buildings fiber and copper cable to IT building on F street.

5. Site Fiber Cable

- a. The standard for the county is to install singlemode fiber and OM4 multimode fiber for any current and future projects. The county has legacy 62.5/125 MM site fiber serving the majority of the campus buildings.
- b. Tier 1: Provide new 24 strand SMF and 24 strand OM4 fiber from the campus main MDF to the new HHS building.
- c. Tier 1: Provide new 12 SMF and 12 OM4 fiber from the campus main MDF to the existing IDF at the C Ave building where fiber was demolished.
- d. Tier 2: Provide new 12 strand SMF and 12 strand OM4 fiber from the campus main MDF to each building that has a fiber connection from the secondary MDF which will be demolished.
- e. Tier 3: Provide new 48 strand SMF and 48 strand OM4 fiber from the campus main MDF to the Technology building on F Ave.