

# What to Ask for Your Indoor Commercial Lighting Projects

## A holistic approach to installing luminaires improves your indoor lighting system's success

*Indoor commercial lighting, particularly in office buildings, is meant to provide well distributed light that will not cause glare or interfere with worker performance. Therefore, installing a commercial lighting system is more than simply replacing luminaires. In fact, there are many things to consider with getting an efficient lighting system, such as state and local regulations, proper light distribution, control settings and utility rebates. It all depends on what you're trying to achieve.*

*Some advanced lighting systems can increase the cost of your construction project up front, so your lighting designer needs to know how to justify these costs with energy savings, maintenance and productivity. That's why it's important to understand the building owner's business priorities, either it be style, efficiency and/or affordability. This white paper will guide you question-by-question to getting answers for each factor of your project's lighting system.*

### QUESTION #1 — What are My Goals?

Commercial lighting has long been a key source of energy savings. There are utility incentive programs and tax deductions available to owners of new or existing commercial buildings that have been constructed or retrofitted to save on energy. While there are many benefits to moving into an efficient lighting system, there are also other things to review besides energy savings. Therefore, ask your building's owner what his or her business objectives are for the project, which could be any of the following:

- Improve look and feel by creating uniformity of illumination
- Reduce environmental impact and preserve natural resources
- Decrease maintenance and labor costs
- Increase energy savings

### Goals Defined

When an owner is looking at creating uniformity, he or she is looking at enhancing the visual quality. It's all about combining visual comfort with efficiency. LEDs are good for lighting quality because of the intensity of illumination on the areas of interest and the uniformity of illumination. Unlike fluorescent lamps, LEDs are directional in nature and when combined with a unique optic, LEDs can create a specified beam spread; so you can create illumination in specific areas of interest.

Look at the Color Rendering Index (CRI), which is a system derived from visual experiments. To achieve a good CRI, you must use a high quality phosphor. To see if you are comparing apples to apples with LED lighting, you need to look at the CRI.

To achieve a quality environment of color rendition and quality light, the R9 value (or saturated red) is an important value to look at because it's where LEDs are the weakest. For instance, a negative R9 value is seen in cheaper manufactured LED lamps. It is also important to note that CRI is different than Correlated Color Temperature (CCT).

LEDs are also the most environmentally friendly lighting option available. They last longer than other lighting products, and they won't need replaced

nearly as often. Therefore, this is good for decreasing costs on maintenance, labor and disposal. LEDs also contain no mercury and use less heat, which could reduce cooling costs.

As you can see, LEDs will help your building's owner to save on energy. However, when do you go with a LED versus an energy efficient fluorescent option? It just depends on your project's budget. For example, an energy efficient fluorescent lamp can still get you some of the benefits of a LED, such as some energy savings and possibly reducing maintenance costs. It's a good alternative to HID fixtures and produces less glare. However, even an energy efficient fluorescent won't give you the amount of savings as a LED.

All fluorescent lamps require a small amount of mercury to operate them, so they are not environmentally friendly. The government has recognized how these types of products can cause pollution in our landfills, so now the Restriction of Hazardous Substances Directive (RoHS) requires proper recycling of fluorescent lamps.

Also, it's important to note that while it can cost less upfront to purchase a fluorescent lamp, you won't get as many savings as a LED long-term. There may be incentives for installing LEDs throughout the facility.

Furthermore, when deciding on an LED or a fluorescent, decide on whether you're doing a full replacement or a retrofit. For example, if your building owner cares about cost and labor, replacing a troffer may be a bigger task than you think. So if you want the benefits of a LED and don't want to do a complete renovation, you can find LED replacement tubes, such as the [DirecT8™ series](#), instead of changing out the entire luminaire.

