



The Newsletter

PROVIDING
FINANCE AND
TECHNOLOGY
STRATEGIES FOR
ENERGY-EFFICIENT
DESIGN IN NEW
CONSTRUCTION

Taking Stock

When Staples, Inc. began the design of a new distribution facility in Southern California, they made a conscious decision to make energy efficiency and sustainability a high priority. Realizing that the building design would impact not only ongoing operational costs, but also the comfort and productivity of their workers, they chose to investigate these issues thoroughly before the design was finalized. The focus of the resulting work centered on improving summer conditions without significantly impacting energy use and utility costs. The investigation included computer simulation analyses of various ventilation, air stratification, illumination, and building-shell measures.

Planned as a state-of-the-art, automated warehouse and distribution center, the facility would have 50-foot ceilings and product shelves approximately 40 feet tall with narrow aisles between. It would not have air-conditioning, and the owners were concerned about indoor temperatures for employees since the exterior climate is dry and warm, with summer peak temperatures typically exceeding 100 degrees. Using simulation models, indoor temperatures for the facility were predicted to rise as high as 97.5 degrees at the top levels of the multilevel work areas. The model also showed a four-degree temperature stratification between floor- and top-level work areas. More importantly, the workers at the highest level would also be exposed to the uncomfortable effects of radiant heat from the sun on the roof.

The study explored numerous options to mitigate the daytime warming of the interior of the facility. The most feasible solution proved to be the incorporation of a nighttime venting cycle using ceiling smoke exhaust fans. This strategy takes advantage of the cooler nighttime air by ventilating the interior to precool the concrete floor and the stored products, which then release their stored coolness slowly during the daytime. Two-speed motors on the exhaust fans, running at half speed, were determined to provide the best air distribution for night-venting at the least energy cost. To ensure a comfortable environment for the workforce each morning, the system was also designed to provide thermostat control of the fans so they begin to operate when the outside temperature is five degrees cooler than the interior space, but—to prevent overcooling—disengage when the facility falls below 68 degrees.

Other options evaluated for mitigating indoor temperatures included changing the roof material to a lighter color to lower heat gain through the roof, increasing the value of the roof insulation to delay the transfer of outside heat to the interior, and installing an evaporative cooling system to provide some cooling capability at the top work levels during the summer. Again, computer simulation models were used to analyze each measure for the energy

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With the sustainable design and energy features implemented, Staples will realize approximately \$130,000 in annual utility savings for their new facility.

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What Is Sustainable Design?

“Then I say the earth belongs to each . . . generation during its course, fully and in its own right, no generation can contract debts greater than may be paid during the course of its own existence.”

—Thomas Jefferson, September 6, 1789

The word *sustain* has roots in the Latin word *sustineo*, meaning “to hold up” or “to endure.” Sustainability, as it applies to building design, consists of a focused, integrated, systems approach to developing and achieving a healthy and efficient building by jointly addressing economic, environmental, and human issues. The advantages gained from incorporating sustainable concepts into a building include:

- Long-term financial savings derived from O&M efficiencies
- Enhanced comfort and productivity of building occupants
- Reduced absenteeism and illnesses
- A positive contribution to the environment

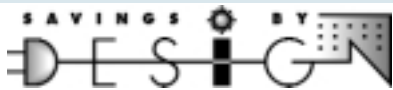


SOUTHERN CALIFORNIA
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Energy Design Resources is funded
by California utility customers and
administered by Southern California
Edison, under the auspices of the
California Public Utilities Commission.

savings by design

Last issue, we introduced you to **SAVINGS BY DESIGN**, a new statewide energy-efficiency program sponsored by California utilities that encourages high-performance design and construction for new buildings. As a building owner, you should seriously consider taking advantage of the program resources every time you are involved in a new construction or major renovation project. The program can affect the bottom line of your new facility in several positive ways.

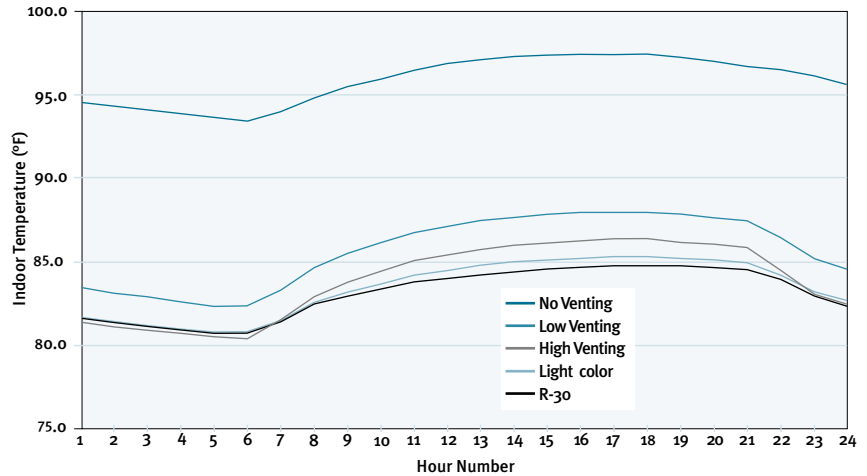
The most direct benefit will be long-term operating **SAVINGS OF AT LEAST 10 TO 30 PERCENT** annually when you implement energy-efficiency strategies in your building. Another benefit is the **INCREASED PROPERTY VALUE** you will realize when you produce and own a high-performance building. Finally, **SAVINGS BY DESIGN** offers **FINANCIAL INCENTIVES UP TO \$250,000 PER PROJECT** to help you offset costs associated with energy-efficiency components. The program can provide you with these resources up front, and you will reap the benefits every year for the life of the facility.



