

LED Lighting Fact Sheet

There has been a vigorous effort over the past several decades to replace inefficient lighting with more energy efficient options, including LEDs. Light-emitting diodes (LEDs) are now used in a large number of applications, including digital device screens, television screens, electronic billboards, automobile headlights, street lighting and light bulbs for residential, commercial and institutional lighting.

Here are the basics:

- LEDs are a type of solid-state lighting that use a semiconductor to convert electricity into light.
- Instead of watts, the light output or brightness of LEDs is measured in lumens.
- LED light bulbs use very little power and about 90% of the energy used is converted into visible light. Traditional incandescent bulbs actually convert 95% of energy to heat and only 5% into light!
- LEDs have a long life span (up to 50,000 hours).

But there is also a dark side to this new lighting technology.

LEDs produce significant amounts of blue light, which can cause harm to our eyes and disrupt our circadian rhythm. Blue light encompasses shorter wavelengths and is a higher energy emitter, similar to ultraviolet light, except that ultraviolet (UV) light is invisible and blue light appears white to the naked eye. Until relatively recently, our only exposure to blue light was the sun, which is considered a short term exposure. LEDs contain about 35% of harmful blue light and we are exposed to it more and more in our homes, workplaces and schools and in our daily use of devices with screens.

LED bulbs contain lead, arsenic, nickel and copper, in different amounts depending on the bulb. However, any of these toxic metals can create a health hazard if they break in the home or at a traffic accident site. Clean up crews are often not warned of the potential hazard and the public has not been instructed to clean up broken LED bulbs with extreme care. According to the experts, LED makers could easily reduce the concentrations of heavy metals in their products or even redesign them with truly safer materials if state or federal regulators required them to do so.



Exposure to LED lighting can cause both short and long-term effects on our health.

The Color Spectrum

Light color, or color temperature, is measured using the Kelvin scale, which has a typical range of 1,000K to 10,000K. LEDs are available in warm colors (below 3500K) to match the yellowish light of incandescent bulbs, but they also come in white-blue cool colors (5500K to 6500K) which most closely resemble daylight. In layman's terms, color temperature is used as a method of describing the warm or cool color characteristics of a light source.

LEDs and our eyes

Cumulative exposure to LED bulbs and the myriad of devices with screens we gaze at every day can cause both short and long term effects on eye health. Short term effects include eye strain, headaches, and dry and burning eyes. More serious long term effects include retinal cell damage, cataracts and age related macular degeneration (AMD), which are typically related to aging, but are now being diagnosed at younger ages.

LEDs and circadian rhythm

Exposure to LEDs in the form of lighting or digital device screens can interrupt our natural circadian rhythm or sleep/wake cycle, leading to poorer quality or insufficient sleep. Darkness at night is also critical for the production of melatonin in the brain's pineal gland. Melatonin regulates hormones as well as performing various other protective and vital functions in our bodies. Regular suppression of the production of melatonin is known to disrupt our biological clock and be a factor in serious health problems. Low levels of melatonin have been associated with cardiovascular disease, high blood pressure, obesity and diabetes.

Blue-light and cancer

A study published in 2017 on outdoor light at night and breast cancer was conducted by the Harvard School of Public Health and four other medical schools. Its findings suggest that exposure to residential outdoor light at night may contribute to invasive breast cancer risk.

The American Medical Association (AMA) has also weighed in, recommending intensity thresholds that minimize blue-rich lighting to protect public health.

What can you do?

- Replace LED and compact fluorescent bulbs (CFLs) with long-life incandescent bulbs wherever possible. If you must use LEDs, choose bulbs with a lower color temperature of 2700K.
- Avoid looking at bright screens beginning two to three hours before bedtime.
- Expose yourself to natural light during the day, which will boost your ability to sleep at night, as well as lift your mood and alertness during the day.
- Reduce the amount of blue light that screens emit by either changing the settings on your device (if there is a built-in function), or by using a free downloadable app, such as ***f.lux*** or ***Iris***, which reduces harsh blue light and turns your screen to a yellow/orange hue.
- Consider wearing specially tinted glasses that block much of the blue light when working on computers or even driving at night.