Lighting Checklist — Parking Garage Lighting

Many municipalities have expressed an interest in using grants for upgrading municipal parking garages. There are a number of technologies that can be used in these applications, including induction, light-emitting diode (LED), T5 fluorescent systems and high performance T8 (HPT8) fluorescent systems.

Parking garage lighting is about more than just the technology. Consideration must be given to light quality, light levels, ease of maintenance and other issues that relate to safety and security issues affecting both the drivers and pedestrians within the space.

While LED parking facility lighting products only emerged over the last five to seven years, LED technology is well established in certain niche markets and is constantly improving in its performance characteristics. Additionally, improvements in other technologies including linear fluorescent and induction bear consideration. Each technology has different operating characteristics. Your specific location and facility operating characteristics (such as ambient temperature, ease of maintenance, and security issues) will help identify which technology is right for you. The table below compares common high-pressure sodium (HPS) and metal halide (MH) baseline systems with alternative technologies.

Checklist for a Successful Project

Step 1: Conduct Complete Inventory

Consider all opportunities and list what you want to replace, and why you want to replace it. Is energy the only issue? Be sure to collect information on each existing fixture you wish to replace. Ramps and entrance areas may have different fixture types than basic parking areas to provide appropriate light levels.

Step 2: Decide Retrofit vs. New

The decision to retrofit existing fixtures with new lamps or lamps and ballasts, or replace the entire fixtures should be based on the existing technology, age of the equipment, and how well the existing equipment lights the space. Replacement technologies appropriate for parking garage lighting upgrades are often not compatible with existing fixtures.

Step 3: Consider Light Quantity and Quality

When considering parking garages, it is common to assume one uniform light level, night or day, is appropriate. The Illuminating Engineering Society (IES) recommends a low light level for basic parking areas and higher light levels for ramps and higher still for entrance areas. Additionally, since most parking garages are lighted 24/7, ramps and entrance areas should have even higher light levels during daylight hours to facilitate eye adjustment from natural exterior light.

Lighting uniformity must also be considered for safe vehicle and pedestrian interaction. Too much contrast between bright and dark light areas creates safety issues. Using fixtures with appropriate distribution patterns and layouts with appropriate spacing make all the difference. Consequently, one-for-one replacement may not be an option when considering appropriate light levels and uniformity. Also consider surface colors, as lighter colors on ceilings and vertical surfaces will increase reflection, improving lighting levels and uniformity. You can refer to IES resources or your local lighting professional for assistance.

Step 4: Consider Controls for Transition Areas

Using controls to adjust light levels for changing daylight and occupant activity will help save energy as well. Parking garages having significant ramp and entrance areas require higher light levels during daylight hours as described above. Consider adding photosensors to reduce ramp and entrance lighting levels to save additional energy during nighttime hours. If considering adding occupancy sensors to turn lights down or off during low activity

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Technology ➤	*Baseline technology*	*Baseline technology*	*Energy Efficient Alternative*	*Energy Efficient Alternative*	*Energy Efficient Alternative*	*Energy Efficient Alternative*
Characteristic ➤	*High Pressure Sodium 150 watt*	*Metal Halide 175 watt*	*Induction*	*LED*	*Linear Fluorescent T5/T5HO*	*Linear Fluorescent HPT8*
Lamp Life (hours)	*24,000+*	*10,000-20,000*	*Varies[1]*	*30,000-50,000[2]*	*35,000+[3]*	*30,000+[3]*
Reaction to Ambient Temperature	*No effect on light output*	*No effect on light output*	*Light output reduced at low temperatures*	*Light output reduced at high temperatures*	*Light output reduced at low temperatures*	*Light output reduced at low temperatures*
Min Starting temp	*-20° F*	*-20° F*	*-40° F*	*No minimum*	*0° F*	*0° F*
Color Rendering[4]	*21*	*65-80*	*80+*	*70+*	*80+*	*80+*
Mean System Efficacy (mean lumens per watt)[5]	*70-80*	*50-75*	*60-70*	*60-80*	*81+*	*88+*

[1] Systems are commonly rated for 100,000 hours; consult manufacturer data for specific ratings. [2] Industry standard test method currently in development.
[3] Based on 12 hours per start. [4] Rates how naturally color is reproduced (e.g., how identifiable is vehicle paint color) on a 0 (worst) to 100 (best) scale.
[5] Mean System Efficacy = mean lamp lumens / system watts

time periods, carefully consider carefully whether to turn off individual fixtures or reduce fixture output. Turning off fixtures may result in increasing shadows and reducing safety. However, some technologies require special dimming ballasts for high/low controls scenarios. For some technologies, such as fluorescent, an inexpensive alternative is dual-circuiting fixtures allowing the controls to turn off some lamps within the fixtures which helps maintain uniform lighting while still reducing energy use.

