

Integrated Office Lighting System

California National Guard Joint Force Headquarters

Sacramento, CA



PIER Buildings Program

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The Problem

Office lighting is often provided by overhead fluorescent troffers or pendants, with additional task lighting supplied by energy-intensive fluorescent undercabinet fixtures and desk lamps. In an open office environment, overhead ambient lighting is usually controlled in large zones. As a result, large areas of a building may be illuminated for long periods of time, regardless of occupancy.

The Solution

CLTC partnered with the California Army National Guard through the Public Interest Energy Research (PIER) Program to demonstrate an Interior Office Lighting System (IOLS) at the Joint Force Headquarters in Sacramento, CA. The project demonstrated the energy and maintenance savings that can be achieved by using a combination of low ambient lighting, high-quality task lighting and advanced lighting controls. Average IOLS energy savings is 40–50%.

Features and Benefits

- High-quality ambient and task lighting provide an aesthetically pleasing office environment
- Energy-efficient LED task light components can be customized to the individual workspace
- Personal occupancy sensors control task lights
- Zonal occupancy and daylighting controls maximize energy savings

Technology Costs and Incentives

An IOLS retrofit will generally cost twice as much as a lamp-and-ballast retrofit, yet the IOLS yields twice the energy savings. Increased first costs are attributed to the addition of high-quality LED task lighting systems, advanced lighting controls, and, often, replacement of existing luminaires with direct/indirect pendants.

Payback periods for IOLS retrofits typically are between three and seven years, depending on the incumbent ambient and task lighting. In the case of pre-existing T8 systems, like those encountered in this demonstration, payback periods can be as long as 10 years.

FIGURE 1: POST-RETROFIT LUMINAIRES

California National Guard Joint Force Headquarters, Sacramento, CA



Energy-efficient lighting retrofits can expect utility incentives of \$100 per kW demand saved and \$0.05 per kWh saved. These incentives can sometimes be combined with incentives associated with T12 or T8 lamp replacements, the addition of occupancy sensors, and LED light source retrofits. Facility managers can contact their utilities to determine applicable incentives.

Demonstration Results

California National Guard Joint Force Headquarters Sacramento, CA

The National Guard Joint Force Headquarters is a two-story administrative facility. The building contains a mix of open office areas, private offices, and associated support areas. The demonstration space selected for this project consisted of 1/4 of the second floor, and included a large open cubicle space, five private offices, and a conference room. Existing lighting consisted of recessed, fluorescent troffers with T8 lamps, and T12 undercabinet task lights or incandescent desk lamps.

In the cubicle area, recessed fluorescent troffers were replaced with pendant-mounted indirect/direct fluorescent luminaires controlled by ceiling mounted, zonal occupancy sensors. Luminaires along the west and north perimeter included fixture-integrated photosensors. Existing T12 fluorescent undercabinet task lighting, and incandescent desk lamps were replaced with customized, LED task lighting (Personal Lighting Systems by Finelite). Each PLS utilized a combination of 6 W or 9 W undercabinet task lights or desk lamps.

The Berkeley Lamp II was provided at the front reception desk to provide additional localized ambient and task lighting. The private offices and conference room received a similar retrofit but with dual-technology, occupancy-sensing wall switches installed instead of ceiling-mounted sensors.

CLTC installed monitoring equipment to quantify real energy savings produced by the demonstration. CLTC monitored office occupancy and the on/off state of the ambient lighting system. As expected, the addition of multiple lighting zones, controlled by individual occupancy sensors, reduced the overall operating time of the ambient lighting system. The observed lighting usage was 35% for ambient lighting and 36% for task lighting. This usage translated to an annual energy savings of 50% or 5,900 kWh for ambient lighting, and 85% or 10,500 kWh for task lighting.

Product Availability

The Personal Lighting System is available from Finelite. The Sona pendant-mounted indirect/direct fluorescent luminaire is manufactured by Philips Ledalite and is offered with fixture-integrated occupancy and daylighting sensors. The Berkeley Lamp II is available from Full Spectrum Solutions. Occupancy sensors were provided by WattStopper.

TABLE 1: ENERGY AND MAINTENANCE COST AND SAVINGS

TECHNOLOGY	SYSTEM SIZE (WATTS)	ANNUAL ENERGY CONSUMPTION (kWh)	ANNUAL ENERGY COST	ANNUAL MAINTENANCE COST	TOTAL ANNUAL COST	LIFECYCLE ENERGY COST	LIFECYCLE MAINTENANCE COST	TOTAL LIFECYCLE COST
FLUORESCENT UNDERCABINET	4,196	13,343	\$1,708	\$25	\$1,733	\$26,854	\$1,805	\$28,659
LED TASK LIGHT	588	1,870	\$239	\$0	\$239	\$3,763	\$0	\$3,763
SAVINGS		11,473	\$1,469	\$25	\$1,494	\$23,091	\$1,805	\$24,896
FLUORESCENT TROFFER	3,864	11,847	\$1,516	\$53	\$1,569	\$24,927	\$1,045	\$25,972
FLUORESCENT PENDANT	2,702	5,093	\$652	\$0	\$652	\$10,717	\$0	\$10,717
SAVINGS		6,754	\$864	\$53	\$917	\$14,210	\$1,045	\$15,255

Annual hrs of incumbent use: 3,066 Annual hrs of retrofit use: 2,190 Cost of labor: \$50/hour Time to replace lamp: 0.25 hrs Energy cost: \$0.128/kWh

What's Next

The CLTC continues to develop demonstrations of energy-efficient office lighting technologies through the State Partnership for Energy Efficient Demonstrations (SPEED) program. This program is aimed at achieving widespread implementation of these and other energy-efficient lighting and controls technologies.

Collaborators

This demonstration was the result of collaboration among CLTC, UC Davis and California Army National Guard, as well as manufacturing partners Finelite, Philips Ledalite, Full Spectrum Solutions, and WattStopper. It was sponsored by the CEC-PIER SPEED program, which is coordinated by the California Institute for Energy & Environment (CIEE).

For More Information

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About PIER

This project was conducted by the California Energy Commission's Public Interest Energy Research (PIER) Program. PIER supports public interest energy research and development that helps improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

Jerry Brown, Governor
California Energy Commission

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