



DAYLIGHTING *initiative*

Design tools and information from PG&E

Industrial Application

Restaurant Application

[Office Application](#)

School Application

Museum Application

Retail Application



VeriFone, Inc.

Shedding a D

Unconventional skylights solved th

PG&E'S DAYLIGHTING INITIATIVE

PG&E's Daylighting Initiative has two goals: to raise awareness of good daylighting practice within the design community and to improve the practice of daylighting design. This case study is one of a dozen case studies undertaken within the initiative. Together, they document a wide range of successful technical solutions demonstrated across a number of different commercial applications.

The Daylighting Initiative includes projects that will make better design tools available to the daylighting design community. The Desktop Radiance project, a collaborative effort of Lawrence Berkeley National Laboratory and PG&E, is bringing the powerful Radiance lighting simulation capabilities into the practical world of architectural CAD software. The Daylighting Initiative also includes a series of workshops and seminars at the Pacific Energy Center in San Francisco. For more information, visit the project's web site at www.pge.com/pec/daylight.

Tubular skylight
with clear plastic dome.



DAYLIGHTING AT VERIFONE AUBURN, CALIFORNIA

Management at VeriFone, Inc., believed they could benefit from integrating daylighting features into their existing single-story office building in Auburn, California, so they worked with a PG&E ACT² project team to find a workable solution. The 7,500 sq.ft. building's high ceiling—suspended 10 feet below the roof—presented a challenge. It precluded the use of conventional skylights, forcing the designers to search for an alternative method for delivering daylight into the open office areas.

A new tubular type of skylight coupled with custom light wells solved the problem inexpensively for this typical low-rise office building. More daylight in the space allowed the designer to replace T-12 fluorescent fixtures with T-8 fixtures and dimmable electronic ballasts to dramatically reduce the lighting power density.

DAYLIGHTING FEATURES VERIFONE, INC.

1 TUBULAR SKYLIGHTS

Forty-seven tubular skylights spaced 8 to 10 feet apart were installed to bring daylight into the office work areas. The skylights each have a 13-inch diameter pipe capped with a clear plastic dome and reflective inner walls that direct light to a circular diffuser 10 feet below, slightly above ceiling level. Fifty percent of the outside light is transmitted through the skylight. The solar heat gain is minimal.

1 TUBULAR SKYLIGHT

2 CUSTOM SKYLIGHT WELL

3 PHOTOSENSOR

2 CUSTOM SKYLIGHT WELL

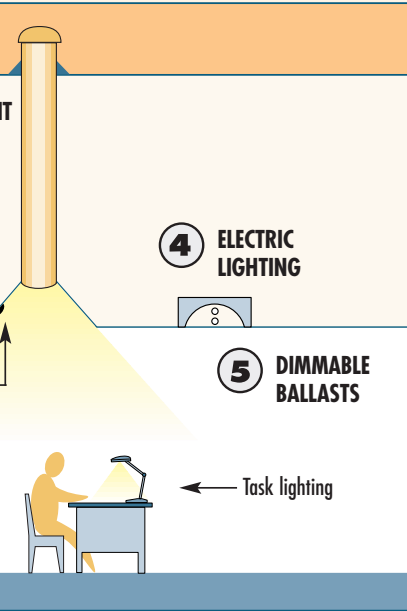
The tubular skylight diffuser is positioned 2 feet above the ceiling plane inside a 2 ft. x 4 ft. sloped-wall well installed in the suspended ceiling system. This custom skylight well is insulated and has a flat-white interior. The well is designed to hide the skylight diffusers from sight and reduce potential glare on computer monitor screens.

3 PHOTOSENSOR AND LIGHTING CONTROL SYSTEM

A dedicated lighting controller works in combination with a photosensor and electronic ballasts that dim electric lights in response to available daylight. The system was calibrated to achieve the desired illuminance. It uses an open-loop

Different Light

is company's daylighting challenges.



Tubular skylights and more efficient electric lighting provide dramatic energy savings and an improved workspace.

daylighting control strategy. The photosensor records the amount of daylight entering the space from vertical windows or skylights and sends a signal to the lighting control that adjusts the electric lights. Through experimentation, it was determined the system could best control light levels in the interior space by moving the photosensor into the bottom of the well, aligned facing the diffuser dome.

