Recommended Light Levels by Space

|  |  |  |
| --- | --- | --- |
| **Room Type** | **Light Level (Foot Candles)** | **Light Level (Lux)** |
| Locker Room | 10-30 FC | 100-300 **lux** |
| Lounge / Breakroom | 10-30 FC | 100-300 **lux** |
| Mechanical / Electrical Room | 20-50 FC | 200-500 **lux** |
| Office - Open | 30-50 FC | 300-500 **lux** |

The three most common **energy**-**efficient lighting** types are Halogen Incandescent **Lights**, Compact Fluorescent **Lamps** (CFL), and **Light** Emitting Diodes (LED). Each of them comes in a variety of wattage **power**, **light** spectrum color, and size.

Energy-efficient lighting design principles include the following:

* More light is not necessarily better: light quality is as important as quantity
* Match the amount and quality of light to the performed function
* Install task lights where needed and reduce ambient light elsewhere
* Use energy-efficient lighting components, [controls](https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/lighting-controls), and systems
* Maximize the use of [daylighting](https://www.energy.gov/energysaver/daylighting).

Here are some basic methods for achieving energy-efficient indoor lighting:

* Install [fluorescent](https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/fluorescent-lighting) or [LED](https://www.energy.gov/energysaver/led-lighting) light fixtures for all ceiling- and wall-mounted fixtures that will be on for more than 2 hours each day, such as kitchen and living room, bathroom, hallway, and other higher-demand locations.
* Consider installing fluorescent or LED fixtures, rather than using fluorescent or LED replacement lamps in incandescent fixtures.
* Use CFLs or LEDs in portable lighting fixtures that are operated for more than 2 hours a day.
* Use ENERGY STAR® labeled lighting fixtures.
* Use [occupancy sensors](https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/lighting-controls) for automatically turning on and off your lights as needed.
* Consider light wall colors to minimize the need for artificial lighting.
* If you are using recessed lights in a ceiling with an unconditioned space above it, use only Underwriters Laboratory (UL) approved fixtures that are airtight, are IC (insulation contact) rated, and meet ASTM E283 requirements.

**Outdoor Lighting Design**

When designing outdoor lighting, consider the purpose of the lighting along with basic methods for achieving energy efficiency.

Outdoor lighting for homes generally serves one or more of three purposes:

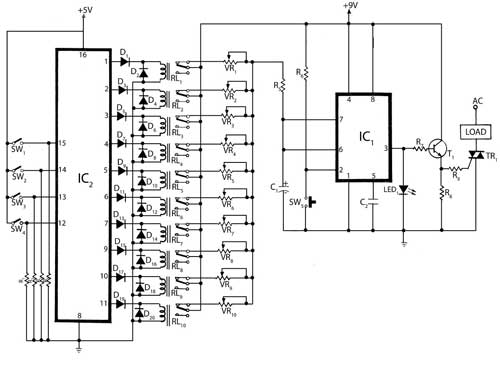
* Aesthetics: Illuminate the exterior of the house and landscape
* Security: Illuminate the grounds near the house or driveway
* Utility: Illuminate the porch and driveway to help people navigate safely to and from the house.

Here are some basic methods for achieving energy-efficient outdoor lighting:

* Security and utility lighting does not need to be bright to be effective.
* Use [LED](https://www.energy.gov/energysaver/led-lighting) or [fluorescent](https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/fluorescent-lighting) lights unless [incandescent lights](https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/incandescent-lighting) are automatically controlled to be on for just a few minutes each day.
* Consider flood lights with combined [photosensors and motion sensors](https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/lighting-controls) in the place of other security lighting options.
* Make sure outdoor light fixtures have reflectors, deflectors, or covers to make more efficient use of the light source and help reduce light pollution.
* Use timers and other [controls](https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/lighting-controls) to turn decorative lighting on and off.
* Use [outdoor solar lighting](https://www.energy.gov/energysaver/save-electricity-and-fuel/lighting-choices-save-you-money/outdoor-solar-lighting) where applicable.

