Take Control & Save®

Business lighting guide

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Our goal for the Take Control & Save Business Lighting Program is to promote energy efficiency through the use of new, high efficiency lighting.

The guide has been developed to help identify existing lighting during the initial walk-through lighting audit; ***it is not intended to be a technical guide for recommending new lighting.***

Advantages of energy-efficient lighting

Lighting is a critical component of every business. Employees must be able to see clearly to safely perform their jobs; and floor space should be aesthetically pleasing to encourage sales.

You may be surprised to learn that lighting can take a larger share of a building's electricity use than any other single end use. Lighting systems produce sizable amounts of heat as well, and are typically the largest source of waste heat inside commercial buildings. Energy-efficient lighting, such as compact fluorescent bulbs, create less heat than inefficient lighting. By decreasing internal heat gain, efficient lighting also reduces a building's cooling requirements.[1]

Significant cost savings can be achieved with energy-efficient improvements. Due to continually improving technology, lighting usually provides the highest return on investment of major upgrades. With good design, lighting energy use in most buildings can be reduced up to 50 percent while maintaining or improving lighting quality. Such designs typically pay for themselves in energy savings alone within a few years, and offer more benefits in terms of the potential savings for smaller and less costly cooling systems.

Every dollar saved through energy-efficient practices is income that can benefit members.

Lighting offers the greatest and easiest energy savings opportunity in most commercial buildings.

Poorly maintained lighting systems cost far more in lost productivity than in the energy wasted.

Good lighting decisions serve several functions. Fundamentally, light is used to illuminate an area so that a task may be carried out safely. But good lighting can also reduce errors, and improve productivity and mood. Successful lighting design begins with an assessment of an occupant's lighting needs, which depends on the tasks performed in the workspace. The lighting system should be designed to provide the quantity and quality of light responsive to those requirements.

Therefore it is important that a trusted professional make new lighting recommendations to the member.

[1]ENERGY STAR®; www.energystar.gov

Efficient lighting *equals* big savings potential

The amount of energy and money to be saved with an energy-efficient lighting upgrade is determined by the relative efficiency of the new equipment and the hours of lighting operation. See the chart at right for standard lighting operating hours. Changing incandescent bulbs to compact fluorescent lamps (CFLs) and replacing fluorescent lamps and ballasts with more efficient tubes and electronic ballasts are the most common upgrades.

Beyond the obvious financial gains that may be achieved through improved lighting efficiency, there are broader business benefits available from good lighting:

- ***Improved productivity***
- ***Improved safety***
- ***Improved color rendering***
- ***Improved aesthetics***
- ***Reduced running costs***

The operating cost of lighting systems

Lighting contributes to a large percent of electricity consumed in commercial buildings, thus it is a target for energy savings through use of energy-efficient light sources along with other advanced lighting technologies.

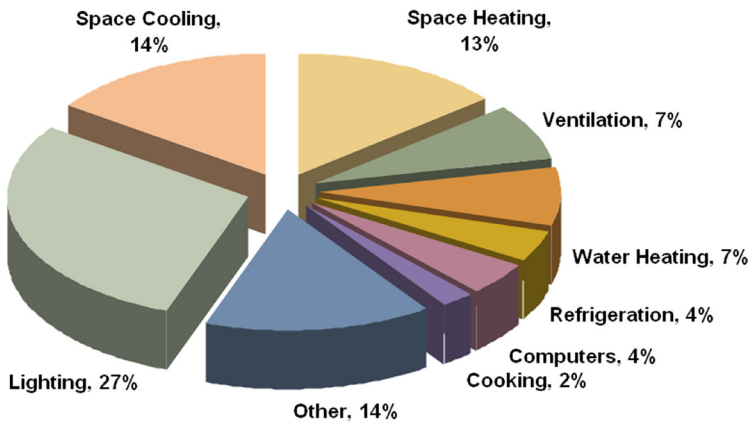
The chart below shows total energy consumed by major energy sources by end use for most commercial buildings.

Standard lighting operating hours

Building type	Annual hours*
Office	3,435
Restaurant	4,156
Retail	3,068
Grocery/ supermarket	4,612
Warehouse	2,388
Elementary/ secondary school	1,270
College	5,010
Health	3,392
Hospital	4,532
Hotel/motel	2,697
Manufacturing	3,500
Other/misc.	2,278

Source: Impact evaluation of Orange & Rockland's small commercial lighting program

Commercial energy use



Source: 2008 EIA Buildings Energy Data Book

Electricity accounts for 27 percent consumed by lighting, more than any other individual end use.

An out-of-date lighting system could be costing you a large amount of money. Upgrade with an energy efficient lighting system that should:

- ***Deliver a 30-50 percent return on investment***
- ***Reduce operating expenses***
- ***Improve lighting system quality***
- ***Increase your building assets value***

LIGHT FOR LESS

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Business Lighting Program *overview*

This rebate program is being offered to commercial, industrial and agricultural cooperative business members. Only members with greater than 10 bulbs or fixtures at their facility will qualify. The rebate amount will be determined prior to installation and calculated based on an audit of existing and replacement lighting. Total rebate amount is limited to $30,000 per member per year and in no case will exceed 40 percent of the total equipment cost.