Step 5: Investigate Utility Incentive Programs

Some utility programs may offer incentives to help buy down the initial cost of the products in order to reduce the overall electric load. Be sure to contact your local utility before purchasing the lights, as some utilities require a pre-approval. A database of incentives supported by US Department of Energy can be used to help identify incentive programs available at *http://www.dsireusa.org*.

Step 6: Determine Specifications

Once you decide how many fixtures and what technology you prefer to use, assemble your specifications. If you specify LED products, consider requiring the products be listed on the DesignLights™ Consortium Qualifying Products List found at *http://www.designlights.org*. If you are specifying T8, be sure to require High Performance T8 lamps and ballasts as listed on the Consortium for Energy Efficiency HPT8 list found at *http://www.cee1.org* under commercial lighting. These organizations review product claims to see if they meet certain specifications. The DOE Commercial Building Energy Alliances offers a comprehensive design specification titled "High Efficiency Parking Structure Lighting Technology Specification" available at *http://www1.eere.energy.gov/buildings/alliances/parking_structure_spec.html*.

EECBG & SEP Technical Assistance Program: Creating Jobs and Building Clean Energy Capacity

The Department of Energy's (DOE) Technical Assistance Program (TAP) supports the Energy Efficiency and Conservation Block Grant Program (EECBG) and the State Energy Program (SEP) by providing state, local, and tribal officials the tools and resources needed to implement successful and sustainable clean energy programs. Through TAP, DOE has launched a $25 million effort to assist EECBG and SEP American Recovery and Reinvestment Act recipients. This effort, which is jointly-funded with EECBG and SEP Recovery Act dollars, is aimed at accelerating payments, improving project and program performance, and increasing the return on Recovery Act investments.

Step 7: Solicit Bids

After reviewing the inventory, selecting the right technology for your area, identifying the appropriate system layout to provide lighting quality and quantity and completing the specifications, you can prepare a successful request for proposal (RFP). Be sure to review proposed product specifications to confirm they meet your needs.

Step 8: Life-Cycle Cost Analysis

Once you have pricing from several sources, you can assemble a complete life cycle cost (LCC) analysis including energy and energy cost reduction, simple payback period and return on investment. This will allow you to make the appropriate final decision. There are free LCC analysis tools from various product manufacturers and utility programs.

Step 9: Purchase and Install

Remember to clearly identify required specifications and warranties in your purchase order or contract. Most parking garage lighting systems will not require commissioning unless controls are involved. If controls are involved, be sure to identify who is responsible for commissioning before signing the purchase order. Lastly, remember to file for those utility incentives within the required time period after completion.

Resources:

Consortium for Energy Efficiency list of High Performance T8 lamps and ballasts:
http://www.cee1.org

DesignLights™ Consortium Qualifying Products List:
http://www.designlights.org

DOE GATEWAY Study—
Lighting with LEDs—Area Lights for Commercial Garages:
http://apps1.eere.energy.gov/buildings/publications/pdfs/ssl/gateway_ppmc.pdf

DOE DSIRE™
"Database of State Incentives for Renewables & Efficiency":
http://www.dsireusa.org.

DOE Commercial Building Energy Alliances *"High Efficiency Parking Structure Lighting Technology Specification":*
http://www1.eere.energy.gov/buildings/alliances/parking_structure_spec.html

IESNA Lighting Handbook 9th Edition; Chapter 22; pp. 23-24

IESNA RP-20-98 Lighting for Parking Facilities; Section 10

In addition to providing one-on-one assistance, providers are available to work with EECBG and SEP grantees at no cost to facilitate peer-to-peer matching, workshops, and trainings. Requests for direct assistance can be submitted online via the ***Technical Assistance Center*** *(https://tac.eecleanenergy.org/) or by calling 1-877-EERE-TAP (1-877-337-3827). Once a request has been submitted it will be evaluated to determine the level and type of assistance TAP will provide.*