The **programmable timer** is a simple **circuit** in the series of a **timer**. This **timer circuit** is used to **switch** ON/OFF a device. The time period of this **circuit** is from 8 seconds to 2 hours. The **programmable timer** works with the single input and in some other conditions, it may use a pair of signals.

This circuit is constructed by two integrated circuits. The [integrated circuit](http://www.edgefxkits.com/blog/relay-driver-circuit-using-uln2003-ic/) IC1 is a 555 IC and the IC2 is a 7442 IC. The 555 IC is used as a monostable mode, therefore when the output is low the pin-2 of the trigger is high and vice-versa. The preset time output is high when it is determined by [the value of capacitor](http://www.edgefxkits.com/blog/how-to-make-a-capacitor-and-its-working/) C1 with its corresponding preset through the switch SW5.



**Programmable Timer Circuit using 555 Timer IC**

The IC 7442 is a second integrated circuit (IC2), it is used for selecting the time duration period. There are 10 outputs from the programmable timer are connected to the 3-volt relay respectively. Where preset VR1 to VR10 are connected to an RL1 trough RL10 respectively. The following table shows the approximate binary codes. The resistor values of R1, R2, R3, R4, R6, R7 is equal to the 10Kohms. The capacitor values of C1 and C2 are 220 µF/25V, 0.01 µF respectively.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Preset** | **SW4 8** | **SW3 4** | **SW22** | **SW1 1** |
| **VR1** | 0 | 0 | 0 | 0 |
| **VR2** | 0 | 0 | 0 | 1 |
| **VR3** | 0 | 0 | 1 | 0 |
| **VR4** | 0 | 0 | 1 | 1 |
| **VR5** | 0 | 1 | 0 | 0 |
| **VR6** | 0 | 1 | 0 | 1 |
| **VR7** | 0 | 1 | 1 | 0 |
| **VR8** | 0 | 1 | 1 | 1 |
| **VR9** | 1 | 0 | 0 | 0 |
| **VR10** | 1 | 0 | 0 | 1 |

Programmable Digital Timer Circuit

A timer is a type of clock used for measuring the time intervals. The timers are classified into two different types like counting upwards and counting downwards. The designs of the timer are completely needed in the industry that means keeping time on certain devices and the timers are the mechanical devices used in the clockwork mechanisms. In the market, the digital logic circuit has more popular with less price and individual timers are implemented with the single chip circuit design. The development of two electromechanical timers is designed to produce more precise time measurement.

Energy efficient windows are an important consideration for both new and existing homes. Heat gain and heat loss through windows are responsible for 25%–30% of residential heating and cooling energy use.

If you are selecting windows for new construction or to replace existing windows, it's important to choose the most efficient windows you can afford that work best in your climate.

If your existing windows are in good condition, taking steps to reduce the energy loss through windows can make your home more comfortable and save you money on energy bills.

You have two broad options if you hope to reduce the amount of energy lost through your windows and improve the comfort of your home:

1. Update your existing windows to improve efficiency
2. Replace your windows.

## Update Existing Windows to Improve Efficiency

If your windows are in good condition, taking steps to improve their efficiency may be the most cost-effective option to increase the comfort of your home and save money on energy costs. There are several things you can do to improve the efficiency of your existing windows:

* Check existing windows for [air leaks](https://www.energy.gov/energysaver/weatherize/air-sealing-your-home/detecting-air-leaks)
* [Caulk](https://www.energy.gov/energysaver/weatherize/air-sealing-your-home/caulking) and [weatherstrip](https://www.energy.gov/energysaver/weatherize/air-sealing-your-home/weatherstripping). Check out our do-it-yourself project to learn how to [weatherstrip double-hung windows](https://www.energy.gov/node/387679).
* Add window treatments and coverings. Learn more about your [window treatment options](https://www.energy.gov/energysaver/energy-efficient-window-attachments).
* Add [storm windows](https://www.energy.gov/energysaver/storm-windows) or panels
* Add [solar control film](https://www.energy.gov/energysaver/energy-efficient-window-attachments)
* Add exterior shading, such as [awnings, exterior blinds](https://www.energy.gov/energysaver/energy-efficient-window-attachments), or overhangs.