The focus of the program is to save the member money by using less energy to light their facility. When assessing the opportunities for improvement presented by an existing lighting system, the first step is to measure how effectively the existing light levels and characteristics serve their function.

Many opportunities exist for cost-effective retrofits to an existing lighting system and it is possible to simultaneously increase lighting levels and use less energy if the most efficient technology and practices are used.

Eligible bulbs and fixtures

Fluorescent T-5 and T-8 lighting systems with electronic ballasts

LED (light emitting diode) exit signs

LED lights and fixtures

2-piece compact fluorescent light bulbs and fixtures

**Plus other technologies listed in the lighting rebate tables, available from your electric cooperative.*

How do I participate?

The first step on the road to implementing new energy-efficient lighting in your facility is to contact your local cooperative. They will determine your eligibility and provide the application, lighting tables and all other needed information to begin your lighting retrofit project.

You will want to be sure you have a trusted lighting vendor to help you with new lighting recommendations and a knowledgeable employee from the facility to assist with your initial walk-through lighting audit.

Follow the nine steps on Page 4 to calculate a rebate of *up to* 40 percent of the total lighting equipment costs.

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Business Lighting Program *implementation*

Follow these nine steps to calculate a rebate of *up to* 40 percent of the total lighting equipment costs.

Step 1: Member must contact the cooperative to discuss the program guidelines, receive the lighting application and tables and receive verification that the member qualifies for the program.

Step 2: An initial walk-through of the facility needs to be conducted by the member (preferably by the owner, maintenance person or any other employee responsible for lighting in the facility) and a lighting vendor or cooperative staff member if needed and available. This is done to determine existing lighting in the facility. The information collected should then be recorded on the **lighting application**, in the "old system" columns.

A walk-through audit checklist can be found on Pages 5 and 6, which list detailed information about the lighting audit and recommended tools and materials to have with you during the audit.

Step 3: Member contacts a lighting vendor for recommendations on new lighting. The member and vendor then complete the application with new lighting recommendations.

Step 4: Member must return the application and quote (from lighting vendor) for proposed new lighting equipment to the cooperative for approval prior to installing new lighting.

Step 5: Cooperative staff must verify:

~ Proposed new lighting is eligible for a rebate by using the new lighting tables

~ New system calculations on application are correct

~ Rebate amounts are correct and do not exceed 40 percent of total equipment cost

Step 6: Cooperative staff and member both sign Page 3 of the application, agreeing to proposed new lighting equipment and rebate amount. Cooperative staff should keep original application and give member a copy listing approved lighting equipment and rebate amount. Member may now install the new equipment agreed upon with cooperative.

Step 7: After lighting has been installed, member must submit fully-completed application, specification sheets and all receipts to the cooperative for rebate.

Step 8: Cooperative will perform a walk-through of the facility to verify installation. Cooperative representative will then sign the bottom of Page 1 on the application form verifying the new lighting installation.

Step 9: Member will receive the agreed upon rebate amount in a time frame set by the cooperative.

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The lighting audit walk-through checklist

☑ ***Gather helpful tools for the walk-through***

~ Business lighting application
~ Existing lighting tables used to identify existing lighting
~ Program guide
~ Ballast discriminator (see box at right)
~ Flashlight
~ Camera
~ Measuring tape (at least eight feet)
~ Step stool or ladder

Ballast Discriminator

The Ballast Discriminator is the ideal tool to quickly determine your retrofit opportunities by distinguishing between magnetic and electronic ballasts. Simply point the Discriminator at a light fixture, then press and hold the grey button until the LED on the Discriminator illuminates.

☑ ***Look for five types of existing lighting to replace:***

Linear fluorescent T12 lamps
Incandescent bulbs
Mercury vapor - high and low bay
Metal halide - high and low bay
Incandescent EXIT signs

Linear fluorescent T12 lamps EXAMPLE

☑ **Identify the existing lighting type**
Example: T12 fluorescent

☑ **Determine the length of the fixture**
Example: 4 feet

☑ **Find the equipment description and wattage.** You can look at the existing bulb or replacement bulbs, or ask the maintenance supervisor to find this information.
Example: Description - F40T12; wattage - 92

☑ **Count the number of bulbs to determine code**
Use the existing lighting tables to identify code.
Example: Code - 8013

☑ **Count the number of fixtures**
Example: 10

☑ **Enter the description, code, quantity of fixtures and per fixture watts on Page 3 of the application under "old equipment"**

Example of "old equipment" section on application.

OLD EQUIPMENT			
A	**B**	**C**	**D**
Description	Code	Qty of Fixtures	Watts per Fixture
F40T12	8013	10	92

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The lighting audit walk-through checklist

Incandescent, mercury vapor or metal halide EXAMPLE

- **Identify the existing lighting type**
  Example: incandescent
- **Determine the wattage** You can look at the existing bulb or replacement bulbs, or ask the business employee or purchasing department to find this information.
  Example: 40 Watt
- **Count the number of fixtures**
  Example: 10
- **Enter the description, code, quantity of fixtures and per fixture watts on Page 3 of the application under "old equipment"***

Lamp wattage

Example of "old equipment" section on application.

