

ENERGY & POWER

MANAGEMENT

Formerly *Energy User News*

Serving the commercial, industrial and institutional markets

ENERGY-SAVING OPPORTUNITIES

Lead to LEED CERTIFICATION

Cutting-edge lighting design and controls contribute toward LEED certification

BY TOM MEYERS

L EED—Leadership in Energy and Environmental Design—is a rating system built upon scientifically-based performance criteria. Sanctioned by the United States Green Building Council (USGBC), the LEED Rating System provides a national standard for what constitutes a green building.

A building can become LEED-certified by meeting seven prerequisite design requirements and earning at least 26 of 69 available credits in five performance categories: Energy and Atmosphere, Indoor Environmental Quality, Materials and Resources, Sustainable Sites, and Water Efficiency. Innovative or exceptional project performances can

earn credits in a sixth category Innovation and



Figure 1. Intelligent switching systems are being mandated by many building state codes to optimize energy use. These systems are a great starting point for reducing energy consumption. Softswitch 128' switching system from Lutron shown.

Design Process, which awards efforts that exceed the expectations of the LEED Rating System or innovate the LEED initiative.

Two performance categories —Energy and Atmosphere and Indoor Environmental Quality—represent nearly half of all available LEED certification credits. More important, a focus on these categories can lead to significant energy savings, higher employee productivity, and reduced churn and maintenance costs, providing an attractive return on investment (ROI) to business owners. Lighting control strategies can contribute a significant number of LEED credits in these two categories, simultaneously

saving energy and improving the indoor environmental quality of a space.

As a LEED prerequisite requirement, buildings must be designed to comply with the ASHRAE/IESNA 90.1-1999 Standard or the applicable local energy codes, whichever is more stringent.

The lighting design and control standards aim to ensure a desired level of lighting energy efficiency by defining requirements in two areas. First, they define maximum allowable connected lighting loads for given applications by setting limits on the design watts per square foot of the lighting design. The lighting design team must evaluate various lamp types, luminaire designs, and layouts in correlation with the reflectance of the walls, floor, and ceiling to provide a design that does not exceed the maximum allowed watts per square-foot limits. Second, the standards mandate the use of time clocks and occupancy sensors.

Meeting these standards satisfies only one of the prerequisite requirements of the LEED Rating System. Intelligent switching systems and occupancy control are critical components to any building design but are just the starting point towards LEED certification. To earn required credits toward LEED certification, a proposed design must significantly

Lead to LEED

CERTIFICATION



Figure 2. Fluorescent dimming ballasts can easily integrate with photosensors, occupancy sensors and infrared remotes to provide energy efficient and cost-effective lighting control strategies. The new EcoSystem solution from Lutron is pictured here.

exceed the energy performance requirements mandated by ASHRAE 90.1. Switching systems alone may be limited in how much they can further improve energy performance without compromising the quality of the lighted environment.

The solution in lighting control is not “lights on” or lights off” but everything in between. In striving for LEED certification, dimming controls offer the greatest potential to optimize the energy performance of the lighting system and earn LEED credits.

Dimming technologies provide infinite adjustment options and lighting levels throughout the day. Building owners can save energy, while creating the optimal environment for their facilities. Appropriate lighting levels can be based on available daylight, each individual’s personal preference, or the task at hand. Energy savings results are immediate and virtually linear to dimmed light output. Dimming control strategies enhance the indoor environmental quality, while optimizing energy performance, supporting the LEED initiative down to the definition.

Dimming and other lighting control strategies create an ongoing annuity for the building owner

Dimming Controls

A project can earn LEED credits by introducing daylight and views into the design of occupied areas of the building. This motivates architects to increase the effective use of windows and skylights in their designs. As a result, attaining optimum light levels in these environments poses an interesting challenge and an opportunity. Most of the time lights are on in a commercial building during the day, when daylight is coming into the space. Keeping the lights “on” provides too much light and wastes

energy, while turning lights “off” at various levels is often unacceptable. The best solution is to dim the electric light to supplement the available daylight.

Building owners and managers need effective ways to manage both the electric light and daylight in their buildings. Sunlight can be easily, effectively, and aesthetically controlled with automated window treatments and solar fabrics. These products reduce glare, enhancing employee comfort, and productivity while contributing towards reducing the demands on the building’s HVAC system.

