



DAYLIGHTING *initiative*

Design tools and information from PG&E

Industrial Application

Retail Application

Restaurant Application



School 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.

DAYLIGHTING AT McDONALD'S BAY POINT, CALIFORNIA

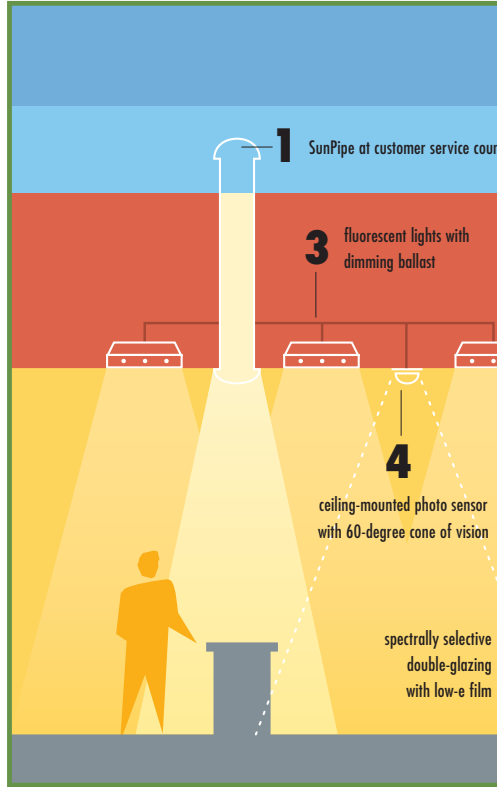
At its Bay Point restaurant just east of San Francisco, McDonald's incorporated simple, off-the-shelf daylighting technologies into the building's design. The technologies selected—tubular skylights, advanced glazing, daylighting sensors, and dimmable fluorescent ballasts—produced excellent results as well as some unexpected surprises.

The daylighting features of this restaurant, as with all the measures incorporated into The Energy Efficient McDonald's (TEEM), meet simple, but rigorous, project criteria. They must:

- Save energy.
- Enhance the space for customers and employees.
- Be easy to maintain.
- Be simple to operate without management attention.

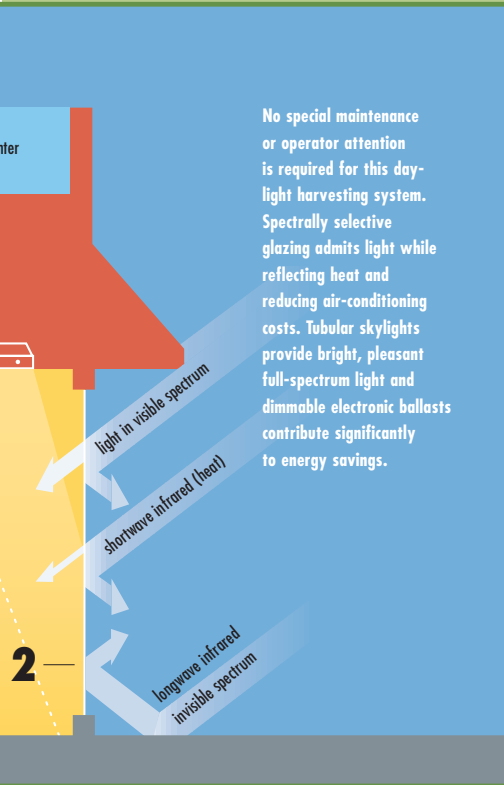
DAYLIGHTING FEATURES OF THE BAY POINT TEEM RESTAURANT

1 TUBULAR SKYLIGHTS With a diameter of just 13 inches, the tubular skylights were simple to incorporate into the design. They provide bright, pleasant, full-spectrum light at the counter area, throughout the Playplace, and in the restrooms. The "tubes" can be sized to any reasonable vertical length to accommodate various interstitial depths between the roof and the ceiling. The small cross-sectional area of this fixture minimizes disruption to the structural and mechanical infrastructure above the ceiling. This product incorporates a diffuser at the bottom of the tube, at ceiling level, giving an appearance much like an HID fixture.



2 HIGH PERFORMANCE GLAZING How does a designer admit visible light into a space while restricting heat gain? Glazing products now available on the market provide a realistic solution to this common design problem in daylighting design. The solution is spectrally selective glazing. It is designed to admit the visible portion of the sun's electromagnetic spectrum while severely restricting the infrared and ultraviolet radiation. The glazing at TEEM Bay Point reduces heat transfer by 2-1/2 to 3 times that expected of clear double-paned glass while reducing light by only about one-third.

Glazing technologies such as these provide synergistic opportunities. At Bay Point, the low heat transmittance permits the use of downsized air conditioning with evaporative technologies. This greatly reduces air-conditioning costs and reliance on CFCs used in conventional vapor compression equipment cycles.