OLD EQUIPMENT			
A	**B**	**C**	**D**
Description	Code	Qty of Fixtures	Watts per Fixture
40 watt	8061	10	40

**Use the "existing lighting tables" to assist in determining description and code*

Incandescent EXIT sign EXAMPLE

- **Identify the existing lighting type**
  Example: incandescent EXIT sign
- **Determine the wattage**
  Refer to the existing lighting table to reference this information. You can view the bulbs in the EXIT sign by looking up through the opening at the bottom (see photo at right)
  Example: 15 Watt - 2 lamp incandescent = 30 Watt
- **Count the number of signs**
  Example: 10
- **Enter the description, code, quantity of fixtures and per fixture watts on Page 3 of the application under "old equipment" ***

Light bulbs can be identified by looking here

Example of "old equipment" section on application.

OLD EQUIPMENT			
A	**B**	**C**	**D**
Description	Code	Qty of Fixtures	Watts per Fixture
15 Watt 2 lamp incand.	8091	10	30

**Use the "existing lighting tables" to assist in determining description and code*

Introduction to lighting *concepts and terms*

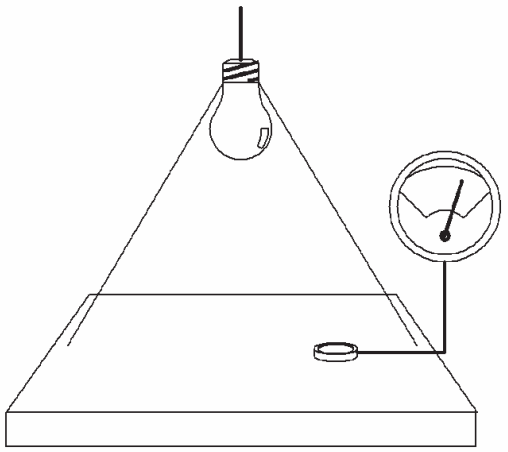
What is a foot-candle?

A foot-candle (fc) is the unit used to measure the amount of light hitting a surface from 30 degrees above the horizontal plane of the surface. Foot-candles are a common unit of measurement used to calculate adequate lighting levels of work spaces in buildings or outdoor spaces.

The Illuminating Engineering Society of North America (IESNA) sets suggested standards of foot-candle illumination in the United States. There are tools available to automatically calculate the foot-candles for you.

What is a lumen?

Lumens are the units for measuring the amount of light emitted by a source.



Example of how foot-candles are measured

Color temperature of fluorescent lamps

Light color is measured on a temperature scale referred to as Kelvin (K). A lower Kelvin rating indicates a warm, yellowish light and a higher Kelvin rating produces a cooler, bluish light.

Warm White, Soft White	Cool White, Bright White	Natural or Daylight
The standard color of incandescent bulbs.	Good for kitchens and work spaces.	Good for reading.
2700K - 3000K	*3500K - 4100K*	*5000K - 6500K*

Source: US Environmental Protection Agency, ENERGY STAR program

Look for the Kelvin rating on the bulb package before you purchase to be sure it matches the color and mood you would prefer for your rooms. For a yellowish light, look for bulbs rated at 2700-3000 Kelvin; for a whiter light, look for bulbs rated at 3500-4100 Kelvin; and for a bluer white light, look for bulbs rated at 5000-6500 Kelvin.

Cool light is usually preferred for visual tasks because it produces a higher contrast than warm light. Warm light is usually preferred in living rooms, dining rooms and recreation rooms.

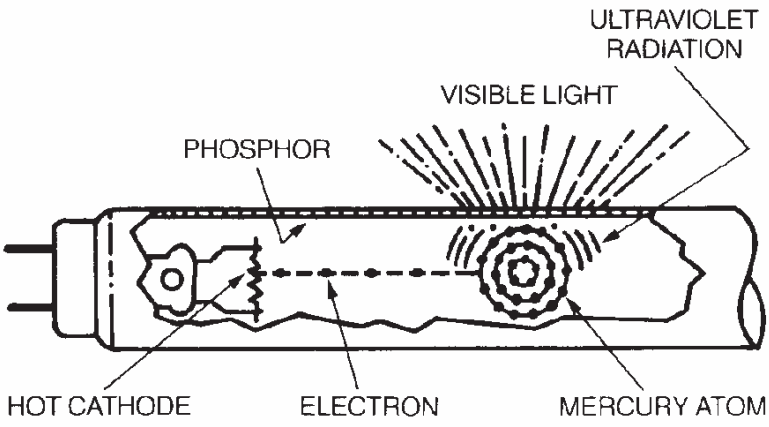
A color temperature of 2700–3600 Kelvin is generally recommended for most indoor general and task lighting applications.

Existing business lighting

Fluorescent Lamps

Fluorescent lighting is the "standard" technology for lighting spaces such as offices and classrooms and is up to four times more efficient than the incandescent lamp. However, older obsolete fluorescent lighting systems can result in poor light quality and flicker. Advancements in fluorescent lighting systems have resulted in the introduction of new systems that provide improved energy efficiency, lighting quality and design flexibility.

