Better Buildings®
U.S. DEPARTMENT OF ENERGY

Fact Sheet

BETTER BUILDINGS ALLIANCE PARKING STRUCTURE LIGHTING

Better Building Alliance High-Efficiency Parking Structure Lighting Specification

Converting traditional lighting in parking structures to high-efficiency lighting technologies and controls can lead to significant energy savings. A U.S. Department of Energy (DOE) Better Building Alliance (BBA or the Alliance) project team is focused on making reliable, energy-efficient, and competitively priced parking structure lighting more widely available.

High-efficiency lighting from fluorescent, induction, and LED sources could offer immediate returns without requiring major changes to parking structures, such as the one pictured above. A BBA project team studied the lighting technology to create a performance specification.

Parking structures operate long hours, sometimes all day and night. Some spaces are infrequently occupied and open to daylight, making additional lighting unnecessary. Significant energy savings can be created in these spaces by using controls such as occupancy sensors and dimmers. Fluorescent, induction, and light-emitting diode (LED) lighting sources work much better with these controls than traditional high-intensity discharge (HID) lighting sources. Moreover, each of these high-efficiency sources has the same, if not longer, rated life spans as HID sources.

The Alliance helps commercial building owners and managers cut energy costs by working with appliance, heating, cooling, and lighting manufacturers to improve energy efficiency. Lighting improvements offer immediate returns because they can be made without major changes to the structure. The introduction of new technologies and enhancement to existing technologies creates more options for retrofitting or constructing parking structures with lighting that reduces energy usage and lowers costs.

A BBA project team was formed in May 2009 to investigate the use of high-efficiency lighting and controls for BBA member parking structures. The project team of more than 60 members addressed Alliance member lighting performance requirements and investigated the availability and use of high-efficiency lighting technologies. Thus far, the project team has developed performance specifications and evaluation procedures based on BBA member needs. Public and private entities are increasingly utilizing parking structure lighting systems that meet the BBA specification. In 2011, Cleveland Clinic used the specification in an RFP for LED parking structure lighting and controls, and expects energy savings of over 65% compared to ASHRAE Standard 90.1-2010.

The BBA-developed specification for high-efficiency fluorescent, induction, and LED lighting systems in parking structures include recommendations for controls and daylighting practices, which can lead to even greater energy savings.

DOE Support

This DOE-sponsored effort is being implemented by the Pacific Northwest National Laboratory. DOE provides technical assistance in support of this performance specification project, including:

- Product performance testing
- Product demonstration
- Analysis of energy cost savings
- Analysis/quantification of maintenance cost savings
- Investigations into life measurements and other performance indicators
- Development of a BBA performance specification

Overview of the BBA Specification

Typically, technology specifications focus on a product rather than an application. In order to maximize the benefits of converting traditional HID technology to high-efficiency alternative technologies, BBA developed a performance specification that should be applied to specific sites. For best results, commercial building organizations (e.g., large retailers, hospitals, educational organizations, municipalities, or developers) will work with lighting designers, engineers, and luminaire manufacturers to provide lighting solutions for various locations. The performance specification provides information about both the luminaire and how the site should be lighted. Key details include:

- A five-year warranty covering the luminaire, finish, and power supply
- Identification of testing requirements
- A lighting power density (0.18 W/ft2) that is 10% less than the ASHRAE Standard 90.1-2010 limit and the site is eligible for the maximum Energy Policy Act of 1992 tax incentive
- Uniformity metric of maximum-to-minimum ratio.

Table 1. Comparison of Lighting Technologies in the Specification

Product Feature	Fluorescent	Induction	LED
Overall Lighting System Efficiency	Most efficient of the sources listed in the performance specification. Due to the optical nature of luminaires designed around this light source, more fixtures probably needed than for other sources.	The light source is efficacious and used in efficient light fixtures.	Very efficient because of LED directionality, meaning nearly 100% of light leaves the luminaire.
Life	Expected life of 24,000 to 46,000 hours. Actual value depends on ballast plus lamp pairing and controls.	Expected life of 100,000 hours. Generator may not last the entire period and have to be replaced.	Expected long life of 50,000+ hours but actual end-of-life performance not completely understood.
Light Output Depreciation	Extremely low depreciation rate. Approx. 5% after 12,000 hours and then 3% more during the course of the lamp's life.	Roughly 20% at 20,000 hours and then a continual depreciation for the remainder of the lamp life.	Low lumen depreciation rate. 30% over the 50,000 hours.
Maintenance	More maintenance than compared to the other sources in the performance specification. However, maintenance is not as expensive in a parking structure compared to a parking lot.	Very low maintenance expected due to long life and durability.	Very low maintenance expected due to long life and durability.
Environmental Impact	More maintenance than compared to the other sources in the performance specification. However,maintenance is not as expensive in a parking structure compared to a parking lot.	Contains a very limited amount of mercury (less than the amount allowed in fish). Some lead in glass.	Contains no mercury. Possible lead in solder.
Use with Controls	Fully dimmable and easy to use with occupancy sensors.	Fully dimmable.	Fully dimmable.

Table 2. Overview of Lighting Requirements

Area of Parking Structure	Horizontal Illuminance Requirement (footcandles)	Verticall Iluminance Requirement (footcandles)	Uniformity Max:Min
Overall Lighting System Efficiency	2.00 (Min)	1.2 (Min)	7:1
Ramps	2.00 (Min)	1.0 (Min)	10:1
Vehicle Entry/Exit (Day)	60.00 (Min)	30.0 (Min)	10:1
Vehicle Entry/Exit (Night)	1.00 (Min)	1.2 (Min)	10:1
Uncovered Parking Areas (Top Deck)	0.75 (Min)	0.4 (Min)	10:1

To see the full performance specification, visit http://apps1.eere.energy.gov/buildings/publications/pdfs/alliances/creea_parking_structure_spec.pdf.
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