To manage the electric light, automatic dimming controls supplement available daylight. The use of photosensors and fluorescent dimming ballasts can reduce electric light use by 30-50% in the perimeter and atrium zones of a building.

Using dimming with daylighting applications has the added advantage of being transparent to building occupants. Rather than the abrupt “on and off” of a switching system, a dimming system saves energy comfortably and does not interfere with a person’s ability to work in his/her environment. This strategy is becoming increasingly attractive because the cost of dimming ballasts has fallen by roughly 50% over the past few years. The bottom line is that daylighting strategies that incorporate dimming controls offer an elegant and acceptable performance and are a big contributor in obtaining LEED credits for optimizing energy performance.

More on Controls

Energy managers and designers can tune maximum light levels and can cut energy use by 5-10% with virtually no additional cost. During system commissioning, light levels can be adjusted to the exact design level intended in each area. Above and beyond factors for lamp lumen depreciation, energy savings potential is still 5-10%, sometimes more. Lighting designs for commercial spaces use uniform luminaire types and symmetric ceiling plans. As a result it is not unusual to measure light levels of 37 to 38 footcandles (fc) in areas where the intended target was 35 fc. Dimming ballasts that are used for other control strategies like daylighting control, peak-demand management, or personal lighting controls, can also be used to “tune” the high-end light levels to the design target and capture energy savings.

Building owners can add personal lighting control to systems that incorporate fluorescent dimming. Personal lighting controls reduce energy consumption while enhancing an

Lead to LEED

CERTIFICATION

employee's comfort and performance, whether they work in an office or a cubicle. Employees typically reduce their light level 25-50%—especially those who spend a lot of time on the computer. Though typical office lighting is fine for paperwork, it's usually two or three times brighter than it should be to work comfortably at a computer. For maximum effectiveness, a good personal lighting control system should be easy, fast, and intuitive for users by using wireless or PC-based controls.

Automated window treatments combined with electric light control sit on the cutting edge in lighting design and controls. Its use offers a powerful opportunity to optimize comfort, aesthetics, and energy performance and could be considered in the Innovation and Design Process category. (See sidebar.)

LEED "Innovation" Points Add Up

A project design can be awarded up to four LEED credits in the Innovation and Design Process category. These points are awarded for exceptional performance above the requirements and recommendations set by LEED or not specifically addressed by the LEED Rating System for certification. They're intended to reward creative teams for "raising the bar" on what makes for a green building.

The integration of automated window treatments with the control of electric light is not only one of the most exciting innovations in lighting design and control but also a breakthrough that can ensure an employee's comfort by reducing glare and hot spots. These innovative systems also lessen the load on a HVAC system and reduce lighting operat-

Integrated lighting controls may contribute towards meeting the requirements of up to 22 credits in five of six LEED categories.

LEED Results

Dimming and other lighting control strategies create an ongoing annuity for the building

ing and maintenance costs.

Most people assume window treatments have only manual controls. But new systems can enable shading to operate automatically, holding programmed positions that most effectively block harmful and distracting sun rays throughout the day. Highly flexible, these programmed positions can be based on season of the year, time of day and solar conditions.

These silent window treatments can use shading material that reflects solar energy and block radiated heat gain. Different degrees of reflectivity provide different levels of performance, but it is possible to reject over 90% of the potential radiated heat gain in a space.

This approach surpasses the LEED goal to improve the indoor environmental quality. It permits building managers to enhance occupant comfort, while optimizing the energy performance of both the lighting and HVAC systems.

Another innovative lighting control strategy is to use smart, integrated lighting controls to reduce a building's peak demand of electric power. Impacting peak demand could exceed the original intent of the Energy and Atmosphere category, because it goes beyond using renewable energy or green power. Reducing peak demand means that less power, of any kind, is being used. *e&pm*

An innovative solution: integrate automated window treatment systems with lighting control systems to maximize employee comfort and energy savings. Sivoia QED roller shade from Lutron shown.

owner. By saving electricity, reducing HVAC loads, increasing lamp life and reducing maintenance costs, building owners recognize a sizable return on investment.

Studies have shown that increased levels of personal lighting control can translate to a 4-7% increase in worker productivity, which can quickly recover the cost of higher performance lighting controls in months, not years.

Compliance with LEED standards can produce dramatic energy savings for new and existing buildings. But the savings go far beyond the bottom line. LEED certification demonstrates a company's commitment to the environment and to the health and wellbeing of its employees.