The primary components of standard fluorescent lighting systems are the ballast, which modifies incoming voltage and controls electrical current, and the lamp (bulb or tube), the source of artificial light.



Above is a cutaway of a fluorescent tube showing the interworkings of the equipment.

The work horse of commercial lighting since the 1920s has been the fluorescent lamp. Fluorescent bulb technology comes in a variety of diameters (see sidebar) and lengths, including two-foot through six-foot tubes and eight-foot tubes.

Recent versions of this lamp are smaller in diameter, more efficient and higher quality. By varying tube size and shape, gas mixtures, pressures and phosphor coating materials, numerous shaped lamps, efficiencies and color options are made possible.

Magnetic ballasts

Magnetic ballasts are common and still used extensively today due to their low initial cost. However, these ballasts are considerably less efficient than new electronic ballast designs and are prone to flicker and humming, particularly as they age. Magnetic ballast fluorescent lighting systems are vintage technology dating back to 1939.

Are you still using T12 fluorescent technology?

T12 lamps are an older technology and should be replaced with T8 or T5 lamps in your facility. T8 and T5 lamps provide superior lighting quality and last longer, while improving efficiency by 30 percent. Fixtures also operate on electronic ballasts that are more efficient than older magnetic ballasts, which are common among fixtures using T12 lamps.

Fluorescent bulbs come in a variety of diameters

T12 tubes = 1.5 inch diameter

T8 tubes = 1 inch diameter

T5 tubes = 5/8 inch diameter

Magnetic ballast

Existing business lighting

Standard incandescent lamp identification

Incandescent lamps are commonly used in many applications throughout a facility, including recessed "can" fixtures, wall sconces, suspended fixtures, task lighting, accent and "track" lighting, illuminated exit signs and exterior lighting. Typically you will find the wattage of each lamp stamped somewhere on the incandescent bulb.

Are you still using incandescent A-lamps? Incandescent lamps are one of the most inefficient lighting sources available. This is the common incandescent that can be found everywhere. A-lamps can be replaced with compact fluorescent lamps (CFLs) to achieve a 75 percent energy savings. CFLs also last longer than incandescent lamps, which will reduce maintenance costs, labor and inventory demands.

To qualify for a rebate when replacing an incandescent with a CFL, the CFL must be a permanent fixture.

Screw-in CFLs do not qualify for a rebate. See the new lighting tables for the list of qualifying CFLs.

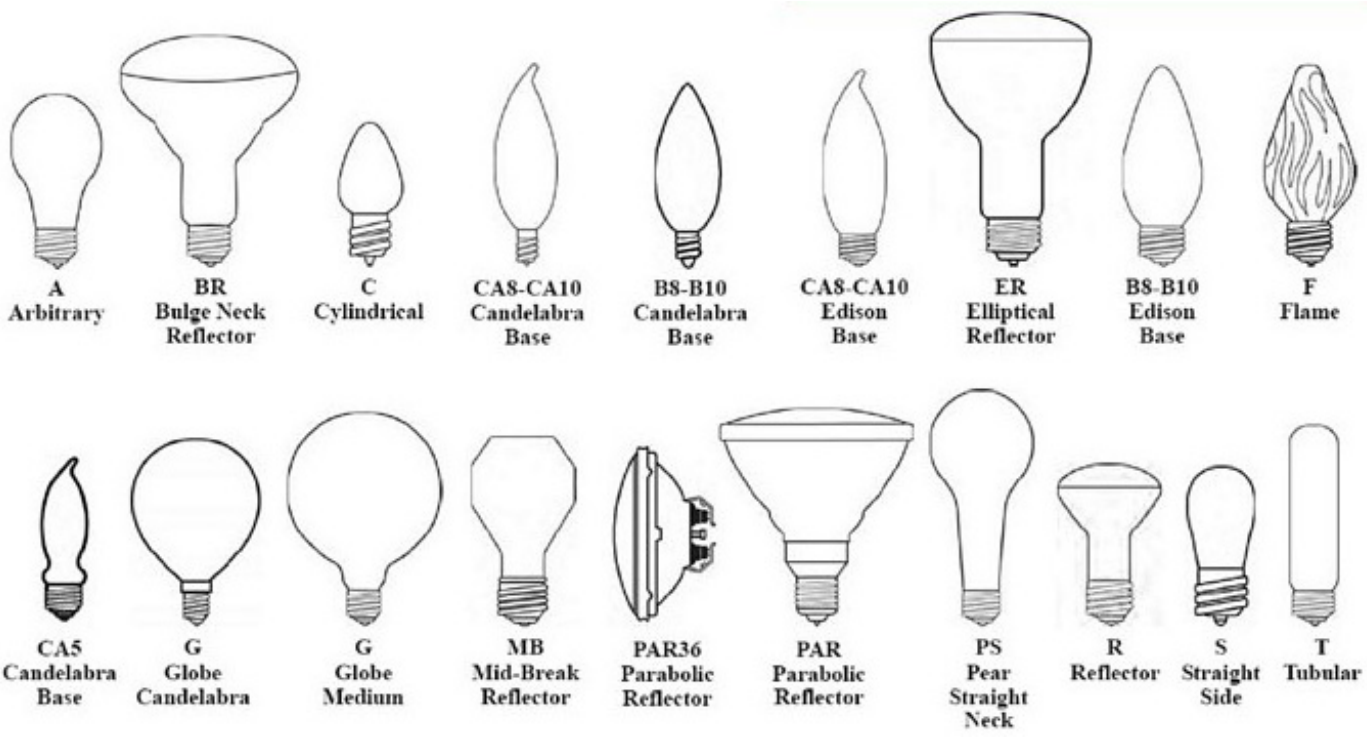
Standard incandescent bases:

