



# DAYLIGHTING *initiative*

Design tools and information from PG&E

Industrial Application

Restaurant Application

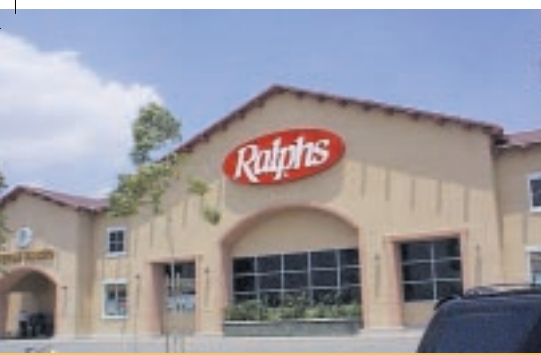
School Application

Retail Application



Museum Application

Office Application



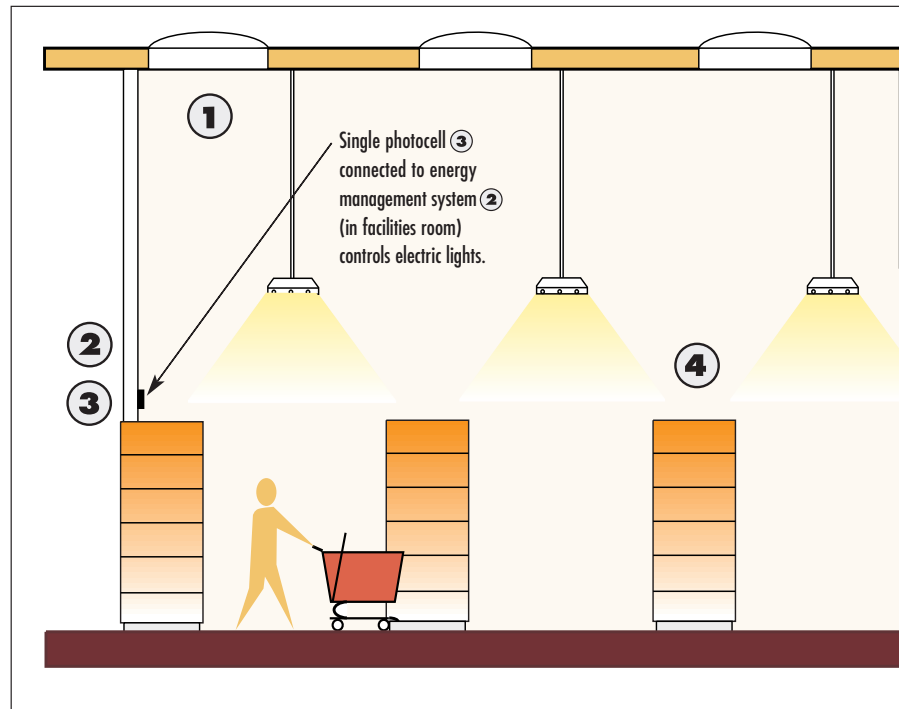
## PG&E'S DAYLIGHTING INITIATIVE

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](http://www.pge.com/pec/daylight).

# Serving Up Savings With

They're a building standard for Ralphs — one of the



### DAYLIGHTING AT RALPHS SUPERMARKET IN VALENCIA, CALIFORNIA

Ralphs Grocery Company, a leading food retailer in Southern California, uses energy-saving lighting practices in all of its new stores. In the Valencia store, for example, high efficiency skylights and a very simple lighting control strategy demonstrate that daylighting makes good sense. It's inexpensive, it saves energy, and it increases the supermarket's quality of light.

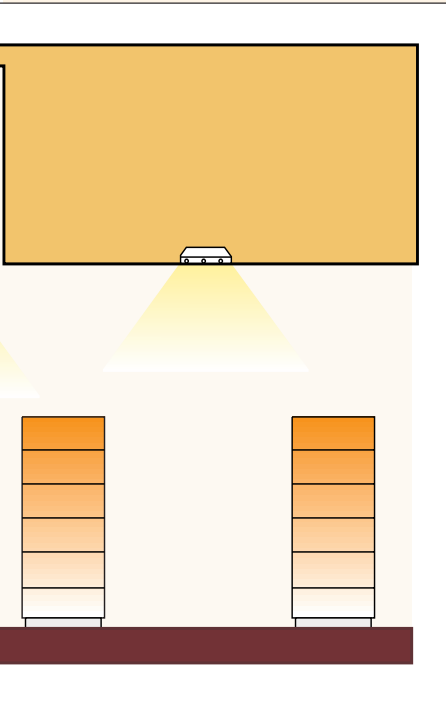
### DAYLIGHTING FEATURES

#### 1 SKYLIGHTS

The supermarket design includes a central daylit core with a 20-ft.-high ceiling that covers approximately 50% of the store's area. Surrounding the core area, the perimeter ceiling height is 14 ft. Forty-five rectangular 4' x 8' skylights provide daylight throughout the core. The skylights are constructed of a highly efficient acrylic-clad fiberglass—40% more efficient than standard medium white acrylic-only skylights. Visible light transmittance for each skylight is 72% with a 66% shading coefficient, providing a combination of high natural light transmission with low heat gain.

# th Daylighting Controls

the largest supermarket chains in Southern California.