4 ELECTRIC LIGHTING

Daylighting in the open office area allowed designers to reduce dependence on fluorescent lighting. The original 4-lamp T-12 fluorescent fixtures with magnetic ballasts were replaced with 2-lamp T-8 fluorescent

fixtures with dimmable electronic ballasts. The fixture design has two lamps stacked one on top of the other to reduce glare on visual display terminals—a desirable effect requested by VeriFone employees, since each worker has at least one computer at his/her workstation.

5 DIMMABLE BALLASTS

The specified continuous dimming ballasts may be dimmed to 10% of light output, which reduces power consumption to 28% of full-load power. In addition to gaining energy savings from daylighting, the dimming ballasts may be used to tune light levels and provide lumen maintenance control.

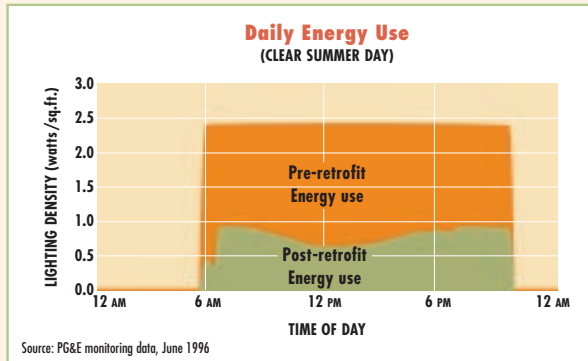
VERIFONE, AUBURN — AN ACT² DEMONSTRATION SITE

VeriFone's office in Auburn, California, is one of nine PG&E ACT² — Advanced Customer Technology Test For Maximum Energy Efficiency — demonstration sites that have tested energy efficiency and cost-effective packages of advanced technologies. The Auburn building includes energy-saving technologies and design features that reduced total energy consumption by 42%.

For further information, refer to the ACT² VeriFone Commercial Site Impact Evaluation Report at www.pge.com/pec/act2.

The building's ceiling, suspended 10 feet below the roof, presented a challenge that was met by delivering daylight through tubular skylights.





This chart shows the dramatic drop in daily energy consumption after the tubular skylight and light fixture retrofit. Annual energy savings are projected at 7.3 kWh/sq.ft.-yr.

RESULTS

Tubular skylights and more efficient electric lighting provided dramatic energy savings and an improved work space. Full lighting power in the open office areas has been reduced from 2.4 watts/sq.ft. to 0.9 watts/sq.ft., while maintaining the desired light levels. In addition, the lighting energy efficiency measures at the site reduced internal heat gain and lowered cooling requirements.

Illumination levels averaging 50 foot-candles during the day are typical. Based on extensive data monitoring and evaluation using an energy simulation model (DOE2), annual energy savings, attributed to the tubular skylights, dimmable ballasts, and lighting fixture upgrades, are projected at 7.3 kWh/sq.ft.-yr. The reduced cooling load is also included in this calculation.

VeriFone relocated to another office in 1997. The new occupants have retained the system.

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Employees have reacted favorably to their office space. Here are some comments from recent employee surveys:

"Having seen and experienced the system, I am considering installing a similar system in my home."

"I very much like having skylights."

RESOURCES

PG&E does not endorse particular products or services from any specific manufacturer or service provider. High efficiency products and services similar to those used in this project are available from multiple suppliers. For informational purposes, PG&E notes that the following companies provided equipment or services to the project:

Dimmable Ballasts/Lighting Control Photosensors:
Lutron Electronic Co., Coopersburg, Pennsylvania
www.lutron.com — 1-800-523-9466

Tubular Skylights:
The SunPipe Company, Northbrook, Illinois
1-800-844-4786

Energy Analysis and Design
Davis Energy Group, Davis, California
www.davisenergy.com — 530-753-1100

ADDITIONAL CONTACT INFORMATION

Pacific Energy Center, San Francisco, California
www.pge.com/pec/daylight — 415-973-7206

ACT² VeriFone Commercial Site
Impact Evaluation Report
www.pge.com/pec/act2