Medium

Candelabra

Mogul

Identification guide for
Incandescent bulbs, bases and filaments **to be replaced**



Existing business lighting

Conventional high-intensity discharge (HID) – *Mercury vapor and metal halide lamps*

Due to their intensity, HID lighting systems are useful for lighting large areas from high ceilings. However, older HID installations are often mercury vapor lamps, an extremely inefficient design. Like fluorescent lamps, HID systems have ballasts, and systems built before 1978 may contain potentially harmful substances such as PCBs (Polychlorinated biphenyls). HID lamps are commonly used in garages, warehouses, areas with high ceilings and exterior safety lighting.

Metal halide lights also take time for the temperature and pressure to build up in the arc tube, which means it takes a while for the light to warm up and fully turn on. The duration of warm-up depends on wattage. When power is momentarily interrupted, the lamp must cool down before it can fully turn back on. Because of the delay in these lights to fully turn on, many lights may stay on even when the room is not occupied to avoid delays in start-up, thus wasting even more energy. In addition, National Electric Code requires a back-up lighting system for all HID systems including metal halide lights.

You now have energy-efficient low and high bay lighting options. Metal halide lamps, a member of the high-intensity discharge (HID) family of lamps, produce high light output for their size, making them a compact, powerful and efficient lighting source. Originally created in the late 1960s for industrial use, metal halide lamps are now being replaced with energy-efficient low and high bay linear fluorescent systems.

High-intensity discharge fixtures

Outdoor - floodlights, parking lots, roadways

Low and high-bay applications - Industrial, gymnasiums, warehouses

Example of HID parking lot lights

Example of high-bay warehouse lights

New energy-efficient lighting *available for rebates*

Fluorescent T8 lamps

In 1981, the 32-watt T8 lamp was introduced in the United States, providing further improvements in fluorescent lamp technology. Today, the T8 lamp is the standard for retrofitting and new construction and is a popular replacement for the 34-watt T12 lamps. All major lamp manufacturers market T8 lamps of various wattages, and they are readily available in a variety of linear and U-shaped configurations.

Lighting manufacturers have been improving T8 fluorescent lamps for many years by enhancing key performance characteristics, including light output, efficacy, rated life, maintained light output and color.

Fluorescent T8 tubes

Fluorescent T5 tubes

Fluorescent T5 lamps

The T5 lamp is an increasingly popular development in fluorescent lighting. In 1995, T5 fluorescent lamps entered the market in the United States. Recently, lighting designers have begun to specify such T5 luminaires for high-end new construction.

Standard T5 lamps are the most efficient fluorescent tube, 12-18 percent higher than T8 lamps, and offer higher intensity and potentially longer life. The lamps are constantly increasing in flexibility and are now applicable to a variety of task and accent lighting applications, as well as general lighting of larger spaces. The lamps operate on electronic ballasts and the peak light output at 35C (95F).

Hard-wired compact fluorescent lamps (CFLs)

CFLs today have come a long way from miniature straight-tube fluorescent lamps available historically. Modern CFLs use rare-earth phosphors for improved energy efficiency and color performance, and come in many varieties to enhance their application.

Hard-wired CFLs are a good replacement option for incandescent lamps, since the higher lumens per watt results in energy savings. They also don't require the ballast to be replaced when you change the bulb, and some hard-wired CFLs include dimmers or two-way switches. Another important benefit of replacing incandescent lamps with CFLs is the longer life of the CFL, which means less labor will go into replacing bulbs. CFLs are rated with a life of 10,000 to 20,000 hours, which is ten or more times the rated life of incandescent bulbs.

Use the four-to-one rule to choose the correct wattage when replacing incandescent lamps with CFLs. For example, replace a 60-watt incandescent with a 15-watt CFL.

Screw-base CFLs are not included in this rebate program as they have limited commercial applications, are not permanent and are less efficient than equivalent two-piece CFLs.

New energy-efficient lighting *available for rebates*

Induction lamps

Induction lamps, also called electrode-less lamps, consist of a coupling device that generates a magnetic field and a glass housing that contains the gases and phosphor coating — no electrodes required.

The main advantages of induction lighting are the ability to produce a substantial amount of light in a relatively compact package and a long lamp life, typically 100,000 hours, due to the elimination of the electrodes.

The major drawback of induction lighting is high installation cost, although in applications where maintenance costs are high, induction lighting systems can be cost-effective.

Lighting fixture or luminaire?

A light fixture is an electrical device used to create artificial light and/or illumination. A luminaire is a lighting fixture complete with the light source or lamp, the reflector for directing the light, an aperture (with or without a lens), the outer shell or housing for lamp alignment and protection, an electrical ballast, if required, and connection to a power source.

