LED Replacements for High Intensity Discharge (HID) Lighting
Which Lighting System is Right for You?

LED lighting systems are changing the way we light our indoor and outdoor spaces. In interior high ceiling applications and exterior areas that traditionally use HID fixtures, LEDs offer significant energy savings and dramatically reduce maintenance costs.

LEDs paired with customizable controls can save you substantially more energy than LEDs without controls as the lighting output can be adjusted to meet project requirements. Use the chart below to determine which LED lighting system best fits your HID retrofit needs.

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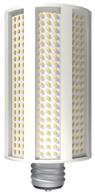

COMFORT	New retrofit **LED Lamp** without controls	New **LED Fixture** or **Retrofit Kit** without Controls	New LED Fixture or Retrofit Kit with **Integrated Controls**
Quality of Light	Good	Better	Best
Controls	On/Off	On/Off, Time of Day, Networked Control Capable Ready	On/Off, Dim, Occupancy, Daylight, Color Tuning
Life	20-50K Hours *varies by type*	50+K Hours *varies by type*	50+K Hours *varies by type*
Light Output	Varies greatly as not tuned to the existing fixture	Distribution tuned at the factory to provide good uniformity	Distribution tuned at the factory to provide good uniformity
Glare	Glare Likely	Application-specific product reduces chances of glare	Application-specific product reduces chances of glare
INCENTIVES AND SAVINGS			
Utility Incentives *(contact your utility for more information)*	May be limited or lower than new fixture	Calculated or deemed	Calculated
Energy Savings	Good	Better	Best
COST			
Cost of Ownership	Good	Better	Best
Equipment Cost	$ / $$	$$ / $$$	$$$
Installation Cost	$ / $$	$$ / $$$	$$ / $$$
Maintenance Cost	$ / $$	$	$

FACTORS TO CONSIDER WHEN EMBARKING ON A LIGHTING UPGRADE

There are a range of factors to consider when retrofitting an existing fixture. The following are important considerations that could influence your decision:

Age and Condition of Ballast: When retrofitting an existing fixture with direct replacement LED lamps, consider the type and age of the existing ballast. Failure of older existing ballasts before HID-LED end-of-life will defeat the 'reduced maintenance' attractiveness of LED solutions. Some incentive programs restrict use of existing ballasts in lighting upgrades.

Age and Condition of Sockets: As fixtures age, lamp sockets can become brittle due to the heat and UV exposure they experience over time. Older fixtures may need new sockets to offer best life expectancy.

Net Efficacy: New highly-efficient LED products installed into existing fixtures can experience losses of up to 10 – 15 percent due to inter-reflected light loss – basically, light trapped within the fixture. Addition of a lens will reduce efficiency another 10 – 12 percent, or even more if the lens is old and yellowed. Note that these reductions were present with the existing HID lamps also.

Light Distribution: The way a fixture distributes light is determined by its reflectors and lens, which are designed around the original lamp type. Replacing existing lamps with LEDs will change the distribution characteristics of the fixture, which may cause shadowing or sharp cutoff at walls. A test installation will help determine whether direct one-for-one lamp replacement will give suitable results. Be sure to evaluate the light levels, the lighting distribution and the visual look of the space in the test installation.

LABOR COSTS: Labor costs will depend on the type of LED retrofit planned.

- **LED Lamps** – HID-LED lamp replacement can be as simple as removing the existing HID lamps and plugging in the LED lamp. LED lamps may require incompatible ballasts to be replaced, may require removal of the existing ballast and rewiring of the fixture, or may require replacement of the ballast with a new LED driver. In all cases damaged sockets should be replaced.
- **Retrofit Kits** – Retrofit kids install into the existing housing from below the ceiling and can be an effective alternative to LED lamps or new fixtures. They generally require removal of all internal components of the existing fixture and installation of new internal LED components.
- **New Fixtures** – With new fixtures the replacements do not need to be on a one-for-one basis or even in the same location, which allows for the lighting layout to be optimized in the space. Replacing or relocating a fixture may require seismic anchor wires (slack wires), which may or may not be present on the existing fixtures.
- **Some types of replacements require an electrician.** The new fixture, retrofit kit and replacement lamp descriptions in this guide provide additional details regarding which types of retrofits will require an electrician.

LIGHTING GLOSSARY

NEW LED LAMP

HID-LEDs for replacing existing high intensity discharge lamps are screw-based LED lamps that use the existing lamp sockets in the existing HID fixture housing. Although LED replacement lamps typically offer better efficiency and longer life than existing HID lamps, their lighting distribution can't be optimized for all fixture optics. Retrofit kits and new fixtures are designed as engineered units and offer higher energy savings, better life and better lighting quality than HID-LED lamp replacements.

Types of HID-LEDs available to replace HID lamps:

- **Plug and Play (Type A)** – These lamps use the existing HID ballast (if compatible) and lamp socket. As such, installation does not require rewiring or an electrician. Plug and play HID-LED lamps are typically the fastest and least expensive way to upgrade to LED, but are also the least efficient retrofit option. They can be a short-lived solution due to potential ballast failure, ballast incompatibility or difficulty in finding a ballast replacement. Also, if dimming is desired, a compatible dimming ballast and dimmable LED lamp is required.
- **Line Voltage (Type B)** – Also known as ballast bypass, these replacements do not use the existing ballast, eliminating the ballast issues seen in plug and play lamps. They offer greater energy savings than plug and play as the ballast wattage draw is eliminated. Installation costs are higher than plug and play LEDs, as an electrician is required to remove the old ballasts and re-wire the fixture. To add or maintain dimming, the HID-LED must be dimmable and a new dimmer compatible with the HID-LED will need to be installed.

NEW LED FIXTURE OR RETROFIT KIT

New LED fixtures and retrofit kits use LEDs as the light source instead of traditional high intensity discharge (HID) sources (high pressure sodium and metal halide). The LEDs are factory installed directly in the fixture without the use of traditional lamp sockets. Since fixtures and retrofit kits come with new drivers, they are typically compatible with dimming controls and networked control systems (commonly referred to as 'network control capable ready').

NEW LED FIXTURE OR RETROFIT KIT WITH INTEGRATED CONTROLS

Integrated control fixtures and retrofit kits are generally referred to as Luminaire Level Lighting Control (LLLC) fixtures and kits. At minimum, LLLCs incorporate embedded occupancy sensors, daylight sensors and wireless controls into LED light fixtures or retrofit kits. Most LLLC products offer additional energy and occupant comfort features such as continuous dimming, task tuning (brightening or dimming each fixture or a group of fixtures to provide the ideal light level for occupants), programmable scheduling, and more. The fixtures wirelessly communicate with each other, so can operate in groups or independently.'network control capable ready').