

BETTER BUILDINGS ALLIANCE SITE (PARKING LOT) LIGHTING

Better Buildings Alliance LED Site (Parking Lot) Lighting Specification

The U.S. Department of Energy (DOE), its national laboratories, and the Better Buildings Alliance (BBA or the Alliance) members are working to support the market introduction of light-emitting diode (LED) parking lot lighting. A BBA project team is focused on making reliable, energy-efficient, and competitively priced outdoor LED lighting systems more widely available in the marketplace.



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

Members of the Alliance are working to support the increased use of high-efficiency

LED parking lot lighting that is reliable, energy efficient, and competitively priced. LED technology is becoming more common as a practical solution for parking lot illumination. The potentially long life of LED products defers the cost of maintenance. Additionally, LEDs can provide more uniform illumination than other lighting technologies. Some of the many benefits for LED lighting in parking lots are shown in Table 2.

The Alliance is 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 BBA project 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 BBA members' performance requirements. On February 15, 2012 DOE released the BBA LED Site Lighting Specification v1.3.

Table 1. Overview of Energy and Lighting Requirements

| Lighting Zone | Power Density | Minimum Illuminance Footcandle Requirements per LZ | | | | |
|---------------|------------------------|--|-----------|-----------|-------------|----------|
| | | Main Area | 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 | 0.40 |
| LZ4 | 0.08 W/ft ² | 1.00 | | 0.50 | 2.00 | 0.50 |

DOE Support

This DOE-sponsored effort is being implemented by the Pacific Northwest National Laboratory (PNNL) in coordination with Alliance 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 demonstration technical support
- ▶ Analysis of energy cost savings
- ▶ Analysis/quantification of maintenance cost savings
- ▶ Investigations into life measurements and performance indicators
- ▶ Development and maintenance of the BBA product performance specification
- ▶ Performance specification technical assistance as needed.

BBA Member Opportunities and Benefits

BBA members play an integral role in the development and application of the Alliance LED site lighting 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.

Public and private entities are increasingly utilizing parking lot lighting systems that meet the BBA site lighting specification. This specification saves 50% or more energy, compared to typical parking lot lighting systems. Some early adopters include Walmart, Lowe's, and Cleveland Clinic. Walmart is now using lighting that conforms to the specification in all new parking lot sites, with over 300 sites in design or completed to date. Both Walmart and Lowe's report energy savings of 58% compared to ASHRAE Standard 90.1-2010 (for LZ3).

Overview of the BBA Specification

The BBA lighting project team developed a performance specification to maximize the benefits of converting to SSL technology from the traditional high-intensity discharge technology. The specification provides information about both the luminaire and how the site should be lighted. Lighting designers, engineers, or SSL manufacturers ideally will work with commercial building organizations (e.g., large retailers or commercial developers) to provide lighting solutions for different locations. Key details of the specification include the following:

- ▶ Luminaires backlight, uplight, and glare (BUG) rating should be characterized per IES 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 2. Overview of Features of Specification

| 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 maximum/minimum 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. |

Resources developed in support of this effort are available at <https://www4.eere.energy.gov/alliance/activities/technology-solutions-teams> (see Lighting & Electrical). To see the full performance specification, visit http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/cbea_led_site_lighting_spec.pdf. For more information, contact Linda Sandahl, Pacific Northwest National Laboratory, at linda.sandahl@pnnl.gov.