Light-emitting diode (LED)

Light-emitting diodes are solid-state electronic devices that convert electrical energy directly into visible light. They offer several advantages over conventional light sources. Advantages include vibration resistance and longer life, about 50,000 hours compared to 750-1,000 for typical incandescent bulbs.

LEDs are also extremely energy-efficient, using up to 90 percent less energy than incandescent bulbs and are environmentally friendly since they contain no mercury and have less disposal waste because of their longer life. LED products are rugged and more resistant to breakage, perform well in cold climates and can be dimmed to produce a more pleasing light. LEDs also turn on faster, providing quicker response in applications like automotive brake lights.

Lighting Fixtures

◀ 4-foot wrap-around surface mount fluorescent

▶ 6 inch recessed downlight (can) incandescent

◀ 2x2 recessed lensed fluorescent

▶ 2x2 recessed parabolic fluorescent

New energy-efficient lighting *available for rebates*

Electronic ballasts

Electronic ballasts are electrical devices that start and operate fluorescent and HID lamps. Ballasts are not generally interchangeable with lamps or lamp types. Incorrect ballasts can reduce lamp life and/or light output if they start the lamp at all. Ballasts consume a small amount of energy (sometimes referred to as "ballast loss").

Electronic ballast functions include:

1. Provides correct voltage to start arc discharge
2. Limits lamp current to design value
3. Provides energy to heat cathodes (fluorescent rapid-start and program-start only)

Exit signs

Exit signs are an excellent low-cost, low-labor opportunity to increase the energy efficiency and safety of your facility. The continuous operation of exit signs provides short payback in energy costs and significantly reduces maintenance costs.

Replacing incandescent exit signs that operate at about 40 watts per sign, or fluorescent exit signs that operate between 12 and 20 watts per sign, with an ENERGY STAR qualified exit sign can increase the energy efficiency of your exit signs by 3 to 8 times!

Many ENERGY STAR qualified exit signs are based on light-emitting diode (LED) technology, many of which use only three or fewer watts. You may also be able to retrofit your exit sign with LED technology while retaining the housing.

To learn more about ENERGY STAR qualified and other energy-efficient exit sign technologies visit www.energystar.gov.

Occupancy sensor types

Infrared: A passive system that senses a heat source that is moving. The sensor is a line-of-sight device that cannot detect motion around partitions or corners and is more sensitive to cross-motions.

Ultrasonic: An active system that transmits a high frequency (16 - 50 kHz) signal and detects deviations in the return signal. Coverage tends to fill the space that you're intending to control, but can also go beyond that space's boundaries, resulting in unwanted detections.

Different models provide different areas of coverage and features. Sensors mounted on the ceiling or high on a wall provide the best overall room coverage. Switch replacement sensors are convenient retrofits but have limited application since they are prone to tampering and can't always "see" who's in the room.

Daylight sensor: Light-sensitive controls turn the lights on and off automatically based on daylight, thus producing convenient energy savings. Timers can be used, but don't react to changing daylight conditions.

Lamp and ballast disposal requirements

Lamp disposal

A lighting upgrade will most likely require the removal and disposal of lamps and ballasts. Group relamping every several years and occasional spot relamping as necessary will also create additional lamp waste. Some of this waste may be hazardous and must be managed according to applicable federal, state, and local requirements.

To get a list of lamp and ballast recyclers in the United States visit www.lamprecycle.org, which is maintained by National Electrical Manufacturers Association (NEMA) and provides a very detailed review of the Universal Waste Rule. On the Web site you can also enter your zip code along with the item you would like to dispose of to get a list of disposal sites in your area. Many states, counties, and municipalities also have Web sites dealing with disposal rules.

Ballast recycling regulations

For ballasts, the proper method of disposal depends on the type and condition of the ballasts. Generally, ballasts manufactured after 1978 contain the statement “No PCBs,” meaning they have not been found to contain polychlorinated biphenyls (PCBs). The disposal of PCBs is regulated under the Toxic Substances Control Act (TSCA). Other factors controlling the disposal of ballasts will depend on the regulations and recommendations in effect in the state in which they are removed or discarded. Because disposal requirements vary from state to state, check with regional, state, or local authorities for all applicable regulations.

Recycling is also required for electronic ballasts as they are considered electronic waste. For more information about disposal regulations and recycling options, visit www.energystar.gov.

Helpful Web sites

www.lighting-solutions.org: This site provides "how to" guidance on ways to improve your building interior lighting efficiency and reduce your energy consumption without compromising quality design criteria.

Strategies include the use of high performance commercially available products, daylighting and lighting controls, all within the context of integrated designs supported by performance specifications.

www.energystar.gov: Click on the Buildings & Plants tab for extensive information about energy-efficient buildings.

www.lamprecycle.org: On this site you can find a recycling location for many products by entering your zip code, city or state. You will also find a wealth of information about disposal requirements of lamps.

www.energysavers.gov/your_workplace: Saving energy in the workplace results in saving money. This site provided by the U.S. Department of Energy (DOE) will show you how to use energy in your workplace more efficiently.

