

Improving office lighting

Opportunities exist to improve office lighting and reduce energy costs by up to 40% and improve the quality of the lighting in the office.

The Challenge

Did you know that lighting consumes about a third of the total energy used by your building?

If you lease office space and only pay directly for the "tenant energy" then lighting will account for at least half of your energy bills.

Lighting also has a profound effect on the feeling of well-being and productivity of office staff. So it makes sense to ensure that your office lighting is performing at its best and as energy efficiently as possible.

This guide provides an overview of the range of technologies and actions that can improve office lighting and reduce energy costs.

Opportunities

1. Turn off lights that are not needed

This is the simplest way of saving lighting energy, but it is an opportunity that is not always taken.

One reason may be a belief that fluorescent lamps use a burst of power when starting, or that frequent switching shortens their life. In fact the power used at start-up is equal to only a few seconds running time.

Switching the lamps off and on does shorten their life, but when they are switched off for five minutes or longer the energy saved compensates for the shortened lamp life.

So turning off the lights in your office or work area is worthwhile if you are going to be absent for longer than five minutes.

Label switches where multiple switches control open-plan office lighting can help, as it is then possible for people to turn off lights in their area.

2. Use daylight

Arrange desks near windows so people can use daylight, but ensure that users are not dazzled or distracted by direct sunlight through windows or reflections on the screen. Ideally, light for manual tasks should come from the "non-writing" side of the desk.

Switching must be arranged so people who can use daylight can also switch off the lighting near their workstation.

3. Maintain the lighting system

As lighting systems age, the light levels on the desks and other working surfaces can drop by over 50%. Factors include loss of output from the lamps, dirt on the reflecting and diffusing surfaces of the light fitting, and dirt on the room surfaces.

The first two factors can be offset by bulk-replacing the lamps and cleaning the fittings. Cleaning or repainting room surfaces is also desirable.

Light colours will raise illumination levels substantially.

In older installations, yellowed diffusers may drastically reduce light levels and should be replaced. Fittings installed in the 60s and 70s may contain toxic chemicals called PCBs. As it is no longer legal to use equipment containing PCBs, checks of older installations should be performed by an electrical contractor, and PCB containing equipment replaced.

4. Remove unnecessary lamps

Sometimes office rearrangement can mean areas used as passageways have more lighting than they need. In other areas, over-lighting can result from a design which provides too many fittings and lamps.

Energy savings of 5 - 15% can often be made by selectively removing lamps from these areas. A light-meter can be used to check that light levels are adequate. It is advisable to mark empty holders to avoid accidental re-lamping by maintenance personnel. Suitable stickers are available from EECA.

5. Use NG triphosphor fluorescent lamps

When lamps are bulk-replaced during periodic maintenance, triphosphor lamps should be used.

Triphosphor lamps, which were developed during the 1980s, have many advantages. These include higher light output for the same power consumption and lower rate of light loss as they age. Their improved colour rendering considerably improve the visual quality of working spaces.

The triphosphor lamp has been superseded by the new-generation (NO) triphosphor lamp, which has all the advantages of the original triphosphor lamp combined with even lower loss of light over the life of the lamp.

The number of lamps can be adjusted during the bulk re-lamp to optimise light levels and uniformity. A light meter is required to do this correctly.

6. Install high-efficiency reflectors

One of the most common light fittings used in commercial offices is the recessed "troffer" with a prismatic diffuser covering the lamps. Light is lost inside the fitting because of the box shape and, especially as the fitting ages, because the white paint does not reflect light efficiently.

Specially shaped reflectors of silver or aluminium can be custom-made and fitted behind the lamps. They improve the efficiency of the fitting by up to 40% and can allow further energy savings as fewer lamps are required. In older offices with poor lighting, light levels can be brought up to standard with no extra expenditure of energy.

7. Replace incandescent with fluorescent

Low-voltage and mains voltage tungsten halogen lamps use about four times the energy of fluorescent lamps to produce the same amount of light. Fluorescent lamps last four times as long as tungsten halogen lamps.

Tungsten halogen lamps are intended for display and flood-lighting, but are often misused as a source of general lighting.

A range of compact fluorescent fittings is available to replace tungsten halogen fittings. Another option is a conversion kit which allows the fitting to be converted to accept compact fluorescent lamps. In most commercial-building situations, the money saved in energy and by not having to replace lamps as often, repays the cost of the installation within three years. From then on, the continued savings are "free".

Compact fluorescent lamps are all triphosphor and are available in colours which match the warm colour of the

incandescent lamps they replace, or in cooler colours similar to those used in regular fluorescent office lighting.

Compact fluorescent lamps are available as a plug-in replacement for ordinary incandescent lamps. These can be an economic option, but sometimes are not compatible with the existing fitting. Consider replacing the entire fitting with one which suits the compact fluorescent lamps.

8. Fit timers or occupancy detectors

Timers that switch lights off after a pre-set period are a suitable solution in open plan offices or large conference rooms where it is difficult to make a particular individual responsible for turning off the lights at the end of the day. They can also be useful for isolated areas visited for short periods, such as stack rooms. Some timers give a warning before switching the lights off, and can be re-set if light is still needed. The lights can still be turned off manually, so labelling is also desirable if timers are mounted centrally.

Occupancy detectors are another solution in open-plan office areas and conference rooms where the lights are often left on when they are not needed.

The occupancy detectors turn the lights off if they have not detected movement for around 15 minutes, but turn them on again when anyone enters the space.

They are more expensive than timers, but are more effective at saving energy in areas where sections of the floor are vacant during the day, or in conjunction with a cleaning regime where all cleaners work on one floor at a time.

Take control of your lighting costs

Lighting costs \$4 to \$9 per square metre of office space a year. Most offices can save up to 40% of these costs and improve lighting by the following steps.

- Encourage staff to turn off lights that are not needed, and use daylight where possible
- Evaluate the condition of your lighting system and decide which of the measures mentioned in the leaflet apply to you
- Put the measures into practice

Key findings

1. Turn off lights that are not needed.
2. Use daylight.
3. Maintain the lighting system.
4. Selectively reduce the number of lamps in over-lit areas.
5. Use triphosphor fluorescent lamps.
6. Install high-efficiency reflectors.
7. Replace incandescent light fittings with fluorescent.
8. Fit timers or occupancy detectors.
9. Energy-saving measures 1 to 5 have been found to provide cost-effective savings in a large number of retrofit situations and should be the first to be carried out. Measures further down the list are cost-effective only under certain conditions, so the costs and benefits should be carefully weighed before deciding to implement them.
10. If electricity prices rise, all retrofit opportunities will become more cost-effective, but the order of effectiveness will stay the same.



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