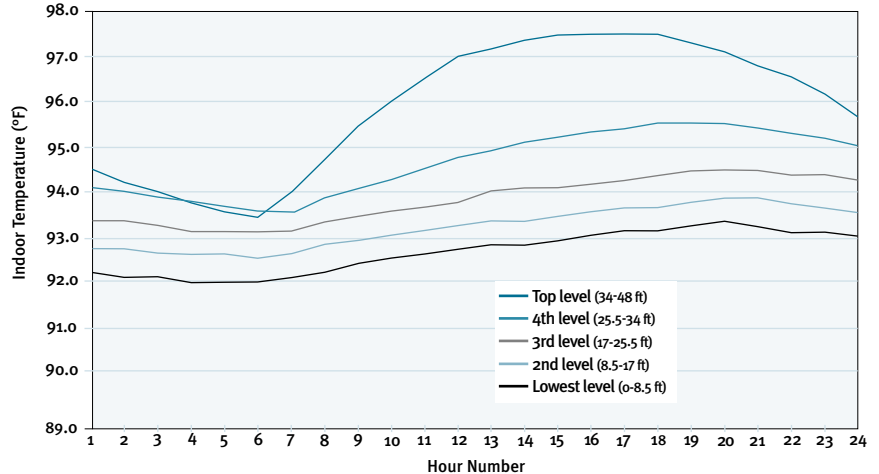
Knowledgeable utility representatives will guide you through the program. Basic steps in the process include linking your project with the most pertinent program approach, providing appropriate evaluation and analysis to support decision-making, formalizing a commitment to reserve funding, and delivering the onetime financial incentive once verification of the new building is complete.

Contact a Southern California Edison new construction representative at 800-338-8502 or check the website, www.savingsbydesign.com, for more information.

Venting and Envelope Strategies Compared—Summer Peak Day



Base Design—Summer Peak Day



COMPUTER SIMULATION MODELS FOR STAPLES: THE BOTTOM GRAPH DEPICTS INDOOR TEMPERATURES AT VARIOUS WORK LEVELS FOR THE BASE BUILDING DESIGN, AND THE TOP GRAPH SHOWS INDOOR TEMPERATURES AT THE TOPMOST WORK LEVEL WHEN DIFFERENT ENERGY STRATEGIES ARE COMPARED.

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and environmental impacts on the warehouse/distribution design.

Illumination schemes that married appropriate daylighting levels with high-efficiency lights were carefully considered. An optimized design included skylights with the area of roof coverage fine-tuned to meet required foot-candle levels for each work area. To provide adequate light levels for the lower shelves in the very narrow aisles between the storage racks, fluorescent fixtures are used with occupancy sensors to turn off three out of every four fixtures when there is no one in an aisle. A photosensor has also been included to provide two-stage control for the electric lighting when the skylights provide ample illumination.

With the sustainable design and energy-efficiency features implemented, Staples, Inc. will realize approximately \$130,000 in annual utility savings for their new facility. By incorporating the

climate and environmental conditions of the site into the building design, they have been able to improve indoor summertime conditions, save energy dollars, and model positive stewardship of resources.

SUSTAINABLE DESIGN TECHNIQUES

- Set environmental/energy use goals
- Use an integrated design approach
- Specify Earth-friendly materials
- Think about the impact of decisions
- Assure design intent is maintained
- Involve users in design decisions
- Never forget the goals

Four Walls and a Roof

A building is not just four walls and a roof. A building becomes an environment where people spend time engaged in the activities that constitute their lives. Whether the structure is a hospital, school, government facility, retail store, warehouse, or office building, it provides an encompassing indoor environment complete with the appropriate lighting and temperature for humans to effectively interact, work, or play. Most buildings easily have a life span of at least 30 to 40 years, and during that time, approximately 50 percent of the energy use of that building is devoted to producing the right environment for the building occupants.