“ . . . [the] packaging graphics and food appearance are enhanced by the vibrant, full-spectrum illumination. . . . ”

Tony Spata
Building Systems Manager
McDonald's

3 DIMMABLE ELECTRONIC BALLASTS WITH SIMPLE CONNECTIONS As bright and pleasant as daylighting features may be, there can, of course, be no significant energy savings without control of the electric lighting system. At TEEM Bay Point, the T-8 fluorescent fixtures in the dining area are driven by dimmable electronic ballasts that permit continuous dimming, down to 30 percent of light output and 50 percent energy input. Today, even further refinements in these ballasts have been made. They can dim light output down to 10 percent while saving up to 80 percent in energy.

The connection in this ballast is another hallmark innovation. The ballast receives its operating signal via control wiring that snaps in with a standard RJ-11 phone jack—it's that simple.

4 PHOTOSENSORS AND LIGHTING CONTROL SYSTEM A simple, closed-loop control system dims the fluorescent fixtures in response to available daylight. There are two perimeter and three interior zones in the space. For each zone, a ceiling-mounted photosensor reads the illumination level within a 60-degree cone of vision. Each sensor connects directly to a group of several fluorescent fixtures by control wiring with RJ-11 connections. The sensor dims its group of fixtures in response to the available daylight from the skylights and windows. A central energy management system (EMS) or other interface device is not required for this system.

THE TEEM PROJECT

- A McDonald's corporate effort at four different U.S. sites to test advanced, off-the-shelf energy efficiency designs and measures in real-world conditions.
- A collaborative project: McDonald's, the franchise owner/operator, the local utility company, the U.S. Department of Energy, and equipment manufacturers.
- Comprehensive focus: The project included not only daylighting and other lighting measures, but HVAC and refrigeration measures as well.
- At Bay Point, the combined energy savings for all measures is in the range of 15 to 20 percent. The successful TEEM measures will be incorporated into standard plans for new McDonald's restaurants.
- For more information on TEEM, refer to the resource section on the back cover.



RESULTS

The *Daily Energy Use* chart illustrates the effectiveness of the restaurant's daylight harvesting system—glazing, dimmable ballasts, and skylights. For the controlled area, the savings amounted to over 7000 kWh per year or 34 percent savings for all spaces combined. In commercial applications of a similar nature the cost of a similar dimming system can be recouped in one to two years.

Once installed, none of the daylighting measures at TEEM Bay Point required any special maintenance or operator attention.

There were other less-tangible benefits that may be even more important. Properly designed daylighting systems produce a bright, comfortable atmosphere well regarded by building occupants. Other details may emerge as well depending on the specific application. McDonald's, for example, was not really counting on the appealing effect achieved by locating the tubular skylights above the food service counter.

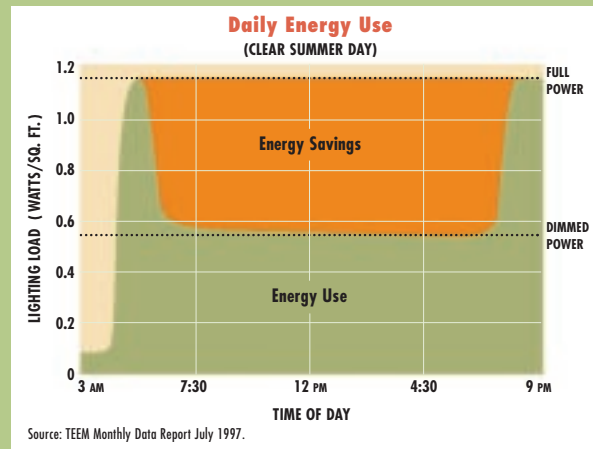
By all measures—esthetic, economic, and functional—daylighting improved the McDonald's Bay Point restaurant.

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.

Reproduction or distribution of the whole or any part of the contents of this document without written permission of PG&E is prohibited, except that limited reproduction, with attribution to PG&E, is permitted for educational purposes within an academic institution. Neither PG&E nor any of its employees makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any data, information, method, product or process disclosed in this document, or represents that its use will not infringe any privately owned rights, including, but not limited to, patents, trademarks, or copyrights.

© 1999 Pacific Gas and Electric Company

♻️ Printed on recycled paper.



Glazing, skylights, daylighting sensors, and dimmable ballasts all contribute to an effective daylight harvesting system that reduces energy use significantly. Over 7000 kWh per year was saved in the controlled area or 34 percent energy savings for all spaces combined.

RESOURCES

PG&E does not endorse any 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 & Daylighting Controls:
Electronic Lighting Inc., Newark, California
www.elinet.com — 1-800-395-5767

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

Spectrally Selective Glazing:
Southwall Technologies, Palo Alto, California
www.southwall.com — 1-800-365-8794

Contact: Nancy Rhea
nrhea@southwall.com

ADDITIONAL CONTACT INFORMATION

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

McDonald's Corporation
Contact: Tony Spata, Building Systems Manager
tony.spata@mcd.com