Energy Cost Calculators for Energy-Efficient Products
The calculators on this link allow you to enter input values (e.g., utility rates, hours of use, etc.) to estimate energy cost savings from buying more efficient products. Some are Web-based tools; others are Excel spreadsheets provided by ENERGY STAR® for download. http://www1.eere.energy.gov/femp/technologies/eep_eccalculators.html

www.lightingtaxdeduction.com/tax_deduction.html: Guide & FAQs to the Energy Efficient Commercial Buildings Lighting Tax Deduction information.

www.dsireusa.org: DSIRE is a comprehensive source of information on state, local, utility and federal incentives and policies that promote renewable energy and energy efficiency. Click on your state to find out about rebates for your business or home.

Frequently asked questions

What lamps are eligible for replacement?

1. Incandescent
2. T12 fluorescent
3. Mercury vapor
4. Metal halide
5. High pressure sodium

What lamps are eligible for a rebate?

1. Retrofit T8 from T12
2. Super T8 (3100 lumen output)
3. T5
4. Cold cathode
5. Induction
6. LED (light-emitting diode)
7. Exit signs, occupancy sensors and photo cells
8. Two-piece CFLs

What is high-bay lighting?

High-bay lighting is used in high-ceiling areas to light surfaces more than 15 feet away.

What is low-bay lighting?

Low-bay lighting is used in low-ceiling areas to light surfaces less than 15 feet away.

What does "T8" mean?

The "T" designation in fluorescent lamp stands for tubular, the shape of the lamp. The number immediately following the T gives the diameter of the lamp in eighths of an inch. A T12 lamp is therefore twelve-eighths of an inch, or one and a half inches in diameter. A T8 lamp is eight-eighths of an inch, or one inch in diameter. A T5 lamp is five-eighths of an inch in diameter.

What are the color characteristics of T8 and T5 lamps?

T8 and T5 lamps achieve both improved color rendering and high efficacy by employing rare-earth phosphors. The correlated color temperature (CCT) and color rendering index (CRI) of the lamps is controlled by varying the selection of phosphors. The CRI of T8 and T5 lamps can be specified from 70 to as high as the mid-90's. Every lamp manufacturer has a product coding system denoting CRI, which may require a catalog to decipher. For great lighting quality, specify a CRI of at least 80.

Do T8 lamps require a special ballast or fixture?

T8 lamps require an electronic ballast specifically designed to operate lamps at a lower current than T12 lamps. When T12 lamps are replaced with T8 lamps, the ballast must also be replaced. When you install an electronic ballast for optimum light quality and efficiency, electronic ballasts don't flicker or hum, and they use less power. T12, T10 and T8 lamps can all use the medium bi-pin base, which allows T8, and T10 lamps to fit into the same luminaires as T12 lamps of the same length. T5 lamps have a different base and are shorter than T8s, so new lumenaires are needed. Electronic ballasts operate fluorescent lamps at much higher frequencies (20KHz and up) than the standard 60 Hz at which magnetic ballasts operate lamps. Because of the common .88 ballast factor, many electronic ballasts provide a slight reduction in light output while using significantly less power compared to magnetic ballasts, which generally have a ballast factor of .94. Electronic ballasts with higher ballast factors (as high as 1.2) produce more light.

Electronic ballasts offer lots of advantages, such as no flicker, less heat, much less noise, and the ability to operate as many as four lamps on a single ballast. Some offer dimming, soft start, and better power quality characteristics as well.

What are the savings from using T8 lamps?

T8 lamps used with electronic ballasts will typically use about 32 percent less energy than the same lumenaires with T12 and magnetic ballasts.

Frequently asked questions

How long do T8 lamps last?
T8 lamps have the same 20,000-hour plus rated lamp life as standard T12 lamps. Frequent on/off cycles can reduce fluorescent lamp life. Using programmed start or dimming ballasts can increase lamp life to as much as 30,000 hours. T8 lamps also exhibit a slower decline in light output over time, relative to T12 lamps. At 40 percent of their rated life, standard T12 lamps only produce about 80 percent of their initial rated light output, compared to about 90 percent for T8 lamps.

How do I get started?
Contact your local cooperative, and follow the nine steps on Page 5 of the Business Lighting Program Guide. Be sure to fill out all the entire application.

Is there a checklist to help me do a walk-through lighting audit?
Yes. See Page 5 of the Business Lighting Program Guide.

How long will the program be available?
Each year the program will be evaluated with a 6-month lead time to determine the availability of rebate funds

Will the rebate amounts change?
Rebate amounts will be reviewed in December of each year and any changes will be posted on the "Lighting Tables for New Equipment" before January 1.

Look for the specific year on the lower right hand portion of the table. For example, rebates valid for 2012 will say "Program year: 2012"

Where can I find more information about the lighting program?
Contact your local co-op for information about the program.

Where can I find information on lighting that is not included in the lighting tables?
See the links on Page 15 of the Business Lighting Program Guide.

Can a business with fewer than ten fixtures combine with other businesses in the same shopping plaza in order to be eligible for the program?
Yes.

What is typical payback time for a lighting retrofit?
On average, 1-3 years. Energy efficient lighting retrofits are one of the best investments for improving your bottom line.