With any efficiency improvements, take steps to ensure proper installation and [check for air leaks](https://www.energy.gov/energysaver/weatherize/air-sealing-your-home/detecting-air-leaks) again after making the improvement.

## Replace Your Windows

If you decide to replace your windows, you will have to make several decisions about the type of windows you purchase and the type of replacement you will make.

You may have the option of replacing the windows in their existing frame; discuss this option with your window retailer and installer to find out if it will work for you.

You will also need to decide what features you want in your windows. You will need to decide on the following:

* Frame types
* Glazing type
* Gas fills and spacers
* Operation types

Visit the [Window Types](https://www.energy.gov/energysaver/window-types-and-technologies) page for more information on all of these options.

### Selection Process

In addition to choosing the window type, you also need to consider design, energy use and labeling, warranties, and proper installation.

First look for the ENERGY STAR label when buying new windows. Then review ratings on the [energy performance label](http://www.nfrc.org/energy-performance-label/) from the National Fenestration Rating Council (NFRC) to find the most efficient windows for your needs.

NFRC ratings are included on all ENERGY STAR certified windows and provide a reliable way to determine a window’s energy properties and compare products. Learn about [energy performance ratings](https://www.energy.gov/energysaver/design/windows-doors-and-skylights/energy-performance-ratings-windows-doors-and) for windows to understand how to read the labels and energy-use information.

The Efficient Windows Collaborative offers a selection process for both replacement windows and windows for new construction:

* [Selection process for replacement windows](http://www.efficientwindows.org/existing_process.php)
* [Selection process for windows for new construction](http://www.efficientwindows.org/new_process.php)

For more specific recommendations, download the [window selection fact sheets](http://www.efficientwindows.org/publications_factsheets.php) for your state.

Then use the window selection tools for [replacement windows](http://www.efficientwindows.org/existing_selection1.php) or [new construction](http://www.efficientwindows.org/new_selection1.php) to compare options based on your climate and home design.

### Window Selection Tips

* Look for the [ENERGY STAR](https://www.energystar.gov/products/building_products/residential_windows_doors_and_skylights) and [NFRC labels](http://www.nfrc.org/energy-performance-label/).
* In colder climates, consider selecting gas-filled windows with low-e coatings to reduce heat loss. In warmer climates, select windows with coatings to reduce heat gain.
* Choose a low U-factor for better ther­mal resistance in colder climates; the U-factor is the rate at which a window conducts non-solar heat flow.
* Look for a low solar heat gain coef­ficient (SHGC). SHGC is a measure of solar radiation admitted through a window. Low SHGCs reduce heat gain in warm climates.
* Select windows with both low U-factors and low SHGCs to maximize energy savings in temperate climates with both cold and hot seasons.
* Look for whole-unit U-factors and SHGCs, rather than center-of-glass U-factors and SHGCs. Whole-unit numbers more accurately reflect the energy performance of the entire product.

Learn more about [energy performance ratings](https://www.energy.gov/energysaver/design/windows-doors-and-skylights/energy-performance-ratings-windows-doors-and) for windows.

### Installation

Even the most energy-efficient window must be properly installed to ensure energy efficiency and comfort. Have your windows installed by trained professionals according to manufacturer’s instructions; other­wise, your warranty may be void.

Window installation varies depending on the [type of window](https://www.energy.gov/energysaver/window-types-and-technologies), the construction of the house (wood, masonry, etc.), the exterior cladding (wood siding, stucco, brick, etc.), and the type (if any) of weather-restrictive barrier.

Windows, flashing, and [air sealing](https://www.energy.gov/energysaver/weatherize/air-sealing-your-home) should all be installed according to the manufacturer’s recommendations to perform correctly.