## QUESTION #2—What Do I Look for with State and Local Regulations?

By now, you know the importance of an energy efficient system; and since lighting accounts for an estimated 20 percent of electricity<sup>1</sup> in commercial buildings, it's not a surprise that regulations are consistently evolving. Therefore, it's your responsibility to make sure the project's luminaires are complying with federal, state and local regulations. So if you're buying an energy efficient lighting option any-ways, meeting those federal regulations shouldn't be a problem. It's the state and local regulations that get a little tricky because every construction project is different. Therefore, you'll need to consult with your local utility company contact for exact requirements and state compliance.

For example, part six of title 24 by the California Building Standards Code was created to reduce energy consumption without compromising the quality of lighting in California. It limits the amount of watts installed in a facility, and it

### FEDERAL REGULATIONS

Produced in response to the U.S. energy policy, the Energy Independence and Security Act (EISA) of 2007 (once called the Clean Energy Act) moved the U.S. toward greater energy independence and security. It implemented new standards for increasing energy efficiency and availability of renewable energy.<sup>5</sup> And because regulating appliances and equipment has proven to save on energy, Title III was created, which directly impacted lighting energy efficiency.<sup>2</sup>

The Department of Energy (DOE) enabled legislation under EISA and established a minimum lumen amount per watt for a number of popular fluorescent lamps and incandescent reflector lamps. DOE eliminates all 4-foot T12 lamps, some 4-foot T8 lamps and most 8-foot lamps. All T12, T8, T5 and U-bend lamps must meet a minimum lumen amount per watt. Any lamp above 4500K has a slightly lower standard.<sup>3</sup>

### A LOOK at the BALLAST RULE

The Energy Policy Act of 2005 addressed growing energy problems by providing tax incentives and loan guarantees for energy production. It also included DOE's Ballast Rule, which includes the use of magnetic ballasts operating T12 lamps. The new standards were created to enforce the use of energy efficient electronic ballasts.<sup>4</sup> Within the pulse-start offering, there are magnetic and electronic ballasts. These new regulatory standards require minimum ballast efficiencies for luminaires based on location, such as outdoor or indoor. It covers new luminaires and not replacement ballasts. Probe-start ballasts were banned for luminaires with 501 to 1,000 watts.

Effective in 2009, manufactured metal halide luminaires must comply with energy efficiency requirements. A summary of those efficiency requirements include the following:

- No probe start ballast within metal halide lamps rated 150W to 500W
- 150W to 500W pulse start luminaires must use a magnetic ballast with at least 88 percent efficiency
- Lamps greater than 250W may include an electronic ballast if it's at least 92 percent efficiency

Compliance is required by February 10, 2017, and it will affect the availability of 50 to 1,000 watt luminaires.<sup>5</sup> Ballast regulations are getting stronger, so you have several options to make sure you stay compliant:

- Move to a LED
- Find a different version of fluorescent

<sup>1</sup> Retrieved September 2015 from [energy.gov/eere/energybasics/energy-basics](http://energy.gov/eere/energybasics/energy-basics)

<sup>2</sup> Retrieved August 2015 from [www.gpo.gov/fdsys/pkg/PLAW-110publ140/html/PLAW-110publ140.htm](http://www.gpo.gov/fdsys/pkg/PLAW-110publ140/html/PLAW-110publ140.htm)

<sup>3</sup> Retrieved August 2015 from [energy.gov/sites/prod/files/2014/12/f19/gsl\\_final\\_rule.pdf](http://energy.gov/sites/prod/files/2014/12/f19/gsl_final_rule.pdf)

<sup>4</sup> Retrieved August 2015 from [www1.eere.energy.gov/buildings/appliance\\_standards/pdfs/epact2005\\_appliance\\_stds.pdf](http://www1.eere.energy.gov/buildings/appliance_standards/pdfs/epact2005_appliance_stds.pdf)

<sup>5</sup> Retrieved September 2015 from [www.ecmag.com/section/lighting/lighting-regulations](http://www.ecmag.com/section/lighting/lighting-regulations)

requires lighting to be controlled for efficient operation. Many applications are now required to have advanced dimming controls, occupancy and daylight sensors.

Another example is the Chicago Plenum, which states that any fixture installed in Chicago needs to have special gasketing to completely enclose the fixture wireway to prevent electrical fires.

