



## Bi-Level Stairwell Lighting System

*“We are seeing significant energy savings, particularly during off-peak periods or when building occupancy is low.”*

Jack Powazek—Facilities Management, UCLA

PIER Buildings Program

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### Energy Savings Opportunity

**Better light, safety, energy savings, up-keep, payback**

Stairwell lighting typically operates continuously at full output despite very low, intermittent use. Simple occupancy sensors are not used due to building code requirements that prohibit zero light levels even when unoccupied.

A bi-level product line demonstrated by the New York State Energy Research and Development Agency (NYSERDA) and the PIER Program uses an ultrasonic occupancy sensor to detect motion in areas like stairwells and corridors. During unoccupied periods, the lamps are dimmed to as low as 5% of normal. An adjustable time-delay can be used to maximize energy savings based on usage patterns. Currently, the Uniform Building Code requires minimal lighting of one foot-candle (fc) for emergency egress in all stairwells. The National Fire Protection Association (NFPA) has already adopted a new minimum illuminance level of 10 fc during all occupied times. Though this code change will take till perhaps 2007 or 2008 to be universally adopted, this bi-level fixture is code compliant far in advance while still saving a great deal of energy.



### Product Overview

#### Energy Savings

Up to 70% annual energy savings depending on occupancy  
Over typical fixture life of 20 years, one fixture can save more than 10,000 kWh

#### Operation/Maintenance

Cost effective replacement for moderate to low occupancy areas. Increased lamp life due to “lamp conditioning circuit” and programmed start dimming ballast

#### Manufacturer:

LaMar Lighting Inc.

#### Market:

Stairwells, hallways, storerooms, restrooms

#### Availability:

Currently available from LaMar Lighting Inc.  
[www.lamarlighting.com/occusmart](http://www.lamarlighting.com/occusmart)

Public Interest Energy Research

University of California

California State University



## Field Demonstrations UC and CSU Campuses

The bi-level fixtures were installed at the University of California Office of the President (UCOP), UC Los Angeles, UC Santa Barbara, UC Irvine, UC Riverside, Sonoma State University, CSU Northridge, and San Diego State University. Average fixture savings was approximately \$50 per year.

### Lessons Learned

- Stairwells with occupancy rates of 15% or less are the most cost effective applications. However, averaging the occupancy rates of multiple stairwells in multiple buildings is a recommended practice.
- If an application is over-lit, the total number of lamps/ fixtures may be reduced due to the high system efficacy.
- Building codes may require stairwell fixtures to have emergency battery backups, an option in these fixtures.
- No problems occurred unless the fixtures were improperly grounded or the installer did not utilize the “lamp conditioning mechanism” as instructed.

### CPUC Partnership

The University of California/California State University (UC/CSU) and Investor-Owned Utility (IOU) Partnership Program has identified incentives for this technology that range from \$90 to \$120 per fixture. For more information please visit: [www.uccsuioeee.org](http://www.uccsuioeee.org).



Top: CSU Northridge pre-retrofit (four T8 lamps)  
Bottom: Post-retrofit maintains equivalent light levels (two T8 lamps)

## Installation Costs

### Retrofit:

The installation/disposal labor cost for complete fixture replacement depends on the contractors' assignment of personnel. One electrician is capable of installing this fixture. It may be appropriate for one electrician and one assistant to perform the installation. Locations with T12, HID, or incandescent fixtures are best for retrofit. Fixture cost was \$150 without battery backup which was an additional \$65.

### New Construction:

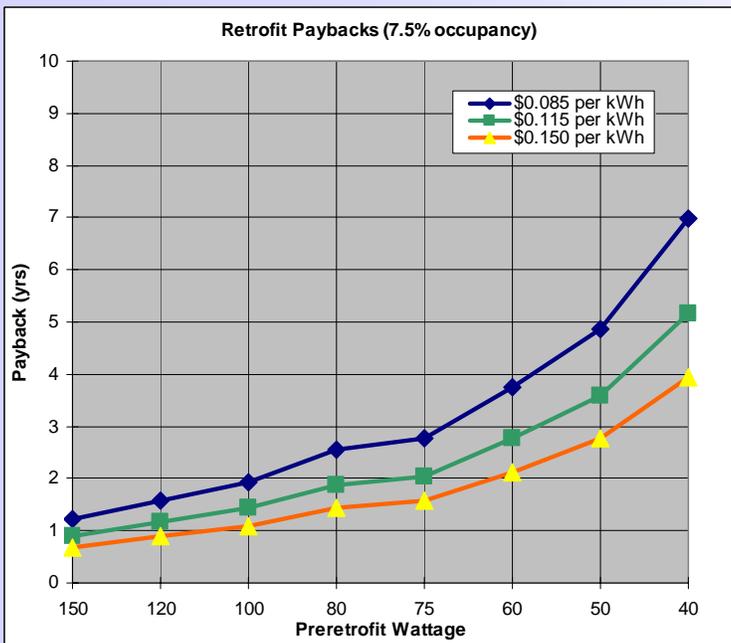
Payback in new construction is much shorter than in retrofit applications since labor costs are equivalent to those for other standard fixtures. Complete renovation projects yield equally brief payback periods.