## 2 ENERGY MANAGEMENT SYSTEM

At all Ralphs stores, an energy management system (EMS) is used to control the operation of HVAC (heating, ventilation and air conditioning), refrigeration, and scheduling of interior and exterior lights. The EMS installed at the Valencia store also manages the interior lights with a photosensor control. Calibration of the photosensor and programming of illuminance setpoints and schedules are all done at the EMS. This eliminates the need for a dedicated daylighting controller and saves on installation costs. The integrated EMS eases the facility manager's job by requiring him to learn only one computer system.

A *step dimming* control strategy is employed at Ralphs. Each electric light fixture contains three lamps. When the illumination level reaches approximately 120 foot-candles (fc), the middle lamp in each lighting fixture is turned off. At an illumination level of ~140 fc, the two outer lamps turn off while the middle lamp restarts. All three lamps are never off simultaneously. At least one lamp is on at all times for those accustomed to seeing a light fixture on during operating hours. A minimum interior light level of 100 fc is desired throughout the day.

## 3 PHOTOSENSOR

A single, low-cost photosensor attached to a column inside the store measures the interior illumination level in the core daylight area. The photosensor faces outward, monitoring the combined contribution of natural and electrical lighting to maintain a minimum illuminance of 100 fc.



## 4 ELECTRIC LIGHTING SYSTEM

Built in 1996, the Valencia store design specified 8-ft., three-lamp T-12 fluorescent fixtures in the daylight core of the store and 4-ft., three-lamp T-8 fluorescent fixtures throughout the perimeter area. Because a step dimming control strategy is employed, standard electronic ballasts are utilized in all fixtures to save on the typically higher cost of continuous dimming ballasts. New stores built today would include T-8 lamps throughout the store.

## RALPHS PUSHES EMS INDUSTRY TO INCORPORATE INTERIOR DAYLIGHTING CONTROLS

When Ralphs began looking at incorporating sky-lights and lighting controls into their supermarkets in the late 1980s, the controls industry wasn't very sophisticated. After some early frustration with less-than-adequate dedicated lighting controllers, Ralphs turned their attention to building energy management systems that provided the interior daylighting control needed to achieve consistent, reliable energy savings. Most energy management systems (EMS) at the time could only work with simple lighting strategies turning lights on at dusk and off again at dawn. Pushed by Ralphs' desire to control their interior lighting in response to daylight availability, several EMS companies added sophistication to their products. Today, interior daylighting control has become a standard option on most EMS products.



## RESULTS

The daylighting features incorporated into the 10,000 sq. ft. core area of this super-market greatly reduce the need for electrical lighting during daytime hours. During this period the core area of the store operates with high light levels and low power consumption that produces significant energy savings. Based on short-term monitoring conducted in the summer of 1998, annual energy savings are estimated at 30% of the core lighting energy during daylight hours, or 2.0 kWh/sq.ft.-yr. Interior illuminance levels range from 100–600 fc on a clear summer day.

In 1999 the Heschong Mahone Group completed a study on daylighting and retail sales that examined the sales performance of a chain retailer operating a set of nearly identical stores. This study found a significant increase in sales at daylighted vs. non-daylighted stores, indicating that daylighting economics involve more than just energy savings. The study is available at [www.pge.com/pec/daylight](http://www.pge.com/pec/daylight).

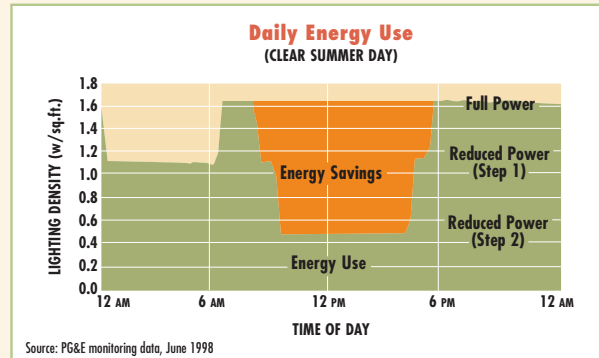
Through an evolutionary process spanning 10 years, the daylighting design at Ralphs has resulted today in a low-cost, extremely reliable system, one that helps reduce operating costs while providing a pleasant environment in which customers can shop.

This program is funded by California utility customers and administered by Pacific Gas and Electric Company, under the auspices of the California Public Utilities Commission.

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The step dimming daylighting control strategy employed at Ralphs is shown here for a clear summer day. Short-term monitoring data indicates a 30% annual energy savings or 2.0 kWh/sq.ft.-yr.

## 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:

### Skylights:

Bristolite Skylights, Santa Ana, California  
[www.bristolite.com](http://www.bristolite.com) — 714-540-8966

### EMS with Daylighting Controls:

Energy Controls International, Hunt Valley, Maryland  
[www.ecintl.com](http://www.ecintl.com) — 410-403-4000

Computer Process Controls, Kennesaw, Georgia  
[www.cpcus.com](http://www.cpcus.com) — 1-800-829-2724

## ADDITIONAL CONTACT INFORMATION

Pacific Energy Center, San Francisco, California  
[www.pge.com/pec/daylight](http://www.pge.com/pec/daylight) — 415-973-7206

Ralphs Grocery Company, Los Angeles, California  
Contact: Mike Toman, Energy Manager  
[www.ralphs.com](http://www.ralphs.com) — 310-884-2895