Also, the New York City code for light fixtures requires them to be built with 20-gauge steel or better. It ensures the fixture is durable.

To find state and local energy efficiency programs, visit [www.sba.gov/content/state-and-local-energy-efficiency-programs](http://www.sba.gov/content/state-and-local-energy-efficiency-programs).

### QUESTION #3—Where Do I Start with Utility Rebates?

Before starting your lighting project, research your building owner's utility rebate options. It will help you see what type of new lighting equipment is needed to obtain the rebate. A number of the programs out there will require pre-authorization to confirm your project qualifies for a rebate. That pre-authorization must happen before any lighting product is purchased for the project.

Utility rebates can be very complex because every type of rebate has its own incentives, goals and procedures. Not one utility rebate is the same. There's a lot that goes into a lighting utility rebate. The majority of these programs are administered by states, municipal utilities and electric cooperatives; so the amounts vary based on the product's technology and program administrator. Utility rebates are typically broken down into three categories—prescriptive, midstream and custom (see below). It's important to seek support from a lighting manufacturer throughout the process to see where you qualify and how you can get the highest return.

More information on utility rebates can be found in TCP's white paper titled, "Simplifying Commercial Lighting Utility Rebates When It Seems Impossible."

<p><b>PRESCRIPTIVE</b> straight forward</p> <p><b>OBTAIN:</b></p> <ul style="list-style-type: none"><li>• meet energy guidelines</li><li>• submit the application to receive the rebate</li></ul>	<p><b>MIDSTREAM</b> select energy efficient lighting</p> <p><b>INCENTIVE OFFERINGS:</b></p> <ul style="list-style-type: none"><li>• purchase select products at reduced cost at time of sale.</li></ul>	<p><b>CUSTOM</b> custom rebates</p> <p><b>OBTAIN:</b></p> <ul style="list-style-type: none"><li>• on-site inspection</li><li>• receive rebate based on energy savings before and after</li></ul>
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### rebate categories

### QUESTION #4—What Certifications are Important?

Just because a luminaire isn't ENERGY STAR® rated doesn't mean it's not energy efficient. Check the DesignLights Consortium™ (DLC) [Qualified Products List](#) (QPL) to help you decide on what's energy efficient.<sup>6</sup> ENERGY STAR is for lamps while DLC has qualifications for energy efficient fixtures.

You also need to consider what the Underwriters Laboratories (UL) listing is for a fixture. All UL approved products must include the UL listing mark, which means it's been tested and the product meets nationally recognized safety standards. Look to see if the lighting product is rated for dry, damp or wet locations.

### QUESTION #5—How Much Light Do I Need?

It's crucial to determine the right amount of light. When you choose levels too low, you're risking the success of your project. When you choose levels too high, you're risking too much money being spent on energy consumption. Depending on your goal, the required light distribution may range from broad to narrow. LEDs are generally suitable for narrow distribution, and an energy efficient fluorescent is good for broad distribution. It just depends on what you're trying to accomplish with your indoor lighting project.

Having balanced light distribution throughout your space can make it a wonderful place to spend time, but bad lighting can make the finest contracting work look cheap. That's why we suggest a LED lighting product for those looking for quality lighting to get an improved look. But because LEDs don't waste light like a fluorescent, you can get sharper shadows when not used correctly. Therefore, you must make sure that you're buying the correct number of fixtures and spacing them out evenly.



<sup>6</sup> Retrieved September 2015 from [www.ledlightingrebates.com/dlc](http://www.ledlightingrebates.com/dlc)

In order to have great lighting design, you need to consider the types of lighting to produce integration within your facility, such as ambient or general, accent and task. The Illuminating Engineering Society of North America (IES) recommends the most widely accepted method for determining lighting levels while integrating each type, which is measured in foot-candles.

