

Technology Specification Project: LED Site (Parking Lot) Lighting

The U.S. Department of Energy (DOE), its national laboratories, and Commercial Building Energy Alliance (CBEA) members are working to support the market introduction of light-emitting diode (LED) parking lot lighting. A CBEA Project Team is focused on making reliable, energy-efficient, and competitively priced outdoor LED luminaires more widely available in the marketplace.

LED technology has advanced into new categories of “white light” applications, including parking lot lighting, where early indications suggest a high-quality light and long life. At present, however, tested products are available from a limited number of suppliers, performance in the later years of the product’s life-time can only be estimated, and LED luminaires are relatively expensive on a first-cost basis. Nonetheless, there are many benefits for LED lighting in parking lots. Refer to Table 1 on page 2.

DOE’s CBEAs are focusing on reducing commercial building energy costs and consumption by working with a host of industry suppliers, including appliance, heating, cooling, and lighting manufacturers, to meet members’ energy-efficiency needs. One area in particular that offers immediate returns is lighting, because the performance of high-efficiency lighting systems using solid-state lighting (SSL) technology is rapidly improving and gaining market acceptance. A CBEA Project



A Walmart in Leavenworth, Kansas, has the first retail parking lot designed from inception to meet the CBEA LED parking lot site lighting specification. The superstore is serving as a test site to determine the viability of expanding LED parking lot lights throughout Walmart stores nationwide.

Team has investigated the use of LED parking lot lighting for commercial buildings with the goal of accelerating the market availability of LED parking lot lighting products that meet CBEA members’ performance requirements. To date, the Project Team has:

- Identified candidate luminaires and are investigating their field and laboratory performance, as well as life and reliability issues
- Developed product performance specifications and evaluation procedures based on CBEA members’ needs.

DOE Support

This DOE-sponsored effort is being implemented by the Pacific Northwest National Laboratory (PNNL) in coordination with CBEA members. DOE actively supports research and commercialization of LED lighting through its SSL program, which focuses on research and development, product testing, technical information development, product demonstrations, and outreach to energy-efficiency program administrators. Visit ssl.energy.gov for more information on DOE’s SSL portfolio.

DOE provides technical assistance in support of this specification project, including:

- Product performance testing
- Product demonstration technical support
- Analysis of energy cost savings
- Analysis/quantification of maintenance cost savings
- Investigations into life measurements and other performance indicators
- Development and maintenance of the CBEA product performance specification
- Technology specification technical assistance as needed.

Resources developed in support of this effort are available at www1.eere.energy.gov/buildings/alliances/rea_subcommittees.html (see Lighting and Electrical). To see the full performance specification, visit http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/cbea_led_site_lighting_spec.pdf.

CBEA Member Opportunities and Benefits

CBEA members play an integral role in the LED site lighting technology specification. They identify candidate products, review product laboratory testing, conduct field demonstrations, evaluate candidate products, and assist with the development of LED parking lot lighting performance specifications to guide the design and purchase of LEDs for parking lots.

CBEA members who participate in the LED parking lot lighting specification project find they are better informed of the potential of LED parking lot lighting (from DOE research and reports from other members). They also benefit from being among the first to hear about new and promising technologies, as well as other demonstration projects in which they can participate.

Overview of the CBEA Specification

In order to maximize the benefits of converting to SSL technology from the traditional high-intensity discharge (HID) technology, the CBEA team developed a performance specification that should be applied to a specific site (rather than a specific product). SSL area luminaire manufacturers would ideally work with either DOE or commercial building organizations (i.e., large retailers or developers) to provide lighting solutions for different locations. The specification provides information about both the luminaire and how the site should be lighted. Key details of the specification include the following:

- Luminaires should be compliant with backlight, uplight, and glare (BUG) rating requirements in IESNA TM-15

- Luminaires should carry a five-year warranty covering the luminaire, finish, and power supply
 - Testing requirements are identified
 - Different amounts of light (illuminance) are needed for different parts of the parking lot
 - Both power density and illuminance requirements are by lighting zone (LZ); different environments need more or less light (and thus use power differently).
- Refer to Table 2 for more information on basic power density and illuminance requirements.

Table 1

Product Feature	LED
Overall Lighting System Efficiency	Very efficient because of LED directionality, meaning nearly 100% of light leaves the luminaire
Life	Expected long life (50,000+ hours) but actual end-of-life performance not completely understood
Maintenance	Very low maintenance expected due to long life and durability
Environmental (Mercury)	Contains NO mercury
Light Output Depreciation	Low lumen depreciation rate
Lighting Uniformity	Directionality and flexibility make uniformity ratios below 10:1 easily achievable
Dimmability	Fully dimmable
Durability	Solid-state technology is much less fragile and less susceptible to vandalism, breakage, or damage from high winds and vibration
Light Pollution	Easy to reduce light pollution effects due to inherent directionality of source

Table 2

Lighting Zone	Power Density	Minimum Illuminance (lm/ft ²) requirements per LZ			
		Main Area	Perimeter	Front Aisle	Vertical
LZ2	0.05 W/ft ²	0.50	0.20	1.00	0.25
LZ3	0.06 W/ft ²	0.75	0.40	1.50	0.50
LZ4	0.08 W/ft ²	1.00	0.50	2.00	0.50

A Strong Energy Portfolio for a Strong America

Energy efficiency and clean, renewable energy will mean a stronger economy, a cleaner environment, and greater energy independence for America. Working with a wide array of state, community, industry, and university partners, the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy invests in a diverse portfolio of energy technologies.