## Payback (for UC/CSU campuses with CPUC Incentives)

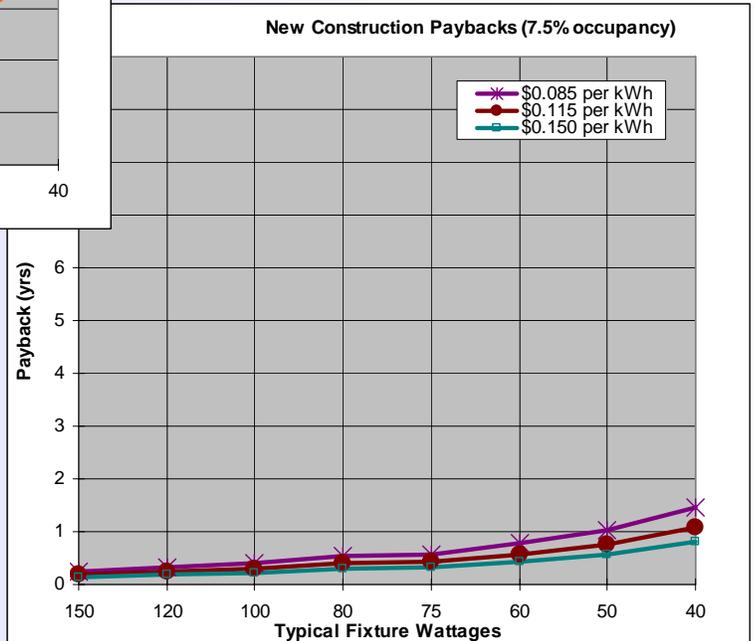
Base Case	% Occupancy	Fixture kWh saved annually	Material (Avg.)	Labor (Avg.)	Payback (\$0.115 per kWh)	Annual Savings per fixture (\$0.115 per kWh)
2 34W or 40W T12	5% to 10%	500 to 600	\$40	\$75	0-2 years	\$30 to \$75
2 32W T8		350 to 400	\$60		1-3 years	\$25 to \$55
New Construction/ Renovation		350 to 400	\$0	\$0 (Incl.)	0 years	\$40 to \$75

# Study Results

Campus	Pre-retrofit Fixtures	Bldg. Type	Qty	% Unoccupied	\$ Savings/yr
UCOP	2 32W T8	Office	32	95%	~ \$1,500
UCLA	2 42W T8	Cogen Bldg.	50	88%	~ \$2,000
UCLA	2 42W T8	Bunche Hall	50	91%	~ \$2,300
UC Riverside	150W Incand.	Dormitory	38	99%	~\$2,800
UCSB	2 32W T8	Classroom	15	93%	~\$420
UCI	2 42W T8	Office/Classroom	37	70%	~\$900
Sonoma State University	2 32W T8	Office/Classroom	27	77%	~\$1,200
San Diego State University	2 32W T8	Classroom	29	84%	~\$1,150
CSU Northridge	4 32W T8	Admin.	16	93%	~\$1,700



PSFA Building, San Diego State Univ.



Inverness Dorm, UCR



LaMar Bi-Level fixture at Cheadle Hall, UCSB

## Considerations

### Ease of Installation:

Typical installation time is less than an hour, usually a one-to-one swap. Often able to use existing wall/ceiling mount hardware.

### Attractiveness:

All campus users noted much improved light quality and brightness when occupied.

### Issues/Concerns:

The manufacturer has noted that the only problems with these fixtures have been related to installation, improper wiring, or forgetting to trigger the "lamp conditioning circuit" which is critical for ensuring longer lamp life.

## Conclusion

### Cost Effectiveness:

Cost effective for retrofit, remodeling, and especially new construction applications. Programmed start ballast and special "lamp conditioning circuit" increase lamp life and reduce maintenance. Best retrofit paybacks are for replacing incandescent fixtures or T12 fluorescent fixtures.

### Potential Impact:

Drastically reduced average fixture wattage. Huge energy savings for new construction and retrofit applications. Reduces peak demand. Attractive option for tall buildings and low traffic stairwells.

### Applicability:

Primarily stairwell and hallway applications. May be used in parking structures and bathrooms.

### Considerations:

Improved lighting quality, easy to install, easy to clean.

## Availability

The LaMar Occusmart VO Series bi-level stairwell fixture is currently available from LaMar Lighting. There are multiple fixture types in the Occusmart series.

## 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.



For more information see [www.energy.ca.gov/pier](http://www.energy.ca.gov/pier)

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