To get your desired light, look at the audience who will be using this facility. What are their ages? What is the area being used for? Those questions must be answered to hit proper levels of illumination. Refer to the chart on the right to see recommended light levels.<sup>7</sup>

Many people like to predict the average illuminance level in a room by looking at the amount of lumens. However, this method has some drawbacks, because it doesn't determine the range of light intensity in a room and the difference in where intensity occurs.

For example, a lumen is equal to one foot-candle, and one lux is one lumen per square meter. Illuminance is measured by the intensity to which something is illuminated; not the amount of light it's producing. This too is measured in foot-candles and looks at how much light falls on an area at a particular distance. Candlepower is a way of measuring how much light is produced by the lamp, but it's not the amount of light at the area you want lit. That's why it's important to look at the foot-candles when choosing your lamps and not your lumen level. Therefore, to see how bright something is, you must consider the source and the target you want lit.

Many people over light their facility. You might find that you won't need as many fixtures. To compare what the building is currently producing in light to what you think it should be producing in light, conduct a lighting audit. It's a good way to get a detailed room-by-room analysis to see what is really needed for the application, and it will help you to reduce costly changes and create a suitable lighting environment that will meet your owner's objectives.

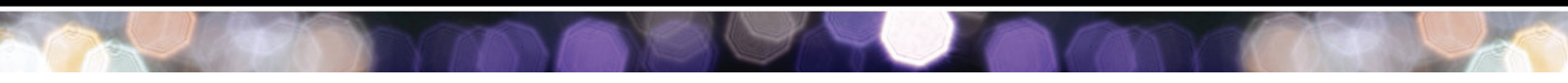
Lighting design is determined by the appropriate type and calculations. There is software and lighting manufactures who will help you determine the types of lamps you'll need for your application. Once you know how much light distribution you should have, decide where to place your luminaires. How much light you need is determined by where you're placing the luminaires. For office buildings, this is especially important to avoid glare and reflections. Where you place those luminaires determines if you should emphasize or minimize a surface texture.

## Recommended Light Levels for Specific Areas

SEE REFERENCE 7—U.S. General Services Administration

AREA	NOMINAL ILLUMINATION LEVEL in Lumens/Square Meter (Lux)
<b>Office Space</b>	
Normal work station space, open or closed offices	500
ADP Areas	100
Conference Rooms	300
Training Rooms	500
Internal Corridors	200
Auditoriums	150-200
Public Areas	—
Entrance Lobbies, Atriums	200
Elevator Lobbies, Public Corridors	200
Pedestrian Tunnels and Bridges	200
Stairways	200
<b>Support Spaces</b>	
Rest Rooms	200
Staff Locker Rooms	200
Storage Rooms, Janitors' Closet	200
Electrical Rooms, Generator Rooms	200
Mechanical Rooms	200
Communication Rooms	200
Maintenance Rooms	200
Loading Docks	200
Trash Rooms	200
<b>Specialty Areas</b>	
Dining Areas	150-200
Kitchens	500
Out-leased Space	500
Physical Fitness Space	500
Child Care Centers	500
Structured Parking, General Space	50
Structured Parking, Intersections	100
Structured Parking, Entrances	500

<sup>7</sup> Retrieved September 2015 from [www.gsa.gov/portal/content/101308](http://www.gsa.gov/portal/content/101308)



## QUESTION #6—Should I Have Lighting Controls?

As discussed with California's regulations, building energy codes are adopting occupancy sensors. Lighting controls can decrease energy costs by automatically changing during certain times of the day or when no one is present. They can also change the area to meet its purpose or enhance a mood. However, lighting controls are not included in federal energy conservation standards and are partially included in state and local building codes.

Once you see what your state and local regulations are, you'll be able to see what's needed for finding a compatible fixture. Again, it's

all about deciding if you're going to replace the entire luminaire or do a retrofit. This will determine what type of product you'll need to purchase to have complete control of your lighting system.

No matter if you're constructing or retrofitting an existing or new commercial building, a strategic approach is needed; so, you must ask yourself the right questions to meet the building owner's objectives. Approaching commercial lighting as a complete system rather than a simple replacement will help you to achieve just that.

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