The Building America Solution Center offers guidance on [complete window and frame replacement](https://basc.pnnl.gov/resource-guides/complete-window-and-frame-replacement). Consult this guide with your window professional to ensure proper installation.

## Purpose of uninterruptible power supply (UPS)

The purpose of UPS is to provide guidance **for facilities engineers in selecting, installing, and maintaining an uninterruptible power supply (UPS) system** after the decision has been made to install it.

UPS selection, installation and maintenance guide (photo credit: habrahabr.ru)

This technical manual has been prepared to provide generic guidance to agencies responsible for the selection, installation, and maintenance of UPS systems at Command, Control, Communications, Computer, Intelligence, Surveillance, and Reconnaissance (**C4ISR**) facilities.

Although it is written mainly for C4ISR facilities, which require a higher level of reliability, it could also be utilized as a reference in similar applications.

### Scope

The process for identifying the need for an UPS system, selecting, installing, and maintaining the UPS system are covered.

**Covered are:** theory and principles of static and rotary UPS systems, design and selection of UPS, installation and testing of UPS, maintenance and operation of UPS systems, principles of static and rotary UPS, UPS system rating and sizing selection, operations/maintenance, batteries, troubleshooting, harmonic distortions, grounding, checklists,  
and acceptance testing.

### Principles and configurations

### An UPS system is **an alternate or backup source of power** with the electric utility company being the primary source. The UPS provides protection of load against line frequency variations, elimination of power line noise and voltage transients, voltage regulation, and uninterruptible power for critical loads during failures of normal utility source.

An UPS can be considered **a source of standby power or emergency power** depending on the nature of the critical loads.

**The amount of power that the UPS must supply also depends on these specific needs. These needs can include:**

* emergency lighting for evacuation,
* emergency perimeter lighting for security,
* orderly shut down of manufacturing or computer operations,
* continued operation of life support or critical medical equipment,
* safe operation of equipment during sags and brownouts, and
* a combination of the preceding needs.

THE ELECTRICITY ACT, 2003 [No. 36 OF 2003] An Act to consolidate the laws relating to generation, transmission, distribution, trading and use of electricity and generally for taking measures conducive to development of electricity industry, promoting competition therein, protecting interest of consumers and supply of electricity to all areas, rationalisation of electricity tariff, ensuring transparent policies regarding subsidies, promotion of efficient and environmentally benign policies constitution of Central Electricity Authority, Regulatory Commissions and establishment of Appellate Tribunal 2 Short title, extent and commencement Definitions and for matters connected therewith or incidental thereto. Be it enacted by Parliament in the Fifty- fourth Year of the Republic of India.

What is IER??
• The Indian Electricity Rules, 1956 was made under
section 37 of the Indian Electricity Act, 1910
• Now red...

IE rules mainly dealt with
 Appointment of inspectors & their duties.
 Licensing provisions.
 General safety requiremen...

• Under Section 36 (A) of the Indian Electricity Act 1910, a Board
called the Central Electricity Board is constituted and...

• The Indian electricity Rules are expected to serve the
interests of
• project administrators,
• licensees,
• electrical ...

 Every rule in the Indian Electricity Rules 1956 is related
either directly or indirectly to safety.
 Some of those that...

Rule 50
• Energy shall not be supplied, transformed, converted or
used unless the following provisions are observed.
• A s...

Special Provisions in respect of high
and extra high voltage Installations
• Rule 63:
• Approval of Inspector is necessary...

• Rule 66:
• Conductors shall be enclosed in a metallic covering and
suitable circuit breakers shall be provided to protec...

Provison’s in terms of OH line
Rule 77 Clearance of lowest conductor above ground across
street.
Low and Medium Voltage li...

Provison’s in terms of OH lines-
Rule 79 Clearance of low and medium voltage lines
from building
Vertical Clearance 2.5 m
...

Provison’s in terms of OH lines-
Rule 80 Clearance from building of high and extra
high voltage – Pitched Roof
Vertical Cl...