Why is it so important for an owner to encourage a sustainable building design that will enhance the interior environment? Consider the following excerpt from the *Sustainable Building Technical Manual*: “Viewed over a 30-year period, initial building costs account for approximately just two percent of the total, while operations and maintenance costs equal six percent, and personnel costs equal 92 percent.” When evaluated over the total life span of a building, the costs associated with the design, construction, and operations of the building and its energy-consuming systems account for an incredibly small percentage of the total cost, yet the impact of those design decisions is significant on the operation, maintenance, and, most importantly, the occupants of the facility.

Recent studies of a variety of building types have suggested a connection between the indoor environment and the responses of the occupants. In hospital, school, and retail settings, studies are showing a positive correlation between human well-being and well-designed high-performance buildings, especially those with access to natural light and features that are considerate of human behavior. Case studies cited in the *Architect's Energy Guide* by Kelly Karmel suggest gains in

productivity can be more than 6 percent. If salaries and other personnel costs account for an estimated 92 percent of a building's total life-cycle cost, then productivity gains associated with the building design and energy features will presumably yield greater savings than just lower operating costs.

In addition, the building environment directly affects financial value. High-performance buildings incorporating sustainable design characteristics usually result in higher property values, higher lease rates, and increased net operating incomes. According to the Building Operating Management Association, many owners successfully charge higher rents and/or maintain higher building occupancy because of occupant comfort and efficiency factors.

For economic, human, and environmental reasons, it makes good building sense to design more than four walls and a roof.

Sources: *Sustainable Building Technical Manual*, produced by Public Technology, Inc., and the U.S. Green Buildings Council, sponsored by the U.S. Department of Energy, 1996; *Architect's Energy Guide*, written by Kelly Karmel, 1999

Did You Know?

You can receive a copy of the *Sustainable Building Technical Manual*. Produced jointly by the Department of Energy, Public Technology, Inc., the U.S. Green Building Council, and the U.S. Environmental Protection Agency, the manual is the most comprehensive guide available for designing, operating, and maintaining economically sound and environment-friendly buildings.

The manual is available for downloading from the Center of Excellence for Sustainable Development Internet website. Look under the Articles heading in the Green Buildings section.

For the web address and more information about the site, see page 4 of this newsletter.

Sustainable Design Strategies

Work with your architect and design team to define and create a new building that exhibits the long-term ideals and standards of your organization.

Strategies you should consider:

1. Assemble an interdisciplinary team who will work together to integrate all aspects of the project from the outset.
2. Recognize that a single significant decision can realize numerous gains. Look for elements such as incorporating daylight in a facility that impact the whole project.
3. The building site will yield both advantages and constraints. Thoroughly evaluate the site to maximize existing land features and climatic conditions.
4. People respond favorably to natural light, fresh air, and open space in a building. Encourage all three throughout the process.
5. Comfort and energy solutions should be prioritized. Focus on areas of the building with the highest occupancy and longest hours of operation for maximum results.
6. Optimization is key. Use analysis tools to help you find the right combination of strategies and technologies that yield desired results.
7. Consider using native landscape plants, natural site contours, and xeriscaping practices as alternatives to extensive landscaping, grading, and paving.
8. Thoughtful selection of appropriate building materials and products is not only good stewardship but can also pay long-term dividends through low maintenance and durability.
9. Achievements should be shared. Publicize your success to stimulate and encourage others.

Center of Excellence for Sustainable Development

The Department of Energy (DOE) sponsors the Center of Excellence for Sustainable Development. At their website, you will find a wide variety of information regarding sustainable development. The site includes design tools for green buildings, success stories, database resources, codes and ordinances, and useful articles.

www.sustainable.doe.gov

Green Design Network

The Green Design Network is another resource for those interested in designing and building a sustainable future. Featuring the Green Building Resource Center, the network is a tool for finding products, reviewing case studies, locating experts, and researching publications. The site also features a Southern California regional resource directory.

www.greendesign.net

A Green Building Rating System— Simple and Effective

The United States Green Buildings Council (USGBC) has recently introduced a standardized, voluntary green building rating system for new and existing commercial and institutional buildings. Called Leadership in Energy and Environmental Design (LEED), the program evaluates environmental performance from a “whole building” perspective over a building’s life cycle, providing a definitive standard for what constitutes a “green building.” LEED is based on designers using existing proven technologies and is intended to be simple to use yet comprehensive. Based on a self-assessing rating system, the program covers site planning, energy-efficiency improvements, material and resource conservation, indoor quality enhancements, safeguarding of water resources, and design/build process improvements.

The program is a must for building owners looking to raise the standard in designing new facilities integrated with the principles of sustainability. For more information about the LEED program, visit the USGBC website at www.usgbc.org.

**We want to hear
from you!**

Please feel free to contact us at
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Printed on Recycled Paper



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