What happens if we don't know what wattages or types of lighting exist in the building?
You can inspect the lighting fixture/bulbs yourself or have a lighting contractor assist.

What do I do if the existing lighting doesn't match anything in the tables?
You may match to the closest dimensions, bulb count and wattages. The particular lighting technology type must match to qualify.

What is the timeframe for completing my lighting project after applying?
Twelve months after application approval.

Glossary

Ballast
A device that limits the amount of current flowing in an electrical circuit. The most common ballasts used in lights are: Magnetic, Electronic and Mechanical.

Color Rendering Index
The Color Rendering Index (CRI) numerically measures how a light source makes the color of an object appear to human eyes and how well subtle variations in color shades are revealed, compared to a reference source. A higher value CRI (up to 100 for natural light, traditional incandescent light bulbs and some halogens) gives a better color rendering.

Compact fluorescent
A compact fluorescent lamp (CFL) produces light the same way as a standard fluorescent lamp. A CFL has a small diameter tube that is arranged in a shape and style that is more compact than a standard fluorescent lamp.

Efficacy light efficiency
Termed 'efficacy' and is measured in light output per unit of electrical input level, or lumens per Watt. In general, a higher efficacy means a higher efficiency. Each lamp type has different typical efficacy, and some brands of light far outperform other brands.

Foot-candle
Foot-candle (FC) is the measure of light level in US lumens. FC = lumens/square feet, measured with a light meter. Lux is the international unit, 1 FC = 10 lux.

Halogen
A halogen lamp is a type of incandescent lamp, but they are longer lasting than standard incandescent lamps. This lamp also uses a tungsten filament; however it is enclosed in a halogen gas-filled (iodine or bromine) quartz capsule and is operated at a higher temperature than an incandescent lamp.

High Intensity Discharge
A high intensity discharge (HID) lamp produces light by an electrical arc discharge between two tungsten electrodes in a sealed arc tube mounted within an outer bulb. This lamp requires a ballast to start and regulate the arc. There are several types of HID lamps, including mercury vapor, metal halide, and high pressure sodium lamps.

Illumination
The amount of light emitted from a lamp is measured in lumens. The amount of light hitting a surface is measured in lux, or lumens per square meter. Different work tasks require different levels of lighting.

Glossary

Incandescent
An incandescent lamp produces light by applying electrical current to a tungsten filament. The filament is mounted in a glass bulb that is filled with an inert gas such as nitrogen and/or argon. The filament when heated by the current emits visible light. Incandescent lamps are energy inefficient and only convert five to ten percent of the input energy into visible light with the rest converted to heat.

Lamp
The component of the luminaire that produces light, for example, an incandescent light bulb.

Lumen
Lumen is the unit used to quantify the total amount of light produced by a lamp (bulb or tube). Lamps are rated by total lumens.

Luminaire
The assembly of lamp, reflector, aperture, housing, ballast and power connection.

Temperature
A light's color relates to the temperature of the source, although the light spectrum produced is also of consideration. A range of choices of temperature are available that affect the perceived color warmth. They are generally classified as warm white (reddish 3000K), daylight (white), or cool white (bluish 4000K). Daylight at noon has a high ("white") temperature of 5500K, while the incandescent lamps that people have grown accustomed to provide a lower temperature ("redder") color.

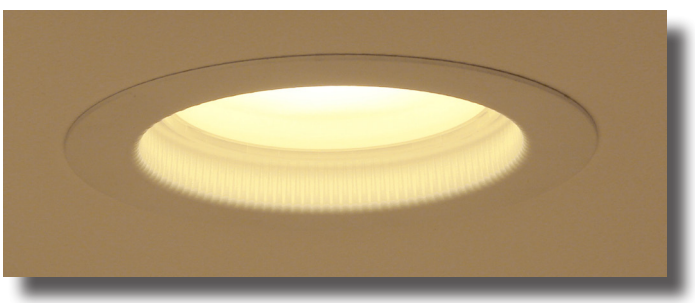
Standard fluorescent
A fluorescent lamp consists of a sealed gas-filled tube. The gas in the tube consists of a mixture of low pressure mercury vapor and an inert gas such as argon. The inner surface of the tube has a coating of phosphor powder. When an electrical current is applied to electrodes in the tube, the mercury vapor emits ultraviolet radiation which then causes the phosphor coating to emit visible light (the process is termed fluorescence).

A ballast is required to regulate and control the current and voltage. Two types of ballasts are used, magnetic and electronic. Electronic ballasts have several characteristics that make them attractive. They are more energy efficient, they permit lamps to start quickly, and they eliminate lamp flicker.

Walk through audit
The first step to a successful lighting upgrade is the lighting survey or audit. In this stage, which is essential to proper planning, the member and co-op representative gather and organize information about the existing lighting system and how it is used. Information that is needed for the audit:

- Hours of operation
- Type and size of fixtures
- Number of fixtures (hand-held mechanical counters can help)
- Number of lamps per fixture
- Type of lamps – T12, incandescent, etc
- Type of ballasts – magnetic or electronic

Watts
The energy of the electrical input per second is measured in watts.



For more information contact: