BEST PRACTICES 2009

# UC Davis, Bi-Level Exterior Lighting Systems

**The UC Davis Bi-Level Exterior Lighting Systems project involved the complete lighting retrofits of three major parking structures. Although the project's primary focus was energy conservation, the project resulted in additional benefits through improved security, lighting quality and reliability, and will decrease maintenance and operations costs.**

**Award Category**

Best Lighting Retrofit

**Green Features**

LED and IF lighting

Occupant sensors and dimmable ballasts

**Annual Energy Savings**

Saves about 1,300,000 kWh per year compared to pre-implementation

Estimated savings of $115,000 per year (assuming $0.0851 per kWh flat rate)

**Cost**

$950 thousand for materials and labor (pre-incentives)

Incentives administered by CPUC at a rate of $0.24 per kWh electrical energy saved

**Completion Date**

November 2009

Working in collaboration with the California Lighting Technology Center, with incentives from a program administered by the California Public Utilities Commission (CPUC), UC Davis replaced high pressure sodium (HPS) and metal halide (MH) exterior lighting fixtures with induction fluorescent (IF) and LED fixtures. Induction florescent lamps are totally enclosed vessels (donut shape) with the light-emitting gas being perfectly sealed. These differ from the more common tubular florescent lamps, which are constructed with metallic probes inserted through the glass on each end. These probes have a finite life, which typically defines the lamp life. With much lower lumen depreciation over their operating life, the new LED and IF lamps better retain lighting output and quality. Also, longer lamp life spans will lower labor and maintenance costs, compared to the older HPS and MH lights. The new fixtures have approximately 100,000 hours of operating lifetime, compared to the approximate operating lifetime of 15,000 hours of the replaced fixtures.

*View of parking structure during off-peak hours. Photo: CLTC*

**When the system's sensors do not detect movement for five munutes during off-peak hours, the lights dim to 40% of total potential output.**

The new IF and LED lights have better color rendition than the older lights, with a color rendering index (CRI) of approximately 80, compared to a CRI of 20 for the former lights. The higher CRI allows patrons to better distinguish different colors, making it easier to identify cars, and patrons have already responded positively to the change.

In addition to the efficiency of the new lamps, the new system further saves energy with dimmable ballasts and occupant sensors. When the sensors do not detect movement for five minutes during off-peak hours, the lights dim to 40% of total output. The lower lighting outputs still meet IES recommended illumination levels for garages, and provide a welcoming environment. In addition to lowering power consumption, the sensor-based controls provide an added safety benefit. A parking patron in one zone of the garage will be alerted to the presence of a person in a different zone when the lighting level increases, increasing the patron's awareness of a potential threat.

The retrofit has been seen as a major success and the UC Davis facilities managers now plan on expanding the application of LED and IF lighting throughout the UC Davis campus, particularly to its pedestrian and bike paths and exterior-mounted building fixtures. A large working group has been established to identify other interior and exterior applications and aims to achieve a campus-wide 50% reduction in energy use.

2009

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### Team

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### More Information

www.facilitiesnet.com/lighting/audiovideo/Lighting-Retrofits-with-Chris-Cioni--20162

## LESSONS LEARNED

The retrofit was designed to provide increased lighting reliability and durability. Chris Cioni, Associate Director of Facilities Management, states that energy consumption post-implementation is roughly 60% below baseline conditions. Mr. Cioni estimates that the project will realize a simple payback of five years resulting from lower operating costs and lower maintenance costs. The retrofit was installed on a one-for-one fixture replacement process, requiring no additional circuits or wiring. The application of new fixtures and lamps was a simple and straightforward process, and this approach can be a successful retrofit strategy for other UC and CSU campuses.

*LED lamp attached to parking structure. Photo: CLTC*

### Collaboration with the UC Davis Police Department, groups concerned about safety, and potential parking patrons was crucial to the success of the project.

Meetings with stakeholders allowed the university to realize potential benefits beyond energy savings, including reduced maintenance costs, decreased waste disposal, and increased security. Ideas that came out of these meetings also led to better operation of the occupant sensor system.

*Best Practices* is written and produced by the Green Building Research Center, at the University of California, Berkeley.

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