LEED standards are currently available or under development for new commercial construction and major renovation projects, existing building operations, commercial interiors projects, core and shell projects, and homes. LEED was established and is sanctioned by the USGBC—a nationwide coalition of leaders from across the building industry representing over 4,000 leading organizations.

USGBC members include representatives from building product manufacturers, building owners, managers, users and brokers, financial and insurance firms, design, architectural, engineering and professional firms, contractors and builders, utilities, and others.

Its members created and continue to refine LEED standards to accomplish six specific goals:

- Define green building by establishing a common standard of measurement
- Promote integrated, whole-building design practices
- Recognize environmental leadership in the building industry
- Stimulate green competition
- Raise consumer awareness of green building benefits
- Transform the building market

Different levels of LEED certification—including silver, gold and platinum—can be achieved by meeting specific prerequisites and earning at least 26 out of 69 possible credits in the six performance categories. A copy of the LEED Rating System is available at usgbc.org.

LEED Credits

LEED standards emphasize a multi-disciplinary approach. Integrated lighting controls may contribute towards meeting the requirements of up to 22 credits in five of six LEED categories.

In the Energy and Atmosphere category, up to 10 credits can be awarded for achieving increasing levels of energy performance above

Lead to LEED

CERTIFICATION



LEED certification represents a building owner's intent to protect the environment, while improving the quality of the conditions inside.

the prerequisite standard. Using lighting control strategies, such as daylighting, tuning, personal control, and the integrated control of daylight and electric light, a project can optimize energy performance by reducing the amount of electric light used and reducing the demand upon the building's HVAC system.

A credit for "measurement and verification" can also be earned if a building is designed with equipment to monitor and verify lighting system energy-performance. Some innovative lighting control systems can be integrated with building management systems to provide this measurement and verification.

Lighting controls can provide up to four of the 15 available credits in this category by enhancing the controllability of the lighting system and accommodating a design emphasis on the incorporation of daylight.

Up to two credits can be earned for providing "daylight and views" in regularly occupied areas of the building. Connecting these interior spaces with the elements outdoors presents challenges that are easily addressed with an appropriate lighting control strategy. Two popular solutions are automated window treatment systems and incorporating dimming controls as a part of a daylighting system.

Two additional points can be earned for the enhanced "controllability of systems" in the perimeter and non-perimeter areas of a building. Control options include personal and local controls of electric light and natural light—including task lighting and occupant-based sensing.

Thirteen credits in the sustainable sites category relate mostly to such criteria as site selection, alternative transportation, and reduced site disturbance. Buildings can also earn one point

for reducing light pollution, which helps improve night sky access and reduce impact on nocturnal environments around the building. Window treatments, dimming and switching systems, and the "tune-to-task" management of high-end light levels are strategies that can contribute to meeting or exceeding the requirements of the LEED Rating System for this credit.

LEED guidelines also award credits for using materials that are manufactured within a building's region, thereby boosting the local economy and reducing the environmental impact of transporting materials. Since many suppliers of lighting solutions have operations worldwide, careful purchasing of materials can help contribute towards meeting the requirements for these LEED credits.

Other credits in this category are awarded for the reuse of a building, construction waste management, the reuse of resources, the use of recycled content, and more.

A fifth LEED category offers credits for a building's water efficiency, including water-efficient landscaping, innovative wastewater techniques, and water use reduction.

LEED with the Lights On

LEED certification represents a building owner's intent to protect the environment, while improving the quality of the conditions inside. Employing lighting control strategies not only contribute towards meeting LEED credit requirements, but also provide a tangible return on investment in energy savings, reduced maintenance costs, and higher employee productivity. Managing the visual environment through daylighting and dimming, tuning, personal control and automated window treatments allows building owners to realize the potential for energy savings and employee satisfaction. *e&pm*

About the Author: Tom Myers, a LEED accredited professional, is the Senior Sales Manager for Corporate Accounts at Lutron Electronics Co., Inc. Tom has spent 23 years in product and market management in both the HVAC and lighting industries. He is a 1979 graduate of the Architecture Engineering program at Pennsylvania State University, and is a member of the Illuminating Engineering Society.

Figure 3. Enhance employee comfort and reduce energy consumption by providing employees with personal lighting control. Touch the orange button to easily recall a personal, favorite light level.